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COMMISSION CLERK

Docket No. 070183-WS – Proposed adoption of Rule 25-30.4325, F.A.C., Water Treatment Plant Used and Useful Calculations.

WITNESS: Direct Testimony of Richard P. Redemann, P.E. Appearing on Behalf of the Staff of the Florida Public Service Commission.

DATE FILED: December 17, 2007

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FPSC-COMMISSION CLERK

DIRECT TESTIMONY OF RICHARD P. REDEMANN, P.E.

Q. Please state your name and business address.

A. Richard P. Redemann, Florida Public Service Commission, 2540 Shumard Oak Blvd., Tallahassee, FL 32399.

Q. Please give a brief description of your educational background and experience.

A. I received a B.S. Degree in Civil Engineering from the University of Wisconsin-Platteville, Platteville, WI, in May 1984. From June 1984 to present, I have worked for the Florida Public Service Commission (FPSC or Commission). Prior to my work at the Commission, I worked for the Wisconsin Department of Transportation in the summers in 1980 and 1982 through 1983. In May through November of 1981, I worked for an engineering testing lab in Appleton and LaCrosse, WI. A copy of my resume is attached. (EX__ RPR-1)

Q. What is your current position at the Commission?

A. I am a Professional Engineer III.

Q. Are you licensed as a Professional Engineer under Chapter 471, Florida Statutes (F.S.)?

A. Yes, I am currently licensed as a Professional Engineer in the State of Florida. I have been licensed as a Professional Engineer since 1989.

Q. What are your general responsibilities at the Commission?

A. I review, analyze, and make recommendations regarding the engineering aspects of original and grandfather certificates, transfers, amendments, rate cases, and overearnings cases for water and wastewater utilities. I also review and make recommendations on territorial agreements for electric and gas utilities. I have prepared and presented expert testimony concerning quality of service and used and useful issues before the Commission.

Q. How many cases have you testified in before the Commission?

A. I testified in Docket No. 860149-WU, (Application of Sunnyland for a rate increase) and in Docket No. 020071-WS, (Application for rate increase in Marion, Orange, Pasco, Pinellas, and Seminole Counties by Utilities, Inc. of Florida). I also filed testimony in Docket No. 060368-WS (Application for increase in water and wastewater rates in Alachua, Brevard, Highlands, Lake, Lee, Marion, Orange, Palm Beach, Pasco, Polk, Putnam, Seminole, Sumter, Volusia and Washington Counties by Aqua Utilities Florida, Inc.), Docket No. 940761-WS (Request for approval of special service availability contract with Lake Heron in Pasco County by Mad Hatter Utility, Inc.), Docket No. 850206-WS (Application of Ussepa Island Utilities, Inc. for interim and permanent rate increase in Lee County), Docket No. 860544-SU (Investigation of rates of Rookery Bay Utility Company in Collier County for possible overearnings), and Docket No. 861441-WS (Investigation into the earnings of Mangonia Park Utility Company, Inc. for 1985).

Q. What is the purpose of your testimony in this docket?

A. The purpose of my testimony is to provide evidence as to the appropriate methodology for calculating the used and usefulness of water systems in rate making proceedings and to support the proposed rule and offer certain alternative language to the proposed rule.

Q. What information have you relied on in preparing your testimony?

A. I reviewed a number of American Water Works Association (AWWA) Manuals and a Committee Report related to water distribution system design, groundwater, and unaccounted for water; the AWWA Water Distribution Systems Handbook; the Recommended Standards for Water Works; the U.S. Army Corps of Engineers Design of Small Water Systems Manual; portions of the Department of Environmental Protection (DEP) rules related to the design and permitting of water systems; and some of the consumptive use permit (CUP) and water conservation rules for three of the five Water Management Districts (WMDs) in Florida.

Q. Can you describe the basis for the recommended methodology in the proposed rule for determining the used and usefulness of water systems?

A. Yes. Utility systems should be designed prudently, with economies of scale in mind (See proposed Rule 25-30.4325(2), EX__ RPR-2.); however, existing customers should not be required to pay for future growth in excess of the statutory requirement (Section 367.081(2)(a)2., F.S.). A used and useful adjustment is made to reduce rate base and expenses if the Commission determines that a portion of those costs should not be passed on to existing rate payers. Section 367.081(2)(a)1., F.S., states that "[t]he commission shall, either upon request or upon its own motion, fix rates which are just, reasonable, compensatory, and not unfairly discriminatory. In every such proceeding, the commission shall consider the value and quality of the service and the cost of providing the service, which shall include, but not be limited to, debt interest; the requirements of the utility for working capital; maintenance, depreciation, tax, and operating expenses incurred in the operation of all property used and useful in the public service; and a fair return on the investment of the utility in property used and useful in the public service." Rule 25-30.432, Florida Administrative Code (F.A.C.), contains the method for determining the used and usefulness of wastewater treatment plants. Staff's proposed rule for determining the used and usefulness of water treatment systems is proposed Rule 25-30.4325, Water Treatment Plant Used and Useful Calculations. (EX__ RPR-2).

Q. What other criteria should be considered in developing a used and useful rule for water systems?

A. Section 367.111(2), F.S., provides that each utility shall provide safe, efficient, and sufficient service which is consistent with the approved engineering design of the system and the reasonable and proper operation of the utility in the public interest. Ch. 62-555, F.A.C., of the DEP rules contains the minimum design criteria for water systems; however, DEP witness Hoofnagle has provided testimony indicating that DEP would support a utility's decision to design and construct wells, treatment, and storage facilities that are larger than these minimum criteria.

Q. Can you describe the reason for the proposed rule?

A. Yes. Over the years, a number of different methods for calculating used and useful for water systems have been used. As a result, substantial amounts of staff, utility, consultant, and ratepayer advocate time has been spent litigating the used and useful percentage for each case. This litigation results in substantial rate case expense, which is ultimately passed on to the utility's ratepayers. In 2003, the Commission concluded a rate proceeding by Order No. PSC-03-1440-FOF-WS, issued in Docket No. 020071-WS, issued December 22, 2003 which included testimony from various parties, as well as staff. I filed testimony in that proceeding which summarized the Commission's policy at that time on used and useful calculations for water treatment systems. The proposed rule is designed to codify the Commission's current policy on used and useful calculations for water treatment systems.

Q. What is the basic formula used to calculate the used and usefulness of a water treatment plant?

A. The sum of the peak demand less excessive unaccounted for water plus a growth allowance and fire flow, if provided, is divided by the firm reliable capacity of the wells to determine the used and usefulness of a water treatment plant. (See proposed Rule 25-30.4325(1)(c) and (5), EX__ RPR-2).

Q. How should the peak day demand be determined?

A. The peak day demand is the single maximum day demand in the test year. However, if there is an unusual occurrence on that day, such as a fire, then the average of the five highest days in a 30 day period in the test year, excluding the day(s) with the unusual occurrence should be used. (See proposed Rule 25-30.4325(7), EX__ RPR-2.) A peak day during which there was a fire (or some other unusual occurrence like a line break) should not be used, because the formula includes a separate element for fire flow. The peak day(s) are determined from the utility's DEP monthly operating reports.

Q. Are there other considerations regarding peak demand for systems with little or no storage?

A. Yes. Water systems with little or no storage capacity must be able to meet the peak hour demands on the system. Most water utilities experience a peak demand in the morning when customers are first waking up and again in the late afternoon when customers are coming home from work and cooking the evening meal. If storage capacity is available, the utility can meet the peak demand periods by relying on water stored in elevated or ground storage tanks that are filled during off peak hours. If the system does not have storage, then the utility must meet the peak demand periods from its well capacity. However, most water utilities do not record water usage on an hourly basis; they maintain records of daily water flows.

Q. How is the peak hour demand determined?

A. The peak hour demand is estimated by dividing the peak day demand by 1440 minutes, which represents the average demand on that peak day in gallons per minute, and then multiplying that amount by a peaking factor. (See proposed Rule 25-30.4325(7)(a), EX__ RPR-2.)

Q. What peaking factor should be used to estimate peak hour flows for water systems?

A. According to the American Water Works Association (AWWA) Manual of Water Supply Practices, Distribution Network Analysis for Water Utilities (M32), the ratio of peak hour demand has been observed to vary from 1.3 - 2.0 times the maximum day demand. (EX__ RPR-3)

Q. Why is a peak hour factor of 2 used in the proposed rule?

A. This method has been used by the Commission in numerous rate cases. By Order No.

PSC-96-1320-FOF-WS, issued on October 30, 1996, in Docket No. 950495-WS, the Commission approved used and useful calculations based on the use of estimated peak hour flows for systems that did not have storage capacity. A peaking factor of 2 was applied to the maximum day demand to estimate the peak hour demand. Although that case was appealed to the First District Court of Appeal on certain issues, the parties did not appeal the use of a peak hour calculation for systems without storage. Southern States Utilities., Inc. v. FPSC, 714 So. 2nd 1046 (1st DCA 1998). There are many other Orders in which the Commission applied a peaking factor of 2, including in Order No. PSC-05-0442-PAA-WU, issued April 25, 2005, in Docket No. 040254-WU (Keen); Order No. PSC-06-0378-PAA-WU, issued May 8, 2006, in Docket No. 050449-WU (Dixie Groves); and Order No. PSC-07-0425-PAA-WU, issued May 15, 2007, in Docket No. 060599-WU (Pasco Utilities, Inc.).

Q. Do you agree with OPC's proposed rule language regarding the use of a range of peaking factors to estimate peak hour flows?

A. No. The purpose of the rule is to simplify and standardize the used and useful formula. OPC's proposed rule language provides that "consideration shall be given to the size and character of the system service area" and refers to "larger systems with a diverse customer base" and "smaller systems with a uniform customer base." These criteria do not give a clear indication of the appropriate factor within the range to be used. In addition, a peaking factor of 2 reflects an allowance for a higher level of quality of service. Even with a peaking factor of 2, many water systems have low pressure problems, and additional plant or line facilities are needed to increase water pressure and the quality of service.

Q. Do you agree with OPC's proposed rule language defining peak demand for a water treatment system?

A. No. OPC's proposal to exclude fire flow from peak demand, unless the maximum day demand with no peaking factor is used, is not consistent with sound engineering design.

OPC's proposal is based on DEP permitting rules regarding the minimum capacity a system must have in order to be permitted. As previously noted, witness Hoofnagle states that DEP would support a utility's decision to design facilities that are larger than these minimum criteria.

Q. How should the utility's current demand be determined for water systems that do not have adequate DEP monthly operating reports (MORs) with a record of daily master metering readings?

A. For systems that do not have adequate DEP MORs with a record of daily master metering readings, the current demand should be estimated based on a peak hour design criteria of 1.1 gallons per minute per equivalent residential connection (ERC). The assumption is that the system should be designed to provide at least 1.1 gallons per minute of water for each ERC in a peak hour. This is consistent with the assumptions of the AWWA M32 manual regarding average to peak hour flows. (See proposed Rule 25-30.4325(7)(a), EX__ RPR-2.)

Q. Has the Commission approved used and useful calculations using an estimated peak hour demand of 1.1 gallons per minute per residential connection for other water systems that do not have a record of daily flows?

