DOCKET NO.: 020071-WS - Application for rate increase in Marion, Orange, Pasco, Pinellas, and Seminole Counties by Utilities, Inc. of Florida.

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

DATE FILED: June 16, 2003

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. Prior to my work at the Commission I worked for the Wisconsin Department of Transportation during the summers in 1980 and 1982 through 1983. In May through November, 1981, I worked for an engineering testing lab in Appleton and LaCrosse, WI. I have been employed by the Florida Public Service Commission (FPSC or Commission) for 19 years. A copy of my resume is attached. (EX__ RPR-1)

Q. What is your current position at the Commission?

A. I am a Utility Systems/Communications Engineer and have worked in this position since 1990.

Q. Are you a Registered Professional Engineer?

A. Yes, I became a Registered Professional Engineer in the State of Florida in 1989.

Q. What are your general responsibilities at the Florida Public Service Commission?

A. I review, analyze, and make recommendations regarding the engineering aspects of original, grandfather, transfer, and amendment certification cases, rate cases, and overearnings cases. I have also 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). I also filed testimony in 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 Useppa 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 overearings), 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 Docket No. 020071-WS?

A. The purpose of my testimony is to discuss and recommend the appropriate methodology to be used for determining the amount of used and useful plant and review of expenses for the Utilities, Inc. of Florida (UIF or utility) water and wastewater systems.

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

A. I reviewed UIF's minimum filing requirements (MFRs) for the water and wastewater systems in this case (Docket No. 020071-WS), as well as Commission orders in which a used and useful determination was made for the UIF systems and other water utilities. I conducted an inspection of the Seminole and Orange County systems on October 28-31, 2002, and November 1, 2002. I also reviewed several American Water Works Association (AWWA) publications related to water distribution system design and some of the consumptive use permit

(CUP) and water conservation rules for the Water Management Districts (WMDs).

Q. Can you explain your recommended methodology for determining the amount of used and useful plant for small water systems?

A. Yes. I prepared EX__ RPR-2 to summarize my recommended methodology and assumptions for determining the amount of used and useful plant for water systems. There is no current rule on evaluating used and useful for water systems. Although water systems are uniquely designed to meet the anticipated demands for a particular development, I believe that the formulas and assumptions shown on EX__ RPR-2 reflect a reasonable approach to determine the amount of used and useful plant for most water systems. The bases of the recommended formulas and assumptions are Commission practice and other generally accepted industry standards.

Q. What is the basic formula for determining used and useful plant for water system?

A. The sum of the utility's current demand on the system, reduced by excessive unaccounted for water, plus required fire flow, plus an allowance for growth, is compared to the system capacity to determine the percentage of plant that is used and useful.

Q. What are some of the basic assumptions inherent in your recommendation?

A. The used and useful formula I am recommending is for systems with potential growth in the service territory. I assume that the wells for a given service territory are not oversized. If the wells or other system components are oversized, then prudence and economies of scale should be considered. However, 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.

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; in Order No. PSC-99-0243-FOF-WU, issued February 9, 1999, in Docket No. 980726-WU; in Order No. PSC-00-0807-PAA-WU, issued April 25, 2000, in Docket No. 991290-WU; and in Order No. PSC-96-1320-FOF-WS, issued: October 30, 1996, in Docket No. 950495-WS.

Q. Are some of the UIF water service territories built out?

A. Yes. All of the UIF water service territories in Seminole, Pinellas, and Orange Counties and all of the water systems in Pasco County except Summertree appear to be built out. Many of these subdivisions are 20 - 50 years old and no significant growth has occurred in these systems in years.

Q. Should the UIF water systems in Seminole, Pinellas, and Orange Counties and all of the water systems in Pasco County except Summertree be considered 100% used and useful because the service territories are built out?

A. Yes. It does not appear that the wells were oversized and there is no apparent potential for expansion in those areas. Therefore, they should be considered 100% used and useful.

Q. Has the Commission previously determined used and useful for those water systems?

A. Yes. In the last rate case for the Seminole and Orange County systems and the Orangewood system in Pasco County, Docket No. 940917-WS, all of the systems were found to be 100% used and useful except for the Crescent Heights

water system that has now been taken off-line (Order No. PSC-95-0574-FOF-WS, issued May 9, 1995). The last rate case for the Lake Tarpon system in Pinellas County was Docket No. 930826-WS. By Order No. PSC-94-1104-FOF-WS, issued September 7, 1994, in that docket, a partial stipulation of Order No. PSC-94-0739-FOF-WS, issued June 16, 1994, was approved finding the Lake Tarpon water system 100% used and useful. I do not believe that a rate case order exists for the Buena Vista water system in Pasco County. However, transfer Order No. PSC-01-1655-PAA-WS, issued August 13, 2001, in Docket No. 000793-WS indicates that the system was virtually built out when it came under Commission jurisdiction in July, 1972.

Q. Which of the UIF water systems are not built out?

A. The Summertree water system in Pasco County and the Golden Hills water system in Marion County are not built out.

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.

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

A. Yes. This method has been used by the Commission in several dockets including Docket No. 991290-WU, by Order No. PSC-00-0807-PAA-WU, issued April 25, 2000 and in Docket No. 950495-WS, by Order No. PSC-96-1320-FOF-WS, issued October 30, 1996.

Q. How should firm reliable capacity be determined for those water systems that have more than one well and are not built out?

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" 1997 Edition, published by Heath Education Services, which is commonly referred to as the Ten States Standards.

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

A. Yes. This method has been used by the Commission in Order No. PSC-02-0656-PAA-WU, issued May 14, 2002, in Docket No. 992015-WU; in Order No. PSC-96-1320-FOF-WS, issued October 30, 1996, in Docket No. 950495-WS; in Order No. PSC-93-0423-FOF-WS, issued March 22, 1993, in Docket No. 920199-WS; and in Order No. PSC-02-1449-PAA-WS, issued October 21, 2002, in Docket No. 011451-WS.

Q. How does water storage capacity affect the utility's ability to meet peak demand?

A. The utility must be able to meet the peak demands on the system. For example, 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 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 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, and has caused saltwater intrusion, land subsidence and wells to collapse. The use of 12 hours per day of pumping also reflects the general usage pattern of customers. In addition, usable storage should be included in the system capacity. All elevated storage capacity is typically usable, however, a portion of the ground storage capacity is not usable because all of the water (approximately 10%) cannot physically be pumped into the system.

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

A. Yes. This method has been used by the Commission in numerous rate cases, including Order No. PSC-02-1449-PAA-WS, issued October 21, 2002, in Docket No. 011451-WS; Order No. PSC-02-0656-PAA-WU, issued May 14, 2002, in

Docket No. 992015-WU; Order No. PSC-01-1574-PAA-WS, issued July 30, 2001, in Docket No. 000584-WS; Order No. PSC-00-1774-PAA-WU, issued September 27, 2000, in Docket No. 991627-WU; Order No. PSC-01-2385-PAA-WU, issued December 10, 2001 in Docket No. 010403-WU; and Order No. PSC-96-1320-FOF-WS, issued October 30, 1996, in Docket No. 950495-WS.

