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November 13, 2006

Mr. Philip Gasteyer, Mayor, and Council Members
Village of Corrales
4324 Corrales Road
Corrales, NM 87048

**Re: PER and MBR Evaluation Peer Review Letter Report**
**Village of Corrales Wastewater Project**
**SMA Project No. 6417098**

Dear Mayor Gasteyer and Village Council Members;

This letter report is prepared by Souder, Miller & Associates (SMA) as a peer evaluation of the 2007 Preliminary Engineering Report (PER) and 2007 Draft Sanitary Sewer Report - MBR Evaluation previously prepared by Larkin Group (Larkin) for the Village of Corrales (Village). Other draft versions of the PER, and supporting reports, produced by Larkin during 2005 to 2007 were also reviewed. This evaluation will become an appendix for the SMA Peer Review Report that will be prepared and submitted to the Village at a later date.

This evaluation is broken into two sections, one for the PER and one for the MBR Report. Within each section, SMA's review comments will address data confirmation and given values and review of noted items for clarification or further discussion. Information in each report that is deemed valid or of no further concern will not be commented upon and is recommended for acceptance by SMA.

During review of the PER, it was noted by SMA that a number of maps and figures were referenced. SMA did not receive those from the Village and a request has just been made to Larkin to provide those documents. SMA does not believe those documents are critical to this letter report but would review them for completion of our future Peer Review Report.

## Preliminary Engineering Report, January 2007

The PER was initially created in draft version in February 2005 with Appendices A through R. Subsequent PER drafts were created in May 2005 and October 2006, with Appendices. A draft Supplementary Engineering Report was created in October 2005. The final version of the PER was created January 2007. All versions have been reviewed by SMA but this evaluation will primarily address the final PER of January 2007. This evaluation presentation follows the required Wastewater PER report format, US. Department of Agriculture Rural Development Bulletin 1780-3, *Preliminary Engineering Report – Wastewater Facilities* and the format of the 2007 PER.

### I. General

- The scope indicates the report was prepared to study non-traditional wastewater treatment alternatives with a comparison to a traditional connection to the City of Albuquerque wastewater system.
- The report was also prepared to address two primary issues:
    - Should the Village connect to City of Albuquerque and subject residents to cost increases, assessments or surcharges beyond Village control?

- Are environmentally conscious non-traditional systems feasible and are they capable of providing beneficial re-use of reclaimed wastewater?

II. Project Planning Area

- The report states that of the 6,000 plus acres in the Village, approximately 1,500 acres are used for agriculture. Residential areas are primarily zoned for 1-acre lots. SMA contacted the Village Planner to discuss zoning and Farmland Preservation. The Planner indicated that acreage zoned for agricultural use is also zoned for residential use and that it was subdividable to 1-acre lots. The Planner also indicated that only 19 acres is currently under Farmland Preservation with another 50 acres potentially coming into that program in the future, depending on the funding ability to purchase that land. It is important to note, considering residential housing density and septic tank use, that there is the possibility of future construction of over 1,400 additional 1-acre residences with septic tanks.
- The PER indicated that the Village was divided into four general environmental areas for the environmental portion of the study and referenced the areas to a "following map". None of the documents provided or obtained by SMA include this map, however, it is not considered a significant piece of missing information as the four areas are described in the PER.
- The section on Soils indicated the predominant soil type as being well drained. SMA's discussions with the Village Planner and New Mexico Environment Department Liquid Waste Program – Albuquerque indicated that clayey soils are problematic in the Village area and cause many of the septic tank leachfield drainage problems. NMED also indicated there have been suspected cases of septic tank run-off to the Rio Grande. This is not indicative of well drained soils. The statement is a generalization and not representative of all of Corrales.
- In the Water Resources section it is stated that "some water wells have caused local directional changes in the groundwater flow". This is indicative of substantial groundwater drawdown in some wells and the potential for capture of septic tank effluent from the surrounding area.
- In the Threatened and Endangered Species section there is reference to forty-two threatened and endangered species and species of concern. The species were not provided nor was the potential impact to any proposed construction addressed.
- SMA agrees with the population projections provided in Section C.