A. Yes. This method has been used by the Commission in cases such as in Docket No. 020406-WU, by Order No. PSC-03-0008-PAA-WU, issued January 2, 2003 (Pinecrest Ranches, Inc.).

Q. What is unaccounted for water?

A. The difference between the amount of water produced (or purchased) and the amount sold to customers or documented as being used for fire fighting, testing, or flushing or resulting from documented line breaks is referred to as unaccounted for water. Unaccounted for water is typically the result of unmetered usage, faulty meters, and leaks in the water system.

Q. Why isn't the water used for fire fighting, testing, flushing, or the amount of water lost through line breaks considered to be unaccounted for water?

A. Some water is used by the utility to flush its distribution system, service lines, mains, hydrants, and tanks to properly maintain the system. Water loss can also occur when lines break during construction. The utility is required to maintain records of the amount of water used to maintain the system or lost through line breaks. The fire department should measure or estimate the amount of water used for firefighting or testing and report the usage to the utility. If water used for maintaining the system or lost through line breaks is properly documented, then it should not be considered unaccounted for usage.

Q. Why is unaccounted for water a concern?

A. Water is a limited natural resource that must be conserved to assure adequate supply; therefore, water utilities should be taking reasonable steps to avoid excessive losses. It is Commission practice to allow 10% of the total water produced or purchased as acceptable unaccounted for water. Excessive unaccounted for water is removed from the peak demand in calculating used and useful. In addition, the chemical and electrical expenses and purchased water costs associated with unaccounted for water in excess of 10% should be adjusted so that rate payers do not bear those costs. The Commission has also required utilities to take corrective action to reduce the excessive unaccounted for water, if economically feasible. (See proposed Rule 25-30.4325(1)(e), EX__ RPR-2.)

Q. Why is unaccounted for water over 10% considered an excessive amount?

A. This has been a long-standing Commission practice. In addition, I reviewed several AWWA publications and WMD rules related to consumptive use permits and water conservation, which support 10% as a reasonable amount of unaccounted for water. Page 31 of the AWWA M32 Manual states that "[t]he percentage of unaccounted-for water can vary widely from system to system. Values ranging from 4-30 percent of the total accounted-for consumption are found, although 10-15 percent may be more prevalent. The percentage can also vary from year to year in the same system. The higher values generally are associated with older systems, in which leakage, no meters or faulty meters are more common place than in newer systems. Systems operating at high pressures usually will experience a high loss percentage." (EX__ RPR-3) The St. Johns River WMD Rule 12.2.5 on Water Conservation Plans requires utilities applying for a public supply water use permit to perform a meter survey. If the initial unaccounted for water is 10% or greater, the utility may need to initiate a meter change-out program and must complete a leak detection evaluation. (EX__ RPR-4) The Southwest Florida WMD Water Use Permit handbook requires water systems in the Northern Tampa Bay Water Use Caution Area (Pasco, Pinellas and Northern Hillsborough Counties) and the Southern Water Use Caution Area (Southern Hillsborough, Manatee, Sarasota, Charlotte, Desoto, Hardee, Highlands and Polk Counties) to take remedial action if the annual report reflects greater than 12% unaccounted for water. For water systems that are not in a Water Use Caution Area, applicants with unaccounted for use greater than 15% may be required to address the reduction of such use through better accounting or reduction of unmetered uses of system losses. (EX__ RPR-5) The Northwest Florida WMD considers 10% a reasonable amount of unaccounted for water. That WMD does not have a specific rule, but relies on a "reasonable and beneficial" test prescribed by Statute.

Q. Should an adjustment be made for unaccounted for water for systems with unaccounted for water in excess of 10%?

A. For those water systems that have over 10% unaccounted for water, if the utility has performed a water audit and is in the process of reducing the amount of water loss, no adjustment to expenses is needed because the cost the company will incur to correct the problem will likely exceed the expenses that would be removed. Also, for those systems that have slightly over 10% unaccounted for water, the adjustment on such small amounts of unaccounted for water would be immaterial. For those water systems with unaccounted for water in excess of 10% where the utility has not taken steps to reduce the water loss, a reduction in peak demand and chemical and electrical expenses and purchased water should be made. In addition, the utility should investigate the source of the water loss and reduce the amount of unaccounted for water if it has not done so already. (See proposed Rule 25-30.4325(1)(e) and (10), EX__ RPR-2.)

Q. Should a growth allowance be included in the used and useful calculation?

A. Yes. Pursuant to Section 367.081(2)(a)2., F.S., a growth allowance must be included in the used and useful calculation for plant needed to serve new customers for five years after the end of the test year, not to exceed 5% per year. Rule 25-30.431, F.A.C., contains the criteria for a growth allowance.

Q. Should fire flow be included in the used and useful calculation?

A. Yes. For water systems where there is a requirement by the local city or county government to provide fire flow, the used and useful calculation should include the required fire flow. If fire flow is provided but is not mandated by the local government, 500 gallons per minute for 2 hours should be included in the used and useful calculation, unless the utility can demonstrate that a greater amount is provided. (See proposed Rule 25-30.4325(1)(c) and (d), EX__ RPR-2.)

Q. Do you agree with OPC's proposed rule language which would include an allowance for fire flow, if provided?

A. No. Fire hydrants are designed by professional engineers and approved by the DEP to provide fire protection. The Commission has consistently recognized the need for fire flow protection and considered it in the determination of used and useful. While hopefully fires do not occur frequently, I believe it is important to allow the utility to include fire flow in its used and useful calculation if there is a local requirement to provide fire flow and fire hydrants exist in the service area. This is consistent with Order No. PSC-96-1320-FOF-WS, issued October 30, 1996, in Docket No. 950495-WS (Southern States Utilities, Inc.), in which the Commission found that, while the Commission does not test fire hydrants or require proof that hydrants are functional or capable of the flows requested, an investment in plant should be allowed.

Q. How should firm reliable capacity be determined for those water systems that have more than one well and are not built out? (See proposed Rule 25-30.4325(6), EX__ RPR-2.)

A. For systems that have more than one well and are not built out, Commission practice has been to remove the largest well and base the capacity on the remaining well(s). This is known as the system's firm reliable capacity. The assumption is that the largest well should be removed to recognize that the utility must be able to meet its demand when one of the wells is out of service. This is consistent with the Recommended Standards for Water Works. Paragraph 3.2.1.1 Source Capacity, states that "[t]he total developed groundwater source capacity...shall equal or exceed the design maximum day demand with the largest well out of service." And paragraph 6.3 Pumps, states that "[a]t least two pumping units shall be provided. With any pump out of service, the remaining pump or pumps shall be capable of providing the maximum pumping demand of the system." (EX__ RPR-6)

Q. Has the Commission approved used and useful calculations for water systems based on firm reliable capacity?

A. Yes. This practice has been accepted by the Commission in Order No. PSC-02-0656-PAA-WU, issued May 14, 2002, in Docket No. 992015-WU (Sunshine Utilities of Central Fla., Inc.); Order No. PSC-96-1320-FOF-WS, issued October 30, 1996, in Docket No. 950495-WS (Southern States Utilities, Inc.); Order No. PSC-93-0423-FOF-WS, issued March 22, 1993, in Docket No. 920199-WS (Southern States Utilities, Inc., and Deltona Lakes

Utilities); and Order No. PSC-02-1449-PAA-WS, issued October 21, 2002, in Docket No. 011451-WS (Plantation Bay Util. Co.).

Q. What is the function of a water storage tank?

A. Storage tanks are used to provide reserve supply for operational equalization and fire suppression. With storage, variations in water quality, quantity, and system pressure will be improved.

Q. How should the utility's firm reliable capacity be determined for water systems that have storage capacity?

A. For systems with ground or elevated storage, the firm reliable capacity of the water system should be based on the capacity of the well(s), with the largest removed from service, and with the remaining well(s) operating 12 hours per day. The assumption is that the wells should have some down time to allow the aquifer to recharge. It is environmentally responsible and prudent to rest a well for 12 hours per day so that the ground water can recharge. Excessive pumping has caused wells to draw air, sand and gravel into the water system; saltwater intrusion; land subsidence; and collapsed wells. The use of 12 hours per day of pumping also reflects the general usage pattern of customers. (See proposed Rule 25-30.4325(6)(b), EX__ RPR-2.)

Q. Has the Commission previously used a 12-hour day to determine well capacity?

A. Yes. This practice has been accepted by the Commission in numerous rate cases, including Order No. PSC-02-1449-PAA-WS, issued October 21, 2002, in Docket No. 011451-WS (Plantation Bay Util. Co.); Order No. PSC-02-0656-PAA-WU, issued May 14, 2002, in Docket No. 992015-WU (Sunshine Utilities of Central Fla., Inc.); Order No. PSC-01-1574-PAA-WS, issued July 30, 2001, in Docket No. 000584-WS (Laniger Enterprises of America, Inc.); Order No. PSC-00-1774-PAA-WU, issued September 27, 2000, in Docket No. 991627-WU (Park Water Co., Inc.); Order No. PSC-01-2385-PAA-WU, issued December 10, 2001, in

Docket No. 010403-WU (Holmes Utilities, Inc.); and Order No. PSC-96-1320-FOF-WS, issued October 30, 1996, in Docket No. 950495-WS (Southern States Utilities, Inc.).

Q. How do you recommend that used and useful be calculated for storage tanks?

A. The used and useful calculation for storage should be made by dividing the peak demand by the useable storage of the storage tank. Useable storage capacity less than or equal to the peak demand should be considered 100 percent used and useful. (See proposed Rule 25-30.4325(1)(d), (8), and (9), EX__ RPR-2.)

Q. Has the Commission recognized that one full day of storage may be needed for a system in prior cases?

A. Yes. See Order No. PSC-97-0847-FOF-WS, issued July 15, 1997, in Docket No. 960329-WS (Gulf Util. Co.).

Q. Are there standards for sizing of storage tanks?

A. The AWWA Water Distribution Systems Handbook and the U. S. Army Corps of Engineers Design of Small Water Systems Manual each recommend guidelines for storage capacity. The AWWA Water Distribution Systems Handbook states that the principal function of storage is to provide reserve supply for operational equalization, fire suppression reserves, and emergency needs. Operational storage is to make up the difference between the consumers' peak demands and the system's available supply. The volume of operational storage required is a function of demand fluctuation in a community and is commonly estimated at 25 percent of the total maximum day. Fire storage needs vary significantly by community. Emergency storage is the volume of water recommended to meet demand during emergency situations, such as source of supply failures, major transmission main failures, pump failures, electrical power outages, or natural disasters. The Department of the Army's Design of Small Water Systems Manual states in Section 4-3c that "distribution storage facilities are used to meet peak demands (including fire flows), allow continued service when the supply is interrupted, equalize system pressures, eliminate continuous pumping, and facilitate the use of economical pipe sizes...[D]epending upon system size and type, distribution storage volume may vary from about one-half the average daily use, to the maximum daily use, to a 2- or 3-day supply." (EX __ RPR-7) Florida has frequent fires, lightning, hurricanes, and floods which can cause power outages for an extended period of time or well contamination. The only source of water would be the amount in the ground or elevated storage tanks.

