PROJECT FINAL REPORT

City of Oakland Rainwater Harvesting Project

San Francisco Bay Watershed

August 2009 through March 2013

CITY OF OAKLAND AND CALIFORNIA STATE WATER RESOURCES CONTROL BOARD

Agreement No: 09-811-550

Project No: C-06-6443-110

Funding Type:

Clean Water State Revolving Fund

American Recovery and Reinvestment Act of 2009

Total Project Cost:

$1.2 million

EXECUTIVE SUMMARY

The City of Oakland Rainwater Harvesting Program (program) consisted of providing subsidized rain barrels and cisterns to Oakland residents to reduce stormwater peak flows and to store rainwater for landscaping irrigation. The program included rain barrel and cistern sales, marketing and surveys, public hands-on workshops, promotional activities, Web site development, social media, demonstration installations, data collection and analysis and monitoring. Close to 1,400 homes installed rainbarrels and cisterns, and four large demonstration projects were installed for a total of over 400,000 gallons of new rainwater retention. Additionally, hundreds of residents personally participated in the eight hands-on public workshops and thousands more were reached through over 50 promotional activities and the 45 public education events.

PROBLEM STATEMENT & RELEVANT ISSUES

Roofed structures and other impervious surfaces are known to shed rainwater more quickly than undeveloped vegetated landscapes. The conversion of vegetated landscapes to impervious surface areas in sloped erodible landscapes concentrates stormwater flows and is known as Hydromodification. Hydromodification can increase landslide risk, increase erosion, and negatively impact aquatic and riparian habitats. With continued development, the costs associated with improving and maintaining stormwater infrastructure also increase.

In recent years, rain barrels and cisterns have grown in popularity to both reduce stormwater contributions from roofs as well as store small amounts of water for outdoor irrigation. The rainwater program was implemented to address hydro-modification by promoting sustainable practices for stormwater source control by offering low cost rain barrels and cisterns to detain stormwater. Through public workshops, educational materials and Web sites, the program also taught residents in the practices of wise stormwater management, climate appropriate landscape vegetation, and water conservation.

PROJECT GOALS

The overall goal is to improve water quality in the San Francisco Bay and local watersheds that drain into San Francisco Bay by reducing erosive flows through on-site stormwater retention and infiltration.

PROJECT DESCRIPTION

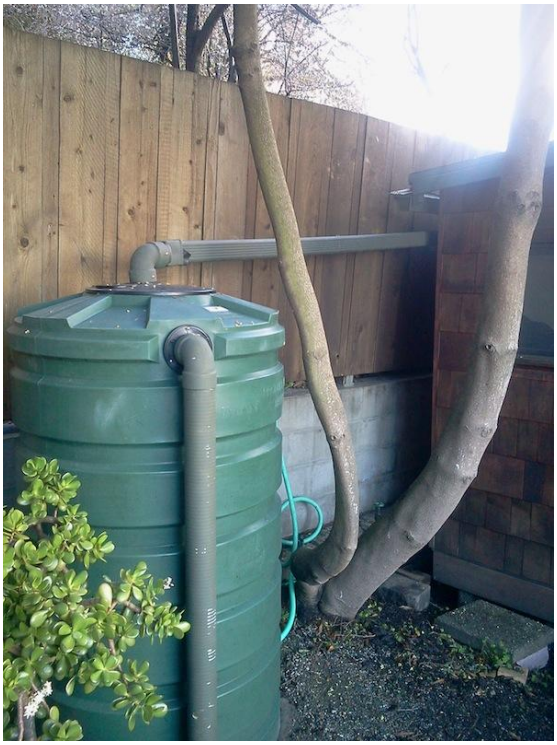
The City of Oakland Rainwater Harvesting Program provided City of Oakland residents with an opportunity to reduce stormwater runoff impacts by slowly releasing water that typically would rapidly enter the stormdrains, sewer system, creeks, Lake Merritt, and the San Francisco Bay and to conserve water by storing rainwater for later re-use for landscape irrigation purposes. The program provided subsidized rain barrels and cisterns to Oakland residents, completed marketing and surveys, public hands-on workshops, created Web site resources, built demonstration installations, and collected data for analysis and monitoring.

