Lower Rio Grande Water Users Organization
Technical Committee
Summary Meeting Minutes

Committee Members	Bobby Creel (NMSU), Mariano Martinez, (DAMDWCA), Adrienne Widmer (CLC), Gary Esslinger, (EBID), Phil King (EBID), Debbie Lujan (Town of Mesilla), Charles Trujillo (AW&WD)
Others Present:	Martin Lopez (LRGMDWA), Karen Nichols (LRGMDWA), Roberto Nieto (LRGMDWA), Manuel Garcia, Montana Vista Community, Charles Huestis (DAMDWCA), Diane Gamboa (LRGWUO)
Time/Date of Meeting:	January 29, 2009, 1:30 p.m.
Place of Meeting:	Utilities Center, Conference Room 150

Meeting commenced at approximately 1:30 p.m.

1. **Lower Rio Grande Public Water Authority-**
   - Martin Lopez presented. Refer to attached handout.
   - Five mutual domestics (Berino, Desert Sands, La Mesa, Mesquite & Vado) will merge to form the authority.
   - House Bill 185 is on the legislative website for review.
   - Asking for support to get this legislation approved.
   - Membership into the LRGWUO a future possibility.

2. **WRRI Grand Unified Groundwater Model Development for the Lower Rio Grande Project Deliverables**
   - Phil King reviewed progress. In the process of joining the models together.
   - Expect to complete project by May 2009.

3. **EBID Grand Unified Groundwater Model Development for the Lower Rio Grande Project Status**
   - Phil King reviewed progress. Refer to attached Draft Technical Report by Wolfgang Schmid. Internal review by EBID of Technical Report.
   - Expect to complete project by March 2009.

4. **EPA Grant Status**
   - Grant expires September 30, 2009. Refer to attached handout for grant project balances.

5. **Other Items of Interest**

5a. **Implementation of the Operating Agreement between EBID and El Paso #1**
   - Phil King suggesting this item be taken before the LRGWUO Board.

5b. **LRGWUO Board Meeting in March**
   - Board Meeting tentatively scheduled for March 19th.
   - Agenda: Items 1 and 5a noted above.

5c. Next LRGWUO Technical Committee Meeting is tentatively scheduled for Feb. 19, 2009.

Meeting ended at approximately 2:30 p.m.

Lower Rio Grande Water Users Organization

c/o City of Las Cruces Utilities – P. O. Box 20000 – Las Cruces, NM 88004
575-528-3511 telephone / 575-528-3619 fax

NOTICE OF TECHNICAL COMMITTEE MEETING

A meeting of the Lower Rio Grande Water Users Organization Technical Committee is scheduled for Thursday, January 29, 2009 at 1:30 p.m. at the City of Las Cruces Utilities Center, Conference Room 150, 680 Motel Blvd, Las Cruces, NM.

AGENDA

1. Lower Rio Grande Public Water Authority – Martin Lopez, Mesquite Mutual Domestic Water, and Olga Sanchez, Rural Community Assistance Corporation, will present.

2. WRRI Grand Unified Groundwater Model Development for the Lower Rio Grande Project Deliverables – Dr. J. Phillip King will present.

3. EBID Grand Unified Groundwater Model Development for the Lower Rio Grande Project Status – Dr. J. Phillip King will discuss.

4. EPA Grant Status

5. Other Items of Interest

If you need an accommodation for a disability to enable you to participate fully in this event, please contact us 48 hours before the event at 541-2000/v or 541-2821/TTY.

