Exhibit 26A: Detailed Discussion of Alternative 26—Domestic Wastewater

Acknowledgements: This discussion, which follows the same basic format as the fact sheet it accompanies, provides additional details and information that support the conclusions presented in the fact sheet. It was written by Sue E. Umshler, Esq., P.E. as part of the "Evaluation of Alternative Actions for Technical, Physical, Hydrological, Environmental, Economic, Social, Cultural, and Legal Feasibility and Water Quality Issues and Legal Overview" contracted to Daniel B. Stephens & Associates, Inc.

1. Alternative Evaluation

1.1 Technical Feasibility

Enabling New Technologies and Status

The technology exists to collect, treat, and dispose of wastewater currently being deposited into septic tanks in the urban and suburban area. In fact, in portions of the planning urban and suburban area, it is both a requirement and policy to connect households and businesses to central wastewater treatment facilities where economically feasible. In November 1993, the Bernalillo County Commission adopted the Groundwater Protection Policy and Action Plan, which identified septic tanks as a "main source of groundwater contamination," particularly along the Rio Grande valley where the water table is high (Bernalillo County, 2002; Rose, 2001) Thus, the City of Albuquerque and the County of Bernalillo have made removal of septic tanks and connection to municipal sewer lines a high priority (Bernalillo County, 2002). The Bernalillo County Wastewater Ordinance requires all homes within 200 feet of a municipal sewer line to take this action (Bernalillo County, 2002). In addition, the City offers a loan program to provide funds for the down payment and monthly payment to cover the Utility Expansion Charge (UEC) or a grant for low income houses, which effectively waives the UEC (Bernalillo County, 2002).

At present neither Sandoval County nor Rio Rancho require sewer connections. However, Rio Rancho is in the process of reviewing their ordinances and considering such a requirement for residences and businesses within a reasonable distance to a sewer interceptor line (COA et al., 2002). Likewise, Valencia county and communities to the south do not have mandatory connection requirements, but voluntary connections have increased, with a commensurate decrease in onsite wastewater treatment permit requests since 1994 (COA et al., 2002). Over the planning period considered in this Report (to 2050) it is likely that all of the communities and counties in urban and most in the suburban settings will have mandatory sewer connection ordinances resulting in a decline in the number of new septic tank installations in those areas. However, for this report, an assumption of level installations is made to project a maximum number of potential systems that would be proposed for removal and connection to central wastewater treatment facilities.

Onsite/decentralized wastewater treatment systems (mostly septic tanks) serve approximately 25 percent of U.S. households. (U.S. EPA, 2000a). The Environmental Protection Agency (EPA) estimates that four billion gallons of wastewater per day are released from these systems, with about 25 percent of the systems failing annually, resulting in 700 million gallons of improperly treated wastewater being discharged daily nationwide. (U.S. EPA, 1997 and 2000a). Septic systems can provide adequate treatment to protect human health and the environment if they are properly sited, designed, operated and maintained. (U.S. EPA, 2000a). Unfortunately most existing systems do not provide the level of treatment needed to protect surface and groundwater quality at current standards and thus can pose a threat to public health and create environmental pollution (U.S. EPA, 2000a; Rose, 2001). Investigations in New Mexico have found that failing septic tank systems are the cause of the problem, with the most common reasons being “improper site evaluation and design, improper construction, and inadequate maintenance” (Rose, 2001). The New Mexico Environment Department (NMED) estimates that the 170,000 household septic tanks and cesspools are responsible for 61 percent of supply well contamination incidents and are responsible for “nitrate or anoxic pollution” in such areas as Albuquerque, Belen, Bernalillo, Bosque Farms, Corrales, and Los Lunas in aquifers as deep as 200 to 600 feet (Rose, 2001).