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

A. For systems with storage, the single maximum day flow during the test year as reflected in the utility's DEP monthly operating reports should be used unless it appears that some extraordinary event occurred during the period, such as a main break or a fire. If such an anomaly is believed to have occurred during the test period, the average of the five highest days within a 30 day period during the test year should be used.

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

A. For systems with little or 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. Consistent with my previous testimony regarding firm reliable capacity, removing the largest well is consistent with the "Recommended Standards for Water Works" or 10 states standards.

Q. How should the utility's current demand be determined for water systems that have little or no storage capacity?

A. For systems with little or no storage, the demand should be based on a peak hour instead of a peak day. Since utilities do not have hourly flow data, the peak hour demand should be estimated based on the maximum day flow

divided by the number of minutes in a day (1440) to get an average flow rate per minute for the maximum day and then multiplied times 2. The assumption is that the average gallons per minute on the peak day does not reflect the peak hourly demand and therefore, should be multiplied by 2 to recognize that the utility must be able to meet the peak hour demand.

Q. What is the basis for multiplying the maximum day flows by 2 to estimate peak hour flows for water systems?

A. The peaking factors are based on the American Water Works Association (AWWA) Manual of Water Supply Practices, Distribution Network Analysis for Water Utilities, M32. According to the manual, ratio of peak hour demand to maximum day demand has been observed to vary from 1.3-2.0:1.0. (EX__ RPR-3)

Q. Has the Commission approved used and useful calculations using the peak hour for water systems without storage capacity in other cases?

A. Yes. 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).

Q. How should the utility's current demand be determined for water systems that do not have adequate Department of Environmental Protection (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. The peak hour design criteria is 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 AWWA M32 manual regarding average to peak hour flows.

Q. Has the Commission approved used and useful calculations using 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 dockets such as Docket No. 020406-WU, by Order No. PSC-03-0008-PAA-WU, issued January 2, 2003.

Q. Do you agree with the conclusions in the testimony of Mr. Frank Seidman on used and useful for the water systems?

A. Yes. I generally agree with his conclusions on used and useful for the water systems.

Q. Do you agree with Mr. Frank Seidman's use of instantaneous flows to determine customer demand for the water systems?

A. No. Mr. Seidman used instantaneous flows to represent the customer demand for all of the UIF water systems, regardless of whether actual usage data was available. Instantaneous flow is a design criteria that is used to estimate the water capacity needed for a development based on the anticipated number of customers. The instantaneous flow requirements per customer are assumed to be high for a small customer base and taper off for a larger customer base. There is limited information available on instantaneous flow

criteria. Typical references for the design of water systems include the maximum day and peak hour. I believe that if water flow data is available, used and useful should be based on actual flows using the formulas and assumptions I have previously described. If actual flow data is not available, I believe that peak hour demand of 1.1 gallons per minute per residential connection should be used to determine used and useful plant for small water systems with little or no storage.

Q. Has the Commission commented on the use of instantaneous demand in determining used and useful recently?

A. Yes. In Order No. PSC-03-0647-PAA-WS, issued May 28, 2003, in Docket No. 020407-WS the Commission found that "... without actual measurements for the peak hour or minute demand, some type of estimation is appropriate in order to recognize the utility's demand requirements based on the number of customers during the test year. While we find that the water system is 100% used and useful, we disagree with the utility's method to determine the water customer demand factor. The utility's instantaneous demand estimate was based on a 1965 publication by Joseph S. Ameen, entitled *Community Water Systems Source Book*." The order also states, "We note that instantaneous demand to determine the amount of customer demand on a system without water storage is not commonly used. While maximum day and peak hour demand calculations are common in engineering design manuals for building water systems, the publication referenced by the utility is 38 years old, and is not commonly used today. We believe that this document does not necessarily reflect current water usage patterns by the utility's customers or the trend toward water conservation."

Q. Have you compared Mr. Seidman's methodology with the formulas and assumptions you are recommending to determine used and useful plant for the water systems in this case?

A. Yes. I prepared EX__ RPR-4. This table shows the number and size of wells for the small UIF water systems (excluding the Crescent Heights and Davis Shores systems in Orange County and Wis-Bar in Pasco County, where all water is purchased). The table provides a comparison of the maximum day flows, estimated peak hour demand based on a peaking factor of 2, design peak hour demand based on the number of connections, and Mr. Seidman's proposed instantaneous demand criteria.

Q. How do the estimated peak hour flows compare with the design peak hour and instantaneous demand criteria?

A. In each instance, the instantaneous demand criteria is significantly higher than the estimated peak hour demand based on actual customer usage. Further, in most instances the instantaneous demand criteria is significantly higher than the total available well capacity. If the instantaneous demand actually occurred, there would be pressure problems in many of the systems.

Q. Are you aware of any pressure problems in the water systems?

A. No. I am not aware of any pressure problems.

Q. Has the utility proposed adding any pro forma water plant to increase the capacity of the water systems?

A. No.

Q. What do you conclude?

A. The instantaneous demand criteria does not appear to correlate with the actual demands of the customers.

Q. Based on your proposed assumptions and formulas, what is the appropriate used and useful percentage for the Summertree water system in Pasco County and the Golden Hills water system in Marion County?

A. The Summertree water system has four wells and no storage capacity. If the largest well is removed, the firm reliable capacity is 720 gpm. The sum of the peak hour demand of 460 gpm plus the required fire flow of 1,000 gpm equals 1,460 gpm, which exceeds the firm reliable capacity of 720 gpm. The approximate 2% growth and 6.2% excessive unaccounted for water would have little effect on the calculation. Because the demand on the water system is greater than the firm reliable capacity, the Summertree water system should be considered 100% used and useful. The Golden Hills water system has two wells and no storage capacity. If the largest well is removed, the firm reliable capacity is 330 gpm. The sum of the peak hour demand of 535 gpm and the required fire flow of 500 gpm equals 1,035 gpm, which exceeds the firm reliable capacity of 535 gpm. The approximate 3% growth and 12.2% excessive unaccounted for water would have little effect on the calculation. Because the demand on the water system is greater than the firm reliable capacity, the Golden Hills water system should be considered 100% used and useful.

Q. Has the Commission ever made a used and useful determination for the Summertree and Golden Hills water systems?

A. Yes. In the last rate case for the Summertree water system in Pasco County (previously known as Paradise Point West), Docket No. 910020-WS, the water system was found to be 100% used and useful in Order No. 25821, issued February 27, 1992. The last rate case for the Golden Hills system in Marion County was Docket No. 930826-WS. By Order No. PSC-94-1104-FOF-WS, issued

September 7, 1994, in that docket, a partial stipulation of Order No. PSC-94-0739-FOF-WS, issued June 16, 1994, was approved finding the Golden Hills system 100% used and useful.