Lower Rio Grande Water Users Organization

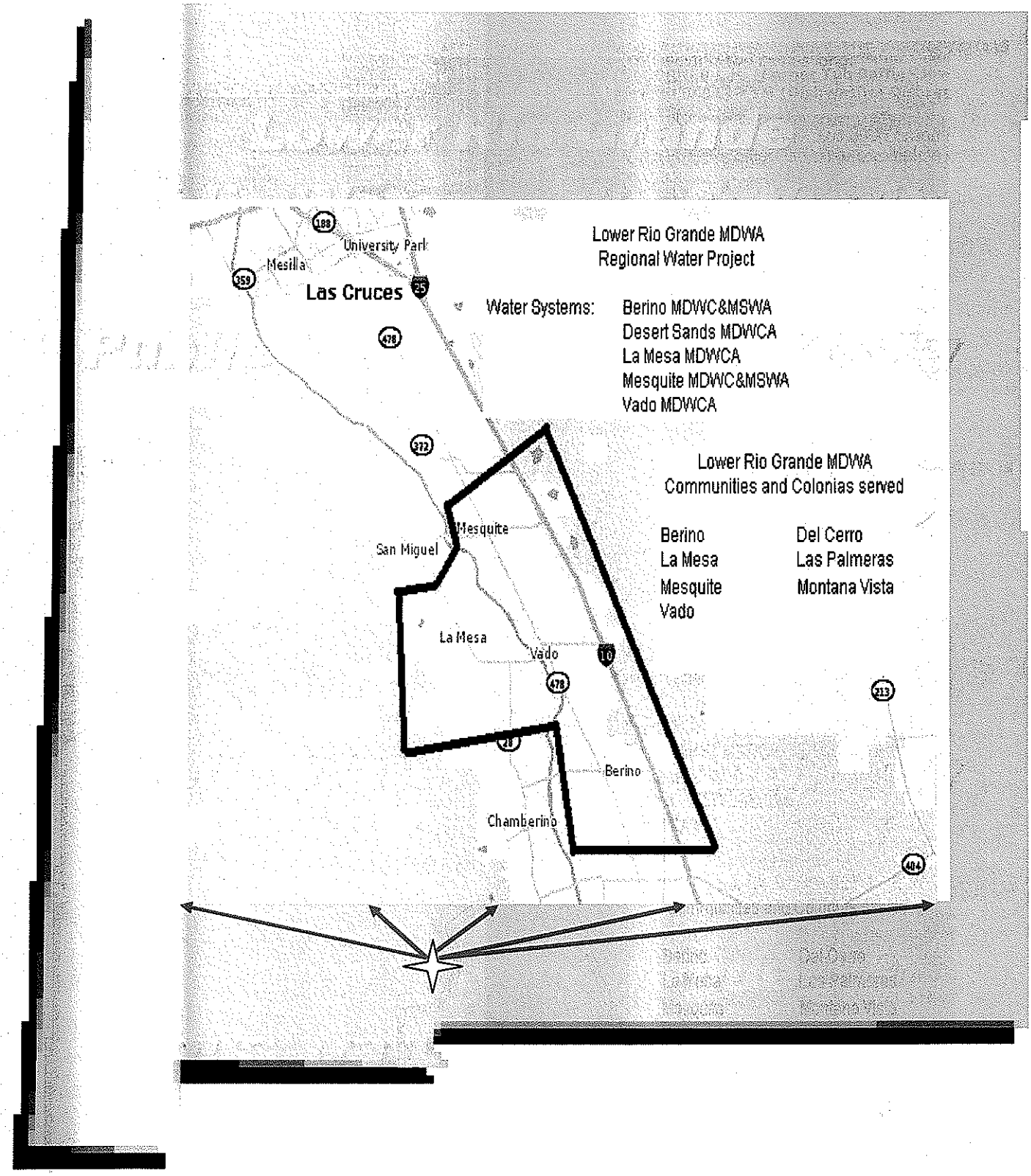
c/o City of Las Cruces Utilities – P. O. Box 20000 – Las Cruces, NM 88004
505-528-3511 telephone / 505-528-3619 fax

SIGN-IN SHEET
LRGWUO TECHNICAL COMMITTEE MEETING
January 29, 2009

PRINTED NAME	ORGANIZATION	PHONE
PHIL KING	NMSU/EBID	571-8166
Manuel Garcia	Mesilla Valley Community Coalition	(915)525-0082
Karen Nichols	Lower Rio Grande MDWA	882 0313
Roberto M Nieto	Lower Rio Grande MDWA	(575) 621-9097
MARTIN G. Lopez	Lower Rio Grande MDWA	571-3628
C D Hwests	DAMDWUA	527-4103
Charles Trujillo	AWSD	882-3922
Debbie Lujan	Mesilla	524-3262 ext 103
Adrienne Widen	CLC	528-3527
Gary Esslinger	EBID	639-4377
BOBBY CREEL	NMSU	646-4337
Marianne D Martin	Doña Ana MDWCA	644-4028
DIANE GAMBOA	LRGWUO	649-7035

