Technologies & Innovative Solutions for Non-Potable Uses of Rainwater & Stormwater in Urban Settings: Current Best Practices & Case Studies U.S. EPA, Cincinnati

Neal Shapiro
Office of Sustainability & the Environment's
Watershed Section
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Presentation Outline

1. Rainwater Catchment in the US - matrix
2. Rainwater Catchment in California – State AB1750
3. Southern California RWH Matrix – LA County Public Health
4. 9 Main Challenges
5. Santa Monica Examples in the Ground

1. Rainwater Catchment Around the US

- In the United States, a range of experience exists from excellent programs to embryonic to roadblocks.
- Dozens of examples: certainly not complete, Neal's legislative-policy matrix, includes indoor and outdoor uses, laws, policies, manuals, states, cities, counties, trade groups, approved, under consideration.
- IAPMO Green Supplement, January 2014.
- ARCSA-ASPE Design Standard – final review, 2013/14
- ICC Design Standard – in planning stage, draft just out.

- EPA's Wet weather document promoting rainwater harvesting, green infrastructure, water quality guidelines (via Texas' work).
- Promoting Low Impact Development.
- New EPA draft stormwater standards in June 2013.
- We have wins!

Examples of US RWH for Outdoor & Indoor Uses

Agency	State	Bill, Policy, Code #, Manual, Guideline	Purposes	Year	Status	Backflow	Indoor Uses	Outdoor Uses
San Francisco, city & county	California	MOU	MOU to encourage the safe collection, storage, and use of RW for non-potable uses WITHOUT treatment to potable stds. Lists permits and component requirements for RW harvesting systems; Good list of benefits	2008	passed	air gap is required by Dept of Building/Safety	yes, non-potable	yes, non-potable
	California	ABXXXX	RWH and runoff from roofs, parking lot, road, and any other man-made impervious surface = RW capture sytem (VERY GOOD), though not sure if applies to offsite harvesting or only onsite harvesting from these surfaces; for outdoor non-potable Ls uses only; potential for indoor in future; inc. 2010 Green Plumbing & mechanical Code Supplement of IAPMO	2011	in legislature	approved backflow device required	some uses, TBD	Ls use only, not sure if spray or drip
Berkeley	California	Calif Plumbing Code: Chapter 16a/Appendix G, Chapter 6 Sec. 601.1	Guidelines for RWH; has GOOD Findings, reference to Green Bldg Stds, 2010; permit may or not be needed depending upon system size, greater 100 gallons yes, permit; appropriate code depends whether RW for irrigation sub-surface, irrigation above ground or interior non-potable uses; table on treatments stds, refers to EPA 833-F-08-010 for exterior and indoor uses, inc. non-potable, follow ARCSA/ASPE stds; does have "subject to Environmental Health review" not sure if State/county public health or city health	2010	approved	Air gap OR an approved RP	non-potable toilet, laundry	non-potable sprinklers, sub-surface
	Colorado	SB80	Rural uses not connected to municipal potable system	2009	passed	????	yes	yes
	Colorado	HB1129	10 new residential and mixed use pilot projects for non-potable uses	2009	passed	????	non-potable	non-potable
	Georgia	Section I101-102	Amendments to Int'l Plumbing Code 2009, 2010 to include systems for flushing water closets, urinals; added clothes washers; outdoor irrigation not restricted by Section but no standards or what uses; RW disinfected by approved method, such as Cl, UV, Ozone, but nothing on level of treatment or to what standard; only roofs; hard parking/driving surfaces not mentioned	2010	passed	Section I102.3, potable makeup, protection can be air gap OR in accordance w/Section 608 (which deals with backflow protection	water closets, urinals, clothes washers	Section does not restrict outdoor uses but no specifics mentioned
Atlanta	Georgia	Appendix XXX	For single-family residential potable uses (though can use for non-potable uses but treat to potable); Cl, UV, ozone treatment but no standards of what level; VERY GOOD text on holding harmless the local govt; which permits mentioned; GOOD Guidelines; if for private potable uses must treat to EPA primary drinking water stds (VERY GOOD if you want this option, meet federal guidelines); roof collection only; backflow protection device, generic, not specific	2009	draft	Need backflow prevention device; cross-connection in accordance with Int'l Plumbing Code; no specifics on which type of BP device	seems for both non-potable and potable uses	seems for outdoor potable uses
	Hawaii	Rainwater Catchment Systems for Hawaii	Guidelines for RWH in Hawai'I, water collection, storage, maintenance, treatment, testing; generally for non-potable and potable uses; unique to the islands.	2010 revised	online	not mentioned	yes	yes

