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A Fix for a Thirsty World - Making Direct and Indirect Reuse Legally Possible

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A FIX FOR A THIRSTY WORLD—MAKING DIRECT AND INDIRECT REUSE LEGALLY POSSIBLE

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ABSTRACT

Reliably providing safe drinking water to the public is an essential function of state and local governments. Across the United States, government officials and public water system managers are exploring mechanisms for ensuring water security. One method for increasing public drinking water security that has garnered the attention of water officials and the public is returning treated wastewater to the drinking water supply. However, in the absence of federal regulations on water reuse, states need guidance to develop the statutory framework necessary to make potable reuse legal. This Article details the processes of direct and indirect potable reuse and reviews the existing federal and state regulations concerning water systems and reuse. After discussing why, for energy and policy reasons, states and municipalities might want to encourage direct and/or indirect potable reuse, the Article concludes with model legislation for states to use in developing direct and indirect potable water reuse regulations.

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> *The International Space Station "reclaim[s] waste waters from the Space Shuttle's fuel cells, from urine, from oral hygiene and hand washing, and by condensing humidity from the air. . . . Lab animals on the ISS breathe and urinate, too, and we plan to reclaim their waste products along with the crew's. . . . The water that we generate is much cleaner than anything you'll ever get out of any tap in the United States."*[1]

INTRODUCTION

In the United States, precipitation patterns are likely to change due to climate change, in some cases dramatically, leading to both more flooding and more drought.[2] These droughts will have greater intensity

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[1] NASA, *Water on the Space Station* (Nov. 1, 2000), https://science.nasa.gov/science-news/science-at-nasa/2000/ast02nov_1 [https://perma.cc/3HSS-PGBA].

[2] JOHN WALSH ET AL., NAT'L CLIMATE ASSESSMENT & DEV. ADVISORY COMM., FED. ADVISORY COMMITTEE DRAFT NAT'L CLIMATE ASSESSMENT 13 (Jan. 11, 2013), https://

and be longer in duration than those we have experienced historically.[3] The change will likely stress all facets of how we obtain drinking water.

For the majority of Americans, however, the growing insecurity in the availability of drinking water in times of drought will be less obvious because of how they obtain their water: the municipal water system. A full 86% of Americans are served by public water supply systems.[4] While their customers are expecting—without really thinking about it—that clean water will always be available when they turn on the tap, the managers of these systems are starting to identify gaps in how to ensure a safe, reliable future water supply.[5]

For environmental, permitting, land use and other reasons, new large-scale dam and reservoir projects are often unfeasible,[6] and new research shows that dams are a source of greenhouse gas emissions.[7] Depending on how fast rain events occur, current storage facilities may not be able to catch and store the precipitation that does occur.[8]

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downloads.globalchange.gov/nca/nca3-drafts/NCAJan11-2013-publicreviewdraft-fulldraft.pdf.

[3] *Id.*

[4] *Public-supply water use*, U.S. GEOLOGICAL SURV. WATER SCI. SCHOOL, https://water.usgs.gov/edu/wups.html [https://perma.cc/R9KV-XD8X]. While outside the scope of this Article, water scarcity also impacts industry; companies reported $2.5 billion in detrimental expenses from water risk in 2015. CDP, ACCELERATING ACTION: CDP GLOBAL WATER REPORT 2015 6 (2015), http://www.eenews.net/assets/2015/10/22/document_cw_01.pdf [https://perma.cc/WN8A-KKRS].

[5] *See* Christa Marshall, *Managers see freshwater shortages as part of a new normal for changed climate*, E&E NEWS (May 23, 2014), http://www.eenews.net/climatewire/2014/05/23/stories/1060000131 [https://perma.cc/4YFW-JNC2]. Unfortunately, more water utilities need to focus on how climate change could impact their assets; in a recent survey, only fifteen percent had included climate change as a factor when looking at the vulnerability of their system. *See* Katherine Tweed, *Only 10% of Water Utilities See Climate Change as a Significant Issue*, GREENTECH MEDIA (June 8, 2015), http://www.greentechmedia.com/articles/read/only-10-of-water-utilities-see-climate-change-as-a-significant-issue?utm_source=Daily&utm_medium=Headline&utm_campaign=GTMDaily [https://perma.cc/ND3N-9PNP].

[6] Dave Owen & Colin Apse, *Trading Dams*, 48 U.C. DAVIS L. REV. 1043 (2015), https://lawreview.law.ucdavis.edu/issues/48/3/Articles/48-3_Owen-Apse [https://perma.cc/THK8-XESK]. *See also Alaska dam project canceled after opposition*, E&E NEWS (Apr. 21, 2017), https://www.eenews.net/greenwire/2017/04/21/stories/1060053399 [https://perma.cc/JR9E-NDP3] (noting locals were concerned about harm to salmon and trout populations in the region); *Utility floats alternative to Utah storage project*, E&E NEWS (Apr. 19, 2017), https://www.eenews.net/greenwire/2017/04/19/stories/1060053264 [https://perma.cc/92XC-5WJU].

[7] *See* David Ferris, *Dams warm the climate, study finds*, E&E NEWS (Sept. 30, 2016), http://www.eenews.net/energywire/2016/09/30/stories/1060043672 [https://perma.cc/6YVY-PTKP].

[8] *See* Brittany Patterson, *Dwindling snowpacks could affect 2B people*, E&E PUBLISHING

Groundwater levels will also likely fluctuate significantly with decreases in precipitation, and surface flows will vary based on decreased snowpack, upstream water diversions, and anthropogenic factors such as reservoir management.[9]

Some communities, especially in the drought-prone West, are already dealing with serious supply shortfalls.[10] Communities in California are digging deeper wells, hoping the work will be complete before the groundwater supply to the current wells runs dry. The state maintains an active list of municipal suppliers likely to run out of water within the next 60 to 120 days. At one point in early 2014, the list included seventeen communities with customer bases of up to 11,000 people.[11] The reservoir in Santa Barbara County, California, was down to seven percent capacity, and officials were warning that no water could be available from the lake without significant rainfall.[12] Water deliveries from Lake Powell on the Colorado River were curtailed for the first time.[13]

(Nov. 13, 2015), http://www.eenews.net/climatewire/2015/11/13/stories/1060027926 [https://perma.cc/R6JH-F3JV].

[9] *Id.* NOAA has also determined that global groundwater supplies are scarcer than previously thought and are being depleted rapidly. *See* Debra Kahn, *NASA satellites find global groundwater supplies less than thought, rapidly depleting*, E&E PUBLISHING (June 17, 2015), http://www.eenews.net/climatewire/2015/06/17/stories/1060020372 [https://perma.cc/U9QF-NAV7](discussing the finding by NASA researchers that thirteen of the world's thirty-seven largest aquifers are being depleted at rapid rates with little water re-entering them); Felicity Barringer, *World's Aquifers Losing Replenishment Race, Researchers Say*, N.Y. TIMES (June 25, 2015), https://www.nytimes.com/2015/06/26/science/worlds-aquifers-losing-replenishment-race-researchers-say.html (discussing the same study conducted by NASA and University of California, Irvine that thirteen of the world's largest aquifers are losing significantly more water than is being returned to them).

[10] However, the issue of drought is not limited to the western part of the United States. NASA scientists have found that satellite data show declining water storage in the Southeast. Coupled with models showing climate change reducing rainfall in the Southeast, the same situation may face more communities. *See* Bruce Henderson, *NASA scientist: Southeast faces a scarcity of water*, CHARLOTTE OBSERVER (Dec. 1, 2015), http://www.charlotteobserver.com/news/local/article47457280.html [https://perma.cc/T7M5-2BUA]. The same research found similar trends globally. *See* Kahn, *supra* note 9.

[11] *See* Paul Rogers, *California drought: 17 communities could run out of water within 60 to 120 days, state says*, MERCURY NEWS (Jan. 28, 2014), http://www.mercurynews.com/science/ci_25013388/california-drought-17-communities-could-run-out-water [https://perma.cc/AE46-FGHG].

[12] *See Calif. County scrambling as reservoir nears empty*, E&E NEWS (Nov. 14, 2016), https://www.eenews.net/greenwire/2016/11/14/stories/1060045696 [https://perma.cc/5H8M-FMA5].

[13] Paul Rauber, *Two Months, One Page*, SIERRA CLUB (Nov. 1, 2013), http://www.sierraclub.org/sierra/2013-6-november-december/speed/two-months-one-page [https://perma

Wichita Falls, Texas, is trying a different strategy, one that could provide a more consistent supply longer term: returning treated wastewater to the drinking water supply. Having lost 70% of its water supply in two years due to no rain and a long number of consecutive 100-degree temperatures, the city realized that it could not conserve its way out of the water crisis.[14] As the first U.S. city to attempt reuse, the city received state approval to recycle five million gallons per day, about one third of the city's daily needs.[15] Just reusing coastal discharges—the water that goes from wastewater treatment plants into the ocean—would equal 27% of all municipal use nationwide.[16]

As a necessity on the International Space Station, direct potable reuse is already happening in space, and water reuse has become an increasingly important source of water around the world.[17] Since many people don't consider that most water system intakes are downstream from at least one, often many, other communities' water treatment plants[18]

.cc/TK6T-YQC7]. Aquifers are also not immune; the Ogallala has become "seriously depleted" due to over-pumping for agricultural irrigation. Kristen French, *Aquifer Alert*, ONEARTH 46 (Nov. 1, 2013), http://archive.onearth.org/articles/2014/01/so-what-exactly-is-an-aquifer-we-explain [https://perma.cc/RUH2-MDK2].

[14] Melissa Moody, *No Rain? No Problem: Emergency Water Reuse Pipeline Helps Mitigate Drought-Related Disasters in Wichita Falls*, WATERWORLD (Apr. 1, 2013), http://www.waterworld.com/articles/print/volume-30/issue-4/editorial-features/no-rain-no-problem-emergency-water-reuse-pipeline-helps-mitigate-drought-related-disasters-in-wichita-falls.html.

[15] *See Texas City Plans to Reroute Treated Sewage Into Taps*, E&E NEWS (Apr. 22, 2014), http://www.eenews.net/greenwire/2014/04/22/stories/1059998232 [https://perma.cc/PZQ7-9BFQ]. Wichita Falls has been using direct potable reuse since July 2014. *See* Desmond F. Lawler, *Direct potable reuse to provide cleaner drinking water*, HOUSTON CHRON. (July 25, 2014), http://www.houstonchronicle.com/opinion/outlook/article/Direct-potable-reuse-to-provide-cleaner-drinking-5648285.php [https://perma.cc/73PD-D2JS].

[16] *See* NAT'L RES. COUNCIL, WATER REUSE: POTENTIAL FOR EXPANDING THE NATION'S WATER SUPPLY THROUGH REUSE OF MUNICIPAL WASTEWATER 15 (2002).

[17] *See Water on the Space Station*, *supra* note 1; Clemencia Rodriguez et al., *Indirect Potable Reuse: A Sustainable Water Supply Alternative*, 6 INT'L J. ENVTL. RES. PUB. HEALTH 1174, 1175 (2009), *available at* http://www.ncbi.nlm.nih.gov/pmc/articles/PMC272392/ [https://perma.cc/Z8QU-4HP5]. *See also* Jon Freedman, *GE, MWH And Goldman Sachs Partnering for Greater Water Reuse*, WATERWORLD (June 1, 2016), http://www.waterworld.com/articles/print/volume-32/issue-6/features/ge-mwh-and-goldman-sachs-partnering-for-greater-water-reuse.html.

[18] "Unplanned or incidental use of wastewater for drinking purposes has taken place for a long time. This occurs where wastewater is discharged from a wastewater treatment plant to a river and subsequently used as drinking water source for a downstream community." Rodriguez et al., *supra* note 17, at 1175. Or, as an official from Wichita Falls put it, "when you think about it, everyone downstream is already drinking someone else's

(the exception being places like Orange County, NC, that do not use a river intake),[19] either option has a psychological "ick" factor.[20] However, 63% of all municipal wastewater may become part of a downstream drinking water source.[21] Aside from the public perception and acceptance issues, which utilities understand they must acknowledge and engage with the community over,[22] the greatest hurdle to maximizing highly treated wastewater reuse is legal.

While states allow—and some even encourage—the use of treated wastewater for non-potable uses such as landscaping, recreational field maintenance, and to keep golf courses green,[23] none seems to embrace highly treated wastewater as an option for water resource optimization. As climate change stresses water resources, highly treated water reuse

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toilet water." Darrell Preston, *Brushing Teeth With Sewer Water Next Step as Texas Faces Drought*, BLOOMBERG (Apr. 21, 2014), https://www.bloomberg.com/news/articles/2014-04-22/wichita-falls-braces-for-water-from-sewers-with-texas-in-drought [https://perma.cc/XKX8-BUR6].

[19] OWASA, Drinking Water, http://www.owasa.org/drinking-water#watersupply [https://perma.cc/SZD7-SYT3].

[20] *See* John Schwartz, *Water Flowing From Toilet to Tap May Be Hard to Swallow*, N.Y. TIMES (May 8, 2015), http://www.nytimes.com/2015/05/12/science/recycled-drinking-water-getting-past-the-yuck-factor.html?emc=eta1&_r=3 [https://web.archive.org/web/*/https://downloads.globalchange.gov/nca/nca3-drafts/NCAJan11-2013-publicreviewdraft-fulldraft.pdf]. *See also* Sarah Fister Gale, *Battling Water Scarcity: Direct Potable Reuse Poised as Future of Water Recycling*, WATERWORLD (Sept. 1, 2013), http://www.waterworld.com/articles/print/volume-29/issue-9/editorial-features/battling-water-scarcity.html [https://web.archive.org/web/*/http://www.waterworld.com/articles/print/volume-29/issue-9/editorial-features/battling-water-scarcity.html] (arguing that water demand will bring acceptance of direct potable reuse once consumers are educated about the quality of the water after advanced treatment techniques) [hereinafter *Battling Water Scarcity*]; Preston, *supra* note 18 (overcoming the public perception of potable reuse of treated sewage water). This Article is intended to be more technical in nature and will therefore not address the psychological issues of direct and indirect potable reuse. However, for an in-depth analysis of the issues, see Julia Wester*, Morality, Emotion, and Policy Making: Environmental Decision Making about Recycled Water*, OPEN ACCESS DISSERTATIONS 1636 (Apr. 29, 2016) (unpublished PhD dissertation, University of Miami), http://scholarlyrepository.miami.edu/oa_dissertations/1636/ [https://perma.cc/LS5B-L95T].

[21] Freedman, *supra* note 17.

[22] Wester, *supra* note 20, at 18–21. However, as one CEO noted, the good thing about the drought was that people are "more open to alternative use projects" since they "understand that there is no new water on the planet." Sarah Fister Gale, *Tapping Alternative Water Supplies*, WATERWORLD, http://www.waterworld.com/articles/print/volume-33/issue-4/features/tapping-alternative-water-supplies.html (last visited Oct. 23, 2017) [hereinafter *Tapping Alternative Water Supplies*].

[23] Lori Anne Dolqueist, *Recycling Water in the Spotlight*, WATERWORLD, http://www.waterworld.com/articles/print/volume-31/issue-9/features/recycling-water-in-the-spotlight.html (last visited Oct. 23, 2017).

should at least be allowed. This would require changes to the current legal framework around wastewater reuse in many places.[24]

This Article develops in five parts. First, a brief technology review and a description of water systems and what potable reuse entails from a technical standpoint. Next, the Article discusses the history and purposes of the National Pollution Discharge Elimination System ("NPDES") and how it applies to municipal water treatment plants. This part also includes a discussion of other pertinent federal laws. Third, the Article explores the current status of state-level regulation of direct and indirect potable reuse. The energy and policy reasons for why municipalities and states may want to encourage reuse are also discussed. Finally, I propose model legislation which could act as a starting place for water managers to work with state legislators and administrators to enable more use of direct and indirect potable reuse.

I. WHAT IS POTABLE REUSE?

Public water systems generally follow a similar process to treat and distribute water. Raw water—water coming from the municipality's typical supply source, usually a river, well or reservoir—is drawn through an intake and travels to the water treatment plant.[25] At the start of the water treatment process, chemicals are added to remove silt and particles, clarifying the raw water.[26] The clarified water is then filtered, disinfected, and tested to ensure the finished water meets water quality standards. At that point, the pressure of the water is increased to what is necessary to ensure the water flows when people turn on the tap.[27] Trace amounts of chloramines remain in the finished water to ensure it stays disinfected through the distribution system.[28]

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[24] While reclaimed water could be more widely used for some applications, this Article does not address the legal framework necessary for a greater allocation of reclaimed water. Direct and indirect potable reuse has several advantages over reclaimed water which could make it more beneficial to municipalities. First, direct and indirect potable reuse does not need duplicate infrastructure, with that associated additional cost. Maintaining a second system for reclaimed water is also more energy intensive, with the need to maintain pressure in the second system.

[25] *The Water Treatment Process*, SANTA CLARA VALLEY WATER DIST., http://www.valleywater.org/services/TheWaterTreatmentProcess.aspx [https://perma.cc/T295-W2UH] (last visited Oct. 23, 2017). *See* EPA, *Drinking Water Distribution Systems*, https://www.epa.gov/dwsixyearreview/drinking-water-distribution-systems [https://perma.cc/S97F-48Q6] (last visited Oct. 23, 2017) [hereinafter *Drinking Water Distribution Systems*].

[26] *Drinking Water Distribution Systems*, *supra* note 25.

[27] *See id.*

[28] *The Water Treatment Process*, *supra* note 25. The distribution system includes any

Wastewater treatment systems basically work in reverse; collecting waste (and sometimes stormwater) and moving it, using gravity as much as possible, to a wastewater treatment plant or publicly owned treatment work ("POTW").[29] After treatment, the effluent (treated wastewater) being released from a POTW generally flows directly into a nearby creek or river, and from there into larger water bodies.[30]

For water systems considering reuse, there are two options: direct potable reuse and indirect potable reuse. In direct potable reuse, rather than flowing into a river, the treated wastewater follows one of two processes to be added back into the water supply without dilution.[31] Option one is for the treated wastewater to be processed through an advanced treatment plant, where the treated wastewater typically will undergo several additional purification steps including filtration to filter out larger particles, reverse osmosis to remove contaminants including inorganic impurities, and clarification and/or UV disinfection to kill bacteria, after which it is added directly into the water distribution system.[32] Water that has gone through this reuse process is actually cleaner than what traditional water treatment plants produce,[33] and health professionals accept "that advanced treatment can produce recycled water in compliance with drinking water standards and guidelines."[34]

The second option is for the treated wastewater to return to the start of the municipal water treatment plant, where it will then be mixed with raw water, and will go through the entire standard water treatment process.[35]

In indirect potable reuse, highly treated wastewater is discharged into groundwater or surface water resources from which the same community pulls their drinking water supply, and the discharge is done with the intent of supplementing the community supply.[36] Orange County,

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water storage facilities, like clear wells or water tanks, and the pipes bring water to homes, businesses and other users. *Drinking Water Distribution Systems*, *supra* note 25.

[29] N.Y.C. Dep't. of Envtl. Prot., *New York's Wastewater Treatment System*, NYC.GOV, http://www.nyc.gov/html/dep/html/wastewater/wwsystem-process.shtml [https://perma.cc/9KFU-XSQ3] (last visited Oct. 23, 2017).

[30] *Id.*

[31] *Battling Water Scarcity*, *supra* note 20.

[32] *Battling Water Scarcity*, *supra* note 20.

[33] Schwartz, *supra* note 20.

[34] Rodriguez et al., *supra* note 17, at 1180. "Despite variations in treatment technologies and technological changes over time, all IPR projects have demonstrated high removal efficiency for contaminants tested." *Id.*

[35] Moody, *supra* note 14.

