RAS 9697

SEC Project No. 302100

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Lea County
Water Users Association

Municipal Water Audit
Phase I - "Building the Foundation"

The technical material and data contained in this document were prepared under the supervision and direction of the undersigned, whose seal as a Professional Engineer licensed to practice in the State of New Mexico, is affixed below.

December 2003

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LES-01170

LES Exhibit 27

Template=SECY-028

SE-CY-02

U.S. NUCLEAR REGULATORY COMMISSION

In the Matter of Louisiana Energy Services, L.P.

Docket No. 70-3103 Official Exhibit No. LES 27

OFFERED by: (Applicant/Licensee) Intervenor _____

NRC Staff Other _____

IDENTIFIED on 2/9/05 Witness/Panel Keith Campbell, Peery, Stokes, Woosley

Action Taken: (ADMITTED) REJECTED WITHDRAWN

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Lea County Water Users Association

Municipal Water Audit
Phase I – "Building the Foundation

Contents

INTRODUCTION

The New Mexico legislature, recognizing the state's need for water planning, created and funded New Mexico's Regional Water Planning Program in 1987. The legislature gave the New Mexico Interstate Stream Commission (ISC) the responsibility of overseeing a grant program and the planning process. The Commission adopted a regional water plan "acceptance criteria" in April 1999. This criteria mandates conformance to the Regional Water Planning Handbook[1] and inclusion of local governments in implementing provisions of regional water plans. The Commission has recognized sixteen water-planning regions of which the Lea County Region is one. Each region was tasked with developing a regional water plan.

The process for preparing a Lea County Regional Water Plan[2] began in September of 1998. The Plan was prepared with public and local community involvement and submitted to the ISC, gaining formal approval in April of 2001. The Plan concluded that reductions in municipal water use are "very feasible"[3] based on local data and on the experiences of other communities across the American west.

Water management and conservation alternatives proposed for community systems in Lea County included modifying rate structures, assisting large users in identifying water saving practices, reducing system losses, reusing wastewater, and improving efficiency of indoor residential use. The Plan recommended that water audits for each municipality be conducted to help understand how much water each community was withdrawing from the aquifer and how that water is being consumed. This audit is an implementation of that recommendation.

PURPOSE

The Lea County Water Users Association contracted Smith Engineering Company (SEC) to obtain water production data and demand information from Eunice, Hobbs, Jal, Lovington, and Tatum, and to analyze the information so a better understanding of water use by the County's public water systems could be attained. Specifically, the LCWUA wanted to accomplish three goals:

1.) Define meaningful water use categories to help manage the region's water,
2.) Identify effective conservation measures that the various systems can consider, and
3.) Investigate infrastructure problems that may affect water use.

There are other, smaller non-municipal public water systems in Lea County, including several mobile home parks in the Hobbs area. By far the largest of these small systems is owned by the Monument Mutual Domestic Water Consumers Association (MDWCA) and serves the unincorporated community of Monument. Because Monument is large (approximately 250 people) and because it is beneficial to have as complete a picture as possible of the County's public water use, SEC chose to include the community in the audit.

METHODOLOGY

In March 2001 the New Mexico Office of the State Engineer (NMOSE) issued a guidance manual titled "A Water Conservation Guide for Public Utilities" (the Manual). The goal of the manual is to "...present virtually everything a municipality or water utility might conceivably consider when dealing with water

[1] ISC, Regional Water Planning Handbook, *New Mexico Interstate Stream Commission*, Santa Fe, NM (1994)
[2] LH, Lea County Regional Water Plan, *Leedshill-Herkenhoff, Inc., John Shomaker & Associates, Montgomery & Andrews PA* (2001)
[3] ISC, pg. 8-21 (2001)

conservation issues."[4] The Manual presents a step-by-step approach that communities can take to better understand their water use and thereby formulate conservation strategies. While no one approach for managing water will work for every community, the Manual was selected as a guide for this audit.[5]

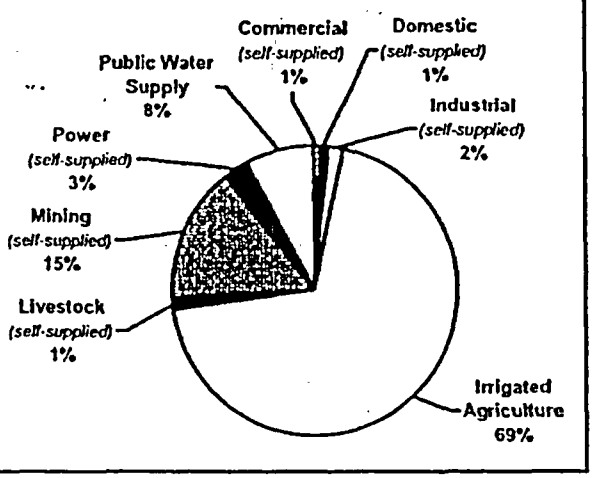
In keeping with the Manual and with the LCWUA's three stated audit goals (see above), SEC has performed the audit. This report presents the audit's findings with the intention of:

a.) **Building a Foundation** for future water management of publicly used water in Lea County. Water use categories that accurately describe the ways water is used by public systems are recommended. These categories, combined with a custom recordkeeping format that complies with the NMOSE guidelines, will help the LCWUA to monitor water use and help the various communities to develop tailored management and conservation programs.

b.) Helping the communities **Prioritize Conservation Alternatives** by rating the benefit that the various conservation programs, listed in the guidance manual and the regional water plan, are likely to have for the audited water systems.

c.) **Note Observed Deficiencies** in the various water systems that may be corrected in the short-term to allow for better management and water conservation. Particular emphasis is placed on each system's ability to measure the water it withdraws and uses, and subsequently quantify the water it loses.

FIGURE I-1
Lea County Water-Use by NMOSE Category in 2000
Wilson (2003)

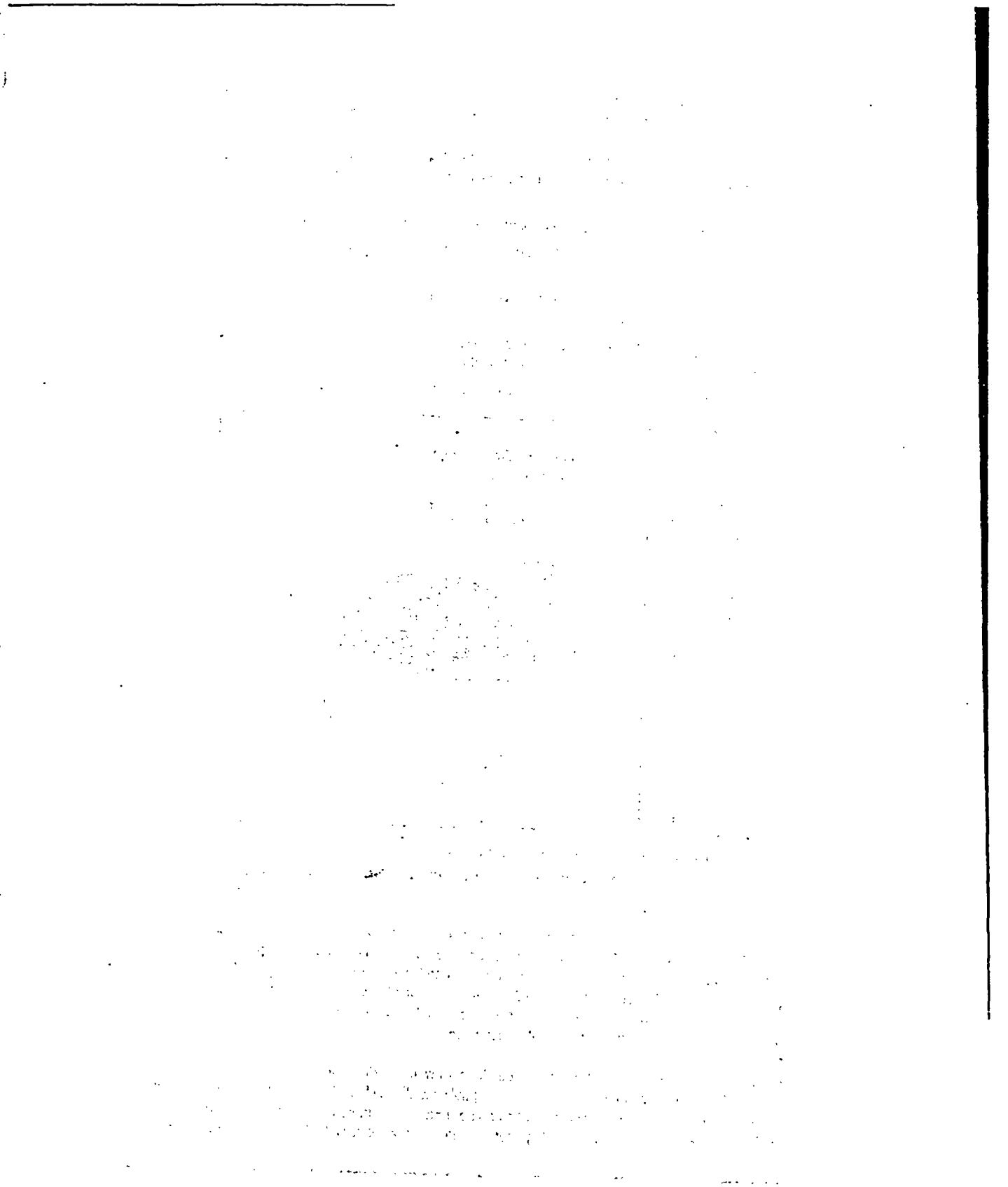


PERSPECTIVE

Every five years the NMOSE conducts a statewide audit of New Mexico's water resources. Each management area or drainage basin is examined for water withdrawals and depletions. For purposes of understanding water use, withdrawals (water retrieved from natural storage for use) are divided into nine basic categories:

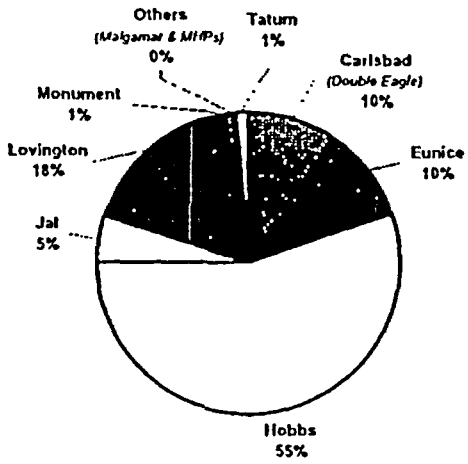
[4] Wilson, Brian C., A Water Conservation Guide for Public Utilities, *New Mexico Office of the State Engineer*, Santa Fe, NM, pg. 2 (2001)

[5] The manual is written in 17 Sections. This audit addresses Section 2 – "Building the Foundation for a Water Conservation Program" and Section 6 – "Recordkeeping and Water Audits (Water Demand Analysis)." The roles of metering (Section 5), leak detection (Section 7), indoor plumbing (Section 9), landscape irrigation (Sections 10 through 13), and using reclaimed wastewater (Sections 14 & 15) in water management are discussed conceptually but – in general – are left to future audits and to the individual communities to examine and develop. Information from the guidance's introductory discussion (Section 1) and case studies (Section 17) is used at several locations in the text. Drought management (Section 16) is beyond the audits' scope and is not discussed.



- Public Water Supply – community water systems that consist of common collection treatment, storage, and distribution facilities operated for the delivery of water to multiple service connections.
- Domestic – self-supplied residences where water is used for normal household purposes.
- Irrigated Agriculture – water used for irrigation of crops grown on farms, ranches, and wildlife refuges.
- Livestock – includes water used to raise livestock, maintain self-supplied livestock facilities, and provide for on-farm processing of poultry and dairy products.
- Commercial – includes businesses and institutions involved in the trade of goods or provision of services. Golf courses, greenhouses, and plant nurseries are also included.
- Industrial – includes self supplied enterprises engaged in the processing of raw materials or the manufacturing of goods.
- Mining – self-supplied enterprises engaged in the extraction of solid or liquid minerals occurring naturally in the earth's crust. Water used for drilling, quarrying, and processing at the mine site is included.
- Power Generation – self-supplied power generating facilities and associated contiguous coal mining.
- Reservoir Evaporation – evaporation from manmade reservoirs that have a storage capacity of 5,000 acre-feet or more.

FIGURE I-2
Lea County Public Water Suppy – Water Production by Community in 2000

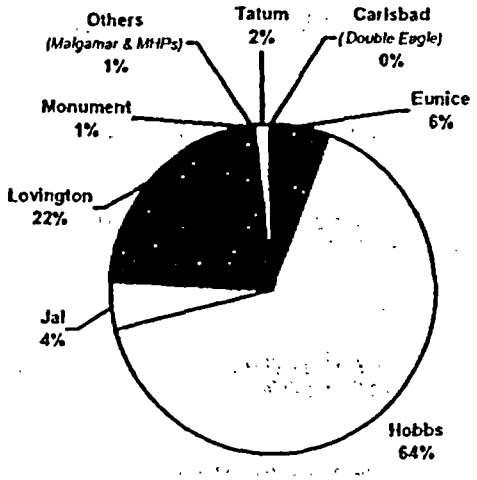


The NMOSE's breakdown of water use (withdrawals) for community water systems in Lea County for the year 2000 is reflected in FIGURE I-2. This can be compared with each community's population in FIGURE I-3. Water used by public systems is a significant part of Lea County's total water budget. While far behind irrigated agriculture, public systems pose the third largest demand for water in Lea County at almost 8% of the total used. Effective management and conservation of water by the County's communities can therefore have a significant impact on the region's water resources.

Because this report deals with that portion of Lea County's water produced for Public Supply or Municipal systems, a further breakdown of water produced by public facilities in Lea County during the year 2000 is shown in FIGURE I-2. When combined, Hobbs and Lovington pump more than 7 out of every 10 gallons, while the other Lea County communities together account for only about 17%. Carlsbad, an Eddy County

municipality, pumps around 10% of the water within Lea County produced by a public water supply. In addition to public consumption, Carlsbad water is dispensed to a variety of uses.

FIGURE I-3
Community Population in Lea County in 2000
(Does not account for rural population.)



AUDIT FORMAT

In Section 2 of the Manual, four steps are given to "Build a Foundation" for managing and conserving a community's water. This report discusses each of the six communities in separate sections, attempting to follow the four steps and "Build a Foundation" for increased water management/conservation.

STEP 1: SYSTEM EVALUATION

Step 1 includes a list of seven items that, if understood, will provide a profile of a community's water supply system.

DEMOGRAPHICS

Population statistics and growth trends are essential to any community planning.

WATER RIGHTS

All water rights in Lea County are groundwater. The amount of righted water claimed by each community and their per capita equivalent will facilitate supply planning.

TREATMENT SYSTEMS

Water Treatment

Groundwater used by communities in Lea County is high quality. Disinfection is the only treatment required. All Lea County communities use chlorine gas as their disinfection reagent.

Wastewater Treatment

Wastewater treatment can allow for reuse of effluent. Treated effluent can offset a community's water use requirements.

WATER PRODUCTION

All water produced by communities in Lea County is pumped from groundwater. Moreover, with the exception of Jal, all the communities produce water from the Ogallala Aquifer in the Lea County Underground Water Basin (UWB). Jal produces water from the Alluvial Aquifer in the Jal UWB.

WATER DEMAND

Water Deliveries

If water is measured at the point of delivery, a community can profile how they use this resource. The more a community understands about the way it uses water, the better able it will be to manage the resource.

Unaccounted Water

The difference between the water a community produces and the water it delivers is unaccounted for. Unaccounted water includes: distribution system losses through leaks, un-metered water, water delivered through fire hydrants, water taken illegally from the distribution system, inoperative system controls (i.e. blow-off valves and altitude control valves), water used in flushing water mains or sewers, and meters that are poorly calibrated. Water lost from a system typically occurs at connections and joints, and sometimes through degraded piping.

Variability

Variability is a gauge of the potential to save water through community conservation measures. Those with a large variability have a high potential for water savings through conservation, and visa-versa. Communities typically use more water in summer than they do in winter. Changes in landscape irrigation and evaporative cooler use combine for most of this seasonal variation. Winter use often indicates the consumption rate below which a community's standard of living will be affected, and is therefore considered

a "base." Little conservation can be expected below the winter base rate, and conservation is generally available for use above the base.