The EPA has concluded that “adequately managed decentralized wastewater treatment systems are a cost-effective and long-term option for meeting public health and water quality goals, particularly in less densely populated areas” (U.S. EPA, 1997). That is the key to the issues of this alternative. It is expensive to construct and operate the centralized treatment facilities and costly to install the pipeline/pump station network necessary to collect the wastewater from the individual residences and/or businesses. Only as the population density increases does it become practical and economic to implement this alternative. It is also the density that contributes to the more significant pollution concerns for the underlying groundwater aquifers. Thus, the solution tends to converge with the problem in more densely populated areas such as Albuquerque, Rio Rancho, Bernalillo, and Sandoval counties.

Infrastructure Development Requirements

To implement this alternative, main interceptor pipelines would be required to collect wastewater from current septic tanks locations or clusters. If gravity flow could not be achieved, pump stations would be needed to lift water to collection points and/or the wastewater treatment plant. New or expanded wastewater treatment plants may be required to treat the wastewater to current federal and state standards if excess capacity is not available in a conveniently located plant. Administrative processes must be developed to support the infrastructure project; these would include permitting, easement acquisition, sampling, monitoring, and reporting if a new plant and/or new pipeline system were installed. Finally, individual homes and businesses would have to connect and additional lift pumps can be required if gravity flow into the collection system is infeasible.

Expansion of existing systems could utilize current organizations, but their personnel and material resources may need to be increased to handle additional wastewater flows. Another management alternative would be development of a central collection and treatment authority or cooperative joint management agreements between the various governmental entities encompassed by the urban and suburban areas.

Total Time to Implement

The total time (and related costs) to implement this alternative depends upon the septic tank locations; wastewater treatment plant location in relation to septic tanks (pipeline length and location; pump station location(s)); existing and projected capacity in existing plants; acquisition time for funding (grants, loans, rate increases, etc.); easement acquisition; and resource procurement such as design and construction personnel and materials. The time and costs would vary depending upon each site selected for the treatment plants and environmental studies, as well as the extensive public outreach and communication, which would be required based upon the proposed location for the project or projects.

This alternative may also experience a phased implementation as population density increases providing the economic and practical incentives to connect to or construct a new centralized facility in particular locations. Thus, over the planning period, septic tank numbers may decline as the urban and suburban area naturally expands and requires centralized collection and treatment. The costs would be distributed over the time frame of each cluster addition to such a centralized system, and the timing of removal would be phased in gradually as well.

For this report, an assumption that all septic tanks would be removed simultaneously, either in 2003 or 2050, was made to facilitate the cost computations and because a phased approach could not be reasonably assumed only for global planning purposes. This approach should result in describing lower and upper boundaries of resource needs for the alternative.

1.1.1 Physical and Hydrological Impacts

Effect on Water Demand

If this alternative just collects wastewater for treatment, there would be no change to demand. The same amount of water currently or planned for future diversions or pumping from the aquifer would occur. However, the wastewater that is not consumed would be shifted to a central treatment location. If the treated water is dedicated to a reuse program, there could be some effect on per capita demand (see A-27).

Effect on Water Supply (surface and groundwater)

Collection and treatment may result in no net change, i.e. just collecting and treating water that has already been diverted from a surface source or pumped from groundwater aquifer does not change the impact to surface or groundwater supply sources. Moving the wastewater discharge from current dispersed vadose recharge locations could impact local groundwater levels by changing where the water is returned to the cycle to a remote and singular NPDES outfall. However, as noted above, if the treated effluent is put into a reuse program, it could become a new source of supply for nonpotable consumptive uses (see A-27). The treated effluent could also result in increased supply, if it were directed to replenish groundwater aquifers or placed in a surface source that serves as supply.

Water Saved/Lost (consumption and depletions)

See above, there would be no effect for just collection and treatment, but perhaps some savings would be achieved by reuse of the treated effluent. There would be some system losses in the pipeline and treatment plant, but they would not exceed losses that are potentially occurring at present when the water is tied up in the vadose zone or removed from the tank during maintenance activities.