Q. Do you agree with OPC's proposed rule language defining peak demand for storage?

A. No. OPC's proposal to include only 25% of the utility's maximum day demand for storage is based on DEP Rule 62-555.320, F.A.C., which contains the minimum criteria for designing storage capacity.

Q. Do you agree with OPC's proposal to evaluate used and useful for high service pumps and storage tanks separately?

A. No. High service pumps should not be evaluated separately from storage. The cost of high service pumps is minimal compared to the cost of storage. If a party to a proceeding believes that a separate evaluation should be made for high service pumps, the alternative calculation provision in the proposed rule may be used.

Q. Should the hydropneumatic tank be included in the storage calculation?

A. No. The hydropneumatic tank is designed to maintain pressure in the water distribution system. Once the pressure drops it must be refilled from the well or storage tank and high service pumps. (See proposed Rule 25-30.4325(8), EX __ RPR-2.)

Q. How should the utility's firm reliable capacity be determined for water systems that have no storage capacity?

A. For systems with no storage, the firm reliable capacity should be based on the gallons per minute capacity of the well(s), with the largest well removed from service. (See proposed

Rule 25-30.4325(6)(a), EX __ RPR-2.)

Q. What if the systems are built out?

A. The used and useful formula is for systems with potential growth in the service territory. If the utility's service territory is built out and there is no apparent potential for expansion in the surrounding area, the system should be considered 100% used and useful if it appears that the system was designed prudently. (See proposed Rule 25-30.4325(4)(b), EX __ RPR-2.)

Q. Has the Commission previously found utility water systems to be 100% used and useful if the utility's service territory is built out and there is no apparent potential for expansion in the surrounding area?

A. Yes. In Order No. PSC-98-0130-FOF-WS, issued January 26, 1998, in Docket No. 970633-WS (Paradise Lakes Util., Ltd.); Order No. PSC-99-0243-FOF-WU, issued February 9, 1999, in Docket No. 980726-WU (Dixie Groves Estates, Inc.); Order No. PSC-00-0807-PAA-WU, issued April 25, 2000, in Docket No. 991290-WU (Brendenwood Water System); and Order No. PSC-96-1320-FOF-WS, issued, October 30, 1996, in Docket No. 950495-WS (Southern States Utilities, Inc.).

Q. How should used and useful be calculated for water systems with only one well?

A. For systems with only one well, the system should be considered 100% used and useful unless it appears that the well is oversized. As with any used and useful calculation, prudence and economies of scale are always considered. Commission rules and statues require the Commission to evaluate quality of service in rate cases, including the operational condition of the utility's plant and facilities and the utility's attempt to address customer satisfaction. With one well systems, the reliability is poor and the result can be poor customer satisfaction. Over time, the one well system will fail or need repair, which will require it to be out of service. I believe from a quality of service standpoint one well should be 100% used and useful. (See proposed Rule 25-30.4325(4)(c), EX __ RPR-2.)

Q. Has the Commission found water utilities with only one well to be 100% used and useful in other cases?

A. Yes. This practice has been accepted by the Commission in many cases including Docket No. 991290-WU, by Order No. PSC-00-0807-PAA-WU, issued April 25, 2000, (Brendenwood Water System), and in Docket No. 950495-WS, by Order No. PSC-96-1320-FOF-WS, issued October 30, 1996 (Southern States Utilities, Inc.).

Q. Can you please summarize your testimony?

A. A rule to address the amount of used and useful water facilities to be included in a water utility's rate base must be broad enough to address a wide range of issues concerning the size, age, and types of treatment while balancing utility and customer concerns. Minimum design criteria must be weighed against economies of scale. I believe that staff's proposed rule generally meets those criteria. However, there are three sections of the proposed rule that could be revised to clarify the intent of those provisions. Exhibit RPR-8 contains a matrix showing the proposed rule and the changes that the Commission may want to consider.

Q. Do you agree with OPC and the industry regarding moving the provisions in section (11) of the proposed rule to section (2)?

A. Yes. This rule generally addresses the utilities filing requirements for a rate proceeding. Moving the provisions of section (11) to section (2) clarifies and consolidates some of the factors the Commission considers in evaluating used and useful plant.

Q. Do you agree with OPC's proposal to move alternatives and limiting factors found in several other sections of the rule to section (3)?

A. Yes. Section (3) of the proposed rule addresses, in part, alternative used and useful calculations. OPC's proposal to move alternatives and limiting factors found in sections (6) and (11) of the rule, such as service area restrictions, treatment capacity, and well draw down limitations, to section (3) provides additional clarification and consolidation of the rule language. The new language allows any party to a proceeding, not just the utility, or the Commission staff to propose and justify an alternative calculation.

Q. Do you agree with Aqua Utilities, Inc.'s witness Guastella's proposal to revise the language regarding unaccounted for water?

A. I agree in concept with that change. Witness Guastella proposes that the alternative language in Rule 25-30.4325(1)(e) should read "Excessive unaccounted for water (EUW) is finished potable water produced (delivered to the system) that exceeds 10% of that production quantity." The proposed rule could be changed for clarification purposes to read "Excessive unaccounted for water (EUW) is unaccounted for water in excess of 10 percent of the amount produced."

Q. Do you have anything further to add?

A. No. I do not.

EX_RPR – 1

RESUME OF RICHARD PAUL REDEMANN, P.E.

RESUME

RICHARD PAUL REDEMANN, P.E.

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Work: (850) 413-6999

EDUCATION

University of Wisconsin-Platteville, B.S. Degree in Civil Engineering, May 1984
Emphasis: Sanitary-Environmental, Geotechnical and Structures

Related Course Work

Wastewater Treatment, Hydrology, Sanitary Engineering, Advanced Soil Mechanics, Fluid Mechanics, Steel Design, Foundation Design, Structural Mechanics, Computer Application, Reinforced Concrete, Engineering Geology, Transportation Systems, Engineering Economics, Technical Writing, and Business Law.

PROFESSIONAL LICENSE

State of Florida Professional Engineer No. 41668

PROFESSIONAL EXPERIENCE

Florida Public Service Commission

Professional Engineer III – March 2005 - to Present

Duties and Responsibilities include: Review and evaluate highly complex and controversial rate, original, grandfather, transfer, territorial agreement and amendment of certificate applications. Industries include water and wastewater, gas and electric utilities. This position handles highly complex customer inquiries, complaints and special projects. The position requires preparation and presentation of expert engineering testimony at hearings held by Commissioners.

Utility Systems/Communication Engineer - July 1990 – March 2005

Duties and Responsibilities included: Review and evaluate highly complex and controversial original, grandfather, transfer, and amendment of certificate and exemption applications. This position handles highly complex customer inquires, complaints and special projects. The position requires preparation and presentation of expert engineering testimony at hearings held by Commissioners.

Engineer IV - June 1989 - July 1990

Duties and Responsibilities included: Review and evaluate the more complex and controversial original, grandfather, transfer, and amendment of certificate and exemption applications. The position required preparation and presentation of engineering recommendations. This position handled the more complex customer inquires, complaints and special projects.

PROFESSIONAL EXPERIENCE (Continued)

Engineer III - June 1987 - June 1989

Duties and Responsibilities included: Reviewed, analyzed, and evaluated engineering data in complex rate and over earnings investigations, identifying issues and ultimately making final engineering recommendations and conclusions to be utilized by the Commission in its decisions. The position required preparation and presentation of recommendations and/or expert testimony concerning complex matters before the Commission. Conducted engineering investigations and inspections of water and wastewater utilities to determine compliance with Commission standards.

Engineer II - Feb 1986 - June 1987

Duties and Responsibilities included: Reviewing, analyzing, and evaluating engineering data in rate and overearnings investigations, identifying issues and ultimately making final engineering recommendations and conclusions to be utilized by the Commission in its decisions. This position required preparation and presentation of recommendations and/or expert testimony concerning matters before the Commission. Conduct engineering investigations and inspections of water and wastewater utilities to determine compliance with Commission standards.

Engineer I - June 1984 - Feb 1986

Duties and Responsibilities included: Reviewed, analyzed, and evaluated engineering data in rate cases, identifying issue and ultimately making final engineering recommendations and conclusions to be utilized by the Commission in its decisions. Evaluated the percentage of plant used and useful in the public service in rate cases. Conduct engineering investigations and inspections of water and wastewater utilities to determine compliance with Commission standards.

Wisconsin Department of Transportation, District 4, Wisconsin Rapids, WI

Engineer Trainee - May 1980 - August 1983 (Summers) (Except 1981)

Responsibilities included: Supervising the construction of bituminous and concrete road surfaces, and graveling of shoulders and intersections. Supervising the construction of curbs and gutters, culverts, storm sewer pipes, inlets, manholes and bridges. Surveying mainline, curves, ramps, and realignment of roads for highways and bridges. Running gradations for sand, gravel and concrete stones and computing concrete mix designs for quality control. Computing payments and checking final projects costs.

Twin City Testing and Engineering Laboratory, Appleton and LaCrosse, WI

Engineer Trainee - May 1981 - Nov. 1981

Responsibilities included: Analysis of sod savers with load testing machine, which I constructed. Running proctors, gradations and computing soil density of various types of soil. Breaking concrete and mortar cylinders. Working with strain gauges. Helping drill soil borings.

COMPUTER EXPERIENCE

WordPerfect for Windows, Lotus 1-2-3, Microsoft Word, Microsoft Excel, Netscape, Internet Explorer, Microsoft Outlook, Juno.

EX_RPR – 2

PROPOSED RULE NO. 25-30.4325

25-30.4325 Water Treatment and Storage Used and Useful Calculations

(1) Definitions.

(a) A water treatment system includes all facilities, such as wells and treatment facilities, excluding storage, necessary to produce, treat, and deliver potable water to a transmission and distribution system.

(b) Storage facilities include ground or elevated storage tanks and high service pumps.

(c) Peak demand for a water treatment system includes the utility's maximum hour or day demand, excluding excessive unaccounted for water, plus a growth allowance based on the requirements of Rule 25-30.431, Florida Administrative Code, and, where fire flow is provided, a minimum of either the fire flow required by the local governmental authority or 2 hours at 500 gallons per minute.

(d) Peak demand for storage includes the utility's maximum day demand, excluding excessive unaccounted for water, plus a growth allowance based on the requirements of Rule 25-30.431, Florida Administrative Code, and, where provided, a minimum of either the fire flow required by the local governmental authority or 2 hours at 500 gallons per minute.

(e) Excessive unaccounted for water (EUW) is finished potable water produced in excess of 110 percent of the accounted for usage, including water sold; other water used, such as for flushing or fire fighting; and water lost through line breaks.

(2) The Commission's used and useful evaluation of water treatment system and storage facilities shall include a determination as to the prudence of the investment and consideration of economies of scale.

(3) Separate used and useful calculations shall be made for the water treatment system and storage facilities. However, if the utility believes an alternative calculation is appropriate, such calculation may also be provided, along with supporting documentation.

(4) A water treatment system is considered 100 percent used and useful if:

CODING: Words underlined are additions; words in ~~struck through~~ type are deletions from existing law.