[36] *Battling Water Scarcity*, *supra* note 20; Angela Godwin, *Orange County's GWRS Exemplifies Power of Collaboration*, WATERWORLD, http://www.waterworld.com/articles

California, actually found that the water being produced in their indirect potable reuse system was too clean—it caused arsenic to escape from clay sediments in a way that naturally infiltrating water did not, because the reuse system water lacked minerals.[37] In order to keep arsenic levels down, water managers have started adding a calcium-rich substance to the water before injecting it into the aquifer.[38]

Additionally, the United States Geological Society Water Quality Assessment Program:

> determined that streams and rivers used for public drinking water have low levels of about 130 chemical contaminants, most of them without drinking water standards. Nearly two-third[s] of these contaminants were also found in drinking water. These results indicate that conventional drinking water treatment was unable to remove the trace contaminants.[39]

And yet, indirect potable reuse processes "are able to remove most of these contaminants to levels below limits of detection."[40]

Especially with indirect potable reuse, the use of the treated wastewater is only slightly changing what is already happening most places; the difference is that the treated wastewater is becoming part of the raw water supply for that community, rather than the next community downriver.[41] Part of the reason why downstream communities—despite the fact that at least part of their drinking water comes from upstream communities' wastewater treatment plants—are less concerned is because of the ecosystem services provided by the river and nature generally.[42] Additionally:

> The use of environmental buffers such as rivers, dams, lakes or aquifers is considered world's best practice given

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/print/volume-30/issue-4/departments/viewpoint/orange-county-s-gwrs-exemplifies-power-of-collaboration.html (last visited Oct. 23, 2017).

[37] Monte Morin, *Purified wastewater triggers release of arsenic within aquifer, study finds*, L.A. TIMES (Sept. 4, 2015, 3:20 PM), http://www.latimes.com/science/sciencenow/la-sci-sn-arsenic-water-20150904-story.html [https://perma.cc/7FH8-LWTF].

[38] *Id.*

[39] Rodriguez et al., *supra* note 17, at 1181.

[40] *Id.*

[41] *See id.* at 1175.

[42] *See id.*; Schwartz, *supra* note 20.

> that natural systems have a high capacity to further purify water. Retention time of the recycled water in the raw water supply allows any remaining contaminants to be degraded by physical processes . . . or biological processes.[43]

While the public is more accepting of using (and regulations more explicit allowing) treated wastewater for uses such as irrigation,[44] both direct and indirect potable reuse differ from reclaimed water or grey-water systems, because with either direct or indirect potable reuse, the water goes through additional treatment steps to treat it to potable standards before being used.[45] While there are few examples of direct potable reuse, projects around the world use indirect potable reuse. When studied, there have been no documented health impacts at any of these projects attributable to the potable reuse.[46]

II. FEDERAL STATUTES AND REGULATIONS

The need for federal and state standards to maintain clean water has long been recognized. As noted by the International Association of Game, Fish, and Conservation Commissioners in 1935,

> in the framing of legislation now pending or contemplated and in the drafting of recommendations by Federal and state agencies relative to water-purity standards to be set or maintained in public waters, correct standards require conditions not merely sub-lethal, but favorable to all stages of the desirable food and game fishes of the particular region and to those aquatic organisms, both plant and animal, which comprise the food of these fishes.[47]

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[43] Rodriguez et al., *supra* note 17, at 1175 (citations omitted).

[44] Citizens in California have turned to grey-water systems—comprised of water from clothes washers, showers or bathroom sinks (but not toilets), kitchen sinks or dishwashers—to water plants. Matt Stevens, *Once illegal, watering the garden with water from the washer is gaining favor*, L.A. TIMES (July 4, 2015, 4:00 AM), http://www.la times.com/science/la-me-gray-water-20150704-story.html [https://perma.cc/R6YP-TFPC]. California's plumbing code now allows homeowners to install grey-water systems without a permit, and some municipalities, like Los Angeles, have agreed no permit is required when water only from clothes washers is used. *Id.*

[45] *Battling Water Scarcity*, *supra* note 20; Godwin, *supra* note 36.

[46] Rodriguez et al., *supra* note 17, at 1177–79.

[47] ASS'N OF FISH AND WILDLIFE AGENCIES, RES. 1935-05-07, WATER PURITY STANDARDS

The country attempts to maintain such standards using a variety of statutes and regulatory schemes.

A. Clean Water Act / The National Pollution Discharge System

The Clean Water Act ("CWA") sets a national goal "to restore and maintain the chemical, physical, and biological integrity of the Nation's waters," and that all waters should be fishable and swimmable where possible.[48] The National Pollution Discharge Elimination System ("NPDES"), created in 1972 as part of the CWA, was the primary method for attaining this goal.[49] The NPDES prohibited discharges "of pollutants from any point source into the nation's waters except as allowed" by permit.[50] In 1977, Congress amended the CWA to control toxic discharges in addition to conventional pollutants.[51] Permits are written "to ensure the receiving waters will achieve their Water Quality Standards."[52] These standards "define the water quality goals of a lake, stream, or other waterbody by designating the beneficial uses and setting criteria to protect those uses."[53] The criteria "establish standards necessary to protect and ensure that beneficial uses are attained. Criteria may be numeric or narrative standards[.]"[54]

Additionally, the CWA funded construction grants to build sewage treatment plants.[55] This made sense, as one of the main drivers of water pollution—and, therefore, public concern about water quality—was untreated sewage.[56] Publicly owned treatment works ("POTWs"), or, as they are better known, sewage treatment plants, must obtain an NPDES

(Sept. 13, 1935), http://digitalcommons.law.msu.edu/cgi/viewcontent.cgi?article=2001&context=afwa_reso [https://perma.cc/MCA4-LDFY].

[48] Clean Water Act of 1977 § 101, 33 U.S.C. § 1251 (2012).

[49] *Id.* § 1342.

[50] EPA, *A Brief Summary of the History of NPDES*, https://www.epa.gov/region1/npdes/history.html [https://perma.cc/7G7Y-ERQJ] (last updated Apr. 10, 2017).

[51] *Id.*

[52] EPA, *NPDES Wastewater & Stormwater Permits*, https://www3.epa.gov/region9/water/npdes/ [https://perma.cc/DH3V-7A97] (last updated Mar. 7, 2017).

[53] EPA, *Water Quality Standards*, https://archive.epa.gov/region09/newsletter-archive/web/html/index-144.html [https://web.archive.org/web/*/https://archive.epa.gov/region09/newsletter-archive/web/html/index-144.html] (last updated May 1, 2016).

[54] *Id.*

[55] EPA, *History of the Clean Water Act*, http://www2.epa.gov/laws-regulations/history-clean-water-act [https://perma.cc/26NJ-9G8Z] (last updated Aug. 8, 2017).

[56] Nancy Stoner, *Celebrate the 40th Anniversary of the Clean Water Act*, THE EPA BLOG (Oct. 8, 2016), https://blog.epa.gov/blog/2012/10/cwa40/ [https://perma.cc/SL8N-FRFD] ("Municipal and household wastes flowed untreated into our rivers, lakes and streams.").

permit for releases of treated wastewater into surface waters.[57] POTWs generate an estimated thirty-two billion gallons of municipal wastewater each day.[58] Currently, only 6.4% of that is reused for any purpose, including irrigation or industrial uses systems.[59] Potable reuse is only a small part of overall wastewater reuse.[60]

This regulatory scheme already provides the framework to allow for direct and indirect potable reuse. NPDES permits are required to protect beneficial uses of any waterway that effluent is discharged into.[61] If that waterway becomes a drinking water supply source downstream—which is pretty much all of them, except those that discharge into the ocean where there is no desalination plant nearby—the NPDES permit must already have permit limits set to protect drinking water.[62] If all the effluent being discharged from wastewater treatment plants currently is meeting standards where it can be utilized as a drinking water source for someone downstream, there is no reason it should not be used as a drinking water source for that community.[63]

B. Safe Drinking Water Act / Source Water Protection

The Safe Drinking Water Act ("SDWA") established the federal protection of drinking water quality by authorizing the EPA to set minimal drinking water standards and to require managers of public water systems to comply with those standards.[64] The SDWA's national primary drinking water regulations "apply to each public water system in each State," except to a public water system:

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[57] 33 U.S.C. § 1342.

[58] Moody, *supra* note 14. Public water supply accounts for approximately forty-four billion gallons per day, but not all of that flows back to a treatment plant. MOLLY A. MAUPIN ET AL., U.S. GEOLOGICAL SURVEY, CIRCULAR 1405, ESTIMATED USE OF WATER IN THE UNITED STATES IN 2010 45 (2014), http://pubs.usgs.gov/circ/1405/pdf/circ1405.pdf [https://perma.cc/H3CZ-NSBG].

[59] *US Wastewater Market to Total US$11.0 Billion Through* 2025, BLUEFIELD RES. (Aug. 5, 2015), http://bluefieldresearch.com/us-wastewater-market-to-total-us11-0-billion-through-2025/ [https://perma.cc/6AYF-JSGQ].

[60] Potable reuse currently makes up fifteen percent of the total reuse capacity in the United States. *Id.* Irrigation is by far the highest user of water reuse capacity, at sixty-nine percent; industrial users account for sixteen percent. *Id.*

[61] *See* 33 U.S.C. § 1342.

[62] *See NPDES Wastewater & Stormwater Permits*, *supra* note 52, and accompanying text.

[63] *See* Rodriguez et al., *supra* note 17, and accompanying text.

[64] Safe Drinking Water Act, 42 U.S.C. § 300f e*t seq.* (2015); EPA, *Summary of the Safe Drinking Water Act*, https://www.epa.gov/laws-regulations/summary-safe-drinking-water-act [https://perma.cc/7BHH-6982] (last updated Aug. 24, 2017).

> which consists only of distribution and storage facilities (and does not have any collection and treatment facilities) . . . which obtains all of its water from, but is not owned or operated by, a public water system to which such regulations apply . . . which does not sell water to any person [and] which is not a carrier which conveys passengers in interstate commerce.[65]

Under the SDWA, states have the primary enforcement responsibility of drinking water standards if the EPA has determined that a state "has adopted drinking water regulations that are no less stringent than the national primary drinking water regulations," "has adopted and is implementing adequate procedures for the enforcement of such State regulations," and "will keep such records and make such reports with respect to its activities."[66]

The SDWA requires the EPA to "publish a maximum contaminant level goal and promulgate a national primary drinking water regulation for a contaminant" if the agency determines that a contaminant "may have an adverse effect on the health of persons," "is known to occur or there is a substantial likelihood that the contaminant will occur in public water systems with a frequency and at levels of public health concern," and "presents a meaningful opportunity for health risk reduction for persons served by public water systems."[67] In 1996, the SDWA was amended to require states "to create a Source Water Assessment Program for all their public drinking water systems."[68] This program mandates states to identify the land area containing the source water from which each of the state's public water systems receives its drinking water, determine existing and potential sources of contamination in those areas, evaluate the susceptibility of contamination to each public water system, and make public the results of the assessment.[69]

Direct and indirect potable reuse are allowed within this existing regulatory scheme. The advanced treatment of wastewater in direct and indirect potable reuse has been shown to produce water at a quality level well above what is permitted under the minimum standards set forth by

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[65] 42 U.S.C. § 300g (2012).
[66] *Id.* § 300g(2)(a)(1)–(3).
[67] *Id.* § 300g(1)(b)(1)(A)(i)–(iii).
[68] EPA, *Source Water Assessment Program*, https://www3.epa.gov/region1/eco/drinkwater/pc_sourcewater_assessment.html [https://perma.cc/3CK4-T8W5]; 42 U.S.C. § 300j(13).
[69] *Id.* § 300j(13)(a)(2, 7).

the EPA and states under the SDWA.[70] Additionally, standard treated wastewater already must meet the minimum standards in accordance with the CWA and NPDES.[71] Advanced treated wastewater produced and used during direct and indirect reuse may need to be identified as a source water and assessed as such to comply with the Source Water Assessment Program of the SDWA.

C. Ground Water Rule

In 2006, using the authority granted to it under the SDWA, the EPA promulgated a national primary drinking water regulation, the Ground Water Rule ("GWR"), "to provide for increased protection against microbial pathogens in public water systems that use ground water sources."[72] "The Ground Water Rule establishes a risk-targeted approach to target ground water systems that are susceptible to fecal contamination."[73] The GWR requires public water systems that rely on ground water as a source of drinking water to conduct sanitary surveys, monitor source water, monitor compliance, and take corrective actions when necessary.[74]

Indirect potable reuse in a public water system whose main source of water comes from a groundwater aquifer is the only circumstance where direct and indirect potable reuse would interact with the GWR. Even in this circumstance, the requirements of the GWR would remain the same and do not prohibit indirect potable reuse so long as it does not present a pathogenic health threat.

D. Water Quality Standards Regulation and Guidance

The EPA developed and codified "the requirements and procedures for developing, reviewing, revising, and approving water quality

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[70] Rodriguez et al., *supra* note 17, at 1181; *see also* EPA*, How EPA Regulates Drinking Water Contaminants*, https://www.epa.gov/dwregdev/how-epa-regulates-drinking-water-contaminants [https://perma.cc/QL7R-TUCX] (last visited Oct. 23, 2017).

[71] *A Brief Summary of the History of NPDES*, *supra* note 50.

[72] Final Ground Water Rule, 71 Fed. Reg. 65574 (Nov. 8, 2006) (to be codified at 40 C.F.R. pt. 9, 141, 142).

[73] *Id.*

[74] EPA, *Ground Water Rule Factsheet: General Rule Requirements*, https://www.epa.gov/dwreginfo/ground-water-rule [https://perma.cc/FZ36-6WBN]; 71 Fed. Reg. 65574 (Nov. 8, 2006) (to be codified at 40 C.F.R. pt. 9, 141, 142), *available at* https://www.gpo.gov/fdsys/pkg/FR-2006-11-08/pdf/06-8763.pdf [https://perma.cc/246H-58M3].

standards by the States as authorized by section 303(c) of the Clean Water Act" in order to protect public health.[75] Water Quality Standards Regulation must designate "the use or uses to be made of the water" and set the "criteria that protect the designated [water] uses."[76] One common designated use of water is for the public drinking water supply.[77] Establishing water quality standards "serve[s] the dual purposes of establishing the water quality goals for a specific water body and . . . the regulatory basis for the establishment of water-quality-based treatment controls and strategies."[78] Additionally, a state's water quality standards must include an antidegradation policy that maintains and protects the existing levels of water quality.[79] The EPA provides a Water Quality Standards Handbook[80] and a Reference Library of Water Quality Standards Policy and Guidance Documents[81] for states to use when reviewing, revising, and implementing water quality standards.

This regulatory scheme fits within the framework of direct and indirect potable reuse as long as states designate the use of the advanced treated wastewater in direct and indirect potable reuse for the public drinking water supply. In developing water quality standards for direct and indirect potable reuse, states may need to pay particularly close attention to the required antidegradation policy because discharging advanced treated wastewater during direct or indirect potable reuse has the potential to influence the existing quality of water.

However, there are no national regulations for potable reuse; that is left to the states.[82] Even where regulations do exist, permitting times can be up to a decade,[83] and without clear regulations in some places, even those who want to utilize potable reuse are unable to do so,[84] while

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[75] 40 C.F.R. § 131.1.
[76] *Id.* § 131.2.
[77] *Id.* § 131.1.
[78] *Id.* § 131.2.
[79] *Id.* § 131.12.
[80] EPA, *Water Quality Standards Handbook*, https://www.epa.gov/wqs-tech/water-quality-standards-handbook [https://perma.cc/8CPK-QR9G].
[81] EPA, *Reference Library of Water Quality Standards Policy and Guidance Documents*, https://www.epa.gov/wqs-tech/reference-library-water-quality-standards-policy-and-guidance-documents [https://perma.cc/3R4S-KXSV].
[82] *Battling Water Scarcity*, *supra* note 20.
[83] Matt Stevens & Monte Morin, *Metropolitan Water District aims to build plant to recycle sewage into drinking water*, L.A. TIMES (Sept. 22, 2015), http://www.latimes.com/science/la-me-mwd-recycled-water-20150923-story.html [https://perma.cc/Q34D-8FWN].
[84] *Cf.* the Rocky Mountain Arsenal National Wildlife Refuge wanted to use eighty-two million gallons of recycled water to fill three lakes that were once toxic, rather than use

others are banned outright from supplementing water supplies using direct potable reuse.[85] There is a clear need to integrate potable reuse into the drinking water regulatory scheme.[86]

III. STATE WATER RIGHTS SYSTEMS AND REGULATIONS

A. Water Rights Systems: Riparian Use and Prior Appropriation

In the United States, water rights are primarily determined by two different doctrines: the doctrine of riparian use and the doctrine of

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water from Denver's drinking water supply. However, Colorado's Water Quality Control panel refused to allow the switch. Bruce Finley, *Recycled water fight stalls plans for bison, birds, fish and museum*, DENVER POST (May 19, 2014), http://www.denverpost.com/2014/05/19/recycled-water-fight-stalls-plans-for-bison-birds-fish-and-museum/ [https://perma.cc/DTG6-95M9]. *See also* Art Haddaway, *The Recycling Revolution: Water Recycling Trends, Technologies in CA Amid Ongoing Drought*, WATERWORLD, http://www.waterworld.com/articles/print/volume-31/issue-11/features/the-recycling-revolution-water-recycling-trends-technologies-in-ca-amid-ongoing-drought.html [https://web.archive.org/web/*/http://www.waterworld.com/articles/print/volume-31/issue-11/features/the-recycling-revolution-water-recycling-trends-technologies-in-ca-amid-ongoing-drought.html] (last visited Oct. 23, 2017) (noting that Santa Clara Valley Water District would like to implement direct potable reuse).

[85] Even in places like California, which allow for indirect potable reuse, some municipalities would like to use direct potable reuse but are concerned about the lack of regulatory clarity. Anne C. Mulkern, *Californians tap technology—and psychology—to stretch water supplies*, E&E NEWS (May 12, 2015), http://www.eenews.net/greenwire/2015/05/12/stories/1060018411 [https://perma.cc/VH28-AHHX]; Julia Prodis Sulek & Sophie Mattson, *California Drought: Support grows in Bay Area for toilet to tap water*, MERCURY NEWS (June 24, 2015), http://www.mercurynews.com/drought/ci_28372207/california-drought-support-grows-bay-area-toilet-tap [https://perma.cc/DH7Y-UHY2]; Troyt Wolverton, *San Jose: water district opens doors to wastewater plant, serves residents treated sewer water*, EAST BAY TIMES (Oct. 24, 2015), http://www.eastbaytimes.com/ci_29018814/water-district-opens-doors-wastewater-purification-plant [https://perma.cc/WJD5-E5UF]. The Padre Dam Municipal Water District in California is building a plant that would be high enough quality for DPR, but they are moving forward with an indirect system due to the fact that "the state has no regulations governing" DPR. *Tapping Alternative Water Supplies*, *supra* note 22, at 12. North Carolina is also in this situation; the city of Raleigh already uses indirect potable reuse but would like to have direct potable reuse as an option. Preston, *supra* note 18. Hillsborough County Public Utilities in Florida initiated a direct potable reuse pilot project and hopes to incorporate DPR permanently in the future. Steve London, *Florida County Aims for Full Usage of Reclaimed Water*, WATERWORLD (Mar. 2017), http://www.waterworld.com/articles/print/volume-33/issue-3/features/florida-county-aims-for-full-usage-of-reclaimed-water.html [https://perma.cc/W5AU-AY3G] [hereinafter London, *Florida County*].