Impacts to Water Quality (and mitigations)

Collection of wastewater from septic tanks should result in significant reductions in multiple dispersed point sources of inadequately treated raw wastewater potentially moving into the vadose zone and thence to the groundwater aquifer. If failed onsite treatment systems produce pollutants that migrate to groundwater, the cleanup costs can be significant and such an expense would be avoided if the individual units were connected to a centralized treatment system. However, it is difficult to estimate this savings opportunity because the costs are so uniquely related to individual pollution plume characteristics and no attempt to do so was made in this report.

The estimate of septic tanks in operation in the urban corridor at present is between 32,000 and 40,000. (COA et al., 2002). This range is not presented as an absolute quantification since information sources could only document permits actually issued over a limited timeframe. The reported numbers do not account for unpermitted systems or septic tanks installed prior to the initiation of permitting activities in the mid 1970s. This range does aggregate information gathered from county and NMED databases with a 10 percent error allowance to provide for old or unpermitted systems. Therefore, the quantification of wastewater that could be collected from onsite treatment systems is between the following ranges:

Flow Estimate			
(mgd)	(ac-ft/day)	(gpcd)	(gptd)
6.4 to 8.0	19.6 to 24.5	75	200
9.6 to 12.0	29.5 to 37.8	110	300

mgd = Million gallons per day
ac-ft/day = Acre-feet per day
gpcd = Gallons per person per day
gptd = Gallons per tank per day

No volume reductions would be assumed based upon implementation of a conservation program that reduced indoor use flows for capital construction, which would have to be premised on maximum estimates of daily flows and failure of conservation initiatives, i.e. the plant and collection system must be sized for the maximum anticipated volumes.

Using the EPA national estimate that 25 percent of these septic systems are in failure, then removal of these onsite treatment units could result in elimination of between 1.6 to 3.0 mgd

(5.0 to 9.2 ac-ft/day) of potential pollutants from transport into the groundwater from inadequately treated wastewater.

Using a level projection of new septic tank installations to the year 2050 of about 1,500 new systems per year results in the following ranges. These values are probably too high based upon the more realistic gradual decline of such installations in the urban/suburban area. However, they present a maximum volume scenario using permit applications rates at the present time.

Flow Estimate			
(mgd)	(ac-ft/day)	(gpcd)	(gptd)
20.8 to 22.4	63.8 to 68.7	75	200
31.2 to 33.6	95.7 to 103.1	110	300

mgd = Million gallons per day
ac-ft/day = Acre-feet per day
gpcd = Gallons per person per day
gptd = Gallons per tank per day

Again, no volume reductions would be assumed based upon implementation of a conservation program that reduced indoor use flows for capital construction, which would have to be premised on maximum estimates of daily flows and failure of conservation initiatives, i.e. the plant and collection system must be sized for the maximum anticipated volumes.

Using the current EPA national estimate that 25 percent of these septic systems would fail, removal of these onsite treatment units in 2050 could result in elimination of between 5.2 to 8.4 mgd (16.0 to 25.8 ac-ft/day) of potential pollutants from transport into the groundwater from inadequately treated wastewater.

To protect receiving bodies of water, soils, and/or aquifers, treatment must meet applicable state and federal requirements, to avoid concentration of pollutants into a new single point source. If reuse is contemplated, higher standards of treatment may be required (see A-27).

Watershed/Geologic Impacts

If reuse is instigated, this alternative could protect the geologic structure of the aquifer by reducing or delaying groundwater pumping. Release points of water when returned to stream flows or in aquifer replenishment must be carefully chosen and monitored to not create adverse geologic impacts at other specific locations. Such negative affects could result from different water flow or new recharge locations, whereby erosion occurs or different water quality is placed in sensitive sites where vadose transport could carry contamination into the aquifer.

1.1.2 Environmental Impacts

Impact to Ecosystems

There may be no net change, just a shifting of water use and effluent release locations. This could decrease the water available in some ecosystems and increase it in other areas. Collection and treatment should reduce potential pollution releases if appropriate treatment is achieved and proper disposal or reuse implemented. Reuse can result in other impacts (see A-27).

