

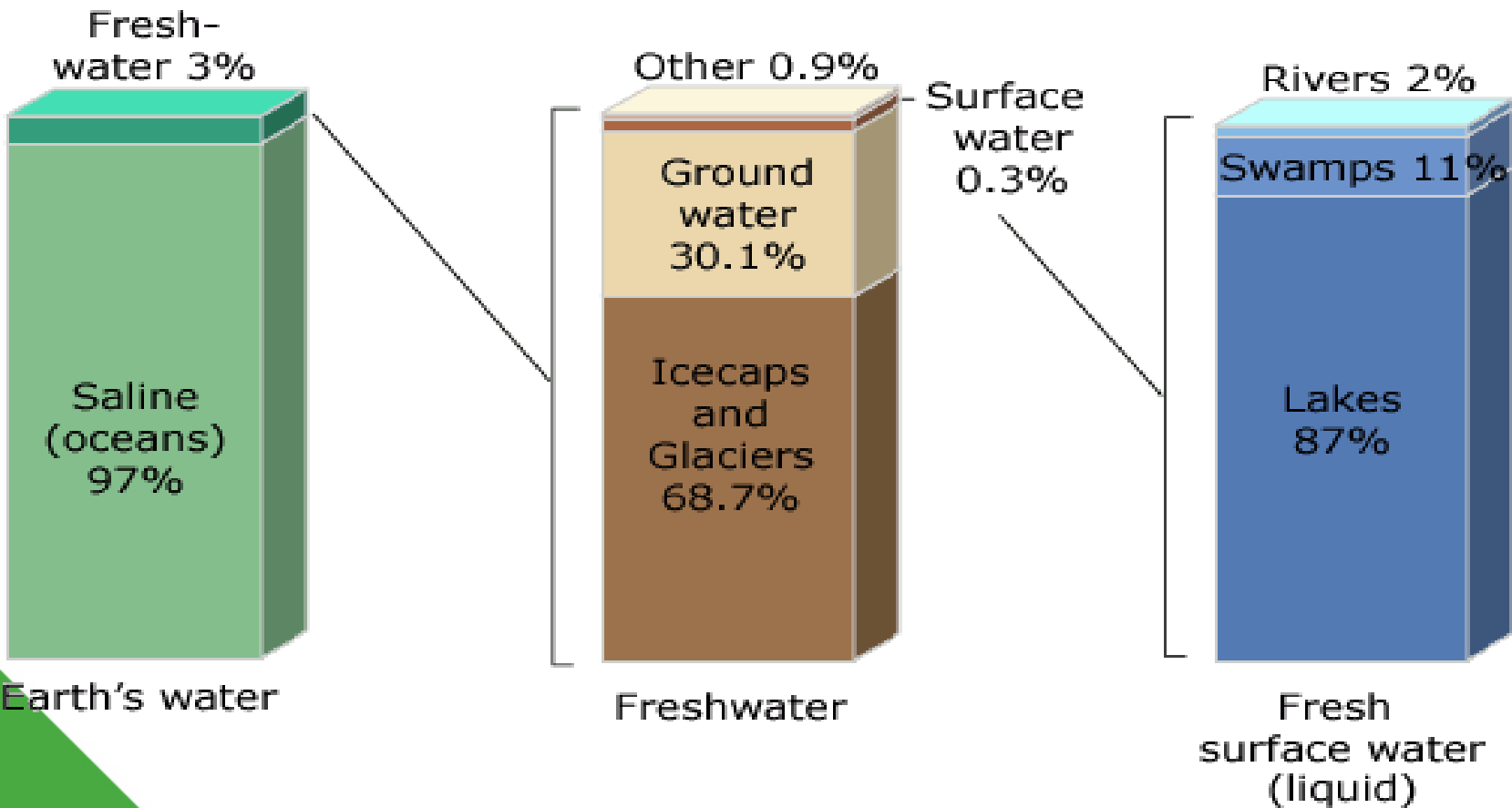
Rainwater harvesting systems

CSA B805-18/ICC 805-2018
National Standard of Canada



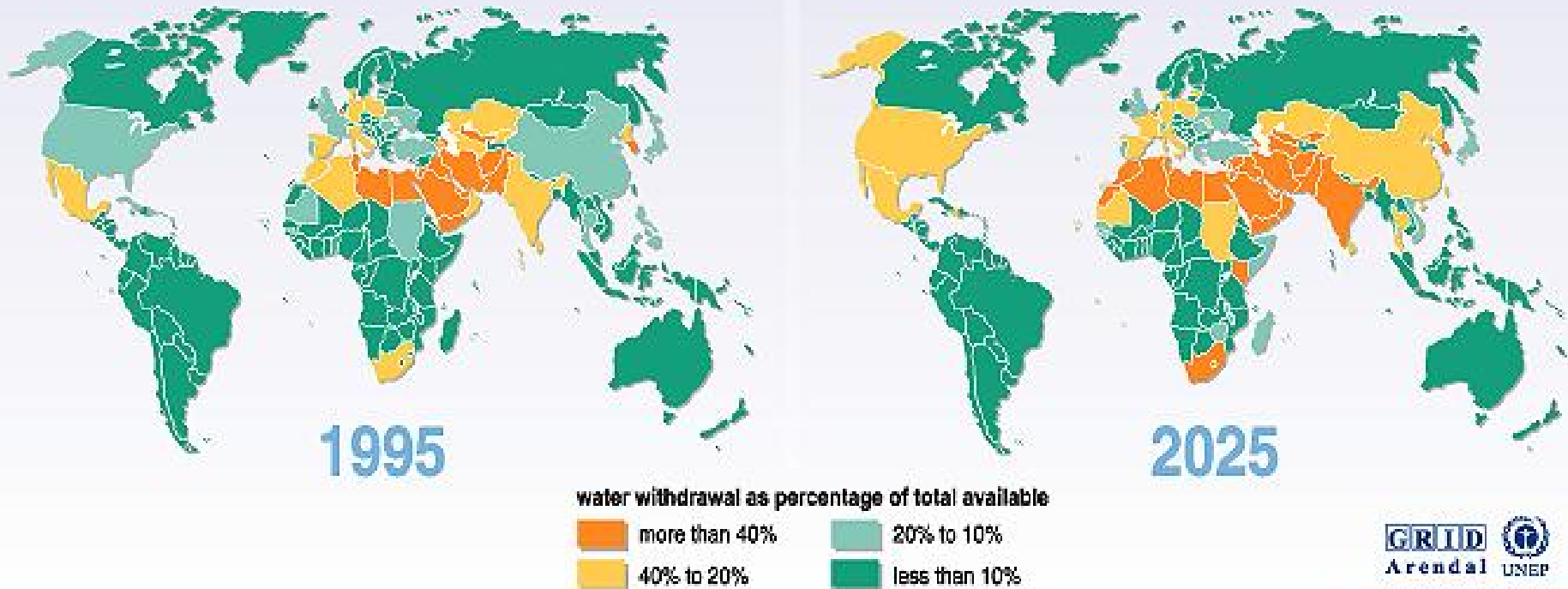
HUMAN RELATIONSHIP TO THE WATER CYCLE

Distribution of Earth's Water