(a) The system is the minimum size necessary to adequately serve existing customers plus an allowance for growth and fire flow; or

(b) The service territory the system is designed to serve is mature or built out and there is no potential for expansion of the service territory; or

(c) The system is served by a single well.

(5) The used and useful calculation of a water treatment system is made by dividing the peak demand by the firm reliable capacity of the water treatment system.

(6) The firm reliable capacity of a water treatment system is equivalent to the pumping capacity of the wells, excluding the largest well for those systems with more than one well. However, if the pumping capacity is restricted by a limiting factor such as the treatment capacity or draw down limitations, then the firm reliable capacity is the capacity of the limiting component or restriction of the water treatment system. In a system with multiple wells, if a utility believes there is justification to consider more than one well out of service in determining firm reliable capacity, such circumstance will be considered. The utility must provide support for its position, in addition to the analysis excluding only the largest well.

(a) Firm reliable capacity is expressed in gallons per minute for systems with no storage capacity.

(b) Firm reliable capacity is expressed in gallons per day, based on 12 hours of pumping, for systems with storage capacity.

(7) Peak demand is based on a peak hour for a water treatment system with no storage capacity and a peak day for a water treatment system with storage capacity.

(a) Peak hour demand, expressed in gallons per minute, shall be calculated as follows:

1. The single maximum day (SMD) in the test year unless there is an unusual occurrence on that day, such as a fire or line break, less excessive unaccounted for water, divided by 1440 minutes in a day, times 2 [((SMD-EUW)/1,440) x 2], or

CODING: Words underlined are additions; words in ~~struck through~~ type are deletions from existing law.

2. The average of the 5 highest days (AFD) within a 30-day period in the test year, excluding any day with an unusual occurrence, less excessive unaccounted for water, divided by 1440 minutes in a day, times 2 [((AFD-EUW)/1,440) x 2], or

3. If the actual maximum day flow data is not available, 1.1 gallons per minute per equivalent residential connection (1.1 x ERC).

(b) Peak day demand, expressed in gallons per day, shall be calculated as follows:

1. The single maximum day in the test year, if there is no unusual occurrence on that day, such as a fire or line break, less excessive unaccounted for water (SMD-EUW), or

2. The average of the 5 highest days within a 30-day period in the test year, excluding any day with an unusual occurrence, less excessive unaccounted for water (AFD-EUW), or

3. If the actual maximum day flow data is not available, 787.5 gallons per day per equivalent residential connection (787.5 x ERC).

(8) The used and useful calculation of storage is made by dividing the peak demand by the usable storage of the storage tank. Usable storage capacity less than or equal to the peak day demand shall be considered 100 percent used and useful. A hydropneumatic tank is not considered usable storage.

(9) Usable storage determination shall be as follows:

(a) An elevated storage tank shall be considered 100 percent usable.

(b) A ground storage tank shall be considered 90 percent usable if the bottom of the tank is below the centerline of the pumping unit.

(c) A ground storage tank constructed with a bottom drain shall be considered 100 percent usable, unless there is a limiting factor, in which case the limiting factor will be taken into consideration.

(10) To determine whether an adjustment to plant and operating expenses for excessive unaccounted for water will be included in the used and useful calculation, the

CODING: Words underlined are additions; words in ~~struck through~~ type are deletions from existing law.

Commission will consider all relevant factors, including whether the reason for excessive unaccounted for water during the test period has been identified, whether a solution to correct the problem has been implemented, or whether a proposed solution is economically feasible.

(11) In its used and useful evaluation, the Commission will consider other relevant factors, such as whether flows have decreased due to conservation or a reduction in the number of customers.

Specific Authority: 350.127(2), 367.121(1)(f) FS.

Law Implemented: 367.081(2), (3) FS.

History: New __________.

CODING: Words underlined are additions; words in ~~struck through~~ type are deletions from existing law.

EX_RPR – 3

AWWA MANUAL M 32

Distribution Network Analysis for Water Utilities

AWWA MANUAL M32

First Edition

FOUNDED 1881

American Water Works Association

Unaccounted-for Water

Unaccounted-for water usage is always present in a water system. The unaccounted-for usage is estimated by comparing the average annual water production with the average annual metered consumption of a system. The difference between the two values is unaccounted-for water.

Unaccounted-for water usage can result from many factors. Some of the most prevalent factors include unidentified leaks in a pipe network, main breaks, periodic fire-hydrant flushing, tank drainage for maintenance purposes, unauthorized use, unmetered services, inaccurate and nonfunctioning meters, and water and wastewater treatment plant use. The uses of water at a plant for backwashing filters, mixing chemicals, rinsing equipment and tanks, and sanitary purposes are sometimes not metered and can represent up to 5 percent of the production rate for a system. Losses at the source or treatment facility customarily do not affect the model, as long as pump-suction characteristics are properly defined.

The unaccounted-for water usage must be added to system demands in the system model so that total water supplied will equal total water demand. The unaccounted-for usage is generally distributed equally to all nodes because specific or isolated causes are difficult to pinpoint, unless district zone measurements are made throughout the distribution system. System-wide district zone measurements permit a more accurate allocation of unaccounted-for usage. To increase accuracy, some systems have used leakage tests in subareas of the distribution system to prorate the unaccounted-for water usage. When, through subarea leakage tests, it was determined that various areas had various rates, the total leakage was allocated accordingly.

It is important to note that much of system analysis is conducted using peak-hour conditions. This reduces the impact of inaccurately distributing leakage to system nodes. For example, if total unaccounted-for water usage is 15 percent at average-daily demand, then at maximum-day demand it will generally constitute less than 10 percent, and at peak-hour demand, less than 5 percent. Such inaccuracy is generally less than the achievable accuracy of the model demand allocation.

The percentage of unaccounted-for water can vary widely from system to system. Values ranging from 4–30 percent of the total accounted-for consumption are found, although 10–15 percent may be more prevalent. The percentage can also vary from year to year in the same system. The higher values generally are associated with older systems, in which leakage, no meters, or faulty meters are more commonplace than in newer systems. Systems operating at high pressures usually will experience a high loss percentage.

Demand-Allocation Process

Demand allocation is the process of assigning water-consumption data to appropriate nodes in the system model. Consumption data from meter-route books or other sources are allocated to the nodes that best represent actual system withdrawal characteristics. Allocating demands to nodes is more an art than a science and requires, more than anything else, good working knowledge of system usage. Demand-allocation subroutines are available with some network-solution programs. A tabular approach, using a personal computer and spreadsheet software, can be an effective tool for expediting demand assignment.

Meter-route books. Meter-route data is of great value for allocating water consumption over a computer-simulated pipe network. Information available from meter-route books generally includes quarterly consumption for each customer and curve and the maximum-day demand rate at any point in time would represent the flow into or out of storage facilities.

At the minimum-hour demand rate, represented by point C in Figure 3-1, the demand for storage replenishment is at its maximum. This is often a limiting condition that must be analyzed to determine whether the distribution system can provide this replenishment rate to the storage facilities.

At the peak-hour demand rate, represented by point D in Figure 3-1, flow out of the storage reservoirs is at its maximum rate. The storage reservoirs must provide outflow to meet the demand above the maximum-day demand rate. This is another limiting condition that must be evaluated to determine whether the distribution system can draw flow from storage and distribute it to meet the system demands at this rate.

Fire-flow demand. An important limiting demand condition that is not shown on the curve is fire-flow demand. According to the Insurance Services Office, fire-flow demands should be superimposed on the average demand of the maximum day. This occurs at points A and B on the curve in Figure 3-1. The most limiting of these points is B, because at this point storage facilities would have been used for equalization of demands and would be at a lower water level than at point A.

Peaking factors. Peaking factors are most-limiting demand conditions. Peaking factors are developed from the diurnal-demand curve, with maximum-day demand used as the base demand (Figure 3-2). The peak factors for the example diurnal-demand curve in Figures 3-1 and 3-2 are

peak-hour demand/maximum-day demand = 1.45

minimum-hour demand/maximum-day demand = 0.39

Typical ranges observed for these peak factors in distribution systems of various size are

peak-hour demand/maximum-day demand: 1.3–2.0

minimum-hour demand/maximum-day demand: 0.2–0.6

Additionally, a peak factor is generally developed for the ratio of maximum-day demand to average-day demand. This ratio has been observed to vary from 1.2 to 2.5.

Effect on system components. The various limiting demand conditions are most limiting to various components of the distribution system. In general, the relationship between limiting demand conditions and system-component performance is as follows:

The most-limiting demand conditions for system piping are maximum-day demand plus fire-flow demand, maximum storage-replenishment rate, and peak-hour demand.

The most-limiting demand conditions for system storage are peak-hour demand, and maximum-day demand plus fire-flow demand.

The most-limiting demand conditions for pumps are maximum-day demand, maximum-day demand plus fire-flow demand, and peak-hour demand.

Note that average-day demand is not included in the list of limiting conditions. Generally, average-day demand is a limiting condition only for pump selection, and it can be accommodated without individual model runs. Pumps are generally required to meet maximum-day demand, fire-flow demand, and/or peak-hour demand and are selected to have performance curves that allow operation through the full range of demands, including average-day demand.

EX_RPR – 4

ST. JOHNS RIVER WATER MANAGEMENT DISTRICT WATER CONSERVATION PLAN

of a new use when either no records are available or there are less than one year's records, a ratio of between 1.5 and 2.0 will be used, although engineering documents justifying a different ratio are acceptable evidence in determining a different ratio.

When a utility operates more than one treatment plant and the plants operate independently (no interconnections), a maximum daily withdrawal is determined for each treatment plant and its associated wellfield(s).

12.2.5 Water Conservation Plan

12.2.5.1 All permit applicants for a public supply-type water use who satisfy the following water conservation requirements at the time of permit application are deemed to meet the criterion in 10.3(3):

(a) An audit of the amount of water used in the applicant's production and treatment facilities, transmission lines, and distribution system using the District's Water Audit Form No. 40C-22-0590-3 (see Appendix C-3) must be submitted. The audit shall include all existing production, treatment and distribution systems accessible to the applicant. The audit period must include at least 12 consecutive months within the three year period preceding the application submittal.

(b) An applicant is required to perform a meter survey, and to correct the water audit to account for meter error, if the initial unaccounted for water is 10% or greater based on the results of the initial water audit. The purpose of this survey is to determine a potential correction factor for metered water use by testing a representative sample of meters of various ages. The survey also helps to determine the appropriateness of a meter change-out program. As part of the survey, the applicant must randomly test 5% or 100 meters, whichever is less. The sampling must be of meters representing an even distribution of type and age, or cumulative lifetime flow. A documented meter change-out program that can provide an estimate of the overall meter accuracy may be substituted for this requirement.

(c) An applicant whose water audit, as required under paragraph 12.2.5.1(a), shows greater than 10% unaccounted for water use, must complete the leak detection evaluation portion of Form 40C-22-0590-3. Based upon this evaluation, an applicant may choose to implement a leak detection program immediately or develop an alternative plan of corrective action to address water use accountability and submit a new water audit to the District within two years. If the subsequent audit shows greater than 10% unaccounted for water, the applicant must implement a leak detection and repair program within one year unless the applicant demonstrates that implementation is not economically feasible. In all cases, this evaluation and the repair program may be designed by the applicant to first address the areas which are most suspect for major leaks. The evaluation and repair program may be terminated when the permittee demonstrates that its unaccounted for water loss no longer exceeds 10%.