Constructed wetlands are not a viable option for treatment of raw sewage because they do not currently meet secondary or tertiary requirements for discharge of effluent or for ponding in aesthetic areas where human exposure is possible. They are an alternative if additional treatment processes are employed in conjunction with the wetland proposal, but the particular circumstances must be carefully evaluated based on the site, the potential exposure to humans, and other uses of the water in the wetland. This conclusion is derived from the following quotations and citations.

"Constructed wetlands are complex systems in terms of biology, hydraulics, and water chemistry," which necessitates a specific case-by-case evaluation of design specification and performance measures (U.S. EPA, 2000b; Thomson et al., 1996). Constructed wetlands are not able to remove significant amounts of nitrogen and phosphorus and must be used in conjunction with other aerobic treatment process to remove nitrogen to meet current and upcoming nutrient standards. (U.S. EPA, 2000b; Thomson et al., 1996). A study of constructed wetlands in the state found that the "average effluent total nitrogen concentration of 38.4 … in nearly four times the 10 mg N/L as NO3 established for groundwater protection [in New Mexico]" (Thomson et al., 1996) "Constructed wetlands may require post-treatment processes, depending on the ultimate goals of the treatment system. More demanding effluent requirements may require additional processes in the treatment train or may dictate the use of other processes altogether." (U.S. EPA, 2000b; Thomson et al., 1996). Constructed wetlands are poor at removal of bacteria and are potential reservoirs of pathogens that could be harmful to humans and wildlife while attracting both humans and wildlife to use them. (U.S. EPA, 2000b; Thomson et al., 1996). "The very high Fecal Coliform concentrations in all of the wetland effluents sampled in this study suggest that this effluent should continue to be considered a possible health hazard and that reasonable precautions should be taken to limit contact with it" (Thomson et al., 1996). Maintenance costs can be quite high and require many hours of specialized manpower and most New Mexico facilities are "not being properly operated due to inadequate understanding of the treatment process by the operator, or due to difficulties inherent in the facility." (Thomson et al., 1996). However, constructed wetlands have an inherent aesthetic appeal to the general public so the tension is the demand by the public and the lack of knowledge concerning the treatment mechanisms so that the public and the environmental community can appreciate the limitations of the technology. (U.S. EPA, 2000b). "In [some] situations, constructed wetlands will be too costly or unable to produce the required effluent water quality." (U.S. EPA, 2000b)

There is some viability of using constructed wetlands to polish secondary effluent from the central treatment facility, but that would be outside the scope of evaluation of this alternative, which is simply collection and treatment (to standards) of raw wastewater. Because of the extremely large number of variables, this option is not considered in the evaluation for this alternative as stated.

Implications to Endangered Species

This alternative could result in additional water supply to river system if treated effluent is returned to the Rio Grande or its tributaries. It could also result in water being available for riparian areas if aquifer replenishment and recharge programs were instituted near the river, effecting areas used by the willow flycatcher. If the water is not so released, there would be no impacts unless pollution from currently installed failed systems is impairing the surface flows or riparian areas presently used by the endangered species listed in the region.

1.2 Financial Feasibility

In recent years several New Mexico rural communities have evaluated the costs of developing decentralized systems versus the "Big Pipe" option of centralized collection and treatment. In 1986, Peña Blanca estimated that a central system (facultative ponds with sand filters) would cost 3.1 Million dollars compared to new septic tanks installation of about $1.2 Million. Columbus, found in 1995 a Big Pipe (areated ponds and wetlands) cost of $4.21 Million versus $1.19 Million for new septic tanks. And in 2000, Willard determined that facultative ponds would cost about $1.6 Million compared to $0.97 Million for advanced treatment septic systems (Rose, 2001)

In urban and suburban areas with high population densities (more than three to four dwellings per acre), large scale, centralized collection and treatment of wastewater is most cost-effective. But in areas with one dwelling per one-half to one acre, located at moderate distances from a centralized treatment facility, the discussion centers on cost and the benefits that the high price tag creates depending on local conditions. (U.S. EPA, 1997). In 1995, the EPA provided the following estimates for centralized systems in rural communities (450 people living in 135 homes) and fringe communities (10 miles from city, population 1550 people in 443 homes). (U.S. EPA, 1997)

