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Executive Summary

Introduction

The Jemez y Sangre region, which includes most of Santa Fe County, all of Los Alamos County, and a portion of Rio Arriba County, is one of 16 water planning regions in the State of New Mexico. Regional water planning was initiated in New Mexico in 1987 with the purpose of protecting New Mexico water resources while ensuring that each region is prepared to meet future water demands. Regional water planning activities are overseen by the New Mexico Interstate Stream Commission (ISC).

For the purposes of the Jemez y Sangre water planning effort, the region was divided into 10 sub-basins for hydrologic and water demand analysis. These sub-basins were then grouped into 5 subregions for the projection of future supply and demand based on source of supply for projected demands. The 5 subregions, along with the sub-basins that they encompass, are:

- Northern subregion (Velarde, Santa Clara, and Santa Cruz sub-basins)
- Aamodt subregion (Tesuque and Pojoaque-Nambé sub-basins)
- Los Alamos subregion (Los Alamos sub-basin)
- Santa Fe subregion (Santa Fe, Caja del Rio, and North Galisteo Creek sub-basins)
- South Galisteo Creek subregion (South Galisteo Creek sub-basin)

The original *Jemez y Sangre Regional Water Plan* (2003 JyS Plan) was completed and accepted by the ISC in 2003. The purpose of the 2003 JyS Plan is to assist governmental and other entities within the Jemez y Sangre region to make sound planning decisions to provide for the region's future needs.

Purpose and Scope of 2007 Update, Phase I

In March of 2007, the Interstate Stream Commission and the Jemez y Sangre Water Planning Council contracted with Daniel B. Stephens & Associates, Inc. and Amy Lewis to update the 2003 JyS Plan, under the direction of the Jemez y Sangre Water Planning Council (Council). The Council consists of representatives from local governments, water users groups, and the



public. DBS&A produced a draft report for Council review in September of 2007. After review of the draft report and monthly meetings to discuss the content, the Council has revised that draft report to produce this document.

The scope of work for Phase I of this Update does not include full revision and re-publication of the regional water plan. Instead, the present scope of Phase I of the Update of the 2003 JyS plan is designed to identify changes in the region's supply and demand. In particular, the scope focuses on evaluating the public water supply sector, which experienced the most growth when the original plan was prepared and did not include the agricultural sector where less change has occurred. Phase I of the Update considers only average precipitation, stream flows and historically normal conditions and documents changes in policy, ordinances, rules and regulations, and litigation since completion of the 2003 JyS Plan.

Key Findings from the Jemez y Sangre Regional Water Planning Council

Based on newly available and updated information in the draft report by DBS&A, the Council determined that the key findings from Phase I of the Update are:

- Since 2003, the Jemez y Sangre Region has made progress in closing the projected gap between water supply available in 2000 and the projected demand in 2060, largely due to the implementation of water conservation efforts (decreasing demand) and the proposed projects to divert native Rio Grande water rights and San Juan-Chama water from the Rio Grande (increasing available supply).
- Four of the five subregions (Northern, Aamodt, Los Alamos, and Santa Fe) do not expect a significant gap between demand and supply until the year 2040 based on projected historical supply while closing the gap for one subregion (South Galisteo) is dependent upon unquantified groundwater.
- A projected gap for the entire Jemez y Sangre region will not occur until after 2040 based on 2007 conditions provided that City of Santa Fe and Santa Fe County, Los Alamos and Espanola have all completed proposed projects to divert San Juan/Chama and obtained the full amount of planned native water rights from the Rio Grande and the water for the Regional Water System proposed under the Aamodt Settlement is made available.



- The projections in the Update are based on historically normal conditions. If drought and other negative conditions impact the region's water supply, the gaps will be greater than projected under normal conditions.
- The Update reports that the observed recent annual population growth rate may be lower than the projections in the 2003 JyS Plan which could affect the projected gap between supply and demand.
- Changes in population projections will increase or decrease the projected gap between supply and demand. Given that population growth is responsive to multiple factors (types of business development, economic conditions, tax policy, reliability of water and other natural resources, etc.), population projections are indicators of possible future scenarios. Preparation of high, likely and low projections may be helpful planning tools.
- There is more and improved hydrologic information available to the region.

Sources of Information for Phase I of the Update

To determine the changes that have occurred and revise the projections of supply and demand, DBS&A, in conjunction with the Council, developed a survey to solicit information regarding actions taken on each of the alternatives included in the 2003 JyS Plan. In addition, the survey solicited updated information on water use, changed policies or ordinances, and other activities that may impact or augment water supplies in the Jemez y Sangre region. The survey was mailed in the spring of 2007 to 89 water suppliers, government agencies, pueblos, and advocacy groups, 28 of which responded. In addition to the mailed surveys, DBS&A interviewed key water suppliers and decision makers in the region. Information was also obtained from government web sites and communication with agency staff, and from water planning documents completed since publication of the 2003 JyS Plan.

Revisions in Projected Gap between Supply and Demand

Since 2003, the water providers in the Jemez y Sangre water planning region have made great strides toward not only closing the gap between supply and demand, but also protecting the region's water resources through watershed and riparian restoration projects, stormwater management, and conjunctive use strategies. Figures ES-1 through ES-5 show the future supply



and demand projected for the original 2003 JyS Plan along with the revised projections prepared for this update.

In some cases projected demand has increased:

- The projected demand in the Northern and Aamodt subregions has increased due to new golf courses in these subregions.
- The Los Alamos subregion's projected demand has increased due to projected growth from land transfers and future activities at Los Alamos National Laboratory.

Review of population estimates in 2006 revealed that the annual growth rate from 2000 to 2006 may be less than the rate predicted by BBER for the 2003 JyS Plan except in Los Alamos, where the growth rate is about twice the rate predicted by BBER. However, the projections of population growth upon which the demand projections (Figures ES-1 through ES-5) are based have not been modified for Phase I of the Update, except in the Los Alamos subregion. Population projections are based on many variables and are uncertain. The uncertainty will only impact when new measures to close the gap between supply and demand will need to be implemented, not whether those changes are needed.

In all subregions except the South Galisteo, the gap between supply and demand in the year 2060 is being met, largely due to proposed projects to divert San Juan-Chama water and native Rio Grande water rights from the Rio Grande (increasing available supply) and to water conservation efforts (decreasing demand). The gap reduction is also due to new domestic wells that continue to be drilled in all subregions, amounting to an increased diversion of about 300 acre-feet per year (ac-ft/yr) since 2000 that could increase another 2,000 ac-ft/yr by 2060 if the rate of well drilling continues.

Plans are in place for infrastructure projects to address water supply needs through the year 2040 in the Northern subregion, through 2060 in the Aamodt and Los Alamos subregions, and through 2030 in the Santa Fe Subregion. The supply-demand gap in the South Galisteo subregion can only be met through domestic wells at this time.



The gaps shown in Figures ES-1 through ES-5 do not account for drought vulnerability, yet as regions depend more and more on surface water, the vulnerability to drought will increase. Some of this vulnerability may be offset by a decreased dependence on groundwater (due to the increased use of surface water in wet years) that allows the aquifers to recover and be available during drought periods.

Future Activities

An important objective of Phase I of the Update was to solicit input on how the Council and future updates of the plan could provide the most value to the stakeholders in the region. Survey respondents were unanimous in agreeing that there is value in communication and collaboration, but that each entity is going to pursue their own projects and address their specific needs. Several of those surveyed appreciated the excellent support for projects, projections of future water uses, useful advice, options charts, and compilation and summaries of existing reports and documents.

Recommendations from those surveyed included condensing the water plan into a short version that could be useful to show what is being done now to improve and sustain water resources, highlighting regional issues such as aquifer management, surface water-groundwater interactions, plume migration, and sustainability. Survey respondents also indicated that the Council needs a clear mission and ongoing support, money for public relations and advocacy, and a more defined educational role.

The Council has an opportunity to continue education through development of a web site or public meetings on particular issues. The Council could also continue to collect information, as was done for this Update, and to discuss regional water resources management issues. The Council could play a vital role in investigating the sustainability of water resources, water right transfers, adoption of acéquia bylaws, or other information that characterizes changes in the region. The role of the Council is to examine the issues from a broader perspective and find common ground and solutions with the greatest benefit.



Planning for Drought

One of the important issues that the Jemez y Sangre region continues to face is potential drought. Because predictions of global warming effects on water supplies indicate that a greater percentage of extreme conditions (both drought and flood) is likely, the region needs to be well prepared for meeting demands during drought. Recommended strategies that could be undertaken to better prepare the region to address drought conditions are:

- Conduct regional surface water modeling to assess more quantitatively vulnerability under scenarios of greater drought (such as shortages of San Juan-Chama project water) or policy changes that may affect future availability of surface water.
- Develop joint powers agreements and official drought sharing agreements among water systems in the area; identify where regional solutions (beyond what is currently being done) can assist in making sure that all water providers are prepared to address drought conditions.
- Continue to update and implement tiered water conservation plans that can lower water use during drought. In particular, the Council may be a possible resource to bring together small providers that have not progressed in this area to the extent that larger water suppliers have.

In addition to these investigations, future activities that may help the region better understand the supply-demand gap include evaluation of agricultural water use and acéquia policies (which was not included in the scope of this update), additional technical updates as new data become available, and re-evaluation of alternatives.

Key Recommendations from the JyS Regional Water Planning Council

After reviewing the draft DBS&A report, the Council recommends that Phase II of the Update consider:

- the anticipated changes to future water supplies based on changing conditions (drought, variable precipitation, increased temperature, climate change);
- the amount of water in the region's aquifers and the long-term viability of the aquifers as they impact available water supply;



- the addition of text and graphs which reflect conjunctive use strategies, i.e. using renewable surface water in wet years in order to rest the non-renewable water in aquifers so that water will be available in dry years;
- more information regarding the availability of San Juan/Chama project water in the event of problems associated with legal constraints and long-term drought, increased temperatures and/or climate change;
- regional surface water modeling to assess more quantitatively vulnerability under scenarios of great drought (such as shortages of San Juan-Chama project water) or policy changes that may affect future availability of surface water;
- update population projections to reflect likely increases or decreases in demand;
- review and update 2003 JyS Plan public welfare statement;
- include updating supply and demand information for the agricultural sector;
- develop a “do nothing” scenario which analyses the risks and costs of no action; and consider water quality impacts.



1. Introduction

The Jemez y Sangre (JyS) region is one of 16 water planning regions in the State of New Mexico. Regional water planning was initiated in New Mexico in 1987 for the purpose of protecting New Mexico water resources while ensuring that each region is prepared to meet future water demands. Regional water planning activities are overseen by the New Mexico Interstate Stream Commission (ISC).

The JyS region includes most of Santa Fe County, all of Los Alamos County, and a portion of Rio Arriba County (Figure 1). For the purposes of the JyS water planning effort, the region was divided into 10 sub-basins for hydrologic and water demand analysis. These sub-basins were then grouped into 5 subregions (Figure 1) for the projection of future supply and demand based on source of supply for projected demands. For instance, the City of Española's well fields are in both the Santa Clara and Santa Cruz sub-basins and the City itself and several nearby Pueblos overlap these and the Velarde sub-basin. The 5 subregions, along with the sub-basins that they encompass, are:

- Northern subregion (Velarde, Santa Clara, and Santa Cruz sub-basins)
- Aamodt subregion (Tesuque and Pojoaque-Nambé sub-basins)
- Los Alamos subregion (Los Alamos sub-basin)
- Santa Fe subregion (Santa Fe, Caja del Rio, and North Galisteo Creek sub-basins)
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The *Jemez y Sangre Regional Water Plan* (2003 JyS Plan) was completed and accepted by the ISC in 2003 (DBS&A and Lewis, 2003). In March of 2007, the ISC retained Daniel B. Stephens & Associates, Inc. (DBS&A) and Amy Lewis to complete Phase I of an Update of the regional water plan, under the direction of the Jemez y Sangre Water Planning Council (Council). The Council consists of representatives from local government, water users groups, and the public.



The scope of work for this Update does not include full revision and re-publication of the regional water plan (although it may be valuable at some point in time to consider revising and republishing the entire plan, that level of effort was not warranted currently). Instead, the present scope is designed to identify changes in the region as they affect the balance between supply and demand. Accordingly, the scope of work for this update includes:

- Conducting a survey to identify changed conditions and current or planned implementation of regional water planning strategies
- Summarizing new water science research, geologic and hydrologic mapping information, including developing a bibliography and summary tables
- Analyzing the current projected gap between supply and demand
- Discussing how the region's gap could be affected by weather variability
- Recommending strategies for drought and conservation planning
- Recommending continued water planning based on survey discussions and updated information
- Recommending ways to make the plan more useful

In September, 2007, DBS&A submitted Phase I of an Update Report to the 2003 JyS Plan. The Council reviewed the report, added further updates, analyzed findings of the report, discussed recommendations, and approved this Phase I of the Update (2008).



2. Summary of Changed Conditions

This section summarizes the Interview Process, Survey, and Summary of Actions on Alternatives (Section 2.1); Changes in Policy, Ordinances, Rules and Regulations, and Lawsuits (Section 2.2); JyS Regional Planning Council Planning Activities (Section 2.3); and Other Planning Activities (Section 2.4). A bibliography listing documents relevant to the region that have been obtained since publication of the 2003 JyS Plan is included in Appendix B.

2.1 Interview Process, Survey and Summary of Actions on Alternatives

To assess the activities that may impact or augment water supplies in the JyS water planning region, DBS&A, in conjunction with the Council, developed a survey that outlines the various alternatives included in the 2003 JyS Plan. Through this survey, the Council requested that respondents provide information regarding actions they have taken on each of the alternatives included in the original regional water plan. In addition, the survey solicited updated information on water use, changed policies or ordinances, and other relevant information. The survey was mailed to 89 water suppliers, government agencies, pueblos, and advocacy groups, 28 of which responded; those returned surveys were used in this summary. In addition to the mailed surveys, DBS&A also interviewed key water suppliers and decision makers in the region. A list of all entities receiving or being interviewed regarding the survey, along with the blank survey form, is included in Appendix A.

Information was also obtained from government web sites and communication with agency staff. For instance, information on forest restoration projects was obtained from the U.S. Forest Service (USFS) web site and New Mexico Environment Department (NMED) Surface Water Bureau. The New Mexico Office of the State Engineer (OSE) was contacted for information on development of Critical Management Areas, water right transfers, and subdivision review. OSE's online WATERS database was accessed to obtain information on new domestic wells.

Completed surveys resulting from interviews include:

- City of Española



- City of Santa Fe
- Eldorado Area Water and Sanitation District (WSD)
- Los Alamos Water Utility
- Madrid Water Cooperative
- New Mexico Rural Water Users Association
- Pojoaque Pueblo
- Rio Arriba County
- Santa Clara Pueblo
- Santa Fe County
- San Ildefonso Pueblo
- Tesuque Pueblo
- New Mexico Acéquia Association
- Galisteo Mutual Domestic Water Consumers Association (MDWCA)

Interviews were planned, but not completed, with two entities:

- Ohkay Owingeh Pueblo (indicated they don't want to be surveyed)
- Nambé Pueblo (Ernest Mirabal, Nambé Pueblo Council member, attempted to arrange an interview, but was unable to set a date with the Governor)

Completed surveys (no interview) returned include:

- Acéquia Madre on the Santa Fe River
- Chupadero Water-Sewage Corp.
- El Vadito de los Cerrillos
- Greater Chimayo MDWCA
- Hyde Park Water Association
- La Acéquia de la Cañada Ancha
- La Puebla Community Well Association
- La Vista Homeowners' Association
- Lower Cerro Gordo Ditch Association
- NMED Surface Water Quality Bureau
- New Mexico State Land Office
- Santa Cruz Irrigation District
- San Marcos Association
- Solacito Mutual Domestic Water Users Association (MDWUA)

Additional interviews (no survey) were conducted with:

- Mike Johnson, OSE Hydrology Bureau Chief
- Mary Young, OSE Water Rights Bureau
- John Longworth and Jerry Keller, OSE Water Use and Conservation Bureau
- Peter Chestnut, Northern Pueblo Tributary Water Rights Association Attorney



- David Hogge, NMED Surface Water Quality Bureau
- Ted Bagley, OSE Legal Division

During development of the 2003 JyS Plan, the Council investigated a variety of options for addressing the current and future needs of the region. These options were grouped into 5 categories:

- I. Protect existing supplies
- II. Improve system efficiency
- III. Mitigate drought
- IV. Reduce demand
- V. Increase water supply.

Based on the survey and interview results, numerous actions are being pursued by the regions' water suppliers under each of these categories (Table 1).

Under Category 1 (protecting existing supplies), all of the recommendations are currently being pursued or considered, from forest restoration and stormwater management to conjunctive use of surface water and groundwater and restricting the drilling of domestic wells. This category includes actions that will protect water resources but do not result in a water right for additional diversions. Numerous forest restoration projects are underway, as outlined in Appendix C. Cloud seeding has been explored, and funding for a pilot project is being pursued by New Mexico Weather Modification Association, the successor to the Jemez y Sangre Regional Water Planning Council Cloud Seeding Committee. The New Mexico Acéquia Association has provided assistance to more than 20 acéquias in revising bylaws to require approval by acéquia commissioners before water rights are transferred.

Under Category II, improve system efficiency, all but one of the potential alternatives are being pursued. Wastewater reuse, replacing septic tanks with regional infrastructure, lining irrigation ditches, upgrading infrastructure and other improvements to system efficiency are being pursued by many of the water suppliers. Aquifer storage and recovery was not reported as a current



project by any of the entities interviewed or surveyed, although Santa Fe County may consider this option in the future.

Category III includes actions for mitigating drought, which is addressed through water banking, temporary leases of water, emergency conservation ordinances, and shortage sharing agreements. The Cities of Santa Fe and Española and the Counties of Santa Fe and Los Alamos have either adopted or are pursuing emergency conservation ordinances, and some pueblos address emergencies through instructions to tribal members. Eldorado Area WSD does not have the authority to pass an ordinance (with fines), but they do have a drought policy and they post signs to warn residents of drought situations. The Village of Cerrillos, which was supplied by water from the National Guard during recent droughts, has drilled a supplemental well and built a new storage tank to address water shortages during droughts.

The demand reduction alternatives for Category IV are being pursued by many water suppliers. Demand reduction through management of growth and land use has been implemented where water supplies are marginal to meet demands, such as in Madrid and Cerrillos. Santa Fe County has mandated minimum lot sizes based on water supply as part of the Land Use Code since the late 1970s. Rio Arriba County is not restricting population growth, but manages the type of growth in order to maintain agriculture.

Water conservation is the most effective method for reducing demand and is being pursued through a variety of mechanisms, such as rate structures and rebates. The City of Santa Fe's conservation ordinance has been highly effective in reducing demand, from 168 gallons per capita per day (gpcd) in 1995 when they purchased the water utility to 106 gpcd in 2006. Las Campanas is now using effluent from the City of Santa Fe's wastewater treatment plant on their two 18-hole golf courses, which has reduced their demand on the Buckman well field water from a high of 948 acre-feet per year (ac-ft/yr) in 2001 to 521 ac-ft/yr in 2006. The major water suppliers in the region, including the Cities of Santa Fe and Española and Santa Fe and Los Alamos Counties, all have conservation plans in place. Based on survey responses (from 2007



and previous surveys in 2002 and 2003), La Puebla MDWCA, Solacito Homeowners Association, Eldorado, and Hyde Park Estates also have conservation plans in place.

Most of the alternatives under Category V, increase water supply, are being pursued. In particular, the entities with contracts for San Juan-Chama project (SJC) water are either in the feasibility or permitting stage for a direct diversion of their SJC water. In particular:

- The City and County of Santa Fe's direct diversion of SJC water, the Buckman Direct Diversion (BDD) project, increases the physical supply available to the areas served by those entities; however, the allowable diversions in the near future cannot be increased without the acquisition of more water rights. The BDD project allows for conjunctive use of surface water and groundwater and improves the reliability of the supply.
- Santa Fe County and Las Campanas will be diverting native Rio Grande water from the BDD project, increasing the supply available to the region. An estimated 540 acre-feet of water rights from the middle Rio Grande Valley have been transferred to the Buckman wells by Las Campanas and Santa Fe County since 2000, 245 of which are used as offsets. The BDD project allows for a total diversion of 3,125 acre-feet of native Rio Grande water rights by Santa Fe County and Las Campanas.
- Both Los Alamos County and the City of Española also are pursuing diversion of SJC water.
- The status of Ohkay Owingeh's diversion of SJC water is not known.
- Above the Otowi gage, water right transfers may be pursued by the City of Española and parties to the Aamodt Settlement Agreement (Section 3.3.2). No transfers across the Otowi gage are being pursued.
- Nearly 1,200 new domestic wells have been drilled in the JyS region since 2000, as discussed in more detail in Section 3.2.

Water diversion projects and their status are summarized in Table 2, and the locations of such projects are shown in Figure 2.



2.2 Changes in Policy, Ordinances, Rules and Regulations, and Lawsuits

An important component of understanding changed conditions in the JyS region is an understanding of new laws or policies that could affect the management of water in the region. Recent changes to policies, ordinances, rules and regulations, and lawsuits that may impact supply and demand or water management include the Aamodt Settlement Agreement, newly revised New Mexico domestic well regulations, the OSE's Active Water Resource Management (AWRM) initiative, OSE and New Mexico Supreme Court decisions and issues related to SJC are discussed below.

2.2.1 Domestic Well Regulations Adopted in 2006

The OSE adopted *Rules and Regulations for Governing the Use of Public Underground Waters for Domestic and Household Use* (19.27.5 NMAC) in 2006. These rules increase the fee for obtaining a domestic well permit to \$125 (from \$5) and reduce the allowable diversions from 3 ac-ft/yr to 1 ac-ft/yr. The rules and regulations also allow the State Engineer to establish Domestic Well Management Areas where stream-connected groundwater systems require special water resource protection. To date, no Domestic Well Management Areas have been established in the JyS region (Johnson, 2007).

2.2.2 Active Water Resource Management (AWRM)

AWRM was developed by the OSE to manage the state's water resources, particularly during droughts, in the absence of adjudicated water rights (only 30 percent of the water rights in New Mexico are adjudicated). In December 2004, the State Engineer promulgated statewide AWRM rules and regulations. The tools for AWRM include measuring and metering, rules and regulations, creation of water districts and appointment of water masters, and development of water master manuals. In the JyS Region, the Nambé-Pojoaque-Tesuque Basin is one of the stream systems identified as high priority for AWRM by the State Engineer.

The Tri-State Generation and Transmission Association and the New Mexico Mining Association sued the OSE over the new AWRM regulations, maintaining that they were unconstitutional because they violated the separation of powers and the rights of water users to



due process. In May 2007, Judge Matthew Reynolds upheld the State Engineer's authority to set rules for managing the state's waters, but found portions of the AWRM rules to be unconstitutional. Only court decrees or a license issued by the OSE can be used to establish priority dates for priority administration under AWRM. Other evidence such as hydrographic surveys, permits, or best available evidence may not be used to establish a priority date. Judge Reynolds's decision is on appeal.

2.2.3 Decisions from the OSE and New Mexico Courts

Two cases have been decided that may have implications for water use in the region.

* The OSE 2006 Report and Recommendation (Hearing No. 03-27) in the matter of the application by Mary L.W. Pepler and the estate of Phillip S. McKee (the "Pepler decision") for a water right change in point of diversion and place and/or purpose of use from surface water to groundwater in the Rio Grande Basin held that ". . . it would be contrary to sound public policy to approve an application for a specified purpose when the applicant does not intend to actually place water to beneficial use for that purpose and such use is unlikely to occur within a reasonable period of time." The applicant had requested "subdivision" as one of several beneficial uses for the water. During the hearing, however, the applicant made it clear that she herself did not intend to subdivide the land and would only place the water to beneficial use for livestock, irrigation, and agricultural purposes. The applicant also testified that she intended to sell the land to a purchaser that presumably would subdivide and develop the land.

* In December, 2006, the New Mexico Supreme Court decided *Montgomery v. Lomos Altos, Inc.* holding that the State Engineer must:

1. make findings on conservation and public welfare before he can approve an application (most of the OSE decisions are silent on those issues) and
2. determine if all existing water rights will be impaired, not just those of protestants, when analyzing impairment.

Both of these holdings may make it slightly harder to transfer water rights.



2.2.4 San Juan-Chama Project Water

The 2003 JyS Plan White Paper 16, “Alternative: Utilize San Juan-Chama Project Water” (Vol. 2, Appendix F) lists the San Juan-Chama Project Contractors in the Region: City/County Santa Fe; San Juan Pueblo; Los Alamos County; Pojoaque Valley Irrigation District; and the City of Espanola. Several changes related to SJC Project water have occurred since the 2003 JyS Plan was completed:

- The 2003 JyS Plan White Paper notes among the “Actions Needed to Implement/Ease of Implementation” that: “In order to fully use all the SJ-C Project water collectively contracted by governmental entities in the region, the following are needed: Convert SJ-C fixed-term water service contracts to perpetual contracts (if possible).” In 2006, contractors with SJC water were able to convert their water service agreements with the Bureau of Reclamation from agreements with expiration dates to permanent repayment contracts (USBR, 2006)
- The City of Santa Fe has leased 3,000 acre-feet of the Jicarilla Apache Nation SJC water to use as offsets on Buckman Well Field pumping (City of Santa Fe and Jicarilla Apache Nation, 2004).
- Santa Fe County and the City of Santa Fe signed a Water Resources Agreement (January, 2005), in which the previously joint 5,605 ac-ft SJC contract was separated into 375 ac-ft for the County and 5,230 ac-ft for the City.
- The City of Santa Fe, Santa Fe County, and Las Campanas signed an agreement on facility operations and procedures for the Buckman Direct Diversion project in September of 2006, which resolves payment and operation of the facility (City of Santa Fe et al., 2006).
- SJC water is subject to shortage sharing in the San Juan Basin according to the Navajo River Settlement (NM OSE, 2005). Under the Settlement, the SJC Project is allowed 17 percent of New Mexico’s Colorado Compact apportionment, which averages 105,200 ac-ft/yr, which is less than the allowed 110,000-ac-ft/yr average diversion (NM OSE, 2005). The impact of the shortage sharing agreement on SJC contractor water will depend on the amount of water available from Heron Dam.



2.2.5 Other Planning Efforts

In addition to these policies, several water planning initiatives have been undertaken in the region (Table 3). While the bibliography included in Appendix B includes only documents completed since the plan was published, Table 3 includes older documents as well, to provide a comprehensive list of planning documents. These planning activities set a direction for future policies regarding water management in the region.

2.3 Jemez y Sangre Regional Planning Council Planning Activities

The Council has continued to meet monthly and has conducted a number of planning activities both at the Council and through Council committees.

2.3.1 Landscape Management and Water Capture

On September 21 and 22, 2005, the Council in collaboration with the Water Resources Technical Assistance Office of the Los Alamos National Laboratory, City of Santa Fe, the Santa Fe Area Homebuilders Association and the Sierra Club organized the Jemez y Sangre Water Resources Summit and Workshop on Managing Landscapes and Watersheds for Water Resources. The two-day meeting provided a forum for the formulation of specific recommendations for increasing available water supplies. The program and recommendations can be found on the Jemez y Sangre Water Planning Council website: http://www.ose.state.nm.us/isc_regional_plans3.html. These recommendations also provided input to the Technology Committees report on Alternative Water Resources (see 2.3.2 below).

2.3.2 Technology Committee

The Technology Committee focused first on a recommendation to conduct a workshop on cloud seeding from the 2003 JyS Plan White Paper 8, “Increase Precipitation, Runoff, and Infiltration from Cloud Seeding” (Vol. 2, Appendix F). The workshop was held on January 22 and 23, 2004. The proceedings are available at http://www.ose.state.nm.us/isc_regional_plans3.html. The workshop attendees agreed to seek funding for a demonstration project. Because a cloud seeding



demonstration project might impact more than one water planning region and because of the synergy with summer cloud seeding projects operational in other parts of New Mexico, a new organization, the New Mexico Weather Modification Association, Inc, (NMWMA) was formed. The Technology Committee continues to monitor the potential for cloud seeding and works collaboratively with the NMWMA. The Technology Committee also completed a comprehensive review of technologies that may play a role in increasing supply. The review is currently available on the JyS RWP website at <http://www.ose.state.nm.us/water-info/NMWaterPlanning/regions/jemezysangre/PCTC/PCTC-Report-2007-12-10.pdf>.