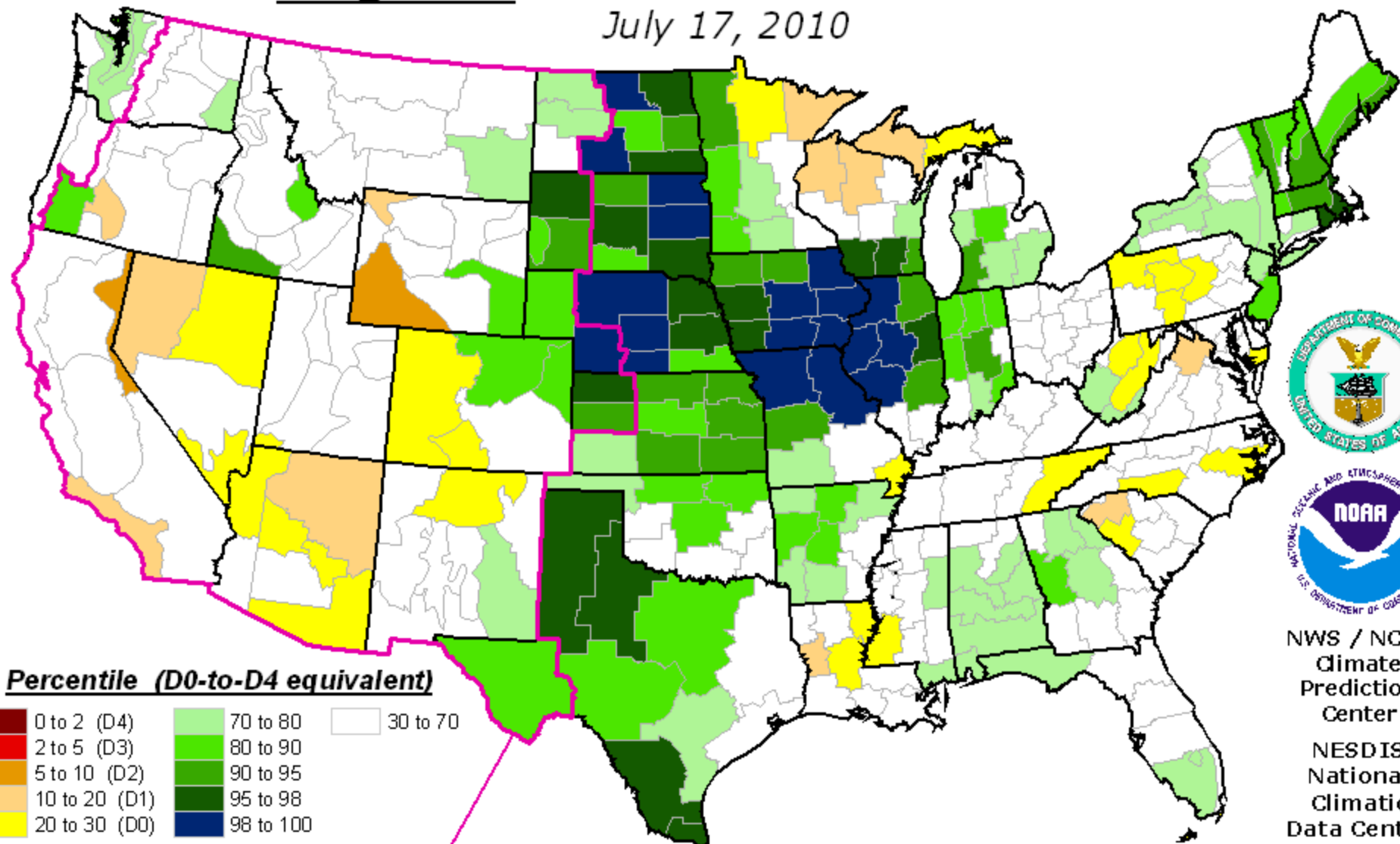
Worldwide Water Shortage

Freshwater stress



Objective Long-Term Drought Indicator Blend Percentiles

July 17, 2010



NWS / NCEP
Climate
Prediction
Center
NESDIS
National
Climatic
Data Center

Inputs (as percentiles):