- Rural:
  - Capital cost (1995 dollars): $2.322 Million to $3.570 Million
  - Operation & Maintenance Costs: $30,000 to $40,000 per year

  - Using Engineering News Record Indices (ENR, 2002) and a 3 percent escalation for O&M, these figures for 2003 could be estimated at:
  - Capital: $2.77 to $4.27 million; O&M: $37,000 to $49,000 per year

- Fringe: One Mile From Sewer Line
  - Capital cost (1995 dollars): $3.323 to $3.787 Million
  - Operation & Maintenance Costs: about $83,800 per year

  - Using Engineering News Record Indices (ENR, 2002) and a 3 percent escalation for O&M, these figures for 2003 could be estimated at:
  - Capital: $3.97 to $4.525 Million; O&M: $103,100 per year

- Fringe: Five Miles From Sewer Line
  - Capital cost (1995 dollars): $5.378 to $5.842 Million
  - Operation & Maintenance Costs: about $95,900 per year

- Using Engineering News Record Indices (ENR, 2002) and a 3 percent escalation for O&M, these figures for 2003 could be estimated at:
- Capital: $6.43 to $6.98 Million; O&M: $118,000 per year

Planning, design, and construction require professional expertise and resources. For purposes of cost estimation, it is assumed all septic tanks would be removed simultaneously, thus requiring treatment plant construction and/or expansion, pipeline installation, some lift stations, administration costs, and individual connections with related lift pumps if necessary. All of these values are highly dependent upon locations and distances and for ease of comparison, median assumptions have been used and values listed in dollars per gallon. Extreme caution must be used before projecting these costs to any real project, which will present unique challenges and requirements that could make the specific costs higher or lower. The variables are too numerous to make rational assumptions at this planning stage. More realistic costs would be determined during the feasibility and conceptual design stages of actual proposed projects.

For instance, pipeline costs would be provided based upon length of pipe and variability of elevations and terrain, not in dollars per gallon. If a treatment plant exists and has surplus capacity, the plant costs would be unnecessary. If gravity flow is obtainable, no lift station would be required. If new easements must be obtained, administrative costs could be higher depending upon the cost and location of the land. If the rate base is large enough the connection fees can be lowered on a per customer basis or adsorbed by grants, such as County Dona Ana has been able to achieve with its county-wide program to connect septic tanks to several, phased centralized treatment systems. Therefore, these cost estimates should only be used for relative planning comparisons and not to project actual costs to connect any one or more of the existing septic tanks in the region.

The 2050 figures are based upon an escalation rate of 3 percent for the cost values and a flat increase of 1500 septic tank installations over the next 48 years. This value is probably too high, but provides a maximum potential number of systems and related volume upon which to estimate volumes and costs in 2050. These values also assume that no systems are removed before that date and this would be the cost to begin the alternative at the later date. This is also unrealistic, but should present a cost that would exceed real project costs, particularly if the septic tanks are removed gradually over that time period and new installations likewise are steadily reduced as central treatment facilities become available and are close enough to economically justify connection. This result is feasible, especially if onsite treatment standards become more stringent driving up the installation and maintenance costs of individual septic tanks.

1.2.1 Initial Cost to Implement

To expand current treatment facilities or build new smaller stand-alone satellites and/or wastewater treatment plants estimated 2003 dollars could range as follows (no adjustment is made for conservation as design and construction of treatment facilities, pipeline collection, administrative costs, and connection fees would be based upon maximum potential volumes):

- Treatment Plant build or expansion (COA et al., 2002; New Mexico Heritage Preservation Alliance, 2002)
  - Low flow (200 gallons per tank), range of 32,000 to 40,000 tanks – $12.8 million to $40.0 million
  - High flow (300 gallons per tank), range of 32,000 to 40,000 tanks –$19.2 million to $60.0 million
- Interceptor Collection Pipeline(s) (COA et al., 2002; New Mexico Heritage Preservation Alliance, 2002)
  - Low flow (200 gallons per tank), range of 32,000 to 40,000 tanks –$3.5 million to $8.4 million
  - High flow (300 gallons per tank), range of 32,000 to 40,000 tanks – $5.3 million to $12.6 million
- Lift Costs and Administrative, such as permits, easements, etc. (COA et al., 2002; New Mexico Heritage Preservation Alliance, 2002)
  - Low flow (200 gallons per tank), range of 32,000 to 40,000 tanks – $2.9 million to $8.0 million

