San Francisco’s Non-potable Water System Projects

San Francisco Public Utilities Commission
July 2018
San Francisco’s Non-potable Water Program creates a regulatory framework and streamlined permitting process for commercial, multi-family, and mixed-use developments in San Francisco to collect, treat, and reuse alternate water sources for toilet flushing, irrigation, and other non-potable uses. The program was established in September 2012 through Ordinance 195-12, commonly known as the Non-potable Water Ordinance, to allow the collection, treatment, and use of alternate water sources for non-potable applications. In October 2013, the Ordinance was amended to allow district-scale water systems consisting of two or more buildings sharing non-potable water. The Ordinance was further amended in July 2015 to mandate the installation of onsite water systems in new developments meeting specified criteria. Beginning November 1, 2016 all new development projects of 250,000 square feet or more of gross floor area must install onsite non-potable water systems to treat and reuse available alternate water sources for toilet and urinal flushing and irrigation. The Ordinance also requires new development projects between 40,000 and 250,000 square feet of gross floor area to submit a water budget application and Water Use Calculator to the San Francisco Public Utilities Commission (SFPUC).

In dense, urban centers like San Francisco, the use of on-site alternate water sources is a key strategy for expanding potable water savings. Alternate sources of water that can be used in a non-potable water system are:

- Rainwater – precipitation collected from roofs or other manmade above grade surfaces
- Stormwater – precipitation collected from at or below grade surfaces
- Graywater – wastewater from bathroom sinks, showers, and washing machines
- Blackwater – graywater and wastewater from kitchen sinks and toilets
- Foundation Drainage – nuisance groundwater that floods basements
- Other sources as approved by the San Francisco Department of Public Health (SFDPH)

San Francisco’s Non-potable Water Program is a collaborative program involving three San Francisco agencies: San Francisco Public Utilities Commission (SFPUC), San Francisco Department of Public Health (SFDPH), and San Francisco Department of Building Inspection (SFDBI). The SFPUC provides technical and financial assistance to assist developers through the processes for permitting, installing, and operating non-potable water systems. SFDPH regulates the water quality and monitoring requirements. SFDPH also issues operating permits and establishes reporting requirements for on-site treatment systems. SFDBI oversees the design and construction of non-potable water systems, and issues final approvals for building occupancy. Each project proponent must ensure that the project is designed and installed safely, complies with applicable laws and regulations, and is operated in a manner that causes no harm or damage to building occupants or others.

This report details developments in San Francisco that are currently operating or are in the process of installing a non-potable water system. As more of these systems are installed in San Francisco, they will be added to this report. More information about San Francisco’s Non-potable Water Program, including a developers guidebook, is available at: www.sfwater.org/np. If you have questions or need additional assistance, please email nonpotable@sfwater.org.
**San Francisco Public Utilities Commission Headquarters — 525 Golden Gate Avenue**

**Project Description:**
In the summer of 2012, the San Francisco Public Utilities Commission (SFPUC) completed construction of its new, 277,500 square-foot headquarters at 525 Golden Gate Avenue in San Francisco's Civic Center District. The LEED Platinum building, housing approximately 950 employees, contains two onsite water systems – a Living Machine® and a rainwater harvesting system.

The Living Machine®, treats all of the building’s wastewater, up to 5,000 gallons per day, and then distributes the treated water for toilet flushing. The system reduces the building’s potable water consumption by approximately 65% and provides an annual potable offset of approximately 1,500,000 gallons. The system utilizes a series of diverse ecologically engineered wetlands, located in the sidewalks surrounding the headquarters and in the building lobby, to treat the wastewater. This unique treatment process blends function and aesthetics – the wastewater is treated to San Francisco Department of Public Health (SFDPH) reuse standards while providing a high-profile pilot project for on-site water reuse.

The building also has a 25,000 gallon cistern to capture rainwater from the building's roof and children day care center’s play area. The water is treated and distributed to nine irrigation zones around the building where it is used for subsurface irrigation for non-Living Machine plantings and street trees. Due to the use of water-efficient landscaping, the rainwater cistern provides more than enough non-potable water to meet all of the building’s annual irrigation demands. The rainwater harvesting system provides an annual potable offset of approximately 8,000 gallons.

**Drivers for Non-potable Water Reuse:**
From the beginning of the planning stage for the building, the SFPUC’s goal was to have a headquarters that demonstrated the agency’s ambitious sustainability goals and served as an example for building smart, efficient, and sustainable buildings. As a water, wastewater, and power utility, the SFPUC recognized an opportunity to demonstrate its commitment to sustainable and innovative practices in water treatment and reuse by installing low-energy, high-profile non-potable water systems at its headquarters.

Installing the Living Machine also provided a pilot project for the San Francisco Non-potable Program, which was created by an ordinance adopted by the San Francisco Board of Supervisors in September.
2012. The Living Machine became the test case for the program, providing the SFPUC, SFDPH, and San Francisco Department of Building Inspection (SFDBI) with a project for the agencies to test and demonstrate the ideal methods for installing, permitting, and regulating onsite water systems.

Implementing the onsite water systems also allowed the headquarters to obtain additional LEED points towards LEED Platinum certification. The project received an additional six Water Efficiency (WE) points and two Regional Priority (RP) points by implementing the systems.

Finally, the rainwater harvesting system allows SFPUC headquarters to fulfill the requirements of the San Francisco Stormwater Management Ordinance. The Stormwater Management Ordinance requires projects disturbing 5,000 square feet or more of the ground surface to decrease the project’s post-construction stormwater runoff rate and volume by 25% for the 2-year 24-hour design storm.

Ownership Model:
The Living Machine and rainwater harvesting system are owned, operated, and maintained by the SFPUC. The SFPUC’s lead operator for the systems is a State of California Certified Grade V Wastewater Treatment Plant Operator. The operator has received extensive training on how to operate and maintain both systems.

Project Cost:
The Living Machine, rainwater harvesting system, and their distribution piping cost approximately $1,000,000. The non-potable water systems increased the building’s total construction costs of $146.5 million by less than 1%.