- 25% Palmer Hydrologic Index
- 20% 24-Month Precipitation
- 20% 12-Month Precipitation
- 15% 6-Month Precipitation
- 10% 60-Month Precipitation
- 10% CPC Soil Moisture Model

Western Formulation

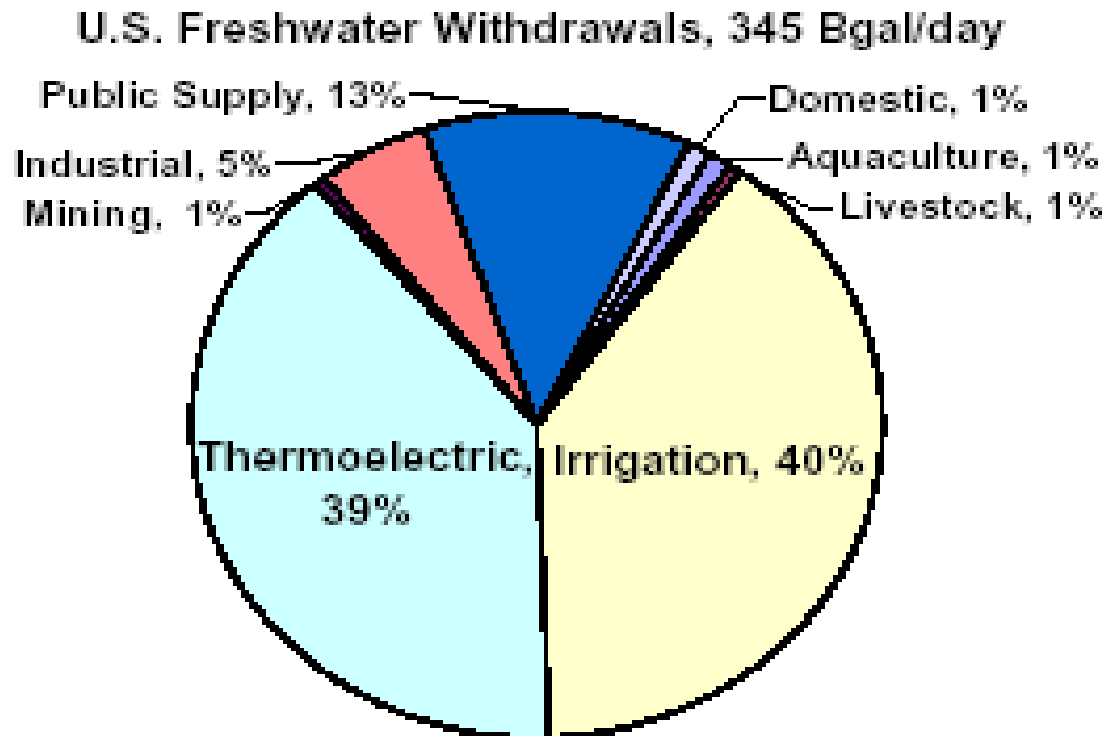
Inputs (as percentiles):