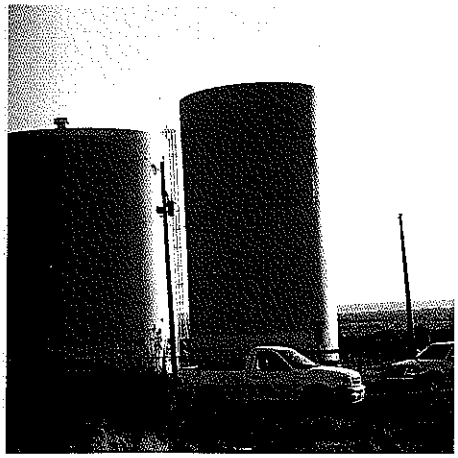
ITEM #1

Lower Rio Grande Public Waterworks Authority

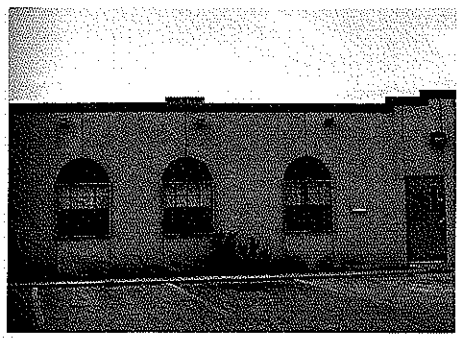


Lower Rio Grande Public Works Authority

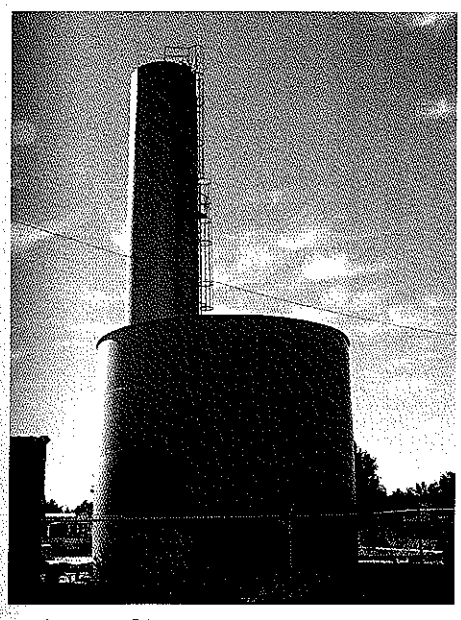
A Regional Approach



Mesquite MDWC & MSWA



Desert Sands MDWCA



Vado MDWCA

How did we get here?

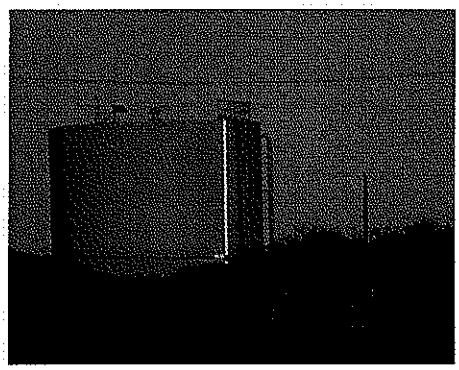
During the last few years, small drinking water systems have found it increasingly difficult to continue in operation. Many issues, such as increased regulatory requirements, increased operating costs, aged and undersized infrastructure and the lack of volunteer board members have created the need to rethink the operating approach. We also discovered that sometimes we retained the same individual for the same services, such as legal services, bookkeeping, auditing and engineering.

Why a regional approach?

The Lower Rio Grande Mutual Domestic Water Association was incorporated in 2007, to form a regional entity that would look into potential alternatives to the current operating approaches. The forming associations, which are mutual domestic utilities organized under the Sanitary Projects Act are: Berino MDWC & MSWA, Desert Sands MDWCA, La Mesa MDWCA, Mesquite MDWC & MSWA and Vado MDWCA. During the last few months, the group has researched different structures to continue work together. The Lower Rio Grande Public Works Authority is the new structure being proposed. The Authority, once created, will give the group the ability to resolve many challenges currently affecting all five associations. The Authority would also create additional benefits, such as:

- Promote economies of scale
- Reduce and/or eliminate duplication of efforts
- Increase technical, managerial and financial capacity
- Establish and define a service area
- Assure compliance with regulations
- Increase the ability to secure funding
- Increase drinking water reliability

Since the Lower Rio Grande group was established, it has been able to secure more than $2 million in public funds for planning, design and construction.