Project Activities Included:

- ***Rainbarrels -*** Purchasing rain barrels and cisterns from vendors at bulk rates and providing then to Oakland residents at low or no cost
- ***Advertising and Promotion -*** Conducting advertising and outreach to promote the reduced cost rain barrels and cisterns
- ***Public Education -*** Conducting public education and workshops to promote wise stormwater Management
- ***Demonstration Projects -*** Installing large publically accessible demonstration cistern projects
- ***Mapping and Monitoring -*** Recording, mapping, and monitoring the use and effectiveness of rain barrel and cisterns in reducing stormwater impacts and conserving water.

Rainbarrels

1,396 homes purchased and installed 2708 rainbarrels and cisterns, for a total of 400,545 gallons of new rainwater retention in the City of Oakland.



Oakland rain barrel pick-up events

To facilitate distribution of the rain barrels, pick-up events were regularly held in sites throughout Oakland including regular events at Merritt College in 2011, monthly events in Montclair for most of 2012, and at American Steel Studios every Saturday from mid-October through November 2012.

Advertising and Promotion

The City conducted various advertising and promotional efforts including in-person literature distribution, paid print advertising, in-store promotional displays, media events and promotion, and on-line promotion such as website and facebook postings and list serve messages.

Literature Distribution

1/10/11 – Oakland Colliseum Swap Meet

7/31/11 – Temescal neighborhood

9/3/11 – Temescal neighborhood

1/7/12 – Grand Lake neighborhood

1/8/12 – Temescal neighborhood

1/8/12 – Rockridge neighborhood

2/18/12 – Grand Lake neighborhood

2/26/12 – Temescal neighborhood

4/21/12 – Oakland Earth Day (90 sites)

4/29/12 – Bay Friendly Native Garden Tour (10 sites)

5/6/12 – Bring Back the Natives Garden Tour (5 sites)

8/1/12 – Planting Justice door-to-door canvasing

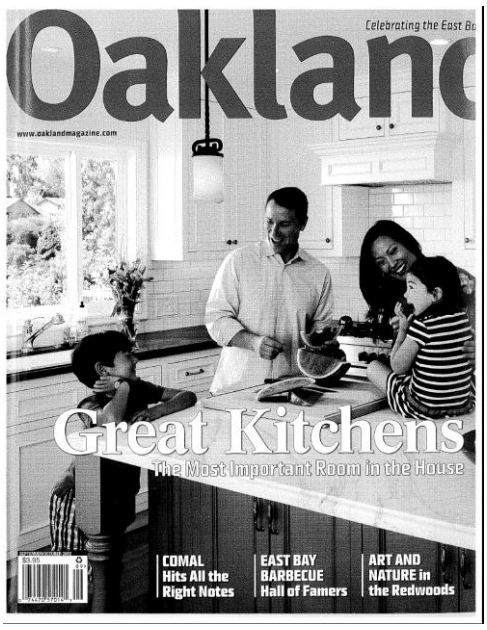
8/7/12 – National Night Out (2 sites)

9/15/12 – Oakland Creek to Bay Day (29 sites)

Advertisements

San Francisco Chronicle advertisement *paid for by Bushman* (9/5/12 - 9/30/12) print ad circulation 22,000; on-screen impressions 250,000.

September/October 2012 issue of Oakland Magazine - circulation 20,440



Mailers

A double sided-bill insert was included in fall 2012 City of Oakland garbage bills; the garbage bill goes to over 80,000 recipients.

In-Store Displays

8/11 through 12/12 – ORBP Banner, barrel display, posters and flyers at Urban Farmer Store

8/12 through 11/12 – ORBP barrel display with posters & flyers at Thornhill Nursery

Media Promotion

11/06/11 - San Francisco Chronicle
http://www.sfgate.com/homeandgarden/checkitoff/article/November-gardening-essentials-2324517.php

1/1/12 - KPFA Radio (Terra Verde) http://www.kpfa.org/archive/id/77085

2/15/12 - Press Conference at residential home

2/16/12 – Oakland North http://oaklandnorth.net/2012/02/16/rainbarrel_phillips_draft/

2/20/12 – Oakland Local http://oaklandlocal.com/posts/2012/02/detain-rain-low-cost-rain-barrels

March/April 2012 – Oakland Magazine http://www.oaklandmagazine.com/Oakland-Magazine/March-April-2012/Catch-the-Rain/