- 30% Palmer Hydrologic Index
- 30% 60-Month Average Z-Index
- 10% 60-Month Precipitation
- 10% 24-Month Precipitation
- 10% 12-Month Precipitation
- 10% CPC Soil Moisture Model

This map approximates impacts responding to precipitation over the course of several months to a few years, such as reservoir content, groundwater, and lake levels. **HOWEVER, THE RELATIONSHIP BETWEEN INDICATORS AND WATER SUPPLIES CAN VARY MARKEDLY WITH LOCATION, SEASON, SOURCE, AND MANAGEMENT PRACTICE. Do not interpret this map too literally.**

This map is based on preliminary climate division data. Local conditions and/or final data may differ. See the detailed product suite description for more details.

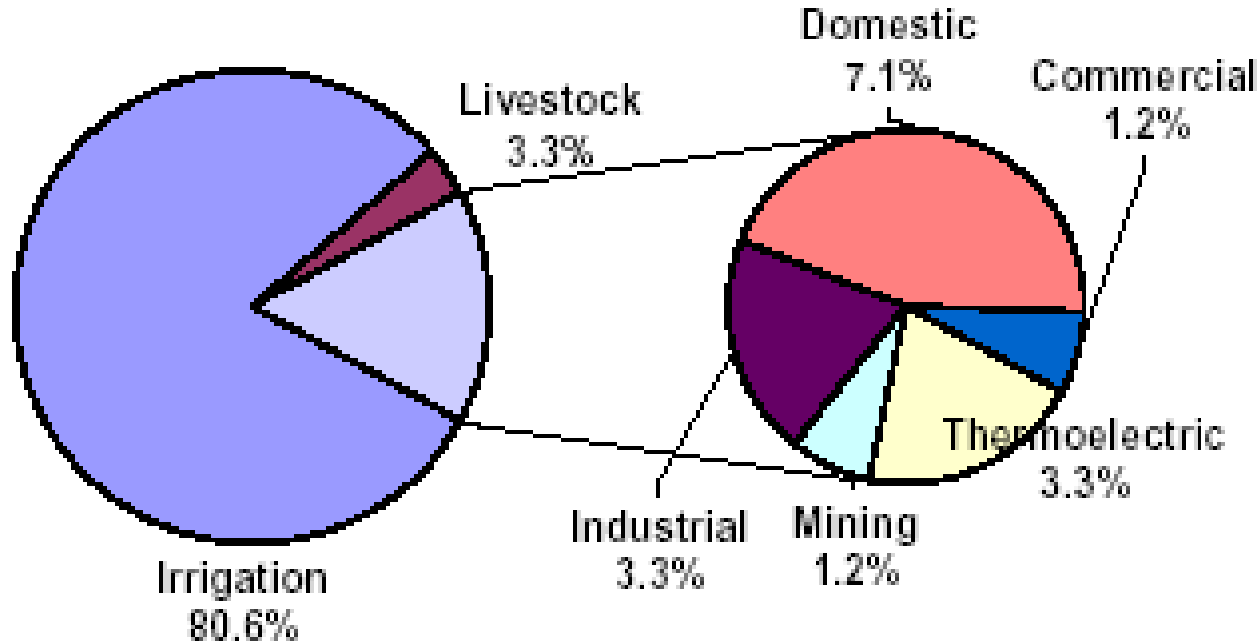
Water Use by Sector

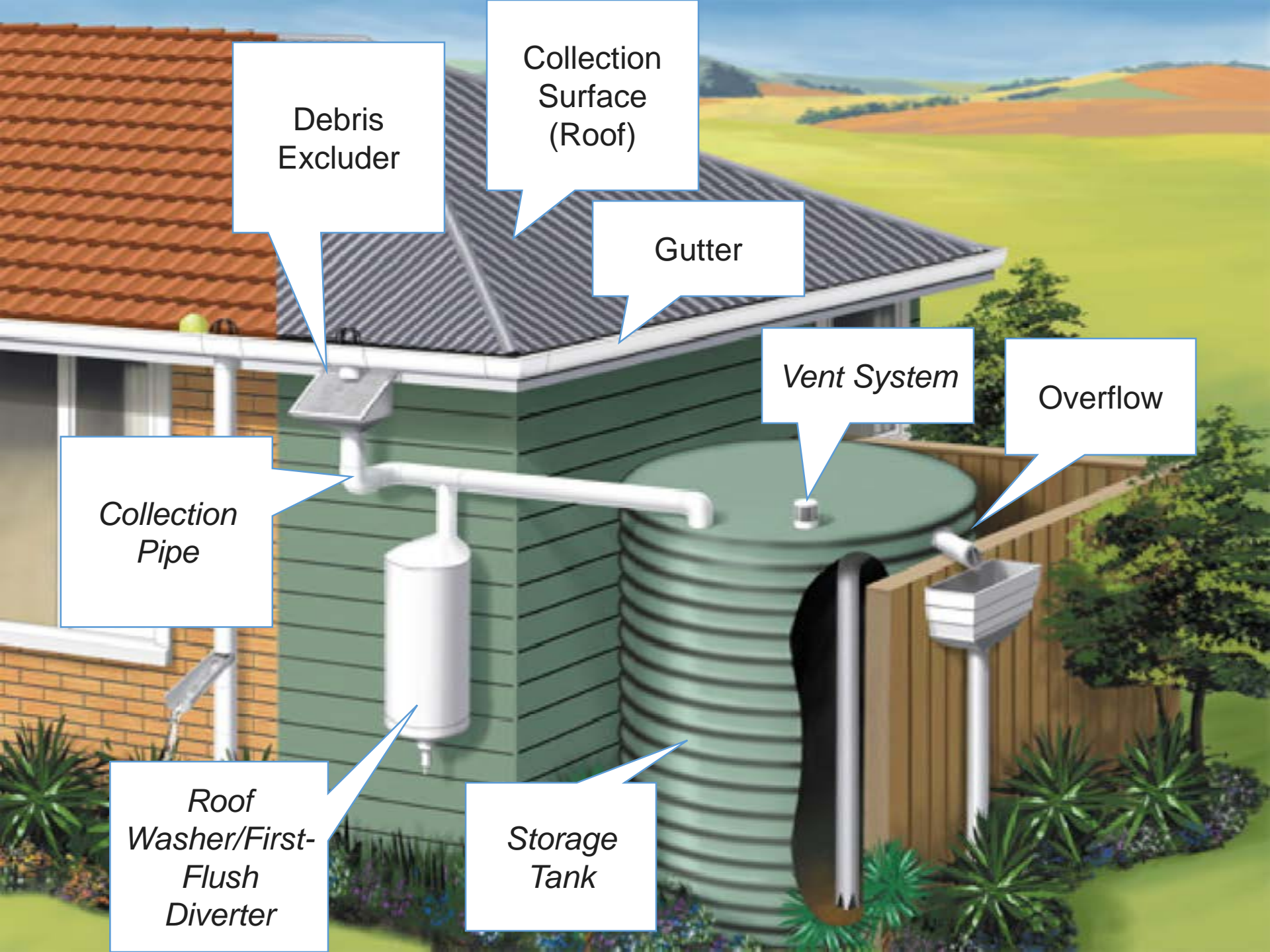


**Figure II-1. Estimated Freshwater Withdrawals by Sector, 2000
(Hutson et al., 2004)**

Water Use by Sector

U.S. Freshwater Consumption, 100 Bgal/day





Debris
Excluder

Collection
Surface
(Roof)

Gutter

Vent System

Overflow

*Collection
