City of Redwood City

Recycled Water Development Standards

11-4-2019

Public Works Services Department
Water Resources Management
650-780-7464
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1. INTRODUCTION

Redwood City’s Recycled Water Project provides disinfected tertiary recycled water to City customers for landscape irrigation and a variety of Title 22 approved non-potable uses including dust control, car washing, concrete mixing, toilet flushing, cooling, and other industrial uses.

Redwood City adopted a Recycled Water Use Ordinance in July 2008 that established the recycled water service area and requirements for use within the service area. The Ordinance (now City Code - Chapter 38 – Article VIII) identifies the required and voluntary uses of recycled water, including requirements for dual plumbing. Table 1.1 lists which uses are required and voluntary.

Redwood City’s recycled water is approved by State Water Resources Control Board – Division of Drinking Water (DDW) for the following uses:

- Landscape Irrigation
- Toilet & Urinal Flushing
- Water features – Fountains, running streams, etc. *
- Wash-down *
- Cooling & Air Conditioning *
- Commercial Laundry
- Window Washing *
- Commercial Car Washing *
- Construction
- Dust control for Construction *
- Dust control for Industrial Process*
- Backfill consolidation & Soil Compaction
- Concrete Batching *
- Firefighting – installed fire control systems and/or fire hydrants

* Refer to Redwood City’s Customer Guidelines for Recycled Water Use for specific use requirements.

**Table 1.1 – City Code Recycled Water Required Uses**

<table>
<thead>
<tr>
<th>LANDSCAPE</th>
<th>INTERNAL SEPARATE PLUMBING</th>
<th>INTERNAL COOLING</th>
<th>INDUSTRIAL PROCESS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Existing/Remodeled Commercial/Industrial Buildings</td>
<td>Required</td>
<td>Consider/Encouraged*</td>
<td>Consider</td>
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<tr>
<td>New Commercial, Industrial, Institutional, and Government Projects</td>
<td>Required</td>
<td>Required</td>
<td>Consider</td>
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<tr>
<td>Existing/Remodeled Apartments, Condos and Townhomes</td>
<td>Consider/Encouraged</td>
<td>Consider/Encouraged*</td>
<td>Consider</td>
</tr>
<tr>
<td>New Apartments, Condos and Townhomes</td>
<td>Required</td>
<td>Required</td>
<td>Consider</td>
</tr>
<tr>
<td>Single Family HOAs</td>
<td>Consider/Encouraged</td>
<td>Not Applicable</td>
<td>Not Applicable</td>
</tr>
<tr>
<td>Single Family Homes</td>
<td>Discouraged</td>
<td>Prohibited</td>
<td>Prohibited</td>
</tr>
</tbody>
</table>

* Requires all plumbing systems to be identified and labeled in the same manner as for new uses.
1.1 Recycled Water Definitions

The following terms are defined for purposes of Redwood City’s Recycled Water Use Ordinance (Chapter 38 Article VIII of the Redwood City Municipal Code):

A. COMMERCIAL PROPERTY: Any building for office or commercial uses with water requirements which include, but are not limited to, landscape irrigation, cooling, toilets, urinals and decorative fountains.

B. RECYCLED WATER DISTRIBUTION SYSTEM: A system of transmission and distribution pipelines, pump stations, storage reservoirs and minor appurtenant facilities intended for the delivery of recycled water only and which is separate from any potable water distribution system. The Recycled Water Distribution System is owned, operated and maintained by the City.

Recycled water plumbing on the customer's side of the City's meter is owned, operated and maintained by the customer, but must still comply with all applicable requirements, including the requirements of California Code of Regulations, titles 17 and 22.

C. LANDSCAPE AREAS OR LANDSCAPING: A landscape area or landscaping includes, but is not limited to landscaped streets and medians, golf courses, cemeteries, common areas and parks.

D. INDUSTRIAL PROCESS WATER: Water used by any industrial facility with process water requirements which include, but are not limited to, rinsing, washing, cooling and or circulation.

E. POTABLE WATER: Means water which conforms to the federal, state and local standards for human consumption.

F. RECYCLED WATER: Non-potable tertiary treated water which, as a result of treatment of wastewater, is suitable for a direct beneficial use or controlled use that would not otherwise occur. (See California Water Code section 13050(n).)

G. PROVIDE FOR THE USE OF RECYCLED WATER: Means providing a separate plumbing system, independent of the plumbing system provided to serve potable water, to serve non-potable recycled water for all uses approved by title 22 of the California Code of Regulations ("CCR"), including but not limited to irrigation of landscape areas, toilet and urinal flushing, trap primers, outdoor decorative fountains and other appropriate landscaping, commercial and industrial uses approved by the State.

H. DUAL PLUMBED SYSTEM OR DUAL PLUMBED: Means a system that utilizes separate piping systems for recycled water and potable water within a facility and where the recycled water is used for either of the following purposes:

   a) to serve plumbing outlets (excluding fire suppression systems) within a building, or
   b) Outdoor landscape irrigation at individual residences.

1.2 Recycled Water Required Uses

The use and distribution of recycled water shall be in accordance with the City's Customer Guidelines for Recycled Water Use and all applicable federal, state and local laws, permits, and regulations, including titles 17 and 22 of the CCR, as may be amended from time to time.

The "Recycled Water Service Area" means the precise geographical area designated by the City and as adopted by resolution of the City Council to which the City will provide recycled water service where it has been determined to be or is expected to be available. The City will maintain a copy of the description of the Recycled Water Service Area, which may be updated by resolution from time to time, on file with the Office of the City Clerk.
A. **Requirement for Commercial Properties in Recycled Water Service Area:**
   1. **Existing Commercial:** Existing commercial properties in the Recycled Water Service Area are required to use recycled water for landscape irrigation. Existing commercial properties must provide a feasibility study to apply for an exception to this Article.
   2. **New Commercial:** Projects involving new commercial subdivision of land for which a tentative map or parcel map is required pursuant to California Government Code section 66426 and Chapter 30, Subdivisions, of the Municipal Code or which require a City permit, or both, and which are located within the Recycled Water Service Area, shall be conditioned to be dual plumbed to provide for the internal use of recycled water and to provide for the use of recycled water for landscape irrigation. The City Manager (or designee) will determine requirements for recycled water plumbing. These requirements and the use of recycled water will become conditions of approval.

B. **Requirement for Industrial Projects in the Recycled Water Service Area:**
   1. **Existing Industrial:** Existing industrial properties in the Recycled Water Service Area are required to use recycled water for landscaping. Existing Industrial properties must provide a feasibility study to apply for an exception to this Article.
   2. **New Industrial:** New industrial projects which require a City permit and which are located within the Recycled Water Service Area are required to provide dual plumbing for internal uses of recycled water and to provide for the use of recycled water for landscape irrigation. Such projects must also provide a feasibility study analyzing the possibility of using recycled water for industrial processes and cooling. The City Manager (or designee) will determine requirements for recycled water plumbing. The feasibility study and, if applicable, any City requirements for the use of recycled water will become conditions of approval.

C. **Requirement for Institutional and Governmental Use in the Recycled Water Service Area:**
   1. **New Institutional and Governmental Projects:** New institutional and governmental projects which are located within the Recycled Water Service Area are required to be dual plumbed to provide for the internal use of recycled water and to provide for the use of recycled water for landscape irrigation. The City Manager (or designee) will determine requirements for recycled water plumbing. These requirements and the use of recycled water will become conditions of approval.

D. **Requirement for Residential Uses in the Recycled Water Service Area:**
   1. **New Apartments and Condominiums:** Apartment and condominium projects involving new commercial subdivisions of land for which a tentative map or parcel map is required pursuant to California Government Code section 66426 and Chapter 30, Subdivisions, of the Municipal Code or which require a City permit, or both, and which are located within the Recycled Water Service Area, shall be conditioned to be dual plumbed to provide for the internal use of recycled water and to provide for the use of recycled water for landscape irrigation in common areas. The City Manager (or designee) will determine requirements for recycled water plumbing. These requirements and the use of recycled water will become conditions of approval.

E. **Construction and Dust Control Activities:** Any person applying for a construction permit for a project that includes dust control activities is required to use recycled water for those activities
PROCEDURES

A. **Recycled Water Application Process:** Upon a final determination by the City that a property shall be served with recycled water, or adoption of a condition of development approval requiring use or accommodation of the use of recycled water, the water customer, owner or applicant shall complete an application to use recycled water.

B. **Existing Potable Water Service:** Voluntary Retrofits: Certain existing potable water customers in the Recycled Water Service Area will be provided the opportunity by the City to retrofit their system to accept recycled water.