4/2/12 - Bay Friendly blog www.bayfriendlyblog.org/2012.01.rainwater-harvesting.html

5/1/12 – Oakmoor Neighborhood newsletter

7/7/12 – Oakland Local http://oaklandlocal.com/article/free-rain-barrels-water-conservation-erosion-reduction-available-oakland-residents-through-y

12/3/12 – StopWaste article http://schools.stopwaste.org/share/high-school/skyline/1058-rain-catchment-at-skyline.html

3/17/13 – LID workshop covered by Estuary News writer

On-Line Promotion

City of Oakland website

Oakland Rain Barrel Program facebook promotion

Craigslist postings (10 postings about ORBP events)

Listserv Promotion

Asian Pacific Environmental Network - http://www.apen4ej.org/

Bay Area Open Space Council - http://www.openspacecouncil.org/

Bay Localize - http://www.baylocalize.org/

Bay Planning Coalition - http://bayplanningcoalition.org/

CA League of Conservation Voters - http://www.ecovote.org/

Center for Environmental Health - http://www.ceh.org/

Chabot Space and Science Center - http://www.chabotspace.org/index.htm

City Slicker Farms - http://www.cityslickerfarms.org/

Communities for a Better Environment - http://www.cbecal.org/

East Bay Alliance for a Sustainable Economy - http://www.workingeastbay.org/

East Bay Express - http://www.eastbayexpress.com/

East Bay Permaculture - Yahoo group

East Bay Regional Parks District - http://www.ebparks.org/

Eco Events - www.ecovegevents.com

Ecology Center - http://www.ecologycenter.org/

Estuary Newsletter Global Footprint Network - www.abag.ca.gov/bayarea/sfep

Friends of Sausal Creek - neighborhood yahoo group

Global Footprint Network – www.footprintnetwork.org/en/index.php/GFN/

Habitat for Humanity East Bay - http://www.habitateb.org/

Hillcrest newsletter - neighborhood yahoo group

Indy Bay - http://www.indybay.org/

KPFA - http://www.kpfa.org/supportkpfa/

Mayor Quan's Newsletter - http://jeanquan.org/

Nature in the City - http://natureinthecity.org/

North Oakland Voters Alliance - neighborhood yahoo group

Oakland Magazine - http://www.oaklandmagazine.com/Oakland-Magazine/Events/Calendar/index.php

Peralta Park Center - http://www.peraltahacienda.org/pages/main.php?pageid=1&pagecategory=1

Planting Justice - http://plantingjustice.org/

Redwood Heights - neighborhood yahoo group

San Francisco Estuary Partnership - http://www.sfestuary.org/pages/home.php

Save the Bay - http://www.savesfbay.org/

SF Bay Guardian - http://www.sfbg.com/index.php

Sierra Club - http://www.sierraclub.org/

Urban Habitat - http://urbanhabitat.org/sec

The Watershed Project - www.thewatershedproject.org

Wholly H2O - http://www.whollyh2o.org

Public Education

Public Rainbarrel and Stormwater Management Workshops

Merritt Self Reliant House, January 2012 Presentation included an overview of rainwater catchment design and installation guidelines, and rain garden practices, and included an interactive exercise, showing participants how to calculate runoff, and a guided installation of four daisy chained rainbarrels.

Castlemont High School Workshop, December 8, 2012 Provided an informal workshop with the nonprofit, Youth Uprising, Castlemont High School students and ORBP participants. The event was a 15 minute presentation of the value and need for rainwater catchment and how rainwater systems work and what tools and parts are involved. The youth participants then worked to install a 305-gallon rain tank to the school garden tool shed.

Skyline High School Workshop, December 1, 2012 Rainwater catchment presentation and tour of Skyline High School workshop. The presentation included an overview of rainwater catchment design and installation guidelines followed by a tour of the cistern project. Participants were also provided with information about the essential construction tools, and how they're used as well as rainwater sample parts. DIG led a rain garden planting for the cistern project.