LARGE USERS

The largest commercial water users include restaurants, hotels and motels, hospitals and health care facilities, recreational facilities, car washes and commercial laundries. The largest industrial water users in Lea County typically are oil field water suppliers and oil/gas processing facilities. Helping a community's large water users to conserve can sometimes be an efficient way to save water.

STEP 2: CONSERVATION GOALS

REDUCE PER CAPITA WATER USE

Per capita water use, expressed in gallons per capita per day (gpcd), is often the best way to assess water use between different communities. But because commercial and industrial activity, recreation facilities, and other high water use activities can vary between communities, causing dissimilar per capita statistics, caution should be exercised when comparing. Residential water use per capita can be expected to be similar for all the communities in an region, unless some form of institutional constraint (i.e. high rates, mandatory use schedules, etc.), are in place.

Large per capita use typically indicates high potential for conservation, and visa-versa. It is not uncommon for southwestern communities to set water reduction goals of around 10% to 30% of their per capita use.

REDUCE WITHDRAWALS

Reductions in withdrawing water are directly related to reductions in use and will be realized accordingly. However, sometimes reduction goals are dictated by restrictions on supply instead of conservation. In Lea County, the sustainable yield of groundwater supplies must be balanced with the demand of long-term occupation and economic activity. Groundwater in Lea County has been over-pumped in the past. In recent years, the rate of water table decent has slowed, but not enough is known about the area's groundwater to establish production limits.

REDUCE WATER LOSSES

Water losses are typically expressed as a percent of total water produced. Losses from community systems at 10% or below are considered reasonable. Losses between 3% and 7% are considered good.

REDUCTION SCHEDULE

A schedule for reducing use may be set by each individual community. Because of the lack of data on the actual water habits of the Lea County communities, no schedule is proposed by this report. An additional water audit is recommended in three years, followed by more detailed continued recordkeeping.

STEP 3: EXISTING CONSERVATION MEASURES

The measures each community has in place to conserve water are described. However, without exception, there is not enough information to determine the effectiveness of these measures. Improved recordkeeping and measurement should allow effectiveness to be assessed during future water audits.

STEP 4: RECOMMENDATIONS

The NMOSE recommends 14 water conservation measures[1] for communities within New Mexico. The

[1] Wilson (2001, pp 10 to 11

measures, listed below, are discussed for each Lea County community in the appropriate section and evaluated by each community's management/staff for conservation potential. Conservation potential is quantified by a ranking (high, medium, and low).

- Public Education/Information – is education and information directed to the water using public, explaining the need and process of conservation.
- In-School Education – is specific information-based programs directed to schools to promote conservation among school-age children.
- Metering – includes installation of meters at all water sources, import and export points, customer service connections, and public landscape irrigation sites.[2] A program for meter testing, repair, and replacement should also be included. Large use should be a high priority for meter calibration.
- Conservation Rate Structuring – is conservation-based rate structuring (water pricing) combined with information-rich water bills. Water bills should show the rate for each block of water and its historical use information so customers can monitor effects of their conservation efforts. Utility bills can include water conservation information and should separate water, sewer, and solid waste charges.
- Recordkeeping/Water Audits – is a system of gathering and recording water dissemination information so it can be used in community planning. For any water conservation program to succeed, it is imperative that a recordkeeping system be established to monitor operation and maintenance costs, revenues, and the use of water.
- Leak Detection and Repair – is locating and eliminating the loss of water through system infrastructure.
- Pressure Reduction – is a program to reduce water pressure in the distribution system to reduce waste.
- Indoor Audits and Incentives – takes a look at the plumbing fixtures and appliances of water users to recommending retrofits, while providing incentive programs to implement the recommendations. Retrofits are aimed at eliminating leaks/losses and providing water saving devices.
- Landscape Ordinances, Audits, and Incentives – are design ordinances, audits, retrofits, and incentive programs to encourage low water-use landscapes and efficient irrigation.
- Training of Landscape Maintenance Personnel – includes the education of professional landscape staff to encourage efficient irrigation. Well trained groundskeepers can have a significant impact on a community's water use.
- Irrigation Management Information System – is a centrally located system that determines when to irrigate and how much water to apply at public landscape irrigation sites.
- Irrigation with Reclaimed Wastewater – uses reclaimed and treated wastewater for non-potable water uses, such as landscape irrigation. Irrigation with reclaimed wastewater can be an effective way to conserve water at large facilities.
- Hotels/Motels – can be encouraged to launder linens less often. Guests staying longer than one night should be given the option of reusing towels and linens.
- Water Waste Ordinances – typically lists specific uses of water that are deemed wasteful. These can include landscape irrigation during the hottest daytime hours (when the evaporation rate is at its highest) and excessive water runoff from irrigation or other water uses.

[2] including self-supplied golf courses, athletic fields, parks, cemeteries, and greenbelts

- Emergency Action Plan for Drought Management – outlines the steps the utility takes in the event of a drought. Recommended plan elements include a definition of what constitutes a "drought" and "drought severity," plus mechanisms by which drought measures are enacted. For areas dependent on groundwater, such as Lea County, a drought is often defined by the changes in the water table elevation.

If, during the course of reviewing the water data for each community, other specific practices appeared to have a high potential for helping a community manage/conserve its water, they were also recommended under this step.

CITY OF EUNICE

The "84 Ranch" was established near what today is the City of Eunice during 1885, but homesteaders were responsible for the area's initial growth. The City of Eunice was founded in 1909 when a Post Office was established. Oil and gas was discovered in 1929 giving a much needed boost to the farming and ranching economy. Oil and gas retrieval activity peaked around 1960, but today continues to be the largest part of Eunice's economy.

EUNICE
Water Brief

DEMOGRAPHICS
Population: 2,562
Total Units (meters): 1200
Housing Units: 1,110

WATER RIGHTS
Own: 3,292 ac-ft/yr
Lease: none
Transfer: none
Aggregate per capita: 1.28 ac-ft/yr

WATER USE
Production
Total: 1.48 MGD (1,654 ac-ft/yr)
Aggregate per capita: 576 GPD

Demand (metered)
Total: 1.10 MGD (1,235 ac-ft/yr)
Residential: 0.59 MGD
per capita: 231 GPD
Outside City: 0.06 MGD
Industrial: 0.14 MGD
Retailers: 0.26 MGD
Commercial: 0.051 MGD

Unaccounted
Total: 0.37 MGD (25% of produced)
Unmetered Use: 0.15 MGD (10%)
System Losses: 0.22 MGD (15%)

Variability
Base [Winter]: 0.92 MGD (359 gpcd)
Maximum [Summer]: 2.18 MGD (851 gpcd)
Difference [Base to Max]: 237%

WATER SYSTEM EVALUATION

DEMOGRAPHICS

In 1940, the first year for which census data is available, Eunice had a population of 1,227. The town grew rapidly during the next two decades, peaking in 1960 with 3,531 residents. A contraction occurred in the 1960's with the population reducing to 2,641 in 1970. Since then, the economy has been able to support a steady population. The 2000 census shows Eunice has 2,562 residents.

WATER RIGHTS

Eunice holds 3,292 acre-feet of righted water per year, which is about 1.28 acre feet per resident. An additional 1,203.71 acre feet are righted in T20S, R38E but these appear to be only paper rights as the water in this area was depleted in the 1960's.

TREATMENT SYSTEMS

Water Treatment

Eunice's water is high quality and requires only disinfection prior to delivery. Chlorine gas is used as the disinfection reagent.

Wastewater Treatment

Eunice treats its wastewater via a trickling filter based process. Renovations at the plant are now being designed. Effluent from the plant is applied to surrounding cropland for disposal. No return credit has been secured for these flows.

WATER PRODUCTION

In past years, Eunice relied on water pumped from wells in the Nadine area. When the Nadine wells became contaminated water production was shifted north. Today the City pumps water from a well field near Hobbs and transports the water south in two parallel cross-country mains to Eunice. The Hobbs well field is positioned in the most productive portion of the Ogallala in New Mexico, where hydraulic conductivity rates approach 240 ft/day, specific yields are between 0.10 and 0.28,[1] and the saturated thickness is about 90 feet.[2] The aquifer's drawdown has slowed dramatically in recent years[3] with the depth to water being about 50 feet.[4] The water quality is very good[5] and no contaminates have been detected in the wells. The City is pumping close to 2900 acre-feet annually, which is a little over 2.6 MGD. Average per-capita use is about 270 GPD.

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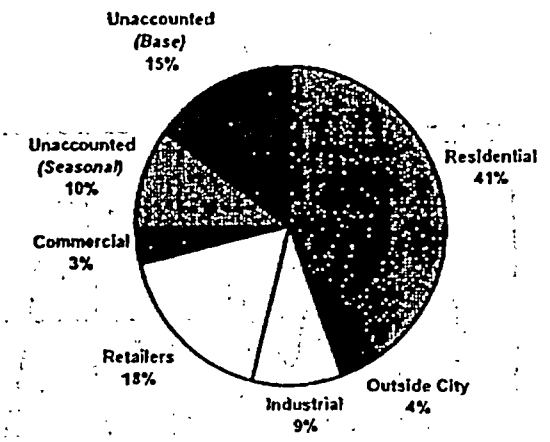
[1] LH (2001), pg. 6-9
[2] LH (2001), Figure 28
[3] LH (2001), Figure 22
[4] LH (2001), Figure 25
[5] 650 µmhos/cm, per LH (2001), Figure 31

WATER DEMAND

Water Deliveries

Eunice records water use by one of five categories: residential, outside city, industrial, retailers, and commercial. As shown in FIGURE E-1, Eunice's residential use poses the single largest demand for water at 41% of the total. At 18% of the produced water, sales to retailers (e.g. trucked to oil field drilling operators) make up the second largest demand. Industrial users (mostly natural gas plants) have the third largest usage at 9%. Residences outside the City use another 4% and commercial establishments use 3%.

FIGURE E-1 – Eunice Water Use by City Category



Average for 2000, 2001, and 2002
(source. City of Eunice)

Unaccounted Water

Twenty-five percent of Eunice's produced water (around 0.37 MGD) is unaccounted. Because water used by:

- municipal offices,
- fire protection services,
- parks and athletic fields,
- cemeteries,
- the rodeo grounds, and
- the golf course along with its lake

is unmetered, much of the unaccounted water is, in fact, used by the City and not lost. While the amount of water actually lost by the City's system is unknown, the amount used for landscape irrigation, but not metered, can be deduced to be around 0.15 MGD or 10% of the produced water on average - based on seasonal lows (see TABLE E-1) of the unaccounted quantity. That leaves 15% of the water produced for unmetered base usage and water losses.

TABLE E1: Eunice - Unaccounted-for Water by Month (MGD)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Avg
0.22	0.24	0.38	0.40	1.05	0.49	0.63	0.62	0.00	0.20	0.00	0.43	0.19

NOTE: Values are averages for 2000, 2001, & 2002

Variability

FIGURE E-2 shows the viability of Eunice's water use by season. Peak summer production of 2.18 MGD (or 850 gpcd) exceeds that of winter's base 0.92 MGD (or 359 gpcd) by 237%. The variation in seasonal residential use is much more dramatic with 1.50 MGD (585 gpcd) in summer and 0.25 MGD (98 gpcd) in winter, a 600% variance.

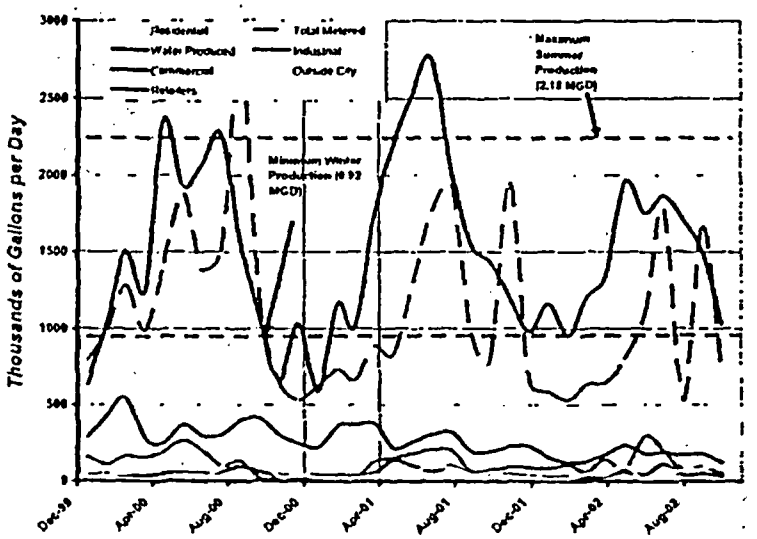
LARGE USERS

The following accounts receive a large amount of water from the Eunice water system.

- Eunice Public Schools
- Key Energy
- Pool (oil field)
- Dynergy (natural gas)

- Vista Services (oil field water haulers)
- Pate Trucking (oil field water haulers)
- Chaparral Services (oil field water hauler)
- B and H Construction (oil field construction)
- Chevron-Texaco (oil field)
- Apache (oil field)
- Ilene Simms (rancher)

FIGURE E-2 - Eunice Seasonal Water Use



DISTRIBUTION INFRASTRUCTURE

Eunice's water system is comprised of major components that were constructed from the late 1940's through the early 1970's. A few smaller sections of the system were installed in the 1980's and 90's. Predominant materials are asbestos cement (transite), cast iron, and ductile iron pipe. Small diameter pipes are commonly galvanized iron. While the service life of asbestos-cement pipe is proving to be very long, the lives of cast iron and galvanized iron are limited. In particular, sizable water losses may be occurring on reaches serviced by aged galvanized piping. Because the City's water meters also date from the 1950's, errors of up to 30% can be expected.[6]

WATER RATES

The City calculates water billings based on the simple declining block rate system shown in TABLE E-2. For both residential and industrial accounts, a set minimum price is charged for use up to 6000 gallons. After use exceeds this threshold, costumers pay at a reduced rate for each additional 1000 gallons.

[6] per Great Southwest Meter, Duran, NM

WATER MANAGEMENT GOALS

Specific conservation goals that may help shape the elements of a future conservation program and evaluate such a program's success are discussed below.

REDUCE PER CAPITA WATER USE

TABLE E-2: Eunice - Water Use Rates

ACCOUNT TYPE	WATER USED (gallons)	RATE
Residential (in City)	1 to 6000 > 6000	$9.00 $0.65 per each 1000-gallons
Residential (outside City)	1 to 6000 > 6000	$14.00 $0.75 per each 1000-gallons
Commercial (in City)	1 to 6000 > 6000	$9.00 $0.70 per each 1000-gallons
Commercial (outside City)	1 to 6000 > 6000	$14.00 $0.75 per each 1000-gallons
Industrial	> 1	$4.00 per each 1000-gallons
Retailer	> 1	$4.00 per each 1000-gallons

Because of the absence of meters on many services, the amount of water actually used in Eunice is unknown, though it can be deduced to average between 500 to 535 gpcd.[7] The most obvious areas of water savings for Eunice are in sales to retailers and in residential use. Bulk water sold to retailers account for about 100 gpcd year-round. If water from lower quality water sources could be substituted for potable sales, the City's average per capita use would drop to a little over 400 gpcd. The extra water used by residences in summer (above that used in winter), when averaged over the year, accounts for over 135 gpcd. Because households in Eunice use water at a large peak summer rates (600% higher than in winter), it is likely that 35% (or about 50 gpcd year-round) of seasonal residential use may be saved through increased public awareness and implementing an inclining water rate structure, based on effects of conservation efforts in Phoenix and Albuquerque between 1995 and 2000. Likewise water used seasonally by municipal facilities (estimated to 85 gpcd) can be reduced about 25% (or 20 gpcd) by educating City staff and implementing better watering techniques. If combined with alternate sourcing for water sales, a 35% savings in seasonal residential use coupled with a 20% savings in seasonal water used by City facilities would likely drop the City-wide per capita water use to about 340 to 360 gallons. There is not enough information to determine whether significant water savings are possible by the City's industrial or commercial users.

REDUCE WITHDRAWALS

Eunice withdraws only about half its righted water each year. While substantial reductions in water sold to retailers and in seasonal residential use appears feasible, there is insufficient data on the full dispensation of the City's water to establish a goal for reducing water production. Because several new developments (including a uranium processing facility) are now being proposed to Eunice, increases in production may be on the horizon. If development occurs, Eunice will benefit from water use planning at new industries, residences, and other facilities.

REDUCE WATER LOSSES

Large unmetered water use by municipal facilities probably accounts for 60% of Eunice's unaccounted for water. The remainder is likely a combination of both leakage and errant metering, and given the age of most Eunice meters, the mis-metered part is likely much larger that of actual system losses. Therefore, a meter replacement program is recommended.