Annual Operations & Maintenance Cost:
TBD

Service Costs to Residents or Tenants:
Not applicable

Reference: John Scarpulla, San Francisco Public Utilities Commission (jscarpulla@sfwater.org)
# The Exploratorium — Pier 15

## Project Description:
After spending 44 years at the Palace of Fine Arts, in April of 2013, the internationally renowned Exploratorium moved to its new 330,000 square feet of indoor and outdoor exhibit space on Pier 15. The LEED Platinum museum, host to over 1,000,000 visitors in its first year, houses more than 600 exhibits and experiences for guests to explore and tinker. The new location, literally on top of San Francisco Bay, is being called a twenty-first-century learning laboratory, and is equipped with oceanographic equipment, which measures the height and direction of tides, pollutants in the air, and the weather.

One of the core goals of the Exploratorium is sustainability. This goal is showcased throughout the museum, and has been validated with the building’s LEED Platinum designation. A major goal the museum is working towards is to become the largest net-zero energy use museum in the United States. Water conservation is also a goal of the museum. In addition to the over 78,000 square feet of solar panels, the Exploratorium utilizes Bay water in its heating and cooling system, eliminating the need for a cooling tower, thereby saving an annual 2,000,000 gallons of water. To install the Bay water system, the Exploratorium had to obtain a National Pollutant Discharge Elimination System (NPDES) Permit from the local State of California Regional Water Quality Control Board to ensure that the system would not negatively impact the aquatic life and water quality of the Bay. The Exploratorium also has to provide annual reports.

## Project Status:
Online

## SFDPH Permit Issued:
Pending. NPDES Permit received from Water Quality Control Board.

## Size:
333,000 square feet

## Alternate Water Sources:
- Rainwater
- Bay water

## End Uses:
- Toilet flushing
- Heating and cooling

## Volume:
Up to 2,364,000 gallons/year (rainwater harvesting system and Bay water heating and cooling system)

## Potable Water Use Reduction:
30% (rainwater harvesting system only)

## Driver(s):
Project sustainability goals, public education, LEED Platinum Certification, and mandate (San Francisco Stormwater Management Ordinance)

## System Cost:
Not available

## Annual O&M Cost:
TBD

## Owner:
The Exploratorium
to the State to show compliance with their NPDES permit requirements.

The Exploratorium also has a 38,600-gallon cistern, which captures rainwater from the roof for toilet flushing purposes. The rainwater harvesting system can save up to 364,000 gallons annually, reducing water usage by approximately 30% in a year of average rainfall. Finally, the building is equipped with high-efficiency dual-flush toilets, waterless urinals, and low-flow sensor-operated faucets—reducing water consumption by another 30%.

**Drivers for Non-potable Water Reuse:**
From the beginning of the design stages for the Exploratorium, two primary objectives were to have a building that demonstrated the museum’s ambitious sustainability goals and served as a localized example of how buildings can be built in response to climate change. Incorporating the Bay water heating and cooling system and the rainwater harvesting system helped to achieve these objectives.

Implementing the onsite water systems also allowed the Exploratorium to obtain additional LEED points to help the project achieve LEED Platinum certification. The project received an additional six Water Efficiency (WE) points and two Regional Priority (RP) points by implementing the systems.

Finally, the rainwater harvesting system also allows the Exploratorium to fulfill the requirements of the San Francisco Stormwater Management Ordinance. The Stormwater Management Ordinance requires projects disturbing 5,000 square feet or more of the ground surface to decrease the project’s post-construction stormwater runoff rate and volume by 25% for the 2-year 24-hour design storm.

**Ownership Model:**
The Bay water cooling and heating system and rainwater harvesting system are owned, operated, and maintained by the Exploratorium.

**Project Cost:**
The new Exploratorium cost $220 million to build. The specific costs for the Bay water cooling and heating system cost and the rainwater harvesting system are not available. The NPDES permit from the Regional Water Quality Control Board for the Bay water heating and cooling system cost $1,943 in 2011.

**Annual Operations & Maintenance Cost:**
TBD

**Service Costs to Residents or Tenants:**
Not applicable

**Reference:** Jennifer Fragomeni, The Exploratorium (jfragomeni@exploratorium.edu)
Whole Foods Mixed-use Development — 38 Dolores Street

**Project Status:** Online

**SFDPH Permit Issued:** N/A (a rainwater harvesting project for non-spray irrigation does not need a permit)

**Size:** 195,000 square feet

**Alternate Water Sources:**
- Rainwater

**End Uses:**
- Subsurface irrigation
- Drip irrigation

**Volume:** 26,000 gallons/year

**Potable Water Use Reduction:** 26% for irrigation; 1.3% total project reduction

**Driver(s):** LEED Points, Sustainable SITES Pilot Project Certification, and mandate (San Francisco Stormwater Management Ordinance)

**System Cost:** Not available

**Annual O&M Cost:** Negligible

**Owner:** The Prado Group (Market Dolores LLC)

**Project Description:**
In fall 2013, the Prado Group (Market Dolores LLC) completed construction on a new 195,000 square-foot mixed-use development containing 81 residential rental units and a 30,000 square-foot Whole Foods grocery store on the ground level. Targeted for LEED Gold, the development — located between Market Street, Dolores Street, and 14th Street — contains a 16,200 gallon cistern that collects rainwater from all rooftop surfaces (traditional roofs, green roof, and flow-through planters). The harvested rainwater is used to irrigate all landscaping within the development via subsurface and drip irrigation systems. The cistern is sized to hold the required average annual detention volume associated with the San Francisco Stormwater Management Ordinance design storm event, while also taking into consideration the project’s monthly irrigation demand. The project will offset an estimated 26,000 gallons of potable water annually.

