
**Recommendations of the
California State Water Resources Control Board
Division of Drinking Water's
Advisory Group on Direct Potable Reuse:**

Terms and Definitions for Potable Reuse

Prepared by:

Advisory Group on Direct Potable Reuse

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California State Water Resources Control Board
Division of Drinking Water

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This document is the product of the Advisory Group on Direct Potable Reuse, which was established by the State Water Resources Control Board – per Section 13565(b)(1) of the California Water Code – to provide advice and input regarding “the development of uniform water quality criteria for direct potable reuse.”

As required, the Advisory Group consists of representatives from water and wastewater agencies, local public health agencies, environmental organizations, environmental justice organizations, public health nongovernmental organizations, the State Water Resources Control Board, the U.S. Environmental Protection Agency, ratepayer or taxpayer advocate organizations, and the business community.

Members of the Advisory Group include the following individuals:

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The following individuals also had served on the Advisory Group, but rotated off due to changes in employment:

- Alisa Reinhardt, San Diego Regional Chamber of Commerce (replaced by Julie Labonte)
- Marsi Steirer, City of San Diego (replaced by Amy Dorman)

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Ad Hoc Committee on Potable Reuse Terminology

The Ad Hoc Committee on Potable Reuse Terminology was instrumental in reviewing and refining terms and preparing this document on behalf of the Advisory Group: Amy Dorman (Chair), Garry Brown, Al Lau, Keith Solar, Marsi Steirer, and Michael Wehner.

Partner Organizations

The following organizations provided input during the development of this document:

- Association of California Water Agencies (ACWA)
- American Water Works Association (AWWA), California-Nevada Section
- California Association of Sanitation Agencies (CASA)
- California Urban Water Agencies (CUWA)
- California Water Environment Association (CWEA)
- National Water Research Institute (NWRI)
- WaterReuse Association (WRA) and WaterReuse California

Advisory Group Sponsors

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- Jeff Mosher (Advisory Group Administrator)
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Document Preparation

Finally, the Advisory Group appreciates the time and effort of the following individuals who helped prepare this document:

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1. INTRODUCTION

Potable reuse (more specifically, direct potable reuse) is a new strategy being considered to augment public water supplies. The terminology surrounding potable reuse is new as well, with different terms being used throughout the industry to describe the same processes, products, or technologies. This inconsistency is not just occurring on a state-by-state basis, due to different states having different regulatory language and water supply project needs, but it is also occurring on a project-by-project basis among neighboring communities. Consequently, the most basic of concepts – “recycled water,” for instance – can be viewed as unacceptable by some (e.g., “do not drink” signs) or as forward-thinking by others (e.g., the next wave of “green” technology).

California has been a leader and pioneer in implementing innovative potable reuse projects, particularly in the last 10 years, and now is breaking new ground with direct potable reuse. As such, the State should consider taking the lead in developing standard terminology for potable reuse. Having standard terminology (that is, clear, appropriate definitions) would create a common ground for regulators, utility personnel, public health officials, industry groups, consultants, researchers, and vendors/manufacturers to seek, share, and understand information about the needs and challenges associated with potable reuse systems.

Another reason to have standard terminology is to communicate properly with the public about the value and safety of potable reuse. As noted in Tchobanoglous et al. (2015):

Appropriate terminology—not technical jargon—is needed when discussing potable reuse. For example, the term “recycled water” may be viewed negatively by some members of the public, whereas “purified water” implies that the water has been treated to a high level and is viewed positively by the public (though it may not be the appropriate term for use within the engineering community). Efforts are being undertaken currently to develop consistent terminology for potable reuse within the water industry. The same is needed for the public. Accurate, understandable, and constructive terminology needs to be developed that can be used, industry-wide, when speaking with the public about potable reuse.

Overall, the goal of developing standard terminology is to assist communities in California (and elsewhere) in successfully planning, promoting, designing, financing, permitting, and operating planned potable reuse projects.

2. TABLE OF TERMINOLOGY

The terms and definitions provided in **Table 1** were developed by the Ad Hoc Committee on Potable Reuse Terminology, a subcommittee of the Advisory Group. Various resources were used to help develop these terms, including documents from stakeholder groups like WaterReuse Research Foundation, American Water Works Association, City of San Diego, and Federal and State sources (e.g., regulations, statues, and/or laws). In addition, these stakeholder groups were given the opportunity to provide feedback.

To assist the reader, the following information is provided in the table:

- Potable reuse terms, any associated or similar terms, and definitions.
- References and sources.
- Location in the California Water Code, if applicable.