Examples of local US RWH for Indoor & Outdoor Uses

Agency	State	Bill, Policy, Code #, Manual, Guideline	Purposes	Year	Status	Backflow	Indoor Uses	Outdoor Uses
Chicago	Illinois		City has no local ordinance. Waiting for state bill. But when state bill passes, still need to update the plumbing code to meet goals of RWH bill; bill only allows RWH. Need state code; to authorize; state guide only says on case by case basis right now, not in code yet. State bill killed by unions so reintroduced. Since have many RWH installations, trying to streamline approval process, tighten up the regs.			Air gap required (w/potable makeup), not RPZ at meter	only toilet flushing	Landscape irrigation
	North Carolina	Appendix C1	Using IGCC Chapter 7 as template, but modifying, adding specific uses; Appendix C1 is existing version and is example of the OUTDATED way to do RWH	2009	passed	According to Section 608, but not sure if state plumbing code or the Int'l Plumbing Code	closets, urinals	none
	North Carolina	New bill being drafted	Using IGCC Chapter 7 as template, but modifying, adding specific uses; differentiates bet uses without and uses with treatment; very clear	2011	draft	air gap not less than 4" above overflow OR approved backflow device as per Int'l Plumbing Code	non-potable, clostes, urinals, see list	non-potable, irrigation, etc. see list
Portland	Oregon	Section 3101.2, 3401.1; 301.2, 601.1	1 and 2 family buildings, and non-residential uses: urinals, toilets and irrigation, non-potable; EPA doc states commercial permitted on case by case; MF and sleeping portions of hotels for irrigation only; non-residential for irrigation, water features, closets, urinals (latter 2 filters and disinfection)	2000	passed	air gap and RPZ (EPA doc states OR, not AND, but actual code says AND)	non-potable water closets, urinals; POTABLE through appeals process	non-potable hose bibs; irrigation (not covered by this code, needs no treatment)
	Oregon	Appendix M	Potable uses and non-potable uses				probably, not sure	
	Texas	HB4299, Sec. 447.004, 430.004, 202.007 (d), 1-003	RWH for new state buildings with roof greater than or equal to 10,000 sq ft and other new state bldgs where RWH is feasible; quarterly training on RWH for counties and municipalities; include guidelines for HOAs; public policy to develop state's natural resources, inc. RWH at public and private facilities inc. residential, commercial and industrial.	2010	not passed	????	non-potable uses	non-potable for irrrigation

Examples of local US RWH for Indoor & Outdoor Uses

Agency	State	Bill, Policy, Code #, Manual, Guideline	Purposes	Year	Status	Backflow	Indoor Uses	Outdoor Uses
	Texas	Rainwater Harvesting Potential & Guidelines for Texas	Report to the 80th Legislature, Texas RWH Evaluation Committee, TX Water Development Board; came up with good findings and recommendations, such as mini. Water quality standards for potable/non-potable indoor uses, as well as treatment methods; dual use with potable make-up; uses include drinking, cooking and bathing. Not sure if recommendations codified into law.	2006	approved	air gap or reduced pressure zone back flow preventer	non-potable, water closets, urinals, laundry	non-potable for irrigation
	Virginia	DEB Section 915.15	Residential, commercial uses; RW systems for water closets, urinals, Ls irrigation; use 2007 VA RW Harvesting Manual (have copy) and ASPE Design Handbook; effluent and first flush to sanitary sewer or septic tank (probably due to Combined system); overflow to MS4; Manual EXCELLENT information, guidelines, benefits, background, LID & Benefits to MS4;	2008	passed	Air gap OR backflow preventor	non-potable (toilet/urinal, laundry) and potable uses	Landscape irrigation
King County, City of Seattle	Washington	Chapter 70.05	Policies/procedures for pressurized systems only; not for non-pressurized; applies Ls irrigation systems, water features, hose bibs; facilitate use of RWH to supply certain types of plumbing fixtures in structures while maintaining public health protection; residential and non-residential uses; has guidelines, specifics; other uses have to get special approval.	2007	approved	says backflow assembly, no specifics in document; annual testing/check; in accordance with plumbing code	non-potable for closets, urinals, laundry	non-potable for irrrigation
		ARCSA-ASCE Rainwater Catchment Design & Installation Standards	Manual with design and installation guidelines; industry standards established by industry leaders in RWH, Boulware, Pope, Lye (EPA), Kniffen, Wheeler, Morris, Jennings, Shultz, Winters, Daily and Kight.	2009	approved	yes	non-potable uses	non-potable uses
		IAPMO's Green Plumbing & Mechanical Code Supplement, Section 505.8	Has RWH plumbing guidelines, industry standards. Section 505.0 Non-potable RW catchment systems, intended uses, reference to ARCSA/ASPE Manual	2010	takes affect 2011	yes, air gap OR reduced-pressure principle backflow preventer	non-potable water closets, urinals	non-potable irrigation, water features
		IGCC RW Collection & Distribution Systems Section 707	International version for RWH; see columns for specifics.	2010	approved	air gap not less than 4" above overflow OR approved backflow device as per Int'l Plumbing Code	non-potable water closets, urinals	non-potable irrigation, water features