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 should maintain a record 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. Unaccounted for water is a concern for two reasons. One, water is a limited natural resource that must be conserved to assure adequate supply and water utilities should be taking reasonable steps to avoid losses through line

leaks and other unaccounted for losses. Two, the cost of excessive unaccounted for water should not be borne by rate payers.

Q. Do some of the utility's Seminole, Orange, Marion, Pasco and Pinellas Counties systems have unaccounted for water?

A. Yes. According to the utility's Financial, Rate and Engineering Minimum Filing Requirements, Schedule F-1, the following systems have unaccounted for water:

<u>Seminole County</u>	
Weathersfield	10.2%
Little Wekiva	13.0%
Phillips	16.8%
Crystal Lake	3.2%
Ravenna Park	10.8%
Bear Lake	5.6%
Jansen	1.5%
<u>Orange County</u>	
Crescent Heights	10.3%
Davis Shores	2.1%
<u>Marion County</u>	
Golden Hills/Crownwood	22.2%
<u>Pasco County</u>	
Buena Vista	10.2%
Orangewood	17.5%
Summertree	16.2%
Wis-Bar	2.4%

Pinellas County

Lake Tarpon 20.6%

Q. Should an adjustment be made for unaccounted for water?

A. It is Commission practice to allow 10% of the total water produced or purchased as acceptable unaccounted for water. The chemical and electrical 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.

Q. How was over 10% determined to be an excessive amount of unaccounted for water?

A. This has been a long-standing Commission practice. In addition, I reviewed several American Water Works Association (AWWA) publications and some of the water management district rules related to consumptive use permits and water conservation that seem to support 10% as a reasonable amount of unaccounted for water. The AWWA M8 Manual on Water Distribution Training Course published in 1962 states on page 11, "A fair average of unaccounted for water might be 10-20% for fully metered systems with good meter maintenance programs and average conditions of service." (EX__ RPR-5) In a more recent publication, page 31 of the AWWA M32 Manual on Distribution Network Analysis for Water Utilities published in 1989 states, "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 common place than in newer systems. Systems operating at high pressures usually will experience a high loss percentage." (EX__ RPR-6) The St. Johns River Water Management District Rule 12.2.5 on Consumptive Use Permits (CUPs) and water conservation requires the utility 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-7) The Southwest Florida Water Management District Consumptive Use Permit handbook requires water systems in the Northern Tampa Bay Water Use Caution Area (Pasco and Pinellas County) to perform water audits. If the 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. For water systems that are not in a Water Use Caution Area (Marion County), 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-8)

Q. Should an adjustment be made for unaccounted for water for these systems?

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 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 are 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% and the utility has not taken steps to reduce the water loss, a reduction in chemical and electrical expense 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. It is important to reduce the amount of unaccounted for water because water is a limited resource that should be protected.

Q. Which systems have over 10% unaccounted for water?

A. For the systems in Seminole County of Weathersfield (10.2%), and Ravenna Park (10.8%), the Crescent Heights system in Orange County (10.3%), and the Buena Vista system in Pasco County (10.2%), which have over 10% unaccounted for water, staff believes that unaccounted for water is reasonable. In addition, the adjustment on such small amounts of unaccounted for water would be immaterial. Staff believes that only Little Wekiva (13.0%) and Phillips (16.8%) in Seminole County, Golden Hills/Crownwood (22.2%) in Marion County, Orangewood (17.5%), Summertree (16.2%) in Pasco County, and Lake Tarpon (20.6%) in Pinellas County have excessive unaccounted for water.

Q. Has the utility addressed the unaccounted for water for those systems with more than 10% unaccounted for water?

A. Yes. In response to Staff Interrogatory No. 69 and Staff's Production of Document Request No. 5, the utility provided a copy of a water audit and a letter dated January 24, 2003 from Mr. David Hanna, State Water Circuit Rider for the Florida Rural Water Association to Mr. Scotty Haws. In the letter, Mr. Hanna made specific recommendations for several of those systems. For example, he recommended that the utility change out the meters determined to be 10 years old or older and repair main leaks. The utility is currently

developing a meter change out program for the Little Wekiva system which is expected to be completed by September, 2003, at the recommendation of the Florida Rural Water Association. A main leak at the Phillips system has been repaired and the master meter is being scheduled for replacement. The Phillips system customers are billed bi-monthly and only one bill has been sent since the repair was completed. When the results of the next billing are available, the utility will be able to better quantify the relationship between pumped and unaccounted for water.

Q. What adjustments should be made for unaccounted for water?

A. The electrical and chemical expenses for systems with unaccounted for water in excess of 10% should be reduced. For the Golden Hills/Crownwood water system, a reduction of $140.42 ($1,150 x .122 = $140.42) should be made to Account No. 618 Chemicals and a reduction of $1,325.03 ($10,852 x .122 = $1,325.03) should be made to Account No. 615 Purchased Power. The utility combined all chemical and electrical expenses for its water systems in Pasco County. Therefore, an adjustment for unaccounted for water should be based on the sum of the total water pumped less the total gallons accounted for in Pasco County. Since the Wis-Bar system purchases water and does not use any chemicals or electricity to repump the water, it would not have any chemical or purchased power costs. The total unaccounted for water for the Pasco County water systems is 14.49%. Therefore, a reduction of $210.99 ($4,699 x .0449 = $210.99) should be made to Account No. 618 Chemicals and a reduction of $699.90 ($15,588 x .0449 = $699.90) should be made to Account No. 615 Purchased Power for excessive unaccounted for water. For the Lake Tarpon water system, the total unaccounted for water was 20.63%. Therefore, a

reduction of $22.32 ($210 x .1063 = $22.32) should be made to Account No. 618 Chemicals and a reduction of $271.81 ($2,557 x .1063 = $271.81) should be made to Account No. 615 Purchased Power for excessive unaccounted for water. The calculations are detailed in EX__ RPR-9.

Q. Do you agree with the utility's used and useful calculations for its water distribution systems?

A. Yes. I agree with the utility's proposal that all of its water distribution systems be considered 100% used and useful. All of the water systems are built-out, with the exception of Summertree in Pasco County and Golden Hills in Marion County. The Summertree water distribution system is fully contributed and therefore a used and useful adjustment is not necessary. The Golden Hills water distribution system should be considered 100% used and useful based on the existing connections, plus an allowance for growth.

Q. Have you looked at the utility's used and useful calculations for its wastewater systems?

A. Yes. The utility currently has only one wastewater treatment plant, and that plant is the Crownwood plant in Marion County.

Q. Did the utility use the proper used and useful methodology for the Crownwood wastewater treatment plant?

A. Yes. The utility proposed a 68.65% used and useful allowance for the Crownwood wastewater treatment plant and I agree with that calculation. The utility's calculations appear to be consistent with Rule 25-30.432, Florida Administrative Code.

Q. Do you agree with the utility's used and useful calculations for the wastewater collection systems?

A. Yes. The wastewater service areas are built-out, with the exception of Summertree in Pasco County. The systems that are built-out are 100% used and useful. In the last rate case order for Summertree, the Commission found that the wastewater interconnection (master lift station and force main) was 100% used and useful and the collection lines were contributed and therefore, a used and useful adjustment was not necessary.

