CITY OF TUCSON
COMMERCIAL RAINWATER HARVESTING REQUIREMENTS
EFFECTIVE June 1, 2010
AGENDA

- Introduction of the Ordinance
- Creation of the Ordinance & Development Standard
- Ordinance Components
- Submittal Components
- Techniques
- Important Considerations
- Question & Answer

RAINWATER HARVESTING
Effective June 1, 2010

• All new “commercial” development in the City of Tucson must meet 50% of its irrigation requirements through rainwater harvesting. TCC Sec. 6-183

Applies to the following project types:
• Commercial,
• Office,
• Retail,
• Industrial,
• Mixed-use, and
• Private and Charter Schools
Applies to the following submittals: TCC Sec. 6-182

- Development Plans;
- Plats;
- Site Plans; and
- Submittal Revisions
Tucson’s Water Use

- Single Family – 59,000 acre-feet
- Multi-Family – 21,000 acre-feet
- Commercial/Industrial – 24,000 acre-feet

An Acre Foot is the equivalent of filling the entire UA football field with 1 foot of water

Source: Tucson Water 2009

RAINWATER HARVESTING
Commercial/Industrial Sector Water Demand

• Commercial/Industrial uses 23% of water

• Commercial/Industrial averages 45,000 gallons/month
  • Indoor – 65%
  • Outdoor – 35%

Source Tucson Water 2009
Paradigm Shift

• Requires a paradigm shift in thinking:

  move it                  vs.                  use it
Ordinance Goals

• Acknowledge Urban Growth

• Acknowledge Competing Needs for Limited Water Resources

• Promote Sustainable Landscaping Around Commercial Development

• Promote Application of New Development Design and Technology
Graywater and Rainwater Harvesting Stakeholder Group

• Members appointed by Mayor and Council
• Tasked with creating the Ordinance
• Made up of architects, contractors, real estate professionals, environmental community, etc.
• Adopted by Mayor and Council on October 14, 2008 – Article VIII. Rainwater Collection and Distribution Requirements
Development Standard Intent

• Provide Guidance in Implementing the Ordinance

• Clarify Key Compliance and Submittal Requirements

• Provide Foundation to Meet Requirement of 50% Rainwater Harvesting Irrigation Within Three Years
CREATION OF THE DEVELOPMENT STANDARD

Rainwater Harvesting
Technical Advisory Group (TAG)

- Tasked with creating the Development Standard
- Made up of architects, engineers, landscape architects, contractors, planners, real estate professionals, developers, hydrologists, and city staff
- Adopted by Mayor and Council May 19, 2009 - Development Standard 10-03
Monitoring & Annual Reporting
TCC Sec. 6-186 & DS 10-03.7.2

- Submit Annual Report by owner or owner’s agent to Tucson Water
- Annual Reporting period is based on the calendar year
- Report form provided by Tucson Water
- Annual Report due January 30th each year
- Comply with the 50% requirement within three (3) years from the certificate of occupancy and every year thereafter
• Source of rainfall data (on-site gauge or www.rainlog.org)
• Sources of metered irrigation water
• Monthly and total annual readings of:
  • Rainfall
  • Projected landscape water demand
  • Actual metered water use
  • Difference between above amounts
• Explanation for excess metered irrigation water use
• Changes to landscape/irrigation system
• Responsibility of the Property Owner
WHAT ELSE IS TUCSON WATER DOING?

- Modifying SMARTSCAPE training
  - Address maintenance of water harvesting systems

- Education seminars 1-2 times per year
  - Address educational needs about ordinance implementation

- Development of demonstration sites
  - Provide examples of techniques and monitor impacts

RAINWATER HARVESTING
Commercial Rainwater Harvesting Submittal Components
TCC Sec. 6-182 & 6-186

• Water Harvesting Implementation Plan
• Site Water Budget
Water Harvesting Implementation Plan
DS 10-03.4.2

Demonstrate how any combination of capture, conveyance, storage and distribution will be utilized onsite to harvest rainwater

- **General Information**
  - How monthly rainfall and irrigation data will be recorded
  - Soil pretreatment techniques and locations
  - Maintenance notes
  - Monitoring and Reporting requirements