[86] Rodriguez et al., *supra* note 17, at 1187.

prior appropriation.[87] Over the last two centuries, states have chosen to adopt these doctrines based on their geographical location and human needs.[88] Riparian use water rights first developed in the eastern United States where water was widely viewed as an abundant community resource.[89] Today, every state east of the Mississippi River follows the doctrine of riparian use (with the exception of Florida, which uses a hybrid system of riparian use and appropriation).[90] In the West, water rights are determined through the doctrine of prior appropriation.[91] The development of the prior appropriation doctrine was in response to water scarcity in the western United States, particularly during the gold rush when gold miners were diverting streams to fulfill their water needs.[92]

Under the doctrine of riparian use, a right to use water from a watercourse is gained as a result of landownership.[93] When a person owns land that contains or abuts "a river, stream, pond, or lake," the landowner automatically has the right to take and use water from that watercourse.[94] The doctrine of riparian use rights first arose from the 1827 case *Tyler v. Wilkinson*.[95] This case involved "a dispute between mill owners over the right to use the water flow from a river for mill power."[96] The opinion of the court established that landowners whose land touches a watercourse have equal rights to the water in that watercourse.[97] Additionally, the *Tyler* Court stated "that no proprietor has a right to use the water to

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[87] *Water Appropriation Systems*, U. OF NORTH DAKOTA ENERGY & ENVTL. RES. CTR., http://www.undeerc.org/Water/Decision-Support/Water-Law/pdf/Water-Appr-Systems.pdf [https://perma.cc/G42T-4R8W] (last visited Oct. 23, 2017) [hereinafter *Water Appropriation Systems*].
[88] M. D. SMOLEN ET AL., WHOSE WATER IS IT ANYWAY? COMPARING THE WATER RIGHTS FRAMEWORKS OF ARKANSAS, OKLAHOMA, TEXAS, NEW MEXICO, GEORGIA, ALABAMA, AND FLORIDA, OKLAHOMA COOPERATIVE EXTENSION SERVICE, DIVISION OF AGRICULTURE AND NATURAL RESOURCES, OKLAHOMA STATE UNIVERSITY 2 (Aug. 2012) http://pods.dasnr.okstate.edu/docushare/dsweb/Get/Document-8459/E-1030%20Water.pdf [https://perma.cc/XE9K-Z7KA] (last visited Oct. 23, 2017).
[89] *Id.* at 1–2.
[90] *Id.* at 1–2, 12, 14. "Florida has a unique and complex two-tiered appropriation system to manage water use. Historically, Florida courts applied the doctrine of riparian rights to water rights cases, but all unexercised riparian rights were statutorily extinguished in 1974 . . . ." *Id.* at 12.
[91] *Water Appropriation Systems*, *supra* note 87.
[92] *Id.*
[93] *Id.*
[94] *Id.*
[95] *Id.*; *see* Tyler v. Wilkinson, 24 F. Cas. 472 (C.C.D.R.I. 1827).
[96] *Water Appropriation Systems*, *supra* note 87.
[97] Tyler, 24 F. Cas. at 474.

the prejudice of another."[98] This meant that an upstream proprietor of water could not diminish natural flow of water to a downstream proprietor, including quantity and, to some extent, quality.[99] Because an upper proprietor must take care to ensure the natural flow of water to a lower proprietor, riparian water rights are considered to be of equal priority.[100]

While the right to water under the doctrine of riparian use is not quantified, a proprietor with riparian water rights only holds the right to the amount of water that can be put to "reasonable use."[101] The right to water through riparian use only applies to water in a watercourse, which typically has a definite "natural channel and a bed with banks" such as a river, steam, pond, or lake.[102] Riparian water rights cannot be lost through non-use of water and are considered to be "part and parcel" with land, meaning the right to water is generally transferred with the sale of the land.[103]

The doctrine of prior appropriation determines water rights by following the principle of "first in time—first in right."[104] Under prior appropriation, the right to use water by an appropriator is given priority based on when the water was first diverted and put to beneficial use.[105] An appropriator who first diverted and used water has a priority right to use that water over an appropriator who diverted and used the water at a later date.[106] However, an appropriator only has the right to the amount of water that has been historically diverted and put to beneficial use.[107] Unlike riparian use water rights, landownership is not a pre-requisite for gaining the right to water under the doctrine of prior appropriation.[108] Establishing priority rule of water rights was important in the western states where the doctrine developed because they needed a method of resolving disputes concerning water scarcity.[109] Another significant difference between riparian water rights and water rights through prior appropriation is that an appropriator may lose their right

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[98] *Id.*
[99] *Id.*
[100] *Id.*
[101] *Water Appropriation Systems*, *supra* note 87.
[102] *Id.*
[103] *Id.*
[104] *Id.*
[105] *Id.*
[106] *Id.*
[107] *Water Appropriation Systems*, *supra* note 87.
[108] *Id.*
[109] *Id.*

to water through non-use.[110] Additionally, water rights through prior appropriation can usually be sold or transferred.[111]

Prior appropriation doctrine has four main elements: intent, diversion, beneficial use, and priority.[112] Today, intent is demonstrated through the application for appropriation of water to a state's environment or natural resource agency rather than by posting notice and making preparation for diversion.[113] The most important facets of prior appropriation are beneficial use and priority.[114] Appropriators can take only the amount of water that they can put to beneficial use.[115] Different states use varying definitions of beneficial use, but a central criterion is to prevent waste.[116] Storage of water is considered by most states to be a valid beneficial use.[117] Priority refers to the right of senior appropriators to take the amount of water they need, and can be put to beneficial use over the right of junior appropriators to that water.[118] A junior appropriator may not use water in a manner that will harm the rights of a senior appropriator, and a senior appropriator may not change their water rights, such as using water for a different purpose or at different times, that would harm the use of water by another appropriator.[119]

B. Current State Regulations

States generally fall into four main categories where statutory or regulatory authority regarding direct or indirect potable reuse is concerned: 1) no statutes or regulations speak directly to the issue; 2) a statute, regulation, or guidance has been passed or issued disallowing any potable reuse; 3) indirect potable reuse is allowed; or 4) both direct and indirect potable reuse is allowed.[120]

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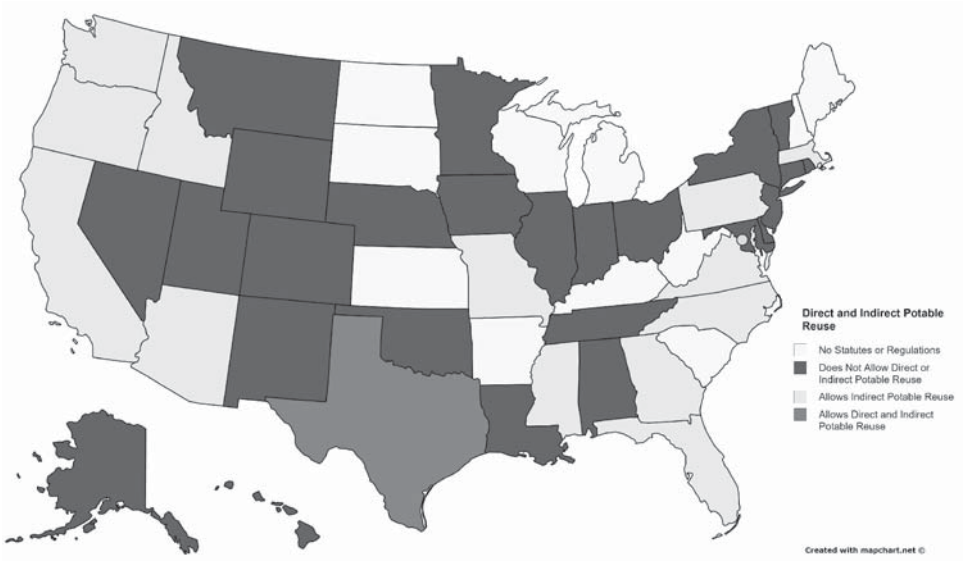
[110] *Id.*
[111] *Id.*
[112] *Id.*
[113] *Water Appropriation Systems*, *supra* note 87.
[114] *Id.*
[115] *Id.*
[116] *Id.*
[117] *Id.*
[118] *Id.*
[119] *Water Appropriation Systems*, *supra* note 87.
[120] Despite research, there does not appear to be any reason for why the states developed each of these positions. Interestingly, these to not seem to break into any of these categories for historical or partisan reasons, and there is also not a riparian vs. prior appropriation split. While individual state positions may be dictated by drought conditions, not all states that have recently experienced drought conditions have adopted statutes or regulations.



Category	**States**
No Statutes or Regulations	Arkansas, Kansas, Kentucky, Maine, Michigan, New Hampshire, North Dakota, South Carolina, South Dakota, West Virginia, Wisconsin
Does Not Allow Direct or Indirect Potable Reuse	Alabama,[121] Alaska,[122] Colorado,[123] Connecticut,[124]

[121] Alabama does allow limited grey-water use for irrigation. ALA. ADMIN. CODE r. 335-6-20-.02 (2015).
[122] Alaska does allow limited grey-water use for indoor toilet flushing and outdoor irrigation. ALASKA ADMIN. CODE tit. 18 § 76.990 (2015).
[123] Colorado allows grey-water systems. COLO. REV. STAT. § 25-8-205 (2013), COLO. CODE REGS. § 1002-84 (2013).
[124] Connecticut allows grey-water systems. CONN. GEN. STAT. § 22a-352(b)(10) (2014), CONN. AGENCIES REGS. § 22a-430-3(o)(1) (2016).

Category	States
Does Not Allow Direct or Indirect Potable Reuse (Continued)	Delaware,[125] Hawaii,[126] Illinois,[127] Indiana,[128] Iowa,[129] Louisiana,[130] Maryland,[131] Minnesota,[132] Montana,[133] Nebraska,[134] Nevada,[135] New Jersey,[136] New Mexico,[137]

[125] Grey-water reuse for specific uses only. 3 DEL. CODE ANN. tit. 3 § 2301 (2009); 7-7103-64.0 DEL. ADMIN. CODE § 7.1 (1999).

[126] Hawaii allows grey-water use. HAW. CODE R. 11-62-01 (LexisNexis 2014). Hawaii's Guidelines on Recycled Water, however, seem to indicate that indirect potable reuse could be allowed but is not currently: "If in the future a community wishes to augment its potable water supply by recharging the potable water supply aquifer with recycled water, [the Department of Health] will review such a request based on findings of a public hearing or a public referendum." HAW. STATE DEP'T OF HEALTH WASTEWATER BRANCH, GUIDELINES FOR THE TREATMENT AND USE OF RECYCLED WATER (2002), http://health.hawaii.gov/wastewater/files/2013/06/reuse-final.pdf [https://perma.cc/88XM-DKLK].

[127] 70 ILL. COMP. STAT. 2305/7 (2013), ILL. ADMIN. CODE tit. 35 § 372 (2016).

[128] 327 IND. ADMIN. CODE 6.1 (2016).

[129] IOWA ADMIN. CODE r. 567-62.10 (2016).

[130] LA. STAT ANN. § 30:2392 (2010).

[131] MD CODE ANN., ENVIR. § 5-5B-04 (West 2002).

[132] MINN. STAT. § 103G.261 (2012).

[133] Montana allows grey water for some uses. MONT. CODE ANN. § 75-5-326 (2015); MONT. ADMIN. R. 17.36.319 (2016).

[134] 119 NEB. ADMIN. CODE § 12-001 to -02 (2017).

[135] NEV. ADMIN. CODE § 445A.2762 (2015).

[136] N.J. ADMIN. CODE § 7:14A-2.15 (2016).

[137] New Mexico allows aquifer storage and recovery and other grey-water systems. Nathan S. Bracken, *Water Reuse in the West: State Programs and Institutional Issues. A Report Compiled by the Western states Water Council*, 18 HASTINGS W.-N.W. J. ENVTL. L. & POL'Y 451, 491 (2012). However, guidance from the New Mexico Environment Department indicates these should only be used for non-potable purposes. N.M. ENV'T DEP'T, NMED GROUND WATER QUALITY BUREAU GUIDANCE: ABOVE GROUND USE OF RECLAIMED DOMESTIC WASTEWATER (2007), https://www.env.nm.gov/gwb/documents/NMED_REUSE_1-24-07.pdf [https://perma.cc/V853-428N]. As noted,

> a regulatory gap may exist for projects that intend to utilize reclaimed domestic wastewater for a direct potable water source. NMED's Drinking Water Bureau regulates potable treatment and distribution systems, and their regulations partially extend to source waters. However, where direct reuse for potable supply is implemented, is possible that no agency will have authority over the wastewater treatment and reclamation systems because the treated water does not discharge to the environment.

Bracken, *supra* note 137, at 492.

Category	States
Does Not Allow Direct or Indirect Potable Reuse (Continued)	New York,[138] Ohio,[139] Oklahoma,[140] Rhode Island,[141] Tennessee,[142] Utah,[143] Vermont,[144] Wyoming[145]
Allow Indirect Potable Reuse	Arizona,[146] California,[147] Florida,[148] Georgia,[149] Idaho,[150] Massachusetts,[151] Mississippi,[152] Missouri,[153] North Carolina,[154] Oregon,[155] Pennsylvania,[156]

[138] New York allows grey-water systems for non-potable uses. N.Y. ENVTL. CONSERV. LAW § 15-0605 (McKinney 2016).
[139] OHIO ADMIN. CODE 3745-42-13 (2016).
[140] Oklahoma does allow treated wastewater to be used for activities like crop irrigation. OKLA. ADMIN. CODE § 252:627-3-2 (2016).
[141] R.I. Dep't of Envtl. Mgmt., Application Guidance for Wastewater Reuse Projects (n.d).
[142] TENN. CODE. ANN. § 68-221-803 (2016); TENN. COMP. R. & REGS. 0400-46-06-.02 (2016).
[143] UTAH ADMIN. CODE R. 317-3-11.4 (2016).
[144] VT. DEP'T OF ENVTL. CONSERV., ENVTL. PROTECTION RULES Chapter 14 (2003).
[145] 20.0011-11 WYO. CODE R. § 82 (2015).
[146] ARIZ. REV. STAT. ANN. § 49-201 (West 2016); ARIZ. ADMIN. CODE. § R18-9-704; Aquifer Protection Permits; *see also* Ginette Chapman, *From Toilet To Tap: The Growing Use of Reclaimed Water and the Legal System's Response*, 47 ARIZ. L. REV. 773, 789 (2005).
[147] CAL. WATER CODE §§ 13560–13569 (West 2016); CAL. CODE REGS. tit. 22 § 60320.200 (2016).
[148] FLA. STAT. § 373.701 (2016), FLA. ADMIN. CODE R. 62-610.550, .554–55 (2016).
[149] While Georgia statutes and regulations do not explicitly allow potable reuse, multiple counties have permits for indirect potable reuse. GA. CODE ANN. § 31-3-5.2 (2016); GA. CODE ANN. § 12-5-7 (2016); GA. COMP. R. & REGS. 267-27-.04 (2016); METRO. N. GA. WATER PLANNING DIST., WATER SUPPLY AND WATER CONSERVATION MANAGEMENT PLAN § 7 (2009), http://northgeorgiawater.org/wp-content/uploads/2015/05/Sec7_Reuse_WSWC_May2009.pdf [https://perma.cc/8HS7-CTGL] (article on Gwinnett discharge into Lake Lanier).
[150] IDAHO ADMIN. CODE r. 58.01.17 (2016).
[151] 314 MASS. CODE REGS. 20.18 (2016).
[152] 11-6 MISS. CODE R. § 4.1 (LexisNexis 2014).
[153] MO. CODE REGS. ANN. tit.10 § 20-2.010 (2016).
[154] N.C. GEN. STAT. § 143-355.5 (2015); 15A N.C. ADMIN. CODE 2U.0501 (2016).
[155] OR. ADMIN. R. 340-055-0007, -0012 (2016).
[156] This is allowed per DEP's guidance documents for Class A+ or A reclaimed water. PA. DEP'T OF ENVTL. PROT., REUSE OF TREATED WASTEWATER GUIDANCE MANUAL 11–12 (2012), http://www.elibrary.dep.state.pa.us/dsweb/Get/Document-88575/385-2188-002.pdf [https://perma.cc/87XD-ZH6H].

Category	**States**
Allow Indirect Potable Reuse (Continued)	Virginia,[157] Washington[158]
Allow Both Direct and Indirect Potable Reuse	Texas[159]

A full half of the states do not allow either direct or indirect potable reuse, even if they may allow grey water to be used for irrigation or other purposes. Many of the states that already use indirect potable reuse typically utilize it for groundwater recharge.[160]

In California, a requested voluntary 20% reduction in 2014 only achieved an 8.8% reduction in water use; many urban municipalities there are also realizing that a longer term, supply side solution is needed.[161] However, experts recognize that regulatory challenges are one of the main limiting factors to increased direct and indirect potable reuse.[162]

IV. SUPPLY, ENERGY AND POLICY CONSIDERATIONS

States and municipalities may want to consider direct as well as indirect potable reuse simply because other forms of supply are either dwindling or more expensive to develop.[163] NASA satellites recently found

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[157] 9 VA. ADMIN. CODE § 25-740 (2016).
[158] WASH. REV. CODE § 90.46.005, .042 (2007); WASH. ADMIN. CODE § 173-505-120 (2016).
[159] These are allowed on a project-specific, case-by-case basis, rather than through statute or regulation. 30 TEX. ADMIN. CODE § 210.32 (2016).
[160] These include projects in California, Arizona, Colorado, Texas, Florida, Nevada, Virginia, and Georgia. Rodriguez et al., *supra* note 17, at 1176.
[161] *Drought Driving Greater Reliance on Wastewater Reuse in California*, BLUEFIELD RES. (May 20, 2015), http://bluefieldresearch.com/drought-driving-greater-reliance-on-waste water-reuse-in-california/ [https://perma.cc/KX5U-JC9E].
[162] Tiffany Strecker, *Utilities struggle to adopt technology to reuse water—GAO*, E&E NEWS (May 2, 2016), https://www.eenews.net/greenwire/2016/05/02/stories/1060036581 [https://perma.cc/SS9G-TBYV]; *see also* Sarah Fister Gale, *Managing Wastewater with Reuse in Mind*, WATERWORLD (Nov. 2016), http://www.waterworld.com/articles/print /volume-32/issue-11/features/managing-wastewater-with-reuse-in-mind.html [https://web .archive.org/web/*/http://www.waterworld.com/articles/print/volume-32/issue-11/features /managing-wastewater-with-reuse-in-mind.html].
[163] *See* Krista Almanzan, *Monterey County's innovative water recycling plant a model for Central Coast*, KCBX (May 26, 2017) http://kcbx.org/post/monterey-countys-innovative-water

that "[g]roundwater supplies around the world are scanter than previously thought and are depleting fast in many places,"[164] which is significant given that groundwater provides the main drinking water supply for more than two billion people worldwide.[165] According to the analysis, California's Central Valley is the fourth most-stressed in the world.[166] Dwindling snowpack is expected to imperil water supply for hundreds of cities in the northern hemisphere.[167] According to the U.S. Government Accountability Office, "[w]ater shortages are expected in 40 states over the next decade."[168] Environmentalists and community members dislike new dam additions, whether for water supply or hydroelectric needs.[169] Continuing salt water intrusion will also require new ways of thinking about water along the coasts; the Hampton Roads area is looking at indirect potable reuse as a way to protect the groundwater from saltwater contamination.[170] Desalination, while an option, is an expensive one, both from a capital perspective and an energy one.[171]

-recycling-plant-model-central-coast#stream/0 [https://perma.cc/Y6V9-S2ML]. Monterey County, CA, is looking at IPR precisely for supply considerations, using irrigation runoff, stormwater, and industrial wastewater in addition to traditional wastewater streams for its new facility.

[164] Debra Kahn, *NASA satellites find global groundwater supplies less than thought, rapidly depleting*, E&E NEWS (June 17, 2015), https://www.eenews.net/climatewire/2015/06/17/stories/1060020372 [https://perma.cc/28BU-DNJL].

[165] *Id.*

[166] *Id.*

[167] Brittany Patterson, *Dwindling Snowpacks Could Affect 2B People*, E&E NEWS (Nov. 13, 2015), https://www.eenews.net/climatewire/2015/11/13/stories/1060027926 [https://perma.cc/7U6Y-DV76].

[168] *Tapping Alternative Water Supplies*, *supra* note 22.