(d) Implementation within the first year after permit issuance of a meter replacement program will be required for those applicants whose small and medium meter survey indicates that a group or type of meters is not 95% accurate. Permittees will be required to replace meters which have been in operation for 15 years or longer or have a cumulative lifetime flow exceeding the maximum lifetime operational flow specified by the manufacturer, unless a comparison of meter survey information to meter manufacturer specifications indicates a decreased accuracy of the meters. An alternative meter replacement schedule shall be approved by the District upon a showing by the applicant that the meter manufacturer specifications predict a different lifetime or gallonage capacity or based upon the results of a meter survey performed by the applicant.

(e) A customer and employee water conservation education program which includes all of the elements listed below as nos. 1 through 10 must be implemented. The frequency and extent to which each of the elements must be implemented will depend upon the size of the applicant's utility, the financial means of the applicant, the degree to which excess water use is identified as a problem, the particular types of uses which are identified as responsible for the excess water use, and any other relevant factors. Implementation of these may be achieved through collaboration with other entities, including the District.

1. Televise water conservation public service announcements.

2. Provide water conservation videos to local schools and community organizations.

3. Construct, maintain, and publicize water efficient landscape demonstration projects.

4. Provide water conservation exhibits in public places such as trade shows, festivals, shopping malls, utility offices, and government buildings.

5. Provide/Sponsor water conservation speakers to local schools and community organizations.

6. Provide water conservation articles and/or reports to local news media.

7. Display water conservation posters and distribute literature.

8. Provide landscape irrigation audits and irrigation system operating instructions to local small businesses and residents.

9. Establish a water audit customer assistance program which addresses both indoor and outdoor water use.

10. Provide water conservation information to customers regarding landscape irrigation, including the requirements contained within Rule 40C-2.042, F.A.C.

(f) The applicant must submit a written proposal and implement a water conservation promoting rate structure, unless the applicant demonstrates that the cost of implementing such a rate structure is not justified because it will have little or no effect on reducing water use. In the event that the applicant has a water conservation promoting rate structure in effect, the applicant must submit a written assessment of whether the existing rate structure would be more effective in promoting water conservation if it were modified, and if so, describe and implement the needed changes. Upon request, the District will assist the applicant by providing available demographic data, computer models, and literature. In evaluating whether a proposed rate structure promotes water conservation, the District will consider customer demographics, the potential for effectiveness, the appropriateness to the applicant's particular circumstances, and other relevant factors. Those permittees required to implement a water conservation rate structure must provide written reminder notices to their customers at least twice a year of the financial incentive to conserve water in order that the rate structure does not lose its effectiveness.

(g) When an applicant operates a reclaimed water system and requests a back-up water source to meet peak demands for reclaimed water, the applicant must submit a management plan designed to minimize the need for augmentation. In developing this plan, the applicant must consider:

1. creation of additional storage,

2. use of lower quality water sources for back-up,

3. pressure reduction,

4. designation of primary and secondary customers,

5. financial incentives for voluntary use reductions,

6. reclaimed water interconnects with adjacent communities,

7. peak demand irrigation restrictions,

8. providing customers with written information supporting the need to conservatively use reclaimed water, and

9. any other measures identified by the District.

The plan must include an explanation of how the above nine items were considered by the applicant.

(h) When an audit and/or other available information indicates that there is a need for additional water conservation measures in order to reduce a project's water use to a level consistent with projects of a similar type, or when an audit and/or other information indicates that additional significant water conservation savings can be achieved by implementing additional measures, other specific measures will be required by the District, to the extent feasible, as a condition of the permit. Additional water conservation measures include those listed in Appendix I.

12.2.5.2 Applicants who cannot implement all of the items listed in 12.2.5.1 must submit documentation demonstrating that the proposed use will otherwise meet the criterion in section 10.3(e).

12.3 Commercial/Industrial-Type Uses

12.3.1 Allocation

The reasonable need for a requested allocation must be based upon the amount of water needed to perform an industrial process in an efficient, non-wasteful and economic manner. If the criteria listed in section 8.0 or 9.0 are satisfied, the allocation will be equal to the reasonable need for water. A reasonable need for water is the greatest allocation which staff will recommend.

EX_RPR – 5

SWFWMD WATER USE PERMIT
INFORMATION MANUAL

Southwest Florida Water Management District

WATER USE PERMIT

INFORMATION MANUAL

PART B

BASIS OF REVIEW

January 2007

is associated with the mining or dewatering, a water balance diagram combining these activities is preferred (to separate water balances for each activity). The balance may be in the form of a spreadsheet or a flow diagram that indicates all water sources and losses. All sources of water that input to the activity must be accounted for. Sources may include, but are not limited to:

a. Ground water from wells,
b. Ground water from water table dewatering or drainage,
c. Surface water withdrawals,
d. Collected rainfall, and
e. Recycled or reused water.

The uses of these water inputs are quantified, and the amount used and lost during each stage of the activity is calculated. All uses and losses must be listed. Uses and losses may include, but are not limited to:

a. Water used to wash the product,
b. Evaporation from settling/recirculation ponds,
c. Water retained and shipped with the product (product moisture),
d. Water used to separate or beneficiate the product, and\
e. Water used to transport the product (slurry).

The final disposal of all water then must be identified. Disposals may include, but are not limited to:

a. Off-site discharges,
b. Disposal/recharge through percolation ponds,
c. Disposal by spray irrigation,
d. Water entrained in clay materials, and
e. Recycling of wastewater.

The amount of water withdrawn should equal the sum of the system losses and disposals.

3. Other uses--determined by calculating the total withdrawal quantity minus the quantity for the uses identified above. Other uses may include lawn and landscape irrigation, outside use, air conditioning and cooling, fire fighting, water lost through leaks, and unaccounted uses. Other uses should generally not exceed 15% of total withdrawals. Applicants with other uses in excess of 15% may be required to address the reduction of such use through identification of specific uses or the reduction of system losses.

CONSERVATION PLANS FOR MINING AND DEWATERING USES WITHIN THE SWUCA

All permit applicants for ground water withdrawals within the SWUCA for mining or dewatering uses are required to submit a water conservation plan describing where and when water savings can be reasonably achieved and specifically addressing all components of use and loss in the water balance, including but not limited to recycling, reuse, landscaping and an implementation schedule to the District at time of application. Existing permittees with ground water withdrawals not previously within a Water Use Caution Area shall submit a conservation plan by January 1, 2003.
1-1-03

3.6 PUBLIC SUPPLY

In order to accurately calculate demand, public supply Applicants must identify the demand for each of the uses listed in this section. Information typically required to demonstrate reasonable demand for each component may include the number, type, and size of service connections; past monthly pumpage records by use type; projected permanent and seasonal population data for the service area; data on the specific uses; development projections; and data specific to the forecasting models used. Demand quantities should be based on quantities required by end-use customers, not withdrawal quantities. The quantities must be expressed in average annual gallons per day for each component of demand.

Where metering, billing, or other record-keeping methods do not provide accurate use estimates, the Applicant must provide the best estimates for each use type and must document the estimation method used.

In applications where a portion of the demand is derived from wholesale customers (e.g., a county utility sells water to a municipality), the Applicant must obtain and report demand information from each wholesale customer. This information is required to demonstrate that the quantities applied for are supported by reasonable demand. Per capita use guidelines and water conservation plans apply to wholesale customers as well as the Applicant.

All public supply Applicants must identify the demand for the following components:

1. Residential Use - shall be divided into single-family residential use and multi-family residential use in accordance with local government zoning policies;
2. Other metered uses - include all uses other than residential accounted for by meter;
3. Unaccounted uses - the total water system output minus all accounted uses above. Unaccounted use may include unmetered use, water lost through leaks, water used to flush distribution lines, firefighting, and other unidentified uses. This quantity generally should not exceed 15% of total distribution quantities. Applicants with unaccounted use greater than 15% may be required to address the reduction of such use through better accounting or reduction of unmetered uses or system losses; and
4. Treatment losses - significant treatment process losses such as reject water in desalination or backflush quantities associated with sand filtration systems. This component should only be calculated when such losses are significant.

1-1-03

PER CAPITA DAILY WATER USE

Per capita daily water use is a guideline used to measure the reasonable withdrawal requests of public supply Applicants. Per capita water use is generally considered to be population-related withdrawals associated with residential, business, institutional, industrial, miscellaneous metered, and unaccounted uses. Projected per capita daily use is calculated by adding the quantities identified for the uses shown in the previous list, except for treatment losses, and then dividing by the permanent or seasonally adjusted population of the service area. Where the per capita daily water use rate exceeds 150 gpd the applicant must address reduction of the high rate in the conservation plan.

SWUCA REQUIREMENTS

The following water conservation requirements designated to apply within the SWUCA shall apply to all public supply utilities and suppliers with Permits that are granted for an annual average daily quantity of 100,000 gallons per day or greater, as well as wholesale customers supplied by another entity which obtain an annual average daily quantity of 100,000 gallons per day or greater, either indirectly or directly under water use permits within the SWUCA, regardless of the name(s) on the water use permit. Failure of a wholesale customer to comply may result in modification of the wholesale permit to add a permit condition limiting or reducing the wholesale customer's quantities, or other actions by the District.
Transferred from Chapters 7.1 and 7.2, 1-1-07.

PER CAPITA DAILY WATER USE WITHIN THE SWUCA

Adjusted Gross Per Capita--Within the SWUCA permittees shall have an adjusted gross per capita daily water use rate no greater than 150 gallons per person per day (gpd). Permittees may deduct significant uses, treatment losses, and environmental mitigation. However significant uses must be reported if deducted and accounted for in a water conservation plan developed by the applicant/permittee which includes specific water conservation programs for each user or type of use, as described in the section "Deducted Water Uses Within the SWUCA", below. The formula used for determining adjusted gross per capita is as follows:

Year: 1955. Quantities in MGD, Average Annual/Peak Month					
Water Sources	Permitted Quantities	Projected Deman	Safe Yield	Safe Yield Balance	Permitted Q Balance
Wellfield A	30/40	30/40	30/35	0/-5	0/0
Wellfield B	10/15	10/15	8/12	-1/-3	0/0
Reservoir A	35/45	45/55	35/45	0/0	-10/-10
Proposed Source	20/40	10/30	40/60	+20/+20	+10/+10
Totals	95/140	95/140	103/142	+18/+12	0/0

In this example, the existing permitted sources show a deficit in safe yield by the year 1995 of 2 MGD on an Average Annual basis and 8 MGD on a Peak Month basis, as well as a deficit in permitted quantities of 10 MGD for both the Average and Peak Month. The proposed source shows a demand of 10 MGD Average and 30 MGD Peak Month, which, combined with the system deficit of 10 MGD average and 10 MGD Peak Month, results in proposed permitted quantities of 20 MGD Average and 40 MGD Peak Month. If permitted, this proposed source would satisfy system-wide demands as well as the safe yield deficit.