2. Rainwater and other Water Catchments in California

- Potable Water – CA Water Code
- Recycled Water – Title 22
- Gray/Greywater – Appendix G
- Rainwater – AB 1750
- Stormwater - LA County matrix
- Dry Weather Runoff – LA County matrix

- 3 years to get RWH state law passed; 2 vetoes; conflicts with plumbing and labor unions.
- 2012 Roadblocks: water rights, use of rainwater across property lines and indoors, public health agency review.
- Roadblocks suddenly appear from the Senate Environmental Quality Committee.
- Governor signed AB 1750 September 2012.

- Final signed bill, basically silent, gutted:

✓ No water rights issues for rooftop harvesting only from existing natural channels (follow State Water Board);

✓ Avoids involvement of state public health agency having a say in water standards;

✓ No mention of indoor/outdoor uses, harvesting surfaces, just states right to capture rainwater that has not entered a “natural channel.” Open ended, broad.

✓ Allows state Buildings Standard Commission to implement rainwater harvesting guidelines in the uniform plumbing code for indoor/outdoor uses;

✓ Allows crossing property lines for applications instead of only onsite where collected.

Assembly Bill No. 1750

CHAPTER 537

An act to amend Section 7027.5 of the Business and Professions Code, and to add Part 2.4 (commencing with Section 10570) to Division 6 of the Water Code, relating to water.

[Approved by Governor September 25, 2012. Filed with Secretary of State September 25, 2012.]

LEGISLATIVE COUNSEL'S DIGEST

AB 1750, Solorio. Rainwater Capture Act of 2012.

(1) Under existing law, the State Water Resources Control Board (state board) and the California regional water quality control boards prescribe waste discharge requirements for the discharge of stormwater in accordance with the national pollutant discharge elimination system (NPDES) permit program and the Porter-Cologne Water Quality Control Act. Under existing law, the state board administers a water rights program pursuant to which the state board grants permits and licenses to appropriate water, upon an application to appropriate water.

This bill would enact the Rainwater Capture Act of 2012, which would provide that use of rainwater collected from rooftops does not require a water right permit from the state board.

(2) Existing law, the Contractors' State License Law, creates the Contractors' State License Board within the Department of Consumer Affairs and provides for the licensing and regulation of contractors. Existing law authorizes a landscape contractor working within the classification of his or her license to enter into a prime contract for the construction of a swimming pool, spa, or hot tub, an outdoor cooking center, or an outdoor fireplace, if certain conditions are met. Under existing law, a violation of these provisions and related provisions of existing law is grounds for disciplinary action.

This bill would additionally authorize a landscape contractor working within the classification of his or her license to enter into a prime contract for the construction of a rainwater capture system, as defined, if the system is used exclusively for landscape irrigation or as a water supply for a fountain, pond, or similar decorative water feature in a landscaping project. The bill would authorize a landscape contractor holding a specified classification to design and install all exterior components of a rainwater capture system that are not a part of, or attached to, a structure.