[169] *Utility floats alternative to Utah storage project*, E&E NEWS (Apr. 19, 2017), https://www.eenews.net/greenwire/2017/04/19/stories/1060053264 [https://perma.cc/YAD3-WPM2]. "The big question is, how much air quality impact is Rocky Mountain Power proposing by lowering the Great Salt Lake? How many wetlands does Rocky Mountain Power plan to dry up? How many birds will die?" *Id.*; Scott Streater, *BLM paves way for contested hydro project near Joshua Tree*, E&E NEWS (Apr. 21, 2017), https://www.eenews.net/greenwire/2017/04/21/stories/1060053411 [https://perma.cc/8LMA-GLSR].

[170] Charles Bott & Ted Henifin, *Sustainable Water Initiative for Tomorrow (SWIFT) Wastewater Injection Project*, HSRD (Feb. 2, 2016), http://scholarship.law.wm.edu/cgi/viewcontent.cgi?article=1037&context=vcpcconference [https://perma.cc/BV5S-P8H2].

[171] However, there is potentially an opportunity to implement desalination in a way that both serves community needs and takes advantage of renewable energy, mainly by only using the desalination plant when there is an oversupply of electricity. Richard Perez et al., *Achieving Very High PV Penetration*, 96 ENERGY POL'Y J. 27 (2016), http://digitalcommons.pace.edu/cgi/viewcontent.cgi?article=1006&context=environmental [https://perma.cc/32RV-PL7V].

Energy use—and the nexus between energy and water—may be another reason to implement direct and/or indirect potable reuse.[172] As the climate changes, not only will water resources become scarcer, but energy will likely become more expensive as we move toward a carbon-constrained world,[173] with energy costs currently representing 25–30% of expenses for water and wastewater utilities;[174] "[n]ationally, this translates to approximately $4 billion in annual spending on energy for drinking water and wastewater treatment."[175] In fact, one advocate is even attempting to have water utilities pair solar power with water treatment, since the electric load from pumps is usually a utility's largest operating expense.[176] And, if "just 10% of homes replaced existing fixtures with water-efficient versions, this would save one billion kWh of electricity per year" due to the decreased pumping and treatment costs.[177] Direct potable reuse has been found to be generally less expensive than alternate sources of new water supply, including in terms of energy requirements.[178] While batteries and other new technology may make

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[172] It is estimated that water and wastewater systems account for approximately three percent of all electricity use in the United States, "or 100 billion kWh annually." ADVANCED ENERGY ECONOMY, THIS IS ADVANCED ENERGY 53 (2016), http://info.aee.net/this-is-advanced-energy [https://perma.cc/RG8G-28E9]. While the connection between water and energy is established, electricity use, water, and planning has not received as much attention; *see* Lincoln L. Davies & Victoria Luman, *Incomplete Integration: Water, Drought, and Electricity Planning in the West*, 31 J. ENVTL. L. & LITIG. 167, 169–70 (2016).

[173] *See Twelve economic facts on energy and climate: A joint report from The Hamilton Project and the Energy Policy Institute at the University of Chicago*, BROOKINGS INSTITUTE (Mar. 27, 2017), https://www.brookings.edu/research/twelve-economic-facts-on-energy-and-climate-change/ [https://perma.cc/46Z4-DS5P].

[174] Sarah Fister Gale, *Identifying an Addressing the Water-Energy Nexus*, WATERWORLD, http://www.waterworld.com/articles/print/volume-31/issue-10/features/identifying-and-addressing-the-water-energy-nexus.html.

[175] ADVANCED ENERGY ECONOMY, *supra* note 172, at 49.

[176] *Pa. Educator matching water treatment with solar*, E&E NEWS (June 1, 2016), https://www.eenews.net/energywire/2016/06/01/stories/1060038100 [https://perma.cc/4MKB-2M3H].

[177] ADVANCED ENERGY ECONOMY, *supra* note 172, at 51.

[178] *The Opportunities and Economics of Direct Potable Reuse*, WATEREUSE (2014), https://www.watereuse.org/watereuse-research/the-opportunities-and-economics-of-direct-potable-reuse/ [https://perma.cc/3XJN-C4DU]. Water being constrained also has an impact on energy production. Katherine Tweed, *The Rising Impact of Water Costs on Energy Production*, GREENTECH MEDIA (Sept. 2, 2016), http://www.greentechmedia.com/articles/read/The-Rising-Impact-of-Water-Costs-on-Energy-Production?utm_source=Daily&utm_medium=Newsletter&utm_campaign=GTMDaily [https://perma.cc/4UAM-MRV6]; Maxine Joselow, *National lab helps utilities plan for a Warmer Earth*, E&E NEWS (June 12, 2017), https://www.eenews.net/energywire/2017/06/12/stories/1060055843 [https://perma.cc/UPF6-9NTN]. "Since [coal- and nuclear-fired power] facilities require cooling, they're dependent on certain temperatures and certain water availability." *Id.*; Davies & Luman, *supra* note

pumping water and other water functions more grid-friendly, these innovations will take time.[179]

A lack of water can also directly impact businesses. In 2015, companies reported $2.5 billion in detrimental expenses, including lost revenue, due to water scarcity.[180] Because of these and other needs, water supply planning is now being recognized as a need in land use law.[181]

While some communities may be hesitant to adopt direct or indirect potable reuse for bioaccumulation reasons,[182] especially around

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172, at 183. "[I]nstances of drought affecting electricity production have been documented across the nation." *Id.*; Jim Witkin, *In a Hot, Thirsty Energy Business, Water Is Prized*, N.Y. TIMES, at F5 (Oct. 8, 2013).

> With so much focus on carbon emitted from the nation's power plants, another environmental challenge related to electricity generation is sometimes overlooked: the enormous amount of water needed to cool the power-producing equipment . . . . A recent analysis by the Union of Concerned Scientists revealed many examples from 2006 to 2012 of plants that had temporarily cut back or shut down because local water supplies were too low or too warm to cool the plant efficiently.

Id. See also Michael E. Webber, THIRST FOR POWER: ENERGY, WATER, AND HUMAN SURVIVAL (2016). However, with the transition to renewable energy, water use for electricity generation is expected to decrease. If states move to a high renewable energy portfolio, there could be "about 9,000 billion gallons in reduced water consumption and 169,000 billion in reduced water withdrawal" for electricity generation. TRIEU MAI ET AL., A PROSPECTIVE ANALYSIS OF THE COSTS, BENEFITS, AND IMPACTS OF U.S. RENEWABLE PORTFOLIO STANDARDS 35, http://www.nrel.gov/docs/fy17osti/67455.pdf [https://perma.cc/HJY7-74TN].

[179] Jeff St. John, *How Batteries Can Make the Water System More Grid-Friendly*, GREEN TECH MEDIA (Sept. 30, 2016), https://www.greentechmedia.com/articles/read/the-water-energy-nexus-how-batteries-can-make-the-water-system-more-grid-fr?utm_source=Storage&utm_medium=Newsletter&utm_campaign=GTMStorage [https://perma.cc/7B9H-PZWW]. Smart meters may help customers understand their water usage and help with operational challenges like leak detection. Also, "water utilities are projected to invest $8.3 billion in smart infrastructure over the next ten years." Jeff St. John, *The Grid Edge's Decoupling Effect, Smart Metering Moves, and Distributed Energy*, GREENTECH MEDIA (July 14, 2017), https://www.greentechmedia.com/squared/read/the-grid-edges-decoupling-effect-smart-metering-moves-and-distributed-energ?utm_source=Squared&utm_medium=Newsletter&utm_campaign=GTMSquared [https://perma.cc/C9HH-3HES].

[180] Benjamin Hulac, *Companies report $2.5B in 'detrimental' expenses from water scarcity this year*, E&E NEWS (Oct. 22, 2015), https://www.eenews.net/climatewire/2015/10/22/stories/1060026738 [https://perma.cc/2L7M-CYJA].

[181] John R. Nolan, *Zoning's Centennial, Part 17: Water Scarcity and Land Use Planning*, LAND USE PROF BLOG (May 2, 2016), http://lawprofessors.typepad.com/land_use/2016/05/zonings-centennial-part-17-water-scarcity-and-land-use-planning-a-series-by-john-r-nolon.html?utm_source=feedburner&utm_medium=email&utm_campaign=Feed%3A+typepad%2FwxOmn+%28Land+Use+Prof+Blog%29 [https://perma.cc/YFQ7-AAKQ].

[182] This is basically the same reason that EPA recommends against eating fish at the top of the food chain; compounds that do not easily break down can increase in concentration and be passed on to the higher-up organism that consumes it.

pharmaceuticals and personal care products, this is one area that the federal government is actively working to address.[183] In a recent study, the EPA found that *before wastewater treatment*, the exposure limits for healthy adults was lower than the therapeutic dose by a margin of more than 100, including for both individual pharmaceuticals and mixing all doses for a particular type of treatment together.[184] Additionally, the studies that have been conducted which determine no potential for harm look at normal treatment processes; direct and indirect potable reuse treatments likely reduce the quantities even further. However, the Safe Drinking Water Act limits exist to ensure that any emerging hazard is detected and addressed. Therefore, bioaccumulation risk can be monitored and mitigated within the current legal framework. The issue then becomes how states and municipalities can implement a regulatory framework that allows for direct and/or indirect potable reuse.

V. MODEL LEGISLATION

Starting as early as 1980, scientists, engineers, and public water system managers recognized the potential of using advanced treatment methods on wastewater to a high enough level of quality that the treated water could be reused in the public water system, rather than being discharged. During the past few years, developing systems for the potable reuse of advanced treatment wastewater have been discussed by public water system managers and the public. The Colorado River Municipal Water District and Wichita Falls, both in Texas, are the first systems in the United States to use treated wastewater in the public drinking water system, having implemented potable reuse in 2013 and 2014 respectively.[185] However, other communities around the country have been hesitant to pursue potable reuse due to a lack of standard regulations for direct potable reuse. Additionally, federal legislation such as the Clean Water Act, the Safe Drinking Water Act, and the National Pollution Discharge Elimination System do not include provisions about the potable reuse of water. Currently, over half of states either do not have any legislation on reuse or have regulations that do not allow for direct or

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[183] Mitch Kostich et al., *Pharmaceuticals in municipal wastewater*, EPA (Sept. 24, 2014), https://www.epa.gov/sites/production/files/2014-09/documents/sswr_pharmaceuticals_in_wastewater_webinar_sept_2014.pdf [https://perma.cc/GM42-J2NK].

[184] *Id.* at 14.

[185] *See* Mike Lee, *Parched Texas Town Turns to Treated Sewage as Emergency Drinking Water Source*, E&E NEWS (July 11, 2014), https://www.scientificamerican.com/article/parched-texas-town-turns-to-treated-sewage-as-emergency-drinking-water-source/ [https://perma.cc/6Y7K-2VJ6].

indirect potable reuse. This model legislation is intended to provide the framework from which states, whether they follow riparian use water rights or prior appropriation water rights, can formulate and pass legislation that will allow communities to explore and develop direct or indirect potable reuse systems.[186]

A. Direct Potable Reuse of Recycled Water Systems Act (Riparian Use)

See Appendix A for model legislation and notes.

B. Indirect Potable Reuse of Recycled Water Systems Act (Riparian Use)

See Appendix B for model legislation and notes.

C. Direct Potable Reuse of Recycled Water Systems Act (Prior Appropriation)

See Appendix C for model legislation and notes.

D. Indirect Potable Reuse of Recycled Water Systems Act (Prior Appropriation)

See Appendix D for model legislation and notes

Each provides choices for states to determine what is best for them.

CONCLUSION

Once these changes are adopted, each municipal water system will be able to determine if direct potable reuse or indirect potable reuse will be an appropriate option for them.[187] As discussed above, states and

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[186] *See supra* Direct and Indirect Potable Reuse Chart.

[187] Factors to decide on using one or the other would include the distance between current wastewater treatment facilities and reservoirs or aquifer injection points and other infrastructure concerns. Also, it may be something that water systems want to consider only in specific drought scenarios, such as when water supplies reach a preset percentage. One complicating factor may be minimum environmental releases established in reservoir permits.

municipalities have many reasons that they may want to adopt direct or indirect potable reuse.

While some members of the public are hesitant to drink water supplied by potable reuse, others are directly asking for it: craft breweries in Oregon, for example, have lobbied for legislation allowing the practice, as the water produced using it is more pure than what they currently receive, and they feel it makes a better product. In California, Lagunitas has created its own water treatment plant, creating electricity from methane produced by bacteria munching on the waste in the brewer's wastewater steam, leaving water clean of organic matter. After being treated using reverse osmosis, the water is pumped directly back into the beer-making process, leading to a forty percent reduction in water use.[188] In fact, at the energy-water nexus, Lagunitas recently upgraded their system with "a new type of technology, originally created to be used on a space station, to clean 50,000 gallons of dirty wastewater a day and generate energy in the process."[189] The Oregon Department of Environmental Quality is also looking at allowing recycled wastewater to be used as a direct ingredient in the beer brewing process,[190] and the Hillsborough County Public Utilities recently worked with the WateReuse Association to provide around 100 home brewers reclaimed water for a beer brewing contest, termed "New Water Brew."[191]

As each situation is different, the potential for reuse will need to be evaluated by the municipal water system. However, it should be one option available to water resource managers in a water constrained world.

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[188] Camille von Kaenel & Madelyn Beck, *Craft breweries turn their wastewater into clean water, energy*, E&E PUB. (Nov. 25, 2015), http://www.eenews.net/climatewire/2015/11/25/stories/1060028553 [https://perma.cc/UG5T-TPVR].

[189] Katie Fehrenbacher, *Beer and Wine Makers Turn to Charged Microbes for Clean Water, Power*, GREENTECH MEDIA (Jan. 24, 2017), https://www.greentechmedia.com/articles/read/beer-and-wine-makers-turn-to-charged-microbes-for-clean-water-power?utm_source=Daily&utm_medium=Newsletter&utm_campaign=GTMDaily [https://perma.cc/TQ6M-5E5F].

[190] SUSTAINABLE WATER, *Oregon DEQ Proposes New Use of Recycled Wastewater*, http://sustainablewater.com/oregon-deq-proposes-new-use-of-recycled-wastewater/ [https://perma.cc/DGW3-WB34].

[191] London, *Florida County*, *supra* note 85, at 39.

> The potable, reused water—treated to the highest standards—was provided to around 100 registered home brewers, each of which received two five-gallon buckets of purified water for brewing. The beers were sampled at the 2016 Annual WateReuse Symposium in Tampa where judges awarded cash prizes and medals for first, second, and third places in four subcategories of beer.

Id.

APPENDIX A: MODEL LEGISLATION FOR DIRECT POTABLE REUSE IN RIPARIAN USE STATES

Direct Potable Reuse of Recycled Water Systems Act
(Riparian Use States)

§ 1. Purpose

The purpose of this Article is to allow the use of recycled wastewater through direct potable reuse in public drinking water systems. Allowing the reuse of water will benefit public water systems by augmenting water supplies, providing an additional tool for water management and conservation, ensuring communities at risk of water shortage have a viable alternative for meeting water needs, decreasing the amount of energy required to fulfill water needs, and generally addressing water scarcity issues.[192]

§ 2. Definitions

The following definitions apply throughout this Article:

(1) "Public water system," or "public drinking water system" means a system that provides water to the public for human consumption through pipes or other constructed conveyances "if the system serves 15 or more service connections or which regularly serves 25 or more individuals."[193]

(2) "Direct potable reuse" means "the introduction of reclaimed water (with or without retention in an engineered storage zbuffer) directly into a water treatment plant [or into the public water distribution system,] either [located next to or away] from the advanced wastewater treatment system."[194]

(3) "Public water treatment facility" means a facility that treats water to a standard suitable for potable water prior to disbursement into the public water system.

(4) "Wastewater treatment facility" means a facility that intakes wastewater that has traveled through the public water systems and treats it to a safe standard to be discharged in accordance with the National Pollution Discharge Elimination System.

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[192] EPA, GUIDELINES FOR WATER REUSE 1-5 (2012), https://nepis.epa.gov [https://perma.cc/X7LD-QU94].
[193] N.C. GEN. STAT. § 130A-313.10 (2015).
[194] EPA, *supra* note 192, at 1-2.

(5) "Advanced wastewater treatment" means the use of advanced biological and technological treatment methods to treat wastewater to a level that complies with the Safe Drinking Water Act.[195]

(6) "'Treatment technique requirement' means 'a requirement of the drinking water rules which specifies a specific treatment technique for a contaminant which leads to reduction in the level of the contaminant sufficient to comply with the drinking water rules.'"[196]

(7) "Wastewater" means "used water [that has been] discharged from homes, business, industry, and other facilities."[197]

(8) "Water reuse" means "the use of treated municipal wastewater."[198]

(9) "Watercourse" means "a definite natural channel and a bed with banks" including, but not limited to, rivers, streams, ponds, and lakes.[199]

§ 3. Scope and applicability

These provisions of this Article apply to each public water system in the State unless the potable use of recycled water is not feasible.

§ 4. Project planning

To examine the viability of a water reuse project, the public water systems considering a direct water reuse project should consider the following project planning steps:

(1) Identify the quantity of wastewater available

(2) Determine if public water systems users will accept potable water reuse of treated wastewater

(3) Compare supply to potential demand

(4) Determine economic feasibility

(5) Obtain regulatory approval, specifically NPDES permits and any other pertinent state regulations

(6) Develop an advanced water treatment facility

(7) Begin delivering water[200]

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[195] *Id.* at 2-13.
[196] N.C. GEN. STAT. § 130A-313.12.
[197] EPA, *supra* note 192, at 1-4.
[198] *Id.* at 1-4.
[199] *Water Appropriation Systems*, *supra* note 87.
[200] EPA, *supra* note 192, at 2-4.

§ 5. Compliance with Federal Regulation—Clean Water Act and Safe Drinking Water Act

Any proposed direct reuse project shall comply with the standards set forth in the Clean Water Act and Safe Drinking Water Act.

§ 6. Amending current state law to allow discharge of treated wastewater

To allow direct potable reuse of recycled wastewater, this Article amends state provisions to permit the introduction of advanced treated wastewater directly into the public drinking water system without further treatment or into source water immediately prior to treatment at a public water treatment facility.[201]

§ 7. Key stakeholders

The use of recycled wastewater through direct potable reuse requires the cooperation of local water and wastewater entities as well as federal and state agencies.[202] Such entities or agencies include, but are not limited to, public water treatment facilities, publicly owned treatment works, the state environmental agency, the Environmental Protection Agency, public health officials, and members of the general public.[203]

§ 8. Developing general criteria for direct reuse

In developing uniform water recycling criteria for direct potable reuse, the regulatory authority shall consider the following[204]:

(1) Monitoring results of research and studies regarding direct potable reuse.
(2) Results of demonstration studies conducted for purposes of approval of projects using direct or indirect potable reuse.
(3) Epidemiological studies and risk assessments associated with direct potable reuse projects.
(4) Applicability of the advanced treatment technologies required for recycled water projects, including, but not limited to, direct potable reuse.

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[201] 15A N.C. ADMIN. CODE 18C.1209 (2016).
[202] CALIFORNIA WATER BOARDS, GENERAL WASTE DISCHARGE REQUIREMENTS FOR RECYCLED WATER USE, Order WQ 2014-0090-DWQ 4 (2014).
[203] WATEREUSE, FRAMEWORK FOR DIRECT POTABLE REUSE 32 (Jeffrey J. Mosher & Gina Melin Vartanian eds., 2015), https://watereuse.org/wp-content/uploads/2015/09/14-20.pdf [https://perma.cc/CPQ5-5552].
[204] CAL. WATER CODE § 13564 (2014).

(5) Water quality, limnology, and health risk assessments associated with existing potable water supplies subject to discharges from municipal wastewater, stormwater, and agricultural runoff.
(6) Research and recommendations from the United States Environmental Protection Agency Guidelines for Water Reuse.
(7) The National Research Council of the National Academies' report titled "Water Reuse: Potential for Expanding the Nation's Water Supply Through Reuse of Municipal Wastewater."
(8) Other relevant research and studies regarding direct potable reuse of recycled water.