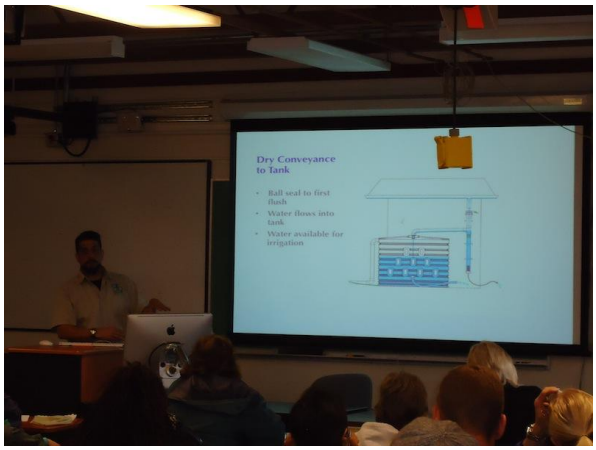
Sausal Creek Residential demonstration workshop, May 12, 2012 This workshop was in coordination with Friends of Sausal Creek and held at a home in the Oakmore Hills. Participants had a presentation of rainwater catchment basics and then participated in the installation of two different styles of rain tanks in separate locations on the property.

Chabot Space & Science Center Workshop, September 8, 2012 The presentation included an overview of rainwater catchment design and installation guidelines followed by a tour of the cistern project. Participants then joined breakout groups of technical support, tools and demo system, cistern demo project testing of distribution line, and an outreach focus group.

Rainwater Catchment Presentation at Laurel ACE Hardware , November 3, 2012 Provided two one hour presentations (12 noon and 1pm) in the outdoor patio of ACE Hardware. Presentation included design and installation basics, drawing and a Q&A session and discussion after each presentation.

Merritt College (Horticulture Department) Workshop, February 23, 2013 The presentation included watershed and stormwater management and Low Impact Development as well as a sampling of their hydrology study and the benefits of throughout the city followed by a tour of the demonstration systems, and general tools used for rainwater catchment.

Redwood Heights Rec. Center, March 17, 2013 The workshop included a presentation of watershed and stormwater management and and comprehensive overview of Low Impact Development strategies and best practices. The presentation was followed by breakout groups of a watershed model demonstration, rainwater catchment tools and sample parts and a tank mockup/demonstration, showing each component of the system.



Presentations at Public Meetings

9/21/11 - Friends of Sausal Creek Meeting

1/30/12 - Piedmont Pines Neighborhood Association Meeting

2/18/12 – Bella Vista Community Garden, Golden Gate Community Garden

5/3/12 – Berkeley Ecology Center

6/1/12 – StopWaste Landscaping for Watersheds Forum

6/6/12 – Urban Farmer Store Open House

7/5/12 – Longfellow Community Church Neighborhood Meeting

7/21/12 – Urban Farmer Store Open House

7/29/12 – Laurel Ace Hardware Staff Meeting

8/11/12 – Oakland Community Garden Tour of Lake Merritt Gardens

8/12/12 – Green Sangha Organization

8/26/12 – Bushrod Community Garden Workday

9/18/12 – Berkeley Climate Action Coalition Meeting

11/11/12 – SF Green Festival

Tabling Events

7/31/11 – Temescal Farmers Market

9/3/11 – Temescal Farmers Market

10/1/11 – Oaktober Fest (Dimond District)

10/18/11 – Friends of Sausal Creek Plant Sale

10/22/11 – Oakland Family Preparedness Fair

10/30/11 – Bishop O'Dowd Harvest Fair

12/4/11 – Montclair Farmers Market

12/6/11 – Seeds of Resilience (Women's Earth Alliance)

12/10/11 – Grand Lake Farmers Market

4/26/12 – Peralta Community College Fair

4/26/12 – EBMUD Earth Day Fair @ Laney College

5/6/12 – East Bay Rose Society

6/14/12 – Parklet/Co-Housing Conference

7/8/12 – Temescal Street Fair

7/14/12 – Redwood Heights Day in the Park

8/4/12 – Art & Soul Festival

8/5/12 – Art & Soul Festival

8/11/12 – Temescal Community Garden Workday

8/11/12 – Laurel Street Fair

9/7/12 – Oakland Art Murmur

10/5/12 - Oakland Art Murmur

10/7/12 – Bring Back the Natives Plant Sale @ East Bay Wilds Nursery

11/3/12 – Laurel Ace Hardware

12/8/12 – Bushman Technical Focus Group @ Urban Farmer Store


Catch the Rain
Be part of the healthy watershed & stormwater solution!
Discounted rain barrels & tanks available for Oakland residents.
Purchase yours at www.oaklandpw.com/rainbarrel
watersheds@oaklandnet.com