IMPLEMENTATION SCHEDULE

To coordinate with other Lea County communities, it is recommended that Eunice implement the recordkeeping improvements suggested by this report by January 2004. If Eunice can begin keeping records in the suggested categories by January 2004 then 2 years of data will be available for a more in-depth water audit at the end of 2006.

[7] Using seasonal variances to estimate the portion of unaccounted water that is used but not metered.

A meter replacement program can be implemented beginning in 2004. At $175 per meter the City's 1200 meters can be replaced for about $210,000. If the meter replacement rate can be split into three groups of approx 400, they can be replaced for about $70,000 a year over the next 3 years.

EXISTING CONSERVATION MEASURES

Eunice regularly monitors its large user accounts for accuracy and is replacing large meters.

RECOMMENDATIONS

Conservation measures, recommended by the NMOSE, are listed in TABLE E-3 along with ratings and comments. Ratings and comments were formed by the City staff in response to the measures' applicability to Eunice. Three measures (Metering, Conservation Rate Structuring, and Training of Landscape Maintenance Personnel) are rated with high potential by Eunice for near-term water savings. These three measures, together with adjustments to the City's recordkeeping, are recommended and discussed below.

CONSERVATION RATE STRUCTURING

Eunice's declining water rate structure provides for high quantity water users to get their water at a cheaper unit price than that afforded low quantity users. As a result, declining rates provide little incentive for water conservation by customers. Large water users and residential customers with high seasonal use rates can be motivated to conserve water by replacing the City's current declining block rate system with an inclining block system. An inclining system would provide economic water for essential activities and promote customer conservation through higher rates for other, less essential, activities – while maintaining the City's necessary revenue stream.

IMPROVE RECORDKEEPING AND METERING

Because recordkeeping is the foundation for any water audit,[8] the City should take strides to rearrange water accounts under the following NMOSE suggested headings:

- Single Family Residential (in City)
- Single Family Residential (outside City)
- Multi-Family Residential (in City)
- Multi-Family Residential (outside City)
- Commercial/Institutional (in City)
- Commercial/Institutional (outside City)
- Industrial
- Retailers
- Public Landscape Irrigation, and
- Other Water Demand

In addition, meter readings from large users (services/sites that average 30,000 gallons per day or more) should be extracted from monthly billings and highlighted. Accurate recordkeeping will be key to increasing Eunice's understanding of how it uses water and where the most potential to conserve exists. Keeping records in NMOSE categories will contribute to a more complete picture of municipal water use throughout the Lea County Region.

Since the accuracy of records is only as good as the water measuring system employed, a meter installation and replacement program, in combination with more detailed recordkeeping, is recommended. An

[8] Wilson (2001), pg. 36

installation/replacement program would install new meters on un-measured municipal facilities (such as parks and City offices) and replace old meters systematically throughout town. Special emphasis should be paid to replacing meters on large water users.

TRAINING OF LANDSCAPE MAINTENANCE PERSONNEL

Several workshops that train landscape personnel in methods and means of water conservation are available at reasonable cost. The closest to Eunice may be in Lubbock at Texas Tech University. Aside from receiving a host of good information, Eunice's groundskeepers would gain tips on evaluating the efficiency of the community's sprinkler systems, optimizing irrigations schedules, and using vegetation maintenance techniques to retain water.

PERFORM MORE DETAILED WATER AUDIT

When water-use is better understood, through the use of improvements in metering and recordkeeping recommended above, that use can be examined further by the water audit process. A more detailed water audit can select and tailor-fit conservation alternatives to areas where the most benefit is anticipated. After two years of improved metering and recordkeeping, the new data can be reviewed by a water audit process. In addition to setting water management goals, this more detailed audit can identify certain sub-areas of water use where additional metering and recordkeeping will be meaningful.

TABLE E-3: Eunice – Evaluation of NMOSE Conservation Measures

CONSERVATION MEASURE	RATING	COMMENTS
Public Education/Information	Low	Sustained public awareness to water conservation has potential to reduce use. Because low turnouts are expected, there is little potential for workshops or public meetings to be successful in Eunice.
In-School Information	Low	Efforts to educate school children on water conservation will have a long term benefit.
Metering	HIGH	Eunice uses large amounts of water that go unmetered and make determinations of water dispensation impossible. A strategy for metering all water use and replacing old meters will be highly beneficial
Conservation "Block" Rate Structuring	HIGH	The City can begin evaluating options for installing an increasing "block" rate billing system for residential water use. More information on the way commercial and large accounts use water is needed before an increasing "block system" can be designed.
Leak Detection and Repairs	Low	While it is believed there are system losses, there is little information on quantity and location. Lack of knowledge, coupled with the high cost of waterline replacement, indicate leak detection and repair will be more effective in the future.
Pressure Reduction	Low	Pressure on the Eunice system is produced through its elevated tanks Lower pressure would require reducing storage and fuel complaints from residents
Indoor Audits and Incentives	Medium	The City already troubleshoots complaints of high water bills.
Landscape Ordinances, Audits, and Incentives	Medium	There is high potential for savings by requiring watering at night. However, enforcement is problematic.
Training of Landscape Maintenance Personnel	HIGH	Education of parks crews would be beneficial
Irrigation Management Information Service	Low	Regular references to a information service would be difficult to install with staff.
Irrigation with Reclaimed Wastewater	Medium	Reuse in areas with public exposure would be very beneficial but would require treatment well in excess of that provided by the City
Hotels/Motels	Low	There are only two hotels in Eunice.
Water Waste Ordinances	Medium	High benefit may result but a waste ordinance is hard to enforce.
Emergency Action Plan for Drought Management	Low	Drought is not acute for groundwater users Participate in regional planning

CITY OF HOBBS

Homesteaders first started to locate in Hobbs around 1907. The first store opened in 1909, followed by the Post Office in 1910. For well over a decade Hobbs was a tiny agricultural community, but with the discovery of oil by the Midwest Oil Company (now AMACO) in November of 1928, the town was enveloped in the oil drilling industry. Over the next three decades, the town grew and prospered as oil activity peaked in the 1960's. Because of Hobbs' position as the largest municipality in Lea County, the community has struggled in recent years to balance its economy between oil, regional commerce, education[1], and health care. Additional activities that fuel Hobbs' economy include the Lea County Event Center (a multi-purpose activity hub), Texas visitors (in-route to New Mexico mountains), and the airport. Near term economic growth may be fueled by a proposed casino and horse track complex that has recently gained momentum, as well as a proposed uranium enrichment plant in Eunice.

HOBBS
Water Brief

DEMOGRAPHICS
Population: 28,657
Total Active Accounts (meters): 10,975
Occupied Housing Units: 10,040

WATER RIGHTS
Own: 20,066.4 ac-ft/yr
Lease: none
Transfer: none
Aggregate per capita: 0.7 ac-ft/yr

WATER USE
Production
Total: 7.84 MGD (8,788 ac-ft/yr)
Aggregate per capita: 274 GPD

Demand (metered)
Total: 6.16 MGD (6,905 ac-ft/yr)
Residential: 3.86 MGD
per capita: 135 GPD
Commercial: 1.71 MGD
Municipal: 0.11 MGD
Irrigation: 0.48 MGD

Unaccounted
Total: 1.68 MGD (21% of produced)
Unmetered Use: 1.0 MGD (12.3%)
System Losses: 0.68 MGD (12.3%)

Variability
Base [Winter]: 4.9 MGD (171 gpcd)
Maximum [Summer]: 12.5 MGD (436 gpcd)
Difference [Base to Max.]: 239%

WATER SYSTEM EVALUATION

DEMOGRAPHICS

The earliest Census Bureau figures, which date from 1930, show 598 residents in Hobbs. Over the next decade Hobbs' population grew by an amazing 1000 people a year to 10,619 in 1940. The community's growth was comparatively small during WWII, but averaged 1,500 people a year through the 1950's. Since 1960 the Hobbs' population has steadied with a low in 1960 of 26,275 to a high in 1990 of 29,445. The City's 2000 population was counted at 28,657 in 10,040 housing units.

City records show water was delivered to an average of 10,975 metered water services during the years of 2000 through 2002. A further breakdown of City records shows 9,135 of the accounts were residential, 1,586 were commercial, 200 were irrigation, and 52 were municipal.

WATER RIGHTS

Hobbs claims 20,066.4 acre-feet per year of righted water within the Lea County UWB, which is 0.70 acre-feet per resident.

TREATMENT SYSTEMS

Water Treatment

Because Hobbs' water is high quality, disinfection is the only form of treatment required. Chlorine gas is currently the disinfection reagent.

Wastewater Treatment

Hobbs reclaims its water at a treatment plant that relies on activated sludge processing. The effluent quality is high and dependable, which allows it to be disposed through reuse by irrigating City cemeteries and vicinity cropland.

[1] Both of Lea County's higher education facilities, New Mexico Junior College and College of the Southwest, are in Hobbs.

WATER PRODUCTION

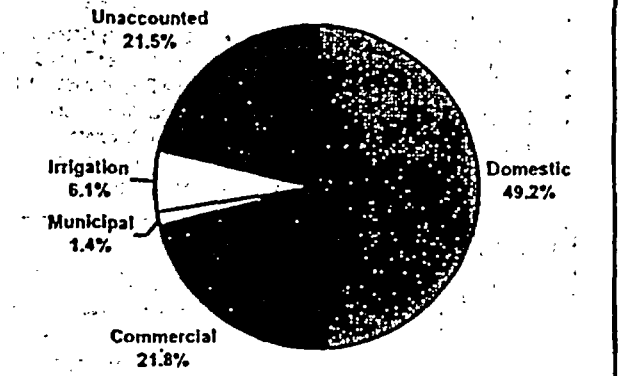
Hobbs pumps water from wells located throughout the community. The wells tap into the Ogallala Aquifer in the Lea County UWB. Hobbs' wells are positioned in a very productive portion of the Ogallala where the specific yield approaches 0.28,[2] depth to water of about 60 feet,[3] the saturated thickness is near 160 feet.[4] The water quality is very good with only small areas of light contamination.[5] Over the last three years (2000-2002) the City pumped 7.84 MGD on average. Average per capita production is about 274 GPD.

WATER DEMAND

Water Deliveries

The City records water use in four categories: domestic (residential), commercial, irrigation, and municipal; see FIGURE H-1 for a breakdown by percentage. Residential use is about 3.86 MGD or 135 gpcd. Commercial uses, totaling 1.71 MGD, include virtually all business and industrial applications. Irrigation use, of around 0.48 MGD, concerns parks and athletic fields. Municipal use, at 0.11 MGD, includes City offices, labs, shops, and court facilities. When taken together all metered water deliveries total about 6.16 MGD.

FIGURE H-1 – Hobbs Water Use by City Category
Average for 2000, 2001, and 2002 *(source: City of Hobbs)*



Unaccounted Water

Unaccounted for water makes up almost 22% of the water produced by Hobbs. As shown in TABLE H-1, unaccounted for water is near 1.0 MGD (13% of water produced) in winter and rises to around 3 MGD (9% of water produced) in summer. Water lost from the system is (in all likelyhood) less than the winter base, somewhere between 7% to 10% of produced water. The remaining 12 to 15% is likely non-metered water (that is actually used) and water not measured (due to metering errors).

TABLE H-1: Hobbs - Unaccounted-for Water by Month (MGD)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Avg.
1.04	1.56	1.84	2.91	3.21	1.34	2.79	1.99	0.74	0.96	0.53	1.28	1.68

NOTE: Values are averages for 2000, 2001, & 2002

Variability

As shown in FIGURE H-2, peak summer water production in Hobbs is 239% higher than winter base usage. Summer use peaks at near 11.7 MGD (412 gpcd) and the winter base is about 4.8 MGD (164 gpcd). Likewise, metered use varies from 9.6 MGD (335 gpcd) in summer to 3.6 MGD (126 gpcd) in winter. Residential use varies from 6.3 MGD (220 gpcd) in summer to 2.1 MGD (73 gpcd) in winter. Commercial, irrigation, and municipal use peak slightly during summer.

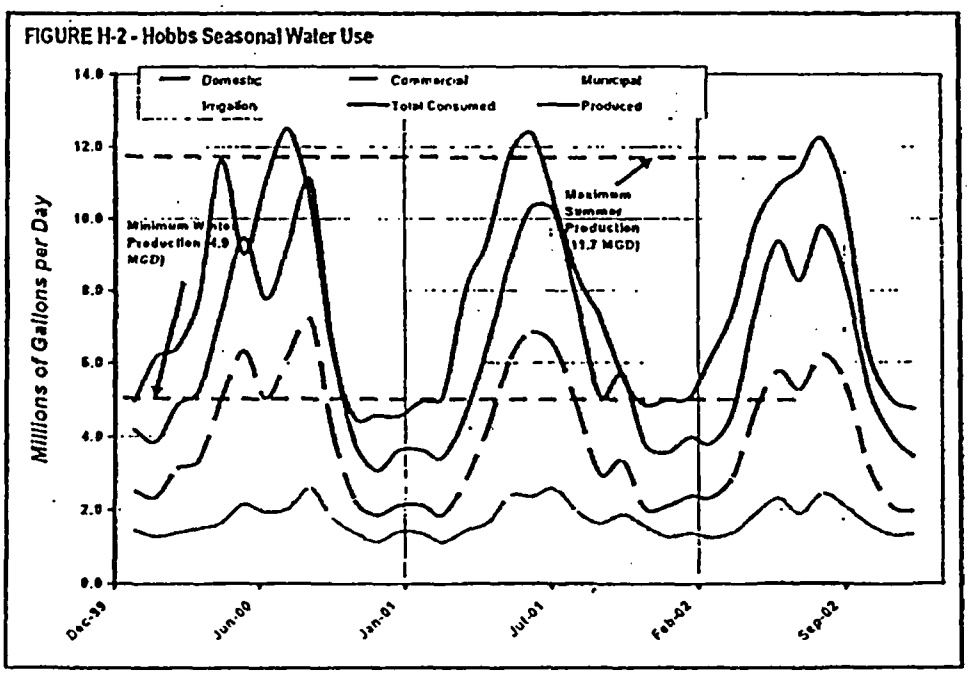
[2] LH (2001), pg. 6-9
[3] LH (2001), Figure 25
[4] LH (2001), Figure 25
[5] Less than 1000 µmhos/cm, per LH (2001), Figure 25

LARGE USERS

The following accounts receive a large amount of water from the Hobbs water system.

- Alpha/Broadway Apts.
- Best Western Hotel
- BJ Unichem Chemical
- Brandon Thompson
- C P G
- Caprock Carwash
- Casa Hermosa
- Cattle Baron
- Chapel of Hope
- Child & Family Services
- City of Hobbs
- College Lane School
- College of the Southwest
- Comfort Inn
- Covington Court
- Culligan
- Dal Paso Laundry/Car
- Days Inn
- Four Seasons Apts.
- Fresenius Medical Care
- Furrs Cafeteria
- G & H Properties
- Grimes Land Co.
- Hobbs Head Start
- Hobbs Healthcare
- Hobbs Schools
- Hobbs Water Mart
- Holiday Inn Express
- Horace Professional Mgmt.
- Jessica Salazar
- K R G Enterprises
- Keeling Travel Center
- Key Energy Services
- Lamplighter Motel
- Landrum, IRA
- Lea County Courthouse
- Lea County Truck & Auto
- Lea Regional Hospital
- Lunch Investment
- Mark R. Veteto
- Master Cleaners
- McFadke XI
- Merrill Gardens LLC
- Monarch Properties
- New Mexico Junior College
- North 40
- Oxy Permian
- Plains Properties
- P M R LLC
- R M Moran
- Ramada Inn
- Regal Manor
- R M S Foods
- Rowland Truck Co.
- S & L Investments
- Soaring Society of America
- S P S & Staubach Co.
- Stone Elementary
- Sunrise Homes
- Wackenhut Corrections
- Wallach Concrete
- Wal-Mart
- Washington Place Apts.

FIGURE H-2 - Hobbs Seasonal Water Use



DISTRIBUTION INFRASTRUCTURE

Most of Hobbs water distribution piping was constructed prior to 1965, during years when the City experienced its highest growth rates. Common water-pipe materials of that time included asbestos-cement (transite) and cast iron. While the service life of asbestos-cement pipe is proving to be very long, that of cast iron pipe can vary, with a minimum of as little as 20 years. Since soils in the Hobbs area are not known for being reactive with cast iron, it is unlikely that water losses due to pipe degradation are large.