- **Tabulated Data**
  - WHIA size, depth, volume
  - Plant Canopy area and quantities, and water demand
  - Passive and/or Active harvesting system capacity

- **Mapped Data**
  - WHIA boundary, flow arrows, sub-watersheds, spot grades, sensors, cisterns
  - Plant Canopy boundary
Water Harvesting Implementation Plan - Example
Calculate the estimated volume of water required for all site landscaping

- Water Demand - monthly and annual based on plant’s water demand
- Water Supply - monthly and annual rainfall. Use an on-site gauge or www.rainlog.org to obtain rainfall data
- Output – calculation showing how 50% of landscape water demand will be met using harvested rainwater

Spreadsheet available from City, or use and explain your own methodology
### Site Water Budget - Example

#### DATA AND CALCULATION SOURCES FOR WHIAs

<table>
<thead>
<tr>
<th>Line</th>
<th>PLANT WATER DEMAND</th>
<th>DATA AND CALCULATION SOURCES FOR WHIAs</th>
<th>Column A</th>
<th>Column B</th>
<th>DATA AND CALCULATION SOURCES FOR TOTAL SITE</th>
<th>Column L</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Individual WHIA identifier</td>
<td>Source for data, and how calculations are done for each Water Harvesting Infiltration Areas (WHIA) in columns A through J</td>
<td>Individual Water Harvesting Infiltration area (WHIA)</td>
<td>Individual Water Harvesting Infiltration Area (WHIA)</td>
<td>Source for data, and how calculations are done for Total of all Water Harvesting Infiltration Areas at the Site</td>
<td>Total for all Water Harvesting Infiltration Areas at the Site</td>
</tr>
<tr>
<td>2</td>
<td>Plant water demand category for this WHIA</td>
<td>APPLICANT: BASED ON ADWR PLANT LIST</td>
<td>LOW</td>
<td>LOW</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Plant canopy area (square feet) for this WHIA. Add the canopies of understory, midstory, and overstory plant areas to get total canopy area for each WHIA</td>
<td>APPLICANT; CAN BE BASED ON LANDSCAPE PLAN OR PLANT LIST</td>
<td>990</td>
<td>4490</td>
<td>= sum (line 3 for columns A through J)</td>
<td>5,470</td>
</tr>
<tr>
<td>4</td>
<td>Plant water demand per year (vertical feet of water per year per square foot of canopy) for this WHIA</td>
<td>GET APPROPRIATE NUMBER FROM TABLE 1 BASED ON PLANT WATER DEMAND CATEGORY FOR THIS WHIA</td>
<td>1.7</td>
<td>1.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>CALCULATE: Annual plant water demand for this WHIA based on plant canopy area (gallons)</td>
<td>= line 3 times line 4; 48 gallons per cubic foot of water</td>
<td>12,789</td>
<td>56,968</td>
<td>= sum (line 5 for columns A through J)</td>
<td>69,557</td>
</tr>
<tr>
<td>6</td>
<td>OVERALL WATER HARVESTING SUPPLY</td>
<td>APPLICANT</td>
<td>2400</td>
<td>6600</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>WHIA area (square feet)</td>
<td>APPLICANT</td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>WHIA average depth (feet)</td>
<td>APPLICANT; CAN BE BASED ON LANDSCAPE PLAN OR PLANT LIST</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>CALCULATE: WHIA capacity (gallons)</td>
<td>line 7 times line 8 times 7.48 gallons/sq ft</td>
<td>35,956</td>
<td>49,817</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Is Passive water harvesting used?</td>
<td>APPLICANT</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Subwatershed identifier</td>
<td>APPLICANT</td>
<td>SW-1</td>
<td>SW-2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Ratio of subwatershed area to plant canopy area needed to meet plant water demand in July through March (use March plant water demand as the indicator month, and effective rainfall in March of 0.41 inches, as shown on Table 2) (no units)</td>
<td>GET APPROPRIATE NUMBER FROM TABLE 2 BASED ON PLANT WATER DEMAND CATEGORY FOR EACH WHIA</td>
<td>3.85</td>
<td>3.85</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>CALCULATE: Total catchment area ideally needed to meet plant water demand in March (square feet)</td>
<td>= line 3 x line 12</td>
<td>20,254</td>
<td>20,254</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Actual use of catchment area designed for this WHIA including the WHIA area itself (square feet)</td>
<td>APPLICANT</td>
<td>3,600</td>
<td>6,600</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>CALCULATE: Actual catchment ratio for this WHIA based on plant canopy area</td>
<td>= line 14 divided by line 3</td>
<td>0.44</td>
<td>0.44</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>CALCULATE: Actual percent of plant water demand that will be met for this WHIA</td>
<td>=64% times line 15 divided by line 12</td>
<td>60%</td>
<td>24%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Is Active water harvesting used?</td>
<td>APPLICANT</td>
<td>T-1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>Tank identifier</td>
<td>APPLICANT</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>Location of tank or ground?</td>
<td>APPLICANT; CAN BE BASED ON LANDSCAPE PLAN OR PLANT LIST</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Tank height (feet)</td>
<td>APPLICANT</td>
<td>16</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>Tank diameter (feet)</td>
<td>APPLICANT</td>
<td>9</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>Tank capacity (gallons)</td>
<td>APPLICANT</td>
<td>4,750</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>Tank location</td>
<td>APPLICANT; CAN BE BASED ON LANDSCAPE PLAN OR PLANT LIST</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>CALCULATE: Percent of plant water demand for this WHIA met by this tank (year)</td>
<td>Total water provided = 4 times line 22 divided by line 5</td>
<td>0%</td>
<td>53%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>CALCULATE: Percent of plant water demand for this WHIA not using harvested rainwater from passive systems and active systems (as applicable)</td>
<td></td>
<td>= line 16 x line 24</td>
<td>60%</td>
<td>58%</td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>TOTAL SITE INFORMATION</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>27</td>
<td>Percent to total site annual landscape demand met using harvested water</td>
<td>WHIA, Total n(A25 x A33,3)+ (B25 x B33,3)+, etc. for all individual WHIA columns. IMPORTANT NOTE: WHEN</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>Water harvesting capacity offsetting retention basin size capacity</td>
<td>APPLICANT’S ENGINEER</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>29</td>
<td>Projected annual metered water use for the site if 50% of annual water use is provided by metered irrigation water (gallons) (50%) is the allowed metered water use per the Commercial Rainwater Harvesting Ordinance</td>
<td>APPLICANT’S ENGINEER</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Site Water Budget and Water Harvesting Implementation Plan
Submittal Schedule
DS 10-03.4.2