This type of information will be used to analyze the total demands of the entire interconnected service area in relation to the availability of the supply sources and permitted quantities. This analysis is useful to analyze the needs and sources of each demand area/supply source individually and the interrelationships among all users and sources.

CONSERVATION REQUIREMENTS WITHIN THE SWUCA

Water Audit--All water supply permittees within the SWUCA shall implement water audit programs within 2 years of permit issuance. Water audits which identify a greater than 12% unaccounted water shall be followed by appropriate remedial actions. A thorough water audit can identify what is causing unaccounted water and alert the utility to the possibility of significant losses in the distribution system. Unaccounted water can be attributed to a variety of causes, including unauthorized uses, line flushing, authorized unmetered uses, under-registration of meters, fire flows, and leaks. Any losses that are measured and verifiably documented are not considered unaccounted water. Large, complex water supply systems may conduct the audit in phases, with prior approval by the District. Each annual report shall state the percentage of unaccounted water. If any annual report reflects a greater than 12% unaccounted water, the permittee must complete a water audit within 90 days of submittal of the annual report. A water audit report shall be submitted within 90 days of completion of the water audit. The water audit report shall include a summary of the water audit and an implementation schedule for remedial actions to reduce the unaccounted water below 12%. The District shall take into account a permittee's adherence to the remedial action plan in any subsequent years when the permittee's annual report reflects greater than 12% unaccounted water.
1-1-03

Exemptions from Water Conservation Requirements--Permittees within the SWUCA whose permitted annual average quantity is less than 100,000 gallons per day are exempted from the residential water use report, water conserving rate structure, and water audit requirements.
1-1-03

GOAL-BASED WATER CONSERVATION PLANS

A public water supply utility may propose a goal-based water conservation plan that is tailored to its individual circumstances. Progress toward goals must be measurable. If the utility provides reasonable

7.0 WATER USE CAUTION AREAS

7.1 HIGHLANDS RIDGE WATER USE CAUTION AREA

All provisions of Section 7.1 deleted in their entirety 1-1-07.

7.2 EASTERN TAMPA BAY WATER USE CAUTION AREA

All provisions of Section 7.2 deleted in their entirety 1-1-07.

7.3 NORTHERN TAMPA BAY WATER USE CAUTION AREA

The Governing Board declared portions of Hillsborough, Pasco, and Pinellas Counties a Water Use Caution Area (WUCA) on June 28, 1989. The area designated is shown in Figure 7.3-1; the legal description is provided in Rule 40D-2.801(3)(c), F.A.C. As of the effective date of this rule, all existing water use permits within the Water Use Caution Area are modified to incorporate the applicable measures and conditions described below. Valid permits, legally in effect as of the effective date of this rule, are hereafter referred to as existing permits. Applicable permit conditions, as specified below, are incorporated into all existing water use permits in the Water Use Caution Area and shall be placed on new permits issued within the area. However, both the language and the application of any permit conditions listed may be modified when appropriate.

These portions of the Basis of Review for the Northern Tampa Bay Water Use Caution Area are intended to supplement the other provisions of the Basis of Review and are not intended to supersede or replace them. If there is a conflict between requirements, the more stringent provision shall prevail.

1. Public Supply

A wholesale public supply customer shall be required to obtain a separate permit to effect the following conservation requirements unless the quantity obtained by the wholesale public supply customer is less than 100,000 gallons per day on an annual average basis and the per capita daily water use of the wholesale public supply customer is less than the applicable per capita daily water use requirement outlined in Section 7.3 1.1.1.

The following water conservation requirements shall apply to all public supply utilities and suppliers with Permits that are granted for an annual average quantity of 100,000 gallons per day or greater, as well as wholesale customers supplied by another entity which obtain an annual average quantity of 100,000 gallons per day or greater, either indirectly or directly under water use permits within the Water Use Caution Area, regardless of the name(s) on the water use permit.

1.1 Per-Capita Use

Per-capita daily water use is defined as population-related withdrawals associated with residential, business, institutional, industrial, miscellaneous metered, and unaccounted uses. Permittees with per-capita daily water use which is skewed by the demands of significant water uses can deduct these uses provided that these uses are separately accounted. Generally, the formula used for determining gallons per day per capita is as follows: total withdrawal minus significant uses, environmental mitigation, and treatment losses, divided by the population served (adjusted for seasonal and tourist populations, if appropriate). For interconnected systems, incoming transfers and wholesale purchases of water shall be

The Permittee shall adopt a water conservation oriented rate structure no later than two years from the date of permit issuance. The Permittee shall submit a report describing the rate structure and its estimated effectiveness within 60 days following adoption.
1-1-03

1.3 Water Audit

All water supply utilities shall implement water audit programs by January 1, 1993. A thorough water audit can identify what is causing unaccounted water and alert the utility to the possibility of significant losses in the distribution system. Unaccounted water can be attributed to a variety of causes, including unauthorized uses, line flushing, authorized unmetered uses, under-registration of meters, fire flows, and leaks. Any losses that are measured and documented are not considered unaccounted water.

This requirement shall be implemented by applying the following permit condition to all existing Public Supply permits:

The permittee shall conduct water audits of the water supply system during each management period. The initial audit shall be conducted no later than January 1, 1993. Water audits which identify a greater than 12% unaccounted for water shall be followed by appropriate remedial actions. Audits shall be completed and reports documenting the results of the audit shall be submitted as an element of the report required in the per capita condition to the District by the following dates: January 1, 1993; January 1, 1997; January 1, 2001; and January 1, 2011. Water audit reports shall include a schedule for remedial action if needed.

Large, complex water supply systems may conduct the audit in phases, with prior approval by the District. A modified version shall be applied to new permits, replacing the initial audit date with a date two years forward from the permit issuance date. Prior to each management period, the District will reassess the unaccounted-for water standard of 12%, and may adjust this standard upward or downward through rulemaking.

1.4 *Residential Water Use Reports*

Beginning April 1, 1993, public supply permittees shall be required to annually report residential water use by type of dwelling unit. Residential dwelling units shall be classified into single family, multi-family (two or more dwelling units), and mobile homes. Residential water use consists of the indoor and outdoor water uses associated with these classes of dwelling units, including irrigation uses, whether separately metered or not. The permittee shall document the methodology used to determine the number of dwelling units by type and their quantities used. Estimates of water use based upon meter size may be inaccurate and will not be accepted.

This requirement shall be implemented by applying the following permit condition to all public supply permits:

Beginning in 1993, by April 1 of each year for the preceding fiscal year (October 1 through September 30), the permittee shall submit a residential water use report detailing:

a. The number of single family dwelling units served and their total water use,

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RECOMMENDED STANDARDS FOR WATER WORKS

Recommended Standards For Water Works

2003 Edition

Great Lakes – Upper Mississippi River Board of State and Provincial Public Health and Environmental Managers

Illinois Indiana Iowa Michigan Minnesota Missouri
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Recommended Standards For Water Works

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Policies for the Review and Approval of Plans and Specifications for Public Water Supplies

A Report of the Water Supply Committee of the
Great Lakes--Upper Mississippi River Board
of State and Provincial Public Health and Environmental Managers

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3.1.5.2 Construction

may require

a. approval from the appropriate regulatory agencies of the safety features for stability and spillway design,

b. a permit from an appropriate regulatory agency for controlling stream flow or installing a structure on the bed of a stream or interstate waterway.

3.1.5.3 Water Supply Dams

Water supply dams shall be designed and constructed in accordance with the requirements of the appropriate regulatory agency.

3.2 GROUNDWATER

A groundwater source includes all water obtained from dug, drilled, bored or driven wells, and infiltration lines.

3.2.1 Quantity

3.2.1.1 Source capacity

The total developed groundwater source capacity, unless otherwise specified by the reviewing authority, shall equal or exceed the design maximum day demand with the largest producing well out of service.

3.2.1.2 Number of sources

A minimum of two sources of groundwater shall be provided, unless otherwise specified by the reviewing authority.

3.2.1.3 Standby power

a. To ensure continuous service when the primary power has been interrupted, a standby power supply shall be provided through

   1. connection to at least two independent public power sources, or

   2. portable or in-place auxiliary power.

b. When automatic pre-lubrication of pump bearings is necessary, and an auxiliary power supply is provided, the pre-lubrication line shall be provided with a valved by-pass around the automatic control, or the automatic control shall be wired to the emergency power source.

3.2.2 Quality

3.2.2.1 Microbiological quality

6.2.7 Lighting

Pump stations shall be adequately lighted throughout. All electrical work shall conform to the requirements of the National Electrical Code or to relevant state and/or local codes.

6.2.8 Sanitary and other conveniences

All pumping stations that are manned for extended periods should be provided with potable water, lavatory and toilet facilities. Plumbing must be so installed as to prevent contamination of a public water supply. Wastes shall be discharged in accordance with Part 9.

6.3 PUMPS

At least two pumping units shall be provided. With any pump out of service, the remaining pump or pumps shall be capable of providing the maximum pumping demand of the system. The pumping units shall

a. have ample capacity to supply the peak demand against the required distribution system pressure without dangerous overloading,

b. be driven by prime movers able to meet the maximum horsepower condition of the pumps,

c. be provided with readily available spare parts and tools,

d. be served by control equipment that has proper heater and overload protection for air temperature encountered.

6.3.1 Suction lift

Suction lift shall

a. be avoided, if possible,

b. be within allowable limits, preferably less than 15 feet.

If suction lift is necessary, provision shall be made for priming the pumps.

6.3.2 Priming

Prime water must not be of lesser sanitary quality than that of the water being pumped. Means shall be provided to prevent either backpressure or backsiphonage backflow. When an air-operated ejector is used, the screened intake shall draw clean air from a point at least 10 feet above the ground or other source of possible contamination, unless the air is filtered by an apparatus approved by the reviewing authority. Vacuum priming may be used.