Hobbs started metering its water services in the 1970's. Many of its meters today still date from this period. The Hobbs staff estimates that as much as 10% to 15% of its delivered water is mis-measured by errant meters.

WATER RATES

The City issues water bills based on an inclining block rate system shown in TABLE H-2. Until recently, accounts were broken into four categories: residential, commercial, municipal, and irrigation.[6] Water use for a fifth category, multi-unit residential, is now being recorded separately. The City's staff hopes to install a sixth category, industrial, soon. A set minimum price is charged for each service connection depending on the meter/line size. The minimum price is the same for each category and covers water use for the first 2000 gallons. After 2000 gallons rates rise incrementally for progressively larger water use.

WATER MANAGEMENT GOALS

Specific management goals that may help shape the elements of a future conservation program and evaluate such a program's success are discussed below.

REDUCE PER CAPITA WATER USE

While Hobbs' per capita water use (274 gpd) is high, it is not excessive.[7] The City's residential per capita use, at 135 gpd, is respectable. Winter use is even more respectable at 73 gpd. Summer usage peaks at 220 gpcd. The reasonableness of residential use indicates that most of Hobbs' water savings might be made in other use categories, such as commercial. Since industry is included in Hobbs' commercial category it is difficult to tell the actual dispensation of water between businesses normally considered commercial (i.e. restaurants, dry cleaners, and hotels, etc.) and those with more intense industrial applications.

Still, the large difference between winter and summer residential usage (about 150 gpcd) indicates savings may be made in landscape irrigation for all categories. The City's

TABLE H-2: Hobbs - Water Use Rates

ACCOUNT TYPE	WATER USED (gallons)	RATE
All Meters	1 to 2,000	5/8-inch meter = $6.50 1-inch meter = $9.10 1.5-inch meter = $11.70 2-inch meter = $18.85 3-inch meter = $71.50 4-inch meter = $91.00 6-inch meter = $136.50 8-inch meter = $188.50
Residential	2,000 to 10,000	$1.00 per each 1000 gallons
	10,000 to 25,000	$1.10 per each 1000 gallons
	25,000 to 50,000	$1.20 per each 1000 gallons
	50,000 to 100,000	$1.30 per each 1000 gallons
	>100,000	$1.45 per each 1000 gallons
Multi-Unit Residential	2,000 to 10,000	$1.00 per each 1000 gallons
	10,000 to 25,000	$1.10 per each 1000 gallons
	25,000 to 50,000	$1.20 per each 1000 gallons
	50,000 to 100,000	$1.30 per each 1000 gallons
	>100,000	$1.45 per each 1000 gallons
Commercial	2,000 to 10,000	$1.00 per each 1000 gallons
	10,000 to 25,000	$1.10 per each 1000 gallons
	25,000 to 50,000	$1.20 per each 1000 gallons
	50,000 to 100,000	$1.30 per each 1000 gallons
	>100,000	$1.45 per each 1000 gallons
Municipal	2,000 to 10,000	$1.00 per each 1000 gallons
	10,000 to 25,000	$1.10 per each 1000 gallons
	25,000 to 50,000	$1.20 per each 1000 gallons
	50,000 to 100,000	$1.30 per each 1000 gallons
	>100,000	$1.45 per each 1000 gallons
Irrigation	2,000 to 10,000	$1.00 per each 1000 gallons
	10,000 to 25,000	$1.10 per each 1000 gallons
	25,000 to 50,000	$1.20 per each 1000 gallons
	50,000 to 100,000	$1.30 per each 1000 gallons
	>100,000	$1.45 per each 1000 gallons

NOTE The City adds a surcharge of 25% to accounts that service customers located outside the City

[6] Irrigation usage measures municipal and individual irrigation accounts.

[7] When compared to other southwestern cities (i.e. Albuquerque, Denver and Phoenix) before the onset of serious conservation efforts after 1995.

approach of measuring and charging for irrigation water separately from interior uses is a nice way to quantify and address this potential. Based on other southwestern cities, a reduction in residential irrigation of 25% (probably around 25 to 30 gpd) may be attainable with increased public awareness and rate incentives. Similar savings would likely be possible for that portion of water delivered to commercial and industrial establishments which is used to irrigate landscaping.

REDUCE WITHDRAWALS

The City only withdraws 44% of its righted water. If the quantity of water Hobbs uses can be reduced by improved water management and by the implementation of conservation measures, the portion of righted water required can be reduced. Combined with the community's small population growth, conservation may allow the City's righted water to be adequate for the community's foreseeable future. While a reduction in residential use appears feasible, there is insufficient data on the full dispensation of the City's water to establish a goal for a reduction in water withdrawals.

REDUCE WATER LOSSES

That portion of the unaccounted for water that remains indeterminate, after correcting for unmetered use, is likely a result of both leakage and errant metering. Hobbs ongoing meter replacement program will hopefully minimize metering errors as the remaining aged meters are changed out. Leakage on the City's system is minimized by an annual program that replaces old waterlines. However, because the portion of water actually lost by the system is small (5% to 7%), a leak detection program is probably not cost effective.

EXISTING CONSERVATION MEASURES

Increasing block rates were established and a meter installation and a replacement program was started. The City meters water as it is pumped after it leaves storage and as it is delivered to customers. In addition, the Hobbs staff regularly replaces aged water mains that were constructed of inferior materials.

The City has a water use category, titled "irrigation," to allow residents to be charged separately for water used to irrigate their landscape. Both the residential homeowners and the City benefit from this arrangement. Homeowners that use this option can save money on sewer rates, which are tied to water use. The City can exercise more control on irrigation use through rate adjustments. The City staff hopes to split the irrigation category into two categories that are more specific, residential irrigation and municipal irrigation.

The City is alert to detect signs of leakage and water waste by its customers. If discrepancies are noted in monthly water use the City contacts owners and tries to ascertain if there is a problem. This alert system will be increasingly automated by the City's billing software in the near future.

RECOMMENDATIONS

Conservation measures recommended by the NMOSE are listed in TABLE H-3, along with rankings and comments from the City of Hobbs staff. Three measures public education, metering, and irrigating with reclaimed wastewater, are rated with high potential by Hobbs for near-term water savings. These measures, together with adjustments to the City's recordkeeping, are recommended and discussed below, along with the performance of another (more detailed) water audit in the future.

IMPROVE RECORDKEEPING AND METERING

Because the water audit is the "foundation for any recordkeeping system,"[8] the City should take steps to rearrange water accounts under the following NMOSE suggested headings.

- Single Family Residential
- Multi-Family Residential
- Commercial/Institutional
- Industrial
- Private Landscape Irrigation
- Public Landscape Irrigation, and
- Other Water Demand (currently only Bulk Water Sales fit into this category).

In addition, meter readings from large users (those using over 50,000 gpd) should be extracted from monthly billings and highlighted. Accurate recordkeeping, in NMOSE categories, will be key to increasing Hobbs' understanding of how it uses water and where the most potential to conserve exists, and contribute to a more complete picture of municipal water use throughout the Lea County Region.

Since the accuracy of records is only as good as the water measuring system employed, a meter installation and replacement program, in combination with more detailed recordkeeping, is recommended. An installation/replacement program would install new meters on unmeasured municipal facilities (such as parks and City offices) and replace old meters systematically throughout town. Special emphasis should be paid to replacing meters on large water users.

TABLE H-3: Hobbs – Evaluation of NMOSE Conservation Measures

CONSERVATION MEASURE	RATING	COMMENTS
Public Education/Information	HIGH	The City is actively educating the public through monthly mailings, and booths and displays at public events and gatherings
In-School Information	Medium	The Hobbs schools are working to raise water awareness amongst the community's children. While effects of in-school education are thought to be delayed (children are not the decision makers), such programs have long term potential.
Metering	HIGH	Hobbs is dedicating $4 million over the next few years to make sure all water deliveries in the City are metered and to test, calibrate, and replace meters.
Conservation Rate Structuring	Medium	The City has established an inclining rate system. Rates will be annually reviewed and adjusting (if required)
Leak Detection and Repairs	HIGH	While the benefit here cannot be measured, the City is currently in the seventh year of a systematic program to replace older water mains that are made of inferior materials. Further, drastic changes in water use at a service will be alerted to the City by its billing software
Pressure Reduction	Low	Pressure reduction would be unpalatable to the community and, because storage is provided by elevated tanks, would reduce emergency supplies.
Indoor Audits and Incentives	Medium	An indoor audit program is difficult to execute because it depends on public participation. However, the City hopes to create an audit capability for industrial customers
Landscape Ordinances, Audits, and Incentives	Medium	While there is potential benefit here, landscape ordinances are difficult to enforce.
Training of Landscape Maintenance Personnel	Medium	Benefits can be realized through better irrigation and turf management practices.
Irrigation Management Information Service	Low	Irrigation management information made available at a remote locations may not get used. Management systems in-place at parks have a much higher potential
Irrigation with Reclaimed Wastewater	HIGH	Hobbs already uses reclaimed wastewater, but intends to expand this use
Hotels/Motels	Medium	Because of the large number of hotels and their high use this may be an inexpensive way to make reductions
Water Waste Ordinances	Medium	Waste ordinances are hard to enforce
Emergency Action Plan for Drought Management	Medium	The City has a drought program in place The goal is to reduce pumping as groundwater surface elevation drops

PUBLIC EDUCATION AND INFORMATION

The City will continue to educate its residents on the merits and practices of wise

[8] Wilson (2001), pg. 36

water use. Future conservation measures will be better received and supported if the public is aware of the water issues they are meant to address.

PERFORM MORE DETAILED WATER AUDIT

When water-use is better understood, through the use of improvements in metering and recordkeeping recommended above, that use can be examined further by the water audit process. A more detailed water audit can select and tailor-fit conservation alternatives to areas where the most benefit is anticipated. After two years of improved metering and recordkeeping, the new data can be reviewed by a water audit process. In addition to setting water management goals, this more detailed audit can identify certain sub-areas of water use where additional metering and recordkeeping will be meaningful.

CITY OF JAL

The JAL cattle ranch and brand, after which the community is named, arrived in southeast NM around 1885. The Jal Post Office opened at the ranch in 1910 and moved to the community's present location in 1916. Jal was a ranching community until the discovery of oil in 1928 after which Jal's economy became driven by oil. Oil activities, which peaked in the early 1960's, continue to be Jal's lifeblood but the City still supports area ranches.

JAL
Water Brief

DEMOGRAPHICS
Population: 1,996
Total Units (meters) 942
Housing Units 957

WATER RIGHTS
Own: 936 ac-ft/yr
Lease: none
Transfer: none
Aggregate per capita: 0.47 ac-ft/yr

WATER USE
Production
Total: 0.716mgd (802.5 ac-ft/yr)
Aggregate per capita: 359 GPD

Demand (metered)
Total: 0.497 MGD (537 ac-ft/yr)
Residential: 0.412 MGD
per capita: 206 GPD
Commercial: 0.021 MGD
Industrial 0.061 MGD

Unaccounted
Total: 0.22 MGD (31% of produced)
Unmetered Use: 0.12 MGD (estm.)
System Losses 0.11 MGD (estm.)

Variability
Base [Winter] 0.33 MGD (165 gpcd)
Maximum [Summer]: 1.14 MGD (571 gpcd)
Difference [Base to Max.]: 345%

WATER SYSTEM EVALUATION

DEMOGRAPHICS

The Census Bureau counted 404 people in Jal in 1930. The community grew at about 800 people a decade until peaking in 1960 at 3,051. The next decade saw the community's first population decline with a head count of 2,641 in 1970. Between 1970 and 1990 the population declined steadily but has leveled out since 1990. In 2000 the Bureau counted 1,996 people living in 957 housing units. City records show water being delivered to 942 metered accounts, of which 859 are residential and 83 are commercial.

WATER RIGHTS

Jal has 1,586 acre feet per year of righted water, which is 0.47 acre feet per resident.

TREATMENT SYSTEMS

Water Treatment

Jal's water quality is high, requiring only disinfection for treatment. Chlorine gas is currently the disinfection reagent.

Wastewater Treatment

An aerated-pond treatment plant cleans Jal's wastewater. All effluent from the plant is pumped to a holding pond at the local county club's golf course. Significant amounts of water are lost to evaporation from the plant's ponds and the golf course pond. Application of effluent to the golf course's turf is made by pumping water from the course's pond to sprinklers.

WATER PRODUCTION

Jal pumps water from the Alluvial Aquifer in the Jal Underground Water Basin. The Alluvial Aquifer is large, dependable, and high quality. At Jal, the aquifer has been reported to have a transmissivity of 2,400 ft²/day, an average effective porosity of 16 percent, and an average saturated thickness of 310 feet.[1] In the past Jal wells have been pump tested at 450 gpm for 36 hours, however, recently completed wells are reported to be much less prolific. While it's estimated that there is 476,160 acre feet of water stored in that part of the Alluvial Aquifer located within the Jal UWB, the depth to the top of the aquifer is being drawn down at about 10 feet each 25 years.

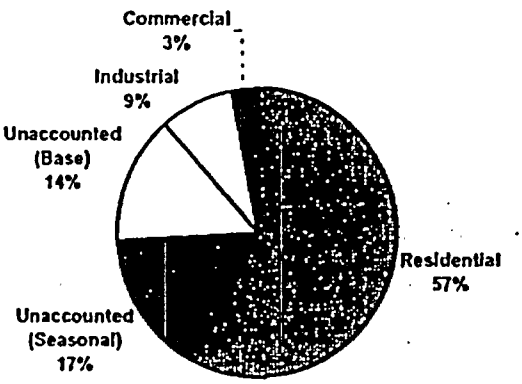
WATER DEMAND

Water Deliveries

In 2002, the number of residential and commercial/industrial meters installed on Jal's system as 859 and 83 respectively. As shown in FIGURE J-1, over half the water produced (57%) is delivered for residential use. Industries use about 9% and commercial accounts use another 3%.

[1] LH (2001) pg. 6-8

FIGURE J-1 – Jal Water Use by City Category
Average for 2000, 2001, and 2002
(source. City of Jal)



Unaccounted Water

Almost 21% of the water produced by Jal goes unaccounted for. Because Jal does not meter public parks and municipal facilities, a large part of this amount is used but not measured. The part that is used can be estimated by referencing the amount of water that goes unaccounted for during winter months. Seasonal values of unused water are shown in TABLE J-1. An average winter unaccounted for value of 0.90 MGD implies that only 14% of the yearly unaccounted for water is lost by the system. The other 17% is used.

TABLE J-1: Jal - Unaccounted-for Water by Month (MGD)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Avg.
0.08	0.09	0.32	0.06	0 21	0 34	0.25	0.30	0 29	0.30	0.16	0 23	0.22

NOTE: Values are averages for 2000, 2001, & 2002

Variability

As can be seen in FIGURE J-2, the variability of Jal's water use by season is pronounced. Peak summer withdrawals of around 1.33 MGD (or about 571 gpcd) exceeds that of winter's base 0.33 MGD (165 gpcd) production by 345%.

LARGE USERS

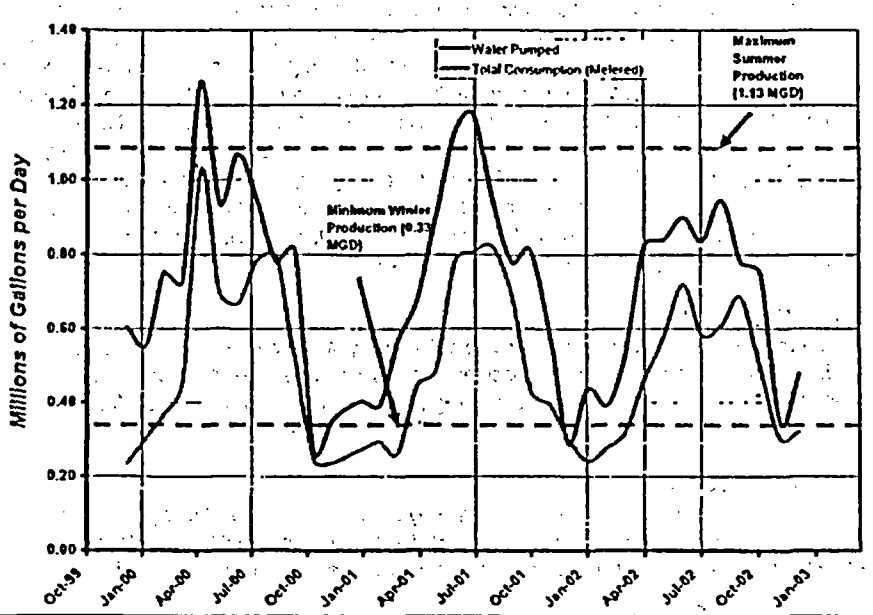
The following accounts receive a large amount of water from the Jal water system.