The project does not have a permit from the San Francisco Department of Public Health because rainwater systems that, at a minimum, include both a first flush diverter and a 100 micron filter, and are used for subsurface irrigation, drip irrigation, or non-spray surface irrigation, do not need one.
Drivers for Non-potable Water Reuse:
The project team installed the rainwater harvesting system to meet the requirements of the San Francisco Stormwater Management Ordinance. The Stormwater Management Ordinance requires projects disturbing 5,000 square feet or more of the ground surface to decrease the project’s post-construction stormwater runoff rate and volume by 25% for the 2-year 24-hour design storm. Installing a rainwater harvesting system with a 16,200 gallon cistern enabled the project to meet these requirements.

The project also installed the rainwater harvesting system to obtain LEED points to help the project achieve LEED Gold Certification. Additionally, the project was designed and certified as a Sustainable SITES Pilot Project, which also was a driver for installing the system. Sustainable SITES certification is given to projects that use sustainable practices that enable built landscapes to support natural ecological functions by protecting existing ecosystems and regenerating ecological capacity where it has been lost.

Ownership Model:
The rainwater harvesting system is owned, operated, and maintained by the Prado Group (Market Dolores LLC), which owns the development and leases the commercial spaces and residential units to tenants.

Project Cost:
The total hard cost for the project was $48 million. The contractor did not break out the cost of the rainwater harvesting system as a discrete item.

Annual Operations & Maintenance Cost:
The cost to operate and maintain the rainwater harvesting system is negligible.

Service Costs to Residents or Tenants:
There are no service costs to the commercial or residential tenants for use of the rainwater.

Reference: Jon Yolles, The Prado Group (jyolles@pradogroup.com); Eric Girod, BKF Engineers (egirod@bkf.com)
James R. Herman Cruise Terminal — Pier 27

Project Description:
On September 18, 2014, the James R. Herman Cruise Terminal – located at Pier 27 – opened its doors for business. The approximately 88,000 square foot, two-level cruise terminal facility, is located in the heart of The City right under Telegraph Hill, with San Francisco’s famous sights within walking distance. The modern terminal, designed to accommodate ships with up to 4,000 passengers, has all the functions and amenities a cruise ship might want. The terminal also includes a 2.3-acre raised plaza with grass and benches intended as a respite for visitors and residents alike.

A core objective of the James R. Herman Cruise Terminal design team was the integration of sustainable technologies in the project. The project was constructed using sustainable design practices in accord with Leadership in Energy & Environmental Design (LEED) standards. The terminal achieved LEED Silver certification due to all of its sustainable initiatives. The following are just some of the sustainable features of the terminal:

- Indoor plumbing fixtures operate 40% more efficient than existing code;
- Potable Water Use Reduction: 50%
- Alternate Water Sources: Rainwater
- End Uses: Toilet flushing, Irrigation
- Size: 88,000 square feet
- Volume: 370,000 gallons/year
- Potable Water Use Reduction: 50%
- Driver(s): LEED Certification and mandate (San Francisco Stormwater Management Ordinance)
- System Cost: $930,000
- Annual O&M Cost: $38,000
- Owner: The Port of San Francisco
• Landscape design resulted in more than 50% irrigation reduction compared to a mid-summer baseline;
• Energy efficient building envelope, lighting, and HVAC systems reduce energy needs by more than 18% compared to a mid-summer baseline;
• Building materials composed heavily of recycled, regional, and Forest Stewardship Council certified wood; and
• A construction process which diverted more than 75% of construction waste materials from landfill.

The terminal also includes a rainwater harvesting system. Rainwater from the roof is sent to a pre-filtration system, removing larger debris, before the collected rainwater drains to a five-tank, 42,000-gal rainwater harvesting system. The five cisterns are able to capture over 75% of the annual rainfall that hits the roof surface. The captured rainwater is used for toilet flushing in the main terminal, and also for outdoor irrigation of the facility’s gardens. However, before being used, the rainwater must undergo treatment. When there are toilet flushing and irrigation demands, rainwater is pumped from the cisterns through a filtration and ozone disinfection treatment system before entering dedicated plumbing lines to the toilets and irrigation zones. A digital rainwater control station houses all of the filters, treatment equipment, and controls.

The innovative rainwater harvesting system installed at the terminal saves approximately 370,000 gallons of potable water per year. The harvested rainwater covers roughly 70% of the terminal’s total non-potable demand, reducing the terminals overall water use by nearly 50%.

Drivers for Non-potable Water Reuse:
Implementing the rainwater harvesting system allowed the terminal to obtain additional LEED points to help the project achieve LEED Silver certification. The project received an additional six Water Efficiency (WE) points and two Regional Priority (RP) points by implementing the systems.

Additionally, the rainwater harvesting system also allows the terminal to fulfill the requirements of the San Francisco Stormwater Management Ordinance. The Stormwater Management Ordinance requires projects disturbing 5,000 square feet or more of the ground surface to decrease the project’s post-construction stormwater runoff rate and volume by 25% for the 2-year 24-hour design storm.

Ownership Model:
The rainwater harvesting system is owned by The Port of San Francisco who has hired Metro Cruise Services to operate and maintain the system.

Project Cost:
The James R. Herman Cruise Terminal cost $93 million to build. The rainwater harvesting system cost $930,000. These systems increased total construction costs by 1%.

Annual Operations & Maintenance Cost:
Maintaining the rainwater system has an annual cost of $38,000.

Service Costs to Residents or Tenants:
Not applicable

Reference: Lucas Yee, San Francisco Public Works (Lucas.Yee@sfdpw.org)
Project Description:
Nestled between the Civic Center and Tenderloin neighborhoods, 121 and 129 Golden Gate Avenue is a ten-story building housing Vera Haile Senior Housing and the St. Anthony’s Dining Room and Social Work Center. St. Anthony’s Dining Room is the only meal program in San Francisco that serves people 365 days a year. Situated on the first floor, the Dining Room serves 3,000 free meals a day and provides a place for people to socialize and find support, as more than 80% of their guests live alone. On the second floor, the building also houses St. Anthony Foundation’s Social Work Center and Free Clothing Program serving the wider community. From floors three through ten, Vera Haile Senior Housing provides affordable apartments for low-income seniors ages 62 and older. There are 90 units in the building, comprised of studios and one-bedroom units that are include with full kitchens and access to internet, cable, and telephone.