Q. Has the Commission previously determined used and useful for the wastewater collection systems?

A. Yes. The Commission determined that they were 100% used and useful.

Q. Does the utility have infiltration/inflow problems in any of the wastewater collection systems?

A. Yes. The utility has an infiltration/inflow problem in the Ravenna Park/Lincoln Heights wastewater system in Seminole County.

Q. What causes infiltration/inflow problems in a wastewater collection systems?

A. Infiltration results from groundwater entering a wastewater collection system through broken or defective pipe and joints. Inflow results from water entering a wastewater collection system through manholes and lift stations.

Q. How did you determine that infiltration/inflow was a problem for the Ravenna Park/Lincoln Heights wastewater collection system?

A. The total amount of water sold was compared to the amount of wastewater treated. For the seven bi-monthly billing cycles in the test year, the total water sold to the residential customers was 21.205528 million gallons (mg), and the total water sold to the general service customers was 3.145380 mg.

The annualized amount for 12 months would be 20.647469 mg. The Commission has recognized that not all water is returned as wastewater. The Commission typically assumes that 80% of the water purchased by residential customers is returned as wastewater and 96% of the water purchased by general service customers is returned as wastewater. In Staff's Interrogatories Nos. 25 and 26, Mr. Lubertozzi responded that these percentages are reasonable. Therefore, the water returned as wastewater would be expected to be 16.920644 mg for the test year. In the Financial, Rate and Engineering Minimum Filing Requirements - Seminole County - Ravenna Park - Page 182, Schedule F-2 shows that the total wastewater treated was 31.155 mg for the test year. Therefore, it appears that approximately 184.1242% of the customers' water purchased was returned as wastewater. I would expect no more than 100% from this estimation.

Q. Please describe the Ravenna Park/Lincoln Heights wastewater collection system.

A. The Ravenna Park/Lincoln Heights wastewater collection system is made up primarily of vitrified clay pipes (VCP), which are more brittle and the construction joints are not as tight when compared to more modern pipes. Also, as explained by Mr. Steven M. Lubertozzi in response to Staff's Interrogatory No. 54, the Ravenna Park system was dedicated to public service on March 5, 1959.

Q. What do you believe is the appropriate method for estimating the amount of infiltration/inflow?

A. Based on the Water Pollution Control Federation Manual of Practice No. 9, Design and Construction, the allowance for infiltration should be 500

gpd/inch-diameter/mile for all pipes. In addition, I recommend that an additional allowance be added for inflow. Mr. Lubertozzi agreed that these numbers are reasonable in response to Staff's Interrogatory No. 27.

Q. Based on your proposed methodology, did the utility estimate the amount of infiltration in the Ravenna Park/Lincoln Heights wastewater collection system?

A. Yes. In response to Staff Interrogatory No. 65, Mr. Orr responded that there are 6,068 linear feet of 8-inch diameter VCP collection mains along with an additional 2,400 to 5,000 feet of service laterals. In response to Staff Interrogatory No. 66, Mr. Orr also responded that the infiltration allowance from the collection mains is about 4,559 gpd or 1,664,035 gallons per year and adding the length of service laterals in the system could increase the allowance to 8,300 gpd or 3,030,000 gallons per year.

Q. Based on your proposed methodology, did the utility estimate the amount of inflow in the Ravenna Park/Lincoln Heights wastewater collection system?

A. Yes. In response to Staff Interrogatory No. 67, Mr. Orr responded that for the period of October 2001 to September 2002, the water sold to wastewater customers was equal to 20.775 mg. Therefore, the inflow allowance based upon 10% of the water sold would be 2.0775 mg. While the period of October 2001 to September 2002 is not the test year, staff believes that this is a reasonable estimate for the test year, because the customers live there year round.

Q. What is the appropriate amount of water returned from the customers as wastewater, plus an allowance for infiltration and inflow for the Ravenna Park/Lincoln Heights system for the test year?

A. The estimated amount of water the customers returned as wastewater was 16.920644 mg. In addition, 3.030 mg should be allowed for infiltration and 2.0775 mg should be allowed for inflow, for a total of 22.028164 mg for the test year.

Q. What is the appropriate purchased wastewater expense for the Ravenna Park/Lincoln Heights system?

A. According to Mr. Lubertozzi, in response to Staff's Interrogatory No. 21, the City of Sanford charges a base charge of $469.32 and a usage charge of $4.13/1000 gallons. Based on flows of 22.028164 mg, the cost would be $96,608 for the test year.

Q. Should an adjustment be made to Account No. 710 Purchased Sewage Expense for the Ravenna Park/Lincoln Heights system?

A. Yes. An adjustment should be made to Account No. 710 Purchased Sewage Expense to remove the cost of excessive infiltration/inflow for Ravenna Park/Lincoln Heights. According to the Audit Work Papers - Page (43-15)/2p2, the 12 month average for purchased wastewater treatment for Ravenna Park/Lincoln Heights is $142,086. Therefore, the cost of treating the excessive infiltration/inflow of $45,478 should be removed.

Q. How should the utility's costs associated with calibrating the meter, disposing of the volume of liquid within the aeration bays, clarifier, digester, and cleaning water that was sent through the meter be treated?

A. According to Mr. Orr, in response to Staff Interrogatory No. 68, the utility estimates that 827,000 gallons was utilized for start-up purposes, including calibration of the meter and cleaning and draining of the wastewater plant tanks. Mr. Orr reported that the cost was $3,416 (827,000 gallons x

$4.13/1000 gallons = $3,416) and recommended that this cost be treated as startup cost to be amortized over 5 years as a non-recurring expense or capitalized as part of the project cost. I agree that the cost should be amortized over 5 years for an annual cost of $683.20.

Q. Have your reviewed the testimony of Mr. Ted L. Biddy, P.E./P.L.S. on behalf of Public Counsel?

A. Yes. I will be providing comments on Mr. Biddy's testimony related to fire flow, storage, used and useful, unaccounted for water, and infiltration/inflow into the wastewater system.

Q. Do you agree with Mr. Biddy's position on the allowance for fire flow?

A. No. The Commission has consistently recognized the need for fire flow protection and considers it in its determination of used and useful. While fires hopefully do not occur frequently, I believe that 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 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. Do you agree with Mr. Biddy's position on evaluating used and useful for storage tanks separately?

A. No. Used and useful should only be evaluated on a component basis when some portion of the system is oversized relative to the size of other components. The storage capacity for any of the systems does not appear to

be oversized, therefore there is no need to evaluate used and useful for the storage tanks separately in this case. The AWWA and the Ten State Standards recommend general guidelines for storage capacity; however, these are general guidelines. Florida has frequent 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. The Commission has recognized that one full day of storage may be needed for a system. See Order No. PSC-97-0847-FOF-WS, issued July 15, 1997, in Docket No. 960329-WS.