- Jal Public Schools
- A & B Trucking (oil field)
- Chaparral Trucking (oil field)

DISTRIBUTION INFRASTRUCTURE

Most of Jal's water system was constructed in the 1950's and 60's. Predominant piping materials at that time were asbestos-cement (transite) and cast iron. Small diameter pipes were commonly made of galvanized iron. While the service life of asbestos-cement is proving to be long, the lives of cast and galvanized iron are limited. In particular, sizable water losses may be occurring on reaches serviced by aged galvanized piping. While some of the City's water meters have been replaced, many date from the 1960's and 70's. The Jal's meters average about 10 years in age. Therefore, errors of up to 20% can be expected.[2]

FIGURE J-2 - Jal Seasonal Water Use



WATER RATES

As shown in TABLE J-2, Jal sells water by one of three use categories: residential, commercial, and industrial in 1000 gallon increments. Two of these (residential and commercial) price water using a base rate for the first 5,000 gallons used and inclining rates for successive blocks of 46,000, 50,000, 100,000 gallons and above. Water to industries (primarily oil field suppliers) is sold at a standard rate (about 300% higher than residential or commercial usage), regardless of the quantity used.

TABLE J-2: Jal - Water Use Rates1

ACCOUNT TYPE	WATER USED (gallons)2	RATE
Residential	1 to 5000	$8 50
	6000 to 50,000	$1.25 per each 1000 gallons
	51,000 to 100,000	$1 35 per each 1000 gallons
	101,000 to 200,000	$1.45 per each 1000 gallons
	201,000	$4.05 per each 1000 gallons
Commercial	1 to 5000	$11 00
	5000 to 50,000	$1 25 per each 1000 gallons
	51,000 to 100,000	$1 35 per each 1000 gallons
	101,000 to 200,000	$1.45 per each 1000 gallons
	201,000	$4.05 per each 1000 gallons
Industrial	> 1	$4 05 per each 1000 gallons

1) per Jal Municipal Code - Ordinance No 021014-1
2) Jal sells water in 1000 gallon increments

[2] per Great Southwest Meter, Duran, NM

WATER MANAGEMENT GOALS

Specific conservation goals that may help shape the elements of a future conservation program and valuate it's success are discussed below.

REDUCE PER CAPITA WATER USE

Because Jal does not meter service connections to parks and municipal facilities, the amount of water used is unknown; however, total per capita water usage can be deduced to be around 310 gpd.[3] Consequently, per capita residential usage is measured to be only about 210 gpd; industrial water (mostly sold to retailers via oil field water trucks) accounts for another 30 gpd; unaccounted water use is 60 gpd and commercial is 10 gpd. Because households in Jal use water at a large peak summer rates (345% higher than in winter), it is possible that 25% of seasonal residential use may be saved through public awareness and implementing a more aggressive inclining block rate structure. A 25% savings in seasonal residential usage is estimated to be around 100 gpcd. If water from lower quality wells could be substituted for industrial sales to oil fields, trucking another 30 gpcd could be saved. Also, since most of the unaccounted water use is thought to be applied to public parks and athletic fields, a 35% savings, or 20 gpcd, could be obtained through better irrigation and turf management practices. There is not enough information to determine how much savings can be expected from commercial use. With savings in residential, industrial, and seasonal unaccounted use, a per capita water use goal of 160 gpcd seems realistic.

REDUCE WITHDRAWALS

Jal withdraws (produces) about 86% of its righted water each year, leaving only a14% buffer for increased demand. While reductions in water use appear feasible, much of the savings projections are based on interpretive analysis of incomplete data. No meaningful goals for reductions in water production can be developed at this time.

REDUCE WATER LOSSES

The water unaccounted for through Jal's system is likely a combination of both leakage and errant metering. Given the age of most of Jal's meters, the portion errantly measured is probably high. However, there is not enough information at this time to determine actual lost quantities and correspondingly solutions.

EXISTING CONSERVATION MEASURES

Jal has a water waste ordinance and has recently instituted new increasing block use rates (see TABLE J-2). The mayor is authorized to schedule and enforce the rationing of water in according to the public need.[4]

RECOMMENDATIONS

Conservation measures recommended by the NMOSE are listed in TABLE J-3, along with rankings and comments from the City of Jal staff. One measure – metering – is rated with high potential by Jal for near-term water savings. This measure, together with adjustments to the City's recordkeeping, is recommended and discussed below, along with another (more detailed) water audit in the future.

[3] The value is estimated by using seasonal variances to calculate the portion of unaccounted water that is used but not metered.

[4] Jal Municipal Code §51.20

TABLE J-3: Jal – Evaluation of NMOSE Conservation Measures

CONSERVATION MEASURE	RATING	COMMENTS
Public Education/Information	Medium	Information on various public education programs/methods can be collected The programs can individually be evaluated for their effectiveness in Jal
In-School Information	Medium	The possibility of coordinating water use education in the schools with Jal and with regional water planning efforts can be explored with school management and teachers.
Metering	HIGH	Jal uses large amounts of water that go unmetered and make determinations of water dispensation difficult. A strategy for metering parks/municipal water use and replacing old meters through a meter replacement program should be developed immediately.
Conservation Rate Structuring	Medium	The City has already instituted an increasing block water rate system. However, the block's rate increases are mild Greater incentive for water conservation can be had, while maintaining income, and providing economic rates for essential uses.
Leak Detection and Repairs	Low	There is little information indicating that Jal's water system has large water losses through leaks.
Pressure Reduction	Low	Pressure reduction options would be difficult and unacceptable to the community.
Indoor Audits and Incentives	Low	The potential for water savings through indoor fixture improvements is small compared to that of outdoor use. An indoor audit program is difficult to setup Work on conserving outdoor use now
Landscape Ordinances, Audits, and Incentives	Low	Let increasing block water rates reduce landscape irrigation.
Training of Landscape Maintenance Personnel	Medium	Efficient landscape irrigation practices and water retaining turf maintenance techniques have potential to save water.
Irrigation Management Information Service	Low	There is low probability that maintenance personnel will use such a resource.
Irrigation with Reclaimed Wastewater	HIGH	The golf course in now irrigated with reclaimed wastewater. There is the potential that other areas may be included, especially the cemetery
Hotels/Motels	Low	There is one hotel in Jal.
Water Waste Ordinances	Low	Jal already has a waste ordinance which is hard to enforce without significant public education
Emergency Action Plan for Drought Management	Low	Drought is not acute for groundwater users Participate in regional planning

IMPROVE RECORDKEEPING AND METERING

Because a recordkeeping system is the foundation for a water audit,[5] it is recommended that the City take steps to rearrange their water accounts and use records under the following NMOSE suggested headings.

- Single Family Residential
- Multi-Family Residential
- Commercial/Institutional
- Industrial
- Public Landscape Irrigation, and
- Other Water Demand.

In addition, meter readings from large users should be extracted from monthly billings and highlighted. Accurate recordkeeping in NMOSE categories will be key to increasing Jal's understanding of how it uses water and where the most potential to conserve exists. Recordkeeping by NMOSE categories will also contribute to a more complete picture of municipal water use throughout the Lea County Region.

[5] Wilson (2001). pg. 36

Since accuracy of records is only as good as the water measuring system employed, a meter installation and replacement program, in combination with more detailed recordkeeping, is recommended. An installation/replacement program would install new meters on unmeasured municipal facilities (such as parks and City offices) and replace old meters systematically throughout town. Special emphasis should be paid to replacing meters on large water users.

PERFORM MORE DETAILED WATER AUDIT

When water use is better understood, through the use of improvements in metering and recordkeeping recommended above, that use can be examined further by the water audit process. A more detailed water audit can select and tailor-fit conservation alternatives to areas where the most benefit is anticipated. After two years of improved metering and recordkeeping, the new data can be reviewed by a water audit process. In addition to setting water management goals, this more detailed audit can identify certain sub-areas of water use where additional metering and recordkeeping will be meaningful.

CITY OF LOVINGTON

From the time of its establishment until the middle of the 20th century, Lovington was primarily a ranching and farming community. The discovery of oil in Lea County in 1928 did not have a significant impact on the City's economy until 1950, when the Denton Pool, located nine miles northeast of town, was discovered. Since the 1950's, oil development has shaped the economy, labor force, and life style of present day Lovington. Only recently has the dairy industry become a significant part of the City.

LOVINGTON Water Brief

DEMOGRAPHICS
Population: *9,471*
Total Units (meters): *3,494*
Housing Units *3,297*

WATER RIGHTS
Own: *5,354 24 ac-ft/yr*
Lease *1845 75 ac-ft/yr*
Transfer: *none*
Aggregate per capita: *0.5653 ac-ft/yr*

WATER USE
Production
Total: *2.62 MGD (2,896 ac-ft/yr)*
Aggregate per capita: *273 GPD*
Demand (metered)
Total: *2.0 MGD (2,207 ac-ft/yr)*
Residential *1 40 MGD (1,568 ac-ft/yr)*
per capita: *148 GPD*
Commercial: *0 40 MGD (153 ac-ft/yr)*
Special: *0.17 MGD (186 ac-ft/yr)*
Unaccounted
Total *0 64 MGD (24% of produced)*
Un-metered Use: *0 34 MGD (12%)*
System Losses *0 30 MGD (12%)*
Variability
Base [Winter]: *1.35 MGD (137 gpcd)*
Maximum [Summer]: *4.44 MGD (467 gpcd)*
Difference [Base to Max]: *329%*

WATER SYSTEM EVALUATION

DEMOGRAPHICS

The Census Bureau counted 411 people in the city in 1920. By 1950, the number had grown to 3,134 and between 1950 and 1960, Lovington experienced a population increase of over 300 percent. Since 1960 the population has leveled at about 9,500, housed in about 3,200 residential units. City records show water being delivered to about 3500 metered accounts, of which 3,064 are residential, 421are commercial, and 15 are special use.[1]

WATER RIGHTS

Lovington claims 5,354 acre feet per year of righted water, which is over 0.50 acre feet per resident. In addition, Lovington recently leased 1845.75 acre feet of righted water, and additional 0.20 acre feet per resident.

TREATMENT SYSTEMS

Water Treatment

Because the City's water is high quality, disinfection is the only form of treatment required. Chlorine gas is currently the disinfection reagent.

Wastewater Treatment

Lovington is currently undergoing a wastewater treatment plant renovation. The renovations will change the plant from a trickling filter-based design to a more intensive activated sludge-based treatment. The improvements should help produce a more dependable quality effluent.

WATER PRODUCTION

Lovington pumps its water from three areas that tap into the Ogallala Aquifer in the Lea County Underground Water Basin. Lovington is positioned in the most productive portion of the Ogallala in New Mexico, where hydraulic conductivity rates approach 250 ft/day, specific yields are between 0.10 and 0.28,[2] and the saturated thickness is about 100 feet.[3] The aquifer's drawdown has slowed dramatically in recent years[4], with the depth to water being about 60 feet.[5] The water quality is very good[6] and no contaminates have been detected in the wells. The City is pumping close to 2900 acre feet annually, which is a little over 2.6 MGD. Average per-capita production is about 270 GPD.

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[1] Businesses with a special use account have negotiated water ratio.
[2] LH (2001). pg. 6-9
[3] LH (2001), Figure 28
[4] LH (2001). Figure 22
[5] LH (2001). Figure 25
[6] 600 µmhos/cm, per LH (2001). Figure 25

WATER DEMAND

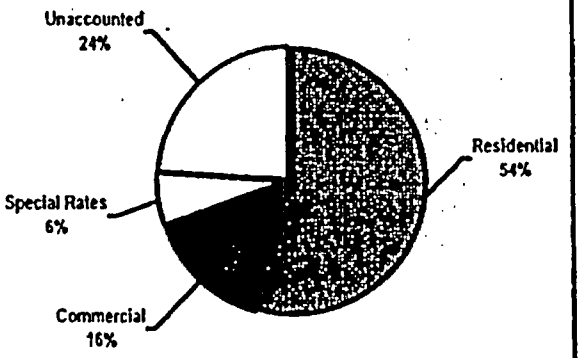
Water Deliveries

Lovington records water use by one of three categories: residential, commercial, and special use. As shown in FIGURE L-1, with over half the total water withdrawal, Lovington's residential use poses the single largest demand. In comparison, less than two gallons out of ten are delivered to commercial accounts, which include businesses and other non-residential units. The category with the smallest use consists of units that have made special rate arrangements with the City.

Unaccounted Water

Unaccounted for water is a little over 24% of yearly withdrawals. Because water used by municipal offices, fire protection services, public parks and cemetery, and recreation facilities is not metered, much of the unaccounted water is, in fact, used by Lovington. While the amount of water lost by the City's system is unknown, it is estimated to be around 300,000 GPD or 12% of the total water produced, based on seasonal lows *[see TABLE L-2]* of the unaccounted quantity.

FIGURE L-1 – Lovington Water Use by City Category
Average for 2000, 2001, and 2002
(source. City of Lovington)



Variability

As can be seen in FIGURE L-2, the variability of Lovington's water use by season is pronounced. Peak summer withdrawals of around 4.5 MGD (or about 467 gpcd) exceeds that of winter's base 1.3 MGD (137 gpcd) production by almost 350%. Likewise, total peak summer metered use of 3.4 MGD (360 gpcd) is much higher than winter's base 1.0 MGD (105gpcd). Residential use is similar with 2.7 MGD (284 gpcd) in summer and 0.6 MGD (63 gpcd) in winter. Commercial use peaks slightly during the fall (late September and October), but special rate has no discernible seasonal pattern.

If peak summer evaporative cooler consumption is estimated at 25 gpcd (0.3 MGD), the remainder of Lovington's summer-to-winter variation in residential use coincides well with New Mexico data developed by Cotter.[7] It is therefore estimated that 70% of Lovington's total residential water demand (indoor plus outdoor) in summer is due to seasonal, outdoor use.

TABLE L-1: Lovington - Unaccounted-for Water by Month (MGD)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Avg.
0.59	0.37	0.75	0 61	1.03	1.27	1 04	0.26	0.62	0 53	0 36	0.36	0.65

NOTE Values are averages for 2000, 2001, & 2002

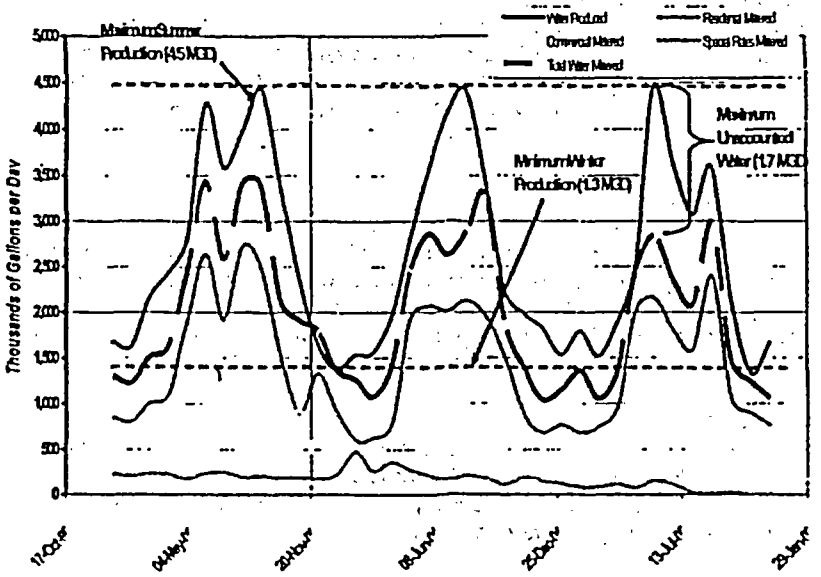
LARGE USERS

The following is a list of users to whom large amounts of water are delivered through the Lovington system.

[7] Cotter, D.J., and D. B. Croft, Water Application Practices and Landscape Attributes Associated with Residential Water Consumption, WRRI Report No. 49, *New Mexico Water Resources Research Institute*, Las Cruces, NM (1974)

- Lea County Cheese Factory (DFA) – food processing (cheese production)
- Lovington Public Schools – educational facilities
- Nor-Lea Hospital – medical (currently undergoing expansion)
- Lovington Good Samaritan – institution (senior citizen home)
- Southwest Dried Products (DFA) – food processing (dried milk products)

FIGURE L-2 - Lovington Seasonal Water Use



DISTRIBUTION INFRASTRUCTURE

Most of Lovington's water distribution piping was constructed before 1963, during years when the City experienced its highest growth rates. Common water pipe materials of that time include asbestos-cement (transite) and cast iron. While the service life of asbestos-cement pipe is proving to be very long, that of cast iron pipe can vary, with a minimum of as little as 20 years. As soils in the Lovington area are not noted for being reactive to cast iron, it is unlikely that water losses due to pipe degradation are large.