The people of the State of California do enact as follows:

SECTION 1. Section 7027.5 of the Business and Professions Code is amended to read:

7027.5. (a) A landscape contractor working within the classification for which the license is issued may design systems or facilities for work to be performed and supervised by that contractor.

(b) Notwithstanding any other provision of this chapter, a landscape contractor working within the classification for which the license is issued may enter into a prime contract for the construction of any of the following:

(1) A swimming pool, spa, or hot tub, provided that the improvements are included within the landscape project that the landscape contractor is supervising and the construction of any swimming pool, spa, or hot tub is subcontracted to a single licensed contractor holding a Swimming Pool (C-53) classification, as set forth in Section 832.53 of Title 16 of the California Code of Regulations, or performed by the landscape contractor if the landscape contractor also holds a Swimming Pool (C-53) classification. The contractor constructing the swimming pool, spa, or hot tub may subcontract with other appropriately licensed contractors for the completion of individual components of the construction.

(2) An outdoor cooking center, provided that the improvements are included within a residential landscape project that the contractor is supervising. For purposes of this subdivision, "outdoor cooking center" means an unenclosed area within a landscape that is used for the cooking or preparation of food or beverages.

(3) An outdoor fireplace, provided that it is included within a residential landscape project that the contractor is supervising and is not attached to a dwelling.

(4) A rainwater capture system, as defined in Section 10573 of the Water Code, used exclusively for landscape irrigation or as a water supply for a fountain, pond, or similar decorative water feature in a landscaping project.

(c) (1) Work performed in connection with a landscape project specified in paragraph (2), (3), or (4) of subdivision (b) that is outside of the field and scope of activities authorized to be performed under the Landscape Contractor (C-27) classification, as set forth in Section 832.27 of Title 16 of the California Code of Regulations, may only be performed by a landscape contractor if the landscape contractor also either holds an appropriate specialty license classification to perform the work or is licensed as a General Building contractor. If the landscape contractor neither holds an appropriate specialty license classification to perform the work nor is licensed as a General Building contractor, the work shall be performed by a Specialty contractor holding the appropriate license classification or by a General Building contractor performing work in accordance with the requirements of subdivision (b) of Section 7057.

(2) Notwithstanding paragraph (1), a landscape contractor performing work under the Landscape Contractor (C-27) classification, as set forth in Section 832.27 of Title 16 of the California Code of Regulations, may design

and install all exterior components of a rainwater capture system, as defined in Section 10573 of the Water Code, that are not a part of, or attached to, a structure.

(d) A violation of this section shall be cause for disciplinary action.

(e) Nothing in this section authorizes a landscape contractor to engage in or perform activities that require a license pursuant to the Professional Engineers Act (Chapter 7 (commencing with Section 6700)).

SEC. 2. Part 2.4 (commencing with Section 10570) is added to Division 6 of the Water Code, to read:

PART 2.4. RAINWATER CAPTURE ACT OF 2012

10570. This part shall be known, and may be cited, as the Rainwater Capture Act of 2012.

10571. The Legislature finds and declares all of the following:

(a) As California has grown and developed, the amount of stormwater flowing off buildings, parking lots, roads, and other impervious surfaces into surface water streams, flood channels, and storm sewers has increased, thereby reducing the volume of water allowed to infiltrate into groundwater aquifers and increasing water and pollution flowing to the ocean and other surface waters. At the same time, recurring droughts and water shortages in California have made local water supply augmentation and water conservation efforts a priority.

(b) Historical patterns of precipitation are predicted to change, with two major implications for water supply. First, an increasing amount of California's water is predicted to fall not as snow in the mountains, but as rain in other areas of the state. This will likely have a profound and transforming effect on California's hydrologic cycle and much of that water will no longer be captured by California's reservoirs, many of which are located to capture snowmelt. Second, runoff resulting from snowmelt is predicted to occur progressively earlier in the year, and reservoirs operated for flood control purposes must release water early in the season to protect against later storms, thereby reducing the amount of early season snowmelt that can be stored.

(c) Rainwater and stormwater, captured and properly managed, can contribute significantly to local water supplies by infiltrating and recharging groundwater aquifers, thereby increasing available supplies of drinking water. In addition, the onsite capture, storage, and use of rainwater for nonpotable uses significantly reduces demand for potable water, contributing to the statutory objective of a 20-percent reduction in urban per capita water use in California by December 31, 2020.