1.3 Recycled Water Voluntary Uses

A. **Existing Commercial Properties in the Recycled Water Service Area:**
   1. **Existing Commercial Properties:** Existing commercial properties that are in the Recycled Water Service Area shall consider using recycled water for internal dual plumbing, internal cooling towers and evaporative coolers.

B. **Commercial Properties Outside of the Recycled Water Service Area:**
   1. **New and Remodeled Commercial Properties:** New and remodeled commercial properties that are located outside of the Recycled Water Service Area shall consider the feasibility of providing for internal dual plumbing and providing for the use of recycled water for landscape irrigation, as recycled water may be extended beyond the current Recycled Water Service Area.

C. **Existing and New Institutional and Governmental Use:**
   1. **Existing Institutional and Governmental Properties:** Existing institutional and governmental properties in the Recycled Water Service Area shall consider the feasibility of using recycled water for internal dual plumbing and landscape irrigation.
   
   2. **New Institutional and Governmental properties Outside of Recycled Water Service Area:** New institutional and governmental properties that are located outside of the current Recycled Water Service Area shall consider the feasibility of using recycled water for internal dual plumbing and landscape irrigation, as recycled water is expected to be extended beyond the current Recycled Water Service Area.

D. **Residential Uses; Inside and Outside of Recycled Water Service Area:**
   1. **Remodeled Apartments and Condominiums:** Remodeled apartment and condominium properties shall consider the feasibility of dual plumbing to provide for the internal use of recycled water and using recycled water for landscape irrigation in common areas.
   
   2. **Existing Apartments and Condominiums:** Existing apartment and condominiums shall consider the feasibility of using recycled water for landscape irrigation in common areas.
   
   3. **Home Owner Associations:** Home owner associations are encouraged to consider the feasibility of using recycled water for landscape irrigation in common areas.

These statements apply to residential uses both within and outside of the current Recycled Water Service Area as recycled water is expected to be extended beyond the current Recycled Water Service Area.
E. **Industrial Projects; Inside and Outside of Recycled Water Service Area:** All existing and new industrial projects shall consider the feasibility of providing for the use of recycled water for industrial processes and cooling.

1.4 Recycled Water Use Requirement Checklists

Use these checklists to determine if a project is required to use recycled water for landscape irrigation or be dual plumbed for internal uses. Prior to completing this checklist refer to Section 1.1 of this document to review definitions of terms defined in the City’s Recycled Water Use Ordinance and Section 1.2 to confirm the project meets the criteria for new development according to property type.

**LANDSCAPE IRRIGATION CHECKLIST**

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<td>1.</td>
<td><strong>Is the Project in the Recycled Water Service Area?</strong>&lt;br&gt;○ - YES – <em>continue to next question</em>&lt;br&gt;○ - NO – <strong>recycled water is NOT required for irrigation</strong></td>
</tr>
<tr>
<td>2.</td>
<td><strong>Does the Project meet the requirement for NEW or EXISTING Commercial or Industrial properties?</strong>&lt;br&gt;○ - YES – <strong>recycled water use IS REQUIRED for irrigation</strong>&lt;br&gt;○ - NO – <em>continue to next question</em></td>
</tr>
<tr>
<td>3.</td>
<td><strong>Does the Project meet the requirement for NEW Residential Apartments or Condominiums, Institutional, or Government properties?</strong>&lt;br&gt;○ - YES – <strong>recycled water use IS REQUIRED for irrigation</strong>&lt;br&gt;○ - NO – <strong>recycled water is NOT required for irrigation</strong></td>
</tr>
</tbody>
</table>

**Is the project required to use recycled water for landscape irrigation?**<br>**YES _____ NO _____**
DUAL PLUMBED CHECKLIST

1. Is the Project in the Recycled Water Service Area?
   - YES – continue to next question
   - NO – go to question 4

2. Does the Project meet the requirement for NEW Commercial, Industrial, Residential Apartments or Condominiums, Institutional, or Government properties?
   - YES – **dual plumbing for recycled water use IS REQUIRED**
   - NO – continue to next question

3. Is the sole purpose of the project a food preparation facility (i.e. restaurants, coffee shops, catering facilities, grocery stores etc.)? **
   - YES – **dual plumbing for recycled water is NOT required**
   - NO – **dual plumbing for recycled water use IS REQUIRED**

4. Does the Project have an EIR or Water Supply Assessment, which includes requirements, mitigation measures, or conditions for the use of Recycled Water?
   - YES – **dual plumbing for recycled water use IS REQUIRED**
   - NO – **dual plumbing for recycled water is NOT required**

** Is the project required to dual plumb for internal uses of recycled water?
   YES ____     NO ____

** If your facility will include a cafeteria or tenant improvement area which is planned to or may be used to prepare food please refer to section 3.8 for more information.

1.5 List of Acronyms

The following is a list of acronyms used in this document.

CA-NV AWWA  California Nevada Section of the American Water Works Association

DDW  The Division of Drinking Water of the California State Water Resources Control Board.

RWER  Recycled Water Engineering Report

RWSA  Recycled Water Service Area of the City of Redwood City

RWUA  Recycled Water Use Area

SWRCB  California, State Water Resources Control Board
2. PROJECT IMPLEMENTATION

In an effort to streamline the regulatory approval process for the use of recycled water, developers should become familiar with this document, and may choose to schedule a meeting with the Public Works Services Department at the beginning the project in order to ensure that plans meet State and City guidelines. Below is a process timeline to aid developers with the approval process.

---

**Public Works**

- Recycled Water Use Application and Agreement Submittal
  
  **Community Development**
  
  - Planning Application Submittal
    
  - Application Deemed Complete
    
  - Environmental & Design Review
    
  - Public Hearing
    
  - Project Entitlements Approved
    
  - Building Permit Submittal
    
  - Building Permit Approved
    
  - Under Construction
    
  - Construction Complete
    
| Draft Recycled Water Engineering Report (RWER) Submitted to City |
| RWER Comments Returned to Developer for Revision (if applicable) |
| RWER Deemed Complete and Transmitted to DDW |
| DDW Review and Approval |
| Cross Connection Test |
| Delivery of Recycled Water / Building Occupancy |
2.1 City Contacts

Public Works is responsible for reviewing Recycled Water Engineering Reports, obtaining approval for the use of recycled water from DDW, and oversight for the ongoing uses of recycled water. Community Development is responsible for permitting projects including project environmental reviews, project entitlement, plan reviews and construction inspections, and enforcements of building codes, city/state/federal codes and city engineering standards. Contact information for each Department is listed in this section

**Public Works Services Department**
*Recycled Water Specialist*
1400 Broadway
Redwood City, CA 94063
Email: recycledwater@redwoodcity.org
Direct: (650) 780-5973
Main: (650) 780-7464
Fax: (650) 780-7445

**Community Development Department**
1017 Middlefield Rd.
Redwood City, CA 94063

**Building Inspection & Code Enforcement**
Email: permits@redwoodcity.org
Direct: (650) 780-7350
Fax: (650) 780-7348

**Engineering & Transportation**
Email: encroachment@redwoodcity.org
Direct: (650) 780-7380
Fax: (650) 780-7309

**Planning & Housing**
Email: planning@redwoodcity.org
Direct: (650) 780-7234
Fax: (650) 780-0128

2.2 Roles and Responsibilities

**Applicant/Developer/Contractor Responsibilities**

1) Design the site’s recycled water system to conform with State and City regulatory guidelines, standards, and operate within the City’s recycled water quality parameters.

2) Contact Public Works to review which recycled water use(s) are applicable to the project.

3) Prepare the site’s Recycled Water Engineering Report using the City’s template.

4) Submit a draft Recycled Water Engineering Report with submittal of the first building permit application for review. Review by the Public Works Services Department will be required prior to the issuance of any building or engineering permits. (When deemed complete Public Works will
submit the Engineering Report to the State Water Resources Control Board, Division of Drinking Water for approval).

5) Inform all parties involved with the construction of the facilities utilizing recycled water of the rules and requirements related to recycled water use.

6) The Contractor and any sub-contractors responsible for the construction of on-site plumbing systems used for drinking, irrigation, fire suppression, and recycled water shall appoint one individual to attend a Recycled Water Site Supervisor Training Program provided by the City.
   a. The contractor and each sub-contractor, for the duration of the project, shall have an assigned recycled water site supervisor.
   b. The appointed Recycled Water Site Supervisor(s) shall:
      i. Have the authority to prevent unauthorized use of recycled water.
      ii. Be familiar with construction practices, plumbing codes, and City rules and requirements relating to the use of recycled water for irrigation and/or internal plumbing systems including but not limited to:
         1. Pipeline separation,
         2. Labeling signage,
         3. Color coding,
         4. Approved uses, and
         5. Safe handling.
      iii. Be a primary point of contact to the Public Works Services Department relating to recycled water use rules and regulations.
      iv. Be present for the cross-connection test.