III. Existing Facilities

- The six facilities listed in the PER as having wastewater discharge permits do not agree with the current NMED database. The PER data may be from 2005. The NMED database currently (Oct. 18, 2007) lists four facilities with wastewater discharge permits, all of which were listed in the PER.
- In the History section statements were made about the age of septic tanks and the likelihood of their functionality. These statements are made as assumptions with reference to age. There are many other variables that would affect the functionality of septic tanks no matter the age, such as method of construction, periodic maintenance, depth to groundwater, soil types, etc.
- In the Residential Properties section a statement is made that a significant number of residential properties cannot or do not use their well water, assumed by SMA to be because of contamination of some sort. There is no clarification as to what the significant

number was. SMA will contact the NMED Drinking Water Bureau in Albuquerque to verify this information.

- In the Residential Properties section it is stated that maintenance of existing septic tank systems ranged from $100 to $400 per year. This is equivalent to approximately $9 to $34 per month. This information can be used for comparison of monthly sewer rates that may be incurred if connection to the Albuquerque Bernalillo County Water Utility Authority (ABCWUA) system occurred or if a Village wastewater treatment facility was constructed.
- In the Commercial and Institutional Properties section the annual costs are equivalent to monthly expenditures as shown in the table below. This is relevant in comparison when considering connection to ABCWUA or construction of a Village treatment facility and the monthly rates that would be incurred.

| Facility | Annual O&M Cost | Monthly O&M cost |
|---|---|---|
| Village Recreation Center | $4,000 | $333 |
| Municipal Complex | $600 | $50 |
| Library | $200 | $17 |
| Restaurants | $300 to $25,000 | $25 to $2,083 |
| Elementary School | $10,000 | $833 |
| Post Office | $2,400 | $200 |
| 50 Commercial and Institutional | average $2,500 | average $208 |

IV. Need for Project

- The PER states in the first paragraph that “there is no clear demand for such a system based on existing septic and well data.” The PER does not provide any synopsis of that data nor does it state what is meant by a “clear demand”.
- The need for a wastewater system was discussed with Mr. Kevin Cook of the NMED Drinking Water Bureau (DWB). At the time of this PER (2007) Mr. Cook was not responsible for the Corrales area. SMA will contact the appropriate person at NMED DWB to discuss past and current knowledge of drinking water in the Corrales area. SMA will also research and review historic and recent well monitoring data provided by the Village and the NMED DWB.
- The need for a system was also discussed with Mr. Fred Kalish, NMED Groundwater Pollution Protection Section of the Ground Water Quality Bureau. Mr. Kalish indicated there is “no hard data” to confirm the need for a wastewater system. Mr. Kalish has not been with the NMED Groundwater Pollution Protection Bureau for a number of years, even before 2005. He has been in the NMED Construction Programs Bureau (CPB).
- The need for a wastewater system was also discussed with Ms. Nora Romero, NMED Liquid Waste Division, Rio Rancho field office. Ms. Romero indicated that she often receives calls regarding septic issues in the Corrales Road Core but she did not maintain a list of complaints or corrections. SMA has contacted Ms. Jennifer Ickes, NMED Liquid Waste Program-Albuquerque, the current Liquid Waste Specialist responsible for the Albuquerque, Rio Rancho, and Ruidoso areas, to discuss historical and current liquid waste issues in Corrales.
- The need for a system was also discussed with Mr. Dave Hogge, NMED Surface Water Bureau. Mr. Hogge indicated NMED planned to monitor Rio Grande water samples over the next few years to try to determine if contaminants are entering the river from septic systems, farming operations, or animal grazing. He also indicated they had no hard data to support the need for a wastewater system. SMA will contact Mr. Hogge and discuss

the current information available, such as the results of the Rio Grande sampling program.