The intent of the terminology is to provide a shared understanding of the potable reuse terms in use today. It can be used as a resource or starting point for the development of standard potable reuse technology in the State of California, if appropriate, and when discussing potable reuse in general.

Table 1: Terms and Definitions for Potable Reuse

Term	Related Terms	Definition	References and Sources	Referenced in State Board Regulations or Statutes*
Advanced Treatment	Advanced Water Purification, Advanced Water Treatment <i>(See Full Advanced Treatment)</i>	This term is often used to mean additional engineered treatment after secondary or tertiary treatment of wastewater to remove contaminants of concern to achieve public health or specific beneficial reuse parameters. However, the amount and type of advanced treatment applied is subject to the application, site-specific parameters, and federal, state, or local regulatory requirements.	Framework for Direct Potable Reuse (WateReuse, 2015).	Title 22, Sec 60320.108(c), 60320.201, 60320.201(i) WC, Sec 13529.2(c), 13564(e)
Advanced Treated Water (ATW)	Purified Water, Advanced Treated Recycled Water	Water produced from an advanced water treatment facility for direct and indirect potable reuse applications.	Framework for Direct Potable Reuse (WateReuse, 2015).	
Advanced Oxidation Process (AOP)		A set of chemical treatment processes whereby oxidation of organic contaminants occurs on a molecular level through reactions with hydroxyl radicals. The advanced oxidation process typically employs hydrogen peroxide, hypochlorite, ozone and/or ultraviolet light, which break down organic molecules into metabolites.		
Augmentation	Augmentation of Water Supply, Raw Water Augmentation, Reservoir/ Groundwater Augmentation	The process of adding purified water to an existing source water supply (such as a reservoir, lake, river, wetland, or groundwater basin) for use as drinking water after further treatment. Recycled water may also be used for groundwater augmentation if it first receives soil aquifer treatment (SAT).	Adapted from WateReuse Glossary www.watereuse.org/product/07-03	WC, Sec 116551, 10608.12(m)(2), 10752(f), and numerous times in Draft Surface Water Augmentation Criteria

Term	Related Terms	Definition	References and Sources	Referenced in State Board Regulations or Statutes*
Beneficial Reuse	Reuse, Water Reuse	The use of recycled water for purposes that contribute to the economy or environment of a community, such as for drinking water, landscape irrigation, industrial and commercial uses processes, or environmental flows (e.g., wetland or river enhancement).	Adapted from 2013 City of San Diego WPDP Final Report Glossary.	“Direct Beneficial use” Title 22, Sec 60301.200 WC, section 13553.1(a) “Beneficial use”
Constituent of Emerging Concern (CEC)	Pharmaceuticals and Ingredients in Personal Care Products	Chemicals or compounds not regulated in drinking water or advanced treated water. They may be candidates for future regulation depending on their ecological toxicity, potential human health effects, public perception, and frequency of occurrence.	Framework for Direct Potable Reuse (WateReuse, 2015).	SWRCB Recycled Water Policy (2013)
De Facto Potable Reuse	Unplanned potable reuse	The downstream use of surface water as a source of drinking water that is subject to upstream wastewater discharges (also referred to as “unplanned potable reuse”).	Framework for Direct Potable Reuse (WateReuse, 2015).	
Direct Potable Reuse (DPR)		The delivery of purified water to a drinking water plant or a drinking water distribution system without an environmental buffer. Additional treatment, monitoring, and/or an engineered buffer(s) would be used in place of an environmental buffer to provide equivalent protection of public health and response time in the event that the purified water does not meet specifications.	Framework for Direct Potable Reuse (WateReuse, 2015). Water Code Section 13561(b) “Direct potable reuse” is the planned introduction of recycled water either directly into a public water system, as defined in Section 116275 of the Health and Safety Code, or into a raw water supply immediately upstream of a water treatment plant.	WC, section 13561(b) and numerous other locations.