FORMATION BOOTH
Institute of Marin
Catch the Rain


OAKLAND
RAIN
BARREL
PROGRAM
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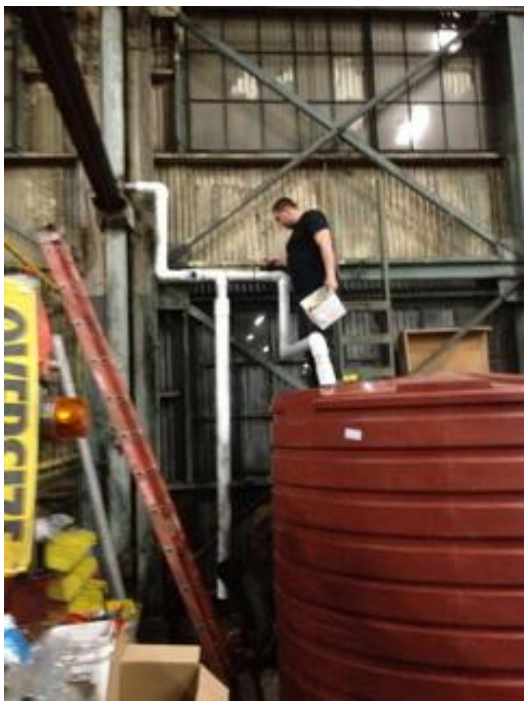
For further information: info@dig.coop or watersheds@oaklandnet.com

Demonstration Projects

As part of the grant, the City installed four publically accessible demonstration cistern projects. These projects, which included examples of other stormwater quality technologies such as rain gardens, are permanently available to the public and provide helpful visual guidance.

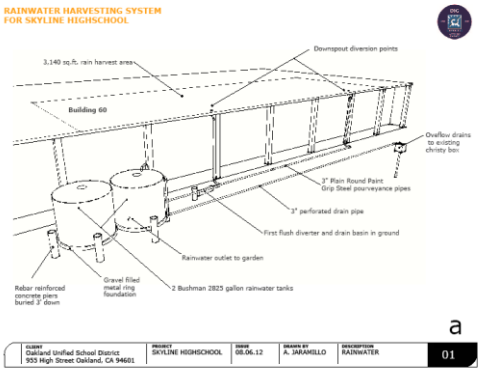
American Steel Studios:
two 2825 gallon cisterns