2.3.3 Growth Management Committee

The 2003 JyS Plan White Paper 18, “Manage Growth and Land Use” (Vol. 2, Appendix F) identified four approaches:

1. designating geographical limits for growth to deal with a limited water supply;
2. conducting project-level analyses for each development;
3. setting numerical limits on rate of growth; and
4. relying on a market approach.

A committee of the Council evaluated pros and cons of each growth management approach and developed materials for use by governmental entities which will be reviewed by the Council.

2.4. Other Planning Activities

Other planning activities related to the JyS Water Planning region follow.

2.4.1 Española Basin Regional Issues Forum

The Española Basin Regional Issues Forum (EBRIF) was created in August, 2004. EBRIF is an ad hoc organization consisting of representatives from fourteen governmental jurisdictions in the Jemez y Sangre planning area, i.e., the Española Basin. EBRIF members include: the counties of Los Alamos, Rio Arriba, and Santa Fe; the pueblos of Cochiti, Nambe, Ohkay Owingeh, San Ildefonso, Santa Clara, Santo Domingo, Picuris, Pojoaque, and Tesuque; and the cities of Española and Santa Fe.



EBRIF's primary goal is to provide recommendations to its member governments by collaborating on issues of regional concern. Water availability and providing for adequate potable water supply and wastewater treatment for the people living in the Basin have been the focus for planning to-date. EBRIF has collaborated with the Council and has a vested interest in the implementation of the recommendations in the 2003 JyS Plan.

2.4.2 The Upstream-Downstream Project

In 2006, the New Mexico Water Dialogue in cooperation with the Interstate Stream Commission and the Utton Center convened representatives from the three regional water plans between the Otowi gage and Elephant Butte Reservoir to discuss the sizable deficit in the region. The participants have developed a Scope of Work "to standardize certain elements of the Jemez y Sangre, Middle Rio Grande and Sierra/Sierra Counties' regional water plans in order to more readily and accurately quantify the water supply and demand planning projections in the Middle Rio Grande Basin (Basin) and to develop a template for measuring the impact of various activities on reducing the Basin's water deficits." Information on the project is available at <http://www.nmwaterdialogue.org/id15.html> and http://uttoncenter.unm.edu/upstream_downstream.html.



3. Updates to Water Supply and Demand Analysis

3.1 Updates to Water Demand Analysis

One of the goals of this update is to examine the projected demand graphs from the 2003 JyS Plan and determine if any revisions are warranted. To that end, per capita demand rates were examined using recent municipal diversion data, population estimates were compared to projections, and the number of new domestic wells was estimated. Other changes in demand, such as new golf courses, were also incorporated. While the 2003 JyS Plan shows projections both with agricultural water use and without, assessment of changes in agricultural water use was not part of the current scope of work. Consequently, this update shows only the projections without agricultural water use. Information on non-agricultural water diversions in the region was obtained from municipalities and estimated for other public, domestic, and commercial uses.

The groundwater diversions from Los Alamos County, City of Española, City of Santa Fe and Eldorado Area WSD well fields (Table 4) totaled 15,451 acre-feet in 2000 (assuming an average use for the City of Española) and was 13,676 acre-feet in 2006. Including the surface water diversions for the City of Santa Fe, municipal diversions in 2000 and 2006 totaled 18,763 acre-feet and 15,761 acre-feet, respectively, or about 16 percent less in 6 years, even though 2006 was a drier year than 2000 (annual precipitation at the Santa Fe Seton gage was 16.7 inches in 2000 as compared to 14.05 inches in 2006). Figure 3 shows the municipal diversions in the JyS Water Planning Region from 1995 to 2006.

Not included in the water demand estimates in the 2003 JyS Plan is the water use by Pojoaque Pueblo's three 9-hole golf courses and Santa Clara Pueblo's one 18-hole golf course. No records of metered use were available for the new golf courses, and thus an average water use of 350 ac-ft/yr for an 18-hole golf course (Grigory, 2007) was used.

Although the OSE's *Water Use by Categories in New Mexico Counties and River Basins, and Irrigated Acreage in 2000* (Wilson et al., 2003) had been released before the 2003 JyS Plan was



published, it came out just one month before the 2003 JyS plan was finalized and long after the water budgets were developed and drafts of the report reviewed. Consequently, the 2003 JyS Plan had relied upon Wilson et al. (1997), which provided estimates of water use for 1995. Also, the 2000 census was not available at the time that the Bureau of Business and Economic Research (BBER) developed their estimates of population in 2000 and projected demand for the JyS water planning region (BBER, 2001). For Phase I of the Update, some of the year 2000 water use estimates have been revised based on the more recent information (2000 water use estimates and the 2000 census). The OSE is currently working on the 2005 water use estimates, but no information is presently available for Santa Fe County.

The OSE's Water Use and Conservation Bureau, which is tasked with providing an opinion on new subdivisions, was contacted to determine if information on changes or growth management in the region could be discerned from their review of subdivisions. Since 2000, 206 proposed subdivisions with 9,792 parcels in the JyS region have been submitted to the OSE for review. As shown in Table 5, only about 4 percent of the parcels received a positive review, and most of these positive reviews were for subdivisions with individual domestic wells. A negative opinion was issued on 49 percent and the remainder received a "deferral," which means that the OSE had no opinion at the time, usually at the master plan stage of review. The OSE opinion has no legal bearing, and a subdivision may proceed even with a negative opinion.

Additional new data that may be relevant to future planning efforts, including groundwater modeling studies, hydrologic or hydrogeologic characterization studies, water planning studies, feasibility analyses for proposed studies, or any other relevant data or published reports, are listed in the attached bibliography (Appendix B). Of particular note are studies of noble gases (including helium isotopes) in groundwater in the Española Basin (McKinney, 2006), which will help in the understanding of recharge mechanisms and quantity. In addition, groundwater modeling efforts by Los Alamos National Laboratory, the City and County of Santa Fe, and Eldorado have all advanced the region's understanding of the resources; however, documentation of the model parameters and stresses will not be published for several months. Abstracts on the multitude of current investigations are provided in the proceedings of workshops sponsored by



the Española Basin Technical Advisory Group, which are available online at <http://esp.cr.usgs.gov/ehtag/past.html>.

In the 2003 JyS Plan, the projected public, domestic, commercial and industrial water demand for each subregion was calculated by multiplying the population times a per capita demand rate of 0.15 ac-ft/yr (134 gpcd), except in Santa Fe, where a per capita demand rate of 0.183 ac-ft/yr (163 gpcd) was used to account for the greater amount of commercial and institutional water use. Because estimates of 2006 population for each sub-basin are not available from the Census (available only by county), the 2006 population by sub-basin was estimated by multiplying the BBER 2000 population estimate by the Census growth rate for each county. This method was modified for the Northern, Los Alamos, Aamodt, and Santa Fe subregions, as described in the corresponding discussions in Section 3.3. In addition, water demand for each sub-basin was revised to include the increased demand from domestic wells after 2000 (Section 3.2) and for diversions from golf courses not previously included.

Comparison of the observed annual growth rate from 2000 to 2006 in each county as compared to the growth rate used in the projections by BBER for each subregion show that BBER's estimates are about double the Census estimate (Table 6). However, the Census growth rate from 2000 to 2007 used for this analysis is based on the entire county (Rio Arriba, Los Alamos, or Santa Fe) and is not specific to the sub-basin areas, which do not encompass entire counties (except for Los Alamos). The annual Census does provide estimates for the City of Santa Fe, which represents much of the Santa Fe River sub-basin, and the Los Alamos sub-basin is almost entirely in Los Alamos County.

3.2 Updates to Water Supply Analysis

The number of new domestic wells after January 1, 2000 was obtained from the OSE's WATERS database. This number includes only domestic wells with locations in the WATERS database (about 73 percent included coordinates) from January 1, 2000 to May 2007. Some of these wells may not have been drilled yet, which could overestimate the number of new wells. However, 27 percent were not counted because no location was available, which may result in an



underestimate of the number of new wells. Table 7 shows the estimated number of new domestic wells by subregion, the population served, and the new diversions from these wells. Figure 4 shows the locations of the new domestic wells in the JyS region.

To evaluate whether the number of new wells in the WATERS database provides a reasonable estimate of new domestic wells in the region, the population growth rate since 2000 was compared to the estimated increase in domestic wells. The population in 2006 for each sub-basin was estimated based on the Bureau of Business and Economic Research's (BBER's) 2000 population estimate times the growth rate reported by the Census from 2000 to 2006. The population served by each domestic well was based on the household size listed by the U.S. Census for each county (U.S. Census Bureau, 2007a). The amount of water diverted by each domestic well was based on the average per capita demand for mutual domestic water supply systems without severe water restrictions of 0.11 acre-feet per capita per year or 99 gpcd (Table 7). As shown in Table 8, the total estimated increase in water demand from new domestic wells is 4.9 percent as compared to the estimated growth from 2000 to 2006 of 4.8 percent for the region according to the census web sites for Los Alamos, Rio Arriba, and Santa Fe Counties. Therefore, the estimated increase in domestic well use appears to be reasonable. Figure 5 shows the estimated increase in water use by domestic wells from 2000 through 2006. The figure also shows the potential increase by 2060 if domestic wells continue to be drilled at the same rate.

Santa Fe County and Las Campanas have purchased and transferred a combined 540 acre-feet of consumptive use water rights to the Buckman wells since 2000 (Young, 2007), although only 245 ac-ft of the 540 ac-ft are available for offsetting Buckman well field pumping effects on the Rio Grande (Borchert, 2007). Total native Rio Grande water rights applied to the Buckman wells are 1,248 ac-ft/yr, including 577 acre-feet owned by Las Campanas (Young, 2007).

3.3 Revised Water Supply and Demand Projections

Projections of supply and demand developed for the 2003 JyS Plan were revised based on information collected during interviews of water suppliers conducted in April and May of 2007 and current data and studies pertaining to water supply and demand. The intent of the review of



supply and demand information was to determine if any significant changes have occurred since the 2003 JyS Plan was completed.

The 2003 JyS Plan projected that the gap between supply and demand in 2040 would be approximately 21,600 ac-ft/yr and approximately 32,700 ac-ft/yr in 2060. The projections in Phase I of the Update were revised to take into account projected changes in supply and demand. A major impact on the projected gap depends on the Santa Fe City and County, Los Alamos and Española all having completed proposed projects to divert SJC project water and that all of the proposed native water rights from the Rio Grande have been acquired in addition to diversion of SJC rights. Without either SJC or native water rights, the gap is projected to be approximately 15,500 ac-ft/yr in 2040 and approximately 25,400 ac-ft/yr in 2060. There will be no projected gap in 2040 assuming completion of the diversion projects and acquisition of the projected water rights and the gap will be approximately 9,100 ac-ft/yr in 2060. This includes 4,000 ac-ft obtained through a regional water system proposed under the Aamodt Settlement. Even though there is no projected gap in 2040, it should be noted that a surplus in one subregion may not be available to close a gap in another subregion.

This section presents charts of supply and demand based on the projected population increases and resultant water demand for the public, domestic, commercial, governmental, and industrial sectors of water use. (The original 2003 projected supply and demand charts are shown along with the revised charts.) The projected supply and demand are based on average conditions and represent the diversions of water, not consumptive use. Option charts showing the possibilities for increasing supply or reducing demand to meet the projected gap in 2060 are also shown for each subregion (except Los Alamos). Alternatives that may help increase or improve the “wet water” supply, such as forest thinning, enhancing recharge, or cloud seeding, are not considered an option for reducing the gap between supply and demand. Such actions will benefit existing supplies and help offset future droughts and declining water tables, but will not create a new supply for appropriation. The gap in 2060, in fact, could be greater than that shown herein, should extended droughts, reduction in aquifer productivity, or limitations due to groundwater contamination occur.



The demand projections and source of supply for each subregion are discussed in Sections 3.3.1 through 3.3.5.

3.3.1 Northern Subregion

The Northern subregion consists of the Velarde, Santa Clara and Santa Cruz River sub-basins. See Figure 1, Jemez y Sangre Subregions; Table 1, Actions Taken on Alternatives; and Table 2, Water Infrastructure Projects.

Status of the Gap between Water Supply and Demand

When the gap between water demand and supply was calculated in the 2003 JyS Plan, it was estimated that the gap in the Northern subregion would be approximately 2,700 ac-ft/yr in 2040 and approximately 4,200 ac-ft/yr in 2060. Demand has increased by the addition of a golf course in the subregion which has increased the projected gap between demand in 2000 and the demand in 2060 to approximately 4,600 ac-ft. However, the supply was also increased through an increase in the number of domestic wells, municipal diversions and other metered wells as shown in Figure 6. Based on these changes, the gap between supply and demand has decreased to approximately 2,500 ac-ft/yr in 2040 and approximately 4,000 ac-ft/y in 2060. If the Northern subregion accesses its SJC water, the gap will be reduced to 1 ac-ft/yr in 2040 and 1,500 ac-ft/yr in 2060.

The Northern subregion can meet projected new demands through 2040 with the diversion of the City of Española's 1,000 ac-ft/yr of SJC water, which can be increased to 2,500 ac-ft/yr with return flow credits as proposed by the City, provided that the SJC water can be made available where the demand occurs. This action will meet 60 percent of the projected increased demand. Ohkay Owingeh holds 2,000 ac-ft/yr of SJC water, but their plans to divert this water were not made available.

Other options for meeting the projected gap between supply and demand are shown in the updated option chart in Figure 7. Each square in the options chart represents approximately 10 percent of the projected gap by the year 2060. Therefore the options chart can be utilized to



develop potential scenarios for closing the gap by selecting ten squares that total 100 percent. It should be noted that the options listed in the chart are based on analyses developed in the 2003 JyS Plan and may not fully represent changing conditions or some new options that will be available in the future.

Changes in Water Demand

The demand projections for the population were originally based on a per capita demand rate of 0.15 ac-ft/yr (134 gpcd), including commercial, industrial, and public supply demands. This rate has not changed; however, the demand projections were increased to include new demands by the Santa Clara Pueblo golf course, estimated at 350 ac-ft/yr for the 18-hole golf course (Grigory, 2007). This new demand is shown as an increased “other metered” supply usage in Figure 6.

Changes in Water Supply

Domestic Wells

Based on OSE’s WATERS database, an estimated 312 more domestic wells were drilled or applied for since 2000 in the Northern subregion. The new domestic wells are diverting an estimated 94 ac-ft/yr, and if this rate of increase should continue until 2060, new diversions would amount to 800 ac-ft/yr.

3.3.2 Aamodt Subregion

The Aamodt subregion consists of the Pojoaque – Nambé and Tesuque sub-basins. See Figure 1, Jemez y Sangre Subregions; Table I, Actions Taken on Alternatives; and Table 2, Water Infrastructure Projects.

Status of the Gap between Water Supply and Demand

When the gap between water demand and supply was calculated in the 2003 JyS Plan, it was estimated that the gap in the Aamodt subregion would be approximately 3,100 ac-ft/yr in 2040 and approximately 6,300 ac-ft/yr in 2060. The total demand in the Aamodt Subregion has



increased by 525 ac-ft, thereby increasing the gap between demand in 2000 and demand in 2060 to 6,775 ac-ft (as shown in Figures 8 and 9). However, supply has increased with increased diversions by the Pueblo water system, additional domestic wells and increased diversions from other metered wells. Based on these changes, the gap between supply and demand has decreased to approximately 3,000 ac-ft/yr in 2040 and approximately 6,100 ac-ft/yr in 2060, without the water supply described in the Aamodt Settlement Agreement.

Since 2003, the Aamodt Settlement Agreement (Agreement) has been signed, but needs further action to go into full effect. The water demand projections in the Aamodt subregion (Figure 8) were revised based on new information available in the Agreement and the Pojoaque Regional Wastewater Study. The Agreement shows existing and future uses for four pueblos: Pojoaque, Nambé, Tesuque, and San Ildefonso. Although the Agreement has not been finalized, it represents the best current understanding of changed conditions in this subregion. The Agreement plans to increase supply include a new water diversion project and purchase and transfer of water rights from above the Otowi gage to meet growing demands. If the Agreement is fully funded and implemented, supply will exceed demand in 2040 by approximately 3,100 ac-ft-yr in 2040 and will be in relative balance by 2060.

Options for meeting the projected gap between supply and demand are shown in the updated option chart in Figure 9. Each square in the options chart represents approximately 10 percent of the projected gap by the year 2060. Therefore the options chart can be utilized to develop potential scenarios for closing the gap by selecting ten squares that total 100 percent. It should be noted that the options listed in the chart are based on analyses developed in the 2003 JyS Plan and may not fully represent changing conditions or some new options that will be available in the future. For instance, it does not show domestic wells as an option, but as shown in Table 8, 200 new domestic wells were reported by the OSE from Jan 2000 to May of 2007.

Changes in Water Demand

The Aamodt Settlement Agreement (New Mexico ex rel. State Engineer v. Aamodt No.



66cv06639 MV/LCS-ACE (D.N.M.)) was signed January 19, 2006 by the seven non-federal parties to one of the longest running federal cases in the United States (began in 1966). The Agreement is contingent on funding for a water diversion structure and water rights for the parties in the Pojoaque-Nambé, and Tesuque drainages, including four pueblos and Santa Fe County. Water rights for the four pueblos as defined by the Agreement are summarized in Table 9. This information was valuable in refining the water demand projections discussed in Section 3 because the Agreement specifies existing and future water uses by the four pueblos.

The consumptive use water rights listed in Table 9 are equivalent to diversion rights unless return flow can be demonstrated. About 750 acre-feet of the water rights are local water rights that will be diverted from the Pojoaque-Nambé and Tesuque drainages. The acquired water, which totals 3,250 acre-feet (2,500 for Pueblo and 750 by the County for non-Indian growth), will be imported from the Rio Grande. The source of water will be SJC project water, native Rio Grande water, and possibly water made available through recalculation of the Cochiti Evaporative Pool (Bagley, 2007).

The existing uses listed in the Agreement are based on uses in 2000 and do not include the golf courses on Pojoaque Pueblo. For this analysis, the existing uses for Pojoaque Pueblo as defined by the Agreement were revised to include water use for the golf courses and potable water demands as shown in the Pojoaque Valley Wastewater Study (ASG, 2005).

The diversions and consumptive use for non-agricultural water are assumed to be equal as defined by the Agreement (Section 5.1.4 of the agreement). The existing and future consumptive water use from the agreement summarized in Table 9) was used to estimate current uses by the Pueblos, with the exception of Pojoaque Pueblo, for which uses were revised based on reported and estimated water use. The water use by Pojoaque Pueblo for a one year period, June 2003 to May 2004, is reported for domestic and commercial uses (ASCG, 2005). An amount for the three 9-hole golf courses was assumed to be 525 ac-ft/yr based on the average golf course use discussed in Section 3.1.



Changes in Water Supply

Domestic Wells

An estimated 200 more domestic wells, diverting 53 ac-ft/yr, were approved since January 2000 in the Aamodt subregion. However, the estimated total amount of water diverted from the domestic wells was reduced based on interviews and information in the Agreement which also included the public water supply systems on the pueblos (in the 2003 JyS Plan it was assumed that all of the pueblo population was served by domestic wells). Most pueblos have water supply systems and few are served by individual wells. If the rate of new domestic wells were to continue, a total increase in diversions from domestic wells would be 455 ac-ft/yr in 2060 above the amount diverted in 2000 (not shown in Figure 8).

Proposed Direct Diversion

Increased demands can be met through 2050 (Figure 9) with the proposed diversion project in the Agreement, which includes a direct diversion of 4,000 ac-ft/yr from the Rio Grande above the Otowi gage on San Ildefonso Pueblo land. The Agreement calls for 2,500 ac-ft/yr of imported water for the four pueblos and 1,500 ac-ft/yr for the non-pueblo parties. The water rights for the surface water diversion are not defined in the Aamodt Settlement, but would have to come from above the Otowi gage. Some amount will also come from groundwater only to the extent that there will be capacity in the pipeline to convey up to 750 ac-ft/yr to non-Indians. Leasing Jicarilla Apache Nation SJC water is not considered an option for the Agreement because a lease would not be permanent.

3.3.3 Los Alamos Subregion

See Figure 1, Jemez y Sangre Subregions; Table I, Actions Taken on Alternatives; and Table 2, Water Infrastructure Projects.

Status of the Gap between Water Supply and Demand

When the gap between water demand and supply was calculated in the 2003 JyS Plan, it was estimated that the gap in the Los Alamos subregion would be approximately 500 ac-ft/yr in 2040



and approximately 600 ac-ft-yr in 2060. The sub-region expects projected demand to increase over the 2003 estimate. Based on these changes, the gap between supply and demand has been increased to approximately 1,700 ac-ft/yr in 2040 and approximately 2,000 ac-ft/yr in 2060. If the Los Alamos subregion accesses its SJC water, the gap will be reduced to approximately 500 ac-ft/yr in 2040 and approximately 800 ac-ft/yr in 2060.

No option chart was previously developed for the Los Alamos subregion because projected demand could be met with existing groundwater rights. Now that the projected demand has increased by approximately 7,600 ac-ft/yr, Los Alamos will not only seek diversion of its SJC water, but also pursue conservation. A reduction in demand of 12 percent will be required to meet demand with available supply, assuming that groundwater rights and SJC water are available to the full amount in 2060.

Changes in Water Demand

The projected demands for the Los Alamos subregion were increased based on Los Alamos County's recent *Long-Range Water Supply Plan* (DBS&A, 2006). The projected increase (Figure 10) is based on the recent acquisition of land from the federal government that is now proposed for housing development and commercial enterprises. The projections also include the potential for Los Alamos National Laboratory to increase activities (U.S. DOE, 2006).

Los Alamos County is pursuing adoption of a rate structure to encourage conservation and ultimately reduce demand by 12 percent and has been implementing voluntary conservation programs through public education.

Changes in Water Supply

Los Alamos County, which acquired the water utility from the Department of Energy (DOE) in 1998, can meet projected demands through their existing water rights, proposed diversion of 1,200 acre-feet of SJC water, and conservation.



3.3.4 Santa Fe Subregion

The Santa Fe sub-region consists of the Santa Fe, Caja del Rio and North Galisteo Creek sub-basins. See Figure 1, Jemez y Sangre Subregions; Table 1, Actions Taken on Alternatives; and Table 2, Water Infrastructure Projects.

Status of the Gap between Water Supply and Demand

When the gap between water demand and supply was calculated in the 2003 JyS Plan, it was estimated that the gap would be approximately 14,400 ac-ft/yr in 2040 and approximately 19,900 ac-ft/yr in 2060. Since 2003, the subregion has reduced the demand projected in the plan by almost 10,000 acre feet by implementing conservation measures as reflected in Figure 11. Supply has been increased by drilling domestic and public supply wells in parts of the sub-region and will be further increased when the Buckman Direct Diversion (BDD) project is completed (now scheduled for 2011) which will enable the region to access native Rio Grande and SJC water. Although accessing the renewable water supplies does increase the available supply, the City's portion will largely reduce reliance on limited ground water supplies. Based on these changes, the gap between supply and demand has been reduced to approximately 1000 ac-ft/yr in 2040 and approximately 4,900 ac-ft/yr in 2060 assuming not only that the BDD project is completed but that all of the water rights permitted through the BDD project have been acquired.

Options for meeting the projected gap between supply and demand are shown in the updated option chart in Figure 12. Note that the total gap shown on this chart remains at 19,900 ac-ft and the options of conservation are highlighted to show how the gap is being filled. Each square in the options chart represents approximately 10 percent of the projected gap by the year 2060. Therefore the options chart can be utilized to develop potential scenarios for closing the gap by selecting ten squares that total 100 percent. It should be noted that the options listed in the chart are based on analyses developed in the 2003 JyS Plan and may not fully represent changing conditions or some new options that will be available in the future.



Changes in Water Demand

The projected demand has been reduced by about 8,600 acre feet by 2040 and about 10,100 acre-feet in 2060. Almost 10,000 acre-feet of that reduction is through aggressive conservation efforts by the City of Santa Fe. The City of Santa Fe's conservation programs and ordinances has been highly effective in reducing demand from 168 gallons per capita per day (gpcd) in 1995 when they purchased the water utility to 106 gpcd in 2006. The single most successful conservation program is the Water Budget Administrative Ordinance, which since 2003 requires all new development to offset their new water use by replacing high flow toilets with water efficient toilets. Additionally, Las Campanas is now using effluent from the City of Santa Fe's wastewater treatment plant on their two 18-hole golf courses, which has reduced their demand on the Buckman well field from a high of 948 ac-ft/yr in 2001 to 521 ac-ft/yr in 2006. Thus, the option chart for Santa Fe (Figure 12) shows that the gap is being reduced through conservation and domestic wells of water supplies.

Consequently, the revised projected municipal and domestic water demand projections shown in Figure 11 were based on a much lower per capita demand for the City of Santa Fe and the North Galisteo Creek sub-basin. Whereas the estimated per capita demand in the 2003 JyS Plan for the Santa Fe subregion was 0.183 acre-feet per person (163 gpcd), it is now 0.13 acre-feet per person (116 gpcd), including commercial water use. The lower per capita demand estimate is based on 2006 metered uses for the population served by the City of Santa Fe's water system (including Santa Fe County Utility and Las Campanas), Eldorado, and Sunlit Hills. In 2006 the total diversions in the Santa Fe River sub-basin were estimated to be 12,364 ac-ft/yr (including domestic and public supply wells) for an estimated 2006 population of 93,673. Projected water demand in the primarily residential area of the North Galisteo Creek sub-basin (Eldorado and Sunlit Hills) was reduced to 0.11 acre-foot per person (98 gpcd) from 0.15 acre-foot per person (134 gpcd) used in the 2003 JyS Plan.

To reduce water demand,

- the City of Santa Fe is continuing to implement its water conservation program, which includes mandatory offset of new growth with replacement of high flush toilets with low flush toilets or,



more recently, water right purchases, rebates for washing machines, hot water recirculation requirements, rain barrels at discounted prices, and public education programs. Summary Drought and Conservation Ordinances in Santa Fe subregion are included on page 31; and

- Santa Fe County adopted several ordinances addressing water conservation. New development is required to install water saving fixtures, rainwater catchment systems, instant hot water devices and swimming pools are disallowed on lots created after 1996. Additionally, most subdivided lots within SF County are limited to 0.25 ac-ft per lot with exceptions occurring in traditional communities. Due to aggressive conservation policy single family homes on the Santa Fe County Utility has water usage of 67 gallons per capita per day.

Changes in Water Supply

Purchased Water Rights

Both Santa Fe County and Las Campanas have purchased and transferred 537 acre-feet of consumptive use water rights to the Buckman wells since 2000 (Young, 2007) although only 245 ac-ft were used for offsetting pumping effects by December 2007 (Borchert 2007). The Santa Fe County water transfers are derived by developers providing water rights for their projects and from Santa Fe County purchases. Total native Rio Grande water rights for offsetting applied to the Buckman wells as of December of 2007 are 949 ac-ft/yr, including 636 acre-feet owned by Las Campanas (Borchert, 2007). As of July 2005, the City's Water Right Transfer Ordinance requires development projects above 5 ac-ft/yr for commercial or 10 ac-ft/yr residential to transfer water rights in the amount of their project water budgets to the Buckman Well Field for offsetting.

Domestic Wells

The number of new domestic wells drilled in the Santa Fe subregion since January of 2000 was estimated to be 523 based on OSE's WATERS database. Of the new wells, 51 were in the Caja del Rio sub-basin, 194 in the North Galisteo Creek sub-basin, and 278 in the Santa Fe River sub-basin. The water demand for the new domestic wells is estimated to be 132 ac-ft/yr new diversions since 2000, using 0.25 ac-ft/yr per domestic well. If this rate continues, by 2060



diversions from domestic wells will have increased by approximately 1,100 ac-ft/yr above the amount diverted in the year 2000.

New City of Santa Fe Production Wells

Five new wells drilled as part of the Buckman well field for the City of Santa Fe have increased the capacity of the well field to the permitted amount of 10,000 ac-ft/yr. The increased capacity will meet demands until the BDD project is completed and in the future under emergency conditions. Since 1972, the impacts of pumping of the Buckman wells on the flow in the Rio Grande have been offset with SJC water. With the BDD project on line, the SJC water will be diverted directly from the Rio Grande and no longer available for offsetting the pumping of Buckman wells. However, according to the final environmental impact statement (FEIS) for the BDD project (SFNF and BLM, 2006), once the BDD project is fully operational, the well field will be initially rested at an average of 1,000 ac-ft/yr. This will allow for conjunctive use of surface water and groundwater, so that in the future groundwater via the Buckman wells can be greater in dry years or for water supply emergencies. Even with no diversions from the Buckman well field, impacts to the Rio Grande will continue for years into the future, and offset rights will thus be required. To address the future impacts, the City of Santa Fe has leased 3,000 acre-feet of Jicarilla Apache Nation SJC water.