- The PER indicated that the 1996 Density Impact Study (abridged version in PER Appendix F) recommended the initiation of a monitoring program for existing "high nitrate" suspect wells and general groundwater monitoring for select or volunteer wells. The PER also states these recommendations were not followed and there is no baseline of data. The PER did not report the data in the referenced 1996 study that showed the results of nitrate samples from 137 home wells in November 1994. This data indicates that 5 percent of the samples exceeded the U.S. EPA nitrate standard of 10 parts per million (ppm). The data also indicated another 17% of the samples exhibited nitrate concentrations of 5 ppm to 9.5 ppm. The nitrate contamination exhibited by these samples may be in isolated in extent, but are widespread through the community. In 2006 Corrales implemented a volunteer well sampling program. The results were not available at the time of the PER but the monitoring event was underway. SMA will report and discuss the results as part of a Village Hydrogeologic Study, which will be provided as an appendix in the SMA Peer Review Report.
- The PER states "There is currently not enough data available to state, without reservation, that the domestic wastewater systems are degrading the groundwater supply or causing other problems". The PER does not discuss or reference the NMED December 6, 2005 *Ground-Water Quality in Corrales* presentation, the NMED December 6, 2005 *Ground-Water Quality in Corrales, Middle Rio Grande Basin* interim progress report, nor the November 2004 *Ground-Water Quality Impacts from On-Site Septic Systems* by Dennis McQuillan, NMED Liquid Waste Manager. SMA will review and discuss these reports as part of the Peer Review Report.
- The PER also does not discuss the historical and current water monitoring for the Village. This includes the results of sampling conducted by NMED since 1994. There is also a number of public water systems located in the Village that are required by NMED DWB to sample and monitor water supply. An initial review by SMA of this information indicates a number of these systems have been in violation for not sampling their wells. It was also noted that three systems reported nitrate concentrations of 0.05 to 0.43 ppm in 2006. These same systems reported nitrate concentrations in 2007 of 1.84 ppm to 4.14 ppm. This is a significant increase in concentration (order of magnitude) of nitrate in a short period of time. This will be discussed in detail in the SMA Peer Review Report.

V. Alternatives Considered

- The PER cites a Village-wide sewer flow of 700,000 gallons per day (gpd) at a population of 11,000. It also cites using a RUS Bulletin design flow of 150 gpd per household for 4,400 households and an additional estimated commercial flow of 30,000 gpd using an industry standard reference, Metcalf & Eddy, 4$^{th}$ Edition. SMA believes the design flows have been underestimated. The RUS 150 gpd/household design flow is more typical for small older rural communities that typically consume much less water then in larger more populated modern areas. The PER-referenced Metcalf & Eddy, 4$^{th}$ Edition indicates that it's advisable to use flowrates based on actual data from similar communities in the same locale. For instance, SMA's experience at Paa-Ko Communities is an average flow rate of 160 gpd/household, however this community typically has modern water saving devices and a number of households that are not lived in year round. Bernalillo County requires a household design flow of 225 gpd. NMED CPB 2003 *Recommended Standards for Wastewater Facilities* indicates that wastewater facilities receiving flows from new wastewater collection systems should be

based on an average daily flow of 100 gallons per capita. The average household size of Corrales is 2.6 (2000 Census). This would indicate a design household flow of 260 gpd. SMA recommends using the Bernalillo County design standard of 225 gpd per household. This results in a total daily flow of 990,000 gal. for a population of 11,000. The PER estimated the commercial flow of 30,000 gpd then later estimated the flow from the Corrales Road core to be 50,000 gpd (PER Appendix R). Even though a number of residences at a flow of 150 gpd were included in the Appendix R estimate, SMA agrees with the estimated 50,000 gpd commercial flow as this is the same commercial flow utilized by the Town of Edgewood for their wastewater system design. Using SMA's recommendations, the total daily flow would be 1,040,000 gpd, or one million gallons per day (1 MGD).