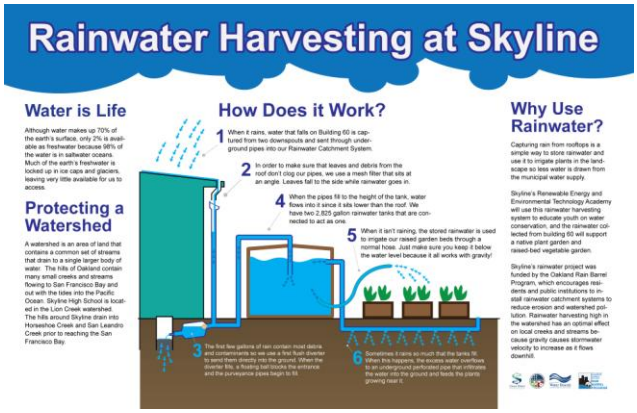


Chabot Space & Science Center:
2825 gallon cistern

Chabot Equestrian Center: Three 2825 gallon cisterns

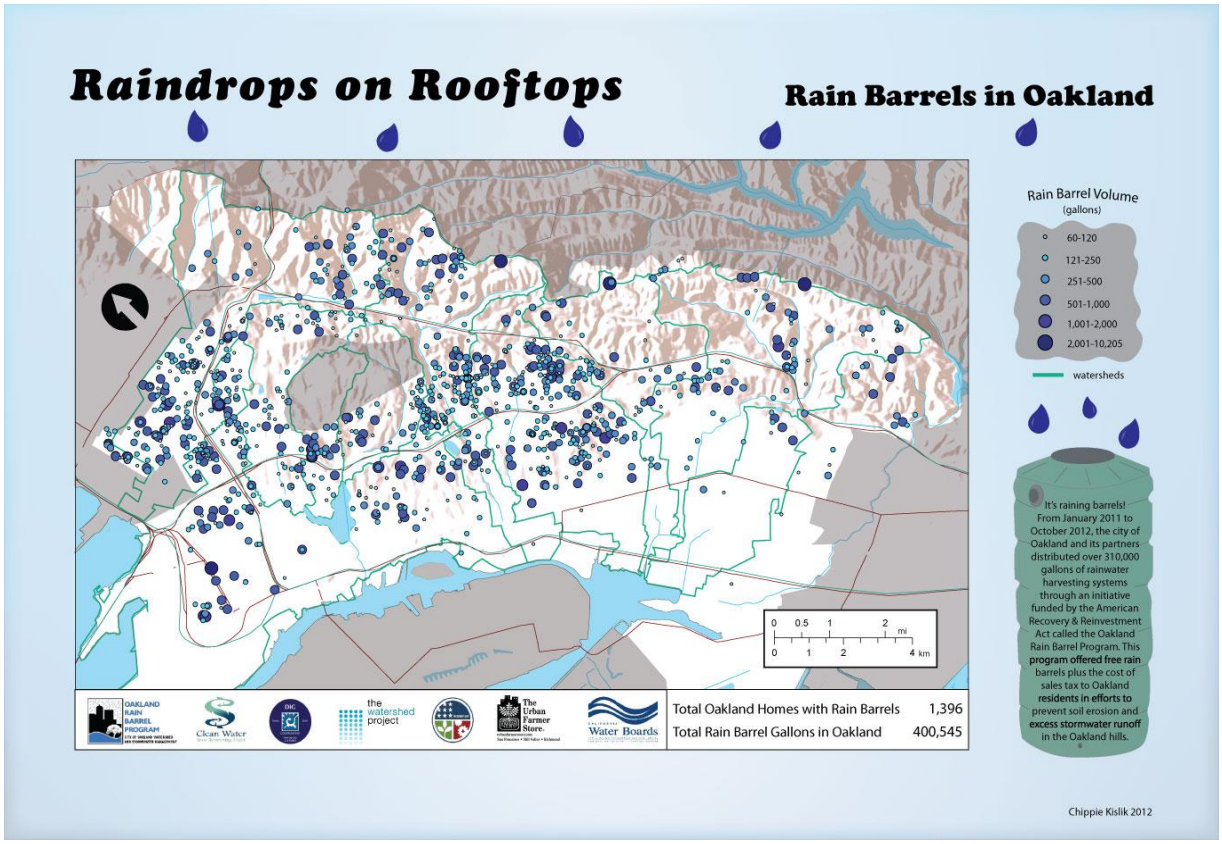
Skyline High School: Two 2825 gallon cisterns





Mapping

All sites and gallons of new rain barrels and cisterns have been sited on the below map, to provide visual information on the amounts and distribution of the new rain barrel systems in the City of Oakland.



CONCLUSIONS

The rain barrel program was a learning process for the City of Oakland. In the beginning the program moved very slowly for a number of reasons including that there was no existing model for a residential rain barrel program focused on retention, rain barrels were not in high demand as they are not commonly used in Mediterranean climates due to the short rainy season, and there was no existing built in distribution system for the barrels. With experimentation and time, workable distribution systems were established, participation grew and many completed elements were very successful. The City is considering finding new funds to continue the program based on the lessons learned.

The biggest lesson was about the challenges of rain barrel and cistern installation. It is not a simple project to connect a rain barrel system to a residential house. For some participants clearer detailed instructions are sufficient but for the majority either hands-on learning through installation workshops or hiring a professional installer is required. For future rain barrel programs the City would budget a far higher portion of the total program towards installation labor, workshops and instructional materials. Other lessons include that over half of any rain barrel program funding needs to go to outreach, installation assistance and technical guidance, administration, and workshops.

Specific Lessons Learned

Installation: Installation was more challenging and was more of a barrier than anticipated.