Buckman Direct Diversion Project (BDD Project)

The BDD project is designed to divert 8,730 ac-ft/yr (5,230 ac-ft/yr SJC for the City of Santa Fe, 1,700 ac-ft/yr for Santa Fe County, and 1,800 ac-ft/yr for Las Campanas). The majority of the water diverted will be SJC water (5,605 ac-ft/yr) and the remainder (3,125 ac-ft/yr) will be native Rio Grande water rights. Las Campanas currently holds 636 ac-ft/yr of native Rio Grande rights and will need to acquire an additional 1,164 ac-ft/yr to divert up to their capacity of 1,800 ac-ft/yr. Between 2000 and 2007, Santa Fe County has acquired 537 ac-ft/yr of native Rio Grande rights (with 181.84 currently in the Buckman well field for offsets), has 727 ac-ft pending approval to be diverted from the Buckman Direct Diversion, and has 375 ac-ft/yr of SJC water, leaving a current deficit of 61 ac-ft/yr to divert their full share of the Buckman Direct Diversion.



Although diverting the City's SJC water via the Buckman Direct Diversion does allow the City full access of its 5,230 ac-ft SJC contract water, it does not increase the City's available supply substantially. In Figure 11, the City's BDD project capacity is shown at full use, but groundwater use both in the City wellfield and Buckman is below existing capacity. In drought years when Santa Fe River water is not fully available, groundwater use may increase. The diversion of the County's SJC water and their acquired native water rights is largely a new source of water for growth, and will replace domestic well use in some limited areas. And although the City has leased 3,000 ac-ft Jicarilla Apache Nation SJC water in 2004, it will be used for offset credits, so it is also not shown as an option for meeting demand currently. As the BDD project FEIS (SFNF and BLM, 2006) does not allow for increased annual diversions, any increased use of the BDD project water beyond the permitted 8730 ac-ft/yr will require additional National Environmental Policy Act (NEPA) and water right permitting.

Transfer Water Rights

The City of Santa Fe passed the Water Right Transfer Ordinance (WRTO) in 2005 and added the Escrow Amendment in 2006 to allow an applicant to provide a financial backup to tendered water rights while awaiting OSE decision. A Water Right Banking Ordinance (WRBO) was also passed in 2006 to allow applicants to move water rights to the City water system and assigned them to development projects after the OSE transfer had been completed. The policy basis for these ordinances was to require new large developments to add to the City water system water right portfolio so that new supplies could be used to address increasing demand.

Other Updates

Watershed Management

As discussed in Section 2.1, approximately 5,000 acres in the Santa Fe River watershed have been treated to reduce the risk of catastrophic fire in watershed, which could drastically reduce the quantity of water available from supply from the Santa Fe reservoirs.



Habitat Protection and Restoration Ordinance

Interest in restoring the habitat of the Santa Fe River has continued to gain momentum through efforts of the community. In April of 2007, American Rivers listed the Santa Fe River as America's most endangered river of 2007. The City of Santa Fe and Santa Fe County are restoring the Santa Fe River ecosystem downstream of the reservoirs including efforts to stabilize banks and habitat in reaches through town and downstream of the wastewater treatment plant and funding groups to restore portions of the Santa Fe River. Aside from establishing a River Commission to guide the community efforts, the City of Santa Fe has also adopted various ordinance, resolutions and policies to help the Santa Fe River. A recent ordinance (Section 25-8 SFCC 1987) establishes a voluntary contribution fund (The Santa Fe River Fund) to acquire water rights for the benefit of the Santa Fe River and the Rio Grande. The donations generated are matched 1:1 with City funds. Additionally, a resolution by the City of Santa Fe directs staff to research and prepare a report on the environmental flow needs of the Santa Fe River.

Water Conservation Policies and Ordinances enacted since 2003

- Eldorado Area WSD adopted the *Eldorado Area Water and Sanitation District Water Alert Management Plan Summary* in 2006 to address water shortages during droughts.
- Santa Fe County adopted ordinance No. 2003-6 amending Ordinance 1996-10, the Santa Fe County Land Development Code, to require rainwater catchment systems for all commercial and residential development.
- The City of Santa Fe is continuing to implement its water conservation program, which includes mandatory offset of new growth with replacement of high flush toilets with low flush toilets or, more recently, water right purchases, rebates for washing machines, hot water recirculation requirements, rain barrels at discounted prices, and public education programs.

Aamodt Settlement Agreement

The Aamodt adjudication settlement agreement, begun in 1966, was signed in 2006 by the seven non-federal government parties to one of the longest running federal cases in the United States



(see pp. 21-24). The agreement is contingent on funding for a water diversion structure and water rights for the parties in the Pojoaque-Nambé, and Tesuque drainages, including four pueblos and Santa Fe County. Settlement of this adjudication provides a greater likelihood of certainty regarding water rights in the Santa Fe subregion.

Santa Fe County Line Extension and Water Service Ordinance

Santa Fe County adopted Ordinance 2006-57, Santa Fe County Water Resources Department Line Extension and Water Service Policy which outlines procedures applied to applications for water service, water line extensions, allocation of scarce resources, and areas served by the Department with water service.

3.3.5 South Galisteo Creek Subregion

See Figure 1, Jemez y Sangre Subregions and Table I, Actions Taken on Alternatives.

Status of the Gap between Water Supply and Demand

When the gap between water demand and supply was calculated in the 2003 JyS Plan, it was estimated that the gap in the South Galisteo Creek Subregion would be approximately 900 ac-ft/yr in 2040 and approximately 1,800 ac-ft/yr in 2060. Closing the gap between supply and demand is based on unquantified groundwater. Based on these changes, the gap between supply and demand has been reduced to approximately 900 ac-ft/yr in 2040 and approximately 1,800 ac-ft/yr in 2060 as shown in Figure 13.

Options for meeting the projected gap between supply and demand are shown in the updated option chart in Figure 14. Each square in the options chart represents approximately 10 percent of the projected gap by the year 2060. Therefore the options chart can be utilized to develop potential scenarios for closing the gap by selecting ten squares that total 100 percent. It should be noted that the options listed in the chart are based on analyses developed in the 2003 JyS Plan and may not fully represent changing conditions or some new options that will be available in the future.



Changes in Water Supply

Domestic Wells

The growth in the South Galisteo Creek subregion has been served entirely by domestic wells. A total of 150 more domestic wells was identified in the WATERS database for the South Galisteo Creek Subregion, which results in an increased diversion of 40 ac-ft/yr. If this rate of increase continues, by 2060 domestic well diversions could be 340 ac-ft/yr above the amount in 2000. Community systems have instituted a moratorium on additional hookups, as summarized in the interviews (Appendix A), and Madrid, Cerrillos, and Galisteo have all placed restrictions on new service connections. Figure 13 shows the projected supply and demand.

Other Updates

The relative growth rate for South Galisteo and North Galisteo (which is in the Santa Fe Subregion) will depend partially on Santa Fe County's Growth Management Strategy and Plan which is in preparation. In addition, oil and gas and other extractive industries are proposing to drill in South Galisteo subregion which could also impact the growth rate.

3.4 Effects of Climate Change and Variability on Water Resource Management

Recent climatological research has identified a warming trend in global temperatures in the 20th Century that increased in recent decades (Gutzler 2005), as evidenced by decreased icepack and snowfields and retreat of glaciers (NM OSE, 2006b). This global warming is thought to be due to the presence of greenhouse gases, concentrations of which are continuing to increase. In New Mexico, wintertime average temperatures have increased statewide by about 1.5 degrees since the 1950s (NM OSE, 2006b).

Though climate predictions are extremely difficult to make and come with large uncertainties (Gutzler, 2005) and the effects of climate change on New Mexico monsoons is not well understood (Lenart, 2205), some trends can be expected. Higher temperatures and higher evapotranspiration will exacerbate effects of droughts when they do occur. According to the



OSE report on the effects of global climate change on New Mexico's water supply and ability to manage water resources (OSE, 2006b), the following effects are likely to occur in New Mexico:

- Temperature is expected to continue to rise.
- The amounts of snowpack and snow water equivalency are expected to decrease, and a greater percentage of precipitation is expected to fall as rain rather than snow.
- Smaller spring snowmelts and/or earlier runoff are expected to diminish supplies of water for irrigation and ecological health.
- Reservoir and other open water evaporation is expected to increase.
- Evapotranspiration is expected to increase due to higher water temperatures and longer growing seasons.
- The severity of droughts and floods is expected to be more extreme.

Effects similar to those predicted state-wide (OSE, 2006b) are expected to occur in the JyS region. Of particular concern are:

- The combined effect of less snow, earlier runoff, and higher water temperatures could lead to water shortages for water users who depend on surface water sources (Santa Fe reservoirs and the BDD as well as agricultural diverters) and could also affect recharge rates and the potential long-term sustainability of groundwater resources.
- Higher temperatures, particularly during dry periods, can significantly increase demands for outdoor water.
- Climate change may increase the risk of forest fire, which may subsequently lead to decreased storage due to sedimentation.
- Global climate change could lead to more intense, although probably less frequent, storms and to more extreme flooding events in the JyS region.

Some strategies to prepare the region to address the effects of climate change have already been initiated, but additional strategies will be needed to ensure that the region is prepared to deal with extreme dry or wet conditions and higher temperatures. Many water providers are initiating conjunctive use strategies to use surface water when available and to have backup groundwater supplies available during drought. Though maintaining both surface and groundwater sources of



supply can involve considerable expense, continuing to implement conjunctive use strategies and storage where feasible will be important for the region to be prepared for potential long-term droughts. More attention is also being focused on improving storage capacity that has been lost to silt.

The region is addressing potential forest fire and sedimentation threats through multiple forest restoration projects (Section 2), but ongoing restoration work will be important to minimize the threat of catastrophic forest fire and the resulting impacts on water supply. Continued monitoring and adaptive management will help to guide an effective long-term forest restoration program. A combination of land use and water management strategies is needed to address flood threats, to capture and recharge storm flows where possible, and to ensure readiness for extreme events.

Early recognition and assessment of potential climate impacts at a local level gives communities time to develop the capacity to adapt to climate impacts, potentially reducing disruptive effects (Binder, 2006). Predicted hydrologic responses that may have the greatest impact on water resource management are the projections for earlier snowmelt and a shift in the timing of peak spring runoff (to occur earlier), lengthening the summer low-flow season (Whitely Binder, 2006; OSE, 2006). Whitely Binder (2006) concluded that building adaptive capacity at the local level is one of the most important components of addressing global climate change, though she recognized that changes may be difficult to implement due to technical, legal, and financial constraints.

The American Water Works Association (AWWA) recommends that utilities consider integrated water resource management (IWRM) to plan for impacts due to greater climate variability. IWRM is a systematic approach to planning and management that considers a range of supply-side and demand-side processes and actions, and incorporates stakeholder participation in decision processes. It also facilitates adaptive management by continually monitoring and reviewing water resource limitations (Miller and Yates, 2006). Given their large number, small



utilities in the JyS region could potentially benefit by working together on planning activities at a regional level.



4. Recommendations

The water providers in the JyS water planning region have made great strides toward not only closing the projected gap between supply and demand, but also protecting the region's water resources through watershed and riparian restoration projects, stormwater management, and conjunctive use strategies. The JyS water planning public meetings, participation in JyS Council meetings, and dissemination of the water plan have likely contributed to the increased awareness of water supply issues and actions that can help protect supplies and reduce vulnerability during drought. The projected gap between supply and demand in the year 2060 has decreased in all subregions except the South Galisteo, largely due to proposed projects to divert San Juan-Chama water and native Rio Grande water rights from the Rio Grande. For instance, the gap in the Santa Fe subregion has decreased due in part to the proposed BDD project but also to conservation efforts by the City of Santa Fe. The gap is also being met due to new domestic wells that continue to be drilled in all subregions, amounting to an increased diversion of about 300 acre-feet per year (ac-ft/yr) since 2000 that could increase another 2,000 ac-ft/yr by 2060 if the rate of well drilling

Thus while the demand gap appears to be reduced, this reduction is contingent on the construction of infrastructure projects for SJC diversions and on the purchase and transfer of water rights to meet the demands of Santa Fe County, Las Campanas, and the parties to the Aamodt settlement. In addition, the supply/demand projections represent the average or median conditions and do not show the vulnerability of surface water supplies to drought or the potential decline in yield of groundwater resources.

The newly estimated annual growth rate from 2000 to 2060 is less than the rate predicted by BBER for the 2003 JyS water plan, except in Los Alamos, where the growth rate is about twice the rate predicted by BBER.

While a great deal of research has been conducted in the Española Basin since the 2003 JyS Water plan was published, much of the research is ongoing and remains to be published and



synthesized, particularly with respect to the structure of the aquifer and the long-term sustainability of the groundwater resources. Groundwater modeling efforts by the City of Santa Fe and by Santa Fe County were not available for review and incorporation into the assessment of water budget components for this water plan update. The extent of groundwater contamination and migration rates of contaminants from Los Alamos National Laboratory continues to be investigated.

The remainder of this section includes recommendations regarding the future usefulness of the Council, as determined from the survey process, and actions that may help the region to continue to update understanding of changed conditions and responses in the region, including strategies to address conservation and drought.

4.1 Recommendations for Continuation of the Jemez y Sangre Water Planning Council

During the survey process, respondents were asked for their opinions about how the Council and future updates of the plan could provide the most value to the stakeholders in the region.

Responses regarding the usefulness of the water planning process and the JyS Regional Water Plan were unanimous in agreeing that there is value in communication and collaboration, but that each entity is going to pursue their own projects and address their specific needs. Several of those surveyed appreciated the excellent support for projects, projections of future water uses, useful advice, options charts, and compilation and summaries of existing reports and documents.

The 2003 JyS Plan does not appear to be used on a day-to-day basis, primarily because of its size and because stakeholders rely on their own planning documents. A compact version of the plan might be more useful. Also, a web site that directs the user to information, such as the white papers on each alternative, could be useful. Recommendations from those surveyed included condensing the JyS plan into a short version and educating the public.

The update of the JyS plan could be useful to show what is being done now to improve and sustain water resources and to focus on regional issues such as aquifer management, surface



water-groundwater interactions, plume migration, and sustainability.

The Council needs a clear mission and ongoing support, money for public relations and advocacy, and a more defined educational role. Most of those surveyed thought that the most valuable aspect of the JyS Plan is the communication that has occurred in monthly meetings since 1998. The Council has an opportunity to continue education through development of a web site or public meetings on particular issues. The Council could also continue to collect information, as was done for this water plan update, and to discuss regional water resources management issues. The Council could play a vital role in investigating sustainability of water resources, water right transfers, adoption of acéquia bylaws, or other information that characterizes changes in the region.

It may not be possible for the Council to do much more than that and remain a neutral body. Each city, county and pueblo is going to proceed with their actions to address their water supply problems regardless of whether the Council exists or not. However, most entities will only be looking at their particular situation and not consider regional implications. The role of the Council is to examine the issues from a broader perspective and find common ground and solutions with the greatest benefit.

4.2 Recommendations for Improved Understanding of the Supply Demand Gap and Strategies to Address the Gap

As discussed in Section 1, this update focused on identifying key changes that affect the supply and demand of the region, but does not include updating and re-publication of all aspects of the water plan. A complete update is not funded at this point in time; however, if additional update activities are undertaken by the Council, recommended analyses to be included are:

- Analyze the gap between supply and demand to reflect drought conditions, considering potential long-term catastrophic droughts.
- Evaluate changes in water rights and policies that would affect water rights transfers, such as acéquia bylaws.
- Incorporate recent geohydrologic investigations into groundwater models.



- Use revised groundwater models to evaluate the sustainability of groundwater resources in the region with the existing and future pumping.
- Use revised groundwater models to evaluate regional flow patterns under changed conditions, particularly related to contaminant migration from Los Alamos National Laboratory.
- Use revised groundwater models to evaluate potential impairment to senior water rights from domestic wells.
- Update maps and charts in the original plan to include more recent data (streamflow statistics, precipitation data, hydrographs, etc.).
- Update demand estimates based on OSE 2005 water use data when that information is released.
- Update sub-basin population estimates based on the 2000 census.
- Re-evaluate alternatives to determine if any new alternatives may be applicable or if some of the alternatives in the 2003 JyS Plan are no longer feasible and should not be included in future efforts.
- Evaluate changed conditions in the agricultural sector (which was not included in the scope for this update), including changes in cropping patterns and quantities of irrigated acreage, as well as any changes in agricultural delivery systems.
- Address the possibilities for new water supplies.

While the water demand and supply budgets could be refined based on the upcoming OSE report for water use in 2005 and population estimates could be prepared for each sub-basin, the general trends are not likely to change with better precision. Consequently, while it is recommended that if future update work occurs the newer data should be included, it is not a critical activity at this time.

One of the important issues that the JyS region continues to face is potential drought. Because predictions of global warming effects on water supplies indicate a likelihood for a greater percentage of extreme conditions (both drought and flood), the region needs to be well prepared



for meeting demands during drought. A summary of recommended strategies that could be undertaken to better prepare the region to address drought conditions are:

- Conduct regional surface water modeling to more quantitatively assess vulnerability under scenarios of greater drought (such as SJC shortages in the San Juan Basin) or policy changes that may affect future availability of surface water.
- Develop joint powers agreements and official drought sharing agreements between water systems in the area; identify where regional solutions (beyond what is currently being done) can assist in making sure that all water providers are prepared to address drought conditions.
- Continue to update and implement tiered water conservation plans that can lower water use during drought. In particular, the Council may be a possible resource to bring together small providers that have not progressed in this area to the extent the larger water suppliers have.



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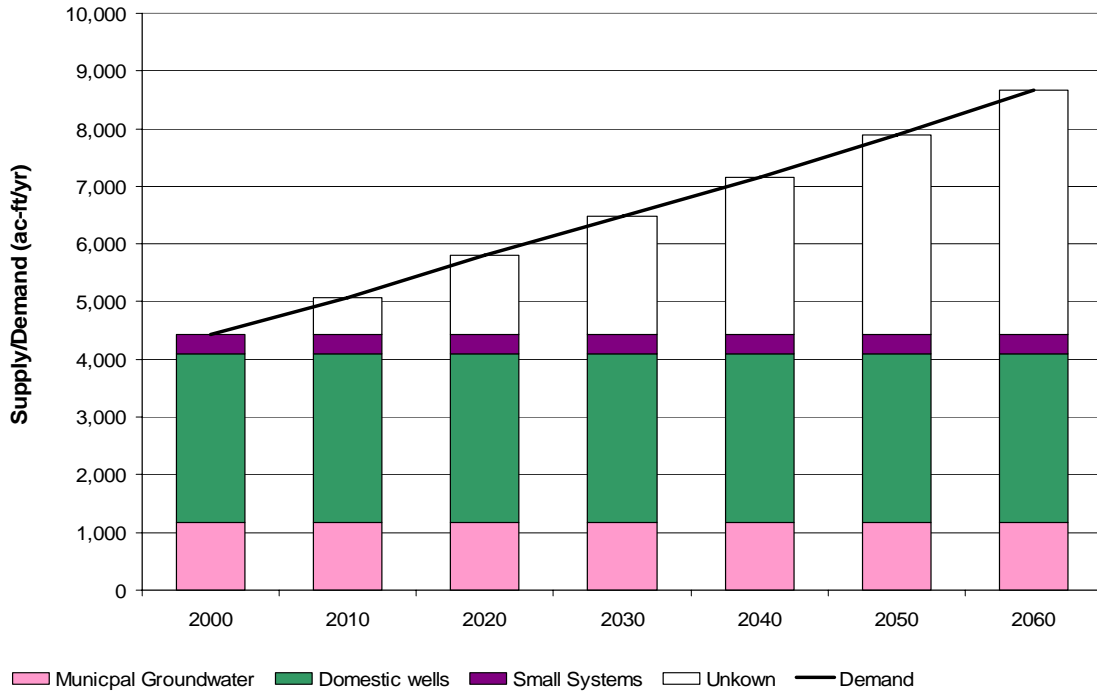
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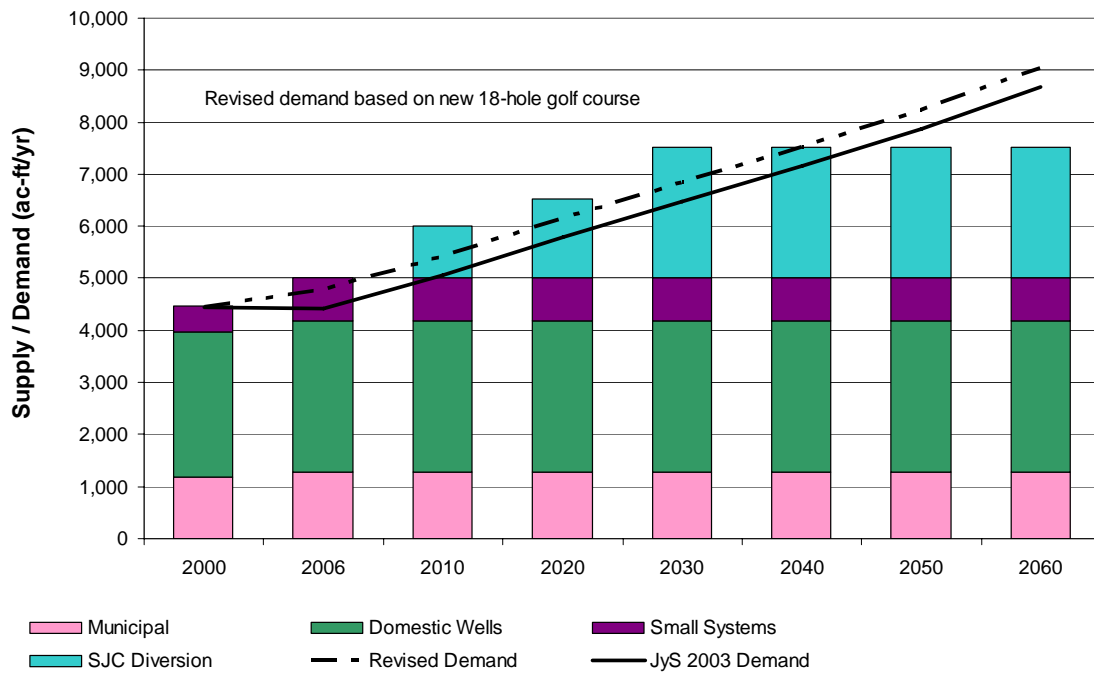
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Original 2003



Revised 2007



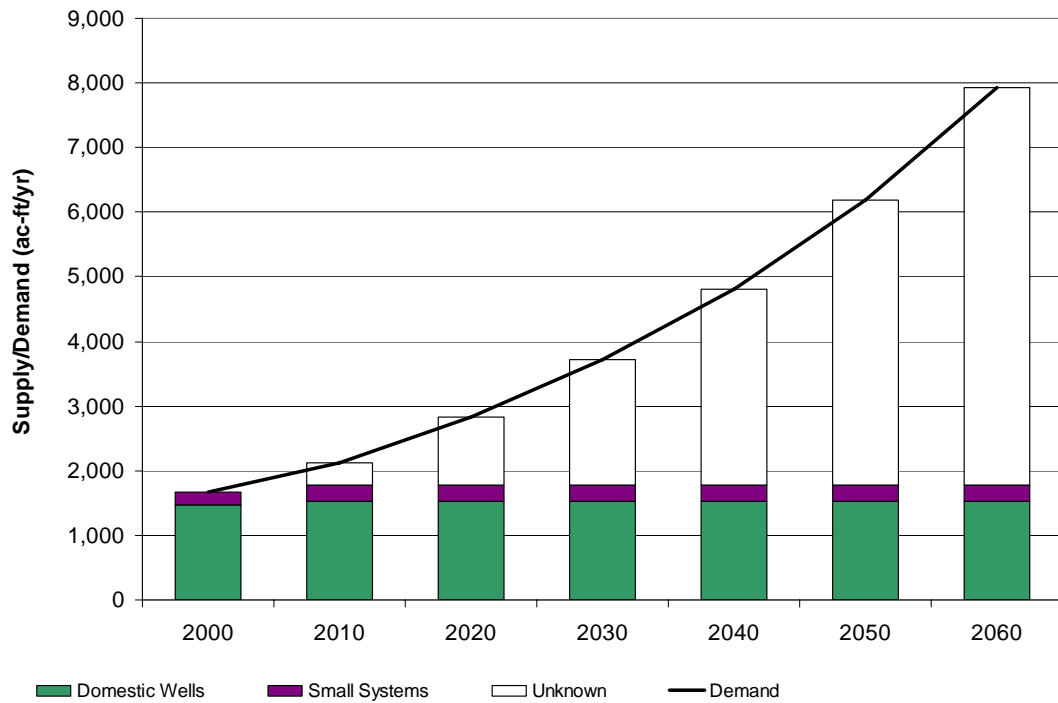
Note: Water supply and demand values represent diversions (not consumption) during average conditions.