This 110,000 square foot building has several sustainability measures, including a solar thermal heating system, hydronic heating system, cool roofing
and high-reflectivity paving, low/no VOC sealants, and an energy efficient envelope and windows. It also has a rainwater harvesting system that will collect water from the roof into a 4,400 gallon cistern for storage. The rainwater is then treated onsite and pumped into restrooms within the Dining Room to flush toilets and urinals. With an average of 1000 Dining Room guests per day, it is estimated that demand for water in the Dining Room restrooms will match the volume of water collected in a normal wet season.

Drivers for Non-potable Water Reuse:
In order to meet the requirements of the San Francisco Stormwater Management Ordinance, the project team installed the rain harvesting system. The Stormwater Management Ordinance requires projects that disturb 5,000 square feet or more to decrease the project’s post-construction stormwater runoff rate and volume by 25% for the 2-year 24-hour design storm. Installing a rainwater harvesting system with a 4,400 gallon cistern enables the project to meet these requirements.

Ownership Model:
Mercy Housing California and the St. Anthony’s Foundation each own certain air rights parcels that are within the building. Mercy Housing California owns an air rights parcel that includes floors 3-10 and the part of the basement where the cistern, stormwater collection, storage, and the water treatment system are housed. St. Anthony’s owns an air rights parcel that includes Floors 1-2. Their stormwater distribution system is partially in both air rights parcels.

Project Cost:
The cost for the rain harvesting system is $400,000. $69 million is the total hard cost for the project ($42 million for the Vera Haile portion and $17 million for the St. Anthony’s portion).

Annual Operations & Maintenance Cost:
The license and testing requirements are approximately $2,500/annually. The project is budgeting $3,500 annually for maintenance.

Service Costs to Residents or Tenants:
Not applicable.

Reference: Sharon Christen, Mercy Housing California (schristen@mercyhousing.org)
Project Description:
The 300,000 square-foot Public Safety Building (PSB) project is a City and County of San Francisco facility that consists of a new six-story building and the rehabilitation of Fire Station #30. The PSB facility houses the Police Headquarters, the relocated Southern Police Station, and the new Fire Station #4. The renovated space in the former Fire Station #30 provides a community meeting space and offices for the San Francisco Fire Department (SFFD) Arson Task Force.

The PSB captures, treats, and reuses multiple alternate water sources using two separate onsite water systems. The first onsite water system treats a combined flow of graywater and condensate drainage for toilet flushing purposes. The proposed system provides enough treated non-potable water to cover all of the building’s toilet flushing demand, reducing the building’s annual potable water demand by approximately 333,000 gallons.

The building also has a rainwater harvesting system that collects rainwater from the building’s roofs and conveys it to a 44,500 gallon cistern in the basement. The rainwater is filtered and disinfected, then used for subsurface irrigation and as make-up water for the closed-loop cooling tower system. The cistern will always maintain a minimum water volume of 24,000 gallons.

Project Status: Completed
SFPDH Permit Issued: Pending
Size: 300,000 square feet
Alternate Water Sources:
• Graywater
• Condensate drainage
• Rainwater
End Uses:
• Toilet flushing
• Irrigation
• Cooling tower make-up
Volume: 748,000 gallons/year
Potable Water Use Reduction: TBD
Driver(s): LEED points and mandate (San Francisco Stormwater Management Ordinance)
System Cost: TBD
Annual O&M Cost: TBD
Owner: City and County of San Francisco
gallons in order to ensure a 96-hour emergency reservoir for cooling tower make-up. The system offsets an estimated 415,000 gallons of potable water annually.

**Drivers for Non-potable Water Reuse:**
The City and County of San Francisco requires all new public buildings to achieve LEED Gold certification. Installing the two non-potable water systems provides the PSB project an additional eight LEED points, thus helping the project achieve LEED Gold certification.

The project team also installed the rainwater harvesting system to meet the requirements of the San Francisco Stormwater Management Ordinance. The Stormwater Management Ordinance requires projects disturbing 5,000 square feet or more of the ground surface to decrease the project’s post-construction stormwater runoff rate and volume by 25% for the 2-year 24-hour design storm.

**Ownership Model:**
The City and County of San Francisco is the owner of the non-potable water systems and will be responsible for assigning appropriate personnel to operate and maintain them.

**Project Cost:**
The construction cost for the two systems is still being determined by the PSB project team. The total cost for the PSB project is $239 million. The Earthquake Safety and Emergency Response Bond which was passed by voters in June 2010, is funding the project.

**Annual Operations & Maintenance Cost:**
TBD

**Service Costs to Residents or Tenants:**
Not applicable

**Reference:** Samuel Chui, Department of Public Works (samuel.chui@sfdpw.org)
San Francisco Museum of Modern Art — 151 Third Street

The San Francisco Museum of Modern Art (image courtesy of Snohetta)

<table>
<thead>
<tr>
<th>Project Status:</th>
<th>Construction completed</th>
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<tr>
<td>SFDPH Permit Issued:</td>
<td>Yes</td>
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<tr>
<td>Size:</td>
<td>235,000 square feet</td>
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<tr>
<td>Alternate Water Source:</td>
<td>Rainwater</td>
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</table>
| End Uses: | • Toilet/urinal flushing  
| | • Irrigation  
| | • Cooling tower make-up |
| Volume: | 1,000 gpd; 365,000 gallons/year |
| Potable Water Use Reduction: | TBD |
| Drivers: | Sustainability goals, reduce potable water use, and compliance with San Francisco Stormwater Management Ordinance |
| System Cost: | Not available |
| Annual O&M Cost: | Not available |
| Owner: | San Francisco Museum of Modern Art |