7) Prior to temporary certificate of occupancy hire a Cross-Connection Specialist certified by the California Nevada Section of the American Water Works Association (CA-NV AWWA) to conduct an approved cross-connection test. (See Section 5 for additional details on the cross-connection test.)
   a. All end use devices and fixtures must be installed to conduct the test.
   b. All Backflow prevention assemblies shall have passed the initial performance test prior to the cross-connection test.
      i. Service Protection: The City will complete the initial performance test for all backflow prevention assemblies installed at the meter for the purpose of protecting the public water system.
      ii. Internal Protection: The Contractor is responsible for hiring a Backflow Prevention Assembly Tester from the City’s Approved List to conduct the initial performance test on backflow prevention assemblies installed on the internal plumbing system, and report the results on the City’s approved testing form.
   c. The cross-connection test method must be approved by DDW and included in the Engineering Report.
   d. The Cross-Connection Specialist must submit a Cross-Connection Test Plan to Public Works prior to commencing the test.
   e. A representative from Public Works must observe the test.
   f. The test must be completed prior to:
      i. Temporary Certification of Occupancy (TCO), and
      ii. Connection to the Recycled Water System.

8) Coordinate all above steps within the permitting and inspection process at the Community Development Department.
**City Responsibilities**

Public Works Services and the Community Development Departments, will provide regulatory guidance and coordination throughout the development process.

1) Review site plans to ensure compliance with regulatory guidelines.
2) Review and submit developer’s engineering report to the SWRCB DDW.
3) Provide inspection for construction
4) Public Works will provide the initial performance test on all backflow prevention assemblies provided for service protection (immediately downstream of the meter).
5) Review cross-connection test plan, and observe initial cross-connection test.
6) Provide Site Supervisor training to Contractors prior to the start of construction.
7) Provide Site Supervisor training to the individuals responsible for operations and maintenance of the site after construction is complete.
8) Perform physical connection (tapping and meter installation) of the project’s recycled water services to the Recycled Water Distribution System

**2.3 Delivery of Potable and Recycled Water During Construction**

Article 5 Section 60313 (d) of Title 22 states: *No recycled water agency shall deliver recycled water to a facility using a dual plumbed system unless the report required pursuant to section 13522.5 of the Water Code, and which meets the requirements set forth in section 60314, has been submitted to, and approved by, the regulatory agency.* Further, approval by the regulatory agency (DDW) is conditioned upon the successful completion of an approved cross-connection control test.

**To comply with this provision the following must be strictly observed:**

1. To protect public health and safety Public Works Services has the sole authority to operate valves connected to the potable water, and recycled water distribution systems including, but not limited to; system valves, auxiliary hydrant valves, corporation stop valves, and curbstop valves. This includes valves on mains and service connections prior to project completion that have become part of the active water distribution network.
2. Only a SWRCB Certified Water Distribution Operator employed by the City of Redwood City under the direction of the designated Chief Operator in charge may operate and control the function of the Water Distribution system.
3. All service connections constructed for a project shall be locked at the curbstop by the City prior to installation of the city issued water meter.
4. Use of water for the purposes of construction shall be through a City issued construction meter. Use of fire services and un-metered water service connections for construction activities is strictly prohibited. Contractors found to be in violation of this will be cited and a stop work notice will be issued until a City issued construction meter has been obtained.
5. Potable water services will be turned on only after the city issued potable water meter and approved backflow prevention assembly is installed.
6. Recycled water services will be turned on after these conditions are met:
   a. DDW has approved the RWER.
   b. A cross-connection control test approved by DDW has been successfully completed, and all corrective actions have been sufficiently addressed.
c. The city issued meter is installed.

7. If for any reason water is needed in a plumbing system downstream of the city issued meter connection prior to the city issued meter being installed the contractor shall obtain a City issued potable water construction meter.

8. Contractors or sub-contractors shall not install spacers or jumpers in place of any city issued water meter that is capable of passing water or sustaining water pressure greater than 0 psi. Further, any spacer that is installed so the downstream plumbing connections are set to match the dimensions of the meter shall be constructed in a manner whereby it is immediately apparent to the City upon inspection that the spacer is not capable of passing water or sustaining water pressure greater than 0 psi. Examples of spacers or jumpers can be seen in Figure 2.3.1, and Figure 2.3.2. (This applies to all City metered connections including, but not limited to potable domestic water, irrigation, fire service connections, and recycled water.)

9. For the purposes of the cross-connection control test and prior to the use of any recycled water on the site the onsite recycled water plumbing system shall be temporarily supplied with potable water.

10. In the interest of public health and in compliance with the regulations as set forth by the State of California the following shall be strictly adhered to. In the event that the developer, contractor, sub-contractor, or any unauthorized individual, with the exception of an authorized representative of the Public Works Services Department of the City of Redwood City, causes recycled water to pass through the city issued meter or a jumper connection, and enter onsite plumbing systems prior to the approval for use of recycled water by the SWRCB-DDW, the installation of the city issued water meter, and successful completion of an approved cross-connection control test the following, at minimum, will be implemented:

   a. All active water service connections to the project/property will be immediately deactivated and physically separated from the public drinking water system. (including removal of any installed city issued water meters). Deactivation of active fire services may be exempted from this requirement through coordination between the Fire Department and Public Works.

   b. All costs incurred by the City, including the cost of removing any installed water meters by City staff or at the expense of the City, will be billed to the project.

   c. All onsite uses of water for the project shall be provided through an approved air gap separation, break tank, and standalone pumping system, and shall be supplied through a city issued potable water construction meter.

   d. The approved air gap separation, break tanks, and standalone pumping system will remain as the sole source of water supply to the project until after:

      i. The SWRCB-DDW has approved the Engineering Report for dual-plumbed recycled water systems pursuant to CCR, Title 22

      ii. The cross-connection test approved by DDW in the Engineering Report has been completed, no cross-connections and/or unapproved uses of recycled water are found, and all punch list items identified on the cross-connection test report have been resolved or corrected.

      iii. The onsite drinking water plumbing systems have been thoroughly disinfected, flushed, and tested through an approved method and found to be absent of coliform bacteria.
e. Any other procedures or mitigation measures deemed necessary by the Public Works Services Department and/or the SWRCB-DDW in the interest of public health and safety.
3. RECYCLED WATER SYSTEM DESIGN

For protection of public health, recycled water systems must be completely separate from the potable water system and shall not have any direct connections including through a backflow prevention assembly or valve of any kind. All recycled water system components, such as interior pipes and fixtures, must be clearly labeled according to state guidelines. Developers should refer to the following resources when designing and constructing a recycled water system:

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<tr>
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<th>Resource</th>
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<tbody>
<tr>
<td>1</td>
<td>California Code of Regulations Particularly, Titles: 17 and 22</td>
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<tr>
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<tr>
<td>2</td>
<td>California Plumbing Code</td>
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<td><img src="http://www.bsc.ca.gov/codes.aspx" alt="Link" /></td>
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<td>3</td>
<td>City Municipal Code Chapter 38, Article VIII.</td>
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<td>4</td>
<td>City Engineering Standards</td>
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<td><img src="http://www.redwoodcity.org/departments/community-development-department/engineering-transportation/engineering/engineering-standards" alt="Link" /></td>
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<td>5</td>
<td>City Customer Guidelines for Recycled Water Use</td>
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<td><img src="https://www.redwoodcity.org/departments/public-works/water/recycled-water" alt="Link" /></td>
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<td>6</td>
<td>Redwood City Recycled Water Development Standards</td>
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<td>This document. Incorporated as part of the City Engineering Standards.</td>
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<td>7</td>
<td>Redwood City Recycled Water Quality Parameters</td>
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<td>Landscaping and Irrigating with Recycled Water</td>
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3.1 Division of Responsibility

The City is responsible for all recycled water facilities up to and including the recycled water meter. After the meter, the responsibility for all piping and appurtenances lies with the property owner or property manager, and is subject to monitoring and inspection by the City. Property owners are also responsible for monthly reporting to the City, and for notifying the City when any plumbing changes are made to the onsite potable and recycled water systems. The City shall be notified not less than 24 hours prior to any planned repairs, and within 24 hours following any emergency repairs. Notification can be made by phone.
or email to Public Works using the contact information provided in Section 2.1 of this document. Any plumbing modifications, additions or deletions made within a dual plumbed facility requires a plumbing permit and must be submitted to the City for review prior to commencing any work on the site.