Berino MDWC & MSWA

La Mesa MDWCA

We invite you to stay involved in the process. For more information, please contact Martin Lopez at 575/233-3947.

Lower Rio Grande Fact Sheet/Hoja de Datos

The Lower Rio Grande Mutual Domestic Water Association became incorporated in 2007 for the purpose of forming a regional entity. The water system members of the regional entity are also mutual domestics organized under the Sanitary Projects Act. The association members of the regional entity are challenged by their management structure, limited in their ability to declare service area, old and undersized infrastructure and many other things.

La Asociación de Agua Doméstica Mutua de Lower Río Grande se incorporó en el año 2007 con el propósito de formar una entidad regional. Los miembros del sistema de agua de la entidad regional también son domésticos mutuos organizados bajo el Acta de los Proyectos Sanitarios. Los miembros de la asociación de la entidad regional se encuentran en una posición delicada por su estructura gerencial, sus habilidades de establecer el área de servicio son limitadas, la infraestructura deteriorada y subdimensionada y muchas otras cosas.

Issues	*Temas*	*Berino MDWC & MSWA*	*Desert Sands MDWCA*	*La Mesa MDWCA*	*Mesquite MDWC & MSWA*	*Vado MDWCA*
Number of Connections (meters)	*Número de conexiones (miras)*	760	542	430	1500	203
Population Served	*Población bajo servicio*	2280	1626	1290	4500	609
Original Incorporation Date	*Fecha original de incorporación*	1967	1975	1989	1968	1960
Regulatory Challenges	*Retos reglamentarios*	Arsenic Arsénico	Arsenic Arsénico	None Ninguno	Nitrate threat Amenaza de Nitrato	Nitrate threat Amenaza de Nitrato
Water Rights	*Derechos de agua*	483.9	340	73.62	875.42	0
Miles of water line	*Millas de tubería*	31.2	36	44.5	42.75	4.9
Number of Wells	*Número de pozos*	2	2	2	4	0
Storage Capacity	*Capacidad de almacenamiento*	250K	344K	250K	845K	150K
Colonia(s) Served	*Colonia(s) bajo servicio*	Berino	Las Palmeras, Montana Vista	La Mesa	Mesquite, Del Cerro, y Vado	Vado

The group is developing legislative language to form a higher structure, a regional authority, the Lower Rio Grande Public Works Authority. Through an authority structure, the group would be able to optimize the economies of scale, significantly reduce or potentially eliminate the redundancy of managerial, financial and technical operations, enforce on the issues the group is currently not able to by statute; and the ability to meet regulatory compliance with all the different regulatory agencies.

El grupo está desarrollando el lenguaje legislativo para formar una estructura más alta, una autoridad regional, bajo el nombre de Lower Rio Grande Public Works Authority. A través de una estructura de autoridad, el grupo tendrá la capacidad de optimizar las economías de escala, significativamente reduciría o potencialmente eliminaría la redundancia de funcionamientos directivos, financieros y técnicos, cumpliría con los requisitos que actualmente el grupo no es capaz de efectuar a través de estatutos, y tendría la habilidad de reunir los cumplimientos de normas con todas las diversas agencias reguladoras.

Lower Rio Grande Mutual Domestic Water Association

Member Associations:

BERINO MUTUAL DOMESTIC WATER & MUTUAL SEWAGE WORKS ASSOCIATION
P O Box 1628, Anthony NM 88021
1150 Berino Road, Berino NM 88024
(575) 882-5672 • Fax: (575) 882-4813
Email: berinomdw@zianet.com

DESERT SANDS MUTUAL DOMESTIC WATER CONSUMERS ASSOCIATION
P O Box 1864, Anthony NM 88021
59 Links Road, Berino NM 88024
(575) 882-0313 • Fax: (575) 882-0314
Email: dsmdwca@zianet.com

LA MESA MUTUAL DOMESTIC WATER CONSUMERS ASSOCIATION
P O Box 98, La Mesa NM 88044
(575) 233-4751

MESQUITE MUTUAL DOMESTIC WATER CONSUMERS & MUTUAL SEWAGE WORKS ASSOCIATION
215 Bryant • P.O. Box 349
Mesquite, NM 88048
(575) 233-3947 • Fax (575) 233-3961
E-mail: msqtwrt@zianet.com

VADO MUTUAL DOMESTIC WATER CONSUMERS ASSOCIATION
325 Holguin Road, Vado NM 88072
(575) 233-4161