**Project Description:**
The San Francisco Museum of Modern Art (SFMOMA) is a world-renowned modern art museum, showcasing over 33,000 pieces of modern and contemporary art. After a three year expansion project, SFMOMA will opened to the public in May 2016 with nearly triple the gallery space, free public spaces, free admission for all visitors 18 and under and enhanced educational programs. In addition to the new, ultra-modern architectural design, SFMOMA will incorporate sustainable elements throughout the museum such as garden terraces and a living wall. SFMOMA's commitment to sustainability is also evident through the implementation of its non-potable water reuse system. The non-potable system will capture rainwater for reuse in the building. The captured water will be treated by a filter assembly including a 50 micron filtration filter and a 20 micron bag type filter. After treatment, the water will be disinfected and distributed for non-potable applications, which include toilet flushing, make-up water for the cooling towers, and drip irrigation of the gardens and living wall. Overall, the system will save 365,000 gallons of potable water annually, equating to roughly 1,000 gallons of water per day.
Drivers for Non-potable Water Reuse:
SFMOMA is building on its tradition of innovation through the implementation of the onsite water system. By harvesting rainwater, the building will offset a significant amount of potable water needed for toilet flushing, irrigation, and cooling tower operation. Secondly, the integration of the onsite water system enables SFMOMA’s expansion project to meet the requirements of San Francisco’s Stormwater Management Ordinance. The Stormwater Management Ordinance requires projects disturbing 5,000 square feet or more of ground surface to decrease their post construction stormwater runoff rate and volume by 25% for the 2-year, 24-hour design storm.

Ownership Model:
The proposed rainwater reuse system will be owned, operated, and maintained by the San Francisco Museum of Modern Art.

Project Cost:
The estimated cost of onsite water system is not available.

Annual Operations & Maintenance Cost:
The estimated annual cost to operate and maintain the onsite water system is not available.

Service Costs to Residents or Tenants:
Not applicable

Incentives provided by SFPUC:
Not applicable

Reference: Bob Reuter, Reuter Project Management (reuter@ix.netcom.com)
Project Description:
The 283,940 square-foot Market Street Place, scheduled to open in 2016, is a brand new, six-level retail center with 91,870 square feet of sub-grade parking located at 945 Market Street. Situated between 5th and 6th Streets, the center contains an 18,300 gallon cistern which collects rainwater from a 48,000 square-foot roof. The cistern is sized to hold the required average annual detention volume associated with the San Francisco Stormwater Management Ordinance design storm event. Treatment for the rainwater will be provided by a Water Control Corporation RW-Series Skid Mounted Water Reclamation Packaged System consisting of 25 and 5 micron filtration followed by ultraviolet (UV) disinfection. After treatment and disinfection, the harvested rainwater will be used for cooling tower make-up and to flush 54 toilets and 18 urinals. The system will offset an estimated 446,000 gallons of potable water annually, reducing the project’s potable water use by approximately 12%.

Drivers for Non-potable Water Reuse:
The project team installed the rainwater harvesting system to obtain the LEED innovation in design credit of 40% potable water use reduction.
The project team is also installing the rainwater harvesting system to meet the requirements of the San Francisco Stormwater Management Ordinance. The Stormwater Management Ordinance requires projects disturbing 5,000 square feet or more of the ground surface to decrease the project’s post-construction stormwater runoff rate and volume by 25% for the 2-year 24-hour design storm. Installing a rainwater harvesting system with an 18,300 gallon cistern enables the project to meet these requirements.

Ownership Model:
The rainwater harvesting system is owned by CRP/Cypress Market Street LLC, who will contract a building management firm for operation. The contracted building operator will operate and maintain the system.

Project Cost:
TBD

Annual Operations & Maintenance Cost:
TBD

Service Costs to Residents or Tenants:
There are no service costs to the commercial tenants for use of the rainwater.

Reference: Phillip Alexander, Randall Lamb (PAlexander@RandallLamb.com); and Kathy Kwong, Gensler (Kathy_Kwong@Gensler.com)
**Project Status:** Under construction (estimated completion December 2016)

**SFDPH Permit Issued:** No

**Size:** 69,000 square feet

**Alternate Water Sources:**
- Rainwater

**End Uses:**
- Toilet flushing

**Volume:** 45,000 gallons/year

**Potable Water Use Reduction:** 10%

**Driver(s):** Project sustainability goals and mandate (San Francisco Stormwater Management Ordinance)

**System Cost:** $280,000 (estimated)

**Annual O&M Cost:** TBD

**Owner:** Mercy Housing California

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**Project Description:**
Located in the South of Market neighborhood in San Francisco, the 69,000 square-foot Bill Sorro Community, is a 100% affordable housing development. The project will demolish an existing building in favor of a nine-story, 85 foot tower with 67 affordable family apartments, restaurant, retail, and community space. Scheduled to open in 2016, the new project is proposing to install a 3,000 gallon cistern to collect rainwater from an 8,800 square-foot roof. The cistern is sized to hold the required average annual detention volume associated with the San Francisco Stormwater Management Ordinance design storm event. Treatment for the rainwater will consist of particulate filters to remove the suspended solids and ultraviolet (UV) disinfection prior to being distributed throughout the building for toilet flushing purposes. The system will offset an estimated 45,000 gallons of potable water annually, reducing the project’s potable water use by approximately 10%.

The project is also located in a designated recycled water use area under San Francisco’s Recycled Water Use Ordinance, and therefore will be plumbed to be ready for the eventual use of SFPUC recycled water for toilet flushing when rainwater is not available.
Drivers for Non-potable Water Reuse:
The project team will install the rainwater harvesting system to meet the requirements of the San Francisco Stormwater Management Ordinance. The Stormwater Management Ordinance requires projects disturbing 5,000 square feet or more of the ground surface to decrease the project’s post-construction stormwater runoff rate and volume by 25% for the 2-year 24-hour design storm. Installing a rainwater harvesting system with a 3,000 gallon cistern enables the project to meet these requirements. Another driver for implementing the rainwater harvesting system is to meet project sustainability goals, include exceeding the San Francisco Green Building Ordinance GreenPoint Rated system for multi-family buildings.

Ownership Model:
Mercy Housing California (MHC) is the owner/developer of the Bill Sorro Community. The City and County of San Francisco owns the land under the building, so there will be a ground lease for the land with the City and County of San Francisco. MHC will assign staff with the appropriate backgrounds from their maintenance team to be responsible for operating and maintaining the rainwater harvesting system.