3.2 Pipe Separation Requirements

**Water Main and Supply Line Separation Requirements**

Regulations for water main separation can be found in the California Code of Regulations, Title 22, Division 4, Chapter 16, California Waterworks Standards. Please refer to the state guidelines for the most up to date requirements.

As of April 2019, the requirements are:

- New potable water mains and supply lines must be installed at least 4 feet horizontally from, and one foot vertically above, any parallel pipeline conveying disinfected tertiary recycled water. All separations must be measured from the outside edge of the respective pipes.
- If crossing a pipeline conveying recycled water, the potable water main must be constructed no less than 45-degrees to and at least one foot above the recycled water pipeline. No connection joints can be made in the potable water main within eight horizontal feet of a recycled water pipeline.
- The one-foot vertical separation is only required when the horizontal distance between the potable and recycled water lines is less than ten feet.
- Exemptions to these requirements must be approved by the City and the SWRCB.

**On-Site Facilities Buried Pipe Separation Requirements**

Buried pipe separation requirements for on-site facilities includes all appurtenances and piping downstream of a City water meter.

**Horizontal Pipe Separation:**

- For new construction, a horizontal separation maintained at 10 feet between buried recycled and potable water lines is preferred. Where this separation is not feasible, either the potable pipe or the recycled water pipe must be sleeved. A horizontal separation of less than four feet is not permitted.

**Vertical Pipe Separation for Retrofit Sites:**

- Recycled water pipes must be at least one foot below potable water pipelines. Recycled water lines installed above a potable water line must be at least one foot above the potable water line, and the recycled water line must be sleeved a minimum of 10 feet on either side of the potable water pipe. Recycled water pipes less than one foot below or less than one foot above a potable water pipeline is not permitted.

3.3 Recycled Water System Pressure

Pressure varies from site to site. Developers shall consult with the City’s Engineering & Transportation Division of the Community Development Department to determine the recycled water system pressure that will be delivered to the project site (typically 30 psi to 50 psi operating pressure range at the meter). The design shall include the appropriate booster pump and appurtenances to provide adequate pressure to the site. See City Engineering Standards for complete system design criteria.
• If a site requires less pressure than that being delivered, the User shall include a pressure reducing valve downstream of the recycled water meter.
• If a higher pressure than that being delivered is required, the User shall provide booster pumping downstream of the recycled water meter. Booster pressure applied on-site must first be approved by the City and will require installation of a backflow prevention assembly.
• Developers shall also consider pressure reductions resulting from the installation of approved backflow prevention assemblies, and friction losses due to pipe material and changes in direction.

3.4 Hose Bibs
Hose bibs are not permitted on recycled water systems. In place of hose bibs, quick couplers approved for recycled water shall be used.

Quick coupling valves, made specifically for recycled water use shall be:

• 3/4-inch or 1-inch nominal size of brass construction.
• Differ in size or other method such that quick couplers in use by potable water on the site are not interchangeable with recycled water quick couplers.
• Have a normal working pressure of 150 PSI.
• Covers must be permanently attached.
• Covers must be made of purple rubber or vinyl with the words “RECYCLED WATER” imprinted on the cover.
• Covers must be provided with a lock. To prevent unauthorized use, the valve must be operated only with a special coupler key for opening and closing the valve.
• Must be installed approximately 12 inches from sidewalks, pathways, trails, curbs, headboards or paved areas.
• Must be identified with an identification tag and installed in a marked valve box.

3.5 Backflow Prevention Assemblies
Developers shall consult with the City during the design phase to identify the backflow prevention assemblies necessary for the project. The location of backflow prevention assemblies shall be indicated on the plans, along with the size, make and model. All backflow prevention assemblies must be of a make and model approved by DDW and included in the current list of backflow prevention assemblies as approved by the University of Southern California, Foundation for Cross-Connection Control and Hydraulic Research. Backflow prevention assemblies must be tested annually by a certified backflow prevention assembly tester from the City’s approved list.

All potable water connections servicing a property that uses recycled water for any purpose must have an approved backflow prevention assembly installed directly downstream of the potable water meter and must conform with the following requirements.

1. Backflow protection must be a reduced pressure principle assembly and/or an approved air gap.
2. Fire Service connections shall utilize an approved a Reduced Pressure Detector Assembly.
3. Backflow prevention Assemblies shall not be bypassed.
4. There shall be no take-offs upstream of the backflow prevention assembly that do not have an approved backflow prevention assembly installed.

Recycled water systems are required to have a backflow prevention device in order to protect the recycled water distribution system under the following conditions:
1. Backpressure from:
   a. Multi-story buildings
   b. Plumbing systems with a pumping system or pressure vessels
2. Sites where chemical additions are made to the recycled water system.
3. Sites where industrial processes or equipment changes the chemical composition or concentration of chemicals and/or contaminants in the recycled water.

3.6 Plumbing Materials
Non-corrosive plastic pipe, such as polyethylene, polyvinylchloride, or other corrosion resistant plastic, is required to be used for the construction of recycled water plumbing systems. Other materials that may be used include: fusion-bonded epoxy-coated carbon steel, Type 316 stainless steel, or ceramic materials.

Due to the potential corrosiveness of recycled water cast iron, ductile iron, copper, steel, Type 304 stainless steel, and concrete are not approved materials for use in recycled water systems.

All selected materials should conform with the approved or current version of the California Plumbing Code.

A developer may request for an exception to use cast iron, ductile iron, copper, steel, Type 304 stainless steel, or concrete in place of approved pipe materials. Each request for exception must be made in writing. The City will consider exceptions for developments that provide onsite water treatment systems to mitigate the effects of corrosion. Developers are strongly encouraged to prepare a corrosion control treatment plan including but not limited to the following topics.

1. Detailed Plans for onsite treatment of the recycled water to prevent corrosion in the onsite plumbing system including but not limited to:
   a. Treatment method(s)
   b. Location of Treatment Facilities
   c. Chemical storage and containment (if applicable)
   d. Identification of waste streams and disposal methods
   e. Potential for treatment by-products and mitigation
   f. State and/or local permitting requirements
2. An Operations Plan including but not limited to:
   a. Standard Operating Procedures
   b. Operational Control Strategies and Personnel
   c. Maintenance Plan

Section 3.10 of this document lists optional methods of treatment, and Section 6 lists historical ranges and averages of water quality parameters found in recycled water which can be used in designing an effective treatment system. Upon request the City can provide additional available recycled water quality parameter data to assist Developers in the design and selection of onsite treatment systems. The City does not assume responsibility for the operation or maintenance of onsite treatment systems or their efficacy.

3.7 Optional Backup Water Source
In the event of a cross connection or failure of the recycled water distribution system, dual plumbed sites (Dual Plumbed: A site that uses recycled water for internal uses. i.e. toilet flushing, commercial laundry, cooling, and other approved internal uses.) may temporarily be without recycled water service. For facilities that are deemed critical or would like a redundant water supply the owner/developer should
plan to install a backup potable water supply to temporarily supply the recycled water system for internal uses.

After recycled water has been supplied to a plumbing system, pipe, fixture, or any end use device a direct connection from a potable water source connected to the public drinking water system (including any supply through a backflow prevention assembly) is strictly prohibited. The only method for providing potable water to the recycled water system is through an approved air gap.

The potable backup source must be supplied through an approved air-gap and storage tank and may require a pump to re-pressurize the on-site recycled water system. Developers should appropriately size the storage tank and pump to meet the operational needs of the facility.

An air-gap is a physical separation between the free-flowing discharge end of a potable water supply pipeline and an open or non-pressure receiving vessel. An “approved air gap” shall be at least twice the diameter of the supply pipe measured vertically above the overflow rim of the receiving vessel; and in no case less than 1 inch (2.54 cm).

3.8 Recycled Water Use Area

The Recycled Water Use Area (RWUA) is the area on a property where recycled water is used, and where recycled water pipes and plumbing fixtures are located. For clarity the RWUA is not the same as the Recycled Water Service Area which is the geographic area in the City where recycled water is required to be used.

The RWUA should be broken into two use categories; irrigation and non-irrigation. Non-irrigation use areas include areas where recycled water is used for toilet flushing, cooling, commercial laundry, and other approved uses.