Pipe*

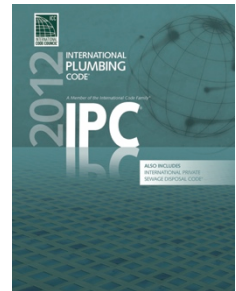
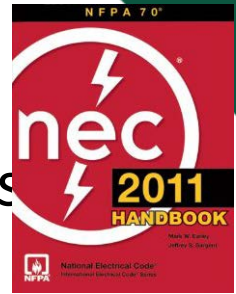
*Roof
Washer/First-
Flush
Diverter*

*Storage
Tank*

RWH: Intersection of Codes

But – existing code provisions did pertain to RWH systems.

- Building Codes: Gutters, roofing, structural, penetrations
- Fire Code: Fire access, cisterns, permissible materials
- Electrical Code: Wiring for pumps, controls, sensors
- Plumbing Code: Indoor piping, backflow preventers, meters, filters, valving, tanks, overflows, etc.
- Zoning Codes: Tank locations, cross-boundary rainwater sharing
- Health Codes: Water quality, maintenance requirements



Rainwater Collection System Standard Project



- Need for a standard identified in 2011 to meet needs in regulatory arena.
- Joint project by CSA and ICC to develop ANSI and SCC standard for rainwater collection system.
 - For use in U.S. and Canada
- Scope
 - Design, installation, maintenance.
 - Systems intended to collect, store, treat, distribute, utilize rainwater.
 - Potable and non-potable applications.