Member Mutual Domestics:

Berino MDWC & MSWA
Desert Sands MDWCA
La Mesa MDWCA
Mesquite MDWC&MSWA
Vado MDWCA

Colonias (Communities) served:

Berino
Del Cerro
La Mesa
Las Palmeras
Mesquite
Montana Vista
Vado

Board

Robert M. Nieto-President (Mesquite)
Roosevelt Boyer-Vice President (Vado)
Rosaura Pargas-Director (Desert Sands)
Gabriel Gutierrez-Director (Berino)
Ismael Borunda-Director (La Mesa)
Santos Ruiz-Director at Large (Berino)
Karen Nichols-Secretary/Treasurer (Desert Sands)
Martin Lopez-Registered Agent (Mesquite)
(575) 571-3628

ITEM #3

Conjunctive Surface-Water / Ground-Water Model in the Southern Rincon Valley using MODFLOW-2005 with the Farm Process

by

Wolfgang Schmid[1]

Technical Report

Draft version subject to approval through the Dr. J. Phillip King, Consultant to the Elephant Butte Irrigation District

Prepared for the Elephant Butte Irrigation District, Las Cruces, NM

January 2009

[1]Research Hydrologist, Department of Hydrology and Water Resources, 1133 E James E. Rogers Way, University of Arizona, Tucson, AZ 85721, Phone: 520-621-1083; Fax: 520-621-1422

Department of Hydrology, University of Arizona

HYDROLOGY AND WATER RESOURCES

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Executive Summary

The Elephant Butte Irrigation District desired the construction of a small-scale hydrologic model located in the southern Rincon Valley within the EBID (Rincon Model) using MODFLOW with the Farm Process (MF-FMP). The purpose of the model is to obtain a tool to demonstrate an MF-FMP model on a pilot project scale before adopting MF-FMP for a regional model encompassing the entire EBID and to illustrate how MF-FMP can simulate (a) un-metered historic pumpage, (b) impacts of surface-water and ground-water abstraction on Rio Grande stream and return flow, and (c) scenarios of changing allotments influence deliveries and downstream stream gains/losses. The model was calibrated not only by observed ground-water levels and streamflows, but by observed cumulative farm well pumpage.

The local fine resolution Rincon Model is coupled to the pre-existing coarse resolution regional Rincon Valley and Mesilla Basin model (Weeden and Maddock, 1999) through boundary conditions derived from the regional model (Tillery and King, 2006). The local Rincon Model using MODFLOW-2005 with the Farm Process (MF2K5-FMP2) simulates evapotranspiration, recharge, and farm-well pumping independently but dynamically linked through their dependence on the ground-water level. Therefore, it does not require any data input for the Recharge Package of the regional model (Weeden and Maddock, 1999) anymore, which used a lumped net irrigation flux (estimates of recharge minus ET minus farm-well pumping). The local Rincon Model uses standard features of the Farm Process such as the distribution of 15 individual "family farms" (for larger models: water-balance regions simulated as "virtual farms"), 6 crop types, and 3 typical soil types. Each of these spatial entities is associated with attributes, such as, on-farm efficiency for farms, or crop specific consumptive use, fractions of transpiration and evaporation, root depths, and water stress response for crop types, or capillary fringes for soil types. More recent features of FMP2 are used, for instance, to specify locations of diversion and returnflow points along the stream-canal-drain network, where known, and to let the FMP2 automatically determine these points and associated flows, where not known. This allows the user to enter parameters that are known, whereas the FMP2 can compliment knowledge gaps such as estimates of unknown (i.e. unmeasured) surface-water deliveries or irrigation returnflows.

The model was calibrated using the parameter estimation code UCODE (Poeter and others, 2005) not only by observed ground-water levels and streamflows, but by observed cumulative farm well pumpage. Model parameters allowed to vary during model calibration were the hydraulic conductivity of layer one, the streambed hydraulic conductivity of the Rio Grande and of the Rincon Lateral, the on-farm efficiency, and the fraction of transpiration (latter two are lumped over time and over all farms or crop types, respectively). Several parameters of this UCODE run were highly correlated (efficiency correlated with fractions of transpiration, hydraulic conductivity of Rio Grande streambed correlated with hydraulic conductivity of aquifer layer one). These correlations could be natural but also could indicate that there may not have been enough information in the observations used to estimate parameter values that allow the analysis of specific farm operation. The scarce number of observations obtained from EBID and USGS sources (47 observations of water levels, streamflows, and cumulative pumpage) appears