Term	Related Terms	Definition	References and Sources	Referenced in State Board Regulations or Statutes*
Disinfection		The removal, inactivation, or destruction of microorganisms in a water supply that may be harmful to humans. Commonly used disinfectants include chlorine and its derivatives, ultraviolet light, and ozone. Chlorine and its derivatives can also be used to provide residual disinfection that protects the water as it is conveyed through pipelines to homes and businesses.	2013 City of San Diego WPDP Final Report Glossary.	Title 22, numerous places. California Regulations for Title 17 sec. §64651.33.
Drinking Water	Finished Water, Potable Water, Treated Water	Water conveyed through pipelines to homes and businesses that is safe for human consumption and meets all federal, state, and local health authority drinking water standards. Water treatment and distribution facilities that produce drinking water require an operational permit issued by the federal, state, or other designated permitting authority.	Adapted from 2013 City of San Diego WPDP Final Report Glossary.	Title 22, numerous places. WC, numerous places.
Drinking Water Plant	Drinking Water Treatment Facility; Water Treatment Facility, Public Water System, Surface Water Treatment Plant	A group or assemblage of structures, equipment, and processes to produce water that is safe for human consumption and domestic water use. Conventional drinking water plants use a four-step process of flocculation, settling, filtration, and disinfection to produce water that is safe to drink (see Drinking Water). However, the amount and type of treatment applied varies based upon the source water quality of a public water system and other federal, state, or local regulatory requirements. These facilities are regulated under the Safe Drinking Water Act and permitted by the SWRCB Division of Drinking Water.	Adapted from 2013 City of San Diego WPDP Final Report Glossary.	“Water treatment plant” Title 22, numerous places. H&SC, numerous places. Title 17 §63750.85. Water treatment facility. Title 17 §64651.23. Conventional Filtration Treatment.

Term	Related Terms	Definition	References and Sources	Referenced in State Board Regulations or Statutes*
Engineered Buffer	Engineered Storage Buffer	Any assemblage of man-made structures, equipment, processes, monitoring, or storage prior to introducing advanced treated water into a drinking water system. A potable reuse project may use an engineered buffer to ensure adequate protection of human health and response time in the event that purified water or recycled water does not meet the required specifications.	Framework for Direct Potable Reuse (WateReuse, 2015).	
Environmental Buffer	Natural Buffer	A water body such as an aquifer, wetland, river, or reservoir which provides a number of benefits. Benefits include contaminant removal, dilution and blending, and time to detect and respond to failures before final treatment and distribution. These benefits, in conjunction with varying levels of upstream treatment, provide the necessary public health assurances required of potable reuse projects.	Adapted from 2013 City of San Diego WPDP Final Report Glossary.	
Filtration		A process that separates small particles from water by using a porous barrier to trap the particles while allowing the filtered water to pass through.	2013 City of San Diego WPDP Final Report.	Title 22, numerous places. Title 17 §64651.43. Filtration.
Finished Water		Water produced by an advanced water treatment facility that meets all federal, state, and local regulatory requirements for a drinking water treatment plant. Finished water can be introduced directly into a water supply distribution system.	Framework for Direct Potable Reuse (WateReuse, 2015).	

Term	Related Terms	Definition	References and Sources	Referenced in State Board Regulations or Statutes*
Full Advanced Treatment (FAT)	Also see <i>Advanced Treatment</i>	The treatment of an oxidized wastewater using a reverse osmosis and an oxidation treatment process.	CCR Title 22, Sec. 60320.201. Full advanced treatment is the treatment of an oxidized wastewater, as defined in section 60301.650, using a reverse osmosis and an oxidation treatment process.	Title 22, Sec 60320.201, 60320.200
Groundwater		Water beneath the land surface that supplies wells and natural springs. A groundwater basin is any underground area that has the capacity to store water.	2013 City of San Diego WPDP Final Report.	Title 22, Sec 60301.370 and numerous other places. WC, numerous places.
Groundwater Replenishment Reuse Project	Groundwater Recharge Project, Indirect Potable Reuse, Aquifer Storage and Recovery	The process of adding recycled water to a groundwater basin for use as a source of water for drinking water supplies. Surface spreading involves augmenting groundwater with tertiary treated recycled water via spreading basins followed by soil aquifer treatment. In addition, full advanced treatment is needed for augmenting groundwater with recycled water by direct injection.	Title 22 Sec 60301.390. Ground- water Replenishment Reuse Project (GRRP). "A "Groundwater Replenishment Reuse Project" (GRRP) involves the planned use of recycled municipal wastewater that is operated for the purpose of replenishing a groundwater basin designated in the Water Quality Control Plan [as defined in Water Code section 13050(j)] for use as a source of municipal and domestic water supply.	Title 22, Sec 60301.390, numerous other places.