- A Class 3 wastewater operator was cited as needed for wastewater operations. A Class (or Level) 4 operator is typically required for the more advanced type of wastewater treatment systems, such as a membrane bioreactor (MBR).
- The PER states that there may be potential hazardous materials encountered during construction for all alternatives due to petroleum leaks from underground storage tanks. There is a specific site on Corrales Road that is well documented by NMED. There should be no significant impacts from this site.
- The No Action alternative indicates that existing septic systems outside of the Corrales Road Core appear to be functioning acceptably and property owners appear to be maintaining their systems adequately. This is overly general, and potentially contrary to information SMA has received from NMED Liquid Waste Program and will be discussed in SMA's report.
    - The No Action 2.8 percent interest rate used for present worth calculations is in error. The interest rate for 2007 published by OMB Circular A-94 is 3 percent for a twenty year loan. This is true of all present worth calculations in the PER.
    - The No Action Advantages/Disadvantages statement that a disadvantage is that there is a potential for groundwater pollution to continue seems to conflict with the statements made in the previous Need for the Project section.
- The design criteria in the Traditional Gravity Collection System/ABQ Connection (ABQ Connection) alternative, and all other alternatives, should reference NMED CPB 2003 *Recommended Standards for Wastewater Facilities.* Portions of this design guidance reference do include those referenced by the PER.
    - The design criteria for the ABQ Connection alternative states that there is no design inflow or discharge characteristics. To achieve this, installation of a gravity system with manholes in areas of high groundwater has to done precisely as there would be a potential for groundwater infiltration. This could be considered a disadvantage for a gravity system.
    - The Construction Problems in the ABQ Connection alternative do not include the extensive traffic control required for conventional trenching. There is no mention of horizontal directional drilling as a possible construction alternative.
    - The unit costs shown in the Estimate Summary for the ABQ Connection alternative are too low and do not reflect current costs. For example, an infrastructure project bid by SMA at the Isleta Pueblo in early 2007 resulted in unit costs for trenching and installation of 8-inch sewerline less than 8 ft. depth ranged from $23 to $35 per linear foot (LF). The PER shows a unit cost of approximately $15/LF. This is a cost difference of approximately 50 percent for this one item, when compared to the lower of the Isleta 2007 unit costs. SMA suspects that the total cost of this alternative is substantially underestimated.

  - The Advantages/Disadvantages of the ABQ Connection alternative do not include the extent of Operation and Maintenance (O&M) required for low initial flows through a large diameter 18-inch sewer main. A scour velocity, to prevent accumulation of solids, of 2 feet per second requires a minimum pipe slope of 0.15 percent and the pipe to be flowing half full. This requires a daily flow of 1.29 MGD, which is equivalent to 5,733 houses (1,333 houses more than projected for Year 2025) with an estimated daily flow of 225 gpd each. Significant O&M could be required in early years of low flow to prevent or remove blockage of accumulated solids. An evaluation of a smaller diameter gravity pipe or multiple gravity sewer mains for the Village would be prudent.
  - The ABQ Connection did not discuss the alternative of a force main/pressure connection which would be much less costly to install and have less impact during construction, but would also require the expense of a lift station, as does the gravity system.
- The PER did not consider or evaluate a vacuum collection system. These types of systems are commonly used in flat areas with high groundwater. The City of Albuquerque and Doña Ana County use many miles of this type of collection system.
- The On-Site/Decentralized alternative considers the replacement of septic tanks with newer type septic tanks with the Village being responsible for managing the new septic tanks. This type of alternative does not seem very feasible or productive. Decentralized systems typically include consideration of on-site advanced treatment types of tanks that produce a much higher quality effluent and are much more protective of the aquifer than conventional septic tanks. It could also include larger scale advanced treatment units (ATUs) that serve a number of households, such as that designed by SMA in Cordova, NM. SMA will further address this alternative in the Peer Review Report.
- The Constructed Wetlands alternative should not have been presented in the PER. Due to numerous failures over the past 15 years, NMED will not longer consider permitting constructed wetlands.
- The Greenhouse System alternative is for a treatment system by Living Machines, Inc. The referenced 2001 EPA Fact Sheet indicated that large scale systems are cost competitive to conventional systems in warm climates. The Fact Sheet estimated a 1 MGD Living Machines system with greenhouse, as would be required for Corrales, to cost $10.5 million (2001 cost) and a 1 MGD conventional system to cost $8.5 million (2001 cost). The PER estimates the cost of a 700,000 gpd system as $8.63 million.
  - The Living Machines system requires a larger area of land (footprint) than conventional systems. The PER indicates 7 acres would be required for a 700,000 gpd system. For comparison, a 700,000 gpd MBR treatment system would only require a 10,000 square foot (SF) building and ½ acre of land.
  - SMA reviewed the Living Machines, Inc. website. There are no project listings past 2002. Most of the projects listed are small capacity systems, less than 40,000 gpd. The largest system shown is a 220,000 gpd plant in the Netherlands. It does not appear that a system the size of that required for a Village central wastewater treatment has ever been designed or constructed.
  - The EPA Fact Sheet describes two demonstration systems that were independently evaluated, one 40,000 gpd system in Frederick Maryland and one 80,000 gpd system in Burlington, Vermont. The performance evaluation of the two systems shows that the Frederick system was not capable of producing total nitrogen (11 ppm) less than the NMED standard of 10 ppm nor did it appear to produce coliform (<200 MPN/100 mL) at the NMED reclaimed wastewater Class