insufficient for a complex multivariate parameter estimation without high parameter correlations. A better observation data basis may allow to initiate an MF-FMP model with simple time-space lumped parameter values, which then are differentiated into estimates varying over associated farms or crop types during the calibration and parameter estimation process. In order to eliminate parameter correlations for the local Rincon Model, the number of estimated parameters was reduced (streambed hydraulic conductivity of the Rio Grande was not used), but efficiency fraction-of-transpiration parameters could be differentiated into estimates for each irrigation season of years 2002 and 2003.

The simulated historic pumpage is one component of the output 'Farm Demand and Supply Budget.' Time series of these budget components reveal 4 groups of farms with respect to sufficiency and farm-well ownership. The first group are farms that own enough wells to compensate for occasional surface-water deficiencies (farms 7, 8, 9, 10, 11, 15). The cumulative maximum pumping capacity of wells of these farms was not exceeded during this dry-year period. That is, even if these farms were during some times 'surface-water deficient,' they remained 'ground-water sufficient.' The second group are farms that do not own wells but were able to operate sufficiently by minimizing their inefficient losses (farms 6 and 14). The third group are small farms that do not own wells and, even with 100% efficiency, were not able to sustain the necessary crop consumptive use (farms 2 and 4). The last group were farms that showed no irrigation requirement either because their fields were fallowed or solely fed by rain or phreatophytic uptake from shallow ground water (farms 1, 3, 5, 12, 13).

MF-FMP allows to break up the former "net irrigation flux" of the previous regional Rincon and Mesilla models into individual component that can vary over time and space and can interact dynamically (deep percolation, six different evaporation and transpiration components, and ground-water well pumping). These components are part of the output 'Farm Budget' that includes all physical flows into and out of each farm. 'Farm Budget' components *transpiratory root uptake* and *farm-well pumping* dynamically interact through their mutual dependency on the ground-water level and irrigation demand. For instance, for the pecan dominated farm 7 (Halsell farm), the water-level depletion during 2003 results in a reduction of transpiratory root uptake, hence, increased irrigation demand, and, as a result of allotment-limited surface-water deliveries, ultimately in increased farm-well pumping.

The impact of the entire agriculture system through surface-water and ground-water abstraction on the downstream Rio Grande streamflow can be described by a correlation between streamflows calculated by MF-FMP and HYDMOD and the cumulative farm irrigation pumpage yielded by the 'Farm Demand and Supply' data output file. The same model investigation technique could be applied to a more regional model and downstream streamflow deliveries (e.g., at the NM-TX state line). The result shows non-linear correlations between increasing surface-water or ground-water deliveries and streamflow during irrigation seasons. With increasing pumpage, the streamflow is depleted in form of an exponential decay. That is, streamflow depletion is non-linearly related to ground-water abstraction and the streamflow depletion diminishes as pumpage reaches highest levels. However, external factors may influence streamflow as well (e.g., natural precipitation and runoff, or constrained deliveries, such as equal

appropriation allotments). Relatively high maximum pumping capacities did not constrain the ground-water pumpage in the present Rincon Model.

Model scenarios tried to evaluate the effect of changing surface-water allotment heights specified for each irrigation stress period (1.2, 0.8, 0.4, 0.2, and 0.1 meters = 3.9, 2.6, 1, 0.65, and 0.33 feet) on surface- and ground-water deliveries and Rio Grande streamflow gains and losses (for 08/31/02 & 08/31/03). Increasing the equal appropriation allotment height causes a nonlinear increase in surface-water deliveries, a nonlinear decrease in ground-water pumping, a nonlinear increase in Rio Grande gains along the farming area before tributary drain returnflow, and a nonlinear decrease in Rio Grande gains when including drain returnflows. The model scenarios show the dynamic interdependence of operational constraints, such as surface-water allotments, surface- and ground-water deliveries, returnflows, and streamflow gains/losses. When allowing sufficiently high allotments, diversions are bound by the irrigation demand and, for some farms, by the available streamflow. In the present model, ground-water pumping could potentially be constrained by (relatively high) maximum pumping capacities, which however were not reached. The model scenarios also simulate reductions in drain returnflow to the Rio Grande, which can be explained by a declining water table and less farm irrigation returnflows in times when higher on-farm efficiency is required.