JEMEZ Y SANGRE REGIONAL WATER PLAN UPDATE Projected Municipal and Domestic Demand Northern Subregion

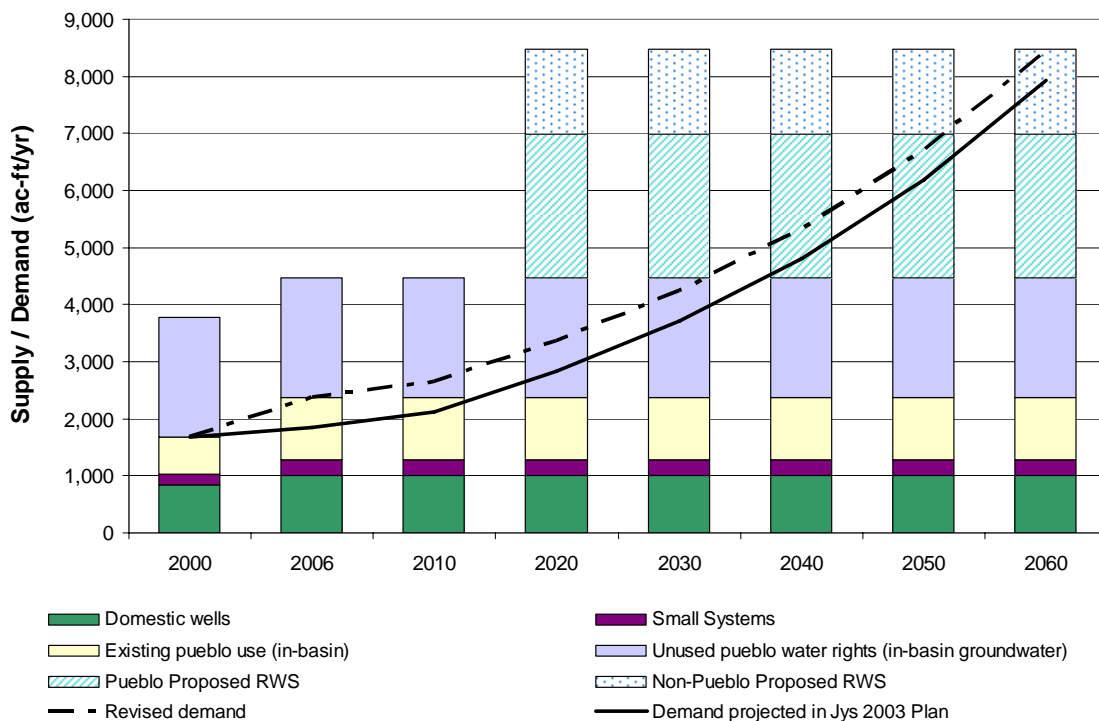


Figure ES-1

Original 2003



Revised 2007



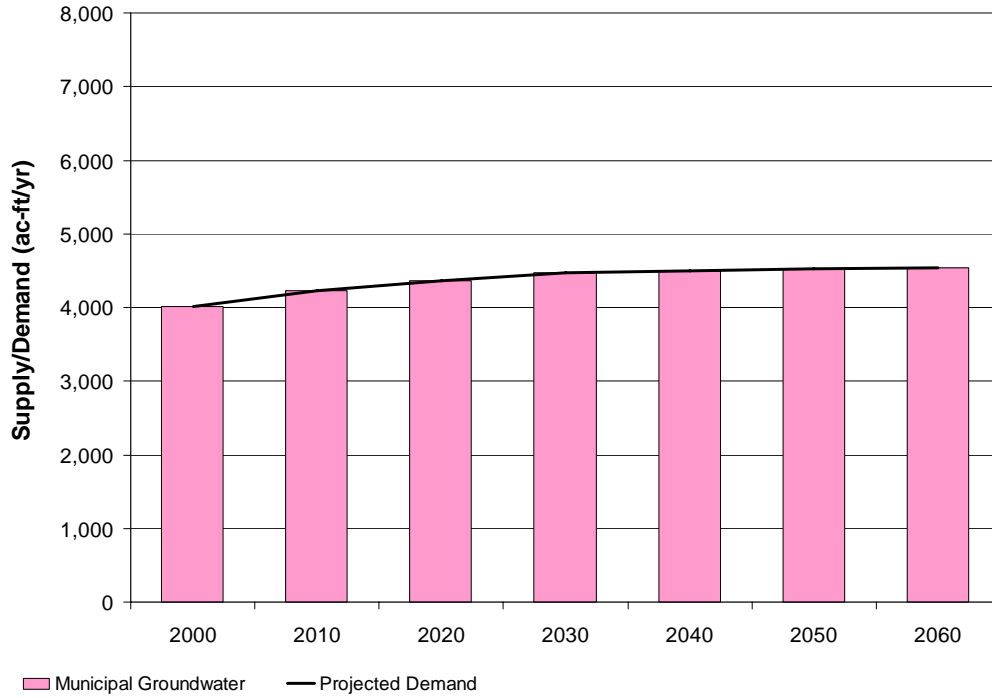
Note: Water supply and demand values represent diversions (not consumption) during average conditions.
RWS = Regional water system

JEMEZ Y SANGRE REGIONAL WATER PLAN UPDATE Projected Municipal and Domestic Demand Aamodt Subregion

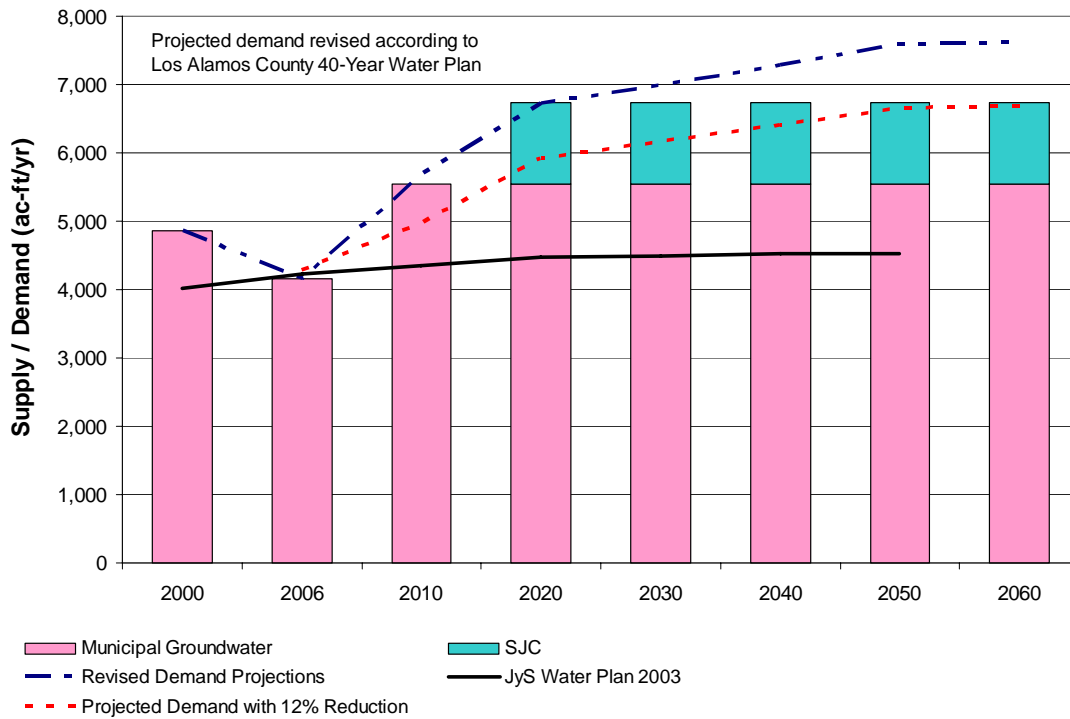


Figure ES-2

Original 2003



Revised 2007



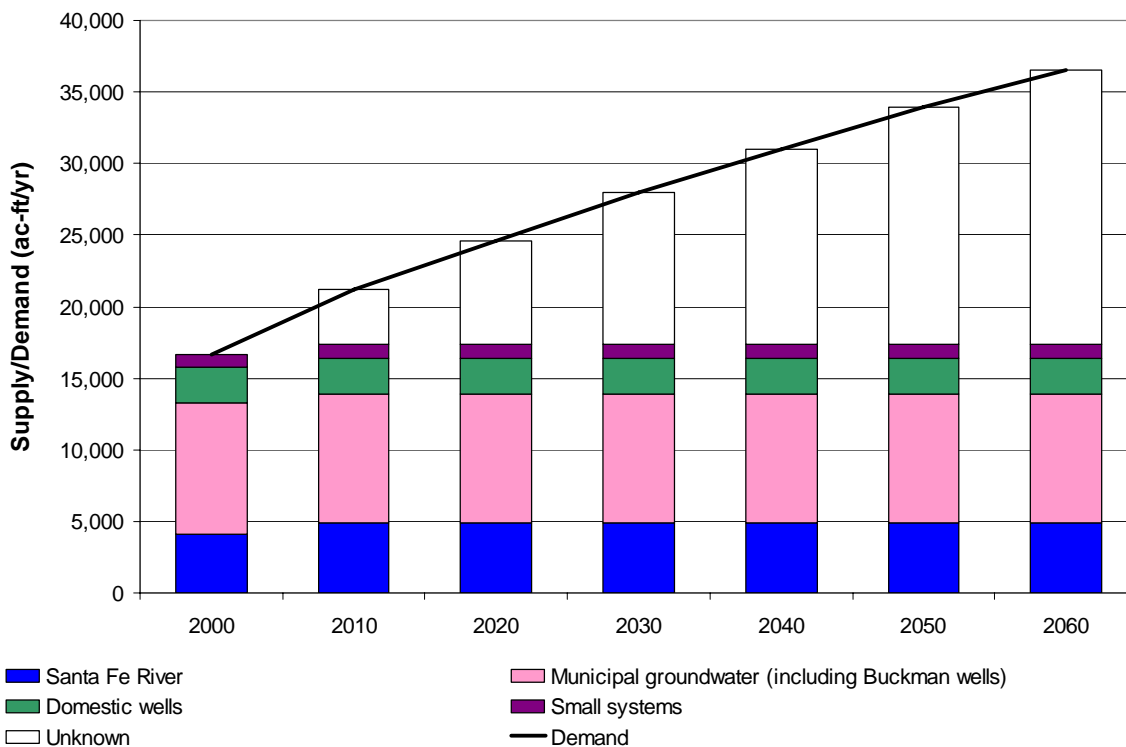
Note: Water supply and demand values represent diversions (not consumption) during average conditions.

JEMEZ Y SANGRE REGIONAL WATER PLAN UPDATE Projected Municipal and Domestic Demand Los Alamos Subregion

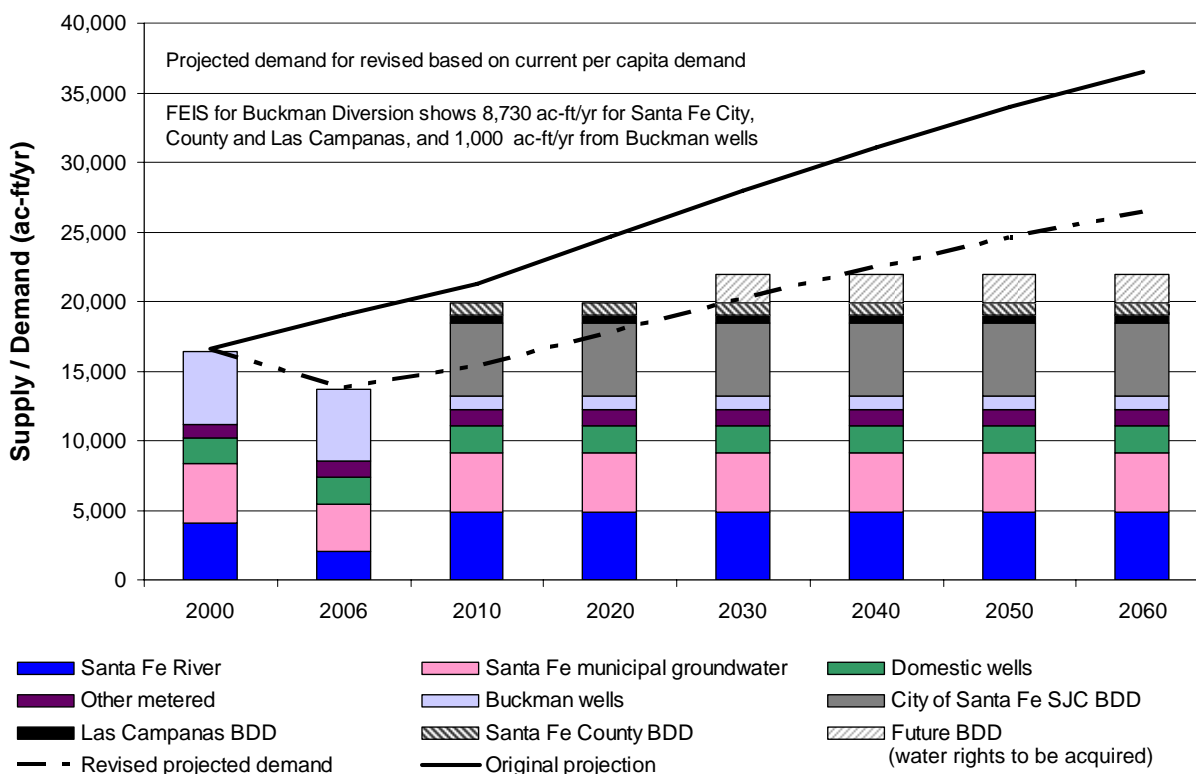


Figure ES-3

Original 2003



Revised 2007



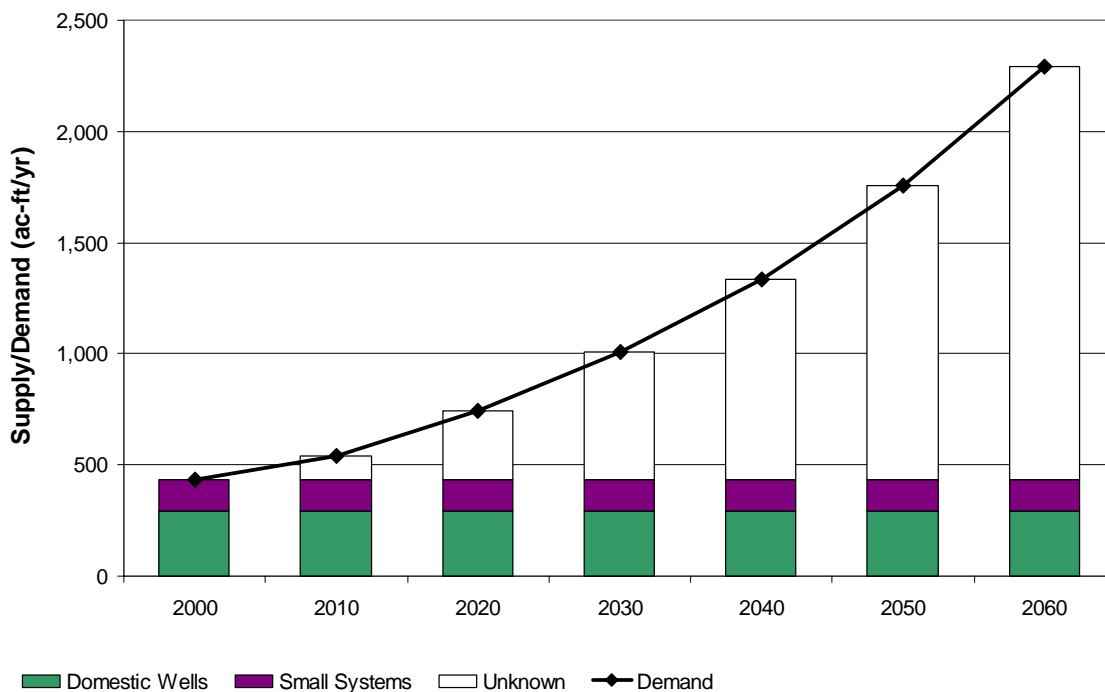
Note: Water supply and demand values represent diversions (not consumption) during average conditions. BDD = Buckman Direct Diversion

JEMEZ Y SANGRE REGIONAL WATER PLAN UPDATE Projected Municipal and Domestic Demand Santa Fe Subregion

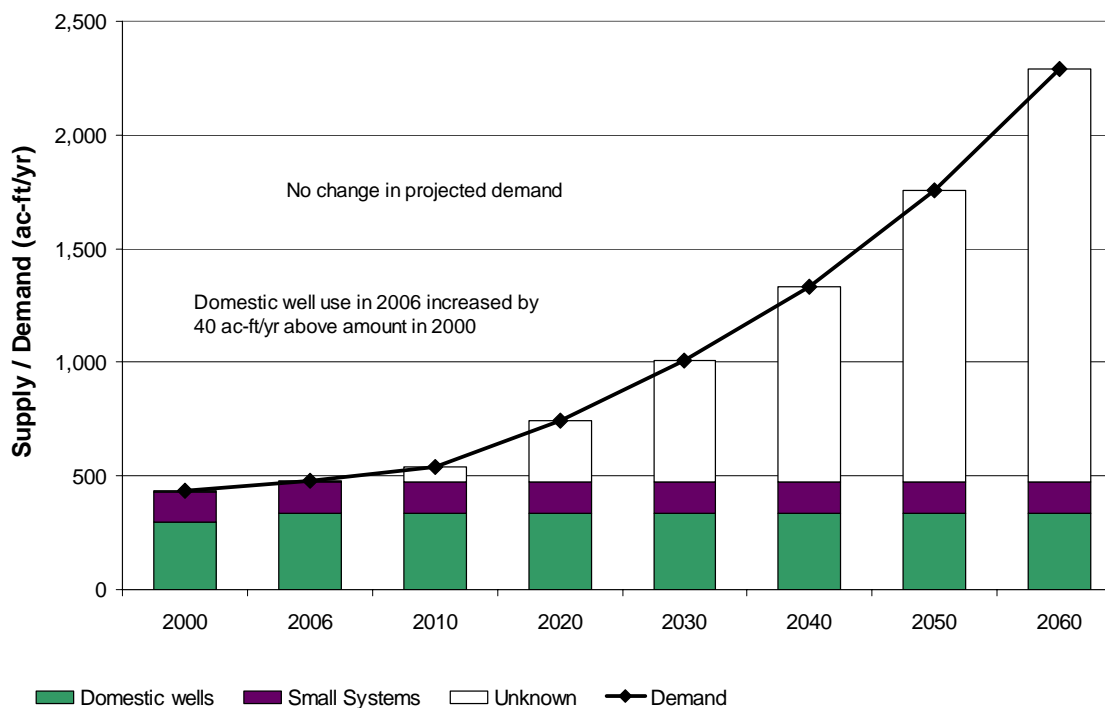
Figure ES-4



Original 2003



Revised 2007

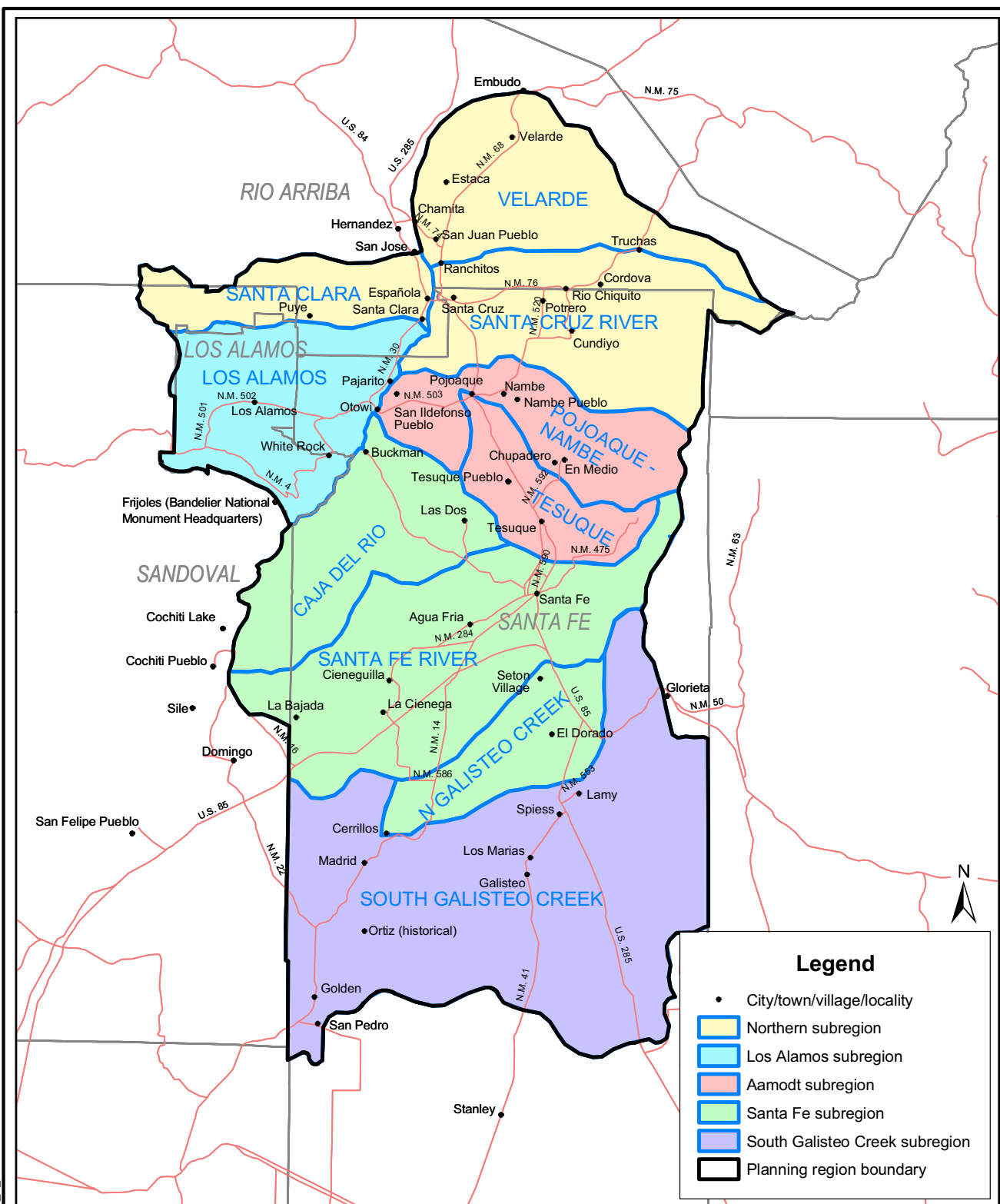


Note: Water supply and demand values represent diversions (not consumption) during average conditions.

JEMEZ Y SANGRE REGIONAL WATER PLAN UPDATE Projected Municipal and Domestic Demand South Galisteo Creek Subregion



Figure ES-5

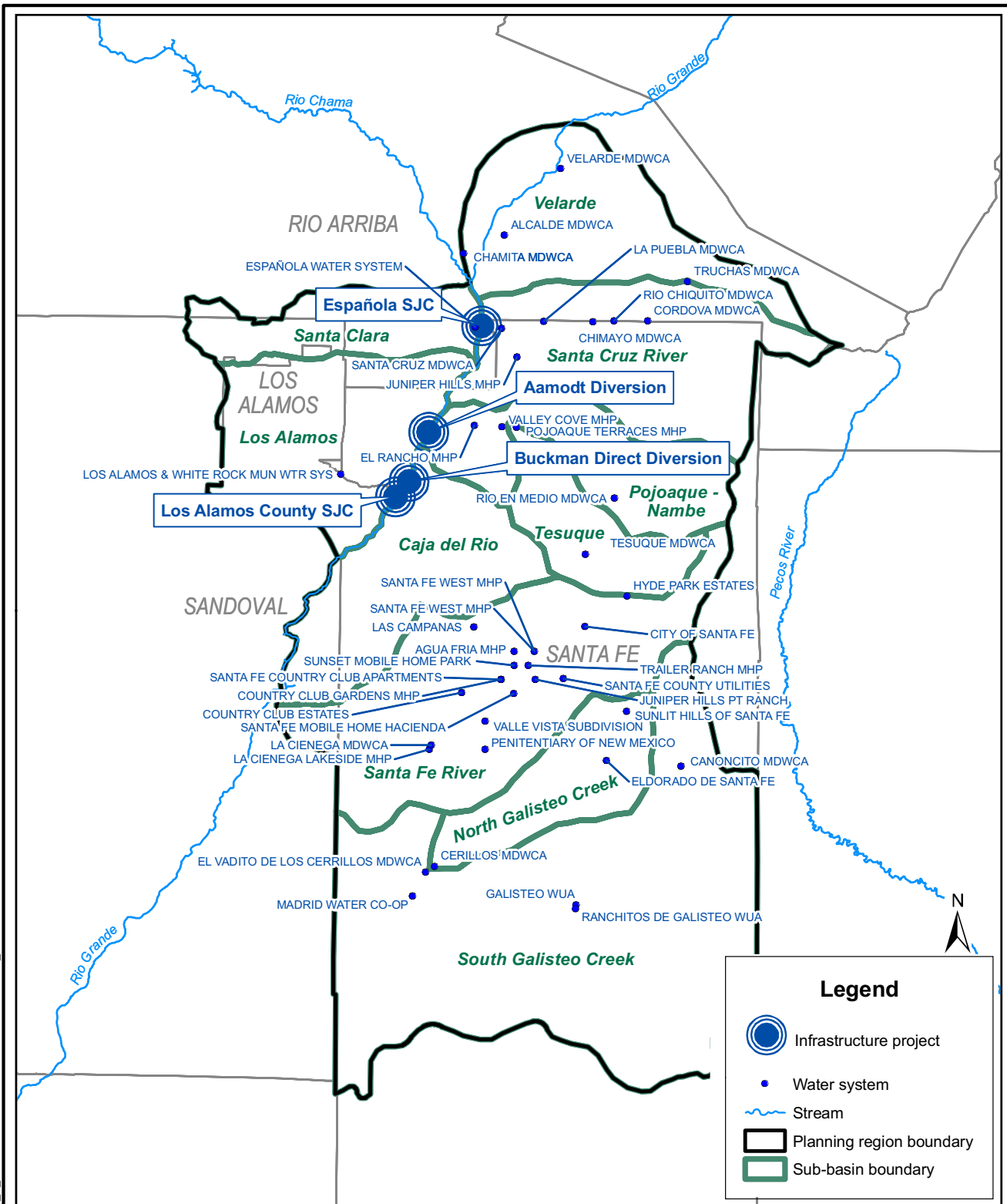


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JEMEZ Y SANGRE REGIONAL WATER PLAN 2007 UPDATE
Jemez y Sangre Subregions

Figure 1



MDWCA = Mutual Domestic Water Consumers Association
 MHP = Mobile Home Park

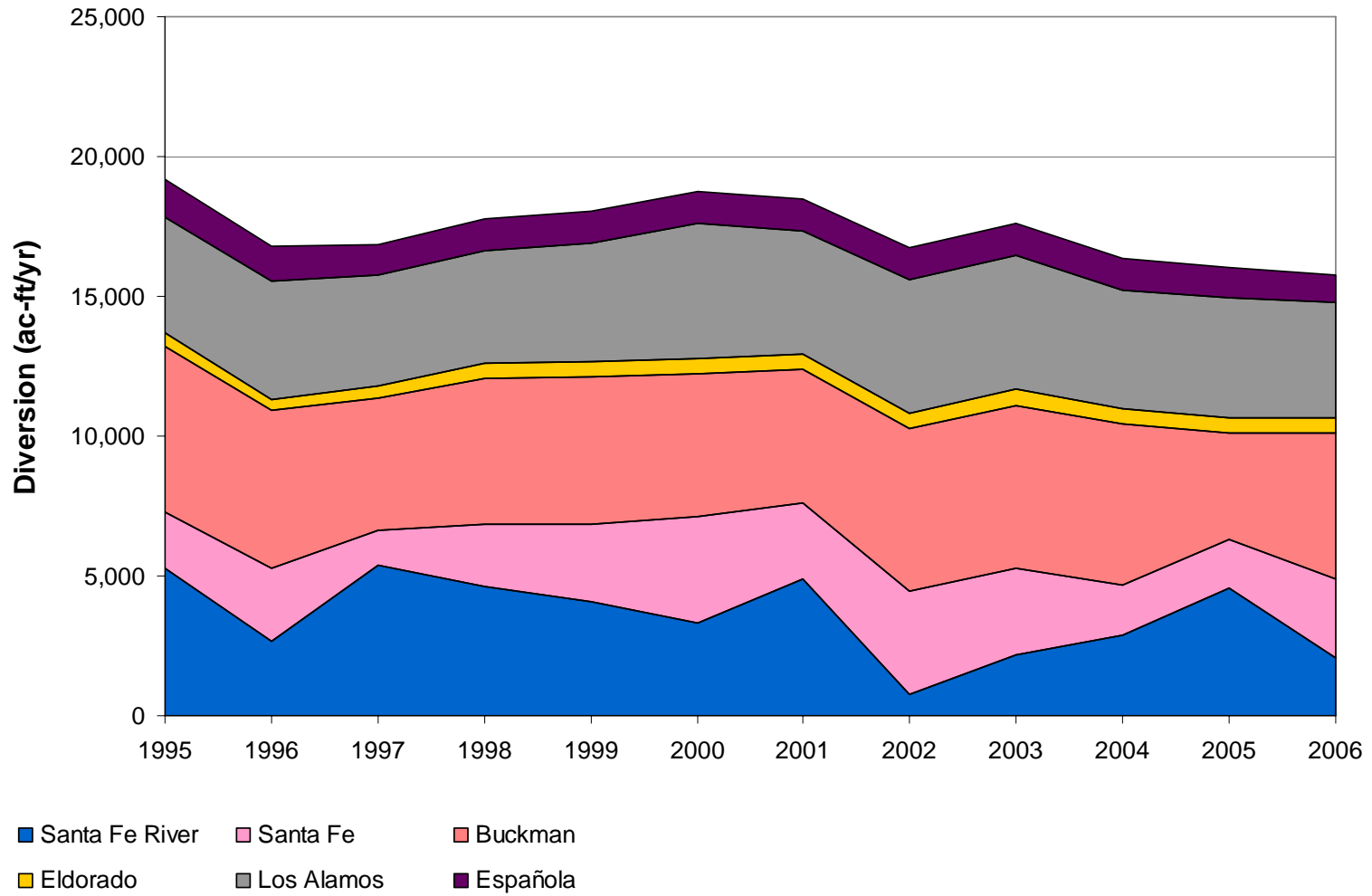
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JEMEZ Y SANGRE REGIONAL WATER PLAN 2007 UPDATE
Water Supply Infrastructure Projects