1A standard of ≤ 23 MPN/100 mL. The Burlington system was able to produce total nitrogen (5.6 ppm) less than the NMED standard but it produced coliform at >1,000 MPN/100 mL which is NMED Class 3 reclaimed wastewater. The PER indicates that the Living Machines system is capable of producing Class 1A reclaimed wastewater. This statement is not supported by the information in the 2001 EPA Fact Sheet. More current statistics may be available from Living Machines, Inc. but SMA does not recommend the Village to further consider a treatment system that appears to be unproven for large scale operations, requires a footprint that would cost approximately $1.5 million more for land as compared to a MBR, or may not be able to consistently provide Class 1A reclaimed wastewater.

  - The PER references the NMED Policy for the Above Ground Use of Reclaimed Wastewater and was provided in Appendix O of the PER. The document provided is the draft policy from March 2003. The final policy in use at the time of the PER is dated August 7, 2003. NMED just released the January 2007 update of this policy and it will be provided by SMA in the Peer Review Report.

- The STEP (septic tank effluent pressure) system described in the Alternative Collection Systems section indicated that existing septic tanks would need to be replaced with a new filtered septic tank. This is not true. Filters can be added to existing septic tanks.
  - This same section describes adding an effluent pump to existing septic tank systems. This may or may not be true. SMA understands there are a significant number of septic systems with mound leachfields that already have effluent pumps. It may be possible to design a STEP system to utilize these pumps, which depends on the size of the pump, STEP system requirements, etc.
  - This section does not describe the potential use of grinder pumps at each residence that could be used to replace the entire septic tank system.
- The STEG (septic tank effluent gravity) system described in the Alternative Collection Systems section also indicates septic tanks would have to be replaced. As stated above for STEP Systems, this is not true.
  - It is also stated in this section that the additional cost of using a 4-inch discharge pipe for the STEG system vs. the 1-inch or 1.5-inch used for a STEP system is "somewhat offset" as an effluent pump required by the STEP system is not required by the STEG system. The cost of installing 1.5-inch pipe vs. the cost of installing 4-inch pipe is at most a several hundred dollars per household whereas the cost of an installed pump is several thousand dollars per household.
- For both STEP and STEG systems cleanouts are required at periodic intervals. The PER did not include this in the description or in the cost estimates.
- For both STEP and STEG systems the PER describes the requirement of the Village to obtain easements from every property owner in order to install necessary components. The PER assumes that the Village would install the components required at each property. It is possible that the Village could require each property, by ordinance, to upgrade and connect to any Village-provided collection system, pay for the expense of upgrade, and be responsible for the O&M of upgrades.
- The Section C Re-use System Options has statements that can be interpreted to mean that on-site/decentralized alternatives do not create re-use water (reclaimed wastewater). Advanced treatment units, whether for an individual property or shared by a group of properties, are capable of providing underground and in some cases, aboveground re-use water.