- Installation rates were much lower than anticipated most likely due to difficulty of installation.
- Homeowners need significant assistance with rain tank installations.
- There is a need to significantly increase education and technical guidance to both effectively train and motivate participants.
- For the large public demonstration projects providing the materials was not enough to facilitate the installation. Expecting the hosts of the large cistern demonstrations to find the funds to pay installation costs was a barrier to getting them done in a timely manner.
- Possible solutions include employing local rainwater pros to visit homes and increase the number of workshops as part of any future rain barrel program.
- Develop installation support materials at the beginning of the program
- Develop a public demonstration site in Oakland for people to see early on, so people could see the product (a variety of tanks in one place). Combine that with workshops and/or pick-up events. This could have allowed the program to offer consistent monthly workshops.
- Require participants to attend workshops before they receive the product.

Materials and distribution: The variety or rain barrel options was confusing and the number of ordered by un-picked up barrels was higher than anticipated

- Limit choices for sizes and colors, leave out 60-gallon tank and start with 205-gallon tank. They take almost the same amount of space, take the same amount of effort to install.

- First flush diverters should be included with all rain barrel installations.
- Require participants to pick up tanks within a month of its arrival to the distributor.
- Online sales are not the most efficient way to help people get the right product. People need to see product before they buy it. Face to face sales ensure more product satisfaction and higher chance of successful installation.

Monitoring

- Residential site visits should be a core component of the program to confirm installation and provide technical assistance on both installation and usage.

Education and Promotion

- Workshop no shows - A fee deposit should be required for workshops and refund the money when participants attend the workshop.
- Educational component should have better explained *why* the program was happening.
- Rain Garden education needs to be a larger component of all education materials and outreach.

PROJECT EVALUATION & EFFECTIVENESS – RESULTS OF PAEP

Project Goal 1: Provide reduced cost rain barrels and cisterns.

The Program successfully provided **2708** low and no-cost rain barrels and cisterns to **1396** households leading to **400,545** gallons in rainwater capture in Oakland.

Project Goal 2: Provide technical guidance and information resources for reducing stormwater runoff from properties.

The Program provide eight public workshops throughout Oakland to teach residents about design, installation and maintenance of rain barrel, cistern, rain gardens and other stormwater management and Low Impact Development practices. Additionally, written information was provided at over 35 outreach events including presentations to community groups, tabling at fairs and markets, in-store events, and flyering target areas and citywide volunteer events. Finally, the City provided technical information and guidance through a facebook page, a new City of Oakland website page and by building four permanent demonstration projects for viewing at publically accessible sites.

Project Goal 3: Monitor the effectiveness of rain barrels in the reduction of stormwater impacts and water conservation.

The City tracked and mapped all size, type, locations of all rain barrels and cisterns. Additionally, the city conducted a survey of participants and randomly conducted site visits at more than 30 residential locations. In general the Survey showed:

- That half the people did not know the overarching goal for the program to slow erosion with rainwater catchment.
- News of the program spread most by word of mouth.
- Economic incentive spurred people to action, but general interest in rainwater catchment & the desire to do something beneficial to the environment were also top motivators.
- Many people have not yet installed their tanks (40% +). This is mostly due to people not knowing enough to attempt the installation or timing-wise they are not ready for the installation.
- For most ORPB participants, the top intension for use of the rainwater is landscape irrigation. Many were also using it as emergency water storage.
- Many participants are not leaving their spigot cracked open for the water to drain slowly and refill in each rainfall.
- We should use ORBP as an opportunity to help people make a stronger connection to their local watersheds.

The complete survey results are attached in Appendix A.

Hydrology Model - A study of the potential effectiveness of the Rain Barrel Program for mitigating stormwater runoff was completed. This study provides an analysis of the effectiveness of rain-barrels in Oakland on detention of runoff from residential rooftops. Analysis was performed at two different scales: 1) the individual parcel scale and 2) the watershed scale

Based on the results from this study, the following are the conclusions based on the results of the study:

- At the parcel scale, the adoption of rain-barrels can reduce peak flow from storm events in the two-year to 10-year events by three to eight percent.
- At the parcel scale, the benefits of rain barrels are slightly increased by downspout disconnection.
- At the watershed scale, due to other impervious surfaces within a watershed (i.e. roads), the analysis suggests that the rain barrel program would have less of an effect on the two-year to 10-year events (zero to three percent depending on levels of adoption).
- At the watershed scale, the largest benefits appear to be during smaller storm events (in the range of 0.5- inches).
- At the watershed scale, current levels of adoption do not appear to be high enough to create a measurable reduction in peak flow; however, if further adoption of rain barrels were to occur, our analysis suggests that measurable benefits would be produced.