6.4 BOOSTER PUMPS

Booster pumps shall be located or controlled so that

a. they will not produce negative pressure in their suction lines,

b. pumps installed in the distribution system shall maintain inlet pressure as required in Section 8.2.1 under all operating conditions. Pumps taking suction from storage tanks shall be provided adequate net positive suction head,

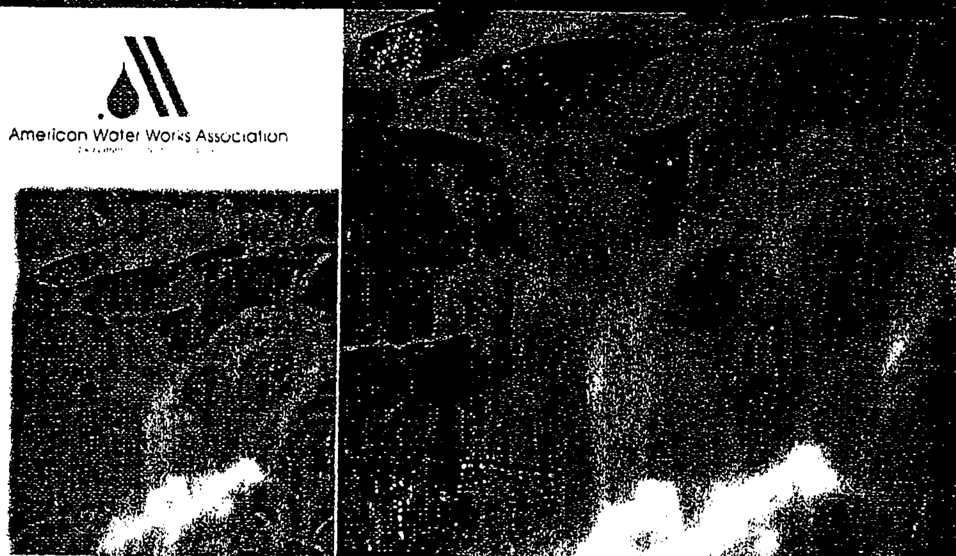
EX_RPR – 7

AWWA WATER DISTRIBUTION
SYSTEMS HANDBOOK

U S ARMY CORP OF ENGINEERS
DESIGN OF SMALL WATER SYSTEMS

McGRAW-HILL HANDBOOKS

American Water Works Association



WATER DISTRIBUTION SYSTEMS HANDBOOK

LARRY W. MAYS

3.2.2 Planning and Design Criteria

To plan and design a water distribution system effectively, criteria must be developed and adopted against which the adequacy of the existing and planned system can be compared. Typical criteria elements include the following:

- Supply
- Storage
- Fire demands
- Distribution system analysis
- Service pressures

3.2.2.1 Supply. In determining the adequacy of water supply facilities, the source of supply must be large enough to meet various water demand conditions and be able to meet at least a portion of normal demand during emergencies, such as power outages and disasters. At a minimum, the source of supply should be capable of meeting the maximum day system demand. It is not advisable to rely on storage to make up any shortfall in supply at maximum day demand. The fact that maximum day demand may occur several days consecutively must be considered by the system planner/designer. It is common for communities to provide a source of supply that meets the maximum day demand, with the additional supply to meet peak hour demand coming from storage. Some communities find it more economical to develop a source of supply that not only meets maximum day but also peak hour demand.

It is also good practice to consider standby capability in the source of supply. If the system has been designed so the entire capacity of the supply is required to meet the maximum demand, any portion of the supply that is placed out of service due to malfunction or maintenance will result in a deficient supply. For example, a community that relies primarily on groundwater for its supply should, at a minimum, be able to meet its maximum day demand with at least one of its largest wells out of service.

3.2.2.2 Storage. The principal function of storage is to provide reserve supply for (1) operational equalization, (2) fire suppression reserves, and (3) emergency needs.

Operational storage is directly related to the amount of water necessary to meet peak demands. The intent of operational storage is to make up the difference between the consumers' peak demands and the system's available supply. It is the amount of desirable stored water to regulate fluctuations in demand so that extreme variations will not be imposed on the source of supply. With operational storage, system pressures are typically improved and stabilized. The volume of operational storage required is a function of the diurnal demand fluctuation in a community and is commonly estimated at 25 percent of the total maximum day demand.

Fire storage is typically the amount of stored water required to provide a specified fire flow for a specified duration. Both the specific fire flow and the specific time duration vary significantly by community. These values are normally established through the local fire marshall and are typically based on guidelines established by the Insurance Service Office, a nonprofit association of insurers that evaluate relative insurance risks in communities.

Emergency storage is the volume of water recommended to meet demand during emergency situations, such as source of supply failures, major transmission main failures, pump failures, electrical power outages, or natural disasters. The amount of emergency storage included with a particular water system is an owner option, typically based on an assessment of risk and the desired degree of system dependability. In

CECW-ET Engineer Manual 1110-2-503	Department of the Army U.S. Army Corps of Engineers Washington, DC 20314-1000	EM 1110-2-503 27 February 1999
	Engineering and Design DESIGN OF SMALL WATER SYSTEMS	
	Distribution Restriction Statement Approved for public release; distribution is unlimited.	

assure that an adequate supply is available during critical periods (e.g., droughts).

c. Peak use. A measure of peak use, such as the maximum hourly use, maximum instantaneous use, or fire flow is needed to size distribution facilities (e.g., pipelines, booster pumps, storage) so that peak demands can be satisfied without overtaxing production and treatment facilities or causing excessive pressure losses.

d. Intermediate use. A measure of use between the average and peak values is ordinarily used in the hydraulic design of treatment facilities. Many engineers design treatment processes to operate normally at the average daily flow rate, but be hydraulically capable of passing a greater flow, say the maximum daily flow. This occasional "overloading" or "overrating" of the plant, or portions thereof (e.g., rapid sand filters), may be acceptable even though effluent quality is reduced to some extent. Alternatively, the plant may be designed to operate without overloading at the maximum daily use rate. In this situation, the plant may normally operate at process rates lower than those used in design, or various treatment units may be taken off line and held in reserve until needed. The latter approach is frequently used, especially with rapid sand filters. Another possibility is that the treatment plant may be designed to meet average demands by operating for only a portion of the day. Higher rates of demand can then be met rather easily by extending the hours of operation. This approach is usually uneconomical for larger cities, but can be very attractive for small operations.

4-3. Storage Requirements

a. Introduction. Depending upon the particular situation, several different types of storage facilities may be needed to ensure that an adequate water supply is always available. Examples include raw water storage (e.g., surface water impoundment), finished water storage at the treatment plant (e.g., clear well and backwash tank), and distribution storage (e.g., ground, elevated or hydropneumatic tanks). Regardless of the type of facility, the basic method used to determine the required storage volume is essentially the same.

b. Raw water storage.

(1) General. Where a surface water supply is used, it may be possible to design a supply system to operate without any raw water storage facility dedicated specifically to water supply. Examples might be a small town drawing water from a large multipurpose impoundment, or even a large city taking water from one of the Great Lakes. However, in the general case, some provision must be made to catch water during periods of moderate to high streamflow and store it for later use. The size of the storage facility required is usually determined based upon consideration of hydrologic information such as minimum dry-weather streamflow, average streamflow and rainfall/runoff patterns, and some average measure of water use, for example, the average daily use. The mass diagram, or Rippl, method has traditionally been used to determine storage requirements. This technique is amenable to either a simple graphical or more complex analytical approach, and is widely known since it is covered in many standard water supply and applied hydrology textbooks (Clark, Viessman, and Hammer 1977; Fair, Geyer, and Okun 1966a; Linaweaver, Geyer, and Wolff 1966; Salvato 1982; Steel and McGhee 1979). Essentially the same method is used to size equalization basins used in wastewater treatment (Metcalf and Eddy 1991). The mass diagram technique is very flexible and may be used in either a deterministic or probabilistic format. For more information the reader is directed to the references noted above.

(2) Design criteria. In the eastern United States, raw water reservoirs are usually designed to refill every year. In more arid regions, streamflow is less dependable and water must be stored during wet years for use during extended dry periods. Typical American practice over the last 50 or 60 years has been to size raw water storage facilities to be adequate to compensate for any drought condition expected to occur more often than once in about 20 years, plus some additional reserve storage allocation (e.g., 25 percent). This rule of thumb, combined with the implementation of use reduction measures when reservoir storage is depleted to some critical level, ordinarily results in a reasonable trade-off between storage requirements and user inconvenience. However, in recent years many other methods have appeared in the water supply literature. Regardless of the method used, it is important to consider the effects of evaporation, seepage, and siltation any time a reservoir is to be designed.

(3) Groundwater. When groundwater serves as the source of supply, no provision for long-term raw water storage is usually made. Short-term storage is, however, often useful. A good example is a situation where groundwater is extracted by a number of relatively low-yield wells (i.e., low-yield water supply to total water demand), pumped to a central storage tank and then withdrawn for distribution. This technique is especially useful for equalizing pumping rates when water from some, or all, of the wells requires treatment prior to distribution. The mass diagram approach mentioned in *b*(1) above may be used to size the storage tank so long as the inflow and outflow rates are known.

c. Finished water storage. Distribution storage facilities are used to meet peak demands (including fire flows), allow continued service when the supply is interrupted, equalize system pressures, eliminate continuous pumping, and facilitate the use of economical pipe sizes. While it is possible to size tanks using the mass diagram approach, it is more common to rely on various rules of thumb. Salvato (1982) suggests that, depending upon system size and type, distribution storage volume may vary from about one-half the average daily use, to the maximum daily use, to a 2- or 3-day supply. Even when rule-of-thumb criteria are used to size distribution storage facilities, it may be useful to conduct a mass diagram type of analysis (*b*(1) above) to ensure that peak demands can be met. Storage requirements for filter backwash tanks, clear wells, and other reservoirs can also be determined from mass diagrams if so desired.

4-4. Municipal Water Use

a. Introduction. As previously mentioned (paragraph 4-2*a*), municipal water use varies widely from city to city and from time to time for a given city. American Water Works Association (AWWA) (1975, 1981) and U.S. Geological Survey (1975) present data that indicate clearly that U.S. water use patterns vary considerably with geographical location. This point is further emphasized by the per capita water use data contained in Metcalf and Eddy (1991), Murray and Reeves (1972), and van der Leeder (1975).

b. Design approach. Design values for water use rates are usually determined as follows:

- Select the design period.
- Forecast the population to be served by the end of the design period.
- Estimate the expected average water use rate at the end of the design period.
- Estimate design use rates by multiplying the average use rate by selected factors.
- Determine the required fire demand from insurance requirements.
- From the various use rates calculated above, select those applicable to various system components.

A brief discussion of each step is outlined below. The same basic format is followed in later sections where rural, recreation area, military installation, and highway rest area systems are specifically addressed.

(1) Design period. As a general rule, the design period for portions of the system that may be readily enlarged (e.g., well fields and treatment plants) is chosen as 10 to 25 years. Components that are difficult and costly to enlarge (e.g., large dams) may be designed for a longer period, say 25 to 50 years. Prevailing interest rates are an important factor, with higher rates generally favoring shorter periods. The source of funds is also important. When funding assistance is available (e.g., in the form of grants or subsidized loans) there is a tendency to overdesign. In effect, this represents extension of the design period. Water lines serving residential areas are usually sized for full development since residential requirements in developing areas tend to change rapidly and replacement of such lines is costly.

(2) Population forecasts. Population forecasts are usually based on some combination of official census data; special studies made by various private and public interests (e.g., market surveys); the attitudes of local people (especially business and political leaders) toward expansion; and input from state, regional, and local planning agencies. Most states have developed population forecasting formulas that are adjustable for various regions within the given state. Because population forecasting has long been of interest to sanitary engineers, the topic is adequately covered in most standard water supply and wastewater engineering texts (Clark, Viessman, and Hammer 1977; Technical Manual 5-813-3; Fair, Geyer, and Okun 1966a; Metcalf and Eddy 1991; Steel and McGhee 1979).

(3) Average per capita use. Average per capita water use is usually determined from past experience in the local area or similar areas, regulatory agency requirements, or the water supply literature. Many studies of municipal water use have been reported and an overall average of about 450 to 800 liters per capita per day (L/cd) (100 to 175 gallons per capita per day (gpcd)) seems to be applicable for the United States. Publications prepared by the AWWA, U.S. Geological Survey and others (Metcalf and Eddy (1991), Murray and Reeves (1972), and van der Leeder (1975)) indicate an estimated national average of 755 L/cd (166 gpcd) for 1975. However, the reported range of values (less than 227 L/cd (50 gpcd) to more than 2273 L/cd (500 gpcd)) is so wide that specific knowledge about the area to be served should take precedence over national, or even regional, averages. A substantial improvement in water use forecasting can be realized by disaggregating municipal water use as described below.