  - This same section states that there are no current provisions in New Mexico for the introduction of treated effluent as groundwater recharge. This is not true. Permitting and water right credit requirements for this scenario were presented by the Office of the State Engineer (OSE) at the New Mexico Infrastructure Financing Conference, held in Albuquerque, during October 2005. Groundwater storage and recharge is an acceptable method of reclaimed wastewater reuse and pertmittable by NMED. It is true, as the PER states, that drinking water standards must be met for this type of discharge, however, the quality of effluent from advanced treatment systems, such as MBRs, require little, if any, additional treatment process to obtain drinking water standards.
  - The PER states that "no specific users can be identified for reuse water at this point". There are a multitude of users for reuse water, as defined in the previously referenced NMED policy. SMA has provided design and seen reuse by communities for irrigation of golf courses, parks, athletic fields, and orchards, water for livestock, and sales to construction companies. Reuse water could also be disposed of in the Rio Grande, under state and federal permits, with subsequent water right credit from OSE. Specific uses must be identified. Reuse water is a commodity of significant value.
  - The PER indicated that the reuse of treated effluent within the Village was of prime concern to citizens. It also stated that effluent might be reused by property owners. It is important to note that SMA has addressed a similar request from the residents of Paa-Ko Communities. Some residents wanted to know why they should not receive the value and reuse the effluent instead of the golf course. SMA's estimated costs to provide reuse water to residents was in the millions of dollars and far larger than the cost to send it to the golf course. Another issue is the guarantee of use by residents, as discussed in the PER and the next bullet.
  - The PER is correct in stating that there must be a guaranteed year-round method of wastewater disposal, or reuse. This is as important as collection and treatment and can be just as costly.
  - The PER states the need for 10 acres of land for reuse storage ponds but does not explain the need or sizing of ponds. SMA has designed reuse storage ponds for five months of winter storage at Paa-Ko Communities and the Town of Edgewood. The ponds can also be used as contingency for emergency storage. The value of the reuse water to a community must be evaluated in order to justify the expense of designing and construction of storage ponds.
  - The cost estimate for lining a storage pond indicates a unit cost of $7.40 per square yard (SY). Recent bids received by SMA have shown this cost to be as high as $9 to $14/SY, depending on the amount of liner required. Synthetic liner is a petroleum product and fluctuates with market prices.
  - The Advantages/Disadvantages for reuse briefly mentions discharge to the Rio Grande although this alternative was not discussed in the text.
- The PER did not discuss other types of conventional treatment systems for comparison, such as integrated fixed film/activated sludge (IFAS), sequencing batch reactor (SBR), membrane bioreactor (MBR) or the relative new technology of multi-stage activated biological process (MSABP). This was not included in the original intent of the report but should be discussed for comparison with the non-traditional alternative systems.
- The PER does not mention how biosolids that would be produced from a treatment system would be dealt with. A biosolids treatment and handling facility for a 1 MGD treatment facility could cost $1 million or more and require several acres of land.

VI. Recommended Alternative

- The evaluation of the rate schedules for the Recommended Alternative do not reflect the current cost of construction. The rates shown would be higher if evaluated by the same methodology. It will also be of value to provide the NMED CPB compilation of 2006 utility rates for communities in New Mexico so that Village members can compare rates for a recommended alternative to rates members of other communities must pay for wastewater utilities.

**Draft Sanitary Sewer Report-MBR Evaluation, March 1, 2007**

This report was prepared as an overview of MBR technology and its application to the Village. A discussion of Advanced Treatment Units (ATU) was also provided. Even though this report discusses other topics than MBR, SMA will primarily make comments related to MBR systems.