Figure 2

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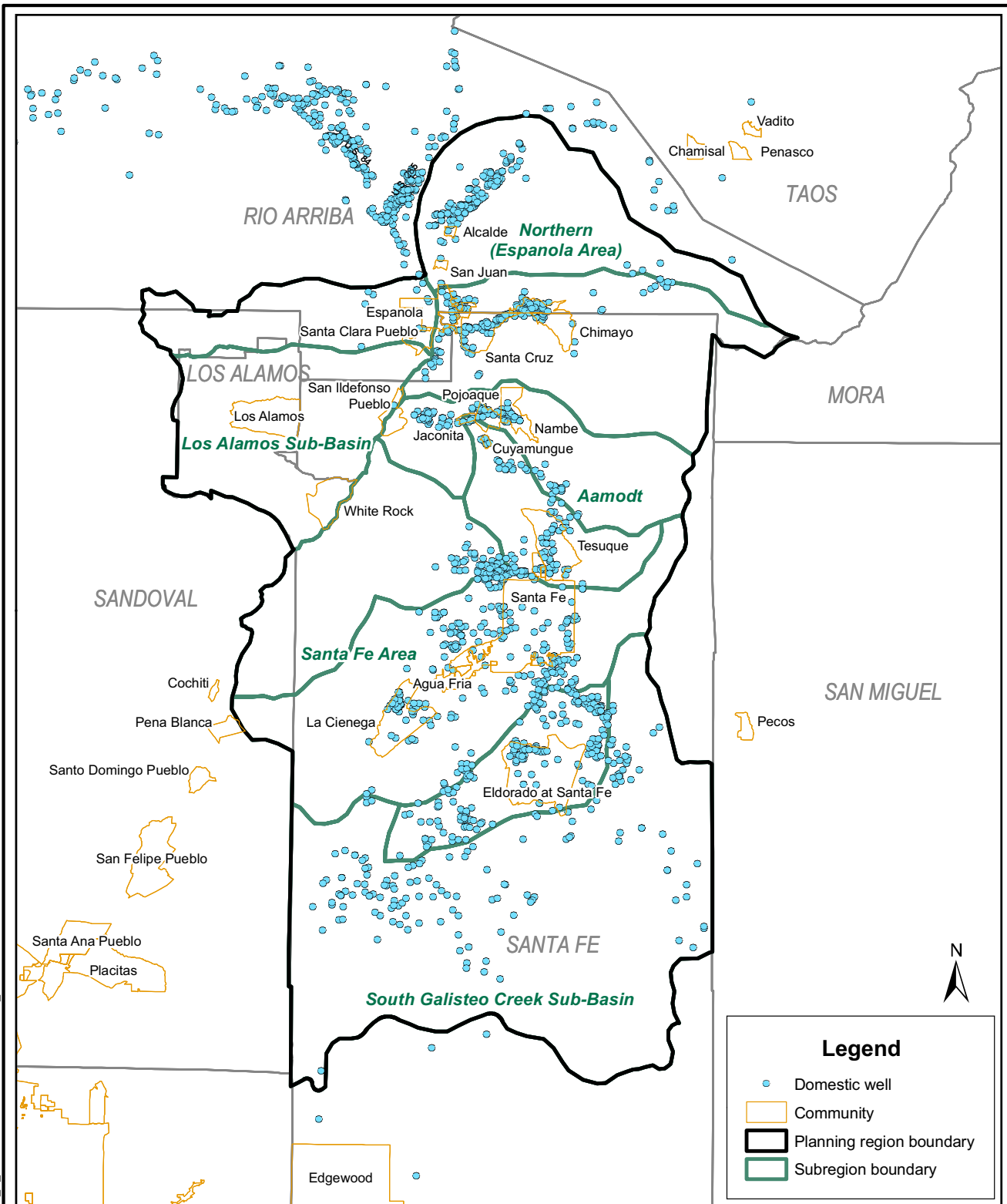




JEMEZ Y SANGRE REGIONAL WATER PLAN 2007 UPDATE
Municipal Diversions in the Jemez y Sangre Region
1995-2006

Figure 3





Source: WATERS Database, OSE

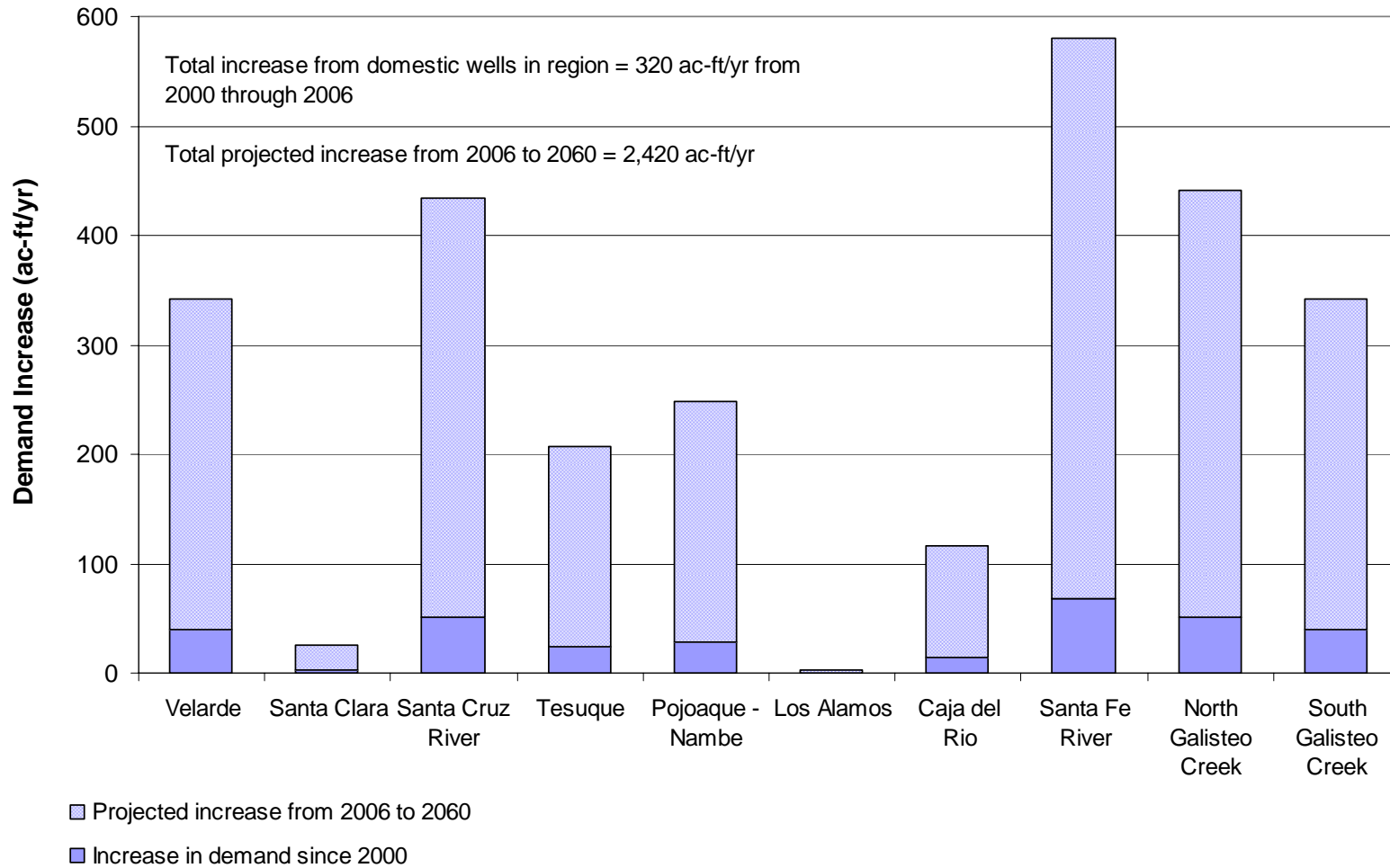
5 0 5 10 Miles

S:\PROJECTS\WR07.0045_JEMEZ_Y_SANGRE\GIS\MXDS\DOMESTIC_WELLS.MXD 7/07/190



JEMEZ Y SANGRE REGIONAL WATER PLAN 2007 UPDATE
New Domestic Wells, 2000 to 2007

Figure 4

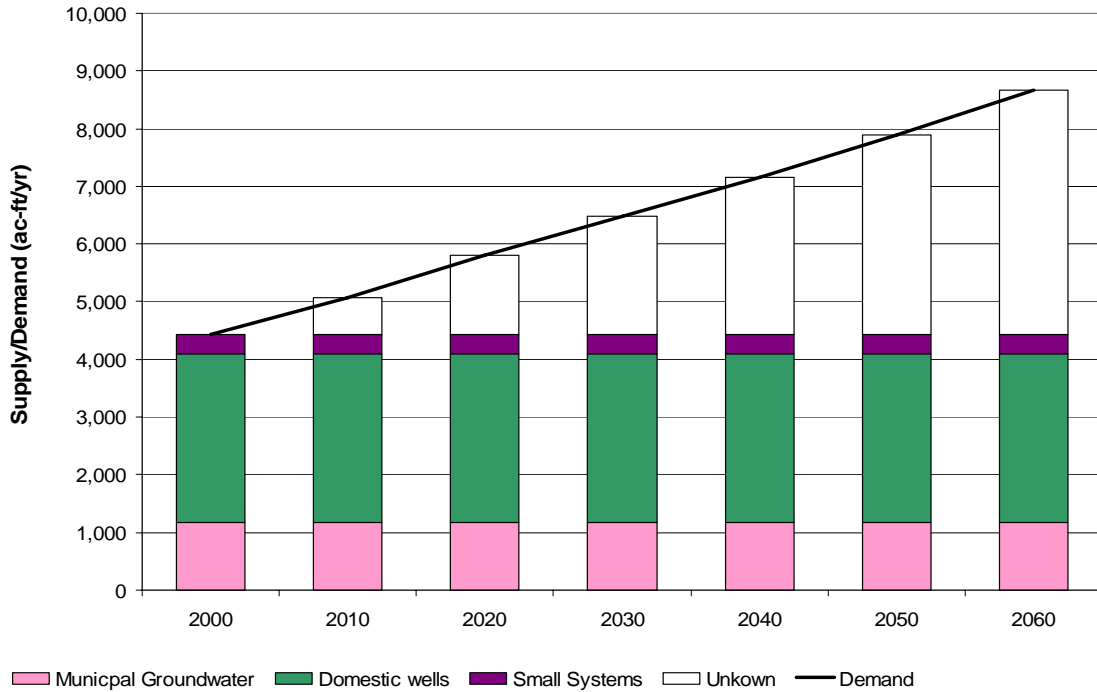


* Based on domestic wells continuing to be drilled at the same rate estimated from 2000 to 2006

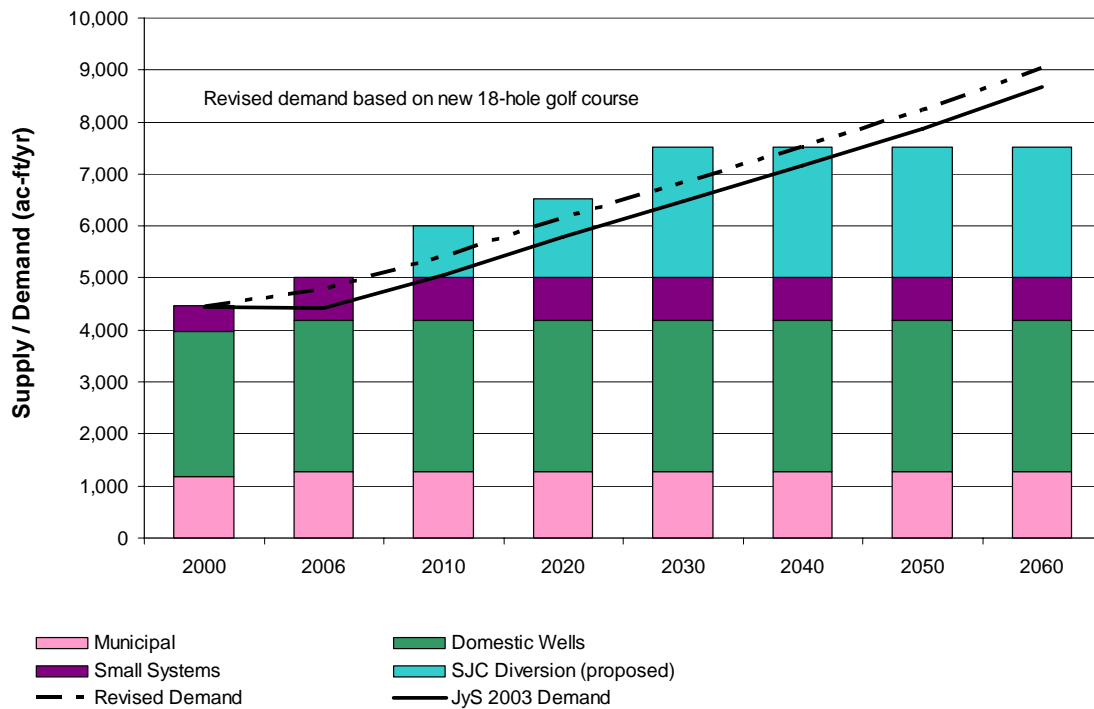
Figure 5



Original 2003



Revised 2007



Note: Water supply and demand values represent diversions (not consumption) during average conditions.

JEMEZ Y SANGRE REGIONAL WATER PLAN UPDATE Projected Municipal and Domestic Demand Northern Subregion



Figure 6

Percent	10	20	30	40	50	60	70	80	90	100
Acre-Feet	458	916	1,373	1,831	2,289	2,747	3,205	3,662	4,120	4,578
Conservation	Reduce NEW indoor and outside demand by 10%	Reduce NEW indoor and outside demand by 25%	Reduce ALL outside use and NEW inside use by 25%	Reduce ALL outside use by 50% and all NEW inside use by 25%	Reduce ALL outside use by 70% and all NEW inside use by 25%					
Growth Management	Reduce projected growth rate by 10%	Reduce projected growth rate by 20%	Reduce projected growth rate by 30%	Reduce projected growth rate by 40%	Reduce projected growth rate by 50%					
Purchase Agricultural Water Rights Below Otowi	220 acres of MRGCD (0.4% of agric. land)	440 acres of MRGCD (0.8% of agric. land)	650 acres of MRGCD (1.1% of agric. land)	870 acres of MRGCD (1.5% of agric. land)	1,090 acres of MRGCD (1.9% of agric. land)	1,310 acres of MRGCD (2.3% of agric. land)	1,530 acres of MRGCD (2.6% of agric. land)	1,740 acres of MRGCD (3% of agric. land)	1,960 acres of MRGCD (3.4% of agric. land)	2,180 acres of MRGCD (3.8% of agric. land)
Purchase Agricultural Water Rights Above Otowi	350 acres (1.8% of JyS agric. land)	700 acres (3.5% of JyS agric. land)	1,050 acres (5% of JyS agric. land)	1,400 acres (7% of JyS agric. land)	1,760 acres (9% of JyS agric. land)	2,100 acres (11% of JyS agric. land)	2,500 acres (12% of JyS agric. land)	2,800 acres (14% of JyS agric. land)	3,200 acres (16% of JyS agric. land)	3,500 acres (18% of JyS agric. land)
Allow More Domestic Wells	2,000 more households on domestic wells	3,400 more households on domestic wells	5,100 more households on domestic wells							
Utilize San Juan-Chama Water^a	Utilize Espanola SJC water	Utilize Espanola SJC water	Return flow credit on Espanola SCJ water							

Select ten blocks, starting on the left, from a combination of alternatives to indicate the desired method of reducing the projected 2060 gap between supply and demand. (Selection of any one block requires selection of all blocks to the left in that alternative.)

100% = 4,578 acre-feet

 = No further reduction in supply/demand gap is viable with this alternative

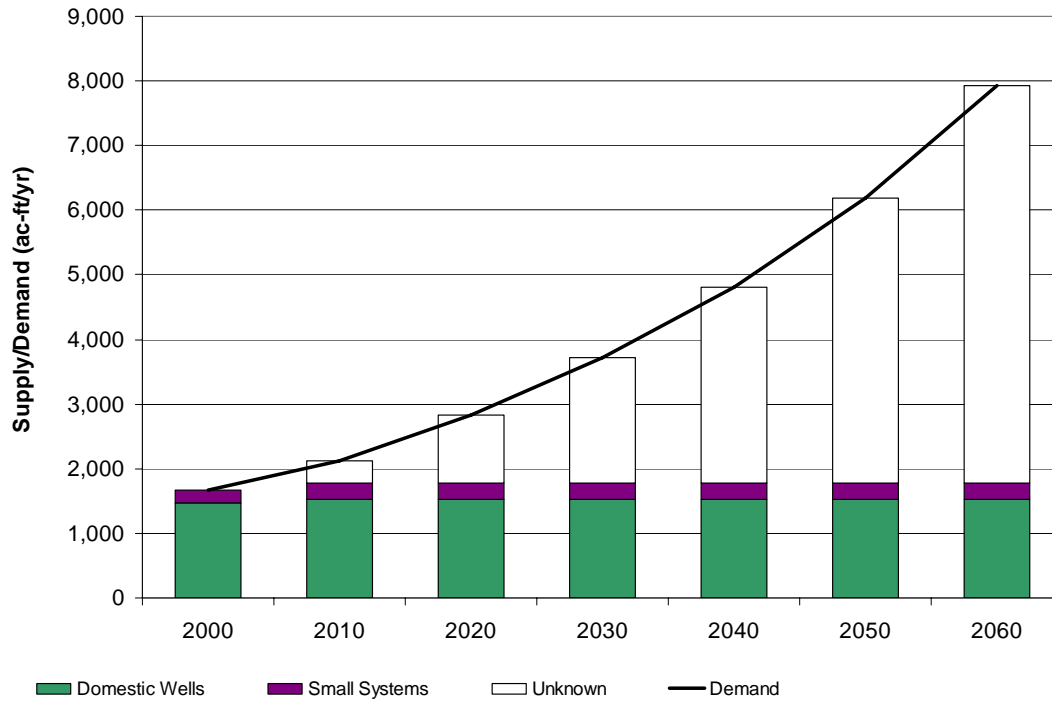
 = Uncertain due to the requirement to modify compact accounting

 = Actions being taken by sub-region to reduce gap between supply and demand

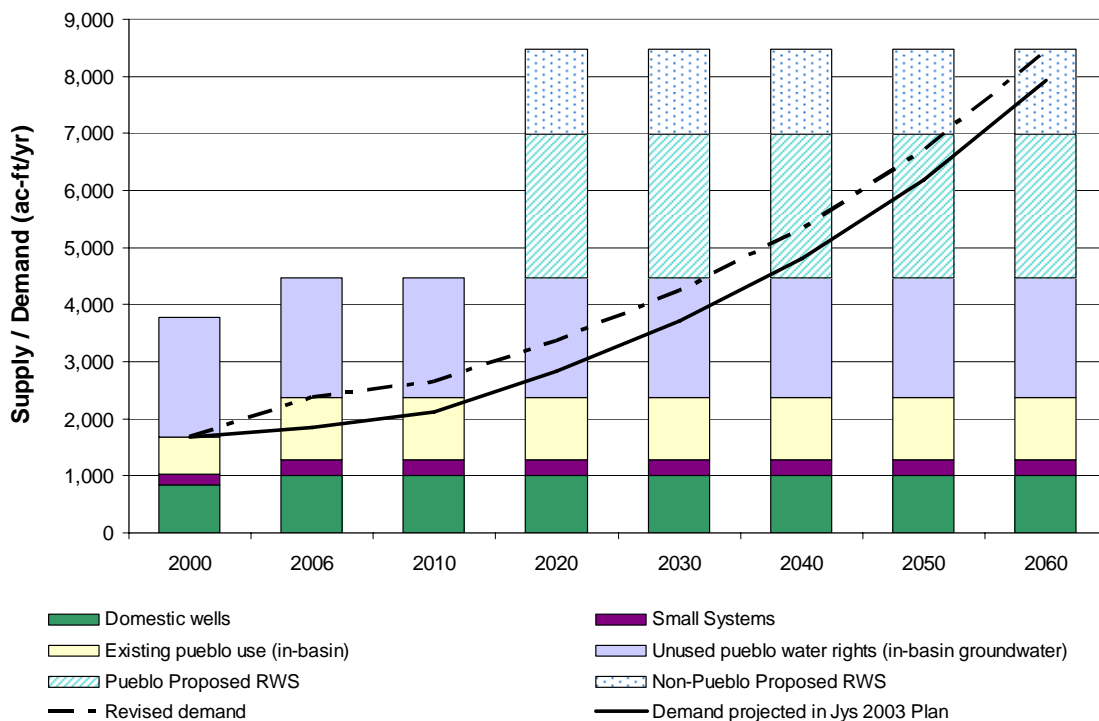
^a Use of Espanola and San Juan Pueblo SJC water are two separate options (each can be implemented independently of the other). Higher percentages reflect use of larger amounts of San Juan-Chama water.



Original 2003



Revised 2007



Note: Water supply and demand values represent diversions (not consumption) during average conditions.
RWS = Regional water system

JEMEZ Y SANGRE REGIONAL WATER PLAN UPDATE Projected Municipal and Domestic Demand Aamodt Subregion



Figure 8

Percent	10	20	30	40	50	60	70	80	90	100
Acre-Feet	678	1,355	2,033	2,710	3,388	4,065	4,743	5,420	6,098	6,775
Conservation	Reduce NEW indoor and outside demand by 10%	Reduce NEW indoor and outside demand by 25%	Reduce ALL outside use and NEW inside use by 25%	Reduce ALL outside use by 50% and all NEW inside use by 25%	Reduce ALL outside use by 70% and all NEW inside use by 25%					
Growth Management	Reduce projected growth rate by 10%	Reduce projected growth rate by 20%	Reduce projected growth rate by 30%	Reduce projected growth rate by 40%	Reduce projected growth rate by 50%					
Transfer Agricultural Water Rights Below Otowi to Municipal Use	320 acres of MRGCD (0.6% of agric. land)	650 acres of MRGCD (1.1% of agric. land)	970 acres of MRGCD (2% of agric. land)	1300 acres of MRGCD (2% of agric. land)	1,600 acres of MRGCD (3% of agric. land)	1,940 acres of MRGCD (3% of agric. land)	2,260 acres of MRGCD (4% of agric. land)	2,600 acres of MRGCD (4% of agric. land)	2,900 acres of MRGCD (5% of agric. land)	3,200 acres of MRGCD (6% of agric. land)
Transfer Agricultural Water Rights Above Otowi to Municipal Use	520 acres (2.6% of JyS agric. land)	1,040 acres (5.2% of JyS agric. land)	1,560 acres (8% of JyS agric. land)	2,100 acres (10% of JyS agric. land)	2,600 acres (13% of JyS agric. land)	3,100 acres (16% of JyS agric. land)	3,650 acres (18% of JyS agric. land)	4,200 acres (21% of JyS agric. land)	4,700 acres (23% of JyS agric. land)	5,200 acres (26% of JyS agric. land)
Allow More Domestic Wells										
Utilize San Juan-Chama Water	Lease Jicarilla Apache SJC water	Lease Jicarilla Apache SJC water	Lease Jicarilla Apache SJC water	Lease Jicarilla Apache SJC water	Lease Jicarilla Apache SJC water	Return flow credit on Jicarilla Apache SJC water	Return flow credit on Jicarilla Apache SJC water	Return flow credit on Jicarilla Apache SJC water	Return flow credit on Jicarilla Apache SJC water	Return flow credit on Jicarilla Apache SJC water

Select ten blocks, starting on the left, from a combination of alternatives to indicate the desired method of reducing the projected 2060 gap between supply and demand. (Selection of any one block requires selection of all blocks to the left in that alternative.)

100% = 6,775 acre-feet

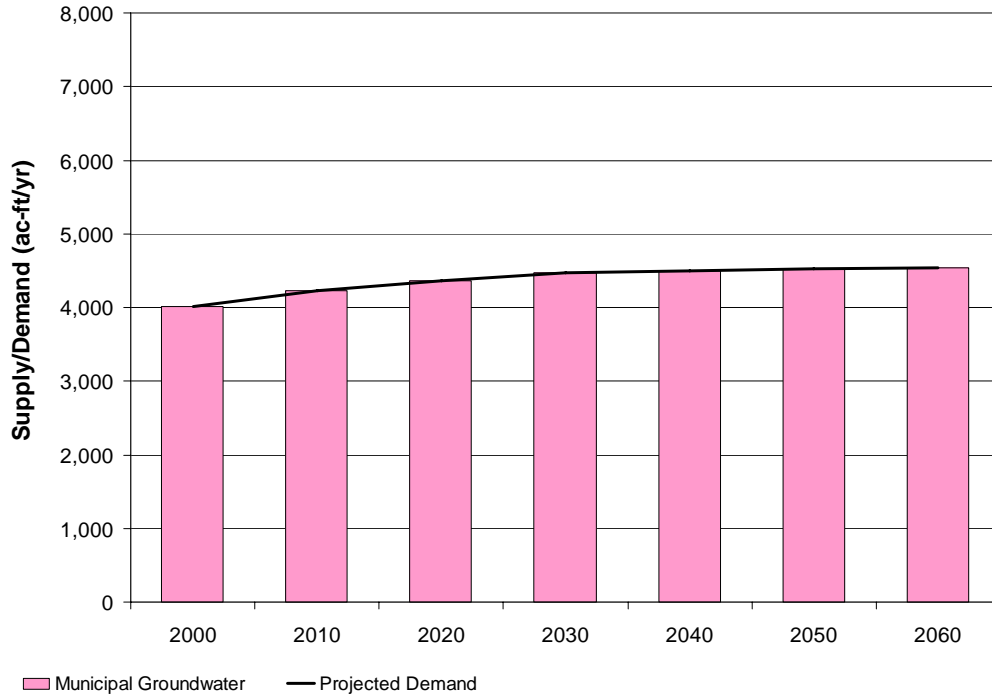
- = No further reduction in supply/demand gap is viable with this alternative
- = Uncertain due to the requirement to modify compact accounting
- = Actions being taken by sub-region to reduce gap between supply and demand

Figure 9

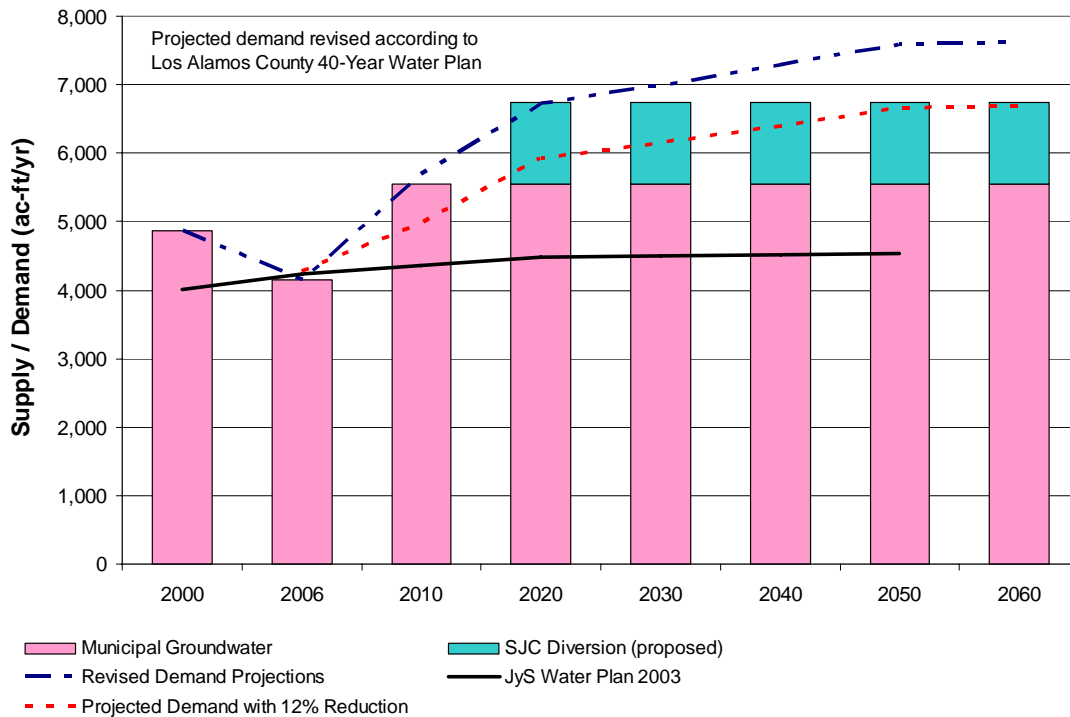


JEMEZ Y SANGRE REGIONAL WATER PLAN
**Options for Meeting Projected
 Supply/Demand Gap in the Aamodt Subregion**

Original 2003



Revised 2007



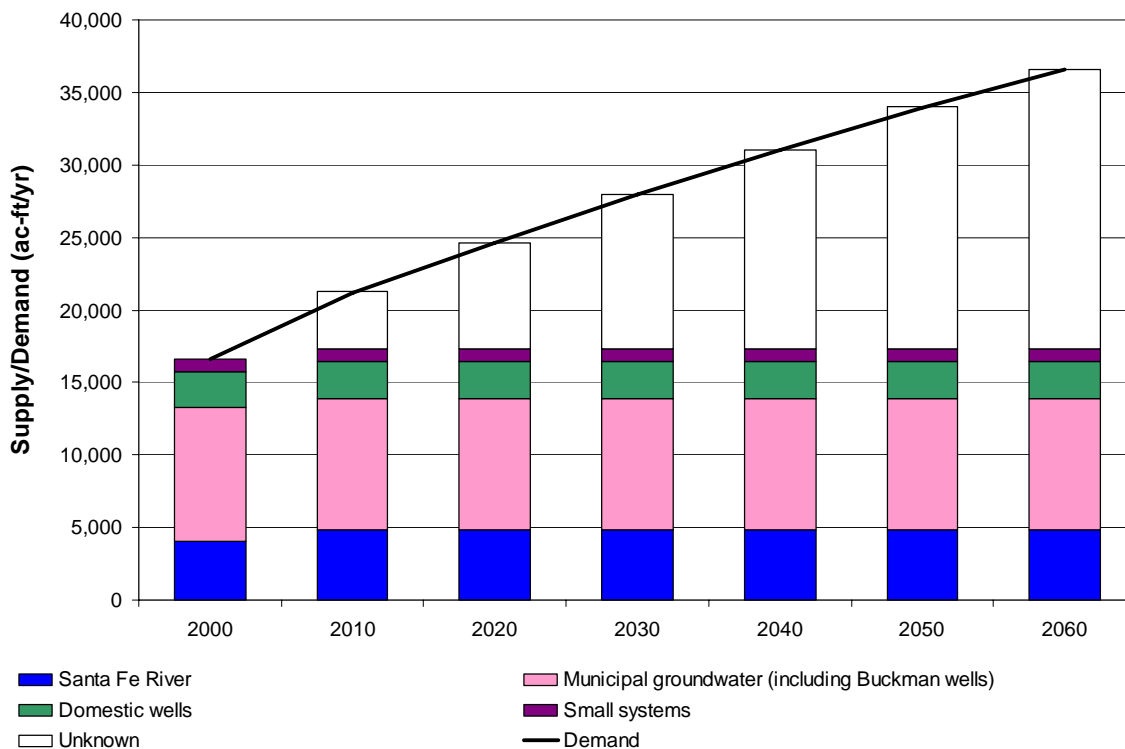
Note: Water supply and demand values represent diversions (not consumption) during average conditions.