Maintenance staff will be trained by the system manufacturer at the completion of the construction for continued operation and maintenance. The basic operations, inspection schedule, and routine preventative maintenance of the non-potable rainwater collection system will be covered during this initial training.

Project Cost:
The total cost for the rainwater harvesting system is estimated to be approximately $280,000.

Annual Operations & Maintenance Cost: TBD

Service Costs to Residents or Tenants:
There are no service costs to the tenants for the use of the rainwater.

Reference: Sharon Christen, Mercy Housing California (schristen@mercyhousing.org)
**181 Fremont Mixed-use Tower — 181 Fremont Street**

**Project Status:** Under construction (estimated completion July 2017)

**SFDPH Permit Issued:** No

**Size:** 706,617 square feet

**Alternate Water Sources:**
- Graywater
- Rainwater

**End Uses:**
- Toilet flushing
- Irrigation

**Volume:** 5,000 gpd; 1,300,000 gallons/year

**Potable Water Use Reduction:** 21%

**Driver(s):** Sustainability goals, LEED Points, and mandate (San Francisco Stormwater Management Ordinance)

**System Cost:** TBD

**Annual O&M Cost:** TBD

**Owner:** 181 Fremont Street LLC

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**Project Description:**

The 70-story, 706,617 square foot, 181 Fremont Mixed-use Tower is a world-class example of modern design and sustainability in a high-rise project. The Tower, which will be over 800 feet tall, features 435,000 square feet of class-A office space and 67 condominium residences on the top floors. Targeted for LEED Platinum, the development – located immediately adjacent to the future Transbay Transit Center – contains several sustainable features such as a 238-stall bike barn, a comprehensive transportation plan, regionally sourced building materials, and a comprehensive lighting design that increases access to the night sky and reduces urban sky glow.

The Tower also includes an onsite water system which will capture, treat, and reuse graywater and rainwater. Graywater will be collected from the condos (showers, laundry and bathroom sinks) and commercial office floors (bathroom sinks), while rainwater will be captured from the roof of the building. The captured graywater will be treated in an Aquacell G20 Treatment System in the lowest basement level of the building. The self-contained treatment system is based on membrane bioreactor technology, a widely employed treatment technology for onsite systems. The system
is ideal for the project because of its small footprint, tight quality controls, high yield and consistent production of high quality treated water. The onsite graywater system will provide up to 5,000 gallons per day of recycled water for toilet and urinal flushing and irrigation, saving annually up to 1.3 million gallons of potable water. Rainwater will be treated in a PHOENIX Rainwater Treatment System, then combined with the treated graywater for the final stage of disinfection. The two sources utilize different process treatment trains by design, however the systems are integrated, offering a central control interface and providing the building with a single supply of highly treated recycled water.

**Drivers for Non-potable Water Reuse:**
From the beginning of the design stages, a primary objective of the Tower was to showcase ambitious sustainability measures in an ultra-modern design. The Tower will serve as a localized example of how buildings can achieve multiple aesthetic and sustainability goals. Implementing the onsite water system also allows the Tower to obtain additional LEED points towards LEED Platinum certification. The project will receive an additional six Water Efficiency (WE) points and two Regional Priority (RP) points by implementing the system. Additionally, by integrating rainwater into the non-potable water system, the Tower is able to fulfill the requirements of the San Francisco Stormwater Management Ordinance. The Stormwater Management Ordinance requires projects disturbing 5,000 square feet or more of the ground surface to decrease the project’s post-construction stormwater runoff rate and volume by 25% for the 2-year 24-hour design storm.

**Ownership Model:**
While the onsite water system is owned by 181 Fremont Street LLC, system design, permitting, installation supervision, commissioning, and operations is the responsibility of PHOENIX Process Equipment Co. (via joint-venture with Aquacell).

**Project Cost:**
TBD

**Annual Operations & Maintenance Cost:**
TBD

**Service Costs to Residents or Tenants:**
TBD

**Incentives provided by SFPUC:**
By reducing potable water consumption by over 1,000,000 gallons per year, the 181 Fremont Mixed-use Tower meets the SFPUC’s Grant Assistance for Large Alternate Water Source Projects eligibility criteria for building-scale projects. The project applied for $250,000 under the SFPUC’s Grant Program, and was issued a Grant Reservation Letter by the SFPUC for that amount. The $250,000 in grant funds will be provided in 3 disbursements when the project meets specific milestones.

**References:** Bill Worthen, Urban Fabrick, Inc. (Bill@urbanfabrick.com); and Mark Meredith, PHOENIX/Aquacell (MarkM@aquacell.us)
UN Plaza Foundation Drainage Project — Market Street

**Project Description:**
The UN Plaza is located along Market Street between 7th and 8th Streets in San Francisco’s Civic Center neighborhood. The Plaza, which is publicly owned and maintained by San Francisco Public Works, was built in 1975 as part of the Market Street Reconstruction Project which coincided with the construction of the Bay Area Rapid Transit (BART) stations along Market Street. The majority of the Civic Center neighborhood was built over an underground branch of Hayes Creek. As a result, San Francisco Public Works encountered foundation drainage issues caused by the construction of a deep vault below the UN Plaza Fountain. Public Works recognized foundation drainage as a valuable alternate water source and historically pumped the water at UN Plaza to a truckfill station used for street cleaning on Market Street. However, that operation was abandoned over thirty years ago. Now, Public Works plans to restart water reuse operations underneath the UN Plaza Fountain and take back the under-utilized resource.