Potential Applications for Rainwater

- Potential Applications
 - Toilet/Urinal flushing
 - Irrigation
 - Trap priming
 - Cooling towers
 - Fire sprinklers
 - Ornamental fountains & water features
 - Potable
- Water quality
 - Largely set by intended use, local ordinances
 - Limited code provisions for some applications
 - Flushing, irrigation, fire sprinklers, etc.



ICC/CSA 805 Standard - Approach



- Prescriptive and Performance risk-based approach to water quality.
 - Uses Water Safety Plan to identify specific site and application risks.
 - Differentiation between commercial and residential scale and risk
- Allow for innovation – encompass wide range of technologies, techniques.
 - Permits use of broad range of source waters
 - Includes both potable and non-potable applications
- Coordination with building systems
 - Coordinated with building codes and national water quality laws
- Use of informative appendices to address best practice and recommendations.

ICC/CSA 805 Standard - Scope



- Residential, multi-residential and commercial applications
- Potable and nonpotable end uses, except:
 - Process water systems for industrial or manufacturing purposes;
 - Water distribution systems for commercial agricultural processes
- Rooftop and ground-level collection
 - Excludes surface water collection (rivers, lakes, streams)
 - All forms of water from natural precipitation

Unique Features

- Rooftop and surface-level sources in a single document
- Inclusion of wide range of tank types incl. wood, matrix, precast concrete, flexible
- Addresses rainwater use with fire protection, stormwater management, vegetated roof systems
- Sets water quality criteria for specific end uses based on risk
- Uses Water Safety Plans to address variable site and systems considerations



Contents



1. Scope
2. Reference Publications
3. Definitions and abbreviations
4. Effects of other Codes
5. General System Requirements
6. System Design and Installation
7. Subsystem Design and Installation
8. Water Quality
9. Rainwater system tests and inspections

Annex A – Particle size Spectrum

Annex B – Suggested evaporative cooling water quality control levels

Annex C – Tank sizing and capacity calculation methodology

Annex D – Guidance for Developing a Water Safety Plan



Chapter 5. General System Requirements



End use tier categorizations

- Potable or non potable water quality
- End uses
- Potential for human contact

Water Safety Plan

Table 5.1
End use tiers and the likelihood of exposure without mitigation measures
 (See Clause 5.2.2.)

End use tier	Category	End uses	Likelihood of exposure*			
			Ingestion	Inhalation	Skin contact	Overall
1	Non-potable	<ul style="list-style-type: none"> • Trap primers • Spray irrigation (restricted access or exposure)[†] • Surface and subsurface irrigation (drip, bubbler) • Fire protection • Ice rinks 	Rare	Unlikely	Unlikely	Unlikely
2	Non-potable	<ul style="list-style-type: none"> • Toilet and urinal flushing • Clothes washing • HVAC evaporative cooling (e.g., cooling tower, evaporative condenser, spray cooler, direct and indirect evaporative cooling) • Rooftop thermal cooling 	Rare	Possible	Possible	Possible
3	Non-potable	<ul style="list-style-type: none"> • Hose bibbs • Pressure washing • Decorative fountains • Vehicle washing • Spray irrigation (non-restricted access or exposure)[†] 	Possible	Likely	Likely	Likely
4	Potable	<ul style="list-style-type: none"> • Human consumption • Oral care • Food preparation • Dishwashing • Bathing, showering, and hand washing • Pools, hot tubs, spas, and splash pads • Misting stations • Swamp coolers 	Certain	Certain	Certain	Certain

* Typical representative outcomes are gastrointestinal illness from ingestion, Legionellosis from inhalation, and bacterial wound infection from skin contact.

[†] The WSP shall establish whether a given application has restricted or unrestricted access or exposure. The WSP may also categorize the end use in a different tier than what is reflected in this Table.

Chapter 6. System design and installation — General

- Materials Compatibility
- Operational Conditions
- Seismic Considerations
- Buried Collection and Distribution piping
- Electrical wiring
- Controls
- Point of Use Signage

Figure 6.1
Point of use signage
(See Clause 6.8.2.)