The RWUA shall not include commercial food preparation facilities, or other commercial facilities where food and drink are prepared onsite. Areas meeting these requirements shall be separately metered through a dedicated service connection to the Public Water System and be clearly defined in the Recycled Water Engineering Report. Sub-metering these facilities from a water service which also provides potable water to the RWUA is prohibited.
Food preparation facilities include: restaurants, cafes, coffee shops, catering facilities, grocery stores, juice bars where fresh fruit and vegetables are washed onsite, and any other areas of similar nature as determined by DDW and not approved for the use of recycled water.

Areas where food and drink are served, and areas where pre-packaged food and drinks are stored or distributed are allowed in the RWUA.

To comply with these requirements a project may need to exclude a small area on a single floor, an entire floor/wing of a building, or an entire building from the RWUA. Additionally, no pipes or plumbing fixtures using or intended for the use of recycled water shall be within or pass through food preparation areas.

All recycled water pipes, fixtures, end use devices, and irrigated areas beginning at the City issued recycled water meter shall be included within the RUWA.

3.8.1 Tennant Improvement Areas

Tennant Improvement (TI) areas in new and existing buildings intended to be used for retail sales, restaurants, personal services, business services, and entertainment establishments shall not be dual plumbed for the use of recycled water and must be excluded from the RWUA. Land use definitions may be revised and amended over time, and developers should consult with Public Works to assess suitability of any particular use with these recycled water development standards.

The following requirements must be met to exclude TI areas from the RWUA:

1. The TI shall be separately metered through a dedicated potable water service connection to the Public Water System provided by the City.
2. Recycled water service connections from the City shall not be provided to TI areas.
3. No pipes or plumbing using or intended for the use of recycled water shall be within or pass through the TI area, including recycled water pipes passing through the TI area servicing RUWAs within the same building.
4. Sub-metering TI areas from a potable water service which also provides potable water to a RWUA is prohibited.
5. A separate hot water system is required for TI areas.
6. Potable pipe labels for cold and hot water in TI areas shall be marked distinctly and shall differ from potable pipe labels within the RWUA. (i.e. DEDICATED DOMESTIC COLD, DEDICATED DOMESTIC HOT)
7. TI areas shall be included in the initial, 4-year, and any other required cross-connection tests performed on the building.

All tenant improvement areas must be specifically identified in the Engineering Report and include a list of potential/approved commercial uses for each area. Should a tenant improvement area use change to something that was not included in the Engineering Report, a retrofit plan and amended Engineering Report may be required and be approved by the City and DDW. Final determination of the use of recycled water in tenant improvement areas shall be made by the City.
3.8.2 Child Care Facilities
The use of recycled water in child care facilities is not prohibited, however, upon request child care facilities may be excluded from the RWUA and from using recycled water for toilet and urinal flushing, and for irrigation in outdoor play areas designated solely for child care.

Developers seeking to exclude child care facilities from using recycled water shall do so through the preparation of the RWER. The RWER shall clearly exclude the child care facility or area from the RWUA. Toilets and urinals shall be labeled as using potable water. Irrigation systems using potable water are required to have a dedicated potable irrigation water meter provided by the City and are subject to potable irrigation water budgets and rates. Potable irrigation systems shall not have any components that are colored or labeled in a way that would identify it as using recycled water.

3.9 System Identification
All recycled water equipment and appurtenances must be identified as conveying recycled water and that the water is not for drinking. Clearly identifying recycled water pipes and appurtenances, as well as other pipelines located near recycled water lines, will reduce the risk of mistakenly connecting a recycled water pipe or a non-recycled water pipe to pipelines conveying drinking water.

Recycled water systems and system components must be labeled according to state regulations and these standards, which ever may be more stringent. Terms such as “reclaimed water” or “non-potable water” shall not be used in place of “Recycled Water” for labeling and signage or for preparation of the RWER.

Examples:
3.9.1 Above Grade Piping

- Potable water pipelines must be labeled with a green background and white lettering having the words “DOMESTIC COLD WATER”. Hot water pipes supplied with potable shall be labeled with a yellow background and black lettering having the words “DOMESTIC HOT WATER” over the pipe insulation. Potable water pipes installed in unexposed areas such as walls, ceilings, or sub-floors shall be continuously labeled. When installed in exposed areas like in the example above labels can be spaced as required in the California Plumbing Code. For retrofit projects, all unexposed pipes shall be exposed and labeled.

- Recycled water pipelines shall be labeled with a purple background and black or white uppercase lettering having the words “RECYCLED WATER – DO NOT DRINK” visible in contrasting letters.
  - Flexible conduits or hoses must be clearly labeled “RECYCLED WATER – DO NOT DRINK” with each adapter or fitting painted purple.
  - Piping and fittings, newly installed or existing, must be identified by the application of Mylar tape with wording identifying the pipe as recycled-water piping.
  - Labels shall be continuous regardless of the location it is installed.
  - For retrofit projects, all unexposed pipes shall be exposed and labeled.

- Non-potable water pipelines must be appropriately labeled with a yellow background and black lettering having the words “NON-POTABLE WATER – DO NOT DRINK” visible in contrasting letters.

3.9.2 Below Grade or Buried Pipe

**New Pipes:**

- All buried potable lines must be identified by continuous lettering on 3-inch minimum width blue tape with 1-inch white lettering bearing the wording “POTABLE WATER” permanently affixed continuously atop all horizontal piping, laterals and mains.
  - Identification tape must extend to all valve boxes, vaults and exposed piping.
  - Identification tape is not necessary for extruded blue-colored PVC with continuous wording “POTABLE WATER” printed in contrasting lettering on opposite sides of the pipe.

- Buried recycled water piping must be purple colored and continuously marked with the wording “RECYCLED WATER – DO NOT DRINK” on opposite sides of the pipe.
o Tape that is at least 3-inches in width and runs continuously along the length of the pipe containing the words “RECYCLED WATER – DO NOT DRINK” is an acceptable alternative to printed pipe.

o The letters must be at least 1-inch in height and either black or white contrasting lettering.

o The tape must be permanently secured to the top of all pipes, mains and laterals.

**Existing Pipes:**

This section shall only apply to existing pipes for landscape irrigation systems. Any existing pipes used for dual plumbed retrofits shall be exposed and labeled in the same manner as new projects.

- Existing potable water piping need not be marked unless exposed during construction or maintenance. The exposed section of pipe shall be continuously marked as “POTABLE WATER”.
- Existing recycled water piping need not be marked unless exposed during construction or maintenance. The exposed section of pipe shall be continuously marked as “RECYCLED WATER – DO NOT DRINK”.

### 3.9.3 Purple Wrapping Tape Specifications

Where it is not feasible to use purple pipe, recycled water pipes should be wrapped with purple tape. Wrapping should be as follows:

- Tape shall be fabricated of polyvinyl chloride with a synthetic rubber adhesive and a clear polypropylene protective coating or approved equal.
- Wrapping tape shall have a minimum nominal thickness of five ten-thousandths (0.0005) inch and a minimum width of two (2) inches.
- Tape must be purple in color and shall be imprinted in black or white, uppercase letters, with the words “RECYCLED WATER – DO NOT DRINK”.
- Wrapping tape is not required for buried PVC pipe manufactured with purple color integral to the plastic and marked on opposite sides to read “RECYCLED WATER – DO NOT DRINK” in intervals not to exceed three 3 feet.

### 3.9.4 Appurtenance Identification

Recycled water appurtenances must be identified with tags or labels as belonging to the recycled water system. Recycled water tags or labels must have a purple background with black lettering stating, “RECYCLED WATER – DO NOT DRINK”.

Potable water appurtenances shall be tagged or labeled as part of the potable water system. Labels must have a blue background with “POTABLE WATER” in white lettering.

Exposed valve boxes, vaults, quick coupling valves, outlets and related appurtenance must be color-coded, labeled or tagged, to differentiate recycled water from potable water:

- For potable water: “POTABLE WATER” in white lettering on a blue background.
- For recycled water: “CAUTION – RECYCLED WATER – DO NOT DRINK” in black or white contrasting lettering on a purple background.
- For non-potable water: “NON-POTABLE WATER – DO NOT DRINK” in contrasting lettering on a yellow background.

Examples of appurtenances that must be identified are:
• Valves
  o Including air/vacuum relief valves, pressure reducing valves, pump control valves, etc. See below for specific valve identification requirements.
• Pumps
• Pressure regulators
• Flow meters
• Quick couplers
• Strainers
• Other related components (i.e. trap primers, shock arresters)

3.9.4.1 Valves
All valves must have an identification tag on the valve operator. Additionally, quick coupling valves must also be installed in a valve box with the valve box cover imprinted with the words “RECYCLED WATER”.