JEMEZ Y SANGRE REGIONAL WATER PLAN UPDATE Projected Municipal and Domestic Demand Los Alamos Subregion

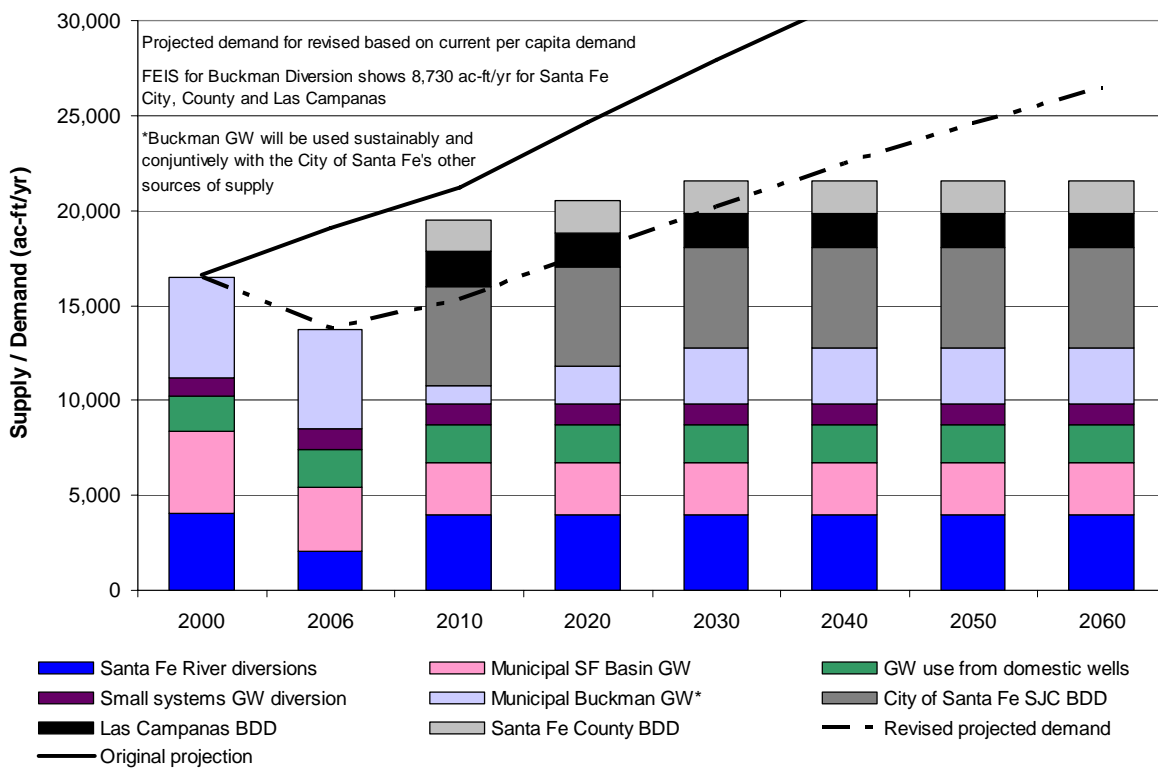


Figure 10

Original 2003



Revised 2007



Notes: Water supply and demand values represent diversions (not consumption) during average conditions.
 BDD = Buckman Direct Diversion

JEMEZ Y SANGRE REGIONAL WATER PLAN UPDATE Projected Municipal and Domestic Demand Santa Fe Subregion

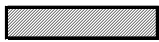
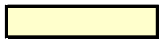


Figure 11



Percent	10	20	30	40	50	60	70	80	90	100
Acre-Feet	1,990	3,980	5,970	7,960	9,950	11,940	13,930	15,920	17,910	19,900
Conservation	Reduce NEW indoor and outside demand by 10%	Reduce NEW indoor and outside demand by 25%	Reduce ALL outside use and NEW inside use by 25%	Reduce ALL outside use by 50% and all NEW inside use by 25%	Reduce ALL outside use by 70% and all NEW inside use by 25%	Further demand reduction may be possible through advanced technologies or more restrictive policies				
Growth Management	Reduce projected growth rate by 10%	Reduce projected growth rate by 20%	Reduce projected growth rate by 30%	Reduce projected growth rate by 40%	Reduce projected growth rate by 50%					
Transfer Agricultural Water Rights Below Otowi to Municipal Use	950 acres of MRGCD (1.6% of agric. land)	1,900 acres of MRGCD (3% of agric. land)	2,800 acres of MRGCD (5% of agric. land)	3,800 acres of MRGCD (7% of agric. land)	4,700 acres of MRGCD (8% of agric. land)	5,700 acres of MRGCD (10% of agric. land)	6,600 acres of MRGCD (11% of agric. land)	7,600 acres of MRGCD (13% of agric. land)	8,500 acres of MRGCD (15% of agric. land)	9,500 acres of MRGCD (16% of agric. land)
Transfer Agricultural Water Rights Above Otowi to Municipal Use	1,500 acres (7.7% of JyS agric. land)	3,000 acres (15% of JyS agric. land)	4,600 acres (23% of JyS agric. land)	6,100 acres (31% of JyS agric. land)	7,700 acres (38% of JyS agric. land)					
Allow More Domestic Wells	8,000 more households on domestic wells									
Utilize San Juan-Chama Water	Return flow credit on City of Santa Fe SJC water	Return flow credit on City of Santa Fe SJC water	Lease Jicarilla Apache SJC water	Lease Jicarilla Apache SJC water	Return flow credit on Jicarilla Apache SJC water					

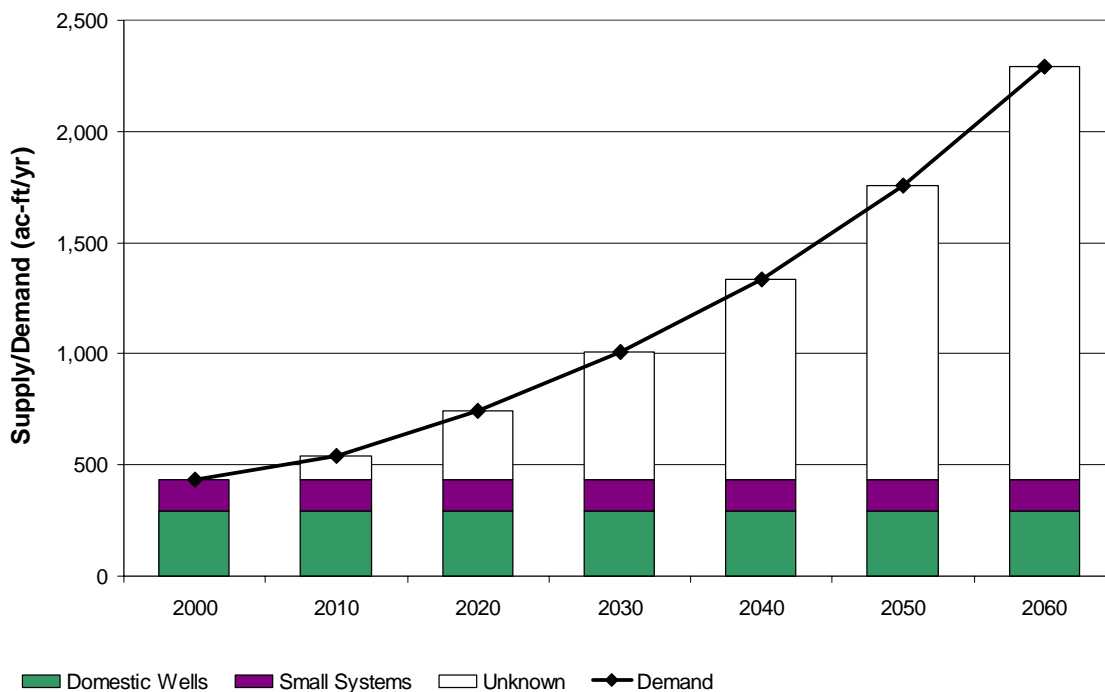
Select ten blocks, starting on the left, from a combination of alternatives to indicate the desired method of reducing the projected 2060 gap between supply and demand. (Selection of any one block requires selection of all blocks to the left for that alternative.)

100% = 19,900 acre-feet

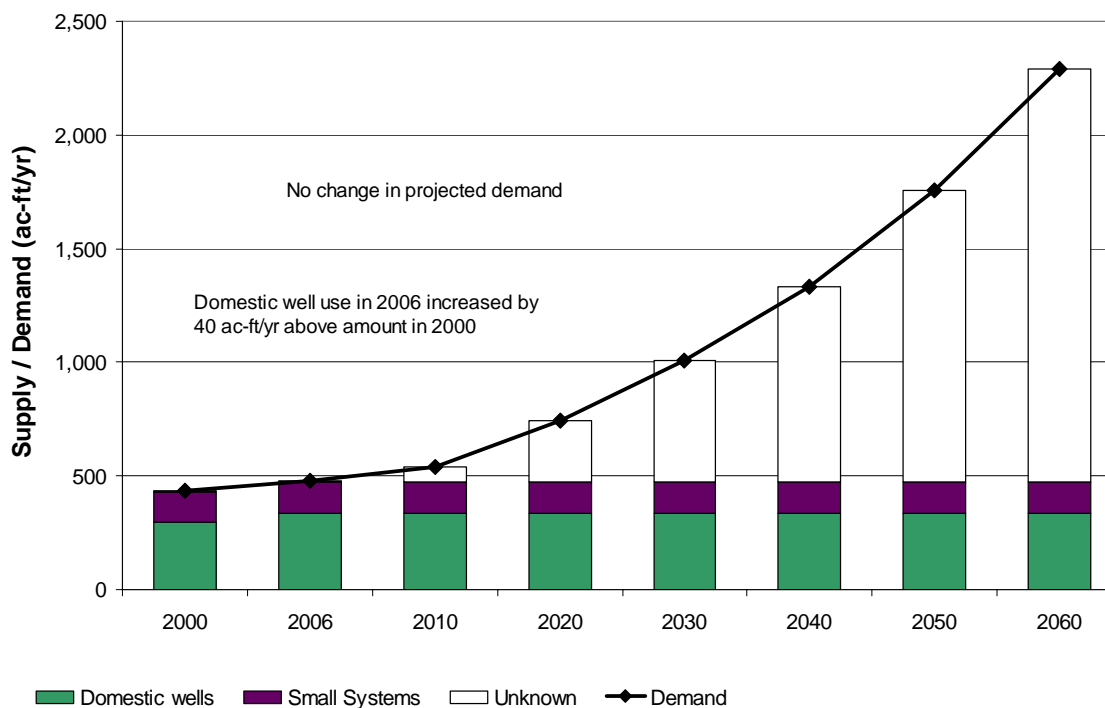
-  = No further reduction in supply/demand gap is viable with this alternative
-  = Uncertain due to the requirement to modify compact accounting
-  = Uncertain due to Area of Origin concerns
-  = Actions being taken by sub-region to reduce gap between supply and demand



Original 2003



Revised 2007



Note: Water supply and demand values represent diversions (not consumption) during average conditions.

JEMEZ Y SANGRE REGIONAL WATER PLAN UPDATE Projected Municipal and Domestic Demand South Galisteo Creek Subregion



Figure 13

Percent	10	20	30	40	50	60	70	80	90	100
Acre-Feet	186	372	558	744	930	1,116	1,302	1,488	1,674	1,860
Conservation	Reduce NEW indoor and outside demand by 10%	Reduce NEW indoor and outside demand by 25%	Reduce ALL outside use and NEW inside use by 25%	Reduce ALL outside use by 50% and all NEW inside use by 25%	Reduce ALL outside use by 70% and all NEW inside use by 25%					
Growth Management	Reduce projected growth rate by 10%	Reduce projected growth rate by 20%	Reduce projected growth rate by 30%	Reduce projected growth rate by 40%	Reduce projected growth rate by 50%					
Transfer Agricultural Water Rights Below Otowi to Municipal Use	Extend lines to the subregion *	Extend lines to the subregion *	Extend lines to the subregion *	Extend lines to the subregion *	Extend lines to the subregion *	Extend lines to the subregion *	Extend lines to the subregion *	Extend lines to the subregion *	Extend lines to the subregion *	Extend lines to the subregion *
Transfer Agricultural Water Rights Above Otowi to Municipal Use										
Allow More Domestic Wells	744 More domestic wells	1,484 More domestic wells								
Utilize San Juan-Chama Water										

Select ten blocks, starting on the left, from a combination of alternatives to indicate the desired method of reducing the projected 2060 gap between supply and demand. (Selection of any one block requires selection of all blocks to the left in that alternative.)

100% = 1,860 acre-feet

- = No further reduction in supply/demand gap is viable with this alternative
- = Actions being taken by sub-region to reduce gap between supply and demand

* Santa Fe County considering extending lines to the subregion





Table 1. Summary of Actions Taken Regarding Jemez y Sangre Regional Water Plan Update
Page 1 of 10

Alternative	Instigator / Action Taken
<i>Category I: Protect Existing Supplies</i>	
Forest restoration project	<ul style="list-style-type: none"> • USFS:13 restorations projects funded by CFRP, totaling \$4,500,000 (see Appendix C for summary) • NMED Section 319: 12 funded watershed restoration projects in JyS (Appendix C) • City of Santa Fe has thinned more than 4,700 acres. • Los Alamos County, Pajarito Watershed Association • Pojoaque Pueblo • Santa Clara Pueblo • Santa Fe County, Santa Fe Watershed Association, Forest Guardians, State Land Office • San Ildefonso Pueblo • Ohkay Owingeh • Tesuque Pueblo
Develop storm water management ordinance	<ul style="list-style-type: none"> • Santa Fe County (as part of Subdivision Ordinance) • City of Española • City of Santa Fe • New Mexico State Land Office • Los Alamos County • Cerro Gordo Ditch Association • Hyde Park Water Users Association
Cloud seeding project	<ul style="list-style-type: none"> • Research and workshops, need funding for pilot project
Develop well field management plan	<ul style="list-style-type: none"> • OSE not developing critical management area (CMA) in JyS region. • City of Santa Fe has well field management plan. • Santa Fe County working on model to guide plan. • Pojoaque Pueblo rotates use of wells. • Eldorado Area Water and Sanitation District (WSD) is developing a plan. • City of Española • Solacito Mutual Domestic Water Association developed wellhead protection project. • Hyde Park Water Users Association (WUA). • Los Alamos County will consider addressing plume migration



Table 1. Summary of Actions Taken Regarding Jemez y Sangre Regional Water Plan Update
Page 2 of 10

Alternative	Instigator / Action Taken
<i>Category I: Protect Existing Supplies (cont.)</i>	
Propose conjunctive use of surface and groundwater supplies	<ul style="list-style-type: none"> • City of Santa Fe preferably uses surface water when it is available. • La Puebla Community Well Association • Santa Fe County working on plan (Buckman Direct Diversion [BDD] combined with wells). • Eldorado Area WSD would like to work with Santa Fe County to acquire surface water. • Los Alamos County has Los Alamos Reservoir surface water rights that have not been used after fire damage. The reservoir is now being rebuilt for nonpotable uses. With San Juan-Chama (SJC) diversion, the County will have additional options. • Parties to Aamodt Settlement Agreement will have options for conjunctive use once a diversion from the Rio Grande is built.
Expand treatment facilities to remove trace constituents (i.e., arsenic)	<ul style="list-style-type: none"> • City of Española developed arsenic abatement plan to blend water from wells to reduce arsenic levels. • City of Santa Fe has conducted wellhead treatment at several wells and applied for a 3-year extension for compliance with the new arsenic standard to explore arsenic treatment options.
Restrict drilling of domestic wells within your jurisdiction	<ul style="list-style-type: none"> • City of Española • City of Santa Fe • County of Santa Fe • La Vista Homeowners Association • Hyde Park WUA • OSE has new domestic well regulations that reduce allowed water use.
Develop/explore methods for instream flow	<ul style="list-style-type: none"> • Santa Cruz • Pojoaque Pueblo • Santa Fe County is exploring the potential for Valle Vista treatment plant to discharge to Arroyo Hondo and revitalize La Cienega. • City of Santa Fe is conducting a tree-ring study to analyze longer historical period of streamflow. • City of Santa Fe is exploring possibilities of releasing reservoir water to help restore the Santa Fe River.



Table 1. Summary of Actions Taken Regarding Jemez y Sangre Regional Water Plan Update
Page 3 of 10

Alternative	Instigator / Action Taken
<i>Category I: Protect Existing Supplies (cont.)</i>	
Develop/explore methods for instream flow (cont.)	<ul style="list-style-type: none"> • NMED Clean Water Act Section 319 Watershed Restoration Action Strategies (WRASs) (see Appendix C for summary of WRASs)
Wastewater treatment plant construction, repairs, or upgrades	<ul style="list-style-type: none"> • PL 108-354 (entitled Chimayo Water Supply System and Española Filtration Facility Act) requires feasibility study of regional system. • Pojoaque Pueblo upgrading wastewater treatment plant (WWTP) from lagoons to Class A treatment. • Española upgrading WWTP from 0.96 millions gallons per day (mgd) to 2.2 mgd. • Los Alamos County has almost completed upgrade of WWTP (1.4-mgd design flow). • El Vadito de los Cerrillos MDWCA • Rio Arriba County Commission is looking into a regional wastewater treatment plant. • Santa Fe County received \$850,000 grant to address wastewater treatment in Sombrillo area.
Acéquia bylaws to prevent water transfers out of acéquia	<ul style="list-style-type: none"> • Santa Cruz Irrigation District has completed bylaws for 14 acéquias in the district. • La Acéquia de la Canada Ancha passed bylaws. • Acéquia Madre • Rio Arriba County has hired a liaison to assist acéquias in developing bylaws. • Cerro Gordo Ditch Association • New Mexico Acéquia Association
<i>Category II: Improve System Efficiency</i>	
Wastewater reuse project	<ul style="list-style-type: none"> • City of Santa Fe has reused effluent since the 1940s and will continue to do so. • Pojoaque Pueblo reuses wastewater and will use more after new plant is constructed. • Santa Fe County • Los Alamos County • Tesuque Pueblo uses effluent from casino to irrigate landscaping.
Project to replace septic tanks and provide for regional WWTP	<ul style="list-style-type: none"> • Santa Clara Pueblo and City of Española exploring possibilities for collaborating on a WWTP. • Santa Fe County looking into regional WWTP.
Line irrigation ditches/acéquias	<ul style="list-style-type: none"> • Santa Clara has lined all ditches. • San Ildefonso has lined all ditches. • Cerro Gordo Ditch Association



Table 1. Summary of Actions Taken Regarding Jemez y Sangre Regional Water Plan Update
Page 4 of 10

Alternative	Instigator / Action Taken
<i>Category II: Improve System Efficiency (cont.)</i>	
Develop a regional water system authority	<ul style="list-style-type: none"> • Eldorado Area WSD interested in partnering with area communities (Lamy, Canoncito, etc.). • BDD Project Board is a regional authority for the one source of supply as of August 2006. • Los Alamos County Water Utility is a regional water system for Los Alamos, White Rock, Bandelier, and Los Alamos National Laboratory (LANL). • Aamodt parties will create a water board to operate a surface diversion from Rio Grande.
Aquifer storage and recovery project	<ul style="list-style-type: none"> • Santa Fe County may consider using treated effluent and surface water.
Optimize reservoir management (sediment removal, evaporative loss reduction)	<ul style="list-style-type: none"> • Project funded to restore Santa Cruz Reservoir, including raising dam and dredging. • Santa Clara Pueblo removed sediment from ponds that were inundated after the Cerro Grande fire. • City of Santa Fe will conduct bathymetry study of McClure and Nichols, may seek carryover storage agreement in Heron Reservoir. • El Vadito de los Cerrillos MDWA has repaired Cerrillos Reservoir dam.
Changes to infrastructure	<ul style="list-style-type: none"> • Santa Clara Pueblo is replacing old infrastructure. • Pojoaque Pueblo is improving infrastructure, adding booster stations, pipelines, and storage tanks. • Eldorado Area WSD is developing system model and will upgrade accordingly. • Solacito completed new storage tank project, needs more repairs and upgrades. • City of Santa Fe water treatment plant capacity is now 8 mgd; storage capacity has also been increased. • Los Alamos County is replacing 50-year-old pipes. • El Vadito de los Cerrillos MDWA has installed a new water line extension and 100,000-gallon tank. • Parties to Aamodt will make changes to infrastructure associated with surface diversion and wells. • Galisteo MDWCA replacing storage tanks and pipelines.



Table 1. Summary of Actions Taken Regarding Jemez y Sangre Regional Water Plan Update
Page 5 of 10

Alternative	Instigator / Action Taken
<i>Category II: Improve System Efficiency (cont.)</i>	
Groundwater modeling studies	<ul style="list-style-type: none"> • Santa Clara Pueblo (groundwater model for Superfund site) • Santa Fe County • City of Santa Fe • Los Alamos/LANL • Eldorado Area WSD
Water audits	<ul style="list-style-type: none"> • Santa Fe County • La Puebla Community Well Association • City of Santa Fe (looking at non-revenue water)
Leak detection and repair	<ul style="list-style-type: none"> • Eldorado Area WSD has surveyed 40% of old lines as of April 2007. • City of Santa Fe • La Puebla Community Well Association • Los Alamos County conducts leak detection and repair program every 5 years. • El Vadito de los Cerrillos MDWA
Aquifer injection	<ul style="list-style-type: none"> • City of Santa Fe potential option for offsetting impacts of Buckman well pumping on La Cienega. • Rancho Viejo conducted injection tests to explore potential of injecting water to offset impacts of pumping.
Drill replacement wells	<ul style="list-style-type: none"> • Pojoaque Pueblo will add wells for redundancy. • City of Española will drill four new wells if funded. • Hyde Park WUA • Santa Fe County • City of Santa Fe • Chupadero Water-Sewage Corp. • Los Alamos County (if SJC direct diversion is delayed or potential contamination is an issue) • El Vadito de los Cerrillos MDWCA drilled supplemental well in 2003. • Madrid Water Cooperative
Transfer indoor water use associated with domestic wells to utility system	<ul style="list-style-type: none"> • Rio Arriba County actively involved in developing legislation to assist mutual domestics, such as SB 901, which provides for transfers of the inside portion of domestic wells into community systems (did not pass in 2007).



Table 1. Summary of Actions Taken Regarding Jemez y Sangre Regional Water Plan Update
Page 6 of 10

Alternative	Instigator / Action Taken
<i>Category III: Mitigate Drought</i>	
Water banking/temporary leases of water rights	<ul style="list-style-type: none"> • Santa Cruz Irrigation District • Acéquia Madre • El Vadito de los Cerrillos
Emergency conservation ordinance to restrict water use	<ul style="list-style-type: none"> • Pojoaque Pueblo sends out letters if water supply is insufficient. • Santa Clara gives instructions to tribal members. • City of Santa Fe has an ordinance. • Eldorado Area WSD has a policy. • City of Española has an ordinance. • La Vista Homeowners' Association • Santa Fe County • Los Alamos County • El Vadito de los Cerrillos MDWA • San Ildefonso Pueblo
Shortage sharing agreements (acéquias)	<ul style="list-style-type: none"> • Santa Cruz Irrigation District has a sharing agreement (Hollaman Decree). • La Puebla Community Well Association • Santa Clara Pueblo has an informal agreement with non-tribal members. • City of Santa Fe has a delivery obligation with Santa Fe County; i.e., in the event of a BDD shortage, the City will deliver water from the Buckman wells.
<i>Category IV: Reduce Demand</i>	
Manage growth and land use	<ul style="list-style-type: none"> • Santa Fe County has minimum lot size, requirement to show water availability for 100 years. • City of Santa Fe requires that new demand for new growth be offset either with toilet retrofits or purchase of water rights. • Rio Arriba manages growth for open space, but doesn't restrict growth. • San Marcos maintains minimum lot size. • El Vadito de los Cerrillos MDWA • Madrid Water Cooperative has moratorium on new water system connections.