  - High flow (300 gallons per tank), range of 32,000 to 40,000 tanks – $4.3 million to $12.0 million

- Individual Connections to Sewer System ($1500 to $2400 each) (COA et al., 2002; New Mexico Heritage Preservation Alliance, 2002)

  - Range of 32,000 to 40,000 tanks – $48.00 million to $96.00 million

The total initial capital cost could range from a low of $67.2 million to a high of $180.6 million dollars to implement this alternative in 2003.

If implementation of the alternative is delayed to the end of the planning period, initial costs, 2050 dollars are estimated using a 3 percent escalation and a flat increase of 1500 new onsite treatment installation per year for 48 years, resulting in the following ranges:

- Treatment Plant build or expansion

  - Low flow (200 gallons per tank), range of 104,000 to 112,000 tanks – $182.4 million to $491.0 million

  - High flow (300 gallons per tank), range of 104,000 to 112,000 tanks – $273.6 million to $736.5 million

- Interceptor Collection Pipeline(s)

  - Low flow (200 gallons per tank), range of 104,000 to 112,000 tanks – $50.2 million to $103.1 million

  - High flow (300 gallons per tank), range of 104,000 to 112,000 tanks – $75.2 million to $154.7 million

- Lift Costs and Administrative, such as permits, easements, etc.

- Low flow (200 gallons per tank), range of 104,000 to 112,000 tanks – $41.0 million to $98.2 million
- High flow (300 gallons per tank), range of 104,000 to 112,000 tanks – $61.6 million to $147.3 million

- Individual Connections to Sewer System ($6,575.85 to $10,521.36 each)
  - Range of 104,000 to 112,000 tanks – $683.9 million to $1,178.4 million

The total initial capital cost could range from a low of $957.4 million to a high of $2,216.9 million dollars to implement this alternative if action were delayed to 2050.

1.2.2 Potential Funding Source

- Rate increase or Utility Connection Charges to individual residence or business

- Bureau of Reclamation Title XVI program, Reclamation, Recycling and Water Conservation. This funding is available for projects that include reclamation and reuse of municipal wastewater, other wastewater, or naturally impaired waters. Thus, the program could be a potential source of funds if the collection and treatment system were linked to a reuse program. The maximum federal cost share is 50 percent for planning, 25 percent for design, and 25 percent for construction, with an overall cap of $20 million for construction of a single project, regardless of total project cost. Often the federal share is non-reimbursable, resulting in a de facto grant, however, projects are funded by specific congressional appropriations, which require advance planning and requests that can be delayed depending upon the federal budget process and its shifting priorities. Matching local funds are essential to obtain and maintain these grants and state programs are designed to leverage such federal funding programs through vehicles such as the Water Project Fund administered by the Water Trust Board.

- State/Federal grants
  - Nonpoint Source Pollution Grants, Section 319 of CWA. EPA provides annual grants to states to control "nonpoint" source of pollution, which includes malfunctioning

onsite septic systems. In states where they are significant source of nonpoint pollution, 319 funds may be used to construct, upgrade or repair onsite systems (U.S. EPA, 1997)

- USDA Rural Utilities Service has water and waste disposal loans and grants in rural areas and towns with 10,000 or fewer residents, up to 75 percent of eligible project costs and RUS guarantees loans made by banks and other institutions (New Mexico Heritage Preservation Alliance, 2002)

- HUD provides community development block grant programs to construct public facilities and improve water and sewer facilities (New Mexico Heritage Preservation Alliance, 2002)