Term	Related Terms	Definition	References and Sources	Referenced in State Board Regulations or Statutes*
Indirect Potable Reuse		The addition of recycled water to augment groundwater or surface waters. Groundwater and surface waters are considered environmental buffers for providing public health protection benefits, such as contaminant attenuation dilution, and time to detect and respond to failures before final treatment and distribution. Indirect potable reuse can use advanced treated water, but can also be accomplished with tertiary effluent when applied by spreading (i.e., groundwater recharge) to take advantage of soil aquifer treatment (SAT).	<p>2013 City of San Diego WPDP Final Report.</p> <p>Framework for Direct Potable Reuse (WateReuse, 2015).</p> <p>Section 13561(c) “Indirect potable reuse for groundwater recharge” means the planned use of recycled water for replenishment of a groundwater basin or an aquifer that has been designated as a source of water supply for a public water system, as defined in Section 116275 of the Health and Safety Code.</p>	<p>Title 22, numerous places.</p> <p>WC, numerous places.</p>
Membrane Filtration		A term used for a group of mechanical filtration treatment processes used to separate particles and/or molecules from water. Membrane filters are characterized by the size of the openings (pores), which are ranked from the largest to the smallest pore size: microfiltration, ultrafiltration, nanofiltration, and reverse osmosis.	Adapted from the 2013 WPDP Final Report.	<p>“Membrane” Title 22, numerous places.</p> <p>Title 17 §64651.54. Membrane Filtration.</p>
Microfiltration		A low-pressure membrane filtration process that uses tiny, hollow, straw-like membranes separate small suspended particles, bacteria, and other materials from water.	Adapted from 2013 City of San Diego WPDP Final Report.	Title 22, Sec 60301.320(b)

Term	Related Terms	Definition	References and Sources	Referenced in State Board Regulations or Statutes*
Multi-Barrier Processes		Purification processes that consist of several independent barriers that provides reduction and or elimination of chemical and pathogen constituents. Example treatment processes include: filtration; disinfection; microfiltration; reverse osmosis; advanced oxidation; soil aquifer treatment.	Water Reuse Terminology (ACWA, 2016)	
Non-Potable Reuse	Recycled Water	Includes all recycled or reclaimed water reuse applications except those related to water supply augmentation and drinking water (i.e., potable reuse).	WateReuse Glossary www.watereuse.org/product/07-03	Title 22, numerous locations. WC, numerous locations.
Pathogen		A microorganism (e.g., bacteria, virus, Giardia, or Cryptosporidium) capable of causing illness in humans.	Framework for Direct Potable Reuse (WateReuse, 2015).	
Potable Reuse		A general term for the use of recycled water to augment drinking water supplies. Potable reuse, which covers both indirect and direct potable reuse, involves various forms of treatment options. Potable reuse can be the addition of advanced treated recycled water or purified water to augment a drinking water supply. This form of potable reuse utilizes advanced treatment technology in combination with either environmental or engineered buffers to ensure that all necessary public health requirements are met to allow the water to be used as a drinking water supply. Potable reuse can also be accomplished with tertiary effluent when applied by spreading (i.e., groundwater recharge) to take advantage of soil aquifer treatment (SAT).	WateReuse Glossary www.watereuse.org/product/07-03	

Term	Related Terms	Definition	References and Sources	Referenced in State Board Regulations or Statutes*
Primary Drinking Water Standards	Primary Maximum Contaminant Levels (MCLs)	Legally enforceable federal and state standards developed under the Safe Drinking Water Act that must be met by public water systems. Primary drinking water standards protect public health by limiting the levels of contaminants in drinking water.	2013 City of San Diego WPDP Final Report.	Title 22, numerous places. H&SC, section 116275(c), numerous other places.
Public Water System (PWS)	Drinking Water System	A system used to provide the public with water for human consumption through pipes or other constructed conveyances, if such system has at least 15 service connections or regularly serves at least 25 individuals.	Section 1401(4)(A) of the Safe Drinking Water Act.	
Purified Water	Advanced Treated Purified Water	Water that has passed through a wastewater treatment plant and a full advanced treatment plant, and has been verified through monitoring to be suitable for augmenting drinking water supplies.	2013 City of San Diego WPDP Final Report.	
Recycled Water	Recycled Water, Reclaimed Water, Recycled Municipal Water, Water Recycling	Water that is used more than one time before it passes back into the water cycle. For example, wastewater that has been treated to a level that allows for its reuse for a beneficial purpose such as irrigation. Recycled water is sometimes called “reclaimed water.” With additional treatment, including advanced treatment, recycled water can be used as a source of water for a drinking water supply (see potable reuse).	Terminology Source: WateReuse Glossary www.watereuse.org/product/07-03	Title 22, numerous places. WC, numerous places (1350-13569).