(d) Expanding opportunities for rainwater capture to augment water supply will require efforts at all levels, from individual landowners to state and local agencies and watershed managers.

10572. Nothing in this part shall be construed to do any of the following:

(a) Alter or impair any existing rights.

(b) Change existing water rights law.

(c) Authorize a landscape contractor to engage in or perform activities that require a license pursuant to the Professional Engineers Act (Chapter 7 (commencing with Section 6700) of Division 3 of the Business and Professions Code).

(d) Impair the authority of the California Building Standards Commission to adopt and implement building standards for rainwater capture systems pursuant to existing law.

(e) Affect use of rainwater on agricultural lands.

(f) Impair the authority of a water supplier pursuant to Subchapter 1 of Chapter 5 of Division 1 of Title 17 of the California Code of Regulations.

10573. Solely for the purposes of this part, and unless the context otherwise requires, the following definitions govern the construction of this part:

(a) "Developed or developing lands" means lands that have one or more of the characteristics described in subparagraphs (A) to (C), inclusive, of paragraph (4) of subdivision (b) of Section 56375.3 of the Government Code.

(b) "Rain barrel system" is a type of rainwater capture system that does not use electricity or a water pump and is not connected to or reliant on a potable water system.

(c) "Rainwater" means precipitation on any public or private parcel that has not entered an offsite storm drain system or channel, a flood control channel, or any other stream channel, and has not previously been put to beneficial use.

(d) "Rainwater capture system" means a facility designed to capture, retain, and store rainwater flowing off a building rooftop for subsequent onsite use.

(e) "Stormwater" means temporary surface water runoff and drainage generated by immediately preceding storms. This definition shall be interpreted consistent with the definition of "stormwater" in Section 122.26 of Title 40 of the Code of Federal Regulations.

10574. Use of rainwater collected from rooftops does not require a water right permit pursuant to Section 1201.

3. Southern California RWH Matrix – LA County Public Health

COUNTY OF LOS ANGELES Public Health

LOS ANGELES COUNTY
DEPARTMENT OF PUBLIC HEALTH

Guidelines for Harvesting Rainwater, Stormwater, & Urban Runoff for Outdoor Non-Potable Uses
July 2011

Tier I	**On-site collection of rainwater in rain barrels for on-site use in gravity flow systems.**

Requirements	**Use**	**Minimum Water Quality Standard**	**Treatment Process**
• Rain barrels must have a screened inflow opening, a spigot and/or hose bib, and an overflow pipe or equivalent. • Rain barrels shall be labeled to indicate non-potable water use only. • The system may not be connected to indoor/outdoor municipal potable plumbing, and shall not be pressurized or sprayed. • The system must be installed in accordance with the rain barrel manufacturer's installation instructions, and installation requirements of local agencies.	Landscape irrigation	Not applicable	Not applicable
	Car washing	Not applicable	Not applicable

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Tier II	On-site collection of rainwater in cisterns for on-site use.		
Requirements	**Use**	**Minimum Water Quality Standard**	**Treatment Process**
• Tier II systems must exclude rainwater collected from locations zoned for agricultural, manufacturing, or industrial use. • Tier II systems must: be installed in accordance with the manufacturer's instructions and local agency requirements; be equipped with an overflow device or rain diverter; be screened or otherwise equipped to prevent vector intrusion.[1] • Tier II systems require prior review by Los Angeles County Department of Public Health Cross Connections Program (DPH) or the appropriate local agency. This review is necessary in order to reduce risk of cross connection with potable water supplies. • Spray irrigation of Tier II water is allowed only when there is negligible human exposure, such as between the hours of sunset and sunrise.[2]	Drip or sub-surface irrigation	Not applicable	Pre-screening
	Spray irrigation Non-interactive outdoor water feature	Total coliforms < 10,000 Most Probable Number/100 milliliters (MPN/100 mL) Fecal coliforms < 400 MPN /100 mL Enterococcus < 104 MPN /100 mL	Pre-screening Disinfection – chlorination, or equivalent treatment required for systems other than private home systems inspected and approved by DPH.