- For Tribes, HUD has resources for Native Americans, EPA has American Indian Environmental Office tribal grants, and the U.S. Department of Health & Human Services also has grant programs for such projects. (New Mexico Heritage Preservation Alliance, 2002)

- The Water and Wastewater Grant Fund (W/WWGF) was created for the purpose of awarding grants to qualified entities for water and wastewater projects. In FY02 77 projects were authorized grants statewide and with 27.6 million in grants and emergency requests being obligated. The fund balance is $13.3 million, with some funds obligated, but not spent. The NM Finance Authority has received 65 applications by October 2002, totally $99.1 million for consideration of funding in FY02-03 (New Mexico Heritage Preservation Alliance, 2002)

- State/Federal loans

  - Clean Water State Revolving Fund provides $1 billion annually to the states which manage individual revolving loan funds for wastewater and other water quality projects (U.S. EPA, 1997). The program provides loans at low or zero interest with repayment periods up to 20 years. Terms vary by state, but typically the money goes to capital costs and not to O&M expenses. There is a lot of competition for these funds (New Mexico Heritage Preservation Alliance, 2002)

- The Wastewater Facility Construction Revolving Loan program is administered by the NMED. It is capitalized by federal grants, state matching and other funds accrued from construction loans. The program is restricted to low-interest loans and eligible entities include municipalities, counties, sanitation districts, and Native American tribes or pueblos with resources to repay loans. The current unobligated balance in the fund is $52.2 million with pending applications for $40.8 million (New Mexico Heritage Preservation Alliance, 2002)

- The Public Project Revolving Loan Fund (PPRLF) is administered by the NM Finance authority and provides low-cost financing for long-term capital projects such as sewerage and waste disposal systems. The program is capitalized with 75 percent of annual government gross receipts tax revenue combined with federal state and local funds. Each project financed for the PPRLF must be authorized by the legislature by way of a statute. The loan capacity at current market rates from the PPRLF is about $500 million (New Mexico Heritage Preservation Alliance, 2002)

- Private loans
- Revenue bonds
- Effluent sales income

1.2.3 Ongoing Cost for Operation and Maintenance

Generally operation and maintenance costs are not included in the grant programs and in many of the loan programs, particularly those from the federal government. Thus, the community or project authority must normally have sufficient rate base or other funds to pay the O&M costs by itself. Moreover, these costs increase as the system complexity increases. For centralized wastewater treatment facilities and pipeline system maintenance, qualified management, operation, and maintenance staff must be provided to keep the system functional and protective of human health and the environment. Sharing of resources via a central authority or joint agreement could maximize use of resources, thereby reducing competition for scarce resources and personnel.

Using cost estimates from current treatment facilities, the following range of values for the first operation year can be predicted in 2003 dollars to be: (COA et al., 2002)

- Low flow (200 gallons per tank), range of 32,000 to 40,000 tanks – $3.8 million to $6.4 million per year
- High flow (300 gallons per tank), range of 32,000 to 40,000 tanks – $5.8 million to $9.6 million per year

Using an industry estimate computation method whereby O&M is estimated at 6.5 percent of total capital costs, the ranges in 2003 dollars for the first year would be as follows:

- Low flow (200 gallons per tank), range of 32,000 to 40,000 tanks – $4.4 million to $9.9 million per year
- High flow (300 gallons per tank), range of 32,000 to 40,000 tanks – $5.0 million to $11.7 million per year

If a conservation program is effective in reducing indoor use and thence wastewater discharges, the O&M costs could be reduced because of the reduced volumes that would require treatment, assuming treatment standards do not become more stringent and offset such savings. Based upon an assumed reduction of indoor use by 15 percent the following reduced initial year O&M cost estimates can be made:

- Low flow (200 gallons per tank), range of 32,000 to 40,000 tanks – $3.3 million to $5.4 million per year
- High flow (300 gallons per tank), range of 32,000 to 40,000 tanks – $4.90 million to $8.2 million per year

Using an industry estimate computation method whereby O&M is estimated at 6.5 percent of total capital costs, the ranges in first year costs in 2003 dollars with a 15 percent conservation rate are as follows:

- Low flow (200 gallons per tank), range of 32,000 to 40,000 tanks – $3.7 million to $8.4 million per year

- High flow (300 gallons per tank), range of 32,000 to 40,000 tanks – $4.2 million to $10.0 million per year

The estimated initial year O&M costs could range from a low of $3.3 million to a high of $11.7 million dollars per year if this alternative was implemented in 2003.