Table 1. Summary of Actions Taken Regarding Jemez y Sangre Regional Water Plan Update
Page 7 of 10

Alternative	Instigator / Action Taken
<i>Category IV: Reduce Demand (cont.)</i>	
Water conservation focused on outdoor use	<ul style="list-style-type: none"> • Eldorado Area WSD (conservation plan) • City of Española • San Marcos • Solacito MDWCA • Hyde Park WUA • Santa Fe County • City of Santa Fe conservation plan addresses fugitive water, requires swimming pool covers, identifies acceptable vegetation; drought stages triggered by reservoir levels and demand. • Los Alamos County
Water conservation focused on indoor use for new construction	<ul style="list-style-type: none"> • El Vadito de los Cerrillos (proposed) • San Ildefonso Pueblo restricts use of potable water for use on gardens or car washing.
Water conservation focused on indoor use through retrofits	<ul style="list-style-type: none"> • Eldorado Area WSD has conservation plan. • City of Española • Solacito MDWCA • Hyde Park WUA • Santa Fe County (including hot water recirculation ordinance) • City of Santa Fe (growth allowed through toilet retrofits) • El Vadito de los Cerrillos (proposed)
Water conservation focused on indoor use through retrofits	<ul style="list-style-type: none"> • Hyde Park WUA • City of Santa Fe
Water harvesting (rooftop)	<ul style="list-style-type: none"> • Santa Fe County (new construction >2,500-ft² roof area) • San Marcos, Hyde Park WUA • City of Santa Fe has proposal.
Rate structure incentive for water conservation	<ul style="list-style-type: none"> • Eldorado Area WSD has proposed rate structure to encourage conservation. • City of Española • City of Santa Fe (revised in Jan 2007) • La Vista Home Owners Association



Table 1. Summary of Actions Taken Regarding Jemez y Sangre Regional Water Plan Update
Page 8 of 10

Alternative	Instigator / Action Taken
<i>Category IV: Reduce Demand (cont.)</i>	
Rate structure incentive for water conservation (cont.)	<ul style="list-style-type: none"> • Hyde Park WUA • Santa Fe County has inclining rate structure. • Los Alamos County (proposed) • El Vadito de los Cerrillos increased rates in 2003. • Pueblos do not charge fee for water use by members of tribe.
Gray water harvesting	<ul style="list-style-type: none"> • Hyde Park WUA • City of Santa Fe
Rebates or other incentives to reduce demand	<ul style="list-style-type: none"> • City of Santa Fe
Wastewater reuse	<ul style="list-style-type: none"> • Santa Fe County • City of Santa Fe • Pojoaque Pueblo to increase use of wastewater effluent on golf course. • Los Alamos County needs more storage.
<i>Category V: Increase Water Supply</i>	
Use San Juan-Chama water	<ul style="list-style-type: none"> • City of Española uses SJC water for offsets on pumping; options for surface diversion being evaluated. • City of Santa Fe: BDD, waiting on Environmental Impact Statement (EIS) Record of Decision (ROD); also leased Jicarilla Apache Nation SJC water, contract for SJC with U.S. Bureau of Reclamation is now permanent. • Santa Fe County working toward direct diversion of 375 acre-feet per year of SJC water. • Los Alamos County to begin EIS in 2008 for diversion of SJC water.
Acquire and transfer groundwater rights to increase water supply.	<ul style="list-style-type: none"> • City of Española • Solacito MDWCA • Chupadero Water-Sewage Corp. • New Mexico State Land Office • County of Santa Fe



Table 1. Summary of Actions Taken Regarding Jemez y Sangre Regional Water Plan Update
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Alternative	Instigator / Action Taken
<i>Category V: Increase Water Supply (cont.)</i>	
Acquire and transfer surface water rights to increase water supply.	<ul style="list-style-type: none"> • Rio Arriba County considering acquisition. • Aamodt Settlement will require water rights. • Eldorado Area WSD interested. • City of Española • Chupadero Water-Sewage Corp. • New Mexico State Land Office • County of Santa Fe (from Socorro, Peña Blanca) • City of Santa Fe • Water Right Transfer Ordinance (WRTO) 2005
Transfer water rights across the Otowi Gage	<ul style="list-style-type: none"> • Currently not allowed by OSE.
Use new domestic wells (72-12-1) for future growth	<ul style="list-style-type: none"> • Santa Fe County trying to discourage the number of domestic wells by having large minimum lot size.
Drill additional municipal wells for future growth	<ul style="list-style-type: none"> • Santa Clara Pueblo • Pojoaque Pueblo • Eldorado Area WSD • Chimayo • Hyde Park WUA • Santa Fe County • City of Santa Fe drilled five new Buckman wells. • El Vadito de los Cerrillos drilled supplemental well for emergency use; seeking permanent use. • Galisteo MDWCA drilled new well.
Reappropriate water above Otowi Gage up to 1929 conditions of the Rio Grande Compact	<ul style="list-style-type: none"> • Santa Fe County issued Notice of Intent, may pursue if OSE indicates that water is available.
Appropriate flood flows during years when excess is available on the Rio Grande	<ul style="list-style-type: none"> • None reported
Build new reservoirs	<ul style="list-style-type: none"> • None reported



Table 1. Summary of Actions Taken Regarding Jemez y Sangre Regional Water Plan Update
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Alternative	Instigator / Action Taken
<i>Category V: Increase Water Supply (cont.)</i>	
Brackish water desalinization	<ul style="list-style-type: none">• Santa Fe County has considered proposals from Estancia Basin.• Small businesses working with LANL on deep well drilling project.• El Vadito de los Cerrillos MDWA (proposed)
Increase water supply by obtaining return flow credits	<ul style="list-style-type: none">• Santa Clara Pueblo• Pojoaque Pueblo will consider.• City of Española• City of Santa Fe• Santa Fe County
Interbasin transfer	<ul style="list-style-type: none">• None currently proposed aside from SJC diversion



Table 2. Water Supply Infrastructure Projects in the Jemez y Sangre Water Planning Region

Project	Parties Involved	Planned Project Capacity	Water Source	Implementation Status	Expected Completion Date
Direct diversion from Rio Grande	City of Española	1,000 ac-ft/yr ^a	San Juan Chama project water ^a	Feasibility study will be completed summer 2007 ^b	No date specified ^b
San Juan-Chama diversion project through horizontal wells	Los Alamos County	1,200 ac-ft/yr ^c	San Juan Chama project water ^c	Feasibility study complete; development of environmental impact statement to begin in 2008	Anticipate construction completion in 2015 or 2017 ^c
Buckman Direct Diversion Project	City of Santa Fe, Santa Fe County, Las Campanas Limited Partnership ^d	8,730 ac-ft/yr ^d (15 million gallons per day ^e)	San Juan Chama project and native Rio Grande water ^d	Final environmental impact statement complete; ^d design/build RFP issued in Spring 2007 ^e	Will be brought online in 2010 ^e
Revised Aamodt Settlement Agreement	Pueblos of Nambé, Pojoaque, Tesuque, and San Ildefonso ^f	2,500 ac-ft/yr ^f	Native Rio Grande water rights ^f	Anticipate finalizing agreement before December 15, 2012 ^f	2020
	Non-Pueblo water users in the Nambé, Pojoaque, and Tesuque stream systems	1,500 ac-ft/yr ^f	Native Rio Grande water rights ^f		

ac-ft/yr = Acre-feet per year

Sources:

^a USBR, 2007.

^b Interview with City of Española, April 18, 2007. See completed survey in Appendix A.

^c DBS&A, 2006.

^d U.S. BLM. 2006.

^e Borchert, 2007.

^f NM OSE, 2007.



Table 3. Jemez y Sangre Region Water Planning Documents
Page 1 of 2

Sub-basin	Citation
Jemez y Sangre water planning region	Duke Engineering & Services (Duke). 2001. <i>Water supply study, Jemez y Sangre Water Planning Region, New Mexico</i> . Prepared for the Jemez y Sangre Water Planning Council. January 2001.
Multiple	INTERA Incorporated. 2006. <i>Final report on data and model evaluation for the Santa Fe County regional aquifer evaluation</i> . Prepared for Santa Fe County. June 10, 2006.
	USBR. 2006. <i>Environmental assessment: San Juan–Chama water contract amendments with City of Santa Fe, County of Santa Fe, County of Los Alamos, Town of Taos, Village of Taos Ski Valley, Village of Los Lunas, and City of Española</i> . May 19, 2006. Available at < http://www.usbr.gov/uc/albuq/envdocs/ea/sanjuanchama/index.html >.
	Consulting Professionals, Inc. (CPI). 1974. <i>Santa Fe County current water use and availability - Phase III - Santa Fe County Water Study, November 1974</i> .
	Consulting Professionals, Inc. (CPI). 1975. <i>Water use and availability, March 1975</i> .
	Wilson, L. 1975. <i>Water availability and land-use policy in Santa Fe County</i> . Prepared for Santa Fe County, Santa Fe, New Mexico. August 1975.
	Wilson, Lee. 1978. <i>Santa Fe County water plan, Santa Fe County, New Mexico</i> .
	Woodward-Clyde Consultants (WCC). 1980. <i>Planning study - Santa Fe water resources for Public Service Co.</i>
	Santa Fe Basin Water Users Association. 1988. Report to the City Council and Staff-County Commission and Staff Area Planners.
	Browne, Bortz & Coddington, Inc. (BBC). 1992. <i>South Santa Fe County water resource assessment</i> . Submitted to New Mexico Interstate Stream Commission, Santa Fe County, Santa Fe Metropolitan Water Board. August 1992.
	Daniel B. Stephens & Associates, Inc. (DBS&A). 1994. <i>Santa Fe County water resource inventory</i> . Prepared for Santa Fe County Land Use and Planning Department. July 1994.
Los Alamos	U.S. Department of Energy (DOE). 1999. <i>Site-wide environmental impact statement for continued operation of the Los Alamos National Laboratory</i> . U.S. DOE Albuquerque Operations Office, Albuquerque, New Mexico. DOE/EIS - 0238. January 1999.
	Boyle Engineering Corporation. 2004. <i>County of Los Alamos San Juan/Chama Project water utilization study, Feasibility study</i> . January 2004.
	Fruth, William H. 2004. <i>Creating a sustainable Los Alamos</i> . Prepared for the Los Alamos, New Mexico First Town Hall, August 19, 20, and 21, 2004. POLICOM Corporation.
	Daniel B. Stephens & Associates, Inc. (DBS&A). 2006. <i>Long-range water supply plan, Los Alamos County</i> . Prepared for Los Alamos County Water Utility, Los Alamos, New Mexico. August 2006.



Table 3. Jemez y Sangre Region Water Planning Documents
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Sub-basin	Citation
Pojoaque-Nambé	ASCG, Inc. 2005. <i>Pojoaque regional wastewater facility planning study, Phase one report</i> . Prepared for the Pueblo of Pojoaque. June 2005.
	ASCG, Inc. Undated. <i>Pojoaque regional wastewater study – Phase II</i> . Prepared for the Pueblo of Pojoaque [circa November 2005].
	Pojoaque Valley Planning Committee and the Santa Fe County Planning Division. 2007. <i>Pojoaque Valley community strategic plan</i> . Review draft. March 2007.
Pojoaque-Nambé and Tesuque	U.S. Bureau of Reclamation (USBR). 2003. <i>Aamodt feasibility study report</i> . Prepared for the 108th Congress of the United States under the direction of the Aamodt Technical Committee and with assistance and cooperation from the Aamodt Settlement Negotiation Team. September 2003.
Caja del Rio	Santa Fe National Forest and Taos Field Office of the BLM in Santa Fe County, 2007. <i>Final Environmental Impact Statement for the Buckman Water Diversion Project</i> < http://www.blm.gov/nm/st/en/fo/Taos_Field_Office/buckman_feis.html >.
Santa Fe River	Harza Engineering Co., Browne, Bortz and Coddington Inc., and J. Shomaker, Inc. 1988. <i>Long-range water planning study for the Santa Fe Area - Phase I</i> .
	Harza Engineering Co., Browne, Bortz and Coddington Inc., and J. Shomaker, Inc. 1989. <i>Long-range planning study for the Santa Fe Area - Phase II report</i> .
	Camp Dresser and McKee, Inc. (CDM). 1998. <i>City of Santa Fe treated effluent management plan</i> . Prepared in association with Lee Wilson and Associates. May 1998.
	Camp Dresser & McKee and Sangre de Cristo Water Division Staff. 2001. <i>Water supply analysis for the City of Santa Fe</i> .
	Sangre de Cristo Water Division Staff. 2001. <i>Forty-year water plan, City of Santa Fe in support of the application to permit the Northwest Well</i> . February 2001.
	Lewis, A.L. 2003. <i>City of Santa Fe water supply option charts</i> . Prepared for the Santa Fe Water Division. September 4, 2003.
	City of Santa Fe. 2005. <i>Long-range water supply plan: Assessing the needs, values, and water supply options</i> . Fact sheet. July 2005.
	City of Santa Fe. 2006. <i>Long-range water supply plan: Developing strategies to meet our future needs</i> . Fact sheet. January 2006.
North Galisteo Creek	Eldorado Area Water and Sanitation District (EAWSD). 2006. <i>Eldorado Area Water and Sanitation District water alert management plan summary</i> . Updated July 20, 2006. < http://www.eldoradowaterdistrict.com/fair.htm >.
South Galisteo Creek	Earth Works Institute. 2005. <i>Watershed Restoration Action Strategy for the Galisteo Creek Watershed: An adaptive management plan for ecological health of the Galisteo Watershed</i> . July 1, 2005.



Table 4. Historical Municipal Groundwater Diversions
Page 1 of 2

Year	Annual Production (acre-feet per year)					
	Santa Fe City Wells	Buckman	Los Alamos	Española	Eldorado	Total
1947	0	---	451	---	---	451
1948	0	---	810	---	---	810
1949	0	---	930	---	---	930
1950	121	---	1,688	---	---	1,809
1951	2,010	---	2,366	---	---	4,376
1952	699	---	2,449	---	---	3,148
1953	594	---	2,504	---	---	3,098
1954	1,618	---	2,314	---	---	3,932
1955	1,649	---	2,397	---	---	4,046
1956	2,594	---	2,891	---	---	5,485
1957	993	---	2,228	---	---	3,221
1958	0	---	2,354	---	---	2,354
1959	1,255	---	2,673	---	---	3,928
1960	550	---	3,262	---	---	3,812
1961	488	---	3,588	---	---	4,076
1962	601	---	3,603	---	---	4,204
1963	734	---	3,661	---	---	4,395
1964	3,154	---	3,962	---	---	7,116
1965	199	---	3,428	---	---	3,627
1966	185	---	3,655	---	---	3,840
1967	3,257	---	4,048	335	---	7,640
1968	1,213	---	4,297	374	---	5,884
1969	1,338	---	4,100	339	---	5,777
1970	4,315	---	4,229	328	---	8,872
1971	4,055	---	4,760	225	---	9,040
1972	3,739	849	4,628	393	15	9,625
1973	962	2,325	4,803	522	11	8,623
1974	2,202	3,288	4,984	664	11	11,149
1975	450	2,372	4,711	621	13	8,167
1976	1,801	2,700	5,193	758	14	10,465
1977	2,009	3,100	4,517	510	23	10,160
1978	810	1,609	4,413	627	26	7,485
1979	1,196	511	4,318	657	53	6,735
1980	1,565	507	4,803	733	46	7,654
1981	2,607	2,486	4,616	760	41	10,510

Sources: JyS 2003 Plan (DBS&A and Lewis, 2003) and records provided by water suppliers



Table 4. Historical Municipal Groundwater Diversions
Page 2 of 2

Year	Annual Production (acre-feet per year)					
	Santa Fe City Wells	Buckman	Los Alamos	Española	Eldorado	Total
1982	2,192	1,274	4,640	630	57	8,793
1983	2,772	16	4,484	547	82	7,901
1984	2,868	312	4,800	881	74	8,935
1985	2,227	1,130	4,864	914	590	9,726
1986	2,095	1,548	4,591	667	118	9,020
1987	2,800	1,442	4,889	603	150	9,884
1988	2,909	2,470	4,478	1,149	148	11,154
1989	3,192	4,551	5,180	727	181	13,831
1990	2,984	3,824	5,039	1,153	197	13,198
1991	2,427	3,186	4,444	1,045	230	11,332
1992	2,248	4,752	4,689	897	349	12,935
1993	2,027	5,610	4,484	1,275	395	13,791
1994	2,054	4,982	4,379	1,264	466	13,145
1995	2,026	5,891	4,161	1,337	503	13,918
1996	2,578	5,656	4,195	1,302	406	14,138
1997	1,241	4,716	3,950	1,094	460	11,461
1998	2,271	5,216	4,011	1,147 ^a	519	13,164
1999	2,802	5,279	4,265	1,147 ^a	502	13,995
2000	3,828	5,081	4,862	1,147 ^a	533	15,451
2001	2,755	4,744	4,395	1,147 ^a	571	13,612
2002	3,702	5,837	4,780	1,147 ^a	539	16,004
2003	3,131	5,825	4,780	1,147 ^a	583	15,467
2004	1,787	5,737	4,242	1,096	593	13,455
2005	1,730	3,784	4,276	1,083	571	12,138
2006	2,826	5,197	4,151	969	533	13,676

Sources: JyS 2003 Plan (DBS&A and Lewis, 2003) and records provided by water suppliers

^a No data available for City of Española for 1998-2003; value represents average of diversions in 1995 to 1997 and 2004 to 2006.



**Table 5. Summary of Subdivision Reports Submitted for Review to the
OSE Water Use and Conservation Bureau Since 2000 (Keller, 2007)**

Potential Water Supply	Number of Sub-divisions	Total Number of Parcels	OSE Opinion on Subdivision Number of Parcels		
			Positive	Negative	Deferral
Santa Fe County Water Utility	28	3,102	1	1,897	1,204
City of Santa Fe Water Utility	39	4,728	15	1,642	3,071
Eldorado Area WSD	8	991	1	985	5
Individual domestic wells	114	651	325	187	139
Other small systems	17	320	21	80	219
Total	206	9,792	363	4,791	4,638



Table 6. Comparison of Projected Population Growth Rates to Census-Measured Growth Rates, 2000-2006

Subregion	Annual Growth Rate (%)	
	County Census ^a 2000 to 2006	Most likely ^b 2000 to 2010
Velarde	-0.10	1.252
Santa Clara	-0.10	1.24
Santa Cruz	-0.10	1.15
Pojoaque- Nambé	1.68	1.85
Tesuque	1.68	3.06
Los Alamos	0.62	0.375
Caja del Rio	1.68	2.23
Santa Fe	1.13	1.71
North Galisteo Creek	1.68	2.23
South Galisteo Creek	1.68	2.175

^a Source: U.S. Census Bureau, 2007b

^b Mostly like population projection identified in the 2003 *Jemez y Sangre Regional Water Plan* (DBS&A et al., 2003, BBER, 2000)



Table 7. Water Supplied for Residential Use in 2000 by Selected Mutual Domestic Water Suppliers

User	Population Served by Water System	Per Capita Residential Use		Groundwater Diversions (ac-ft/y)
		ac-ft/yr	gpd	
<i>Velarde</i>				
Truchas MDWCA	650	0.05	47	33.9
Velarde MDWCA	500	0.14	121	67.7
Alcalde MDWCA	377	0.12	109	46.2
Chamita MDWCA	700	0.10	88	69.1
Total Velarde	2,227	0.10	87.0	216.9
<i>Santa Cruz</i>				
Chimayo MDWCA	150	0.12	111	18.7
Santa Cruz MDWCA	280	0.05	47	14.8
Cordova MDWCA	240	0.07	66	17.8
La Puebla MDWCA	300	0.06	56	18.9
Solacito Homeowners Association	27	0.17	153	4.6
Total Santa Cruz	997	0.08	67.0	74.8
<i>Tesuque</i>				
Rio En Medio MDWCA	120	0.05	45	6.0
Tesuque MDWCA	370	0.07	60	24.9
Vista Redonda MDWCA	125	0.19	167	23.4
Total Tesuque	615	0.09	78.8	54.3
<i>Santa Fe</i>				
Valle Vista Subdivision	410	0.17	153	70.4
La Cienega MDWCA	250	0.09	76	21.4
La Vista Homeowners Association	45	0.15	137	6.9
Country Club Estates	85	0.18	162	15.4
Total Santa Fe	790	0.14	128.9	114.1
<i>North Galisteo</i>				
Sunlit Hills of Santa Fe	900	0.15	134	134.9
<i>South Galisteo</i>				
Canoncito MDWCA	120	0.11	100	13.4
Galisteo WUA	200	0.16	143	32.1
Ranchitos de Galisteo WUA	60	0.22	198	13.3
Total South Galisteo	380	0.15	138.3	58.9
Grand Total	5,909	0.11^a	98.8^a	653.9

Source: Wilson et al., 2003

^a Average



Table 8. New Domestic Well Diversions in the Jemez y Sangre Water Planning Region from January 1, 2000 to May 2007

Sub-basin	Number of Post-2000 Wells in WATERS	Population per Home 2006	Increased Population on New Wells	Domestic Well Demand (ac-ft/yr)				Increase in Domestic Well Demand (%)	Census Growth Rate 2000 to 2006 (%)
				Per Capita Demand	Demand on New Wells	Total 2000 Demand	Total 2006 Demand		
<i>Northern Sub-region</i>									
Velarde	133	2.71	360	0.11	39.9	498	538	8	-0.6
Santa Clara	10	2.71	27	0.11	3.0	150	153	2.0	-0.6
Santa Cruz River	169	2.71	458	0.11	50.7	2,285	2,336	2.2	-0.6
<i>Aamodt Sub-region</i>									
Tesuque	91	2.4	218	0.11	24.2	622	646	3.9	10.1
Pojoaque/Nambe	109	2.4	262	0.11	29.0	847	876	3.4	10.1
<i>Los Alamos Sub-region</i>									
Los Alamos	1	2.43	2	0.11	0.3	0	0	---	3.7
<i>Santa Fe Sub-region</i>									
Caja del Rio	51	2.4	122	0.11	13.5	61	75	22.1	10.1
Santa Fe River	278	2.2	612	0.11	67.7	1,275	1,342	5.3	6.8
North Galisteo Creek	194	2.4	466	0.11	51.5	513	565	10.0	10.1
<i>South Galisteo Sub-region</i>									
South Galisteo Creek	150	2.4	360	0.11	39.8	295	335	13.5	10.1
Total	1,186		2,888		320	6,546	6,866	4.9	4.8



Table 9. Pueblo Water Use in the Aamodt Subregion

Category	Consumptive Use (ac-ft/yr)				
	Nambe	Pojoaque	San Ildefonso	Tesuque	Total
<i>Amount specified in Aamodt Settlement</i>					
<i>Nambe-Pojoaque-Tesuque water</i>					
Existing basin use (see detail below)	522	236	288	345	1,391
Future basin use	937	0	958	374	2,269
Reserved water	302	0	4.82	0	306.82
Total local water rights (from within basin)	1,761	236	1,250.82	719	3,966.82
<i>Rio Grande water</i>					
Supplemental pueblo	0	475	0	0	475
Acquired water	375	375	375	375	1,500
Economic development water	131.25	131.25	131.25	131.25	525
Total imported water (from Rio Grande)	506.25	981.25	506.25	506.25	2,500
Total	2,267.25	1217.25	1,757.07	1,225.25	6,466.82
Total new uses	1,745.25	519.49 ^a	1,469.07	880.25	4,614
<i>Existing basin use by category</i>					
Community, domestic, and commercial	193	171.00	101	168	633
Agriculture	278	17.00	129	129	553
Livestock	51	48.00	58	48	205
<i>Revisions to Aamodt existing use</i>					
Golf courses ^b	---	525	---	---	
Public supply	---	107.76	---	---	
2006 total current for public/commercial	193	632.76	101	168	1,095

Source: U.S. District Court, District of New Mexico, 2006.

^a Pojoaque Pueblo new uses based on total right minus estimated existing uses for golf course, public supply, livestock, and agriculture

^b Golf course use based on average use of 350 ac-ft/yr for an 18-hole golf course (Grigory, 2007). OSE estimated Pojoaque Pueblo existing uses in 2002 to be at least 447 ac-ft/yr, which included the first two 9-hole courses and only 4 of the 9 holes in the third 9-hole course (Smith, undated).

Jemez y Sangre Water Planning Council
 Survey of Water Systems
 April 2007

Date of interview _____

1. Name of Water System or Governmental Entity and person and title completing the survey
 (Acéquia, Mutual Domestic, County, Municipality) _____

2. Actions under **Category I: Protect Existing Supplies** (Please check all boxes that apply and describe in space provided [or attach longer description])

Current	Reports, Data available	Proposed	May consider in the future	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Forest restoration project
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Develop storm water management ordinance
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Cloud seeding project
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Develop well field management plan
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Propose conjunctive use of surface and groundwater supplies
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Expand treatment facilities to remove trace constituents (i.e., arsenic)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Restrict drilling of domestic wells within your jurisdiction
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Develop/explore methods for instream flow
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Wastewater treatment plant construction, repairs, or upgrades
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Acéquia bylaws to prevent water transfers out of acéquia
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Other _____

Please briefly describe the proposed projects and/or projects that have been completed in the last 5 years under Category I.

3. Actions under **Category II: Improve System Efficiency** (Please check all that apply and describe in space provided [or attach longer description])

Current	Reports, Data Available	Proposed	May consider in the future	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Wastewater reuse project
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Project to replace septic tanks and provide for regional WWTP
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Line irrigation ditches/acéquias
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Develop a regional water system authority
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Aquifer storage and recovery project with wastewater
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Aquifer storage and recovery project with surface water
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Optimize reservoir management (<i>sediment removal, evaporative loss reduction</i>)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Changes to infrastructure
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Groundwater modeling studies
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Water audits
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Leak detection and repair
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Aquifer injection
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Drill replacement wells
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Transfer indoor water use associated with domestic wells to utility system
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Other _____

Please briefly describe the proposed projects and/or projects that have been completed in the last 5 years under Category II. Please include records or estimates regarding the amount of water in the project (i.e., diversions for ASR) or any estimates of potential savings from the project.

4. Actions under **Category III: Mitigate Drought** (Please check all that apply and describe the proposed project in the space provided [or attach longer description]).

Current	Reports, Data Available	Proposed	May consider in the future	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Water banking/temporary leases of water rights
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Emergency conservation ordinance to restrict water use
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Shortage sharing agreements (acéquias)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Other _____

Please briefly describe the proposed projects and/or projects that have been completed in the last 5 years under Category III. Provide a copy of drought plan if available.

5. Actions under **Category IV: Reduce Demand** (Please check all that apply and describe the proposed project in the space provided [or attach longer description] and provide an estimate of the amount of water demand reduction (per capita and/or total annual).

Current	Reports, Data Available	Proposed	May consider in the future	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Manage growth and land use
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Water conservation focused on outdoor use
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Water conservation focused on indoor use for new construction
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Water conservation focused on indoor use through retrofits
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Water harvesting (rooftop)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Rate structure incentive for water conservation
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Graywater harvesting
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Rebates or other incentives to reduce demand
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Wastewater reuse
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Other _____

Please briefly describe the proposed projects and/or projects that have been completed in the last 5 years under Category IV, including any data or estimates quantifying the demand reduction.

6. Actions under **Category V: Increase Water Supply** (Please check all that apply and describe in space provided [or attach longer description])

Current	Reports, Data Available	Proposed	May consider in the future	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Use San Juan-Chama water
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Acquire and transfer groundwater rights to increase water supply.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Acquire and transfer surface water rights to increase water supply.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Transfer water rights across the Otowi Gage
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Use new domestic wells (72-12-1) for future growth
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Drill additional municipal wells for future growth
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Reappropriate water above Otowi Gage up to 1929 conditions of the Rio Grande Compact
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Appropriate flood flows during years when excess is available on the Rio Grande
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Build new reservoirs
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Brackish water desalinization
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Increase water supply by obtaining return flow credits
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Develop aquifer storage and recovery project (<i>describe source of water</i>)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Interbasin transfer
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Other _____

Please briefly describe the proposed projects and/or projects that have been completed in the last 5 years under Category V, including any data or estimates quantifying the increased supply and methods of offsetting impacts. (For proposed projects, please include the planned completion date.)

7. Please describe other actions, statutes, ordinances, policy changes, lawsuits (i.e., Aamodt) that may impact supply and demand or water management.

8. Please provide diversion data for 2001-2006 or indicate who we can contact to get annual diversion and population data.

9. Please describe any additional new data that may be relevant to future planning efforts, including groundwater modeling studies, hydrologic or hydrogeologic characterization studies, water planning studies, feasibility analyses for proposed studies, or any other relevant data or published reports.

10. Please provide any comments regarding the usefulness of the Jemez y Sangre regional water planning process. What has been most and least valuable about the process? How can the process be improved in the future? What would make the Jemez y Sangre water plan update most useful to you?