§ 9. Direct potable reuse

Any direct potable reuse project can be developed using either of the two methods of direct potable reuse:

(1) Direct potable reuse conveyed directly into a public drinking water system; or
(2) Direct potable reuse introduced upstream of a public water treatment facility.

§ 10. Direct potable reuse conveyed directly into a public drinking water system

In direct potable reuse that is conveyed directly into the public drinking water system, direct potable reuse shall go through the general following processes[205]:

(1) Wastewater enters into the wastewater treatment facility and undergoes the facility's standard wastewater treatment; then
(2) A determined percentage of that treated wastewater shall be conveyed into an advanced wastewater treatment facility where it will undergo further treatment to eliminate any remaining potentially harmful effluents to meet the required drinking water quality standards; then
(3) (Optional) The advanced treated water shall be conveyed into an engineered storage buffer to make sure it meets

[205] WATEREUSE, *supra* note 203, at 6.

the required water quality–related public health standards;[206] then

(4) A determined percentage of that advanced treated water shall be conveyed directly into the public drinking water system and mixed with the water treated at the public water treatment facility already in the public drinking water distribution system; then

(5) That mixture of advanced treated water and treated raw water shall be conveyed to the public through the public water system.

§ 11. Direct potable reuse introduced upstream of a public water treatment facility

In direct potable reuse where the advanced treated water is introduced immediately upstream of the public water treatment facility, direct potable reuse shall go through the general following processes[207]:

(1) Wastewater enters into the wastewater treatment facility and undergoes the facility's standard wastewater treatment facility; then

(2) A determined percentage of that treated wastewater shall be conveyed into an advanced wastewater treatment facility where it will undergo further treatment to eliminate any remaining potentially harmful effluents to meet the required drinking water quality standards; then

(3) (Optional) The advanced treated water shall be conveyed into an engineered storage buffer to make sure it meets the required water quality–related public health standards;[208] then

(4) The advanced treated water shall be introduced into the raw water supply of the public water system immediately upstream of the public water treatment facility, but not into the reservoir, river, aquifer, or other source of the public water system; then

(5) A determined percentage of the advanced treated water shall be mixed with the raw water supply and shall be treated at the public water treatment facility; then

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[206] *Id.*
[207] *Id.*
[208] *Id.*

(6) That mixture of advanced treated water and treated raw water shall be conveyed to the public through the public water system.

§ 12. Permitting requirements

Direct potable reuse requires the discharge of treated wastewater either directly into the public drinking water system or into the raw water supply immediately prior to treatment at a public water treatment facility. Such discharge shall be permitted by this Article in accordance with the National Pollution Discharge Elimination System and any other pertinent regulation.[209]

§ 13. Advanced Wastewater Treatment

Recycled water that is used for direct potable reuse shall undergo advanced wastewater treatment. For direct potable reuse, advanced water treatment will fulfill the treatment technique requirement. In accordance with this Article, the state and the relevant public wastewater treatment works shall determine the precise processes to be used during advanced wastewater treatment. Such processes include, but are not limited to, "chemical clarification, carbon adsorption, reverse osmosis and other membrane processes, advanced oxidation, air stripping, ultrafiltration, and ion exchange."[210]

§ 14. Treatment facilities

Because direct potable reuse requires advanced wastewater treatment to meet regulatory and health standards, the public water treatment facility and the public wastewater treatment facility in a community planning a direct potable reuse project should work together to upgrade either facility to include advanced wastewater treatment, or to develop a separate wastewater treatment facility that is capable of conducting advanced wastewater treatment. When practicable to keep costs of reuse as low as possible, current public wastewater treatment facilities should take steps towards developing advanced wastewater treatment facilities as a part of the existing facilities. Many public wastewater treatment facilities already use some of the techniques used in advanced wastewater treatment to treat wastewater before being discharged, so adding additional technologies to a current wastewater treatment facility might be more

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[209] Clean Water Act of 1977 § 402, 33 U.S.C. § 1342 (2012).
[210] EPA, *supra* note 192, at table 4-4.

cost effective than building an entirely new facility specifically for advanced wastewater treatment.

§ 15. Water quality standards

Direct reuse of shall meet the enumerated water quality standards in this Article in addition to those standards set forth under federal regulation. The water quality standard for recycled water used in direct potable reuse shall include, but is not limited to:

(1) No detectable total coliform/100ml
(2) 1mg/l CI_2 residual (min.)
(3) pH = 6.5–8.5
(4) ≤ 2 NTU
(5) ≤ 2 mg/l TOC of wastewater origin
(6) Meet drinking water standards[211]

§ 16. Monitoring recycled water use

Direct reuse of shall meet the monitoring standards in this Article in addition to those standards set forth under federal regulation. The monitoring standard for recycled water used in direct potable reuse shall include, but is not limited to:

(1) pH—daily
(2) Total coliform—daily
(3) CI_2 residual—continuous
(4) Drinking water standards—quarterly
(5) TOC—weekly
(6) Turbidity—continuous[212]

§ 17. Ecological flow

In direct potable reuse, the managers of the public water system shall periodically monitor the effects of the direct potable reuse on the ecological flow of the watershed and water system. Particularly, efforts should be made to reduce any potential impact that might negatively affect the ecosystem by a public water system employing direct potable reuse. One such negative impact would be the removal of water from the watershed during the process of direct potable reuse.

§ 18. Pilot potable reuse projects

When necessary to encourage the development of potable reuse, key stakeholders should work to construct pilot potable reuse programs in

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[211] *Id.*
[212] *Id.*

order to demonstrate to the relevant agencies and the general public the safety and benefits of potable reuse.

§ 19. Public education

Customer and public education are an essential part of the development of water reuse in a public water system, especially with direct potable reuse.[213] Therefore, planned direct potable reuse should be accompanied by a public education plan that informs the public about the science and technology that makes potable reuse safe.

[213] EPA, *supra* note 192, at table 2-4.

Notes on Direct Potable Reuse of Water Legislation in Riparian Use States

1. **Section 1. Purpose**: This legislation is intended to provide the framework that states, specifically states that follow riparian water use doctrine, can use to draft and enact legislation that will allow communities to explore and develop direct potable reuse systems.

2. **Section 2. Definitions**: The definitions included in this draft legislation were selected because they match or closely match the definitions found in existing federal and state legislation.[214] States are encouraged to adopt the language which most closely resembles the definitions contained in other water use related legislation and administrative code in their own state. States should pay close attention to the definition of "public water system" or "public drinking water system" because the most significant aspect of direct potable reuse is that advanced treated wastewater is being put directly back into the "public water system" or "public drinking water system" where it will come into direct contact with and/or be consumed by humans.

3. **Section 3. Scope and applicability**: Direct potable reuse may not be feasible for some communities to adopt for a number of reasons including prohibitive costs, public objection, among other reasons; therefore, the draft legislation was written only to establish the legal framework to allow direct potable reuse. This draft legislation should not be considered a mandate for communities to develop direct or indirect potable reuse systems. In states that follow the doctrine of riparian use for determining water rights, developing direct potable reuse systems will likely not be limited by riparian use doctrine because, under this doctrine, the rights of an upstream public water system and a downstream system have equal rights to the water in their watershed.[215]

4. **Section 5. Compliance with Federal Regulation**: No federal regulation exists that prohibits states or communities from using

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[214] *See, e.g.*, CAL. CODE REGS. tit. 22 § 60320.200 (2016); Clean Water Act of 1977, 33 U.S.C. § 1362 (2012); N.C. GEN. STAT. § 130A-313.10 (2015).
[215] *Water Appropriation Systems*, *supra* note 87.

direct or indirect potable reuse processes. States or communities that adopt indirect potable reuse as a part of their public water system shall take care to follow the standards set forth in the pertinent federal regulation, mainly the Clean Water Act, Safe Drinking Water Act, and National Pollution Discharge Elimination System.[216]

5. **Section 6. Amending current state laws**: Currently, there are no state laws which explicitly permit or ban direct potable reuse and the implementation of direct potable reuse would be determined on a case-by-case basis.[217] Although, some states, like North Carolina, have enacted laws that explicitly prohibit the release of treated wastewater into reservoirs which feed directly to the public water system's intake, that restriction might also prevent the discharge of advance treated wastewater immediately prior to the public water systems intake which can be an aspect of some direct potable reuse systems.[218] This draft legislation is meant to remove any existing such prohibition on the use of direct potable reuse. Depending on the public water system's objective in developing direct potable reuse and the existing state laws concerning reuse, states should draft this section to best fit within its own laws unless those laws have created an outright prohibition for using direct potable reuse. A state may choose to narrowly tailor the process of direct potable reuse by mandating that any advance treated water must be mixed with other source water at the intake before being distributed in the public water system if the state was concerned about achieving a careful balance of new source water and advanced treatment. Alternatively, a state might want to phrase this section broadly to allow public water systems to determine what type of system might work best with its existing infrastructure.

6. **Section 8. Developing general criteria for direct reuse**: The criteria put forth for developing direct potable reuse were adopted from the California Water Board's determined best practices.[219] Because the primary rationale behind the use of direct potable

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[216] WATEREUSE, *supra* note 203, at 32–34.
[217] *Id.* at 32–34.
[218] N.C. GEN. STAT. § 143-355.5 (2015); 15A N.C. ADMIN. CODE 2U.0501 (2016).
[219] CAL. WATER CODE § 13564 (2014).

reuse is that it can reliably treat wastewater to a level of high quality that meets all applicable drinking water standards, any state or public water system that undertakes a direct potable reuse project should take extra care to monitor for health concerns, regulatory requirements, project management and operations, as well as public perception.[220] While advanced treatment techniques have proved to be extremely reliable, public drinking water system mangers still bear the burden of ensuring water sent out to the public for consumption is safe.

7. **Section 9. Direct Potable Reuse**: As outlined in this draft legislation, direct potable reuse can be accomplished through two methods. The first method of using direct potable reuse involves advanced treated water being conveyed directly into the public drinking water system. The second method of direct potable reuse occurs when the advanced treated water is discharged immediately upstream of a public water treatment facility's water intake. The merits of each method will be discussed in the proceeding notes.

8. **Section 10. Direct potable reuse conveyed directly into a public drinking water system**: In this method of direct potable reuse, the advanced treated wastewater is considered finished water when it leaves the advanced wastewater treatment facility because it is ready to be discharged directly into the public water system. Advanced treated water is only mixed with other treated source water once it is in the public drinking water system. In order to produce finished water that can be conveyed directly into the public water system, the advanced wastewater treatment facility must also be permitted as a drinking water treatment facility.[221] To date, none of the approved direct potable reuse projects uses this method.[222] The primary reason for the lack of projects using this method is the uncertainty about the issue of mixing finished water and source water inside of the public drinking water system.[223] Nevertheless, there are still reasons why some states or public water systems might want to pursue direct potable reuse

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[220] EPA, *supra* note 192, at 3-28.
[221] WATEREUSE, *supra* note 203, at 7.
[222] *Id.* at 5.
[223] *Id.* at 7.

through the direct conveying advanced treatment. If a public water system's wastewater treatment plant and/or advanced wastewater treatment plant are located far away from the public drinking water system, it may be cost prohibitive to construct enough piping to send the advanced treated wastewater to the existing drinking water facility. With direct discharge into the public water system, the high costs of transporting water back to the drinking water facility could be avoided. States and public drinking water systems should evaluate the characteristics of their own system before determining which method of direct potable reuse to follow. Because the science and facts around this method of direct potable reuse continue to evolve, if possible, states should avoid barring this method of direct potable reuse and, instead, create sufficient safeguards under which this method might be implemented and observed.

9. **Section 11. Direct potable reuse introduced immediately upstream of a public water treatment facility**: In this method of direct potable reuse, advanced treated wastewater is discharged into the raw water supply immediately upstream of a drinking water facility. Because the advanced treated wastewater is mixed with raw water supply before reaching the drinking water facility, it becomes part of the source water for the public water system.[224] Direct potable reuse projects that are permitted in the United States currently use this method.[225] Mixing the advanced treated water and source water prior to being treated at the drinking water facility allows the additional treatment of the combined water, which adds a layer of safety.[226] States looking to develop direct potable reuse systems quickly would likely be served best by choosing this method, at least at the start of the project, because it carries less uncertainty and may not require the highest level of scrutiny since advanced treated water usually already meets the all the necessary drinking water standards.[227]

10. **Section 13. Advanced Wastewater Treatment**: All water that goes through a direct potable reuse system must undergo advanced

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[224] WATEREUSE, *supra* note 203, at 6.
[225] *Id.*
[226] *Id.*
[227] *Id.* at 5.

wastewater treatment. The United States Environmental Protection Agency advises that advanced wastewater treatment should include, but is not limited to, chemical clarification, carbon adsorption, reverse osmosis and other membrane processes, advanced oxidation, air stripping, ultrafiltration, and ion exchange.[228] States are, however, responsible for determining precisely what should be included within an advanced wastewater treatment facility so long as it produces water at an adequately high, safe quality. Most advanced water treatment facilities have found success in using reverse osmosis to treat wastewater.[229]

11. **Section 14. Treatment facilities**: As is laid out in this section, states and public water systems should work strategically together in developing the treatment facility infrastructure needed for direct potable reuse.

12. **Section 15. Water quality standards/Section 16. Monitoring water**: This draft legislation has adopted the suggested water quality standards and water quality monitoring found in the EPA's 2012 Guidelines for Water Reuse in Table 4-4 under indirect potable reuse.[230] It may be necessary for states or public water systems to develop additional standards based on the quality of the advanced treated wastewater being produced at its treatment facilities.

13. **Section 17. Ecological flow**: When developing and utilizing direct potable reuse, the public water systems in charge of the project shall monitor any effects that direct potable reuse is having on the watershed, water system, and ecosystem. Because direct potable reuse can influence in stream flows, discharge flows, and water levels, a direct potable reuse project has the potential to alter the water balance in the water system.[231] Both plants and animals can become dependent on return flows in areas where discharges have occurred for an extended period of time and could be adversely affected if a direct potable reuse project drastically altered the existing in stream and return flows.[232]

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[228] EPA, *supra* note 192, at table 4-4.
[229] WATEREUSE, *supra* note 203, at 6.
[230] EPA, *supra* note 192, at table 4-4.
[231] EPA, *supra* note 192, at 2-38.
[232] *Id.*

14. **Section 19. Public education**: In developing a direct potable reuse system, public education about direct potable reuse is paramount because the public is the consumer, and if the consumer does not want to consume advanced treated wastewater in the public drinking water system, then a reuse project would be a massive waste of resources. First, states and public water systems must engage the public about the safety of using a direct potable reuse system, including being specific about what percentage of the system's water is advanced treated wastewater. To overcome the "ick" factor of consuming treated wastewater, the public must feel confident that the advanced treated wastewater does in fact meet the drinking water standards. Second, states and public water systems must inform the public about the benefits of implementing direct potable reuse.

APPENDIX B: MODEL LEGISLATION FOR INDIRECT POTABLE REUSE IN RIPARIAN USE STATES

Indirect Potable Reuse of Recycled Water Systems Act
(Riparian Use States)

§ 1. Purpose

The purpose of this Article is to allow the use of recycled wastewater through indirect potable reuse in public drinking water systems. Allowing the reuse of water will benefit public water systems by augmenting water supplies, providing an additional tool for water management and conservation, ensuring communities at risk of water shortage have a viable alternative for meeting water needs, and generally addressing water scarcity issues.[233]

§ 2. Definitions

The following definitions apply throughout this Article:

(1) "Public water system," or "public drinking water system" means a system that provides water to the public for human consumption through pipes or other constructed conveyances "if the system serves 15 or more service connections or which regularly serves 25 or more individuals."[234]

(2) "Indirect potable reuse" means "augmentation of a drinking water source (surface or groundwater) with recycled water followed by an environmental buffer that precedes normal drinking water treatment."[235]

(3) "Public water treatment facility" means a facility that treats water to a standard suitable for potable water prior to disbursement into the public water system.

(4) "Wastewater treatment facility" means a facility that intakes wastewater that has traveled through the public water systems and treats it to a safe standard to be discharged in accordance with National Pollution Discharge Elimination System.

(5) "Advanced wastewater treatment" means the use of advanced biological and technological treatment methods to treat wastewater to a level that complies with the Safe Drinking Water Act.[236]

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[233] EPA, *supra* note 192, at 1-5.
[234] N.C. GEN. STAT. § 130A-313.10 (2015).
[235] EPA, *supra* note 192, at 1-4.
[236] *Id.*

(6) "Treatment technique requirement" means "a requirement of the drinking water rules which specifies a specific treatment technique for a contaminant which leads to reduction in the level of the contaminant sufficient to comply with the drinking water rules."[237]
(7) "Wastewater" means used water that has been discharged from homes, business, industry, and other facilities.[238]
(8) "Water reuse" means the use of treated municipal wastewater.[239]
(9) "Watercourse" means "a definite natural channel and a bed with banks" including, but not limited to, rivers, streams, ponds, and lakes.[240]

§ 3. Scope and applicability
These provisions of this Article apply to each public water system in the State unless the potable use of recycled water is not feasible.

§ 4. Project planning
To examine the viability of a water reuse project, the public water systems considering an indirect water reuse project should consider the following project planning steps:
(1) Identify the quantity of wastewater available
(2) Determine if public water systems users will accept potable water reuse of treated wastewater
(3) Compare supply to potential demand
(4) Determine economic feasibility
(5) Obtain regulatory approval, specifically NPDES permits and any other pertinent state regulations
(6) Develop an advanced water treatment facility
(7) Begin delivering water[241]

§ 5. Compliance with Federal Regulation—Clean Water Act and Safe Drinking Water Act
Any proposed indirect reuse project shall comply with the standards set forth in the Clean Water Act and Safe Drinking Water Act.

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[237] N.C. GEN. STAT. § 130A-313.12.
[238] EPA, *supra* note 192, at 1-4.
[239] *Id.*
[240] *Water Appropriation Systems*, *supra* note 87.
[241] EPA, *supra* note 192, at 2-4.

§ 6. Amending current state law to allow discharge of treated wastewater

To allow indirect potable reuse of recycled wastewater, this Article amends state provisions which prohibit the discharge of treated wastewater into potable water reservoirs.[242]

§ 7. Key stakeholders

The use of recycled wastewater through indirect potable reuse requires the cooperation of local water and wastewater entities as well as federal and state agencies.[243] Such entities or agencies include, but are not limited to, public water treatment facilities, publicly owned treatment works, the state environmental agency, the Environmental Protection Agency, public health officials, and members of the general public.[244]

§ 8. Developing general criteria for indirect reuse

In developing uniform water recycling criteria for indirect potable reuse, the regulatory authority shall consider the following[245]:

(1) Monitoring results of research and studies regarding indirect potable reuse.
(2) Results of demonstration studies conducted for purposes of approval of projects using direct or indirect potable reuse.
(3) Epidemiological studies and risk assessments associated with indirect potable reuse projects.
(4) Applicability of the advanced treatment technologies required for recycled water projects, including, but not limited to, indirect potable reuse.
(5) Water quality, limnology, and health risk assessments associated with existing potable water supplies subject to discharges from municipal wastewater, stormwater, and agricultural runoff.
(6) Research and recommendations from the United States Environmental Protection Agency Guidelines for Water Reuse.
(7) The National Research Council of the National Academies' report titled "Water Reuse: Potential for Expanding the

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[242] 15A N.C. ADMIN. CODE 18C.1209 (2016).
[243] CAL. WATER BOARDS, GENERAL WASTE DISCHARGE REQUIREMENTS FOR RECYCLED WATER USE, Order WQ 2014-0090-DWQ 4 (2014).
[244] WATEREUSE, *supra* note 203, at 32.
[245] CAL. WATER CODE § 13564 (2014).

Nation's Water Supply Through Reuse of Municipal Wastewater."