Chapter 7. Subsystem design and installation



- Collection Surfaces
- Conveyance Subsystems
- Storage Tanks
- Treatment and Disinfection Subsystems
- Distribution Systems



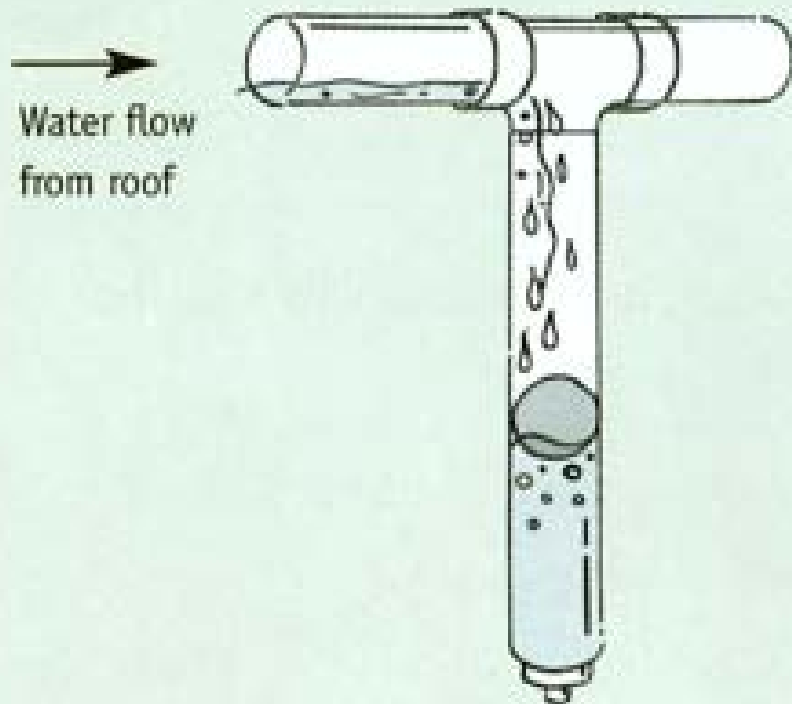
Chapter 7. Subsystem design and installation

Table 7.1
Collection surfaces per water end use tier for the prescriptive approach
(See Clause 7.1.3.1.)

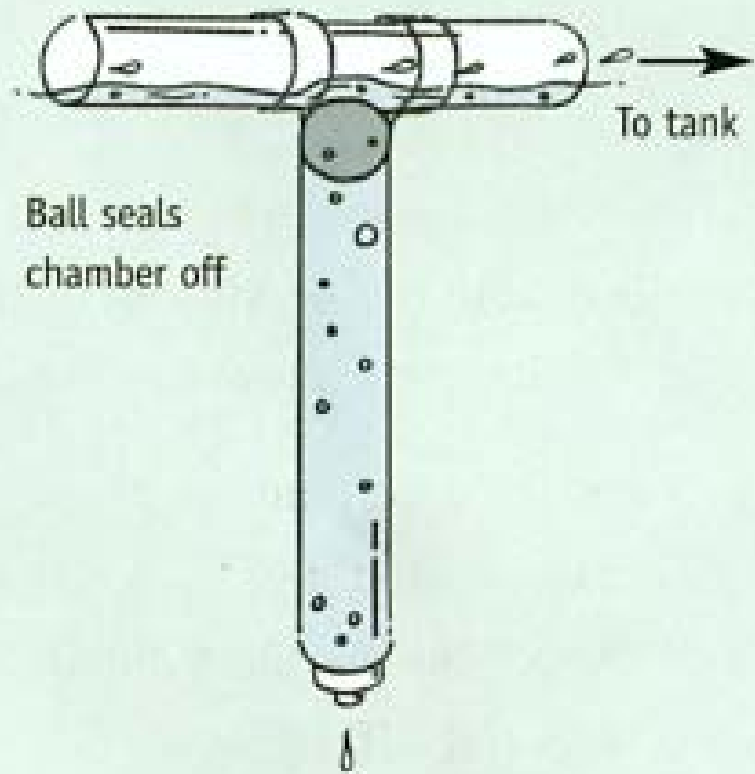
Collection surface	End use tier	
Roofing material	Asbestos cement	‡
	Asphalt	1, 2, 3, 4
	Asphalt felt and bituminous and tar membranes	1, 2, 3
	Ceramic	1, 2, 3, 4
	Clay	1, 2, 3, 4
	Concrete	1, 2, 3, 4
	Copper	1, 2, 3
	Fiberglass	1, 2, 3, 4
	Glass	1, 2, 3, 4
	Polyethylene membrane	1, 2, 3, 4
	Polymer and acrylic	1, 2, 3
	Rubber/Butyl /EPDM membrane	1, 2, 3
Steel, coated	1, 2, 3, 4	

Chapter 8. Water Quality

First flush of contaminated water is diverted into chamber



Once chamber is full fresh water flows to tank



Chapter 8. Water Quality

Table 8.1
Roof runoff water treatment requirements for single-family residential applications
 (See Clauses 8.1.1 and 8.2.1.)