Valves and Mechanical Equipment
• All valves, except fixture supply control valves, shall be equipped with a locking feature.
• All mechanical equipment, which is appurtenant to the recycled water system, shall be painted purple to match the wrapping tape.

Valve Seals
Seal each valve or appurtenance after the recycled water system has been approved, and placed into operation. These seals shall either be a crimped lead wire seal, or a plastic break-away seal which, if broken after system approval, shall be deemed conclusive evidence that the recycled water system has been accessed. The seals should be purple with the words “RECYCLED WATER”.

3.9.5 Storage Tanks and Impoundment Identification
All storage tanks, either stationary or portable, must be structurally sound and free from leaks. Each tank must be conspicuously marked with signs with the words “RECYCLED WATER – DO NOT DRINK” in black letters 2-inches high on a purple background. The “Do Not Drink” symbol should be present on all recycled water storage tanks.

Impoundments (lakes) that receive recycled water are classified as:
• Unrestricted – Swimming and body contact allowed.
• Restricted – No swimming or body contact, but non-contact activities such as fishing and boating allowed.
• Ornamental – No recreational activities allowed.

All impoundments must have the recycled water valves and outlets marked or tagged with the words “RECYCLED WATER – DO NOT DRINK.” At restricted and ornamental impoundments, adequate measures must be taken to prevent body contact. All recycled water impoundments must be kept separate from potable water wells and reservoirs.

If any storage tank or impoundment receives both recycled and potable water, the potable water supply must be properly equipped with an air-gap.
3.9.6 Use Area Signage

It is important that individuals in recycled water use areas are aware that the recycled water is not for drinking; therefore, signage at locations where recycled water is being used is imperative.

- Place recycled water signs at obvious locations in areas where recycled water is used.
- Where recycled water is used on landscapes; signs must be placed at obvious locations such as entrance points, specific work areas, and areas where recycled water equipment is housed or stored.
- When used in decorative fountains, signage should be included at or near the fountain.
- Where recycled water is used indoors, such as in industrial processes and for toilet flushing, the room or area must contain a clearly visible sign indicating that recycled water is being used and identify what the water is being used for.
- Design plans should indicate the location of signs planned for the site.

Signs to be used at a site must be approved by the City.

Below are common recycled water use signs:

- **Room Entrance** – Signs in water closets and/or urinals using recycled water shall contain 1/2-inch letters of a highly visible color on a contrasting background. Room entrance signs should contain text similar to the following:

  “TO CONSERVE WATER, THIS BUILDING USES RECYCLED WATER TO FLUSH TOILETS AND URINALS”

- **Decorative Fountains** – Signs to be placed at decorative fountains will be provided by the City and must be located on or near the fountain and clearly visible to passersby containing the wording:

  “THIS WATER FEATURES USES RECYCLED WATER, DO NOT DRINK”

- **Equipment Room** – Signs in equipment rooms containing recycled water equipment shall contain 1-inch letters on a purple background with text similar to the following:

  “CAUTION RECYCLED WATER, DO NOT DRINK. DO NOT CONNECT TO DRINKING WATER SYSTEM”

  “NOTICE CONTACT BUILDING MANAGEMENT BEFORE PERFORMING ANY WORK ON THIS WATER SYSTEM”

  Additionally, the signs shall contain an international symbol that conveys that the water is not intended for drinking. The symbol shall be similar to Figure 60310-A, Section 60310, Title 22, California Code of Regulations.

- **Tank-type Water Closet** – Signs for tank-type water closets that are flushed with recycled water should be labeled:
Additionally, the signs shall contain an international symbol that conveys that the water is not intended for drinking. The symbol shall be similar to Figure 60310-A, Section 60310, Title 22, California Code of Regulations.

- **Valve Access Door** – Each recycled water valve within a wall should have its access door into the wall equipped with a warning sign approximately 6 x 6 inches with wording in 1 and 1/2 inch letters on a purple background. Attach signs inside the access door-frame and hang in the center of the access door frame.

### 3.10 Optional On-Site Treatment

For sites using recycled water for uses other than landscape irrigation, additional on-site treatment may be necessary to address concerns for equipment susceptible to corrosion. Listed below are a few recommended on-site treatment options for users to consider. Upon request the City can provide additional recycled water quality parameter data it has on record, but does not assume responsibility for the operation or maintenance of on-site treatment systems or their efficacy. It is also the users responsibility to ensure treatment systems are designed by qualified professionals.

#### 3.10.1 Ammonia and Chloride Treatment

**Aerated Nitrification Filter and Ion-Exchange**

This treatment approach is applicable to medium and large industrial users (>10,000GPD). An aerated nitrification filter removes hydrogen sulfide and ammonia, which is followed by demineralization through ion-exchange.

**Ion-Exchange Pre-Treatment and Reverse Osmosis**

An alternative option is reverse osmosis (RO) with ion-exchange pre-treatment. This method is applicable to users with demands less than 10,000 GPD. A typical RO treatment system consists of the following main components: RO pretreatment, RO unit, post-RO treatment, monitoring instruments and valves, storage tank and accessories, and re-pressurization system. Small packaged RO treatment systems are commonly available for water users of 500 to 10,000 GPD. If RO treatment is used care should be taken to prevent corrosion due to low pH in finished water, and chemical additions may be required to raise pH and alkalinity as a buffering agent.

#### 3.10.2 Odor Control

A carbon-impregnated cartridge filter installed at the service connection is one possible method for reducing turbidity and odor of recycled water. These filters are commonly available at hardware stores and are relatively easy to install.

In order to remove odors, it is important to use filter elements that are impregnated with granular activated carbon (GAC). Filter housings should be rated for a working pressure of 100 psig, and should be protected from vandalism and direct sunlight.
3.11 Codes Covenants & Restrictions for Condominiums

California Water Code Section 13553 allows for the use of recycled water for toilet and urinal flushing in condominium projects subject to a number of provisions including but not limited to the following.

1. Potable water service to each condominium project will be provided with a backflow protection device approved by the State Water Resources Control Board to protect the agency’s public water system, as defined in Section 116275 of the Health and Safety Code.

2. The condominium’s declaration, as defined in Section 4135 or 6546 of the Civil Code, shall provide that the laws and regulations governing recycled water apply, shall not permit any exceptions to those laws and regulations, shall incorporate the report described in Section 4 of this document, and shall contain the following statement:

   **NOTICE OF USE OF RECYCLED WATER**

   This property is approved by the SWRCB Division of Drinking Water for the use of recycled water for toilet and urinal flushing. This water is not potable, is not suitable for indoor purposes other than toilet and urinal flushing, and requires dual plumbing. Alterations and modifications to the plumbing system require a permit and are prohibited without first consulting with the appropriate local building code enforcement agency and your property management company or owners’ association to ensure that the recycled water is not mixed with the drinking water.

Property management company or owners’ associations shall inform all new condominium owners, lessees, and tenants that recycled water is used on the property and/or within condominiums for the specific uses described in the Recycled Water Engineering Report, and that any alterations or modifications to the plumbing system require a permit issued by the City of Redwood City prior to the commencement of any work.

3.12 Tenant Notification for Residential Apartments

Property management shall inform all lessees, and tenants that recycled water is used on the property and/or within apartments for the specific uses described in the Recycled Water Engineering Report, and that any alterations or modifications to the plumbing system require a permit issued by the City of Redwood City prior to the commencement of any work. Property Management shall include the following notice in the rental/lease agreement or as a supplemental document to said agreement for each lessee/tenant to the property.

   **NOTICE OF USE OF RECYCLED WATER**

   This property is approved by the SWRCB Division of Drinking Water for the use of recycled water for toilet and urinal flushing. This water is not potable, is not suitable for indoor purposes other than toilet and urinal flushing, and requires dual plumbing. Alterations and modifications to the plumbing system require a permit and are prohibited without first consulting with property management and the appropriate local building code enforcement agency to ensure that the recycled water is not mixed with the drinking water.
4. RECYCLED WATER ENGINEERING REPORT

An engineering report must be submitted to and approved by the California State Water Resources Control Board, Division of Drinking Water (DDW) for all dual plumbed recycled water facilities in accordance with Title 22 requirements. The engineering report must be prepared by a qualified engineer licensed in California and experienced in the field of wastewater treatment, and contain a description of the recycled water system’s design. Public Works has prepared a template Engineering Report to assist developers.