(8) Other relevant research and studies regarding direct or indirect potable reuse of recycled water.

§ 9. Indirect potable reuse

Indirect potable reuse shall go through the general following processes[246]:

(1) Wastewater enters into the wastewater treatment facility and undergoes the facility's standard wastewater treatment facility; then

(2) A determined percentage of that advanced treated wastewater shall be conveyed into an advanced wastewater treatment facility where it will undergo further treatment to eliminate any remaining potentially harmful effluents to meet the required drinking water quality standards; then

(3) The advanced treated water shall be conveyed into an environmental buffer (e.g., groundwater basin or surface water reservoir);[247] then

(4) That mixture of advanced treated water and raw water from the environmental buffer shall be conveyed to the public water treatment facility where it shall be treated; then

(5) The treated water shall be conveyed to the public through the public drinking water system.

§ 10. Environmental buffers

In indirect potable reuse, groundwater aquifers, surface water reservoirs, lakes, or rivers shall serve as an environmental buffer that provides storage, transport, and additional protection of public health.[248]

§ 11. Permitting requirements

Indirect potable reuse requires the discharge of treated wastewater either into a reservoir, aquifer, or ground water supply. Such discharge shall be permitted by this Article in accordance with the National Pollution Discharge Elimination System.[249]

§ 12. Advanced Wastewater Treatment

Recycled water that is used for indirect potable reuse shall undergo advanced wastewater treatment. In accordance with this Article, the state

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[246] WATEREUSE, *supra* note 203, at 8.
[247] *Id.*
[248] *Id.*
[249] Clean Water Act of 1977 § 402, 33 U.S.C. § 1342 (2012).

and the relevant public wastewater treatment works shall determine the precise processes to be used during advanced wastewater treatment. Such processes include, but are not limited to, chemical clarification, carbon adsorption, reverse osmosis and other membrane processes, advanced oxidation, air stripping, ultrafiltration, and ion exchange.[250]

§ 13. Treatment facilities

Because indirect potable reuse requires advanced wastewater treatment to meet regulatory and health standards, the public water treatment facility and the public wastewater treatment facility in a community planning a indirect potable reuse project should work together to upgrade either facility to include advanced wastewater treatment or to develop a separate wastewater treatment facility that is capable of conducting advanced wastewater treatment. When practicable to keep costs of reuse as low as possible, current public wastewater treatment facilities should take steps towards developing advanced wastewater treatment facilities as a part of the existing facilities. Many public wastewater treatment facilities already use some of the techniques used in advanced wastewater treatment to treat wastewater before being discharged, so adding additional technologies to a current wastewater treatment facility might be more cost effective than building an entirely new facility specifically for advanced wastewater treatment.

§ 14. Water quality standards

Indirect reuse of shall meet the enumerated water quality standards in this Article in addition to those standards set forth under federal regulation. The water quality standard for recycled water used in indirect potable reuse shall include, but is not limited to:

(1) No detectable total coliform/100ml
(2) 1mg/l CI_2 residual (min.)
(3) pH = 6.5–8.5
(4) ≤ 2 NTU
(5) ≤ 2 mg/l TOC of wastewater origin
(6) Meet drinking water standards[251]

§ 15. Monitoring recycled water use

Indirect reuse of shall meet the monitoring standards in this Article in addition to those standards set forth under federal regulation. The

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[250] EPA, *supra* note 192, at table 4-4.
[251] *Id.*

monitoring standard for recycled water used in indirect potable reuse shall include, but is not limited to:

(1) pH—daily
(2) Total coliform—daily
(3) CI_2 residual—continuous
(4) Drinking water standards—quarterly
(5) TOC—weekly
(6) Turbidity—continuous[252]

§ 16. Ecological flow

In indirect potable reuse, the managers of the public water system shall periodically monitor the effects of the indirect potable reuse on the ecological flow of the watershed and water system. Particularly, efforts should be made to reduce any potential impact that might negatively affect the ecosystem by a public water system employing indirect potable reuse. Such negative impacts include the removal of water from the watershed and introducing advanced treated water into an environmental buffer during the process of indirect potable reuse.

§ 17. Pilot potable reuse projects

When necessary to encourage the development of potable reuse, key stakeholders should work to construct pilot potable reuse programs in order to demonstrate to the relevant agencies and the general public the safety and benefits of potable reuse.

§ 18. Public education

Customer and public education are an essential part of the development of water reuse in a public water system, especially with indirect potable reuse.[253] Therefore, planned indirect potable reuse should be accompanied by a public education plan that informs the public about the science and technology that makes potable reuse safe.

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[252] *Id.*
[253] EPA, *supra* note 192, at table 2-4.

Notes on Indirect Potable Reuse of Water Legislation in Riparian Use States

1. **Section 1. Purpose**: This legislation is intended to provide the framework that states, specifically states that follow riparian water use doctrine, can use to draft and enact legislation that will allow communities to explore and develop indirect potable reuse systems.

2. **Section 2. Definitions**: The definitions included in this draft legislation were selected because they match or closely match the definitions found in existing federal and state legislation.[254] States are encouraged to adopt the language which most closely resembles the definitions contained in other water use related legislation and administrative code in their own state. States should pay close attention to the definition of "public water system" or "public drinking water system" because the most significant aspect of indirect potable reuse is that advanced treated wastewater is being put back into the "public water system" or "public drinking water system" where it will come into direct contact with and/or be consumed by humans.

3. **Section 3. Scope and applicability**: Indirect potable reuse may not be feasible for some communities to adopt for a number of reasons including prohibitive costs, public objection, among other reasons; therefore, the draft legislation was written only to establish the legal framework to allow indirect potable reuse. This draft legislation should not be considered a mandate for communities to develop direct or indirect potable reuse systems. In states that follow the doctrine of riparian use for determining water rights, developing indirect potable reuse systems will likely not be limited by riparian use doctrine because, under this doctrine, the rights of an upstream public water system and a downstream system have equal rights to the water in their watershed.[255]

4. **Section 5. Compliance with Federal Regulation**: No federal regulation exists that prohibits states or communities from using direct or indirect potable reuse processes. States or communities

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[254] *See, e.g.*, CAL. CODE REGS. tit. 22 § 60320.200 (2016); Clean Water Act of 1977, 33 U.S.C. § 1362 (2012); N.C. GEN. STAT. § 130A-313.10 (2015).
[255] *Water Appropriation Systems*, *supra* note 87.

that adopt indirect potable reuse as a part of their public water system shall take care to follow the standards set forth in the pertinent federal regulation, mainly the Clean Water Act, Safe Drinking Water Act, and National Pollution Discharge Elimination System.[256]

5. **Section 6. Amending current state laws**: Currently, there are many state laws that prohibit indirect potable reuse by preventing the discharge of treated wastewater into potable water reservoirs.[257] For example, a North Carolina law explicitly prohibits the release of treated wastewater into reservoirs that feed directly to the public water system's intake.[258] This draft legislation is meant to remove any existing such prohibition on the use of indirect potable reuse and affirmatively grants the authority for advanced treated wastewater to be discharged into potable water reservoirs. Depending on the public water system's objective in developing indirect potable reuse and the existing state laws concerning reuse, states should draft this section to best fit within its own laws unless those laws have created an outright prohibition for using indirect potable reuse. With indirect potable reuse, a public water system may predetermine where the advanced treated wastewater is sent.[259] The water could be limited to only be used to augment underground aquifers or to be discharged in the reservoir where the public drinking water facility's intake is located.

6. **Section 8. Developing general criteria for indirect reuse**: The criteria put forth for developing indirect potable reuse were adopted from the California Water Board's determined best practices.[260] Any state or public water system that undertakes an indirect potable reuse project should take extra care to monitor for health concerns, regulatory requirements, project management and operations, as well as public perception.[261] While advanced treatment techniques have proved to be extremely reliable, public drinking water system mangers still bear the burden of ensuring water sent out to the public for consumption is safe.

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[256] WATEREUSE, *supra* note 203, at 32–34.
[257] EPA, *supra* note 192, at 3-28.
[258] N.C. GEN. STAT. § 143-355.5 (2015); 15A N.C. ADMIN. CODE 2U.0501 (2016).
[259] EPA, *supra* note 192, at 3-28.
[260] CAL. WATER CODE § 13564 (2014).
[261] EPA, *supra* note 192, at 3-28.

7. **Section 9. Indirect potable reuse**: As outlined in this draft legislation, indirect potable reuse includes the following processes: (1) go through advanced wastewater treatment, (2) be discharged into an environmental buffer, (3) mix in that environmental buffer with the original source water, and (4) be conveyed to the public through the public drinking water system. States may pursue an indirect potable reuse project when there is a limited availability of alternate sources, the cost to develop alternate sources is high, public acceptance exists, and public water system mangers have confidence in the advanced treatment methods and drinking water treatment methods.[262] Indirect potable reuse proved to be a saving source for the town of Wichita Falls, Texas where after years of drought the town was dealing with severe water scarcity. The town became the first city in the United States to develop an indirect potable reuse system.[263]

8. **Section 10. Environmental buffers**: Unlike direct potable reuse, indirect potable reuse always involves the use of an environmental buffer. Groundwater aquifers, surface water reservoirs, and lakes serve as environmental buffers in indirect potable reuse projects. Environmental buffers provide storage for the reused water, transport to the public water system's intake, and an additional protection to public health.[264]

9. **Section 11. Permitting requirements**: As discussed in Note 5, the biggest hurdle faced by indirect potable reuse projects is being able to discharge into reservoirs or lakes in which public water systems intakes are located.[265] Modern public water systems were designed to keep treated wastewater away from drinking water intakes as a health protection. However, the use of advanced treatment facilities produces water that meets drinking water standards and, thus, should be safe to discharge into the reservoirs from which drinking water is taken. One example of an indirect potable reuse project that hinged on receiving the proper discharge permit is at Lake Lanier in Gwinnett County, Georgia. Allowing the project to proceed hinged on receiving a discharge

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[262] *Id.*
[263] Preston, *supra* note 18.
[264] WATEREUSE, *supra* note 203, at 8.
[265] EPA, *supra* note 192, at 3-28.

permit to discharge advanced treated wastewater back into Lake Lanier, which is where the county's raw water intake is located.[266] The stakeholders were able to proceed with the much-needed project after they convinced the state that the discharge would not violate anti-degradation regulations.[267]

10. **Section 12. Advanced Wastewater Treatment**: All water that goes through an indirect potable reuse system must undergo advanced wastewater treatment. The United States Environmental Protection Agency advises that advanced wastewater treatment should include, but is not limited to, chemical clarification, carbon adsorption, reverse osmosis and other membrane processes, advanced oxidation, air stripping, ultrafiltration, and ion exchange.[268] States are, however, responsible for determining precisely what should be included within an advanced wastewater treatment facility so long as it produces water at an adequately high, safe quality. Most advanced water treatment facilities have found success in using reverse osmosis to treat wastewater.[269]

11. **Section 13. Treatment facilities**: As is laid out in this section, states and public water systems should work strategically together in developing the treatment facility infrastructure needed for indirect potable reuse.

12. **Section 14. Water quality standards/Section 15. Monitoring water**: This draft legislation has adopted the suggested water quality standards and water quality monitoring found in the EPA's 2012 Guidelines for Water Reuse in Table 4-4 under indirect potable reuse.[270] It may be necessary for states or public water systems to develop additional standards based on the quality of the advanced treated wastewater being produced at its treatment facilities.

13. **Section 16. Ecological flow**: When developing and utilizing direct potable reuse, the public water systems in charge of the

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[266] *Id.* at 3-29.
[267] *Id.*
[268] EPA, *supra* note 192, at table 4-4.
[269] WATEREUSE, *supra* note 203, at 8.
[270] EPA, *supra* note 192, at table 4-4.

project shall monitor any effects that indirect potable reuse is having on the watershed, water system, and ecosystem. Because indirect potable reuse can influence in stream flows, discharge flows, and water levels, an indirect potable reuse project has the potential to alter the water balance in the water system.[271] Both plants and animals can become dependent on return flows in areas where discharges have occurred for an extended period of time and could be adversely affected if an indirect potable reuse project drastically altered the existing in stream and return flows.[272] Additionally, since advanced treated wastewater in indirect potable reuse is discharged into existing source waters, public water systems managers must monitor the quality of the water being discharged into reservoirs, aquifers, and lakes because both too clean and too dirty advanced treated water could damage the watershed.

14. **Section 18. Public education**: In developing an indirect potable reuse system, public education about indirect potable reuse is paramount because the public is the consumer, and if the consumer does not want to consume advanced treated wastewater in the public drinking water system, then a reuse project would be a massive waste of resources. First, states and public water systems must engage the public about the safety of using an indirect potable reuse system, including being specific about what percentage of the system's water is advanced treated wastewater.[273] To overcome the "ick" factor of consuming treated wastewater, the public must feel confident that the advanced treated wastewater does in fact meet the drinking water standards. Second, states and public water systems must inform the public about the benefits of implementing indirect potable reuse.

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[271] EPA, *supra* note 192, at 2-38.
[272] *Id.*
[273] WATEREUSE, *supra* note 203, at 51.

APPENDIX C: MODEL LEGISLATION FOR DIRECT POTABLE REUSE IN PRIOR APPROPRIATION STATES

Direct Potable Reuse of Recycled Water Systems Act
(Prior Appropriation States)

§ 1. Purpose

The purpose of this Article is to allow the use of recycled wastewater through direct potable reuse in public drinking water systems. Allowing the reuse of water will benefit public water systems by augmenting water supplies, providing an additional tool for water management and conservation, ensuring communities at risk of water shortage have a viable alternative for meeting water needs, decreasing the amount of energy required to fulfill water needs, and generally addressing water scarcity issues.[274]

§ 2. Definitions

The following definitions apply throughout this Article:

(1) "Public water system," or "public drinking water system" means a system that provides water to the public for human consumption through pipes or other constructed conveyances "if the system serves 15 or more service connections or which regularly serves 25 or more individuals."[275]

(2) "Direct potable reuse" means "the introduction of reclaimed water (with or without retention in an engineered storage buffer) directly into a water treatment plant or into the public water distribution system, either [located next to or away] from the advanced wastewater treatment system."[276]

(3) "Public water treatment facility" means a facility that treats water to a standard suitable for potable water prior to disbursement into the public water system.

(4) "Wastewater treatment facility" means a facility that intakes wastewater that has traveled through the public water systems and treats it to a safe standard to be discharged in accordance with National Pollution Discharge Elimination System.

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[274] EPA, *supra* note 192, at 1-5.
[275] N.C. GEN. STAT. § 130A-313.10 (2015).
[276] EPA, *supra* note 192, at 1-4.

(5) "Advanced wastewater treatment" means the use of advanced biological and technological treatment methods to treat wastewater to a level that complies with the Safe Drinking Water Act.[277]
(6) "Treatment technique requirement" means "a requirement of the drinking water rules which specifies a specific treatment technique for a contaminant which leads to reduction in the level of the contaminant sufficient to comply with the drinking water rules."[278]
(7) "Wastewater" means used water that has been discharged from homes, business, industry, and other facilities.[279]
(8) "Water reuse" means the use of treated municipal wastewater.[280]
(9) "Watercourse" means "a definite natural channel and a bed with banks" including, but not limited to, rivers, streams, ponds, and lakes.[281]

§ 3. Scope and applicability
These provisions of this Article apply to each public water system in the State unless the potable use of recycled water is not feasible.

§ 4. Project planning
To examine the viability of a water reuse project, the public water systems considering a direct water reuse project should consider the following project planning steps:
(1) Identify the quantity of wastewater available
(2) Determine if public water systems users will accept potable water reuse of treated wastewater
(3) Compare supply to potential demand
(4) Determine economic feasibility
(5) Obtain regulatory approval, specifically NPDES permits and any other pertinent state regulations
(6) Develop an advanced water treatment facility
(7) Begin delivering water[282]

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[277] *Id.* at 2-13.
[278] N.C. GEN. STAT. § 130A-313.12.
[279] EPA, *supra* note 192, at 1-4.
[280] *Id.*
[281] *Water Appropriation Systems*, *supra* note 87.
[282] EPA, *supra* note 192, at 2-4.

§ 5. Compliance with Federal Regulation—Clean Water Act and Safe Drinking Water Act

Any proposed direct reuse project shall comply with the standards set forth in the Clean Water Act and Safe Drinking Water Act.

§ 6. Amending current state law to allow discharge of treated wastewater

To allow direct potable reuse of recycled wastewater, this Article amends state provisions to permit the introduction of advanced treated wastewater directly into the public drinking water system without further treatment or into source water immediately prior to treatment at a public water treatment facility.[283]

§ 7. Key stakeholders

The use of recycled wastewater through direct potable reuse requires the cooperation of local water and wastewater entities as well as federal and state agencies.[284] Such entities or agencies include, but are not limited to, public water treatment facilities, publicly owned treatment works, the state environmental agency, the Environmental Protection Agency, public health officials, and members of the general public.[285]

§ 8. Water reuse within an existing prior appropriation of water rights

In order to preserve existing prior appropriation of water rights systems while allowing water reuse, public water systems, which are water appropriators, shall have the right to reuse water that has previously been withdrawn from the watershed by the appropriator of the water in a given public water system. Under this Article, the reuse of water by an appropriator shall not diminish the amount of appropriated water received by a public water system based on historic use. Further, the reuse of water shall not be considered an impairment of downstream water appropriators.

§ 9. Water reuse rights to the treatment facility

This Article grants the right to reuse water to the treatment facility that takes in wastewater and treats it for reuse. Treatment facilities that may gain the right to water reuse include wastewater treatment facilities,

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[283] 15A N.C. ADMIN. CODE 18C.1209 (2016).
[284] Cal. Water Boards, General Waste Discharge Requirements for Recycled Water Use, Order WQ 2014-0090-DWQ 4 (2014).
[285] WATEREUSE, *supra* note 203, at 3.

advanced wastewater treatment facilities, and public water treatment facilities. A treatment facility only gains the right to reuse water once the water has been treated and put to beneficial use.

[OR, alternatively]

§ 10. Water reuse rights to the original appropriator

This Article establishes that the original appropriator of water retains the right to reuse the water withdrawn under their appropriation until the water reaches a public watercourse.

[OR, alternatively]

§ 11. The right to reuse water as an independent appropriation

In addition to gaining the right to reuse water under an existing appropriation, the right to reuse water may also be gained through an independent appropriation that is designated explicitly for direct potable reuse. This Article establishes that water reuse is a valid beneficial use for appropriation of water by a public water system.

§ 12. Developing general criteria for direct reuse

In developing uniform water recycling criteria for direct potable reuse, the regulatory authority shall consider the following[286]:

(1) Monitoring results of research and studies regarding direct potable reuse.

(2) Results of demonstration studies conducted for purposes of approval of projects using direct or indirect potable reuse.

(3) Epidemiological studies and risk assessments associated with direct potable reuse projects.

(4) Applicability of the advanced treatment technologies required for recycled water projects, including, but not limited to, direct potable reuse.

(5) Water quality, limnology, and health risk assessments associated with existing potable water supplies subject to discharges from municipal wastewater, stormwater, and agricultural runoff.

(6) Research and recommendations from the United States Environmental Protection Agency Guidelines for Water Reuse.

(7) The National Research Council of the National Academies' report titled "Water Reuse: Potential for Expanding the Nation's Water Supply Through Reuse of Municipal Wastewater."

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[286] CAL. WATER CODE § 13564 (2014).

(8) Other relevant research and studies regarding direct potable reuse of recycled water.

§ 13. Direct potable reuse

Any direct potable reuse project can be developed using either of the two methods of direct potable reuse:

(1) Direct potable reuse conveyed directly into a public drinking water system; or

(2) Direct potable reuse introduced upstream of a public water treatment facility.