Q. Do you agree with Mr. Biddy's position that used and useful should be based on pumping wells for a 24 hour period for a small water system with little or no storage capacity?

A. No. The proper method, as I discussed earlier, is to determine the well capacity based on pumping 12 hours to properly manage the aquifer. According to the AWWA Manual M21:

> It is commonly assumed that one obtains water from a well, but nothing could be further from the truth. A well is a means of access to a water-bearing formation, and it serves the same purpose as a straw in conducting fluid from a glass to your mouth. A well typically includes a pump, which moves water from the aquifer to a distribution system for delivery to the water user.
>
> Cone of depression. To move water from a formation into a well, a gravitational force must be created. The gallonage first pumped from a well removes water in storage from the well bore, then removes water from storage in the aquifer....

See EX__ RPR-10.

Q. Do you agree with Mr. Biddy that the flow of water is steady and equal on a 24-hour basis?

A. No. Water demand is not consistent in a 24-hour period. Typically, there is a peak in the morning around 6 AM, around noon, and around 6 PM. There us generally very little demand on the system between 10:00 PM and 6 AM (8 hours).

Q. Is there an inconsistency with respect to Mr. Biddy's testimony regarding pumping a well for 24 hours and the equalization storage of 20 to 25% of the average daily flow?

A. As I just discussed, the water systems have peak demand periods and water is minimally used during the night. The testimony does not explain where the water, when pumped for 24 hours, would be stored, so that it could be used during the peak periods of the day. In order to fully utilize the well that is pumped for 24 hours the storage amount would need to be about 1/3 to 1/2 of the capacity of the well times 24 hours to allow the utility to obtain 100% used and useful for the well and storage system.

Q. Do you agree with Mr. Biddy's position regarding infiltration and inflow for the Summertree, Weathersfield, and Golden Hills wastewater collection systems?

A. No. For the Summertree system, Mr. Biddy failed to include the wastewater flow from the commercial customers of Summertree/Paradise Pt. which is approximately equal to the wastewater flow from the residential customers. For the Weathersfield system, the total wastewater treated of

90.956 mg reported by Mr. Biddy does not agree with Schedule F-2 of the utility's MRFs which shows that the total wastewater treated was 72.208 mg for the test year. There is no flow meter at Weathersfield. For the Crownwood system, the infiltration/inflow reported of 1.43% is not material.

Q. Do you have anything further to add?

A. No. I do not.

RESUME

RICHARD PAUL REDEMANN, P.E.

2540 Shumard Oak Boulevard
Tallahassee, FL 32399
Home: (850)386-8048
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 Registered Professional Engineer No. 41668

PROFESSIONAL EXPERIENCE

Florida Public Service Commission - July 1990 - to Present

Utility Systems/Communication Engineer, Duties and Responsibilities include:
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.

Florida Public Service Commission - June 1989 - July 1990

Engineer IV, Duties and Responsibilities included:
Reviewed and evaluated 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.

Florida Public Service Commission - June 1987 - June 1989

Engineer III, Duties and Responsibilities included:
Reviewed, analyzed, and evaluated engineering data in complex rate and overearnings 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.

PROFESSIONAL EXPERIENCE (Continued)

Florida Public Service Commission - Feb 1986 - June 1987

Engineer II, 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.

Florida Public Service Commission - June 1984 - Feb 1986

Engineer I, 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
- May 1980 - August 1993 (Summers) (Except 1981)

Engineer Trainee, 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
- May 1981 - Nov. 1981

Engineer Trainee, 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

Corel WordPerfect for Windows, Microsoft Word, Lotus 1-2-3, Microsoft Excel, Netscape, Microsoft Outlook and Juno

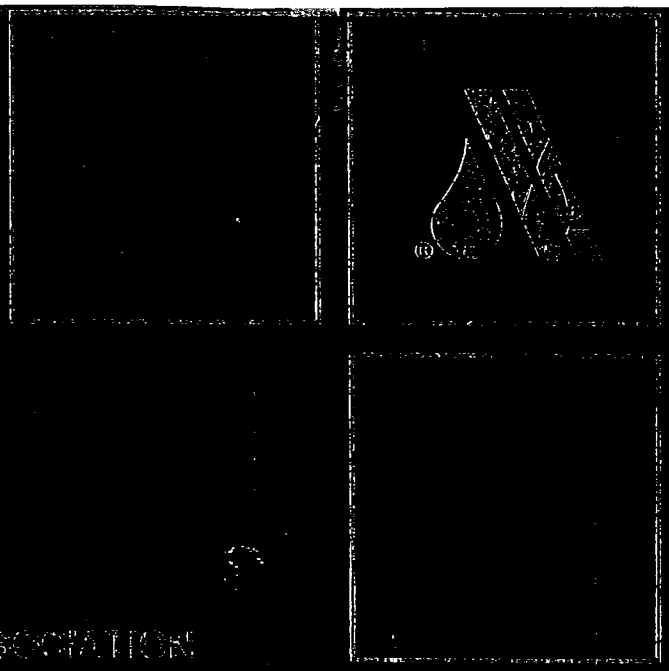
Exhibit__ RPR-2

Used and Useful Formulas and Assumptions

Wells	Storage	Used and Useful formulas (Demand/Capacity)
1	No/Yes	100% used and useful
2	No	((((Maxday-EUW)/1440)*2)+FF+Growth)/1Well (gpm)
2	Yes	(Maxday-EUW+FF+Growth)/1Well@12hr+usable storage(gpd)
3	No	((((Maxday-EUW)/1440)*2)+FF+Growth)/2Wells (gpm)
3	Yes	(Maxday-EUW+FF+Growth)/2Well@12hr+usable storage(gpd)

Assumptions:
1. Service territory has potential for growth. If the service territory is built out, and there is no potential for expansion, the system is 100% U&U.
2. Use the single maximum day in the test year if it appears there is no anomaly that day. If an anomoly may have occurred that day, use the average of the 5 highest days within a 30 day period in the test year.
3. If the actual maximum day (Maxday) flow data is not available, use 1.1 gallons per minute (gpm) per residential connection (peak hour demand criteria).
4. Excessive unaccounted for water (EUW) is flows in excess of 10% of accounted for usage.
5. Fire flow (FF) is based on local requirements.
6. Growth is based on Rule 25-30.431, FAC.
7. Wells are not oversized. If a well appears to be oversized, consider prudency and economies of scale adjustments.
8. If the system has more than one well, remove the largest well in the used and useful calculation (firm reliable capacity).
9. Include only usable storage. Elevated storage is all usable. Ground storage is typically not all usable.
10. Limiting factors in the plant production facilities should be considered in determining the system capacity.

Exhibit__ RPR-3 (Page 1 of 2)
Distribution Network Analysis AWWA M32



AMERICAN WATER WORKS ASSOCIATION

MANUAL OF WATER SUPPLY PRACTICES

Distribution Network Analysis for Water Utilities

AWWA M32

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.