Per San Francisco Mayor Ed Lee’s Executive Directive 14-01, San Francisco City and County Agencies are

**Project Status:** Design

**SFPDPH Permit Issued:** No

**Size:** N/A

**Alternate Water Sources:**
- Foundation Drainage

**End Uses:**
- Irrigation
- Street Sweeping
- Make-up water in UN Plaza Fountain

**Volume:** 14,500 gpd; 5,292,500 gallons/year

**Potable Water Use Reduction:** TBD

**Driver(s):** Reduce potable water use and comply with Executive Directive 14-01

**System Cost:** $3,000,000

**Annual O&M Cost:** TBD

**Owner:** San Francisco Public Works
working to develop alternative local water sources. Following the intent of the Directive, Public Works and SFPUC began discussing the possibility of implementing an innovative Foundation Drainage Reuse Project at UN Plaza. The proposed project will recycle foundation drainage underneath the UN Plaza fountain for beneficial purposes such as irrigation, street sweeping, and use in the Plaza Fountain.

To treat the foundation drainage for reuse, the project will use multiple step media filtration coupled with disinfection. The treated water will be stored in a 15,000 gallon tank that will be located in the existing UN Plaza Fountain reservoir. The onsite water system is projected to provide 14,500 gallons of recycled water per day and 5,292,500 gallons annually.

Drivers for Non-potable Water Reuse:
A primary objective for Public Works is to reduce potable water use. Municipal street sweeping operations in the Civic Center and Tenderloin neighborhoods require multiple truck fills each day, using up to 6,000 gallons per day. Additionally, irrigation around the UN Plaza, City Hall, Civic Center Plaza, Asian Art Museum, and Main Library use up to 37,000 gallons per day, most of which could be met using this non-potable water supply. Lastly, the UN Plaza Fountain loses 50 gallons per week due to evaporation and the non-potable water supply will help offset this water demand. Implementing the onsite water system allows Public Works to utilize foundation drainage as a resource to offset their potable water needs in the UN Plaza area.

Ownership Model:
The proposed foundation drainage treatment and reuse system project is owned, operated, and maintained by San Francisco Public Works.

Project Cost:
The estimated cost for the onsite water system is $3,000,000.

Annual Operations & Maintenance Cost: TBD

Service Costs to Residents or Tenants:
Not applicable

Incentives provided by SFPUC:
The UN Plaza Foundation Drainage Reuse project meets the SFPUC’s Grant Assistance for Large Alternate Water Source Projects eligibility criteria for projects that replace at least 3,000,000 gallons of potable water annually for ten years. The project applied for $500,000 under the SFPUC’s Grant Program, and will be provided with the funds when the project meets specific milestones.

Reference: Ellen Wong, San Francisco Public Works (Ellen.Wong@sfdpw.org)
Project Description:
The Transbay Transit Center plans to capture, filter, and reuse graywater and stormwater through green infrastructure systems. Treated stormwater and graywater will supply about 3.5 million gallons of non-potable water for toilet flushing each year and will meet 25% of the building’s annual flushing demand. While the actual volume of non-potable water will vary seasonally depending on available stormwater, the water reuse system in combination with water-efficient fixtures is expected to reduce annual potable water demand by 49%, or about 12 million gallons (33,000 gallons per day), and sewage conveyance by 50% over a LEED baseline building.

Given that the project is located in a designated recycled water use area under the City’s Recycled Water Use Ordinance, dual-plumbing will be required for eventual use of SFPUC recycled water. Irrigation uses at the Transbay Transit Center will be supplied with potable water from the SFPUC until municipal recycled water becomes available.
Drivers for Non-potable Water Reuse:

Pelli Clarke Pelli Architects submitted the winning proposal in a design competition held by the Transbay Joint Powers Authority for the Transbay Transit Center project. Pelli Clarke Pelli pursued a unique design that included elements such as reduced water use and a vegetated 5-acre Roof Park. Regulatory requirements were implemented at the time of design development, notably the SFPUC’s Stormwater Design Guidelines (SDG), which require the project to manage a portion of stormwater runoff on site. Complying with the SDG meant that the project would need to incorporate stormwater storage, and using this storage for a water reuse system helped make the SDG requirements more achievable. Although the vegetated Roof Park was conceived as a community amenity, the design team looked for opportunities to utilize it more effectively as green infrastructure to capture, retain, and use stormwater.

Ownership Model:
The Transbay Joint Powers Authority (TJPA) is responsible for the design, development, construction, and operation of the new Transbay Transit Center and its associated facilities. The TJPA is a regional government entity created by state law to exercise the joint powers of its authority members: the City and County of San Francisco, the Alameda–Contra Costa Transit District, the Peninsula Corridor Joint Powers Board, and the California Department of Transportation.

Project Cost:
The water reuse system is being funded as part of the larger Transbay Transit Center Program. As a large public project, the Program receives funding from diverse local, regional, state, and federal sources. The first phase of the Program is fully funded at a cost of $1.89 billion. Federal funding includes a $171 million Transportation Infrastructure Finance and Innovation Act (TIFIA) loan, in addition to a $400 million federal economic stimulus grant. The TIFIA loan will be repaid by a variety of grants, land sale proceeds, lease income from acquired right-of-way parcels, and other one-time revenue generation opportunities.

Annual Operations & Maintenance Cost:
TBD

Service Costs to Residents or Tenants:
Tenants of the Transbay Transit Center will not have access to non-potable water for reuse, as all of the graywater and stormwater captured will be treated and used for toilet flushing in the public spaces of the Transbay Transit Center terminal, which are operated by the owner (TJPA). Because the TJPA will use all of the treated graywater and stormwater, there is no pricing structure.

Reference: Claire Maxfield, Atelier Ten (Claire.Johnson@Atelierten.com)

The Transbay Transit Center (image courtesy of the Transbay Joint Powers Authority [TJPA] and Project Architect: Pelli Clarke Pelli)
Moscone Center Expansion Project — 747 Howard Street

**Project Description:**
City and County of San Francisco’s Convention Facilities Department, in conjunction with San Francisco Public Works and the San Francisco Tourism Improvement District Management Corporation (SFTID), have partnered to develop the $500 million expansion to Moscone Convention Center. The project will have a contiguous exhibition space of more than 500,000 square feet, three new ballrooms, more than 80 state-of-the-art new flexible meeting rooms, more than 20,000 square feet of secure outdoor spaces and more than 8,000 square feet of new public open space.