Estimated O&M values for 2050, using a 3 percent escalation results in the following ranges for the two methods:

- Low flow (200 gallons per tank), range of 104,000 to 112,000 tanks – $54.7 million to $78.6 million per year

- High flow (300 gallons per tank), range of 104,000 to 112,000 tanks – $82.1 million to $117.8 million per year

Using an industry estimate computation method whereby O&M is estimated at 6.5 percent of total capital costs, the ranges in 2050 dollars of the first year costs are as follows:

- Low flow (200 gallons per tank), range of 104,000 to 112,000 tanks – $62.2 million to $121.6 million per year

- High flow (300 gallons per tank), range of 104,000 to 112,000 tanks – $71.1 million to $144.1 million per year

With implementation of a conservation program and based upon an assumed reduction of indoor use by 15 percent the following reduced 2050 O&M initial year cost estimates can be made:

- Low flow (200 gallons per tank), range of 104,000 to 112,000 tanks – $46.5 million to $66.8 million per year

- High flow (300 gallons per tank), range of 104,000 to 112,000 tanks – $69.8 million to $100.2 million per year

Using an industry estimate computation method whereby O&M is estimated at 6.5 percent of total capital costs, the ranges in 2050 first year dollars with a 15 percent conservation rate are as follows:

- Low flow (200 gallons per tank), range of 104,000 to 112,000 tanks – $52.9 million to $103.4 million per year

- High flow (300 gallons per tank), range of 104,000 to 112,000 tanks – $60.5 million to $122.5 million per year

The estimated O&M costs could range from a low of $46.5 million to a high of $144.1 million dollars for the first year if implementation of this alternative were delayed to 2050.

References/Bibliography

Bernalillo County Environmental Health Department, New Mexico. 2002. Connecting to Municipal Sewer Lines. <http://bernco.gov/departments/environmental_health/sewer_connection_article.html>

City of Albuquerque Wastewater Facilities, City of Rio Rancho Utility Department, the County of Bernalillo Health Department, and the New Mexico Environment Department. (COA et al.). Interviews with representatives. December 2002.

Engineering News Record. (ENR). 2002. Engineering News Record Cost Index History. <http://enr.construction.com/features/conEco/costIndexes/constIndexHist.asp>

New Mexico Heritage Preservation Alliance. 2002. Presentations at the Infrastructure in the Face of Change, 7th Annual New Mexico Infrastructure Finance Conference. Las Cruces, New Mexico. October 29-31, 2002.

Rose, R.P., Ph.D., P.E. 2001. *Septic Tanks Good or Evil? The Future of Managed Decentralized Wastewater Treatment in New Mexico*. Prepared for Rocky Mountain Section, American Water Works Association and Rocky Mountain Water Environment Association Annual Conference. September 12, 2001.

Thomson, B.M., Ph.D., W.D. Boivin, and T.J. Gallegos-White. 1996. *Evaluation of Constructed Wetland Performance in New Mexico.* Final Report to the Bernalillo County Environmental Health Department.

U.S. Environmental Protection Agency. (U.S. EPA). 1997. Report to Congress on use of onsite/decentralized wastewater treatment systems.

U.S. Environmental Protection Agency. (U.S. EPA). 2000a. EPA guidelines for management of onsite/decentralized wastewater systems.

U.S. Environmental Protection Agency. (U.S. EPA). 2000b. *Manual: constructed wetlands treatment of municipal wastewaters.* EPA/625/R-99/010. National Risk Management Research Laboratory, Office of Research and Development, U.S. Environmental Protection Agency, Cincinnati, Ohio. September