Appendix A: List of Entities Receiving Survey

Table A-1. Received Survey with Request to Interview

Name	Water System
Mr. Cyrus Samii	City of Española Planning Department
Mr. Jerry Cooper	El Dorado Area Water & Sanitation District
Mr. Tom Morin	Galisteo MDWCA
Mr. Gavin Strathdee	Madrid Water Cooperative
Ms. Paula Garcia	NM Acéquia Association
Governor Dennis Vigil	Pueblo of Nambe
Governor George Rivera	Pueblo of Pojoaque
Governor James Mountain	Pueblo of San Ildefonso
Governor Earl Salazar	Pueblo of San Juan (Ohkay Owingeh)
Governor Michael Chavarria	Pueblo of Santa Clara
Governor Charlie Dorame	Pueblo of Tesuque
Mr. Patricio Garcia	Rio Arriba County Planning & Zoning Department
Mr. Steven Wust	Santa Fe County Water and Wastewater Division
Ms. Claudia Borchert	City of Santa Fe
Mr. Buck Monday	Los Alamos County Utilities Department



Table A-2. Received Survey Only (no interview)
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Name	Water System
<i>Environmental</i>	
Mr. Steve Harris	Rio Grande Restoration Director
Mr. Paul Paryski	Santa Fe Chapter of the Sierra Club
Mr. David Groenfeld	Santa Fe Watershed Association
<i>Government</i>	
Mr. Patrick H. Lyons	New Mexico State Land Commission
Mr. Patricio Garcia	Rio Arriba County Planning & Zoning Dept.
Mr. Daniel Jiron	Forest Supervisor Santa Fe National Forest
Mr. Rob Baraker	BIA Albuquerque Area Office Manager
Mr. Mark Blakeslee	BLM Division of Resource Planning and Use and Protection
Mr. Garry Rowe	Albuquerque Area Office Manager Bureau of Reclamation
Mr. Paul Montoya	Natural Resources Conservation Service
Mr. Ed Romero	Natural Resources Conservation Service
Ms. Mary Helen Follingstad	Santa Fe Regional Planning Authority
Mr. Toby Martinez	State Forester
Governor Ray Trujillo	Pueblo of Cochiti
Governor Nelson Pacheco	Pueblo of Santo Domingo
Ms. Marcy Leavitt	New Mexico Environment Department Surface Water Bureau
Mr. Steve Cary	New Mexico State Parks
Mr. Ignacio Peralta	USFS CFRP Coordinator
<i>Irrigation</i>	
Mr. Jim Rogers, Commissioner	Acéquia del Caño
Mr. Barry Rudolf	Lower Cerro Gordo Ditch Association President
Mr. Reynaldo Romero	Acéquia de La Cienega Mayordomo
Mr. & Mrs. Phillip & Eleanor Bove	Acéquia Madre Ditch Association
Ms. Dolores Baca	La Bajada Community Ditch Association
Mr. Fred Waltz	Santa Cruz Irrigation District
Mr. Joe Maestas	Santa Cruz Irrigation District (SFP NRCS)
Mr. Gilbert Garduno	Acéquia de Garduno
Mr. Ted Trujillo	Acéquia de la Cañanda Ancha Commissioner
Mr. Michael Martinez, Mayordomo	Acéquia de los Chicos
Mr. Luis Sanchez	Acéquia del Medio
Mr. Mike Lamb	Acéquia del Potrero
Ms. Helenty Homans	Acéquia Larga and Jacono de Ancon
Mr. Paul Romero	Garcia Ditch
Mr. Leonard T. Valdes	Llano Ditch Association
Mr. Henry Abeyta	New Mexico Acéquia Commission
Mr. Fred Vigil	New Mexico Acéquia Commission Chairman
Ms. Josie E. Lujan	Secretary, Santa Cruz Irrigation District





Table A-2. Received Survey Only (no interview)
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Name	Water System
<i>Municipal/Public Supply</i>	
Mr. Regino Salazar	Agua Sana Water Users Association President
Alfredo Montoya	Alcade MDWCA
	Canada de Los Alamos MDWCA
	Canoncito at Apache Canyon
	Chamita MDWCA
	Chimayo MDWCA
Mr. Phil Villareal	Chupadero Water and Sewage
	Cordova MDWCA
Mr. Frank Lopez	Cuarto Villas Mutual Domestic Water Users' Association
	Cundiyo MDWCA
	El Llano MDWCA
Rudy Martinez	El Vadito De Los Cerrillos Water Association
Mr. Mike Bowlen	Haile Mobile Home Park
	Hyde Park Estates Water Users Association
Reynaldo Romero	La Cienega MDWCA
	La Pueblo MDWCA
	La Vista Homeowners Association
Ms. Kathy Pilnock	Lamy Domestic Water Users Association
Mr. Mikey Baird	Las Campanas
	Llano Chimayo MDWCA
Mr. Matt Holmes	New Mexico Rural Water Association
	New Mexico State Penitentiary
Mr. David Ortiz	Pojoaque Valley Irrigation District
	Ranchitos de Galisteo Homeowners Assoc.
	Rio Chiquito MDWCA
	Rio En Medio MDWCA
Kenny Salazar	Santa Cruz MDWCA
Mr. Sigmund Silbur	San Marcos Association
Mr. Benny Abruzo	Santa Fe Ski Basin
	Solacito Homeowners Assoc.
Mr. Robert Vail	Sunlit Hills Water System
	Sunrise Springs
	Tesuque MDWCA
	Truchas MDWCA
	Velarde MDWCA
	Vista Redonda MDWCA





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Note: This bibliography represents new reference material obtained since publication of the 2003 water plan.

Citation	Annotation
American Rivers. 2007. <i>America's most endangered rivers of 2007</i> . Available at < http://www.americanrivers.org/site/DocServer/-2007_MER_FINAL.pdf?docID=5881 >.	Ranks the Santa Fe River as the most endangered river in the United States.
ASCG, Inc. 2005. <i>Pojoaque regional wastewater facility planning study, Phase one report</i> . Prepared for the Pueblo of Pojoaque. June 2005.	Investigates options for wastewater treatment and effluent reuse within the boundaries of Pojoaque Pueblo.
ASCG, Inc. Undated. <i>Pojoaque regional wastewater study – Phase II</i> . Prepared for the Pueblo of Pojoaque [circa November 2005].	Expands on Phase 1 study to consider providing wastewater service to surrounding areas.
Birdsell, K.H., B.D. Newman, D.E. Broxton, and B.A. Robinson. 2005. Conceptual models of vadose zone flow and transport beneath the Pajarito Plateau, Los Alamos, New Mexico. <i>Vadose Zone Journal</i> 4(August 2005):620-636.	Describes potential pathways for contamination to reach the water table beneath Los Alamos. Concludes that nitrate migrated vertically 328 feet in approximately 40 years.
Blue Water Environmental Consulting, LLC. 2005. <i>Greater Eldorado area water levels and water quality report for 2004</i> . Prepared for the New Mexico Office of the State Engineer. Blue Water Report #02/05-OSE-001. March 31, 2005.	Basic data report on well locations, water levels and water quality.
Boyle Engineering Corporation. 2004. <i>County of Los Alamos San Juan/Chama Project water utilization study, Feasibility study</i> . January 2004.	Feasibility Study for diverting Los Alamos County's 1200 ac-ft of San Juan Chama Water. Explores direct diversion at river and deep wells from White Rock Mesa.
Broxton, D.E., and D.T. Vaniman. 2005. Geologic framework of a groundwater system on the margin of a rift basin, Pajarito Plateau, north-central New Mexico. <i>Vadose Zone Journal</i> 4 (August 2005):522-550.	Describes aquifer beneath Los Alamos
City of Santa Fe. 2005. <i>Long-range water supply plan: Assessing the needs, values, and water supply options</i> . Fact sheet. July 2005.	Summarizes City of Santa Fe Strategy for meeting future water supply demands.





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City of Santa Fe. 2005. <i>Administrative procedures for calculating the City of Santa Fe's operational water system supply and operational water system demand for the purpose of determining an emergency management plan.</i> September 12, 2005.	Describes the method of determining the City's water supply based on Santa Fe River flows, water rights and production capacity to establish the level of water restrictions.
City of Santa Fe. 2006. <i>An ordinance creating Section 25-7 SFCC 1987 regarding a water rights acquisition fund and creating Section 25-8 SFCC 1987 regarding a voluntary contribution fund to acquire water rights for the benefit of the Santa Fe River and the Rio Grande.</i>	Allows water customers to contribute to the purchase of water rights for instream flow in the Santa Fe River
City of Santa Fe. 2006. <i>Long-range water supply plan: Developing strategies to meet our future needs.</i> Fact sheet. January 2006.	Summarizes City of Santa Fe's strategy to meet future water demand.
City of Santa Fe. 2006. <i>San Juan-Chama Project, New Mexico: Contract between the United States of America Department of the Interior and Bureau of Reclamation and the City of Santa Fe.</i> Contract No. 05-WC-40-540. October 19, 2006.	Converts the City of Santa Fe's contract for San Juan-Chama water to a permanent repayment contract instead of a water service contract with an expiration date.
City of Santa Fe. 2007. <i>Santa Fe trends, 2007.</i> City of Santa Fe Planning and Land Use Department. Available at < http://www.santafenm.gov/SFTrends2007.pdf >.	City of Santa Fe information on population and water use.
City of Santa Fe. 2007. Effluent summary data for 2003 through 2006. Microsoft Excel file provided to Daniel B. Stephens & Associates (DBS&A), May 2007.	City of Santa Fe data on wastewater effluent.
City of Santa Fe. 2007. Water demand data. Microsoft Excel file provided to DBS&A, May 2007.	City of Santa Fe production and delivery data.
City of Santa Fe and Las Campanas LP. 2003. Settlement agreement. September 30, 2003.	Limits daily and monthly delivery of Buckman well water, with an annual total not to exceed 322 ac-ft/yr for Las Campanas' golf course. Allows for purchase of treated effluent from the City of Santa Fe. Agreement expires when BDD on line
City of Santa Fe and the Jicarilla Apache Nation. 2004. <i>Water supply agreement between the City of Santa Fe and the Jicarilla Apache Nation.</i> September 2004.	Agreement to lease 3,000 ac-ft/yr of the Jicarilla Apache Nation's SJC water for \$1,500,000 year beginning January 1, 2007.





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City of Santa Fe and Santa Fe County. 2005. <i>Water resources agreement between the City of Santa Fe and Santa Fe County</i> . January 11, 2005.	Defines wholesale delivery requirements to Santa Fe County from the City Water Utility to be 500 ac-ft/yr in perpetuity once the BDD is on line (but subject to shortage sharing). The agreement also defines that the County's share of the SJC water is 375 ac-ft/yr.
City of Santa Fe, Santa Fe County, and Las Campanas LP. 2006. <i>Facility operations and procedures agreement for the Buckman Direct Diversion Project between the City of Santa Fe, Santa Fe County and Las CampanasLP</i> . September 2006.	Agreement between the parties of the BDD stating that the City and County of Santa Fe are equal partners in the shared facilities, but use is shared based on peak capacities (62.09% for the City, 20.33% for the County, and 17.58 % for Las Campanas). O&M costs will be divided based on peak capacities.
Daniel B. Stephens & Associates, Inc. (DBS&A). 2006. <i>Long-range water supply plan, Los Alamos County</i> . Prepared for Los Alamos County Water Utility, Los Alamos, New Mexico. August 2006.	Detailed review of water supply and water use data, including analysis of water quality problems, potential savings from various water conservation programs and projection of future water demands.
Earth Works Institute. 2005. <i>Watershed Restoration Action Strategy for the Galisteo Creek Watershed: An adaptive management plan for ecological health of the Galisteo Watershed</i> . July 1, 2005.	Plan for improving the health of the Galisteo Creek Watershed.
Eldorado Area Water and Sanitation District (EAWSD). 2006. <i>Eldorado Area Water and Sanitation District water alert management plan summary</i> . Updated July 20, 2006. < http://www.eldoradowaterdistrict.com/fair.htm >.	Water Alert Management Plan (WAMP) is to encourage water conservation and the limited use of water by our customers, especially during drought conditions.
Englert, D., F. Ford-Schmid, and K. Bransford. 2004. <i>Post Cerro Grande Fire channel morphology in Lower Pueblo Canyon, Reach P-4 West: and Storm water transport of plutonium 239/240 in suspended sediments, Los Alamos County, New Mexico</i> . Department of Energy Oversight Bureau, New Mexico Environment Department, Santa Fe, New Mexico. October 2004.	Investigation of sediment transport following changed forest conditions after the Cerro Grande fire. Found large contaminant transport rates in Pueblo Canyon and elevated levels of plutonium.





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Englert, D., M. Dale, K. Granzow, and R. Mayer. 2007. <i>Distribution of radionuclides in northern Rio Grande fluvial deposits near Los Alamos National Laboratory, New Mexico</i> . Department of Energy Oversight Bureau, New Mexico Environment Department, Santa Fe, New Mexico. April 2007.	Summary of radioactive contaminant findings in abandoned channels, old floodplains, and other fluvial deposits along the Rio Grande. Study shows LANL influence on plutonium concentrations in sediments adjacent to the Rio Grande.
Fruth, William H. 2004. <i>Creating a sustainable Los Alamos</i> . Prepared for the Los Alamos, New Mexico First Town Hall, August 19, 20, and 21, 2004. POLICOM Corporation.	Economic Development Plan for Los Alamos based on the recent and proposed acquisition of lands from the federal government, showing population projections and growth in jobs.
Grauch, Tien and V. Bankey. 2003. <i>Aeromagnetic Interpretations for Understanding the Hydrogeologic Framework of the Southern Espanola Basin</i> . USGS Open File Report 03-124	Map and cross sections of Espanola Basin showing faults and structure.
INTERA Incorporated. 2006. <i>Final report on data and model evaluation for the Santa Fe County regional aquifer evaluation</i> . Prepared for Santa Fe County. June 10, 2006.	Summary of available groundwater models and approach to model development.
Johnson, P.S., D.J. Koning, and A.S. Read. 2004. <i>Report of findings from 2003 and 2004 hydrogeologic studies, Espanola basin, New Mexico, Technical completion report</i> . New Mexico Bureau of Geology & Mineral Resources/NM Tech, Socorro, New Mexico. December 1, 2004.	Geologic maps, cross sections and water level data compiled in this draft report.
Keating, E.H., B.A. Robinson, and V.V. Vesselinov. 2005. <i>Development and application of numerical models to estimate fluxes through the regional aquifer beneath the Pajarito Plateau</i> . <i>Vadose Zone Journal</i> 4(August 2005):653-671.	Groundwater model of Espanola Basin showing most recharge from elevations above 7,200 ft and at lower elevations, recharge only occurs in the canyons and arroyos.
Kwicklis, E., M. Witkowski, K. Birdsell, B. Newman, and D. Walther. 2005. <i>Development of an infiltration map for the Los Alamos area, New Mexico</i> . <i>Vadose Zone Journal</i> 4(August 2005): 672-693.	Estimates that 23 percent of recharge to the regional aquifer beneath the plateau is from stream loss.
Los Alamos County. 2005. <i>Investing in our future, Los Alamos County economic self-sufficiency, November 2005 progress report</i> .	County Planning report projecting future population and economic trends based on the acquisition of lands from the Federal Government.





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Los Alamos National Laboratory (LANL). 2005. <i>Los Alamos National Laboratory's hydrogeologic studies of the Pajarito Plateau: A synthesis of hydrogeologic workplan activities (1998–2004)</i> . LA-14263-MS. December 2005.	Discusses hydrogeology of Pajarito Plateau and groundwater contamination. Presents two conceptual models of the vadose zone. Anisotropy ranges from 0.00005 to 0.01, indicating the potential for water and contaminants to move horizontally is 100 to 20,000 times greater than the potential to move vertically.
LANL. 2005. <i>Environmental surveillance at Los Alamos during 2004</i> . LA-14239-ENV. Environmental Surveillance Program, Los Alamos National Laboratory, Los Alamos, New Mexico.	Annual water quality, air quality, and sediment sampling results for Los Alamos National Laboratory.
Margolis, E. 2005. <i>Fire history of the Santa Fe Watershed</i> . Presentation edited and presented by Ellis Margolis, Laboratory of Tree-Ring Research, University of Arizona. Data from Jeff Balmat. October 2005.	Results of fire history analysis in the Santa Fe Watershed. Tree rings date back to 1296. Small fires occurred every 4 years, large fires every 24 years. Reconstruction of drought history from 1600 to 2000, shows that the 1950s drought was one of the most severe over this period of record.
Margolis, E., T. Swetnam, and D. Meko. Undated. <i>Santa Fe Watershed research prospectus</i> . Provided to DBS&A by the City of Santa Fe, May 2007.	Proposal to determine fire and drought history from tree rings in the Santa Fe Watershed.
McKinney, K.C. (ed.). 2006. <i>Geologic and hydrogeologic framework of the Española Basin – Proceedings of the 5th annual Española Basin workshop, Santa Fe, New Mexico, March 7-8, 2006</i> . U.S. Geological Survey Open-File Report 2006-1134.	Abstracts on current research in the Española basin, including Noble Gas studies to distinguish between recent mountain front recharge and older paleo water, stream aquifer studies, and groundwater modeling.
McLin, S.G. 2005. <i>Analyses of the PM-2 aquifer test using multiple observation wells</i> . Report LA-14225-MS, Los Alamos National Laboratory, Los Alamos, New Mexico.	Analysis of a 25-day aquifer test shows two competing conceptual models which has implications for monitoring of contaminants beneath Los Alamos National Laboratory.
Molzen-Corbin & Associates. 2006. <i>City of Española, New Mexico, Arsenic abatement preliminary engineering report</i> . ESP061-11.S40. December 2006.	Evaluates alternatives for abating the arsenic in wells 1 and 3 and the arsenic and fluoride in well no 4. Recommendations include well head treatment and blending of water from wells with lower arsenic levels.
Newman, B.D., and B.A. Robinson. 2005. The hydrogeology of Los Alamos National Laboratory: Site history and overview of vadose zone and groundwater issues. <i>Vadose Zone Journal</i> 4(August 2005):614-619.	Overview of hydrogeology and groundwater issues at LANL.





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NM OSE, 2005 <i>Executive Summary of the San Juan River Basin in New Mexico Navajo Water Rights Settlement, April 19, 2005</i> http://www.ose.state.nm.us/water-info/NavajoSettlement/NavajoExecutiveSummary.pdf	Overview of Navajo Water Rights Settlement describing parties that share during shortages, including San Juan-Chama Project water.
New Mexico Office of the State Engineer (NM OSE). 2004. <i>Active water resource management priority basins</i> . October 28, 2004. Available at < http://www.ose.state.nm.us/water-info/misc-maps/AWRM-PriorityBasins.pdf >. Accessed June 2005.	Includes the Nambe-Pojoaque and Tesuque drainages as a priority basin under AWRM
NM OSE. 2004. Memorandum from D.L. Sanders, Chief Counsel, Susanne Hoffman-Dooley, AWRM Project Manager, and Martha Franks, AWRM Project Attorney, to File regarding Comments on the AWRM rules, and revisions made. December 3, 2004. < http://www.ose.state.nm.us/doing-business/ActiveWaterMgt/FinalVersionAWRM-Comments.pdf >. Accessed June 2005.	States that OSE will develop Rio Grande-specific regulations that will address administration of water rights, although the regulations will not become final until the Rio Grande is adjudicated.
NM OSE. 2006. Report and recommendation of the hearing examiner. Hearing No. 03-027 in the matter of the application by Mary L.W. Peppler/ nominee and estate of Phillip S. McKee for permit to change point of diversion and place and/or purpose of use from surface to groundwater in the Rio Grande Basin, New Mexico. OSE File No. 1121 into RG-71275 & RG-71275-S.	Decision on the Peppler water right transfer. Concludes that water rights can not be held for future unspecified uses.
NM OSE. 2006. Settlement agreement, <i>New Mexico ex rel. State Engineer v. Aamodt</i> . No. 66cv06639 MV/LCS-ACE (D.N.M.). January 19, 2006. Available at < http://www.ose.state.nm.us/PDF/Settlements/Aamodt/settlement_agreement_aamodt.pdf >.	Settlement agreement of the tribal and non-tribal water rights in the Tesuque and Pojoaque watersheds involving a joint water diversion project from the Rio Grande.





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NM OSE. 2006. <i>Overview of the revised Aamodt settlement agreement</i> . Available at < http://www.ose.state.nm.us/PDF/Settlements/Aamodt/settlement_agreement_overview_aamodt.pdf >.	Summarizes aspects of the Aamodt Settlement agreement
NM OSE. 2006. <i>The use of public underground waters for household or other domestic use in accordance with Section 72-12-1.1 NMSA</i> . Proposed regulation 19.27.5 NMAC, draft date May 24, 2006. Available at < http://www.ose.state.nm.us/PDF/RulesRegsGuidelines/DomesticWells/72-12-1.1_DraftRules_2006-05-24.pdf >.	Revised domestic well regulations increasing the fee for a domestic well permit from \$5 to \$125 and reducing the permitted water use from 3 to 1 ac-ft/yr.
PL108-354 Chimayo Water Supply System and Española Filtration Facility Act of 2004	A bill to direct the Secretary of the Interior to conduct a feasibility study of a Chimayo water supply system, to provide for the planning, design, and construction of a water supply, reclamation, and filtration facility for Espanola, New Mexico, and for other purposes.
Sangre de Cristo Water Division. 2006. <i>Water update: City of Santa Fe, 3rd quarter 2006</i> . November 2006.	Summary of City of Santa Fe's water use and service connections.
Santa Fe County. 2002. <i>Ordinance No. 2002-13: An ordinance addressing water conservation for all residential and commercial uses of water within Santa Fe County</i> .	City of Santa Fe Conservation ordinance defining water use stages and violations for water waste.
Santa Fe County. 2003. <i>Ordinance No. 2003-6: An ordinance amending Ordinance 1996-10, the Santa Fe County Land Development Code, Article III, Section 4.4.1 and Article III, Section 2.4.1 to require rainwater catchment systems for all commercial and residential development</i> .	Santa Fe County Ordinance defining the requirements for roof top capture of rainwater for new construction depending on the size of the roof area.





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Santa Fe County. Undated. <i>Terrain management handbook: Guidelines for site planning and development in Santa Fe County.</i> Santa Fe County Land Use Department.	Includes storm water ordinance for construction in the City of Santa Fe
Santa Fe National Forest and Taos Field Office of the BLM in Santa Fe County, 2007. Final Environmental Impact Statement for the Buckman Water Diversion Project. http://www.blm.gov/nm/st/en/fo/Taos_Field_Office/buckman_feis.html	NEPA document for City of Santa Fe, Santa Fe County and Las Campanas to divert San Juan-Chama water and native Rio Grande water directly from the Rio Grande.
Santa Fe Watershed Association. 2004. <i>Monitoring forest treatments in the Santa Fe Municipal Watershed.</i> August 2004.	Summary of findings of wildlife, aquatic habitat, stream flow and erosion following the forest thinning operations in the Santa Fe Municipal watershed.
Santa Fe Watershed Association. 2004. <i>Monitoring forest treatments in the Santa Fe Municipal Watershed, Final status report in fulfillment of 319 grant requirements.</i> September 2004.	Describes biological and stream flow monitoring after the forest thinning in the Santa Fe Watershed.
Shomaker, J.W., S.T. Finch, Jr., and M.A. Jones. 2001. <i>Hydrogeology, ground-water flow model, and model-based predictions of drawdown and streamflow depletion, Eldorado area, Santa Fe County, New Mexico.</i> Prepared for Eldorado Area Water and Sanitation District and New Mexico Office of the State Engineer. John Shomaker & Associates, Inc. April 24, 2001.	Groundwater model of the aquifers in the southern Espanola Basin, in the vicinity of Eldorado.
U.S. Bureau of Reclamation (USBR). 2003. <i>Aamodt feasibility study report.</i> Prepared for the 108th Congress of the United States under the direction of the Aamodt Technical Committee and with assistance and cooperation from the Aamodt Settlement Negotiation Team. September 2003.	Describes potential infrastructure for meeting future water demands in the Nambe-Pojoaque and Tesuque Drainages.





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Citation	Annotation
USBR. 2006. <i>Draft environmental assessment: San Juan–Chama water contract amendments with City of Santa Fe, County of Santa Fe, County of Los Alamos, Town of Taos, Village of Taos Ski Valley, Village of Los Lunas, and City of Española.</i> April 17, 2006. Available at < http://www.usbr.gov/uc/albuq/envdocs/ea/sanjuanchama/index.html >.	EA for converting SJC contracts from water service contracts to repayment contracts.
U.S. EPA. 2006. <i>Arsenic in drinking water.</i> < http://www.eng-consult.com/arsenic/treat1.htm >. Office of Ground Water and Drinking Water. Accessed July 2006.	Discusses new Arsenic standard of 10 ppb (was 50 ppb) adopted in January of 2001.
U.S. Department of Energy (DOE). 2006. <i>Draft site-wide environmental impact statement for continued operation of Los Alamos National Laboratory, Los Alamos, New Mexico.</i> DOE/EIS-0380D. June 2006. Available at < http://www.eh.doe.gov/nepa/docs/deis/eis0380d/index.html >	Describes potential water demand for future LANL operations.
U.S. Forest Service. 2004. <i>Santa Fe National Forest, Espanola Ranger District, Santa Fe Watershed thinning project.</i> Map dated September 15, 2004.	Map of the Santa Fe Watershed showing the forest treatments above Nichols Reservoir.
Vesselinov, V.V. 2005. <i>On potential fast contaminant flow paths to the White Rock springs through the regional aquifer beneath Pajarito Plateau.</i> Report LA-UR-05-6871, Los Alamos National Laboratory, Los Alamos, New Mexico.	Calculated pore water velocity of 2,024 ft/yr. Estimated travel time from TW-1 to Spring 2B is approximately 10 years.
West, F. 2006. Letter to Paul White, Pojoaque Basin Water Alliance, regarding the safety of Nambe Dam. September 14, 2006.	Discusses the potential instability of Nambe Dam from pumping proposed production wells associated with Aamodt settlement.
Williams, J. M. and B. D. Rodriguez. 2003. <i>Magnetotelluric data in the southwest Española Basin, northern New Mexico.</i> U. S. Geological Survey Open-File Report 03-0199, 128 p. Available on-line at http://pubs.usgs.gov/of/2003/ofr-03-199/ .	Mapped changes in electrical resistivity with depth that relate to lithologic variations critical to defining aquifer characteristics.





Table C-1. USFS Collaborative Forest Restoration Projects in the Jemez y Sangre Water Planning Region

Lead Organization	Project Title	Funding (\$)			Year Funded	Subbasin
		USFS	Match	Total		
Santa Clara Pueblo	Wood Biomass Heating Design and Implementation of Santa Clara Pueblo South Housing	359,656	90,000	449,656	2006	Santa Clara
Ohkay Owingeh	Birds in the Bosque-Restoration Effects on Avian Habitat	359,656	90,000	449,656	2006	Santa Clara
University of Arizona	Little Tesuque-Black Canyon Watershed Restoration Project	321,132	88,431	409,563	2006	Tesuque
Regenesi Collaboration Development Group	Rio Pojoaque Forest and River Restoration Project	241,371	78,990	320,361	2006	Pojoaque
New Mexico Recycling Coalition	Outreach and Education to Enhance the Utilization of Compost and Mulch from Forest Residuals	187,863			2005	Santa Fe
Santa Fe County	Tree Thinning in Wildland Urban Interface	360,000	90,000	450,000	2004	Santa Fe
Pueblo of Tesuque	Restoration of Historic Fire Regimes along the Rio Tesuque and Arroyo Cuma within the Pueblo of Tesuque	360,000	---	360,000	2003	Tesuque
Santa Clara Pueblo	The Santa Clara Woodworks Small Log project	357,400	---	357,400	2003	Santa Clara
Pojoaque Pueblo	Riparian Forest Restoration Project	360,000	---	360,000	2003	Pojoaque
San Ildefonso Pueblo	Rio Grande Floodplain Rehabilitation Project	360,000	---	360,000	2003	Pojoaque
Ohkay Owingeh	Reduce fire danger on 210 acres of riparian forest along Rio Grande	359,979	---	359,979	2002	Santa Cruz
Santa Clara Pueblo	Santa Clara Pueblo-Valle Caldera Reforestation	344,652	---	344,652	2002	Santa Clara
Total		3,971,709		4,221,267		





Table C-2. NMED 319 Program Projects in the Jemez y Sangre Water Planning Region

Lead Organization	Project Title	Funding (\$)			Completed	Sub-basin	Grant Number
		EPA	Match	Total			
Santa Fe Watershed Association	Santa Fe River Watershed Restoration Action Strategy	47,398	37,272	84,640	2004	Santa Fe	00-D
State Land Office	Improve channel stability in ephemeral reach of the Santa Fe River	143,840	106,628	250,468	2003	Santa Fe	99-L
State Land Office	Santa Fe River Restoration Project, Phase II	89,000	90,995	179,995	2006	Santa Fe	01-M
US Forest Service	Caja del Rio/Santa Fe River watershed improvement project	190,894	128,055	318,949	2004	Santa Fe	99-N
City of Santa Fe/USFS	Upper Santa Fe Watershed Restoration Project: Thinned 6,000 acres	371,866	336,251	708,117 ^a	2005	Santa Fe	00-D
Forest Guardians	Implementation of NPS pollution control in the Santa Fe River-below wastewater treatment plant	144,650	155,750	300,400	2004	Santa Fe	00-E
Earth Works Institute	Galisteo Watershed Restoration	119,102	121,332	240,434	2002	South Galisteo	00-F
Earth Works Institute	Galisteo Watershed Restoration Project, Phase II	267,966	185,780	453,746	2005	South Galisteo	02-F
Santa Fe Botanical Gardens	Santa Fe Botanical Garden and Las Golondrinas: Reduce sedimentation and control invasive and noxious plant species	100,000	76,473	176,473	2004	Santa Fe	01-N
Pajarito Watershed Association?	Pajarito Plateau Watershed Restoration, including burned areas of the Cerro Grande fire	50,000	77,000	127,000	2005	Los Alamos	01-R
Los Alamos County	Development of a stormwater management plan for Los Alamos County and implementation measures in the Pueblo Watershed	148,000	208,500	356,500	Current	Los Alamos	04-A
Forest Guardians	La Cieneguilla Open Spaces/ Santa Fe River Restoration	101,425	86,400	187,825	Current	Santa Fe	05-E

^a Also received Congressional funding