Aiming for LEED Platinum certification, the expanded convention center will have several sustainable features, such as the largest rooftop solar array in San Francisco, zero-emissions electricity, and daylight harvesting to offset electrical lighting. When complete, the building will be one of the most compact, efficient and sustainable convention centers in the U.S., with the lowest carbon footprint per visitor and one of the lowest energy consumption rates per visitor in the world. The building will also have net-positive water usage, meaning that the project intends to export more non-potable water offsite than the amount of potable water consumed onsite.

As part of the expansion, the project showcases a district-scale onsite water system that will harvest, treat and reuse rainwater from the new building’s roof, foundation drainage from the existing building, and steam condensate from the new building’s heating

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**Project Status:** Under construction (estimated completion December 2018)

**SFDPH Permit Issued:** No

**Size:** 1.5 million square feet

**Alternate Water Sources:**
- Rainwater
- Foundation Drainage
- Steam Condensate

**End Uses:**
- Toilet/urinal flushing
- Irrigation around Moscone Center and the Yerba Buena Gardens
- Street cleaning

**Volume:** 15 million gallons/year

**Potable Water Use Reduction:** Meets 100% of onsite non-potable demands & provides offsite potable water demand offset

**Drivers:** LEED certification, compliance with San Francisco Mayoral Executive Directive 14-01, and compliance with San Francisco’s Stormwater Management Ordinance

**Onsite Water System Cost:** $2.5 million

**Annual O&M Cost of Onsite Water System:** TBD

**Owner:** Convention Facilities Department
system. The rainwater, foundation drainage and steam condensate will be collected in a 70,000-gallon tank where it will undergo multi-step filtration and UV disinfection. After treatment, the water will be distributed for use in Moscone Center’s toilets and urinals, the irrigation systems around Moscone Center and Yerba Buena Gardens, and a street cleaning truck fill station that will provide treated water for Public Works street cleaning trucks to use throughout the City. A district-scale onsite water system is optimal for Moscone Center and its neighbors due to the large demand for non-potable water in the area and the availability of a significant amount of foundation drainage. Overall, the onsite water system will offset more than 15 million gallons of potable water annually and help the Moscone Center expansion export more water than the facility consumes.

Drivers for Non-potable Water Reuse:
The project team recognizes that reclaiming and reusing water is the right thing to do, particularly in a state with a history of drought. Other drivers include:

- The LEED Platinum certification target.
- San Francisco Mayor Ed Lee’s Executive Directive 14-01, which requires San Francisco City and County agencies to develop alternative local water sources. Prior to the Directive, San Francisco Public Works implemented a strategy for an onsite water system to take advantage of local water resources for reuse.
- San Francisco’s Stormwater Management Ordinance that requires projects disturbing 5,000 square feet or more of ground surface to decrease their post construction stormwater runoff rate and volume by 25% for the 2-year, 24-hour design storm.

Ownership Model:
The proposed rainwater, foundation drainage, and steam condensate treatment and reuse system project is owned, operated, and maintained by San Francisco Conventions Facilities Department.

Onsite Water System Project Cost:
The estimated cost of the system is $2.5 million.

Annual Operations & Maintenance Cost of Onsite Water System:
TBD

Service Costs to Residents or Tenants:
Not applicable

Incentives provided by SFPUC:
The Moscone Center Expansion project meets the SFPUC’s Grant Assistance for Large Alternate Water Source Projects eligibility criteria for projects that replace at least 3 million gallons of potable water annually for 10 years. The project applied for $500,000 under the SFPUC’s Grant Program and will receive the funds when the project meets specific milestones.

Contact: Brook Mebrahtu, San Francisco Public Works (Brook.Mebrahtu@sfdpw.org)
**Future Projects:**
SFPUC staff continues to receive applications from developments proposing to implement non-potable water systems. Staff also regularly meets with project teams interested in integrating systems into future developments. The following is a list of projects in San Francisco that are proposing to implement non-potable water systems in the future:

<table>
<thead>
<tr>
<th>Project Name</th>
<th>Alternate Water Source(s)</th>
<th>End Use(s)</th>
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</thead>
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<td>Transbay Tower</td>
<td>Rainwater</td>
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</tr>
<tr>
<td>Alta Laguna</td>
<td>Rainwater</td>
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<tr>
<td>250 4th Street</td>
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<td>Hunters View (Phase 3)</td>
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<td>CPMC: St. Luke’s</td>
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</tr>
<tr>
<td>CPMC: Cathedral Hill</td>
<td>Rainwater</td>
<td>Irrigation</td>
</tr>
<tr>
<td>CPMC: Van Ness MOB</td>
<td>Rainwater</td>
<td>Irrigation</td>
</tr>
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<td>350 8th Street</td>
<td>Rainwater</td>
<td>Irrigation</td>
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<td>Starr King Elementary</td>
<td>Rainwater</td>
<td>Toilet Flushing</td>
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<tr>
<td>SFSU</td>
<td>Graywater</td>
<td>Irrigation, Toilet Flushing</td>
</tr>
<tr>
<td>1395 22nd Street</td>
<td>Rainwater, Graywater</td>
<td>Irrigation, Toilet Flushing</td>
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<tr>
<td>5050 Mission</td>
<td>Rainwater</td>
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<tr>
<td>510 Townsend</td>
<td>Rainwater, Graywater, Condensate</td>
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<td>UBER Headquarters</td>
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</tr>
<tr>
<td>Transbay Block 9</td>
<td>Rainwater, Graywater, Condensate</td>
<td>Irrigation, Toilet Flushing</td>
</tr>
<tr>
<td>Thomas Mellon Residences</td>
<td>Rainwater, Graywater</td>
<td>Irrigation, Toilet Flushing</td>
</tr>
<tr>
<td>Park Tower</td>
<td>Rainwater</td>
<td>Irrigation, Toilet Flushing</td>
</tr>
</tbody>
</table>
The Alta Laguna project is proposing to capture and treat rainwater for irrigation (image courtesy of BAR Architects)

The CPMC Cathedral Hill Hospital plans to harvest rainwater for irrigation (image courtesy of CPMC)