(4) Disaggregated use. Municipal water use can be disaggregated (if sufficient data are available) and allocated to various water use sectors. An example scheme is shown in Table 4-1. Many other arrangements could, of course, be used. Typical allocations expressed as percentages of the average daily use are shown in Table 4-2. Disaggregation generally improves forecasting accuracy since the effects of such factors as climate (i.e., need for irrigation), commercial activity, industrial development, and water conservation programs can be readily considered. Residential water use can be further

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MATRIX

25-30.4325 Water Treatment and Storage Used and Useful Calculations

Proposed Rule	Comments	Alternative Rule
(1) Definitions. (a) A water treatment system includes all facilities, such as wells and treatment facilities, excluding storage, necessary to produce, treat, and deliver potable water to a transmission and distribution system.	No change recommended	(1) Definitions. (a) A water treatment system includes all facilities, such as wells and treatment facilities, excluding storage, necessary to produce, treat, and deliver potable water to a transmission and distribution system.
(b) Storage facilities include ground or elevated storage tanks and high service pumps.	No change recommended	(b) Storage facilities include ground or elevated storage tanks and high service pumps.
(c) Peak demand for a water treatment system includes the utility's maximum hour or day demand, excluding excessive unaccounted for water, plus a growth allowance based on the requirements of Rule 25-30.431, Florida Administrative Code, and, where fire flow is provided, a minimum of either the fire flow required by the local governmental authority or 2 hours at 500 gallons per minute.	No change recommended	(c) Peak demand for a water treatment system includes the utility's maximum hour or day demand, excluding excessive unaccounted for water, plus a growth allowance based on the requirements of Rule 25-30.431, Florida Administrative Code, and, where fire flow is provided, a minimum of either the fire flow required by the local governmental authority or 2 hours at 500 gallons per minute.
(d) Peak demand for storage includes the utility's maximum day demand, excluding excessive unaccounted for water, plus a growth allowance based on the requirements of Rule 25-30.431, Florida Administrative Code, and, where provided, a minimum of either the fire flow required by the local governmental authority or 2 hours at 500 gallons per minute.	No change recommended	(d) Peak demand for storage includes the utility's maximum day demand, excluding excessive unaccounted for water, plus a growth allowance based on the requirements of Rule 25-30.431, Florida Administrative Code, and, where provided, a minimum of either the fire flow required by the local governmental authority or 2 hours at 500 gallons per minute.
(e) Excessive unaccounted for water (EUW) is finished potable water produced in excess of 110 percent of the accounted for usage, including water sold; other water used, such as	May reword for clarification purposes.	(e) Excessive unaccounted for water (EUW) is unaccounted for water in excess of 10 percent of the amount produced.

for flushing or fire fighting; and water lost through line breaks.		
(2) The Commission's used and useful evaluation of water treatment system and storage facilities shall include a determination as to the prudence of the investment and consideration of economies of scale.	Add "and other relevant factors such as whether flows have decreased due to conservation or a reduction in the number of customers."	(2) The Commission's used and useful evaluation of water treatment system and storage facilities shall include a determination as to the prudence of the investment and consideration of economies of scale and other relevant factors, such as whether flows have decreased due to conservation or a reduction in the number of customers.
(3) Separate used and useful calculations shall be made for the water treatment system and storage facilities. However, if the utility believes an alternative calculation is appropriate, such calculation may also be provided, along with supporting documentation.	Change "However, if the utility believes an alternative calculation is appropriate, such calculation" to "An alternative calculation" Add "and justification, including but not limited to service area restrictions, factors involving treatment capacity, well drawdown limitations, and changes in flow due to conservation or a reduction in number of customers."	(3) Separate used and useful calculations shall be made for the water treatment system and storage facilities. An alternative calculation may also be provided, along with supporting documentation and justification, including but not limited to service area restrictions, factors involving treatment capacity, well drawdown limitations, and changes in flow due to conservation or a reduction in number of customers.
(4) A water treatment system is considered 100 percent used and useful if: (a) The system is the minimum size necessary to adequately serve existing customers plus an allowance for growth and fire flow; or (b) The service territory the system is designed to serve is mature or built out and there is no potential for expansion of the service territory; or (c) The system is served by a single well.	No change recommended	(4) A water treatment system is considered 100 percent used and useful if: (a) The system is the minimum size necessary to adequately serve existing customers plus an allowance for growth and fire flow; or (b) The service territory the system is designed to serve is mature or built out and there is no potential for expansion of the service territory; or (c) The system is served by a single well.
(5) The used and useful calculation of a water treatment system is made by dividing the peak demand by the	No change recommended	(5) The used and useful calculation of a water treatment system is made by dividing the peak demand by the

firm reliable capacity of the water treatment system.		firm reliable capacity of the water treatment system.
(6) The firm reliable capacity of a water treatment system is equivalent to the pumping capacity of the wells, excluding the largest well for those systems with more than one well. However, if the pumping capacity is restricted by a limiting factor such as the treatment capacity or draw down limitations, then the firm reliable capacity is the capacity of the limiting component or restriction of the water treatment system. In a system with multiple wells, if a utility believes there is justification to consider more than one well out of service in determining firm reliable capacity, such circumstance will be considered. The utility must provide support for its position, in addition to the analysis excluding only the largest well.	Delete after first sentence and move substance to (3)	(6) The firm reliable capacity of a water treatment system is equivalent to the pumping capacity of the wells, excluding the largest well for those systems with more than one well.
(a) Firm reliable capacity is expressed in gallons per minute for systems with no storage capacity. (b) Firm reliable capacity is expressed in gallons per day, based on 12 hours of pumping, for systems with storage capacity.	No change recommended	(a) Firm reliable capacity is expressed in gallons per minute for systems with no storage capacity. (b) Firm reliable capacity is expressed in gallons per day, based on 12 hours of pumping, for systems with storage capacity.
(7) Peak demand is based on a peak hour for a water treatment system with no storage capacity and a peak day for a water treatment system with storage capacity.	No change recommended	(7) Peak demand is based on a peak hour for a water treatment system with no storage capacity and a peak day for a water treatment system with storage capacity.
(a) Peak hour demand, expressed in gallons per minute, shall be calculated as follows: 1. The single maximum day (SMD) in the test year unless there is an unusual occurrence on that day, such as a fire or line break, less excessive unaccounted for water, divided by	Change "30-day period" to "maximum month"	(a) Peak hour demand, expressed in gallons per minute, shall be calculated as follows: 1. The single maximum day (SMD) in the test year unless there is an unusual occurrence on that day, such as a fire or line break, less excessive unaccounted for water, divided by

1440 minutes in a day, times 2 [((SMD-EUW)/1,440) x 2], or 2. The average of the 5 highest days (AFD) within a 30-day period in the test year, excluding any day with an unusual occurrence, less excessive unaccounted for water, divided by 1440 minutes in a day, times 2 [((AFD-EUW)/1,440) x 2], or 3. If the actual maximum day flow data is not available, 1.1 gallons per minute per equivalent residential connection (1.1 x ERC).		1440 minutes in a day, times 2 [((SMD-EUW)/1,440) x 2], or 2. The average of the 5 highest days (AFD) within a maximum month in the test year, excluding any day with an unusual occurrence, less excessive unaccounted for water, divided by 1440 minutes in a day, times 2 [((AFD-EUW)/1,440) x 2], or 3. If the actual maximum day flow data is not available, 1.1 gallons per minute per equivalent residential connection (1.1 x ERC).
(b) Peak day demand, expressed in gallons per day, shall be calculated as follows: 1. The single maximum day in the test year, if there is no unusual occurrence on that day, such as a fire or line break, less excessive unaccounted for water (SMD-EUW), or 2. The average of the 5 highest days within a 30-day period in the test year, excluding any day with an unusual occurrence, less excessive unaccounted for water (AFD-EUW), or 3. If the actual maximum day flow data is not available, 787.5 gallons per day per equivalent residential connection (787.5 x ERC).	Change "30-day period" to "maximum month"	(b) Peak day demand, expressed in gallons per day, shall be calculated as follows: 1. The single maximum day in the test year, if there is no unusual occurrence on that day, such as a fire or line break, less excessive unaccounted for water (SMD-EUW), or 2. The average of the 5 highest days within a maximum month in the test year, excluding any day with an unusual occurrence, less excessive unaccounted for water (AFD-EUW), or 3. If the actual maximum day flow data is not available, 787.5 gallons per day per equivalent residential connection (787.5 x ERC).
(8) The used and useful calculation of storage is made by dividing the peak demand by the usable storage of the storage tank. Usable storage capacity less than or equal to the peak day demand shall be considered 100 percent used and useful. A hydropneumatic tank is not considered usable storage.	No change recommended	(8) The used and useful calculation of storage is made by dividing the peak demand by the usable storage of the storage tank. Usable storage capacity less than or equal to the peak day demand shall be considered 100 percent used and useful. A hydropneumatic tank is not considered usable storage.
(9) Usable storage determination	No change recommended	(9) Usable storage determination

shall be as follows: (a) An elevated storage tank shall be considered 100 percent usable. (b) A ground storage tank shall be considered 90 percent usable if the bottom of the tank is below the centerline of the pumping unit. (c) A ground storage tank constructed with a bottom drain shall be considered 100 percent usable, unless there is a limiting factor, in which case the limiting factor will be taken into consideration.		shall be as follows: (a) An elevated storage tank shall be considered 100 percent usable. (b) A ground storage tank shall be considered 90 percent usable if the bottom of the tank is below the centerline of the pumping unit. (c) A ground storage tank constructed with a bottom drain shall be considered 100 percent usable, unless there is a limiting factor, in which case the limiting factor will be taken into consideration.
(10) To determine whether an adjustment to plant and operating expenses for excessive unaccounted for water will be included in the used and useful calculation, the Commission will consider all relevant factors, including whether the reason for excessive unaccounted for water during the test period has been identified, whether a solution to correct the problem has been implemented, or whether a proposed solution is economically feasible.	No change recommended	(10) To determine whether an adjustment to plant and operating expenses for excessive unaccounted for water will be included in the used and useful calculation, the Commission will consider all relevant factors, including whether the reason for excessive unaccounted for water during the test period has been identified, whether a solution to correct the problem has been implemented, or whether a proposed solution is economically feasible.
(11) In its used and useful evaluation, the Commission will consider other relevant factors, such as whether flows have decreased due to conservation or a reduction in the number of customers.	Delete and move substance to (2)	

BEFORE THE FLORIDA PUBLIC SERVICE COMMISSION

In re: Proposed adoption of Rule 25-30.4325, F.A.C., Water Treatment Plant Used and Useful Calculations.	DOCKET NO. 070183-WS DATED: DECEMBER 17, 2007

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that a true and correct copy of the DIRECT TESTIMONY OF Richard P. Redemann has been furnished by U.S. Mail to the following this 17th day of December, 2007:

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