In summary, the local Rincon Model demonstrates how MF-FMP can estimate supplemental historic groundwater use and evaluate the large-scale impact of surface-water allotments on surface- and ground-water deliveries, streamflow, river seepage, and return flows. In the local Rincon Model, these scenarios were applied to hypothetic locations upstream and downstream the model farming area. In larger-scale models, MF-FMP can analyze analogous scenarios for instance at the New Mexico/Texas state line or the New Mexico/Mexico international border. Coupling the local Rincon Model to the regional Rincon Valley & Mesilla Basin ground-water model (Tillery and King, 2006, Weeden and Maddock, 1999) produced initial and boundary conditions through the telescopic mesh refinement technique (TMR). Inaccurate initial ground-water levels derived from the regional model follow errors in ground-surface elevations (up to 14 meters!) and stream-network topography but affected only the first stress period of the local Rincon Model. Instead of the TMR, we propose to use the Local Grid Refinement technology ((Mehl et al, 2005), which allows a local model to run simultaneously with a regional model across local model boundaries. For updates of this or any other models using MF-FMP within the EBID, we strongly recommend to obtain a better observation data base from additional observation wells and stream gage monitoring, which may require drilling new observation wells or constructing new stream gages along the Rio Grande. A higher density of stream gages would allow the stream gains or losses between these gages to be an additional observation parameter. Also, metered cumulative pumpage of farms should be monitored more densely and in more representative farm locations. Optimally, all farms of an MF-FMP model domain should report cumulative pumpage from their associated farm wells. This would not lead to a redundancy of MF-FMP's ability to simulate farm pumpage, but to the ability to obtain a 'pumpage-calibrated' model that can be transformed into a predictive model driven by management or climate scenarios. Once calibrated by cumulative pumpage data, an MF-FMP model can be one that water mangers can keep current by updating variable data or conditions, such as climate data or changing water rights. Hence, it can be used as a design tool to

plan water supplies for upcoming water years, for long-term predictive scenarios driven by climate change, and for water appropriation planning and negotiations.

This calibrated local Rincon Model could be compared in various ways to the new regional Rincon and Mesilla model of the New Mexico Office of the State Engineer (OSE model). The local Rincon Model could be compared against either a zone of the current OSE model or a zone of an MF2K5-FMP2-updated version of the OSE model. However, more advantageous than to compare the little local Rincon Model would be to compare regionally the OSE model to an according MF2K5-FMP2 update. This comparison would further delineate how the approaches to evapotranspiration, surface-water deliveries, ground-water pumpage, recharge, and streamflow gains and losses are affected by the decoupled approach used in the current OSE model versus the application with the FMP. These comparisons would help quantify any potential differences and help improve the overall set of hydrologic tools used to help guide the management and allocation of water resources in the Lower Rio Grande. This approach would also facilitate a better tool for making projections based on estimates of future short-term or long-term climate.

Acknowledgements and Disclaimers

This material is primarily based upon work supported by the Elephant Butte Irrigation District and upon collaboration with Dr. J.P. King (New Mexico State University, Las Cruces, New Mexico) and with Randall T. Hanson (USGS Water Science Center, San Diego, California). The author would like to thank Randy Hanson for sharing his valuable insights from other MF-FMP models that have been constructed under his leadership in California to assess the water availability in regional aquifer systems. Any opinions, findings, and conclusions of recommendations expressed in this material are those of the author.

LRGWUO EPA Grant Status

GRANTS	Vendor	Contract Amount	Paid to Date	Balance	Percent Complete (Payments)	STATUS
LRGWUO						Grant Expires - Sept. 30, 2009
Unified Groundwater Model-Rincon (WRRI)	NMSU - WRRI	$ 75,378.00	$ 50,468.49	$ 24,909.51	67%	Expect deliverables at Tech Comm mtng in January.
Original Proposal		$ 44,150.00	$ 44,150.00	$ -	100%	
Amended Proposal		$ 31,228.00	$ 6,318.49	$ 24,909.51	20%	
Unified Groundwater Model-Rincon (EBID)	EBID	$ 45,900.00	$ -	$ 45,900.00	0%	Work Ongoing.
Total Grants		*$ 121,278.00*		*$ 70,809.51*		

Item #4