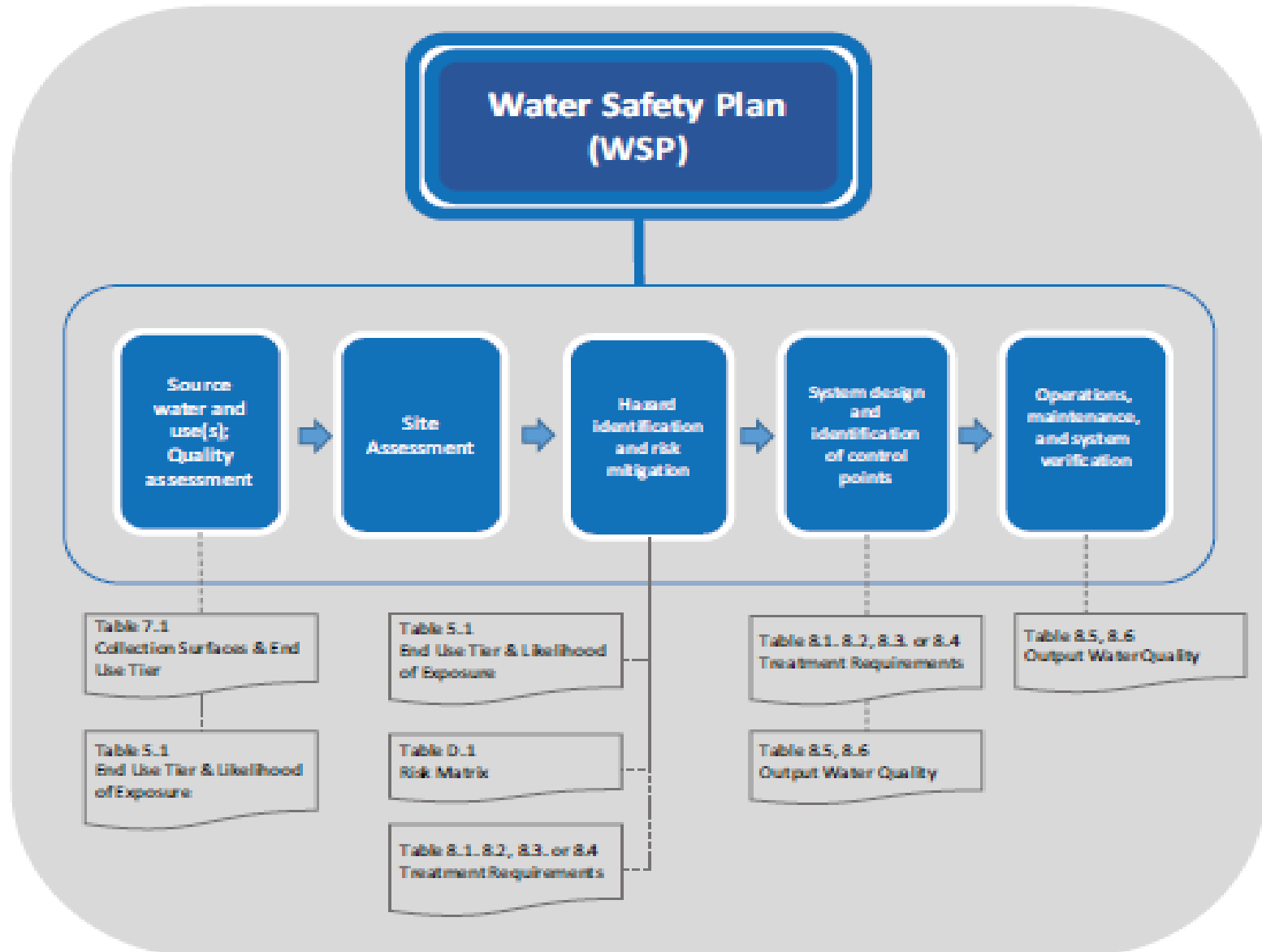
Application				Minimum performance criteria				Minimum prescriptive requirements				
End use tier	Category	Potential for human contact	Examples of uses	Log reduction (% reduction)			pH	Options for post-storage treatment before end use				
				Viruses	Bacteria**	Protozoa		UV††		Chemical-based disinfectants‡‡		Microfiltration or ultrafiltration
								Filtration	Disinfection	Filtration	Disinfection	
1	Non-potable	Low	<ul style="list-style-type: none"> • Trap primers • Spray irrigation (restricted access or exposure)§§ • Surface and subsurface irrigation (drip, bubbler) • Fire protection • Ice rinks 	0	0	0	—	None§				

Chapter 9. Rainwater system tests and Inspections



- Testing for non-potable distribution system cross-connections
- First flush diversion test
- Collection pipe and vent tests
- Tank test
- Water supply system test
- Inspection and testing of backflow prevention
- Inspection of vermin and insect protection
- Water quality

Figure D.1
Water Safety Plan (WSP) overview including resource tables and their relationship to elements of the WSP
 (See Clause D.1.2.)



Questions?

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