- Plan view layout
- Format consistent with the base plan
- Submit at the same time as Development and Landscape Plan submittal
- Revisions may be required in conjunction with preparation of the Grading Plan
Sub-watersheds must be inspected prior to application of any surface treatment such as concrete, asphalt, rock, etc.
Grading Inspection Requirements
DS 10-03.8.1

All landscape-scale grading in Water Harvesting Infiltration Areas must be inspected by PDSD prior to plant installation and application of organic mulch or rock.
PDSD will inspect the site for compliance with the provisions of the Rainwater Harvesting Plan prior to issuance of a final certificate of occupancy.
Recommend inspecting and maintaining the following:

- All Passive and Active Water System Components
- Water Harvesting Infiltration Areas
- Site Improvements necessary for the water harvesting systems to function properly
RAINWATER HARVESTING

TECHNIQUES

Active

Passive
Swales and Micro Basins
Terraced Planting on Slopes
Curb Cuts
Flush Curbs
TECHNIQUES

Recessed Planting Areas
Aboveground Cisterns

Note: Aboveground cisterns are considered an accessory structure.
Belowground Cisterns
Irrigation Pumps
Landscape Requirements
DS 10-03.5.1

Soil Pretreatment
• Pre-treat soils in planting area as needed for adequate harvested water

Plant Selection and Placement
• Choose plants with compatible water needs
• Position plants to account for expected level of inundation

Mulch Placement
• Position mulch away from base of tree trunks
 Design process implications; integral to site design

- Greater and earlier coordination among project team members
- Projects must meet requirements per phase

Construction process implications

- Coordination of grading, building and landscape contractors
- Construction process implications - minimize compaction

Maintenance process implications

- Better coordination between property manager and landscape contractor
CITY OF TUCSON
COMMERCIAL RAINWATER
HARVESTING
REQUIREMENTS
EFFECTIVE June 1, 2010