II. Discussion

- The cited regulated wastewater effluent constituents were not all inclusive. Other regulated constituents, including those for reclaimed wastewater, include total dissolved solids (TDS), chlorides, turbidity, Total Kjeldahl Nitrogen (TKN), and fecal coliform.
- The report indicates that residential ATUs are generally not capable of reducing nitrogen to levels required for surface or subsurface discharge. It is not quite understood what this statement is in reference to but it is assumed to mean in reference to reuse of reclaimed wastewater. This statement is therefore incorrect. There are ATUs that are capable of providing effluent that can be used for reuse. The reuse is typically used for residential subsurface irrigation.
- The discussion of membrane systems, as related to wastewater treatment, provides only a limited discussion. Membrane systems used for wastewater treatment are called membrane bioreactors, MBR. The membrane does act as a separator, or clarifier as it basically only allows water molecules to pass, blocking out solids, organisms, etc. The MBR also builds a biofilm on its aerated membrane that not only structurally supports the membrane but also is part of the biological treatment process. There are also some other important points when considering an MBR treatment system.
    - There are basically two types of membranes, flat plat and hollow fiber. There are advantages and disadvantages to both. The flat plat membranes, as produced by Kubota of Japan, have a long track record and have been very cost competitive in recent years. The Kubota flat plate membranes won competitive bids and are being installed at the SMA MBR projects at Paa-Ko Communities, Town of Edgewood, and San Felipe Pueblo. They were also installed for the Route 66 Casino MBRs.
    - The MBR technology works basically the same for the two types of membranes, however, the process design utilized by the half dozen prominent MBR vendors that currently exist varies from vendor to vendor. For this reason it is necessary to bid and procure the MBR vendor prior to design of a MBR system. One design does not fit all vendors.
    - The required footprint of a MBR can be as small as 25 percent of other conventional treatment systems.
    - MBRs are fully automated and are operated by Programmable Logic Controllers (PLCs). Wastewater operation experience is not as critical as process control. A Class 4 operator is required to operate a MBR.

  - There is a substantial cost for power to operate MBRs as a large portion of the aeration required is to keep the membranes from fouling. Vendors are currently trying to optimize their processes to use less aeration and thus require less power consumption. A 1 MGD MBR would cost approximately $80,000/year for electrical consumption.
  - Annual O&M costs for a 1 MGD MBR, including operator, utilities, analytical, and misc. would be approximately $200,000/year.
  - Membranes are only guaranteed for 10 years operation. Membranes will require replacement cost sometime in a 10-20 year period. For a 1 MGD MBR, this would cost approximately $0.5 million.
- In Section C - Influent, reference is made to settling of small particles in a primary clarifier. A primary clarifier is not required for a MBR system. The membrane acts as the clarifier.
- In Section D –Final Disposition or Disposal, reference is made to injection (treated effluent) to a non-potable water zone not requiring water quality monitoring or permitting. For the Village, NMED would require that state groundwater quality standards be met.
  - The discussion on reuse in this section can be a bit misleading as there are a number of uses of high quality reclaimed wastewater that would be produced by a MBR. Crop irrigation would not necessarily require winter storage as there are many other methods of disposal or reuse in winter months. The value of the reuse water would have to be analyzed vs. the cost to construct and maintain winter storage ponds.