§ 14. Direct potable reuse conveyed directly into a public drinking water system

In direct potable reuse that is conveyed directly into the public drinking water system, direct potable reuse shall go through the general following processes[287]:

(1) Wastewater enters into the wastewater treatment facility and undergoes the facility's standard wastewater treatment facility; then

(2) A determined percentage of that treated wastewater shall be conveyed into an advanced wastewater treatment facility where it will undergo further treatment to eliminate any remaining potentially harmful effluents to meet the required drinking water quality standards; then

(3) (Optional) The advanced treated water shall be conveyed into an engineered storage buffer to make sure it meets the required water quality–related public health standards;[288] then

(4) A determined percentage of that advanced treated water shall be conveyed directly into the public drinking water system and mixed with the water treated at the public water treatment facility already in the public drinking water distribution system; then

(5) That mixture of advanced treated water and treated raw water shall be conveyed to the public through the public water system.

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[287] WATEREUSE, *supra* note 203, at 6.

[288] *Id.*

§ 15. Direct potable reuse introduced upstream of a public water treatment facility

In direct potable reuse where the advanced treated water is introduced immediately upstream of the public water treatment facility, direct potable reuse shall go through the general following processes[289]:

(1) Wastewater enters into the wastewater treatment facility and undergoes the facility's standard wastewater treatment facility; then

(2) A determined percentage of that treated wastewater shall be conveyed into an advanced wastewater treatment facility where it will undergo further treatment to eliminate any remaining potentially harmful effluents to meet the required drinking water quality standards; then

(3) (Optional) The advanced treated water shall be conveyed into an engineered storage buffer to make sure it meets the required water quality–related public health standards;[290] then

(4) The advanced treated water shall be introduced into the raw water supply of the public water system immediately upstream of the public water treatment facility, but not into the reservoir, river, aquifer, or other source of the public water system; then

(5) A determined percentage of the advanced treated water shall be mixed with the raw water supply and shall be treated at the public water treatment facility; then

(6) That mixture of advanced treated water and treated raw water shall be conveyed to the public through the public water system.

§ 16. Permitting requirements

Direct potable reuse requires the discharge of treated wastewater either directly into the public drinking water system or into the raw water supply immediately prior to treatment at a public water treatment facility. Such discharge shall be permitted by this Article in accordance with the National Pollution Discharge Elimination System and any other pertinent regulation.[291]

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[289] *Id.*
[290] *Id.*
[291] Clean Water Act of 1977 § 402, 33 U.S.C. § 1342 (2012).

§ 17. Advanced Wastewater Treatment

Recycled water that is used for direct potable reuse shall undergo advanced wastewater treatment. For direct potable reuse, advanced water treatment will fulfill the treatment technique requirement. In accordance with this Article, the state and the relevant public wastewater treatment works shall determine the precise processes to be used during advanced wastewater treatment. Such processes include, but are not limited to, chemical clarification, carbon adsorption, reverse osmosis and other membrane processes, advanced oxidation, air stripping, ultrafiltration, and ion exchange.[292]

§ 18. Treatment facilities

Because direct potable reuse requires advanced wastewater treatment to meet regulatory and health standards, the public water treatment facility and the public wastewater treatment facility in a community planning a direct potable reuse project should work together to upgrade either facility to include advanced wastewater treatment or to develop a separate wastewater treatment facility that is capable of conducting advanced wastewater treatment. When practicable to keep costs of reuse as low as possible, current public wastewater treatment facilities should take steps towards developing advanced wastewater treatment facilities as a part of the existing facilities. Many public wastewater treatment facilities already use some of the techniques used in advanced wastewater treatment to treat wastewater before being discharged, so adding additional technologies to a current wastewater treatment facility might be more cost effective than building an entirely new facility specifically for advanced wastewater treatment.

§ 19. Water quality standards

Direct reuse of shall meet the enumerated water quality standards in this Article in addition to those standards set forth under federal regulation. The water quality standard for recycled water used in direct or indirect potable reuse shall include, but is not limited to:

(1) No detectable total coliform/100ml
(2) 1mg/l CI_2 residual (min.)
(3) pH = 6.5–8.5
(4) ≤ 2 NTU
(5) ≤ 2 mg/l TOC of wastewater origin
(6) Meet drinking water standards[293]

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[292] EPA, *supra* note 192, at table 4-4.
[293] *Id.*

§ 20. Monitoring recycled water use

Direct reuse of shall meet the monitoring standards in this Article in addition to those standards set forth under federal regulation. The monitoring standard for recycled water used in indirect potable reuse shall include, but is not limited to:

(1) pH—daily
(2) Total coliform—daily
(3) CI_2 residual—continuous
(4) Drinking water standards—quarterly
(5) TOC—weekly
(6) Turbidity—continuous[294]

§ 21. Ecological flow

In direct potable reuse, the managers of the public water system shall periodically monitor the effects of the direct potable reuse on the ecological flow of the watershed and water system. Particularly, efforts should be made to reduce any potential impact that might negatively affect the ecosystem by a public water system employing direct potable reuse. One such negative impact would be the removal of water from the watershed during the process of direct potable reuse.

§ 22. Pilot potable reuse projects

When necessary to encourage the development of potable reuse, key stakeholders should work to construct pilot potable reuse programs in order to demonstrate to the relevant agencies and the general public the safety and benefits of potable reuse.

§ 23. Public education

Customer and public education are an essential part of the development of water reuse in a public water system, especially with direct potable reuse.[295] Therefore, planned direct potable reuse should be accompanied by a public education plan that informs the public about the science and technology that makes potable reuse safe.

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[294] *Id.*
[295] EPA, *supra* note 192, at 2-4.

Notes on Direct Potable Reuse of Water Legislation in Prior Appropriation States

1. **Section 1. Purpose**: This legislation is intended to provide the framework that states, specifically states that follow prior appropriation water rights doctrine, can use to draft and enact legislation that will allow communities to explore and develop direct potable reuse systems.

2. **Section 2. Definitions**: The definitions included in this draft legislation were selected because they match or closely match the definitions found in existing federal and state legislation.[296] States are encouraged to adopt the language which most closely resembles the definitions contained in other water use related legislation and administrative code in their own state. States should pay close attention to the definition of "public water system" or "public drinking water system" because the most significant aspect of direct potable reuse is that advanced treated wastewater is being put directly back into the "public water system" or "public drinking water system" where it will come into direct contact with and/or be consumed by humans.

3. **Section 3. Scope and applicability**: Direct potable reuse may not be feasible for some communities to adopt for a number of reasons including prohibitive costs, public objection, among other reasons; therefore, the draft legislation was written only to establish the legal framework to allow direct potable reuse. This draft legislation should not be considered a mandate for communities to develop direct or indirect potable reuse systems. In states that follow the doctrine of prior appropriation for determining water rights, developing direct potable reuse systems might be hampered by the system of prior appropriation because water rights holders do not have equal rights but have prioritized rights based on who used the water first.[297] Additionally, in prior appropriation states, those with water rights can only use the amount of water that they have historically taken and put to beneficial use.[298]

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[296] *See, e.g.*, CAL. CODE REGS. tit. 22 § 60320.200 (2016); Clean Water Act of 1977, 33 U.S.C. § 1362 (2012); N.C. GEN. STAT. § 130A-313.10 (2015).
[297] *Water Appropriation Systems*, *supra* note 87.
[298] *Id.*

4. **Section 5. Compliance with Federal Regulation:** No federal regulation exists that prohibits states or communities from using direct or indirect potable reuse processes. States or communities that adopt indirect potable reuse as a part of their public water system shall take care to follow the standards set forth in the pertinent federal regulation, mainly the Clean Water Act, Safe Drinking Water Act, and National Pollution Discharge Elimination System.[299]

5. **Section 6. Amending current state laws**: Currently, there are no state laws which explicitly permit or ban direct potable reuse and the implementation of direct potable reuse would be determined on a case-by-case basis.[300] Although, some states, like North Carolina, have enacted laws that explicitly prohibit the release of treated wastewater into reservoirs which feed directly to the public water system's intake, that restriction might also prevent the discharge of advance treated wastewater immediately prior to the public water systems intake which can be an aspect of some direct potable reuse systems.[301] This draft legislation is meant to remove any existing such prohibition on the use of direct potable reuse. Depending on the public water system's objective in developing direct potable reuse and the existing state laws concerning reuse, states should draft this section to best fit within its own laws unless those laws have created an outright prohibition for using direct potable reuse. A state may choose to narrowly tailor the process of direct potable reuse by mandating that any advance treated water must be mixed with other source water at the intake before being distributed in the public water system if the state was concerned about achieving a careful balance of new source water and advanced treatment. Alternatively, a state might want to phrase this section broadly to allow public water systems to determine what type of system might work best with its existing infrastructure.

6. **Section 8. Water reuse within an existing prior appropriation of water rights**: Almost all Western states follow the doctrine of prior appropriation, which can make enacting water reuse

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[299] WATEREUSE, *supra* note 203, at 32–34.
[300] *Id.*
[301] N.C. GEN. STAT. § 143-355.5 (2015); 15A N.C. ADMIN. CODE 2U.0501 (2016).

laws more challenging.[302] The seniority of water rights under prior appropriation ensures that a senior appropriator only takes the amount of water which has historically been taken and put to beneficial use and that a senior appropriator does not impair the rights of a junior appropriator.[303] This means that a senior appropriator cannot take more than has been historically taken for reuse nor can the reuse of water from the existing quota of water impair the ability of a junior appropriator from fulfilling his historical quota of water. Because water scarcity is prominent in the West, prior appropriation states have found a number of different solutions to allow water reuse (excluding Colorado where the water court determined that there is no right to reuse water).[304] State legislators that have addressed reuse have attempted to keep the existing prior appropriation scheme intact by granting the right to reuse with an existing water appropriation. These states have either granted the right to reuse to the wastewater treatment facility or to the original appropriator, which is often the drinking water treatment facility or the public water system. This solution appears to have been successful with a number of potable reuse projects in the West under existing appropriations of water.[305]

7. **Section 9. Water reuse rights to the treatment facility/ Section 10. Water reuse rights to the original appropriator**: States have primarily used two methods for passing legislation that allows potable reuse while keeping their prior appropriation water rights systems intact. Some prior appropriation states, such as Washington and California, have granted the right to reuse water to the wastewater treatment facility that takes in wastewater and treats it for reuse.[306] Rights to advanced treated wastewater for reuse in this system only arise once the water has been treated and can be put to beneficial use. Other prior appropriation

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[302] *Water Appropriation Systems*, *supra* note 87.
[303] *Id.*
[304] Ready Mixed Concrete Co. v. Farmers Reservoir & Irrigation Co., 115 P.3d 638, 642–43 (Colo. 2005).
[305] *Id.*
[306] WASH. REV. CODE §§ 90.46.150, 160; ADAM SCHEMPP & JAY AUSTIN, *Water Right Impairment in Reclamation and Reuse: How Other Western States Can Inform Washington Law* 21–22, ENVIRONMENTAL LAW INSTITUTE (2007), https://www.eli.org/sites/default/files/docs/research/western_water/Water_Right_Impairment_in_Reclamation_and_Reuse.pdf [https://perma.cc/2R5T-UKWW].

states, such as Utah, have determined that the original appropriator retains the right to reuse water withdrawn under their appropriation until the water reaches a public watercourse.[307] This allows a public water system to reuse water that they withdrew that is now wastewater as long as the water had not entered back into a watercourse.[308] By granting water reuse rights to the treatment facility or to the original appropriator, states have established policies with a certain degree of flexibility that fit within their prior appropriation water rights system and allow the development of potable reuse. Both of these methods do not require a new water appropriation for reuse to occur.

8. **Section 11. Water reuse rights as an independent appropriation:** In some prior appropriation states like Colorado, there is no right to reuse under an existing appropriation. In these states, developing direct potable reuse projects will require that the public water system obtain a new, independent appropriation to reuse water taken in under the existing water appropriation.

9. **Section 12. Developing general criteria for direct reuse**: The criteria put forth for developing direct potable reuse were adopted from the California Water Board's determined best practices.[309] Because the primary rationale behind the use of direct potable reuse is that it can reliably treat wastewater to a level of high quality that meets all applicable drinking water standards, any state or public water system that undertakes a direct potable reuse project should take extra care to monitor for health concerns, regulatory requirements, project management and operations, as well as public perception.[310] While advanced treatment techniques have proved to be extremely reliable, public drinking water system mangers still bear the burden of ensuring water sent out to the public for consumption is safe.

10. **Section 13. Direct potable reuse**: As outlined in this draft legislation, direct potable reuse can be accomplished through two methods. The first method of using direct potable reuse involves

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[307] SCHEMPP & AUSTIN, *supra* note 306, at 22.
[308] *Id.*
[309] CAL. WATER CODE § 13564 (2014).
[310] EPA, *supra* note 192, at 3-28.

advanced treated water being conveyed directly into the public drinking water system. The second method of direct potable reuse occurs when the advanced treated water is discharged immediately upstream of a public water treatment facility's water intake. The merits of each method will be discussed in the proceeding notes.

11. **Section 14. Direct potable reuse conveyed directly into a public drinking water system**: In this method of direct potable reuse, the advanced treated wastewater is considered finished water when it leaves the advanced wastewater treatment facility because it is ready to be discharged directly into the public water system. Advanced treated water is only mixed with other treated source water once it is in the public drinking water system. In order to produce finished water that can be conveyed directly into the public water system, the advanced wastewater treatment facility must also be permitted as a drinking water treatment facility.[311] To date, none of the approved direct potable reuse projects uses this method.[312] The primary reason for the lack of projects using this method is the uncertainty about the issue of mixing finished water and source water inside of the public drinking water system.[313] Nevertheless, there are still reasons why some states or public water systems might want to pursue direct potable reuse through the direct conveying advanced treatment. If a public water system's wastewater treatment plant and/or advanced wastewater treatment plant are located far away from the public drinking water system, it may be cost prohibitive to construct enough piping to send the advanced treated wastewater to the existing drinking water facility. With direct discharge into the public water system, the high costs of transporting water back to the drinking water facility could be avoided. States and public drinking water systems should evaluate the characteristics of their own system before determining which method of direct potable reuse to follow. Because the science and facts around this method of direct potable reuse continue to evolve, if possible, states should avoid barring this method of direct potable reuse and, instead, create sufficient safeguards under which this method might be implemented and observed.

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[311] WATEREUSE, *supra* note 203, at 7.
[312] *Id.* at 5.
[313] *Id.* at 7.

12. **Section 15. Direct potable reuse introduced immediately upstream of a public water treatment facility**: In this method of direct potable reuse, advanced treated wastewater is discharged into the raw water supply immediately upstream of a drinking water facility. Because the advanced treated wastewater is mixed with raw water supply before reaching the drinking water facility, it becomes part of the source water for the public water system.[314] Direct potable reuse projects that are permitted in the United States currently use this method.[315] Mixing the advanced treated water and source water prior to being treated at the drinking water facility allows the additional treatment of the combined water, which adds a layer of safety.[316] States looking to develop direct potable reuse systems quickly would likely be served best by choosing this method, at least at the start of the project, because it carries less uncertainty and may not require the highest level of scrutiny since advanced treated water usually already meets the all the necessary drinking water standards.[317]

13. **Section 17. Advanced Wastewater Treatment**: All water that goes through a direct potable reuse system must undergo advanced wastewater treatment. The United States Environmental Protection Agency advises that advanced wastewater treatment should include, but is not limited to, chemical clarification, carbon adsorption, reverse osmosis and other membrane processes, advanced oxidation, air stripping, ultrafiltration, and ion exchange.[318] States are, however, responsible for determining precisely what should be included within an advanced wastewater treatment facility so long as it produces water at an adequately high, safe quality. Most advanced water treatment facilities have found success in using reverse osmosis to treat wastewater.[319]

14. **Section 18. Treatment facilities**: As is laid out in this section, states and public water systems should work strategically together in developing the treatment facility infrastructure needed for direct potable reuse.

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[314] WATEREUSE, *supra* note 203, at 6.
[315] *Id.*
[316] *Id.*
[317] *Id.* at 5.
[318] EPA, *supra* note 192, table 4-4.
[319] WATEREUSE, *supra* note 203, at 8.

15. **Section 19. Water quality standards/Section 20. Monitoring water**: This draft legislation has adopted the suggested water quality standards and water quality monitoring found in the EPA's 2012 Guidelines for Water Reuse in Table 4-4 under indirect potable reuse.[320] It may be necessary for states or public water systems to develop additional standards based on the quality of the advanced treated wastewater being produced at its treatment facilities.

16. **Section 21. Ecological flow**: When developing and utilizing direct potable reuse, the public water systems in charge of the project shall monitor any effects that direct potable reuse is having on the watershed, water system, and ecosystem. Because direct potable reuse can influence in stream flows, discharge flows, and water levels, a direct potable reuse project has the potential to alter the water balance in the water system.[321] Both plants and animals can become dependent on return flows in areas where discharges have occurred for an extended period of time and could be adversely affected if a direct potable reuse project drastically altered the existing in stream and return flows.[322]

17. **Section 23. Public education**: In developing a direct potable reuse system, public education about direct potable reuse is paramount because the public is the consumer, and if the consumer does not want to consume advanced treated wastewater in the public drinking water system, then a reuse project would be a massive waste of resources. First, states and public water systems must engage the public about the safety of using a direct potable reuse system, including being specific about what percentage of the system's water is advanced treated wastewater.[323] To overcome the "ick" factor of consuming treated wastewater, the public must feel confident that the advanced treated wastewater does in fact meet the drinking water standards. Second, states and public water systems must inform the public about the benefits of implementing direct potable reuse.

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[320] EPA, *supra* note 192, at table 4-4.
[321] EPA, *supra* note 192, at 2-38.
[322] *Id.*
[323] WATEREUSE, *supra* note 203, at 51.

APPENDIX D: MODEL LEGISLATION FOR INDIRECT POTABLE REUSE IN PRIOR APPROPRIATION STATES

Indirect Potable Reuse of Recycled Water Systems Act
(Prior Appropriation States)

§ 1. Purpose

The purpose of this Article is to allow the use of recycled wastewater through indirect potable reuse in public drinking water systems. Allowing the reuse of water will benefit public water systems by augmenting water supplies, providing an additional tool for water management and conservation, ensuring communities at risk of water shortage have a viable alternative for meeting water needs, and generally addressing water scarcity issues.[324]

§ 2. Definitions

The following definitions apply throughout this Article:

(1) "Public water system," or "public drinking water system" means a system that provides water to the public for human consumption through pipes or other constructed conveyances "if the system serves 15 or more service connections or which regularly serves 25 or more individuals."[325]

(2) "Indirect potable reuse" means "augmentation of a drinking water source (surface or groundwater) with reclaimed water followed by an environmental buffer that precedes normal drinking water treatment."[326]

(3) "Public water treatment facility" means a facility that treats water to a standard suitable for potable water prior to disbursement into the public water system.

(4) "Wastewater treatment facility" means a facility that intakes wastewater that has traveled through the public water systems and treats it to a safe standard to be discharged in accordance with National Pollution Discharge Elimination System.

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[324] EPA, *supra* note 192, at 1-5.
[325] N.C. GEN. STAT. § 130A-313.10 (2015).
[326] EPA, *supra* note 192, at 1-4.

(5) "Advanced wastewater treatment" means the use of advanced biological and technological treatment methods to treat wastewater to a level that complies with the Safe Drinking Water Act.[327]

(6) "Treatment technique requirement" means "a requirement of the drinking water rules which specifies a specific treatment technique for a contaminant which leads to reduction in the level of the contaminant sufficient to comply with the drinking water rules."[328]

(7) "Wastewater" means used water that has been discharged from homes, business, industry, and other facilities.[329]

(8) "Water reuse" means the use of treated municipal wastewater.[330]

(9) "Watercourse" means "a definite natural channel and a bed with banks" including, but not limited to, rivers, streams, ponds, and lakes.[331]

§ 3. Scope and applicability

These provisions of this Article apply to each public water system in the State unless the potable use of recycled water is not feasible.