Attachment B is a the full memorandum that describes the parcel scale and the watershed scale analyses and presents results for existing conditions as well as varying levels of future implementation.

Project Performance Measures Table

Project Goals	**Desired Outcomes**	**Output Indicators**	**Outcome Indicators**	**Measurement Tools and Methods**
. Provide reduced cost ain barrels and cisterns. 2. rovide technical guidance nd information resources or reducing stormwater unoff from properties.	. Reduced roof unoff to hill slopes, wales, the tormwater network, rainages, and reeks. . Increased mplementation of tormwater best anagement ractices such as rain arrels and cisterns.	. Contract with vendors o supply rain barrels and isterns to program articipants. . Purchase and nstallation of rain barrels nd cisterns by program articipants. . Distribution of technical uidance via mailings, the veb, email, and rain barrel ales events.	. Contract with vendors to upply rain barrels and isterns to program articipants. . Estimated average eduction of roof runoff per rogram participant and for he program. . Distribution of technical uidance via mailings, the veb, email, and rain barrel ales events.	. The locations and number f installed units will be ocumented. City of Oakland taff, student interns, or thers will inspect a sample et of the installation ocations. 2. The number of ain barrels installed and the oof areas will be recorded, apped, and analyzed to stimate treated roof area nd runoff reduction.

Summary of Work Completed

Work Item	**Items for Review #**	**Due Date**	**% Of Work Complete**	**Date Submitted**
Plans and Compliance			(%)	
1	Project Assessment and Evaluation Plan (PAEP)	11-30-09	100%	12/21/2009
Planning and Design				
2	Map of selected high priority watersheds and updates.	09-30-2009, and updated thereafter	100%	10-1-09 (via email)
3	E-commerce and web design and updates.	11-30-2009, and updated thereafter	100%	07/22/10
4	Outreach documents and updates	10-30-2009 and updated thereafter	100%	07/22/10
5	Bid documentation for barrels and cisterns vendor selection and updates	11-30-2009, and updated thereafter	100%	11/24/09

6	Marketing Brochures and updates	11-30-2009, and updated thereafter	100%	3/26/10
7	Specification and Guidance materials for installation and operation of barrels and cisterns and updates	11-30-2009, and updated thereafter	100%	3/26/2010
8	Email and postcard announcement materials and updates	11-30-2009, and updated thereafter	100%	3/29/10
Implementation				
9	Copy of Awarded Vendor Contract, then updated as awarded. (first contracts)	11-27-2009	100%	11/24/2009
10	Advertisement(s), and outreach	10-30-2009 and updated thereafter	100%	10/31/2012 Ongoing
11	Participant letters and requests documentation	12-23-2009 – 06-302012	100%	12/08/10
12	Map of installation locations	07-31-2012	100%	3/31/2013
13	Inspection report and photo documentation	12-18-2009 – 06-30-2012	100%	3/31/2013
Monitoring			%	
14	Rainwater Harvesting Participant Survey questions and storm water pollution interview results	06-30-2010 and yearly	100%	3/31/2013
15	Monitoring Data Analysis and Reporting	Yearly	100%	3/31/2013
16	Report on the estimated reduction in peak flow per watershed.	06-31-2012	100%	3/31/2013
17	Effectiveness monitoring report	07-31-2012	100%	3/31/2013
Technology Transfer				
18	Copies of media releases	Yearly	100%	
Invoicing		Monthly		
Reports				
19	Progress Reports by the twentieth (20th) of the month following the end of the calendar quarter (March, June, September, and December)	Monthly	100%	3/31/2013
20	Annual Executive Summary Report	Annually	0%	
21	Natural Resource Projects Inventory (NRPI) Project Survey Form	Before final invoice	0%	
22	Draft Project Certification	12-31-12	100%	
23	Final Project Certification	3-33-13	100%	3/31/2013

APPENDICES

A. PARTICIPANT SURVEY

Survey of program participants

B. MONITORING DATA and ANALYSIS REPORT

flow study and rainbarrel flow attenuation effectiveness study