The City of Lovington's water system has predominantly Rockwell ™ water meters. Most existing meters are 25 years old. Rockwell ™ meters are known to be one of the best in the industry. However, because of the meters' age, it is likely that significant measuring errors are occurring, with some meters being off by as much as 25%.[8]

WATER RATES

The City issues water bills based on the simple declining block rate system shown in TABLE L-2, for both residential and industrial accounts. A set minimum price is charged for use up to a

TABLE L-2: Lovington - Water Use Rates

ACCOUNT TYPE	WATER USED (gallons)	RATE
Residential	1 to 3000	$11 40
	> 3000	$1 15 per each 1000 gallons
Commercial	1 to 5000	$14 40
	> 5000	$ 1 15 per each 1000-gallons

per Lovington Municipal Code - Ordinance No 442

[8] per Great Southwest Water Meter, Duran NM

certain quantity threshold. After water use exceeds the threshold, customers pay at a reduced rate for each additional 1000 gallons.

WATER MANAGEMENT GOALS

Specific conservation goals that may help shape the elements of a future conservation program and evaluate such a program's success are discussed below.

REDUCE PER CAPITA WATER USE

Because an estimated 70% of peak summer residential water use (about 200 gpcd) is applied to seasonal outdoor use, there is potential for residential water savings. However, there is not enough information to judge whether savings can be expected from both single-family and multi-family accounts, and even less information on commercial accounts or large users. Because of this, a meaningful goal cannot be established at this time.

REDUCE WITHDRAWALS

The City only withdraws about 54% of its righted water. If the quantity of water Lovington uses can be reduced by improved water management and by the implementation of conservation measures, the portion of righted water required by the City can be reduced. Combined with the community's steady population, conservation may allow the City's righted water to be adequate for the community's foreseeable future. While a substantial reduction in residential use appears feasible, there is insufficient data on the full dispensation of the City's water to establish a goal for a reduction in water withdrawals.

REDUCE WATER LOSSES

Large un-metered water use by municipal facilities probably accounts for half of Lovington's unaccounted for water. The remainder is likely a combination of both leakage and errant metering; and given the type and age of most Lovington meters, the mis-metered part is probably much larger than that of actual system losses. A meter replacement program is recommended.

EXISTING CONSERVATION MEASURES

Lovington has recently increased water rates about 40%. Part of the justification for this action was to promote more awareness of the value of water, thereby encouraging conservation. Lovington also has a water waste ordinance in which residences and businesses that waste water, usually through careless irrigation practices, are fined.

RECOMMENDATIONS

Conservations measures recommended by the NMOSE are shown and evaluated in TABLE L-3. Two of these measures (Metering and Recordkeeping Water Audits) are rated with high potential for near-term water savings in Lovington. Records, metering, and auditing and how they relate to Lovington are discussed briefly below.

IMPROVE RECORDKEEPING AND METERING

Because the water audit is the "foundation for any recordkeeping system,"[9] the City should take steps to rearrange water accounts under the following NMOSE suggested headings.

- Single Family Residential

[9] Wilson (2001). pg. 36

- Multi-Family Residential
- Commercial/Institutional
- Industrial
- Public Landscape Irrigation, and
- Other Water Demand.

In addition, meter readings from large users should be extracted from monthly billings and highlighted. Accurate recordkeeping in NMOSE categories will be key to increasing Lovington's understanding of how it uses water and where the most potential to conserve exists, and will contribute to a more complete picture of municipal water use throughout the Lea County Region.

Since the accuracy of records is only as good as the water measuring system employed, a meter installation and replacement program, in combination with more detailed recordkeeping, is recommended. An installation/replacement program would install new meters on un-measured municipal facilities (such as parks and City offices) and replace old meters systematically throughout town. Special emphasis should be paid to replacing meters on large water users.

PERORM MORE DETAILED WATER AUDIT

When water use is better understood, through the use of improvements in metering and recordkeeping recommended above, that use can be examined further by the water audit process. A more detailed water audit can select and tailor-fit conservation alternatives to areas where the most benefit is anticipated. After two years of improved metering and recordkeeping, the new data can be reviewed by a water audit process. In addition to setting water management goals, this more detailed audit can identify certain sub-areas of water use where additional metering and recordkeeping will be meaningful.

TABLE L-3: Lovington – Evaluation of NMOSE Conservation Measures

CONSERVATION MEASURE	RATING	COMMENTS
Public Education/Information	Medium	Information on various public education programs/methods can be collected. The programs can individually be evaluated for their effectiveness in Lovington.
In-School Information	Medium	The possibility of coordinating water use education in the schools with Lovington and with regional water planning efforts can be explored with school management and teachers.
Metering	HIGH	Lovington uses large amounts of water that go unmetered and make determinations of water dispensation difficult. A strategy for metering municipal water use and replacing old meters through a meter replacement program should be developed immediately.
Conservation Rate Structuring	HIGH	The City should begin evaluating options for installing an increasing block rate billing system for residential water use. More information (on the way commercial and large user accounts use water) is needed before an increasing block system for commercial accounts can be evaluated can be evaluated
Leak Detection and Repairs	Low	There is little information indicating that Lovington's water system has large water losses through leaks.
Pressure Reduction	Low	Pressure reduction options can be considered
Indoor Audits and Incentives	Low	The potential for water savings through indoor fixture improvements is small compared to that of outdoor use. An indoor audit program is difficult to setup. Work on conserving outdoor use now
Landscape Ordinances, Audits, and Incentives	Medium	Ordinances/audits/incentives can work but are hard to staff
Training of Landscape Maintenance Personnel	Low	Grounds keeping personel are trained, but improvements and continuing education can help
Irrigation Management Information Service	Low	Be open to grounds crews and landscape maintenance personal coordinate this through a regional IMIS
Irrigation with Reclaimed Wastewater	Medium	The City hopes to reuse wastewater from its new wastewater treatment plant.
Hotels/Motels	Low	A low volume of guests means low potential for water savings
Water Waste Ordinances	Low	Waste ordinances are hard to enforce without significant public education
Emergency Action Plan for Drought Management	Low	Drought is not acute for groundwater users. Participate in regional planning

COMMUNITY OF MONUMENT

Monument, the oldest community in Lea County, was established in 1885 and named for an old Indian monument built to mark the location of a local spring. Monument was initially an agricultural community. A general store was built 1900 and its owner became the community's first postmaster. Monument remained predominantly an agricultural community until the 1930's when many of its residents became employed in the oil industry. Monument had its own high school until the 1970's, when the school building was destroyed by fire. Today Monument maintains a rural agrarian atmosphere, though most residents either commute to businesses in Hobbs or are employed by nearby oil enterprises.

MONUMENT
Water Brief

DEMOGRAPHICS
Population: 250 approximate
Total Units (meters): 75
Housing Units: 70

WATER RIGHTS
Own: 80 ac-ft/yr
Lease: none
Transfer: none
Aggregate per capita: 0.32 ac-ft/yr

WATER USE
Production
Total: 0.11 MGD (127 ac-ft/yr)
Aggregate per capita: 452 GPD
Demand (metered)
Total: unknown
Residential: unknown
per capita: unknown
Commercial: unknown
Unaccounted
Total: unknown
Unmetered Use: unknown
System Losses: unknown

Variability
Base (Winter): 0.08 MGD (325 gpcd)
Max (Summer): 0.14 MGD (575 gpcd)
Difference (Base to Max): 175%

WATER SYSTEM EVALUATION

Monument, which is not an incorporated municipality, is supplied water by the Monument Mutual Domestic Water Consumer's Association (Monument MDWCA).

DEMOGRAPHICS

Because Monument is not an incorporated municipality, community specific census information is not available, though residents report that a peak population was reached sometime in the late 1950's or early 1960's. The community is within the Census Bureau's "Lea County Tract 7 (Hobbs CCD 91470)." In Tract 7 the Bureau counted 7,906 people living in 2,326 households during the 2000 census; that is an average of 3.4 people per household. With approximately 70 meters connected to the Monument system, it is estimated that the system provides water to about 250 people.

WATER RIGHTS

The Monument MDWCA claims 80 acre feet of righted water per year, which is about 0.32 acre feet per resident.

TREATMENT SYSTEMS

Water Treatment

Because Monument's water is high quality, disinfection is the only form of treatment performed. Chlorine gas is currently the disinfection regent.

Wastewater Treatment

Monument residents and businesses use onsite wastewater systems, such as septic tanks with leachfields and cisterns.

WATER PRODUCTION

Monument pumps its water from an old farm well which the community purchased when its original well became contaminated with natural gas drilling by-products. While the original well was located just north of the community (by the old high school), the new well is 4 miles further north-northwest of town. Monument runs its well 24 hours a day, 365 days a year. The well does not supply enough water to meet the community's demand. Therefore, El Paso Natural Gas contributes water to the town through a lateral connection made from a company-owned cross-country water main that passes nearby. The lateral connection is not metered and Monument is not charged for the water. Monument pumps close to 127 acre feet annually (more than its righted amount), which is a little over 0.11 MGD. Average per capita production

from Monument's well is about 450 gallons. Actual values, which would include the EPNG water, will be higher.

WATER DEMAND

Water Deliveries

Monument does not meter the water it delivers.

Unaccounted Water

Because Monument does not meter deliveries, all water produced is unaccounted.

Variability

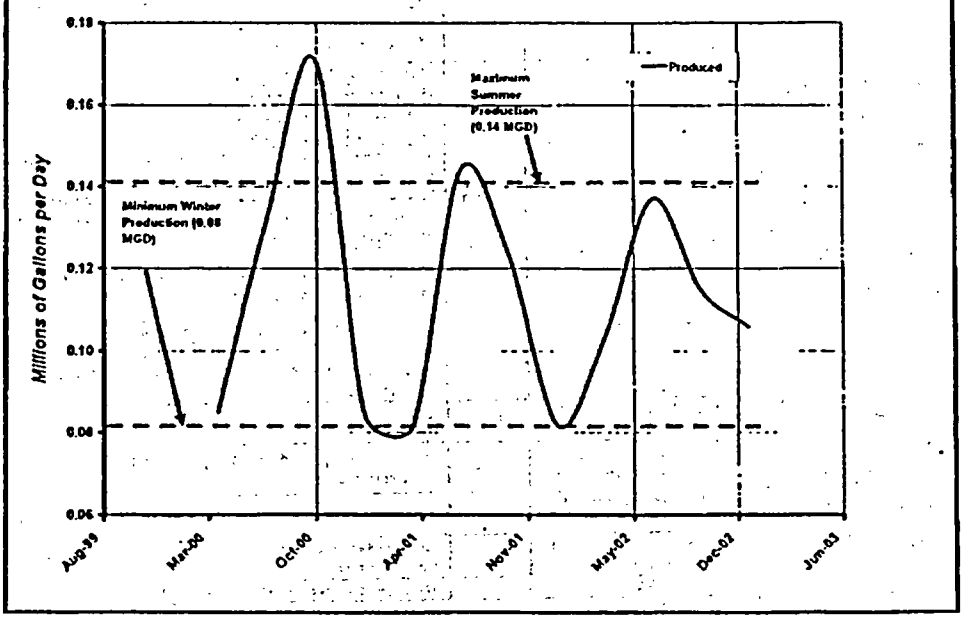
As shown in FIGURE M-1, Monument's water production is 175% higher in summer than winter. Peak summer withdrawals are at 0.14 MGD and winter base withdrawals are about 0.08 MGD. This is a relatively small variation and may be muted by water production figures being recorded quarterly instead of monthly.

LARGE USERS

Monument delivers large mounts of water to the following users.

- Amerada Hess
- Duke Energy
- Monument Cafe

FIGURE M-1 - Monument Seasonal Water Use



DISTRIBUTION INFRASTRUCTURE

Most of the community's water supply infrastructure was constructed in the 1960's and consists of asbestos-cement (transite) pipe. Since then, only small extensions and maintenance related replacements have been made to the original system.

One such extension connects the new well to town. When the original well became contaminated a new well was found further north of Monument. Water is delivered to town from the Association's new well via a 4-inch line, connecting the more distant new well to the closer old well. Water then continues into town from the old well site via a 2½-inch line. The smaller line (between the old well and town) chokes the flow and reduces the well's production.

WATER RATES

Monument charges a monthly fee of $45 per connection, regardless of the amount of water used.

WATER MANAGEMENT GOALS

REDUCE PER CAPITA WATER USE

With summer production at 175% higher than the winter base, there appears to be little potential for water savings. However, this figure is probably muted with quarterly recording. A truer indicator of savings potential is most likely the per capita production rate of 450+ gallons. Because most residential water savings data is gathered from suburban users, the magnitude of savings at Monument (which is a rural community) is difficult to predict. An actual goal in gallons per day per capita cannot be set without metering information.

REDUCE WITHDRAWALS

Because of Monument's high per capita production rate and the contribution made by EPNG there is, in all likelihood, potential available for water production savings.

REDUCE WATER LOSSES

Monument aggressively locates and repairs leaks as they become known. In the absence of metering data, there is little indication that significant amounts of water are being lost from the system.

TABLE M-1: Monument – Evaluation of NMOSE Conservation Measures

CONSERVATION MEASURE	RATING	COMMENTS
Public Education/Information	Medium	Information on various public education programs/methods can be collected. The programs can individually be evaluated for their effectiveness in Monument
In-School Information	N/A	There are no schools in Monument
Metering	HIGH	Monument does not meter its water use. Therefore, it is impossible to determine the actual dispensation of water. Little conservation planning can be made until metering is installed and data is recorded
Conservation Rate Structuring	HIGH	The Community should begin evaluating options for installing an increasing block rate billing system for residential water use. More information (on the way commercial and large user accounts use water) is needed before an increasing block system for commercial accounts can be evaluated.
Leak Detection and Repairs	Low	There is little information indicating that Monument's water system has large water losses through leaks
Pressure Reduction	Low	Pressure reduction options can be considered
Indoor Audits and Incentives	Low	The potential for water savings through indoor fixture improvements is small compared to that of outdoor use. An indoor audit program is difficult to setup.
Landscape Ordinances, Audits, and Incentives	Low	Water demand for landscape irrigation may not be high
Training of Landscape Maintenance Personnel	N/A	The Monument system does not irrigate any public or private parks, clubs, or recreation areas.
Irrigation Management Information Service	Low	Irrigation information would only be applicable to residential users
Irrigation with Reclaimed Wastewater	Low	The community's use of onsite systems precludes this on anything but a gray water basis
Hotels/Motels	N/A	There are no lodging facilities in Monument
Water Waste Ordinances	Low	Hard to enforce.
Emergency Action Plan for Drought Management	Low	Because drought is not acute for groundwater users, participation in regional planning is best option

EXISTING CONSERVATION MEASURES

Monument has a voluntary schedule for watering landscaping, with odd and even addresses watering on alternating days.

RECOMMENDATIONS

Conservations measures recommended by the NMOSE are shown and evaluated in TABLE M-1. Two of these measures (Metering and Recordkeeping Water Audits) are rated with high potential for near-term water savings in Monument. Records, metering and auditing, and how they relate to Monument are discussed briefly below. An additional item, upsizing a portion of the community's small waterline that transmits water from their well site to town, is also discussed. Since Monument produces more than its righted amount of water (not counting the water donated by the EPNG), conservation may be particularly useful to the community.

IMPROVE RECORDKEEPING AND METERING

The following NMOSE suggested water use categories apply to Monument. It is recommended that the Association take strides to rearrange water accounts and record usage under the following headings:

- Single Family Residential
- Commercial/Institutional (Monument Cafe, Post Office, etc.)
- Industrial (Amerada Hiss & Duke Energy), and
- Other Water Demand

Accurate recordkeeping, in NMOSE categories, will be key to increasing Monument's understanding of how water is used and where the most potential to conserve exists, and contribute to a more complete picture of municipal water use throughout the Lea County Region.

PERFORM MORE DETAILED WATER AUDIT

When water use is better understood, through the use of improvements in metering and recordkeeping recommended above, it can be examined further by the water audit process.