§ 4. Project planning

To examine the viability of water reuse project, the public water systems considering an indirect water reuse project should consider the following project planning steps:

(1) Identify the quantity of wastewater available

(2) Determine if public water systems users will accept potable water reuse of treated wastewater

(3) Compare supply to potential demand

(4) Determine economic feasibility

(5) Obtain regulatory approval, specifically NPDES permits and any other pertinent state regulations

(6) Develop an advanced water treatment facility

(7) Begin delivering water[332]

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[327] *Id.* at 2-13.
[328] N.C. GEN. STAT. § 130A-313.12.
[329] EPA, *supra* note 192, at 1-4.
[330] *Id.*
[331] *Water Appropriation Systems*, *supra* note 87.
[332] EPA, *supra* note 192, at 2-4.

§ 5. Compliance with Federal Regulation—Clean Water Act and Safe Drinking Water Act

Any proposed indirect reuse project shall comply with the standards set forth in the Clean Water Act and Safe Drinking Water Act.

§ 6. Amending current state law to allow discharge of treated wastewater

To allow indirect potable reuse of recycled wastewater, this Article amends state provisions which prohibit the discharge of treated wastewater into potable water reservoirs.[333]

§ 7. Key stakeholders

The use of recycled wastewater through indirect potable reuse requires the cooperation of local water and wastewater entities as well as federal and state agencies.[334] Such entities or agencies include, but are not limited to, public water treatment facilities, publicly owned treatment works, the state environmental agency, the Environmental Protection Agency, public health officials, and members of the general public.[335]

§ 8. Water reuse within an existing prior appropriation of water rights

In order to preserve existing prior appropriation of water rights systems while allowing water reuse, public water systems, which are water appropriators, shall have the right to reuse water that has previously been withdrawn from the watershed by the appropriator of the water in a given public water system. Under this Article the reuse of water by an appropriator shall not diminish the amount of appropriated water received by a public water system based on historic use. Further, the reuse of water shall not be considered an impairment of downstream water appropriators.

[OR, alternatively]

§ 9. Water reuse rights to the treatment facility

This Article grants the right to reuse water to the treatment facility that takes in wastewater and treats it for reuse. Treatment facilities that may gain the right to water reuse include wastewater treatment facilities, advanced wastewater treatment facilities, and public water treatment

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[333] 15A N.C. ADMIN. CODE 18C.1209 (2016).

[334] CAL. WATER BOARDS, GENERAL WASTE DISCHARGE REQUIREMENTS FOR RECYCLED WATER USE, Order WQ 2014-0090-DWQ 4 (2014).

[335] WATEREUSE, *supra* note 203, at 32.

facilities. A treatment facility only gains the right to reuse water once the water has been treated and put to beneficial use.
[OR, alternatively]
§ 10. Water reuse rights to the original appropriator
This Article establishes that the original appropriator of water retains the right to reuse the water withdrawn under their appropriation until the water reaches a public watercourse.

§ 11. The right to reuse water as an independent appropriation
In addition to gaining the right to reuse water under an existing appropriation, the right to reuse water may also be gained through an independent appropriation that is designated explicitly for direct potable reuse. This Article establishes that water reuse is a valid beneficial use for appropriation of water by a public water system.

§ 12. Developing general criteria for indirect reuse
In developing uniform water recycling criteria for indirect potable reuse, the regulatory authority shall consider the following[336]:

(1) Monitoring results of research and studies regarding indirect potable reuse.
(2) Results of demonstration studies conducted for purposes of approval of projects using direct or indirect potable reuse.
(3) Epidemiological studies and risk assessments associated with indirect potable reuse projects.
(4) Applicability of the advanced treatment technologies required for recycled water projects, including, but not limited to, indirect potable reuse.
(5) Water quality, limnology, and health risk assessments associated with existing potable water supplies subject to discharges from municipal wastewater, stormwater, and agricultural runoff.
(6) Research and recommendations from the United States Environmental Protection Agency Guidelines for Water Reuse.
(7) The National Research Council of the National Academies' report titled "Water Reuse: Potential for Expanding the Nation's Water Supply Through Reuse of Municipal Wastewater."
(8) Other relevant research and studies regarding direct or indirect potable reuse of recycled water.

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[336] CAL. WATER CODE § 13564 (2014).

§ 13. Indirect potable reuse

Indirect potable reuse shall go through the general following processes[337]:

(1) Wastewater enters into the wastewater treatment facility and undergoes the facility's standard wastewater treatment facility; then

(2) A determined percentage of that advanced treated wastewater shall be conveyed into an advanced wastewater treatment facility where it will undergo further treatment to eliminate any remaining potentially harmful effluents to meet the required drinking water quality standards; then

(3) The advanced treated water shall be conveyed into an environmental buffer (e.g., groundwater basin or surface water reservoir);[338] then

(4) That mixture of advanced treated water and raw water from the environmental buffer shall be conveyed to the public water treatment facility where it shall be treated; then

(5) The treated water shall be conveyed to the public through the public drinking water system.

§ 14. Environmental buffers

In indirect potable reuse, groundwater aquifers, surface water reservoirs, lakes, or rivers shall serve as an environmental buffer that provides storage, transport, and additional protection of public health.[339]

§ 15. Permitting requirements

Indirect potable reuse requires the discharge of treated wastewater either into a reservoir, aquifer, or ground water supply. Such discharge shall be permitted by this Article in accordance with the National Pollution Discharge Elimination System.[340]

§ 16. Advanced Wastewater Treatment

Recycled water that is used for indirect potable reuse shall undergo advanced wastewater treatment. In accordance with this Article, the state and the relevant public wastewater treatment works shall determine the precise processes to be used during advanced wastewater treatment. Such processes include, but are not limited to, chemical clarification, carbon

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[337] WATEREUSE, *supra* note 203, at 8.
[338] *Id.*
[339] WATEREUSE, *supra* note 203, at 8.
[340] Clean Water Act of 1977 § 402, 33 U.S.C. § 1342 (2012).

adsorption, reverse osmosis and other membrane processes, advanced oxidation, air stripping, ultrafiltration, and ion exchange.[341]

§ 17. Treatment facilities

Because indirect potable reuse requires advanced wastewater treatment to meet regulatory and health standards, the public water treatment facility and the public wastewater treatment facility in a community planning a direct potable reuse project should work together to upgrade either facility to include advanced wastewater treatment or to develop a separate wastewater treatment facility that is capable of conducting advanced wastewater treatment. When practicable to keep costs of reuse as low as possible, current public wastewater treatment facilities should take steps towards developing advanced wastewater treatment facilities as a part of the existing facilities. Many public wastewater treatment facilities already use some of the techniques used in advanced wastewater treatment to treat wastewater before being discharged, so adding additional technologies to a current wastewater treatment facility might be more cost effective than building an entirely new facility specifically for advanced wastewater treatment.

§ 18. Water quality standards

Indirect reuse of shall meet the enumerated water quality standards in this Article in addition to those standards set forth under federal regulation. The water quality standards for recycled water used in direct or indirect potable reuse shall include, but is not limited to:

(7) No detectable total coliform/100ml
(8) 1mg/l CI_2 residual (min.)
(9) pH = 6.5–8.5
(10) ≤ 2 NTU
(11) ≤ 2 mg/l TOC of wastewater origin
(12) Meet drinking water standards[342]

§ 19. Monitoring recycled water use

Indirect reuse of shall meet the monitoring standards in this Article in addition to those standards set forth under federal regulation. The monitoring standard for recycled water used in indirect potable reuse shall include, but is not limited to:

(7) pH—daily
(8) Total coliform—daily

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[341] EPA, *supra* note 192, at table 4-4.
[342] *Id.*

(9) CI_2 residual—continuous
(10) Drinking water standards—quarterly
(11) TOC—weekly
(12) Turbidity—continuous[343]

§ 20. Ecological flow
In indirect potable reuse, the managers of the public water system shall periodically monitor the effects of the indirect potable reuse on the ecological flow of the watershed and water system. Particularly, efforts should be made to reduce any potential impact that might negatively affect the ecosystem by a public water system employing indirect potable reuse. Such negative impacts include the removal of water from the watershed and introducing advanced treated water into an environmental buffer during the process of indirect potable reuse.

§ 21. Pilot potable reuse projects
When necessary to encourage the development of potable reuse, key stakeholders should work to construct pilot potable reuse programs in order to demonstrate to the relevant agencies and the general public the safety and benefits of potable reuse.

§ 22. Public education
Customer and public education are an essential part of the development of water reuse in a public water system, especially with indirect potable reuse.[344] Therefore, planned indirect potable reuse should be accompanied by a public education plan that informs the public about the science and technology that makes potable reuse safe.

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[343] *Id.*
[344] EPA, *supra* note 192, at 2-4.

Notes on Indirect Potable Reuse of Water Legislation in Prior Appropriation States

1. **Section 1. Purpose**: This legislation is intended to provide the framework that states, specifically states that follow prior appropriation water rights doctrine, can use to draft and enact legislation that will allow communities to explore and develop direct potable reuse systems.

2. **Section 2. Definitions**: The definitions included in this draft legislation were selected because they match or closely match the definitions found in existing federal and state legislation.[345] States are encouraged to adopt the language which most closely resembles the definitions contained in other water use related legislation and administrative code in their own state. States should pay close attention to the definition of "public water system" or "public drinking water system" because the most significant aspect of indirect potable reuse is that advanced treated wastewater is being put back into the "public water system" or "public drinking water system" where it will come into direct contact with and/or be consumed by humans.

3. **Section 3. Scope and applicability**: Indirect potable reuse may not be feasible for some communities to adopt for a number of reasons including prohibitive costs, public objection, among other reasons; therefore, the draft legislation was written only to establish the legal framework to allow indirect potable reuse. This draft legislation should not be considered a mandate for communities to develop direct or indirect potable reuse systems. In states that follow the doctrine of prior appropriation for determining water rights, developing direct potable reuse systems might be hampered by the system of prior appropriation because water rights holders do not have equal rights but have prioritized rights based on who used the water first.[346] Additionally, in prior appropriation states, those with water rights can only use the amount of water that they have historically taken and put to beneficial use.[347]

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[345] *See, e.g.*, CAL. CODE REGS. tit. 22 § 60320.200 (2016); Clean Water Act of 1977, 33 U.S.C. § 1362 (2012); N.C. GEN. STAT. § 130A-313.10 (2015).
[346] *Water Appropriation Systems*, *supra* note 87.
[347] *Id.*

4. **Section 5. Compliance with Federal Regulation**: No federal regulation exists that prohibits states or communities from using direct or indirect potable reuse processes. States or communities that adopt indirect potable reuse as a part of their public water system shall take care to follow the standards set forth in the pertinent federal regulation, mainly the Clean Water Act, Safe Drinking Water Act, and National Pollution Discharge Elimination System.[348]

5. **Section 6. Amending current state laws**: Currently, there are many state laws that prohibit indirect potable reuse by preventing the discharge of treated wastewater into potable water reservoirs.[349] For example, a North Carolina law explicitly prohibits the release of treated wastewater into reservoirs that feed directly to the public water system's intake.[350] This draft legislation is meant to remove any existing such prohibition on the use of indirect potable reuse and affirmatively grants the authority for advanced treated wastewater to be discharged into potable water reservoirs. Depending on the public water system's objective in developing indirect potable reuse and the existing state laws concerning reuse, states should draft this section to best fit within its own laws unless those laws have created an outright prohibition for using indirect potable reuse. With indirect potable reuse, a public water system may predetermine where the advanced treated wastewater is sent.[351] The water could be limited to only be used to augment underground aquifers or to be discharged in the reservoir where the public drinking water facility's intake is located.

6. **Section 8. Water reuse within an existing prior appropriation of water rights**: Almost all Western states follow the doctrine of prior appropriation, which can make enacting water reuse laws more challenging.[352] The seniority of water rights under prior appropriation ensures that a senior appropriator only takes the amount of water which has historically been taken and put to beneficial use and that a senior appropriator does not impair the

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[348] WATEREUSE, *supra* note 203, at 32–34.
[349] EPA, *supra* note 192, at 3-28.
[350] N.C. GEN. STAT. § 143-355.5 (2015); 15A N.C. ADMIN. CODE 2U.0501 (2016).
[351] EPA, *supra* note 192, at 3-28.
[352] *Water Appropriation Systems*, *supra* note 87.

rights of a junior appropriator.[353] This means that a senior appropriator cannot take more than has been historically taken for reuse nor can the reuse of water from the existing quota of water impair the ability of a junior appropriator from fulfilling his historical quota of water. Because water scarcity is prominent in the West, prior appropriation states have found a number of different solutions to allow water reuse (excluding Colorado where the water court determined that there is no right to reuse water).[354] State legislators that have addressed reuse have attempted to keep the existing prior appropriation scheme intact by granting the right to reuse with an existing water appropriation. These states have either granted the right to reuse to the wastewater treatment facility or to the original appropriator, which is often the drinking water treatment facility or the public water system. This solution appears to have been successful with a number of potable reuse projects in the West under existing appropriations of water.[355]

7. **Section 9. Water reuse rights to the treatment facility/ Section 10. Water reuse rights to the original appropriator**: States have primarily used two methods for passing legislation that allows potable reuse while keeping their prior appropriation water rights systems intact. Some prior appropriation states, such as Washington and California, have granted the right to reuse water to the wastewater treatment facility that takes in wastewater and treats it for reuse.[356] Rights to advanced treated wastewater for reuse in this system only arise once the water has been treated and can be put to beneficial use. Other prior appropriation states, such as Utah, have determined that the original appropriator retains the right to reuse water withdrawn under their appropriation until the water reaches a public watercourse.[357] This allows a public water system to reuse water that they withdrew that is now wastewater as long as the water had not entered back into a watercourse.[358] By granting water reuse rights to the treatment facility or to the original appropriator, states have established

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[353] *Id.*
[354] Ready Mix Concrete Co. v. Farmers Reservoir & Irrigation Co., 115 P.3d 638, 642–43 (Colo. 2005).
[355] *Id.*
[356] WASH. REV. CODE §§ 90.46.150, 160; SCHEMPP & AUSTIN, *supra* note 306, at 22.
[357] *Id.* at 22.
[358] *Id.*

policies with a certain degree of flexibility that fit within their prior appropriation water rights system and allow the development of potable reuse. Both of these methods do not require a new water appropriation for reuse to occur.

8. **Section 11. Water reuse rights as an independent appropriation**: In some prior appropriation states like Colorado, there is no right to reuse under an existing appropriation. In these states, developing indirect potable reuse projects will require that the public water system obtain a new, independent appropriation to reuse water taken in under the existing water appropriation.

9. **Section 12. Developing general criteria for indirect reuse**: The criteria put forth for developing indirect potable reuse were adopted from the California Water Board's determined best practices.[359] Any state or public water system that undertakes an indirect potable reuse project should take extra care to monitor for health concerns, regulatory requirements, project management and operations, as well as public perception.[360] While advanced treatment techniques have proved to be extremely reliable, public drinking water system mangers still bear the burden of ensuring water sent out to the public for consumption is safe.

10. **Section 13. Indirect potable reuse**: As outlined in this draft legislation, indirect potable reuse includes the following processes: (1) go through advanced wastewater treatment, (2) be discharged into an environmental buffer, (3) mix in that environmental buffer with the original source water, and (4) be conveyed to the public through the public drinking water system. States may pursue an indirect potable reuse project when there is a limited availability of alternate sources, the cost to develop alternate sources is high, public acceptance exists, and public water system mangers have confidence in the advanced treatment methods and drinking water treatment methods.[361] Indirect potable reuse proved to be a saving source for the town of Wichita Falls, Texas where after years of drought the town was dealing with severe water scarcity. The town

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[359] CAL. WATER CODE § 13564 (2014).
[360] EPA, *supra* note 192, at 3-28.
[361] EPA, *supra* note 192, at 3-28.

became the first city in the United States to develop an indirect potable reuse system.[362]

11. **Section 14. Environmental buffers**: Unlike direct potable reuse, indirect potable reuse always involves the use of an environmental buffer. Groundwater aquifers, surface water reservoirs, and lakes serve as environmental buffers in indirect potable reuse projects. Environmental buffers provide storage for the reused water, transport to the public water system's intake, and an additional protection to public health.[363]

12. **Section 15. Permitting requirements**: As discussed in Note 5, the biggest hurdle faced by indirect potable reuse projects is being able to discharge into reservoirs or lakes in which public water systems intakes are located.[364] Modern public water systems were designed to keep treated wastewater away from drinking water intakes as a health protection. However, the use of advanced treatment facilities produces water that meets drinking water standards and, thus, should be safe to discharge into the reservoirs from which drinking water is taken. One example of indirect potable reuse project that hinged on receiving the proper discharge permit is at Lake Lanier in Gwinnett County, Georgia. Allowing the project to proceed hinged on receiving a discharge permit to discharge advanced treated wastewater back into Lake Lanier, which is where the county's raw water intake is located.[365] The stakeholders were able to proceed with the much-needed project after they convinced the state that the discharge would not violate anti-degradation regulations.[366]

13. **Section 16. Advanced Wastewater Treatment**: All water that goes through an indirect potable reuse system must undergo advanced wastewater treatment. The United States Environmental Protection Agency advises that advanced wastewater treatment should include, but is not limited to, chemical clarification, carbon

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[362] Preston, *supra* note 18.
[363] WATEREUSE, *supra* note 203, at 8.
[364] EPA, *supra* note 192, at 3-28.
[365] *Id.* at 3-29.
[366] *Id.*

adsorption, reverse osmosis and other membrane processes, advanced oxidation, air stripping, ultrafiltration, and ion exchange.[367] States are, however, responsible for determining precisely what should be included within an advanced wastewater treatment facility so long as it produces water at an adequately high, safe quality. Most advanced water treatment facilities have found success in using reverse osmosis to treat wastewater.[368]

14. **Section 17. Treatment facilities**: As is laid out in this section, states and public water systems should work strategically together in developing the treatment facility infrastructure needed for indirect potable reuse.

15. **Section 18. Water quality standards/Section 19. Monitoring water**: This draft legislation has adopted the suggested water quality standards and water quality monitoring found in the EPA's 2012 Guidelines for Water Reuse in Table 4-4 under indirect potable reuse.[369] It may be necessary for states or public water systems to develop additional standards based on the quality of the advanced treated wastewater being produced at its treatment facilities.

16. **Section 20. Ecological flow**: When developing and utilizing direct potable reuse, the public water systems in charge of the project shall monitor any effects that indirect potable reuse is having on the watershed, water system, and ecosystem. Because indirect potable reuse can influence in stream flows, discharge flows, and water levels, an indirect potable reuse project has the potential to alter the water balance in the water system.[370] Both plants and animals can become dependent on return flows in areas where discharges have occurred for an extended period of time and could be adversely affected if an indirect potable reuse project drastically altered the existing in stream and return flows.[371] Additionally, since advanced treated wastewater in indirect potable reuse is discharged into existing source waters, public water systems

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[367] EPA, *supra* note 192, at table 4-4.
[368] WATEREUSE, *supra* note 203, at 8.
[369] EPA, *supra* note 192, at table 4-4.
[370] EPA, *supra* note 192, at 3-28.
[371] *Id.*

managers must monitor the quality of the water being discharged into reservoirs, aquifers, and lakes because both too clean and too dirty advanced treated water could damage the watershed.

17. **Section 22. Public education**: In developing an indirect potable reuse system, public education about indirect potable reuse is paramount because the public is the consumer, and if the consumer does not want to consume advanced treated wastewater in the public drinking water system, then a reuse project would be massive waste of resources. First, states and public water systems must engage the public about the safety of using an indirect potable reuse system, including being specific about what percentage of the system's water is advanced treated wastewater.[372] To overcome the "ick" factor of consuming treated wastewater, the public must feel confident that the advanced treated wastewater does in fact meet the drinking water standards. Second, states and public water systems must inform the public about the benefits of implementing indirect potable reuse.

[372] WATEREUSE, *supra* note 203, at 51.