UIF Water Systems

Exhibit__ RPR-4

System	Wells gpm	Ground Storage gallons	Firm Reliable Capacity gpm (2)	Customers Schedule F-9	Max gpd Schedule F-3	Fire Flow gpm Schedule F-5	Demand Peak Hour Max gpm X 2 (3)	Design Peak Hour customers X 1.1 (4)	Seidman's Instantaneous Demand gpm Schedule F-5
Seminole County									
Bear Lake (1)	220	13,800	220	220	101,000		140	242	495
Jansen	190 240	0	190	248	152,000		211	273	528
Park Ridge	300	10,000		98	43,000		60	108	315
Phillips (1)	110	0	110	74	51,000		71	81	265
Crystal Lake (1)	240	0	240	165	69,000		96	182	426
Ravenna Park	200 240	20,000	200	335	146,000		203	369	626
Oakland Shores (1)	395	16,800	395	224	154,000	600	214	246	500
Little Wekiva	65	0		61	30,000		42	67	234
Weathersfield	550 1000	100,000		1178	524,000	1250			1260
Pasco County									
Buena Vista (1)	45 75 300	0	120	1109	245,800	500	341	1220	1408
Summertree	120 300 300 550	0	720	829	331,000	1000	460	912	1004
Orangewood (1)	150 150 225 325	0	525	584	211,400	500	294	642	824
Wis-Bar	0	0		140					
Pinellas County									
Lake Tarpon (1)	500	0	500	504	339,500	0	472	554	777
Marion County									
Golden Hills	330 440	0	330	434	385,000	500	535	477	734
Orange County									
Crescent Heights (1)	0	0		283					
Davis Shores (1)	0	0		44					

(1) The systems are interconnected with another water system.

(2) The firm reliable capacity is based on the total well capacity with the largest well removed from the calculation.
If there is only one well and the system is interconnected with another water system, the firm reliable capacity is based on the well capacity and the interconnection is not included as part of the firm reliable capacity.
If there are two or more wells and the system is interconnected with another water system, the firm reliable capacity is based on the largest well being removed from the calculation and the interconnection is considered back-up capacity.

(3) The maximum gpd x 2 (peak factor)/[(60 minutes/hour)(24 hours/day)] = flow in gpm

(4) The design peak hour is based on the 350 gpd/ [(60minutes/hour)(24 hours/day)] x 4.5 (peak factor)= 1.1 gpm

AWWA NO. M8

Water Distribution Training Course

AMERICAN WATER WORKS ASSOCIATION
MANUAL OF WATER SUPPLY PRACTICES

A TRAINING COURSE IN

Water Distribution

AWWA MANUAL M8

PREPARED AND PUBLISHED BY
American Water Works Association, Inc.
6666 West Quincy Avenue
Denver, Colorado 80235
1962

Foreword

This manual on water distribution is the second in a series of four training courses for water utility personnel being developed under the supervision of AWWA Committee 4260 M (now 5110 M—Preparation of Training Manuals). The first manual of the series, published in 1959, was devoted to the subject of water utility management; the remaining two manuals currently being developed relate to water treatment and to sources of supply.

This manual was prepared as a practical guide for operating personnel and should find application as a text in in-service training or for independent study.

The text of this manual was prepared by the following men:

Elwood H. Aldrich	Fred Merryfield
Frederick J. Burgess	Warren C. Westgarth

AWWA and the Committee on Manuals gratefully acknowledge the contribution of each of these men, whose only compensation will be the knowledge that their efforts have contributed to the advancement of the industry.

AWWA Committee on Manuals

Fred A. Eidsness	Edward S. Hopkins	I. N. Ronhovde
Quintin B. Graves	Fred Merryfield	Raymond J. Faust, *Chairman*

only partial metering is in effect, accurate estimates of unaccounted-for water are virtually unobtainable. If unmetered customers form a relatively small percentage of the total, an estimate of water used by such customers based upon the average use of similar metered customers may be proper to secure a reasonable estimate, but the basis for such estimates should be recorded.

The amount of water used for flushing streets and fighting fires is relatively small. It has been estimated by some operators to be 1–3 per cent. The amount of water lost in the pipe system through unavoidable leakage—that is, leakage in mains and services which would cost more to locate and stop than the lost water is worth—has been variously estimated at 1,000–3,000 gpd per mile of pipe, depending on such factors as the age and condition of the pipe system, prevailing system pressures, and ground conditions. Underregistration of meters in a system may vary from as low as 2 per cent to as high as 15 per cent, depending upon the size of meter and efficiency of the meter maintenance program. Unauthorized uses of water, such as through an unmetered fire line or, on occasion, by deliberately bypassing meters, sometimes prove to be an important factor.

Desirable Results

The proper amount of unaccounted-for water in any given system is a function of that system alone. It might range, in a substantially fully metered system, from as much as 35 per cent to as little as 5 per cent. The former percentage may apply if pressures are very high and variable, leakage is difficult to detect and remedy, the pipe system is extensive and old, or practically all customers use water only in small amounts (a principal cause of underregistration of meters). The smaller percentage may be a result of low pressures, the existence of only a few customers who each take a considerable percentage of the total water, and a small mileage of mains. A fair average of unaccounted-for water might be 10–20 per cent for fully metered systems with good meter maintenance programs and average conditions of service.

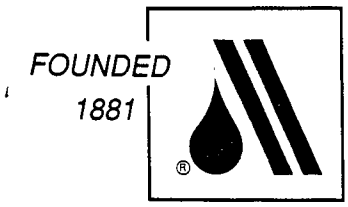
Expansion of Service Areas

Expansion of service areas presents one of the most critical problems in the provision of adequate and reliable water service. In most cities, great increases in population are not taking place within the political boundaries; they are more often taking place through rather haphazard annexation of outlying areas. County- or area-wide planning is becoming increasingly necessary to determine adequately the extent of the future growth of a water system. The extent of such expansion, both in the immediate and more remote future, must be recognized in planning the distribution system.

Distribution Network Analysis for Water Utilities

AWWA MANUAL M32

First Edition



American Water Works Association

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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

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 9 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.

(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-TypeUses

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.

12.3.2 Water Conservation Plan

12.3.2.1 All individual permit applicants for commercial/industrial-type water uses must submit a water conservation plan for their facility to the District at the

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). 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 added to withdrawals; outgoing transfers and wholesale sales of water shall be deducted from withdrawals.

1.2 Water Conserving Rate Structure

Each water supply utility within the Water Use Caution Area shall adopt a water-conserving rate structure by January 1, 1993. This requirement shall be implemented by applying the following permit condition to all existing public supply permits:

> The Permittee shall adopt a water conservation oriented rate structure no later than January 1, 1993. If the Permittee already has a water conservation oriented rate structure, a description of the structure, any supporting documentation, and a report on the effectiveness of the rate structure shall be submitted by January 1, 1993. Permittees that adopt a water conservation oriented rate structure pursuant to this rule shall submit the above-listed information by July 1, 1993.

New public supply permits shall receive the following permit condition:

> 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.