TRANSMISSION LINE UPSIZING

Before a complete accounting of Monument's water can be made its total production must be known; that means either metering the EPNG takeoffs or pumping solely from the community's own well. More water could be transmitted from the community's well to town if the old portion of the transmission line (a 2½-inch pipe) was replaced with a larger pipe. This small line runs about ¼ mile from the community's old well site to town. More water from the Association's new well would make it less dependent on EPNG's generosity and more aware of its water production. Replacing this line with a 4-inch PVC line is recommended. An anticipated project cost is about $15,000.

TOWN OF TATUM

Tatum is Lea County's northern-most municipality and also it's smallest. Tatum is located at the center of what once was the 1.5 million acre Four Lakes Ranch. At the beginning of the 20th century, the ranch was broken up and settlers began to move in. The town, named for an early homesteader, was founded in 1909, when the community's first general store was constructed and the Post Office was established.

While the town originated by supporting local homesteaders and ranches, it came under the influence of oil in the late 1920's. Today the oil and agriculture/ranching industries continue to have a strong presence in Tatum. In addition, Tatum is located at a strategic crossroads and enjoys the business of Texas tourists who travel to the New Mexico mountains. Recently, Tatum has become home to the studios of several artists.

TATUM
Water Brief

DEMOGRAPHICS
Population: 683
Total Units (meters): 365
Housing Units: 391

WATER RIGHTS
Own: 259.16 ac/yr
Lease: none
Credit: 32 ac-ft
Transfer: none
Aggregate per capita: 0.38 ac-ft/yr

WATER USE
Production (3-yr Avg.)
Total: 212 ac-ft/yr (0.19 MGD)
Aggregate per capita: 277 GPD

Demand (metered)
Total: 205.5 ac-ft/yr (0.18 MGD)
Public Supply: 160.7 ac-ft/yr (0.14 MGD)
per capita: 210 GPD
Public Park: 15.8 ac-ft/yr (0.014 MGD)
Cemetery: 21.9 ac-ft/yr (0.020 MGD)
Treatment Plant: 7.2 ac-ft/yr (0.006 MGD)

Unaccounted
Total: 0.06 MGD (3% of produced)
Unmetered Use: unknown
System Losses: unknown

Variability
Base (Winter): 0.08 MGD (122 gpcd)
Maximum (Summer): 0.35 MGD (511 gpcd)
Difference (Base to Max.): 419%

Demand by NMOSE Audit Category
Single-family residential: not available
Multi-family residential: not available
Commercial/institutional: not available
Industrial: not available
Public Landscape Irrigation: not available

WATER SYSTEM EVALUATION

DEMOGRAPHICS

The Census Bureau reported a population in Tatum of 688 in 1950, the first year of recorded. The next decade saw the community grow by almost 70% to a population of 1,168 in 1960. Between 1960 and 1990, the community declined at a rate of about 15% a year. Since 1990, Tatum's population appears to have been sustained. The 2000 census reports 683 residents in 391 housing units, of which 267 were occupied. The Town is not reporting the number of water services or metered accounts.

WATER RIGHTS

The Regional Water Plan[1] reports that Tatum owns 259.16 acre feet of righted water and 32 acre feet of credited return flows each year within the Lea County UWB. The return flow is based on effluent from the community's wastewater treatment plant infiltrating into the subsurface. The combination of owned water and return credits equals about 0.43 acre feet of righted water per resident.

TREATMENT SYSTEMS

Water Treatment

Tatum's water is high quality and requires only disinfection. Chlorine gas is the disinfection regent.

Wastewater Treatment

Tatum uses a passive aerated pond/constructed wetland system for its wastewater treatment. Effluent is disposed into the subsurface via an infiltration gallery. The Town has secured a return flow credit of 32 acre feet per year towards its righted water, in consideration of the aquifer recharge resulting from this disposal.

WATER PRODUCTION

Tatum withdraws water from the Ogallala Aquifer, in the Lea County UWB, from a series of wells located throughout the community. One well, no longer used by the Town, is subject to a contaminant plume (generated by an old gas station) and is now being remediated through a "pump and treat" operation. While Tatum's wells are located north of the most prolific part of the Ogallala in New Mexico, they have a high

[1] LH (1999), Table 7-1

capacity - approximately 900 gpm when combined. Hydraulic conductivity rates approach 230 ft/day, specific yields of around 0.20, and the saturated thickness is about 50 feet. The aquifer has experienced local stabilization, resulting in little drawdown over the last 10 years.[2] The water quality is very good[3] with only one isolated well contamination from a known source. The Town pumps about 212 acre feet annually, which is a little over 0.19 MGD. Average per capita production is 277 gallons a day.

WATER DEMAND

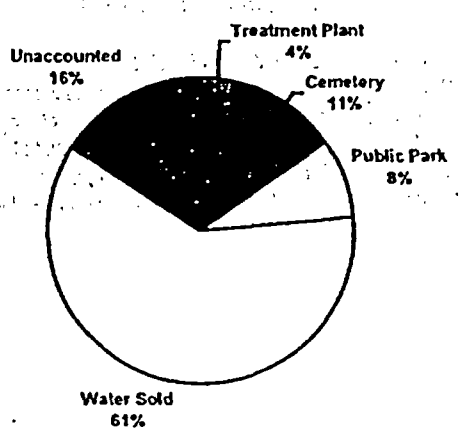
Water Deliveries

Prior to 2002 Tatum recorded only the amount of water it sold through monthly metering. Beginning in 2002, the Town began to keep track of the amount of water used by the municipal facilities. As shown in FIGURE T-1, water sold to community residents and businesses in 2002 is just over 60% of the total water produced. The Town does not categorize sold water by use (i.e. residential, commercial, industrial, etc.), instead water required by municipal facilities (cemetery, parks, and treatment plant) is categorized. Together the various Town uses comprise 23% of the total water produced. Total water use dropped in 2002, an anomaly that the Town attributes to better metering, higher use rates, and the initiation of several conservation measures.

Unaccounted Water

A remnant 16% of the produced water goes unaccounted for. Since all water used by the community is metered this amount can be considered to be water actually lost out of the distribution system.

FIGURE T-1 – Tatum Water Use by Category
2002 Records Only *(source: Town of Tatum)*



Variability

Tatum's water use by season shows a pronounced variation. Peak summer production is 0.35 MGD (511 gpcd), which is over 400% greater than the winter base production of 0.08 MGD (122 gpcd). The winter base closely resembles the amount of water reaching the community's WWTP. Assuming 25 gpcd (0.02 MGD) for evaporative cooler demand, 70% of Tatum's peak summer use appears to be for landscape irrigation of both residences and parks.

LARGE USERS

Tatum has several businesses and institutions that use a relatively large amount of water. They include:

- Tatum Public Schools,
- Nor Lea Medical Clinic,
- 1st United Methodist Church of Tatum, and
- Town & Country Convenience Store

[2] However, some data from 2002-2003 indicate drawdown may be increasing again. The water table level will be monitored closely over in coming months to detect any trends that may be developing.
[3] 620 µmhos/cm, per LH (2001). Figure 31

DISTRIBUTION INFRASTRUCTURE

Most of Tatum's water distribution piping was constructed before 1960. Existing water pipe materials are thought to be mostly asbestos-cement (transite), with galvanized iron being used for sections with small diameters. While the service life of asbestos-cement pipe is proving to be very long, galvanized iron is limited. Sizable water losses may be occurring on reaches serviced by aged galvanized piping. Because the Town's water meters also date from the 1950's, errors of up to 30% can be expected based on age alone.[4]

TABLE T-1: Tatum - Water Use Rates

ACCOUNT TYPE	WATER USED (gallons)	RATE
All Accounts 2002	1 to 3000	$5.00
	> 3000	$1.42 per each 1000-gallons
All Accounts 2003	1 to 3000	$5.00
	> 3000	$1.49 per each 1000-gallons
All Accounts 2004	1 to 3000	$5.00
	> 3000	$1.54 per each 1000-gallons
All Accounts 2005	1 to 3000	$5.00
	> 3000	$1.62 per each 1000-gallons
All Accounts 2006	1 to 3000	$5.00
	> 3000	$1.70 per each 1000-gallons

per Tatum Municipal Ordinances - Section 8.47

WATER RATES

Tatum charges customers for water use on a monthly basis. Billings are based on a simple block schedule where water used up to 3,000 gallons is $5.00 and everything over 3,000 gallons is a higher price. In October of 2002, Tatum decided to increase the rates it charges for water use over 3000 gallons. Tatum's water use rates through 2006 are shown in TABLE T-1.

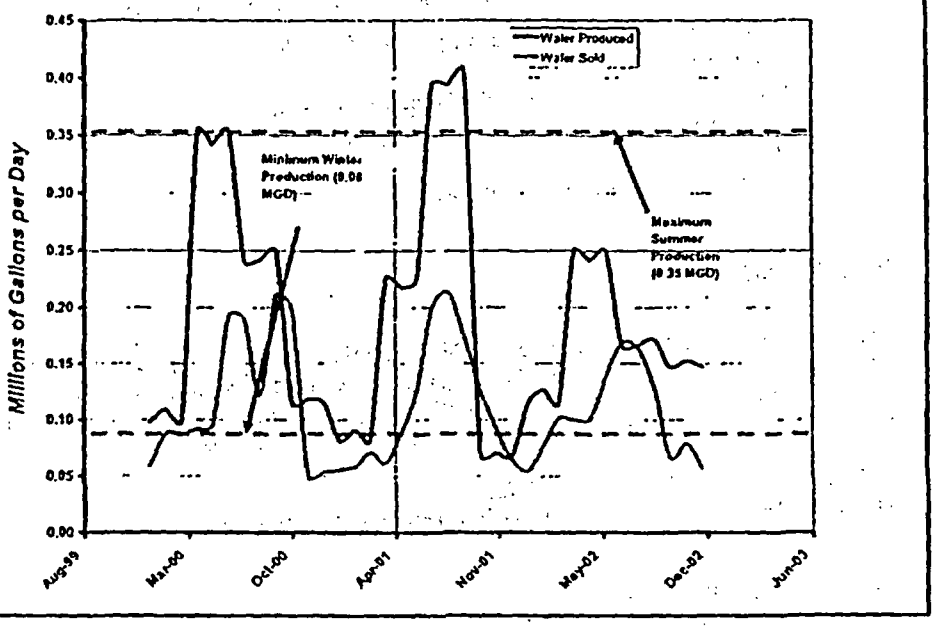
WATER MANAGEMENT GOALS

REDUCE PER CAPITA WATER USE

The Town's winter base use rate of 122 gpcd is reasonable and probably cannot be greatly improved upon without an extensive indoor fixture improvement program. However, with high summer use rates of 511 gpcd, of which over 350 gpcd (or 70%) appears to be applied to landscaping, there seems to be potential for water savings through improved irrigation practices. Because the Town's water records do not record sales by usage, there is not enough information on actual water dispensation to set meaningful goals.

[4] per Great Southwest Meter, Duran, NM

FIGURE T-2 - Tatum Seasonal Water Use



REDUCE WITHDRAWALS

The Town withdraws about 80% of its righted water each year. Combined with the community's steady population, conservation may allow the City's righted water to be adequate for the near future. However, the Town has limited righted water reserves (only 20% above existing demand) which may not be enough for long-term needs. Realistic reduction goals for produced water cannot be set until the community's water use is better understood.

REDUCE WATER LOSSES

System losses appear to be around 16%, so water meter replacement programs and water leak detection programs may be advantageous. However, this figure is the result of only a partial year of complete community water metering. Several years of fully metered system records should be available before the benefits of a leak detection program can be assessed or designed.

IMPLEMENTATION SCHEDULE

To coordinate with other Lea County communities, it is recommended that Tatum implement the recordkeeping improvements suggested by this report by January 2004. If Tatum can begin keeping records in the suggested categories by January 2004, then 2 years of data will be available for a more in-depth water audit at the end of 2006.

A meter replacement program can be implemented beginning in 2004. At $175 per meter the Town's 365 meters can be replaced for about $60,000. If the meters can be divided into thirds (i.e. approximately 120), they can be replaced for about $20,000 a year over the next 3 years.

EXISTING CONSERVATION MEASURES

The Town has worked in recent years to incorporate various conservation practices, including:

- Installation of timers and controls on public park irrigation systems,
- Installation of meters on all water services,
- Promoting the use of timer controlled irrigation systems for residences,
- Planning for controlling water production and storage by SCADA,
- Calibrating well meters,
- And installed progressive block water use rates

RECOMMENDATIONS

Conservation measures recommended by the NMOSE are listed in TABLE T-3, along with rankings and comments from the Town. Three measures (Metering, Conservation Rate Structuring, and Leak Detection) are rated with high potential by Tatum for near-term water savings. These three measures, together with adjustments to the Town's recordkeeping, are recommended and discussed below.

IMPROVE RECORDKEEPING AND METERING
It is recommended that the Town rearrange water accounts under the following NMOSE suggested headings:

- Single Family Residential
- Commercial/Institutional
- Industrial
- Public Landscape Irrigation, and
- Other Water Demand

In addition, meter readings from large users should be extracted from monthly billings and highlighted.

The accuracy of records is only as good as the water measuring system employed. To this end, the Town has metered all services within the last year. However, significant metering errors likely continue because of the excessive age of the community's pre-existing meters. A program which would replace old meters, systematically throughout town, with new meters is recommended. Special emphasis should be paid to replacing meters on large water users first.

LEAK DETECTION AND REPAIR
Through CDBG funding, Tatum has set on an aggressive effort to replace old and likely leaking waterlines. They have scheduled for the completion of line replacements within the next three years. However, additional funding may be required. Tatum is the only Lea County community that has data quantifying actual line losses (as apposed to just unaccounted water). It is recommended that Tatum continue to pursue the line replacement project aggressively.

PERFORM MORE DETAILED WATER AUDIT

When water-use is better understood, through the use of improvements in metering and recordkeeping recommended above, that use can be examined further by the water audit process. A more detailed water audit can select and tailor-fit conservation alternatives to areas where the most benefit is anticipated. After two years of improved metering and recordkeeping, the new data can be reviewed by a water audit process. In addition to setting water management goals, this more detailed audit can identify certain sub-areas of water use where additional metering and recordkeeping will be meaningful.

TABLE T-2: Tatum – Evaluation of NMOSE Conservation Measures

CONSERVATION MEASURE	RATING	COMMENTS
Public Education/Information	Medium	The Town is already doing this with messages and notes included in monthly billings
In-School Information	Low	The schools are already doing this, but coordination with the Town is unnecessary
Metering	HIGH	Errors from old meters are thought to be high. A meter replacement program will have maximum benefit
Conservation Rate Structuring	HIGH	The Town already is seeing the benefits of raising water rates If additional conservation is required small increases in rates will curb water use even more.
Leak Detection and Repairs	HIGH	System losses appear to be high. Old pipes likely contribute to system losses
Pressure Reduction	Low	The community's pressure is set by their elevated tanks, a situation that will continue for many years Pressure reduction would limit storage.
Indoor Audits and Incentives	Medium	The Town now observes large increases in water use and contacts respective account holders Town personnel help account holders determine the problem
Landscape Ordinances, Audits, and Incentives	Low	Incentives to efficient irrigating is included in Town's rate structure
Training of Landscape Maintenance Personnel	Low	Landscape/Parks personnel are already trained in efficient irrigation methods.
Irrigation Management Information Service	Low	Management feels there is a low probability that landscape/parks personnel would use an information service.
Irrigation with Reclaimed Wastewater	Low	Wastewater treatment plant effluent is infiltrated down to the aquifer (the Town receives recharge credits) and therefore is already being reused for irrigation
Hotels/Motels	Low	Little interest and low benefits are perceived
Water Waste Ordinances	Low	Incentives against water wasting are included in Town's rate structure
Emergency Action Plan for Drought Management	Low	The Town already has drought measures in place

COMPARATIVE ANALYSIS

This section compares the water production and use information obtained for each of the Lea County communities. Because each town is unique and because the challenges they face are different, their water use practices vary and will continue to vary. At the same time, the communities share a common resource, groundwater. With the exception of Jal, they all share the same aquifer.