1. A Draft Engineering Report is due for Public Works review no later than with submittal of the first building permit application. Review by the Public Works Services Department will be required prior to issuance of any building or engineering permits.
2. Public Works will provide initial comments to the Developer that must be addressed prior to submission to DDW.
3. When deemed complete Public Works will submit the Report to DDW for Review and Approval.
   a. Additional comments may need to be addressed following initial review by DDW.
4. Following approval by DDW, no changes can be made to the design of the potable water or recycled water plumbing systems. If a design change is required, it must be approved by DDW.

Recycled water used for any dual plumbed uses is strictly prohibited prior to state approval of the engineering report and completion of cross-connection test. During construction and testing, plans should be made for temporary use of potable water (please refer to Section 2.3).

4.1 California SWRCB Requirements

Below is a list of the requirements set forth in Title 22. The Engineer preparing the report is responsible for confirming the current version of these requirements is used when drafting the Recycled Water Engineering Report (RWER). Redwood City has prepared a RWER Template which includes instructions and tips to aid Engineers. A Microsoft Word version of the template is available for download on the City’s website.

§60314. Report submittal

(a) For dual-plumbed recycled water systems, the report submitted pursuant to section 13522.5 of the Water Code shall contain the following information in addition to the information required by section 60323:

1) A detailed description of the intended use area identifying the following:
   (A) The number, location, and type of facilities within the use area proposing to use dual plumbed systems,
   (B) The average number of persons estimated to be served by each facility on a daily basis,
   (C) The specific boundaries of the proposed use area including a map showing the location of each facility to be served,
   (D) The person or persons responsible for operation of the dual plumbed system at each facility, and
   (E) The specific use to be made of the recycled water at each facility.

2) Plans and specifications describing the following:
   (A) Proposed piping system to be used,
   (B) Pipe locations of both the recycled and potable systems,
(C) Type and location of the outlets and plumbing fixtures that will be accessible to the public, and
(D) The methods and devices to be used to prevent backflow of recycled water into the public water system.

(3) The methods to be used by the recycled water agency to assure that the installation and operation of the dual plumbed system will not result in cross connections between the recycled water piping system and the potable water piping system. This shall include a description of pressure, dye or other test methods to be used to test the system every four years.

(b) A master plan report that covers more than one facility or use site may be submitted provided the report includes the information required by this section. Plans and specifications for individual facilities covered by the report may be submitted at any time prior to the delivery of recycled water to the facility.

4.2 Redwood City Requirements

In order to streamline the review process, and reduce the number of revisions to the RWER Redwood City requires the following documents, plans, or plan sheets to be included in the report.

1. Plumbing Plans shall include color coded pipelines such that pipelines can be easily traced from the City meter to each end use device. Color coding shall include, but is not limited to, the following uses, and ideally colors should be as follows, but other color combinations may be used:
   a. Cold water: blue
   b. Hot water: red
   c. Recycled water: purple
   d. Irrigation: green

2. Plumbing plans shall include riser diagrams with a minimum of two dimensions. It is advised to include three-dimensional isometric riser diagrams with the plumbing plans. Isometric riser diagrams may be required to complete the review and obtain approval by DDW.
   a. Riser diagrams shall be color coded in the same manner as other plumbing plan sheets.

3. Landscape irrigation plans shall be included with the RWER.

4. Architectural plans should be included with the RWER submission to aid with the review of the report and for planning the Cross-Connection test.

5. Mechanical plans are required if equipment uses recycled water.

6. It is preferred the City’s Recycled Water Engineering Report Template is used in order to streamline the review process. The template is available for download on the City’s website.
5. CROSS CONNECTION & COVERAGE TESTS

A cross-connection is a connection or potential connection between a drinking water system and any other system that may contain harmful substances that could possibly enter the drinking water system. Cross connections between the potable drinking water system and the recycled water system are strictly prohibited. The drinking water plumbing system must be physically separated from any recycled water plumbing system. The only way to supply potable water to a recycled water system is through an approved air gap.

5.1 Cross-Connection Test

Prior to connecting to the City’s recycled water distribution system, the site must pass a full shut-down cross connection test. This test must be performed by a Cross-Connection Control Specialist certified through the CA-NV Section of the AWWA and observed by Public Works staff.

Cross Connection Tests must be performed on all dual plumbed facilities, and irrigation systems prior to the use of recycled water. The cross-connection testing procedures must be approved by DDW and included in the RWER. A separate and distinct test shall be performed for the irrigation system and each facility/building within the recycled water use area. For larger projects with multiple buildings and/or city metered connections a phased cross-connection test plan shall be included in the RWER. Projects with dedicated potable water services supplying retail tenant improvement areas which are not included in the Recycled Water Use Area shall include these areas in the cross-connection test. Provisions must be made by the contractor to supply the on-site recycled water plumbing system through a temporary metered source of potable water. Please refer to Section 2.3 of this guide for additional detail.

A full shut-down cross connection test is required:
• Prior to occupancy
• Anytime there is a plumbing change to onsite potable and/or recycled water systems, and
• Every four years in accordance with Title 22 regulations.

The standard shut-down test consists of three phases:
1. Test to confirm that all fixtures and end of use devices (potable and recycled) are pressurized.
2. Pressurize the potable water system and de-pressurize the recycled water system. Verify that all potable water fixtures are functional, and that no flow is observed from recycled water fixtures.
3. Pressurize the recycled water system and de-pressurize the potable water system. Verify that all recycled water fixtures are functional, and that no flow is observed from potable water fixtures.

Shut-down tests must be performed by a certified cross-connection control specialist and observed by Public Works. It is the property owner’s responsibility to coordinate the shut-down test and submit the test report to Public Works.

The AWWA Certified Cross-Connection Specialist performing the test shall prepare a report following the completion of the on the City’s approved form. The report shall include a list of any Corrective Actions which shall be completed prior to delivery of recycled water, and Punch List Items which shall be corrected prior to final certification of occupancy. Corrective actions include any and all items that, should recycled water be delivered, would violate the provisions of Title 22 and cause a direct health and safety concern to occupants or the public. Punch list items include all other items that must be completed prior to occupancy and do not pose a health and safety concern.

The City will install the recycled water meter after the following conditions are met:
1. A successful cross-connection test has been completed.
2. All corrective actions have been performed (Some corrective actions may require the cross-connection test to be redone).
4. A Site Supervisor has been named and received training by Public Works.

5.2 Coverage Test
Irrigation Systems are required to have a coverage test. The coverage test is performed to ensure that spray heads and rotors are properly aligned to distribute water to the area intended to be irrigated and is not running off of the site. The coverage test also ensures that recycled water does not come in contact with drinking fountains or picnic tables. Coverage tests are not required for areas irrigated with subsurface systems, however, subsurface irrigation should not cause run-off from the site.

The initial coverage test shall be conducted after installation of the city issued recycled water meter and upon delivery of recycled water to the irrigation system and prior to final certification of occupancy. The Coverage test shall not be conducted through temporary supply connections to the irrigation system to ensure coverage during normal operating conditions.

5.3 Ongoing Inspections and Tests
After connecting to the recycled water system, the City will coordinate annual site inspections with the designated Site Supervisor. The annual inspection is a visual inspection to ensure that no plumbing
changes have been made and that all use requirements are being met. For sites requiring a full shut-down test the City will send a notice to the Site Supervisor when the cross-connection test is due.
**6. REDWOOD CITY RECYCLED WATER QUALITY PARAMETERS**

Historical recycled water quality includes analysis of the parameters listed below from water samples taken at the Recycled Water Distribution Pump Station between December 2009 and June 2018.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Units</th>
<th>Min</th>
<th>Max</th>
<th>Average</th>
<th>Median</th>
</tr>
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<tbody>
<tr>
<td>Acetone</td>
<td>ug/L</td>
<td>4.20</td>
<td>9.00</td>
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<tr>
<td>Alkalinity (bicarbonate, as CaCO3)</td>
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<td>190</td>
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<tr>
<td>Alkalinity (carbonate, as CaCO3)</td>
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<td>ND</td>
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<td>ND</td>
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<td>ND</td>
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<td>Copper</td>
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<td>ND</td>
<td>ND</td>
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<td>Ethylene dibromide / EDB</td>
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<td>ND</td>
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<td>Max</td>
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<td>Median</td>
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<td>Lead</td>
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<td>ND</td>
<td>ND</td>
<td>ND</td>
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<td>ND</td>
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<tr>
<td>Methyl chloride</td>
<td>ug/L</td>
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<td>Methyl ethyl ketone (MEK) (2-Butanone)</td>
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<td>ND</td>
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<td>o-Xylene</td>
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<td>ND</td>
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<td>Tin</td>
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ND = Not Detected

mg/L = milligrams per liter

ug/L = micrograms per liter

uS/cm = microSiemens per centimeter

CU = color unit
7. LANDSCAPING AND IRRIGATING WITH RECYCLED WATER

Redwood City requires all existing commercial and industrial properties, and all new commercial, institutional, industrial, government, and multi-family residential properties within the Recycled Water Service Area to use recycled water for landscape irrigation. To promote plant health and plan for the use of recycled water this section contains important information developers and landscapers should consider when designing and maintaining landscapes irrigated with recycled water.