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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 percent 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,
> b. The number of multi-family dwelling units served and their total water use,
> c. The number of mobile homes served and their total water use.
>
> Residential water use quantities shall include both the indoor and outdoor water uses associated with the dwelling units, including irrigation water.

2. Agriculture

2.1 Irrigation Water Use Allotments

The District allocates agricultural irrigation-related water use based on a modified Blaney-Criddle model and other methods as described below. For each individual crop type, the permittee shall not exceed the quantity determined by multiplying the total irrigated acres by the total allocated inches per irrigated acre per season. Allocated inches per irrigated acre per season are determined separately for three major categories of water use, and the sum equals the total allocated inches per irrigated acre per season. An irrigated acre, hereafter referred to as "acre," is defined as the gross acreage under cultivation, including areas used for water conveyance such as ditches, but excluding uncultivated areas such as wetlands, retention ponds, and perimeter drainage ditches. Other non-irrigation related water uses shall be permitted in accordance with section 3.3, Basis of Review.

3.0 REASONABLE WATER NEEDS

This section describes the factors involved in determining appropriate permit quantities for a particular water use. The quantity of water needed is a function of demand for water, efficiency of the water treatment and distribution systems, water acquired from other sources, water sold or transferred to other entities, and conservation practices employed. Section 3.1 describes the factors to consider in determining the appropriate quantities. Section 3.2 describes the units in which the quantities are identified on the permit. The remaining sections (3.3 through 3.7) describe the procedures for estimating water needs using the components of demand for each water use type.

3.1 DETERMINING REASONABLE QUANTITIES

REASONABLE DEMAND

Proper accounting for each proposed water use is essential to establish that the use is reasonable, beneficial, and in the public interest. In addition, proper accounting of the various water uses enables the District to better estimate water use and to implement water shortage plans. Sections 3.3 through 3.7 identify the components of demand that must be identified for Applicants for each water use type. Demand information may be estimated from historical data, comparable uses, and acceptable forecasting techniques.

SYSTEM EFFICIENCY

In some circumstances, not all water that is withdrawn is actually used. This circumstance may be a result of losses in the system during distribution, or because the water must undergo a treatment process before it is usable.

Distribution Efficiency--The amount of water lost from the system during distribution may occur because of leakage or because a system has been developed with a certain design efficiency. In either case, Applicants may be asked to identify the amount of water lost during distribution.

Treatment Effects--Some water treatment technologies, such as desalination or sand filtration, may cause significant portions of the withdrawn water to be unusable. In such cases, the Applicant may be required to indicate the withdrawal quantity treated, the percent product (usable) water, the percent reject (unusable) water, and the manner in which the reject water will be disposed.

OTHER SOURCES OF WATER SUPPLY

Applicants must identify the quantities obtained from sources other than the primary source of supply. These sources may include reclamation facilities or desalinated seawater. If a source is not reliable throughout the year, the Applicant may request standby withdrawal quantities from the main source of supply, which may be used when the temporary supply is not available. The permit will identify these standby quantities, when they likely will be required, and for what length of time. The Permittee may request that the District extend the period of time on the permit during which a standby quantity may be used if the need arises.

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 percent of total distribution quantities. Applicants with unaccounted use greater than 15 percent 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.

PER CAPITA DAILY WATER USE WITHIN THE SWUCA

Adjusted Gross Per Capita--Within the SWUCA, Adjusted Gross per capita daily water use is defined as 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. However, they must be reported. The formula used for determining adjusted gross per capita is as follows:

$$\frac{WD + IM - EX - TL - SU - EM}{\text{Population}}$$

Where:
WD = ground water and surface water withdrawals
IM = water imported/bought from another supplier
EX = water exported/sold to other suppliers
TL = treatment loss (typically R/O or sand filtration)
SU = significant uses

Exhibit__ RPR-9

Unaccounted for Water Adjustments

Marion County
Unaccounted for water in Thousands of Gallons

	B Total Gallons Pumped	C Total Gallons Purchased	D Gallons Sold	E Other Uses	F Unaccounted for Water B+C-D-E	G Unaccouned for Water (F/B)x100%
Golden Hills/ Crownwood	59.497	0	45.432	0.853	13.212	22.21

Excessive unaccounted for water in Marion County
22.21-10=12.21

		%	Amount
Chemical - Account No. 618	1,150	0.1221	140.42
Purchashed Power - Account No. 615	10,852	0.1221	1,325.03

Pasco County
Unaccounted for water in Thousands of Gallons

	B Total Gallons Pumped	C Total Gallons Purchased	D Gallons Sold	E Other Uses	F Unaccounted for Water B+C-D-E	G Unaccouned for Water (F/B)x100%
Buena Vista	53.637	0	47.858	0.124	5.655	10.54
Summertree	55.874	0	46.572	0.243	9.059	16.21
Orangewood	38.049	0	31.334	0.047	6.668	17.52
	147.56	0	125.764	0.414	21.382	14.49

Excessive unaccounted for water in Pasco County
14.49-10=4.49

		%	Amount
Chemical - Account No. 618	4,699	0.0449	210.99
Purchashed Power - Account No. 615	15,588	0.0449	699.90

Pinellas County
Unaccounted for water in Thousands of Gallons

	B Total Gallons Pumped	C Total Gallons Purchased	D Gallons Sold	E Other Uses	F Unaccounted for Water B+C-D-E	G Unaccouned for Water (F/B)x100%
Lake Tarpon	28.512	0	22.611	0.02	5.881	20.63

* The utility has a standby interconnect with Pinellas County water system, but did not purchase any water.

Excessive unaccounted for water in Pinellas County
20.63-10=10.63

		%	Amount
Chemical - Account No. 618	210	0.1063	22.32
Purchashed Power - Account No. 615	2,557	0.1063	271.81

Water Movement

It is commonly assumed that one obtains water from a well, but nothing could be further from the truth. A well is a means of access to a water-bearing formation, and it serves the same purpose as a straw in conducting fluid from a glass to your mouth. A well typically includes a pump, which moves water from the aquifer to a distribution system for delivery to the water user.

Cone of depression. To move water from a formation into a well, a gravitational force must be created. The gallonage first pumped from a well removes water in storage from the well bore, then removes water from storage in the aquifer. This creates a pressure sink that starts water movement through the formation material into the well bore. This pressure sink is commonly referred to as the cone of depression. If the aquifer is unconfined, as shown in Figure 11-1, then the water table surface within the grains of sand actually forms an inverted cone.