FIGURE C-1 –
Population & Water Accounts by Lea County Community

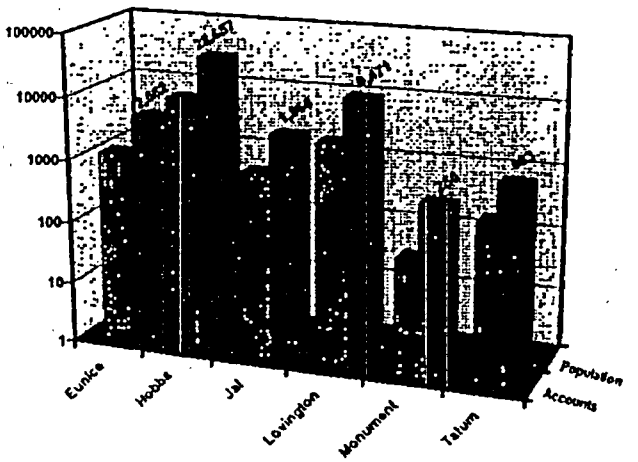
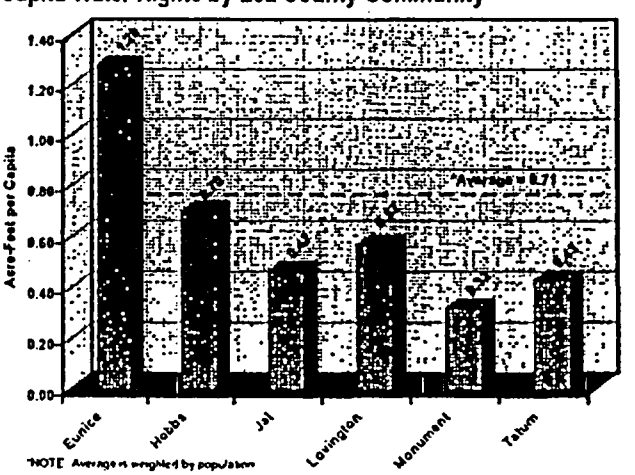


FIGURE C-2–
Per Capita Water Rights by Lea County Community

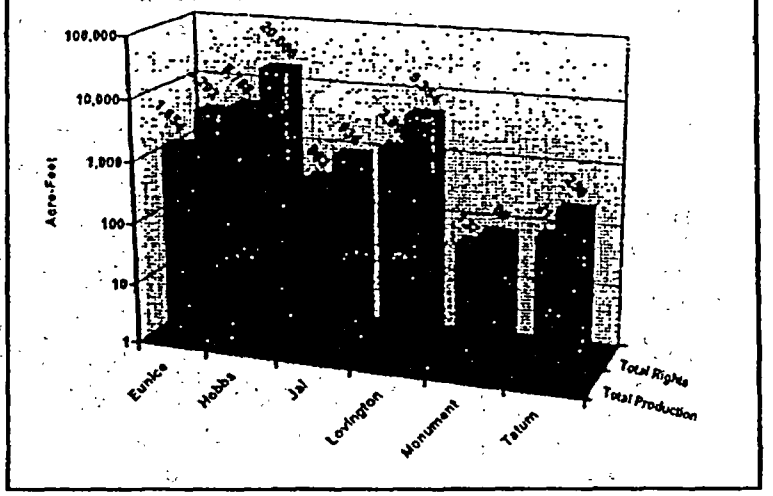


DEMOGRAPHICS

The communities of Lea County have similar histories. They all began as farming and ranching centers that eventually grew to support the region's oil field activity. Today the communities continue to be related by geography, climate, and industry (i.e. the oil fields and agriculture), but they differ in size and in their broader, emerging economic activity. Hobbs, with by far the largest population, has become a regional commercial, medical, and education center and may soon be home to a large racetrack and casino. Lovington, the second largest community, is trying to branch out from its base industry, government (i.e. Lea County Courthouse and Administrative Offices), to a more diversified portfolio. It is looking more and more likely that the third largest community, Eunice, will be home to a new uranium processing facility. Jal and Tatum may have an opportunity for economic growth in alternative industries such as art and remote home businesses. Monument is likely destined to be a rural bedroom community for Hobbs.

The US Census Bureau reported a combined population of 43,589 people residing in the communities audited by this report. Serving the total population is 17,051 water service connections. On average, each connection serves 2.37 people. The largest number of people served by an connection is in Monument with 3.33; the smallest is in Tatum with 1.87. Populations of the various Lea County communities and the number of water services in those communities are shown in FIGURE C-1. Typically, residential communities have a higher number of people per service than do communities with commercial and industrial activities.

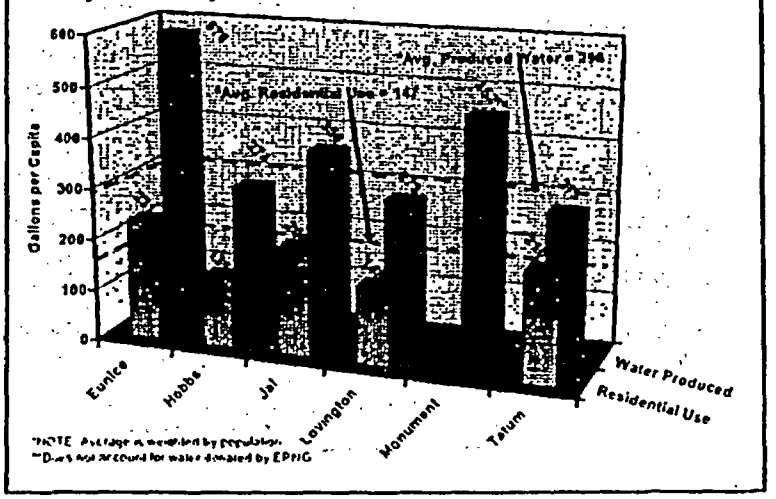
FIGURE C-3 –
Water Produced & Water Righted by Lea County Community



WATER RIGHTS

While it is very difficult for a community to know how many water rights to purchase, the rights held by a community are comparable to the population served and the water produced. Lea County communities claim an average of 0.71 acre feet of righted water for each person annually. As shown in FIGURE C-2, Eunice has the highest righted water reserves per capita with 1.28 acre-feet per person; Monument is the lowest with only 0.32. The part of each community's righted water produced each year is shown in FIGURE C-3. Eunice, Hobbs, and Lovington produce only about 50% of their righted reserves. Tatum and Jal produce a little over 80% of theirs. Monument produces about 60% more water than it has rights too, and

FIGURE C-4 – Per Capita Water-Production & Residential Use by Lea County Community in 2000



actually uses an even higher amount because of a non-quantified donation from EPNG.

WATER DEMAND

FIGURE C-4 shows the per capita production and residential usage for the various Lea County communities. The Countywide average is 296 gpcd for water produced by community systems. Residential customers on community systems use around 147 gpcd. However, the two largest communities, Hobbs and Lovington, and a third community Tatum, produce around 270 gpcd. Jal, at 359 gpcd, and Eunice, at 576 gpcd, are 28% and 105% higher respectively than Hobbs/ Lovington/Tatum.[1] While it is not possible to determine the quantity of water placed into Monument's distribution system, it can be deduced that the amount is well in excess of production for Hobbs/ Lovington/Tatum. A comparison of Lea County with Albuquerque (which pumped 204 gpcd) and Santa Fe[2] (which pumped 145 gpcd) in 2000 indicates there may be ways to reduce the amount of water used in most Lea County communities.

FIGURE C-5 - Unaccounted Water by Lea County Community

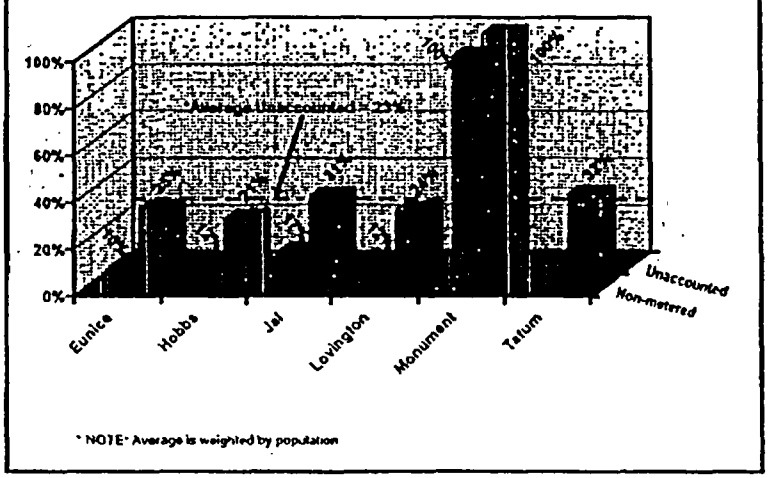
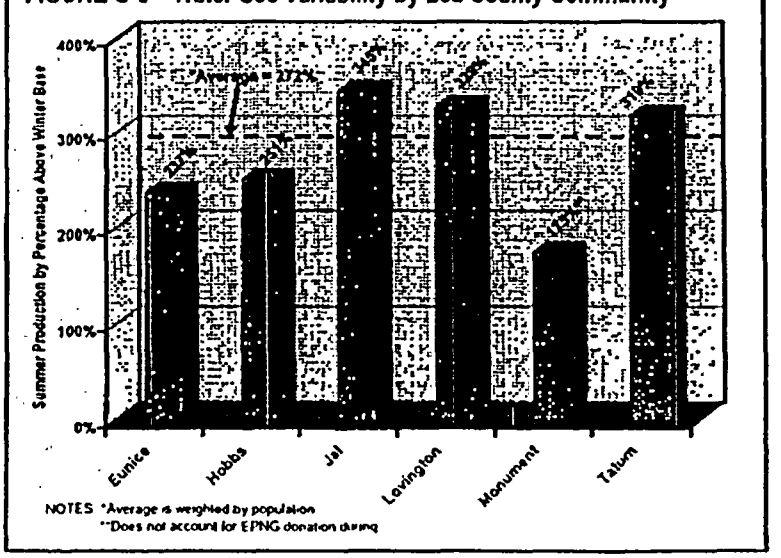


FIGURE C-6 – Water Use Variability by Lea County Community



[1] For reasons why Jal and Eunice have high water use, see the Sections dealing with those communities in this report.
[2] Sangre de Cristo Water Company

UNACCOUNTED

Municipal systems should lose no more than 10% of the water they produce.[3] Well-managed systems often do not lose water in excess 6% or 7%. System leaks and errors in metering are the sources of most unaccounted water. As can be seen in FIGURE C-5, with the exception of Monument, unaccounted water runs between 21% and 32% of that produced by Lea County communities. The countywide average is a little over 23%.[4] The amount of water that is actually used by a community, but not metered, was estimated herein (when possible) by examining seasonal variations in the unaccounted portion. FIGURE C-5 shows the estimated non-metered amount at around 50% of the unaccounted portion for most Lea County communities. This implies the actual portion of produced water that is lost by the Lea County systems is less than 12%. and waterline replacement programs may potentially save about 6% of the water produced by Lea County communities.

VARIABILITY

Engineers typically design a water system to experience summer demands 163% above the winter base use.[5] As shown in FIGURE C-6, seasonal variability in water production by community systems in Lea County is large; countywide summer production averages 272% higher than the winter base. Jal has the highest variation with summer use being 345% above winter. Lovington and Tatum also exceed the average; Eunice and Hobbs are below the average. Monument's variability is indeterminate because water is donated by EPNG during summer peaks. The large variability indicates that substantial water savings may be possible if optional summer uses are reduced.

TABLE C1 – Water Use Categories by Lea County Community

NMOSE Recommended Water Demand Categories *[Wilson (1999), p36]*	Eunice	Hobbs	Lovington	Jal	Monument[3]	Tatum
Single-Family Residential	X	X	X	X		
Multi-Family Residential		X				
Commercial/Institutional	X	X	X[4]	X		
Industrial	X			X		
Public Landscape Irrigation		X[1]				X
Other	X[2]	X[3]				X[6]

1 Hobbs only records irrigation use - without differentiation between public & private accounts.
2 "Retailers" *(Water to Oil Field Truckers)* & "Outside City" *(Residential)*
3 "Municipal" *(City Offices, Shops, etc.)*
4 Includes Industrial

WATER RATES

The NMOSE recommends water use be recorded in six categories:

1. single-family residential,
2. multi-family residential,
3. commercial/institutional,
4. industrial,
5. public landscape irrigation, and
6. other water demand[6]

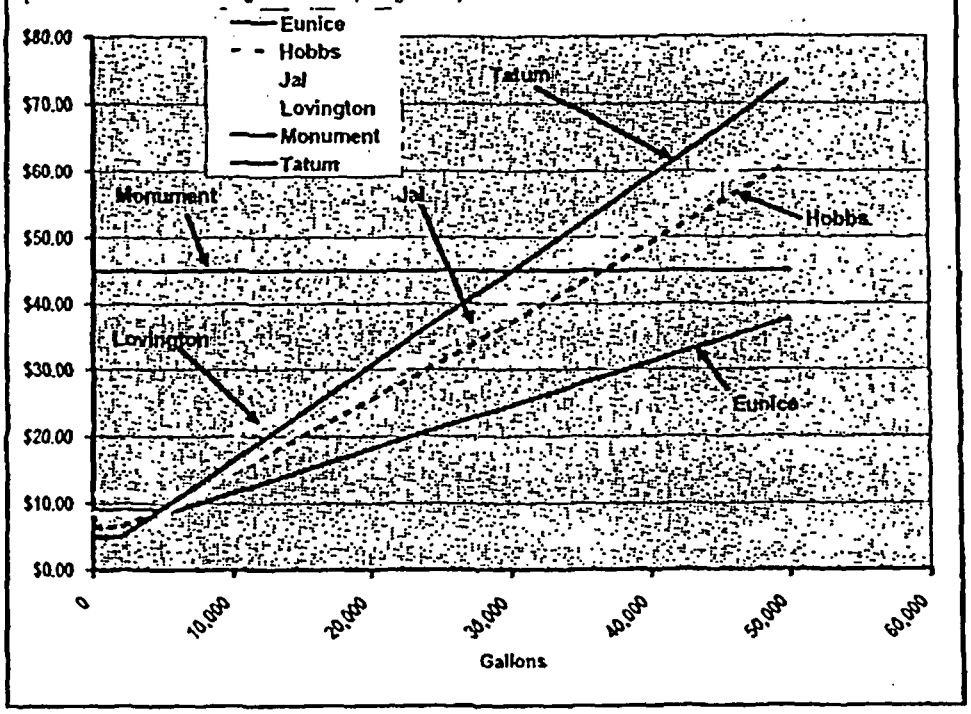
As shown in TABLE C-1, no single community uses all five categories.

Rates for water vary by community and use category. A comparison of rates seen by residential customers using less than 50,000 gallons-per-month (gal/mo) is shown in FIGURE C-7. Tatum has the lowest rates for use under 5,000 gal/mo and the highest rates for use over 25,000 gal/mo. The rates in Hobbs, Jal, and

[3] Wilson (2001). pg 9
[4] Monument, which lacks meters, technically cannot account for any of its water and is not included in the countywide average.
[5] Lindberg (1999). pg 26-18
[6] Wilson (2001). pg 36

Lovington resemble each other, both in minimum fees and the pace for fee increases. Eunice has the lowest rates for high-quantity users. Monument's set rate of $45 per month, regardless of quantity, is in contrast to the other communities.

FIGURE C-7 – Water Use Rates by Lea County Community
(Residential customers using less than 50,000 gal./mo.)



RECOMMENDATIONS

The following is a comparison of how the staff of each Lea County community evaluated the potential effectiveness of the NMOSE Recommended Conservation Measures in their communities. "Metering" had the highest rating across all communities, with everyone rating it as having a high potential for success. "Conservation Rate Structuring" was the next highest rated, with 4 of the 6 communities rating its potential high, and two communities rating it medium. Every community rated the items "Pressure Reduction" and "Irrigation Management Irrigation Service" as having low potential.

TABLE C-2: Evaluation of NMOSE Conservation Measures

CONSERVATION MEASURE	RATING					
	Eunice	Hobbs	Jal	Lovington	Monument	Tatum
Public Education/Information	L	H	M	M	M	M
In-School Information	L	M	M	M	n/a	L
Metering	H	H	H	H	H	H
Conservation Rate Structuring	H	M	M	H	H	H
Leak Detection and Repairs	L	H	L	L	L	H
Pressure Reduction	L	L	L	L	L	L
Indoor Audits and Incentives	M	M	L	L	L	M
Landscape Ordinances, Audits, and Incentives	M	M	L	M	L	L
Training of Landscape Maintenance Personnel	H	M	M	L	n/a	L
Irrigation Management Information Service	L	L	L	L	L	L
Irrigation with Reclaimed Wastewater	M	H	H	L	L	L
Hotels/Motels	L	M	L	L	n/a	L
Water Waste Ordinances	M	M	L	L	L	L
Emergency Action Plan for Drought Management	L	M	L	L	L	L