7.1 Plant Selection

Water quality parameters are used to evaluate landscape conditions as a function of the concentration of total salts [referred to as total dissolved solids (TDS) or electrical conductivity (EC)] as well as the concentration of several specific ions (chloride, sodium, boron), bicarbonate, pH, trace elements, and nutrients (nitrogen, phosphorus, potassium).

While potable water is suitable for irrigation of most any plant, recycled water which is higher in TDS and EC may affect the health and appearance of some plants which is why it is important to select plant species that are more tolerant or can thrive when irrigated with recycled water. Additionally, as water moves through the soil and is evaporated from the soil surface, some of the salts in the water stay behind. When present in high concentrations, some of these salts can damage sensitive plants. In some cases, the salts can cause plant damage when water is applied directly to the foliage by sprinklers.

For landscapes comprised of species having good salt tolerance and low water requirements it is likely that only small adjustments to the irrigation practices will be needed to maintain acceptable landscape appearance. For landscapes comprised of species having moderate salt tolerance and moderate to high water requirement, a significant increase in irrigation (frequency and duration) will likely be required to maintain acceptable plant appearance and health.

Recommended Practices:

- Select plant species from Redwood City’s Recommended Plant List for Irrigating with Recycled Water
- Consider the type of irrigation system being used to minimize the amount of water coming in contact with foliage
- Refer to historical recycled water quality parameters provided in Table 7.4.1 when selecting plants

7.2 Soil Conditions

As a rooting environment, the soil holds the water and elements for root uptake. Some constituents in recycled water can have negative effects on the soil as they concentrate over time, and it may be necessary to amend the soil prior to planting. There are four soil characteristics of key importance.

a. Chemical characteristics – Soils with low concentrations of salts or low pH can accumulate more salts from the water before salt concentrations cause plant damage.

b. Texture of the soil – Clay (fine-textured) soils are more quickly degraded by excess sodium than sandy (coarse textured) soils.

c. Soil profile – The vertical gradation or layering with soil depth affects water percolation, salt accumulation and plant rooting patterns.

d. Soil drainage – Soils with poor drainage characteristics accumulate salts and cannot be easily leached. The poorer the drainage, the better-quality water required.
Recommended Practices:

- Consider implementing a leaching program to maintain soil salinity within the root zone. Leaching is accomplished by applying a large volume of water that carries salts accumulated in the root zone farther down into the soil profile. The volume of water required depends on the texture of the soil, the depth of the root zone, and the salt concentration reduction needed. For leaching treatments to be effective, the soil must drain. If layers are present in the soil profile that restrict leaching, they need to be broken through to allow drainage into the soil below, or drain lines must be installed to carry leach water away.

- Apply gypsum prior to leaching when indicated by soil analysis. Gypsum (CaSO4) is a soil amendment that, when combined with leaching, helps lower soil sodium concentration. The calcium supplied by gypsum displaces sodium on clay particles so that the sodium can be leached below the root zone. To be effective, the soil must drain. The amount of gypsum needed and the frequency of application depend on site-specific soil and water characteristics, and is determined by laboratory analysis.

- Perform soil percolation tests to evaluate effectiveness of leaching programs and need for installation of sub-drainage systems.

7.3 Irrigation Method, Frequency, and Duration

Property owners are responsible for developing and adjusting irrigation. Supplying the right amount of water to the landscape at the right time requires determining appropriate irrigation frequency and duration. The amount of water available to plants depends on how much water the soil holds within the root zone – the soil water reservoir. Soil texture largely determines how much water a given volume of soil will hold. For instance, loamy sand holds 1.2” available water per foot of soil, while a clay loam holds twice that amount, 2.4”/ft.

When using recycled water, irrigation frequency should be increased as needed to maintain moist (but not wet) soil. Drought stress occurs at higher soil moisture as water quality declines because the salts increase the osmotic pressure. As the soil dries, the salts in the soil solution become more concentrated, and plant damage is more likely to occur. Irrigation systems with non-uniform application patterns may need to be upgraded to avoid dry areas.

To assist our landscape irrigation customers Redwood City provides water budgets for all sites using dedicated irrigation water meters. The budget is a calculation of the amount of water required for a given property during a billing period. The goal is for actual landscape water use to be similar to the budget. The budget is calculated daily from measurements of the landscape area (A), daily evapotranspiration (ETo), estimated water requirements of planting (landscape coefficient, KL), and the irrigation efficiency of the water application (IEL). The City has assigned values for KL and IEL based on whether the landscape is composed of turf or non-turf. KL values for turf are 0.8, and 0.4 for non-turf.

Recommended Practices:

- For sites using recycled water Redwood City recommends to irrigate between 100% and 125% of the water budget to maintain moist soil conditions and provide adequate leaching of salts past the root zone of plants.

- Perform an irrigation system audit at each site to quantify application rates and variability. This information is needed to irrigate effectively and to identify potential problem areas that need modification.
• Consider installing soil moisture monitoring equipment to measure the soil moisture at various depths within and below plant root zones. This information would be helpful in evaluating effectiveness of irrigation schedules and leaching treatments.

### 7.4 Landscape Water Quality

The quality of recycled water is dependent on a number of factors that can change the water quality parameters including but not limited to; wastewater sources, season, drought, water conservation, conditions of wastewater collection systems, the wastewater treatment process, and regulatory requirements. The Silicon Valley Clean Water Authority (SVCW) produces disinfected tertiary recycled water for distribution by the City of Redwood City which meets all treatment regulations and permit requirements under the authority of the San Francisco Regional Water Quality Control Board (RWQCB) and State Water Resources Control Board Division of Drinking Water (DDW). Table 7.4.1 lists water quality parameters that can be used when designing landscapes.

Sodium and chloride concentrations are particularly important if irrigation water will be supplied by sprinkler. Plants will absorb both ions through their foliage. Salt damage through foliar absorption will occur at much lower concentrations than through soil absorption, particularly under high evapotranspiration conditions. For this reason, interpretation of water quality is different for foliar applied (e.g. spray irrigation that wets plant foliage) than for soil applied (e.g. bubbler or drip irrigation) irrigation systems. Therefore, water quality may be identified as poor for foliar application and fair for soil application.

### Table 7.4.1 – Historic Recycled Water Quality Parameters for Landscapes

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Min</th>
<th>Max</th>
<th>Average</th>
<th>Median</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bicarbonate (mg/L)</td>
<td>230</td>
<td>350</td>
<td>303</td>
<td>310</td>
</tr>
<tr>
<td>Boron (mg/L)</td>
<td>0</td>
<td>1.3</td>
<td>0</td>
<td>0.3</td>
</tr>
<tr>
<td>Chloride (mg/L)</td>
<td>210</td>
<td>460</td>
<td>271</td>
<td>260</td>
</tr>
<tr>
<td>Conductivity (umho/cm)</td>
<td>1100</td>
<td>2100</td>
<td>1508</td>
<td>1500</td>
</tr>
<tr>
<td>pH</td>
<td>7.18</td>
<td>7.60</td>
<td>7.38</td>
<td>7.38</td>
</tr>
<tr>
<td>Phosphorus (mg/L)</td>
<td>0.38</td>
<td>4.20</td>
<td>2.69</td>
<td>2.95</td>
</tr>
<tr>
<td>Potassium (mg/L)</td>
<td>14</td>
<td>22</td>
<td>18</td>
<td>17</td>
</tr>
<tr>
<td>Sodium (mg/L)</td>
<td>130</td>
<td>260</td>
<td>163</td>
<td>160</td>
</tr>
<tr>
<td>Sodium Absorption Ratio (SAR)</td>
<td>4.16</td>
<td>8.35</td>
<td>5.52</td>
<td>5.34</td>
</tr>
<tr>
<td>TDS (mg/L)</td>
<td>520</td>
<td>980</td>
<td>693</td>
<td>680</td>
</tr>
<tr>
<td>Total Nitrogen</td>
<td>28</td>
<td>61</td>
<td>42</td>
<td>41</td>
</tr>
</tbody>
</table>