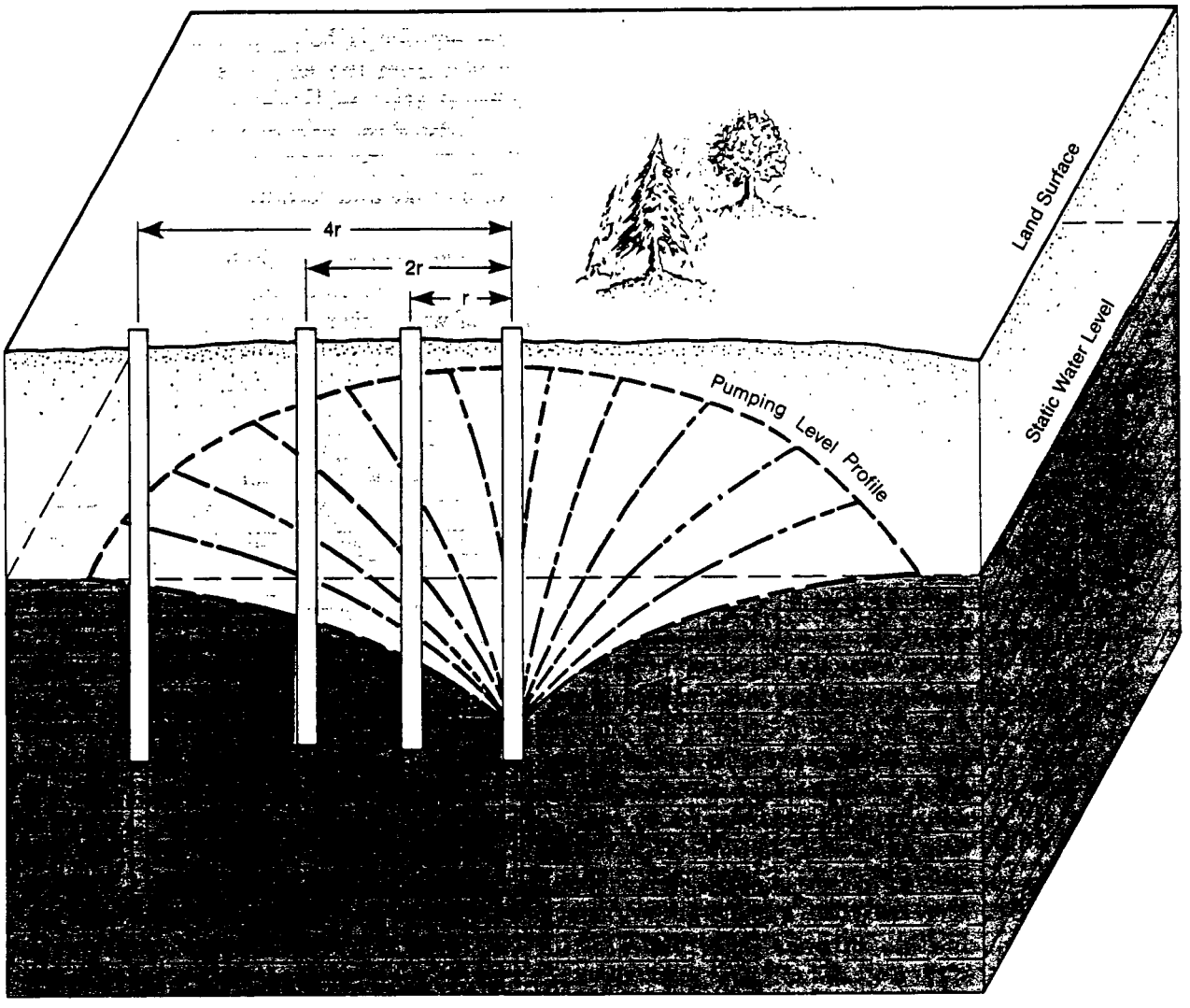

Figure 11-1 Development of a cone of depression.

The cone of depression is circular only if the formation material is homogeneous and isotropic, and the water level is level. As the slope of the water level becomes significant, the cone of depression around the well becomes egg shaped with the short axis up-gradient and the long axis down-gradient. Similarly, if a well was located near a riverbank with connection between the aquifer and the surface water, the cone of depression may extend only a short distance toward the river and extend a greater distance away from the recharge source.

Change in head. A basic assumption made in the theoretical development of groundwater evaluation formulas is that water is instantaneously released from storage with a change in head. Actually, this seldom occurs. Coarse-grained aquifers approach this theoretical assumption in that water is freer to flow through the pore space towards the wells when the pressure sink is created. As the aquifer becomes more fine grained, the movement from the aquifer to the well bore is slower because of the pressure sink. The cone of depression may develop rapidly to ½ mi (1 km) or more as the water begins draining and migrating slowly to the well bore.

Hydraulic Conductivity and Transmissivity

Ideally, when developing a groundwater source all attendant facilities would be placed at one location and one large-capacity well would serve the needs of the utility system. However, this is seldom practical. Often, the cost of attendant facilities far exceeds the cost of well construction and receives extensive consideration when the number and capacity of wells are being selected.

Depending on the hydraulic conductivity and transmissivity of the aquifer, numerous wells may need to be drilled in order to meet the water supply needs. As wells are added within the radius of influence of each other, there is an overlapping or interfering drawdown profile (Figure 11-2). If wells are grouped closely to each other, they take on the characteristic of a large-radius singular well. The group of wells is then dependent on the storage and transmissive characteristics of the aquifer system.

WELL FIELD EVALUATION

When developing a groundwater supply in an undeveloped area, an extensive study needs to be made of the well field. This includes the aquifer material characteristics, the aquifer's recharge source or sustainable yield, the aquifer's natural discharge (if appropriate), the water quality characteristics, and current use being made of the water supply system by others.

Information Sources

Most major aquifers have now been mapped by the US Geological Survey and/or geologic and water resources agencies of state governments. Geologic and water supply reports generally exist for most regions of the United States and for many areas in foreign countries. A review of available literature and data is the first step in identifying the potential location and yield characteristics of a new well field.

After a potential area has been identified, permission should be obtained from appropriate landowners to conduct detailed geophysical surveys (if necessary), in order to identify the areal extent or location of the best aquifer for water yield. This is followed by test-hole drilling. Often, only small land parcels are acquired for the individual well sites. Appropriate spacing between land parcels makes it possible to obtain the required yield from a multiwell development of a large aquifer system.

BEFORE THE FLORIDA PUBLIC SERVICE COMMISSION

In re: Application for rate increase in Marion, Orange, Pasco, Pinellas, and Seminole Counties by Utilities, Inc. of Florida.	DOCKET NO. 020071-WS FILED: June 16, 2003

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that a true and correct copy of the foregoing Direct Testimony of Richard P. Redemann, P.E. has been furnished to **Martin S. Friedman, Esquire**, Rose, Sundstrom & Bentley, LLP, 600 S. North Lake Blvd., Ste. 160, Altamonte Springs, Florida 32701, and **Stephen Burgess, Esquire**, Office of Public Counsel, c/o The Florida Legislature, 111 W. Madison St., Room 812, Tallahassee, Florida 32399-1400, by U.S. Mail, this 16th day of June.

ROSANNE GERVASI, SENIOR ATTORNEY

FLORIDA PUBLIC SERVICE COMMISSION
Gerald L. Gunter Building
2540 Shumard Oak Boulevard
Tallahassee, Florida 32399-0850
Telephone No. (850) 413-6224

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