Term	Related Terms	Definition	References and Sources	Referenced in State Board Regulations or Statutes*
Reliability	Treatment Reliability	The ability of a treatment process or treatment train to consistently achieve the desired degree of treatment, based on its inherent redundancy, robustness, and resilience.	Framework for Direct Potable Reuse (WateReuse, 2015).	
Retention Time	Retention Time	The amount of time that purified water or recycled water is retained in a water body, such as a groundwater basin or surface water reservoir, prior to being extracted.	Adapted from 2013 City of San Diego WPDP Final Report.	Title 22, numerous locations.
Response Retention Time		The amount of time that purified water or recycled water shall be retained underground for to allow a project sponsor sufficient response time to identify treatment failures and implement actions necessary for the protection of public health.	Title 22 <i>Chapter 3. Water Recycling Criteria</i> §60320.124. Response Retention Time. (a) The recycled municipal wastewater applied by a GRRP shall be retained underground for a period of time necessary to allow a project sponsor sufficient response time to identify treatment failures and implement actions, including those required pursuant to section 60320.100(b), necessary for the protection of public health.	Title 22, numerous locations.

Term	Related Terms	Definition	References and Sources	Referenced in State Board Regulations or Statutes*
Reverse Osmosis		A high-pressure membrane filtration process that forces water through semi-permeable membranes to filter out large molecules and contaminants, including salts, viruses, pesticides, and other materials.	Adapted from 2013 City of San Diego WPDP Final Report.	Title 22, Sec 30320.201(a), numerous other places.
Secondary Drinking Water Standards	Secondary Maximum Contaminant Levels (MCLs)	Drinking water quality standards that serve as guidelines to assist public water systems in managing drinking water aesthetic conditions such as taste, color, and odor.	2013 City of San Diego WPDP Final Report.	Title 22, numerous places. H&SC, section 116275(d), numerous other places.
Soil Aquifer Treatment (SAT)	Natural Filtration	The process of treating water by percolating through soil and into an underground aquifer. SAT is a groundwater aquifer recharge option in which water is introduced into the groundwater through soil percolation under controlled conditions. SAT is used to artificially augment the groundwater to withdraw freshwater again at a later stage. During percolation, natural soil filtration occurs and the water enters the aquifer, where mixing occurs.	WateReuse Glossary www.watereuse.org/product/07-03 Sustainable Sanitation and Water Management (www.sswm.info).	Title 22 Sec 60320.118
Source Control		The elimination or control of the discharge of constituents into a wastewater collection system that can impact wastewater treatment, are difficult to treat, and can impair the final quality of the secondary effluent entering the advanced water treatment facility.	Framework for Direct Potable Reuse (WateReuse, 2015).	Title 22 Sec 60320.106, 60320.206

Term	Related Terms	Definition	References and Sources	Referenced in State Board Regulations or Statutes*
Source Water	Raw Water, Water Source	A local or imported water source that through treatment can be safely utilized as a domestic water supply. Some source water does not require any treatment, while some source water requires additional treatment, to be considered safe for human consumption and meet all federal, state, and local health authority drinking water standards.	Title 17 Sec 64402.10. Water Source. “Water source” is an individual groundwater source or an individual surface water intake. Sources which have not been designated as standby sources shall be deemed to be water sources.	Title 22, numerous locations.
Surface Water Augmentation	Surface Water Augmentation Project (SWSAP), Indirect Potable Reuse	The process of adding purified water to an available surface source water supply (such as a reservoir, lake, river, and/or wetland) for eventual use for drinking water after further treatment.	Adapted from WateReuse Glossary www.watereuse.org/product/07-03	WC, section 13561(d), numerous other places. Section 13561(d) “Surface water augmentation” means the planned placement of recycled water into a surface water reservoir used as a source of domestic drinking water supply.
Title 22 Standards		Requirements established by the California State Water Resources Control Board for the production and use of recycled water. Title 22, Chapter 3, Division 4 of the California Code of Regulations, outlines the level of treatment required for allowable used for recycled water.	Water Reuse Terminology (ACWA, 2016)	

Term	Related Terms	Definition	References and Sources	Referenced in State Board Regulations or Statutes*
Wastewater		Treated effluent from a conventional wastewater treatment facility. The level of wastewater treatment can vary. Wastewater can be domestic wastewater from a municipality or community or is can be industrial/commercial wastewater from industrial facilities and businesses.	Water Reuse Terminology (ACWA, 2016)	
Wastewater Treatment	Conventional Wastewater Treatment	A combination of treatment steps that stabilize and remove solids and organic material from wastewater. Although there are many variations and configurations of wastewater treatment plants, a series of the following steps could be included: preliminary treatment, primary treatment, secondary treatment, tertiary treatment, and disinfection.	Adapted 2013 WPDP Final Report Glossary.	Title 22, numerous places mentioned. WC, Sec 13625(b) and numerous other locations.

* T22 = Title 22; WC = Water Code