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Tier III	On-site or off-site collection of rainwater, stormwater and urban runoff in cisterns for on-site or off-site use. (Excludes water collected from locations zoned for high use transportation corridors, industrial, agricultural or manufacturing uses)		
Requirements	**Use**	**Minimum Water Quality Standard**	**Treatment Process**
• Tier III systems must be installed in accordance with the manufacturer's instructions and local agency requirements, and be equipped with an overflow device, vector control measures, and screened openings. • Tier III systems require prior project plan review by DPH and by the local building & safety department. • Tier III water shall meet all bacterial limits at the point of use when distributed offsite. • Spray irrigation of Tier III water is allowed only when there is negligible human exposure, such as between the hours of sunset and sunrise.[2, 5] A typical Tier III system for off-site collection may also require one or more of the following: 1. Storm drain diversion 2. Pre-treatment screening/sedimentation device 3. Pump station (where applicable)	Drip or sub-surface irrigation	Not applicable	Pre-screening
	Spray irrigation Non-interactive outdoor water feature Street sweeping Dust control	Total coliforms < 10,000 MPN/100 mL Fecal coliforms < 400 MPN /100 mL Enterococcus < 104 MPN /100 mL	Disinfection – chlorination, or equivalent For street sweeping, retention/sedimentation

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Tier IV	**On-site or off-site collection of rainwater, stormwater and urban runoff in cisterns for on-site or off-site use. (Includes water collected from locations zoned for high use transportation corridors, industrial, agricultural or manufacturing use)[3]**

Requirements	Use	Minimum Water Quality Standards	Treatment Process
• Tier IV systems require prior review by DPH and by the local building & safety department. • Tier IV systems shall have a stormwater monitoring plan which includes sampling and analysis for a minimum of three storm events per year. Analyses shall be performed for metals, VOCs and semi-VOCs. The operator shall prepare and maintain on the premises, an annual summary of stormwater analyses. The monitoring results will be used to assess the need for further monitoring or use restrictions. • Tier IV cisterns must: be installed in accordance with the manufacturer's instructions and local agency requirements; be equipped with an overflow device; be equipped with screened openings for vector control. • Tier IV treated water shall be tested by the operator on a quarterly basis to determine compliance with the referenced water quality standards. If the standards are exceeded, the	On site drip or sub-surface irrigation	Not applicable	Pre-screening
	Spray irrigation Non-interactive outdoor water feature Street sweeping Dust control	Total coliforms < 10,000 MPN/100 mL Fecal coliforms < 400 MPN /100 mL Enterococcus < 104 MPN /100 mL All bacterial limits must be met at the point of use. Must also meet California Maximum Contaminant Levels, and the California Toxics Rule Standards	Pre-screening Disinfection – chlorination or equivalent For street sweeping, retention and sedimentation

4. Main Challenges of Concern, Debate, Resolution

- **Definitions: Rainwater, stormwater, harvested RW vis-à-vis exposed surfaces; SEE conference definitions.**
- **Grammar: capture v. harvest v. catchment; Use v. REuse (applied with non-potable); rainwater/stormwater v. rain, storm water.**
- **Indoor and/or Outdoor Applications?**
- **Passive (infiltrate) v. Active (direct)**
- **Catchment Surfaces (roofs v. driving surfaces) and Pollutants of Concern (bacteria, heavy metals, organics).**

4. Main Challenges of Concern, Debate, Resolution

- **Unions, Plumbers, Landscape Contractors; ICC and IAPMO green standards, and ARCSA standards.**
- **Backflow Prevention Devices: Air Gap or RPZ or both?**
- **Colors/Labeling of Conveyance Pipes?**
- **Treatment – Disinfection: Yes or No, and to what level?**

5. Santa Monica Examples in the ground

- City's Sustainable Water Master Plan – self-reliance by 2020;
- Reduce 30% imported water gap;
- Role of Rainwater (Stormwater) to close gap;
- Have opportunities, proven technologies;
- Have basic legal authority;
- Missing widespread familiarity and experience in public health, building & safety offices, at the local level.
- Require direct RWH for new and re-development construction.

Private Property Examples

Private Property Examples

Private Property Examples

City's Main Library

City multi-family residential building

New public library

310.458.8223
Neal.Shapiro@smgov.net
www.Sustainablesm.org

Thank You