<u>III. Permitting</u>

- In Section A – Groundwater Discharge Permit reference is made to monitoring (groundwater) and monitoring wells with monthly testing. Groundwater monitoring and monitoring wells are not likely required for MBR discharge, due to its high quality. The MBR influent and effluent would have be monitored at the treatment facility in order to comply with a discharge permit. Groundwater monitoring, if required by permit, is normally required on a quarterly basis.
- In Section B – Surface Water Discharge Permit there is some pertinent information not provided. Discharge requirements to surface water vary by location within the state. The requirements for the Middle Rio Grande will be provided in the SMA Peer Review Report. Discharging to surface water also requires laboratory analysis of samples for potential impact to aquatic life. This analysis can cost several thousand dollars or more per year as there are a limited number of laboratories in the U.S. that perform this service.
- In Section C – Reuse Permit it is incorrectly stated that an irrigation reuse permit is identical to a groundwater discharge permit. The requirements of each will vary greatly. SMA has worked with discharge permits where subsurface discharge of 20 or 30 ppm total nitrogen was allowed. It is very dependant on location and depth to groundwater, the treatment methodology and quality of effluent.
  - This section also states that direct reuse is not clearly defined. SMA is not sure what is meant by “direct reuse” but all methods of reuse are clearly defined and permitted by regulatory agencies.
- In Section D – Village of Corrales, there is a statement that NMED Groundwater Bureau has been alerted to aquifer conditions in the Village that would possibly make permitting more difficult. It also states that NMED might require a more extensive monitoring program. This is not true. The process of permitting treated wastewater discharge is the

same for any community. The requirements of the discharge permit vary as stated previously by SMA. Permitting or monitoring a MBR treatment system would not likely be difficult due to the high quality of effluent produced.

IV. Village of Corrales

- SMA has previously addressed wastewater collection items in this section with PER comments provided above.
- Table 6-4 – Construction Fees for MBR Treatment Facility shows the cost of a 50,000 gpd MBR if built from scratch. Packaged MBR systems are available in this size at a substantial cost savings. A packaged MBR plant of this size would cost approximately $1 million. The Town of Edgewood MBR WWTP is designed for 50,000 gpd with expandability to 150,000 gpd. It is being built from scratch and costs $2.5 million. Approximately $0.5 million additional is required in the future to expand the capacity of the Edgewood MBR to 150,000 gpd.
    - The table also shows costs for handling biosolids (sludge digester and belt press). For small flows such as this it is not usually cost effective to handle biosolids in this manner. It is much cheaper to use a septage hauler to collect waste biosolids and transport to a much larger WWTP, such as the City of Albuqueque.
    - Assuming a 20-year planning period, there are no costs shown for membrane replacement.
    - The NPDES permit cost of $80,000 is too high. A NPDES permit for a 50,000 gpd discharge can be completed for less than $10,000.
    - The electrical cost is too low, assuming new electrical service would need to be brought in to the site.
    - The cost of land implies one-acre of land is required. If available, the 50,000 gpd MBR only requires a 6,000 SF building and 1/4 acre of land.
    - Monitoring wells would not be required.
- Table 6-5 Construction Fees for STEP Pressure System does not have any valves show, i.e., gate valves, air valves, pressure sustaining valve.
- Table 6-6 O&M Estimated Costs do not show replacement cost for membranes.
    - The testing laboratory costs are too high.
- It is not understood how the monthly rates shown in Tables 6-7 and 6-8 are derived. It is assumed that the Village will have some type of funding assistance for this project. Loan and grant scenarios vary between the funding agencies. SMA proposes to utilize a matrix that would show recommended project estimated costs and subsequent rates based on loan or match paybacks at different ratios, such as 100, 75, 50, 25, and 10 percent. Rates should include funds for O&M and equipment replacement. SMA believes it is also helpful to show these rates as a percentage of the median household income.
    - Rates for commercial customers appear to be based on flow. It would also be wise to consider the strength of commercial wastewater produced, unless the Village implements pretreatment criteria for commercial businesses. The wastewater strength greatly affects the design and size of the MBR facility.

SMA will continue to gather and review data for preparation of the Peer Review Report, which will also include a Village Hydrogeologic Report. Please do not hesitate to contact me at 299-0942 if you have questions or require any additional information.

Sincerely,
**Souder, Miller & Associates**

Jerry A. May, P.E.
Senior Engineer/Project Manager

cc: Nora Scherzinger, Village Administrator
Juan Reyes, Village Clerk
Richard Rose, P.E. PhD., NMED CPB

SMA