HYDROLOGY OF DOMESTIC WELLS IN NEW MEXICO

ALBUQUERQUE GEOLOGICAL SOCIETY SEPTEMBER 7, 2005

> W. Peter Balleau Balleau Groundwater, Inc.



"Water is fundamental for life and health. The human right to water is indispensable for leading a healthy life in human dignity. It is a prerequisite to the realization of all other human rights".

(U.N. Committee on Economic Cultural and Social Rights)

<u>Year</u>	Bill	<u>Purpose</u>
Year 2000	Senate Bill 99 and House Bill 482	Ban on domestic wells in municipal service areas
Year 2002	House Bill 307	Restrict domestic wells where there is no unappropriated water or where Interstate Compacts may be affected
Year 2003	House Bill 307 and Senate Bill 565	Domestic wells to be subject to municipal ordinances • Define "CMA" of "heightened protection because water resources may be inadequate to sustain well production as evidenced by excessive drawdown rates or reduced aquifer thickness" • OSE may declare CMA "to prevent impairment of existing water rights" or if "likely to affect the state's obligations pursuant. to an interstate compact" • Deny or limit domestic permits in CMAs • Bar new appropriation for domestic use in CMAs, but allow
		 transfers Limit transfer without public notice to one AFY for domestic wells Require that new domestic wells be supported by existing rights to a density of 0.5 AF per unit. Note: The State Engineer stated he supported the Bill because it allows "denial of a domestic well permit if it impairs rivers, streams or groundwater in high water use areas"

<u>Year</u>	Bill	<u>Purpose</u>
Year 2003	Senate Bill 484	Define "household" and "shared household" wells •Domestic wells to be subject to municipal ordinances •Limit household wells to one AFY (shared three AFY) with metering and reporting •Verify usage and fine \$1,000/AF overage
Year 2004	Senate Bill 89	Provides for critical management areas (CMA) where water resources are inadequate to sustain well production as evidenced by water level decline rates and available aquifer thickness •Provides heightened protection where depletions faffect Interstate Compact delivery requirements" •Limit domestic wells to 0.5 All on a CMA unless rights are transferred or discontinued in the CMA

OTHER CONCERNS IN NEW MEXICO

- Subdivision land use
- Shared drought discipline
- Escape from administrative review
- Competition with other rights
- "Free" domestic water
- Water-borne disease
- Well-service lifetime
- Aquifer contamination in unsewered areas
- Issues of "hard" or "soft" sustainability



YIELD COMPONENTS OF PROPERLY-CONSTRUCTED DOMESTIC WELL

DISTRIBUTION OF PROPERLY CONSTRUCTED WELLS IN NEW MEXICO



GROWTH OF DOMESTIC WELL PERMITS AND POPULATION IN NEW MEXICO





DOMESTIC WELLS AND AQUIFERS IN NEW MEXICO

WATER TABLE ELEVATION AND DEPTH IN NEW MEXICO

Legend

Water Table Depth (feet)

< 50 feet

Water Table Contours (feet)

HOUSEHOLD WATER BALANCE AT SHALLOW WATER TABLE NEAR A STREAM

COMPONENTS OF DOMESTIC WATER ROUTING AT ALLUVIAL SITE (YEAR 2040)

HOUSEHOLD WATER BALANCE AT DEEP WATER TABLE NEAR A STREAM

MAXIMUM POSSIBLE DRAWDOWN FROM PUMPING

SUBDIVISION DOMESTIC WELL TEST

- I. Drill and install a properly-constructed domestic well on the subdivision site.
- Pump the well under controlled conditions at a rate of 5 to 20 gpm for 24 hours.
- 3. Collect water-level recovery data for three days after the end of pumping.
- Calculate the radius of influence of the test and check if additional wells and tests are needed to get a representative sample of the subdivided area.

RECOVERY TREND IN GROUNDWATER SYSTEM WITH BOUNDARIES IN AREA OF INFLUENCE

Trend A is the Theis recovery trend indicating standard projection to t/t' = 1.0

Trend B has the 3-day recovery measurement at a lesser water level indicating steeper slope and smaller transmissivity in projection to t/t' = 1.0

Trend C indicates a flatter slope and larger transmissivity in projection to t/t' = 1.0

NEW MEXICO OFFICE OF THE STATE ENGINEER ADMINISTRATIVE MODELS FOR 17 AREAS

40-YEAR WATER TABLE DRAWDOWN IMPACT OF DOMESTIC WELLS IN THREE MODELED BASINS

LAYOUT OF PERENNIAL **STREAMS AND GROWTH OF** DOMESTIC WELL DENSITY **TO YEAR 2040 IN STATEWIDE** MODEL

Model Cells Representing Perennial Water Features Simulated Growth of Domestic Well Density to Year 2040 50 - 313 Wells/Sq-Mi 5 - 50 Wells/Sq-Mi 1 - 5 Wells/Sq-Mi No Growth Simulated

C o n D

MODEL PROPERTIES				
Minor Aquifers	0.2 ft / day			
Basin Fill	2 ft / day			
Limestone Aquifers	20 ft / day			
Specific Yield:	15 percent basin fill			
	2 percent other material			

ZOOM OF GROWTH OF DOMESTIC WELL DENSITY TO YEAR 2040

40 YEAR FUTURE DRAWDOWN IMPACT OF CURTAILING GROWTH OF WELLS IN NEW MEXICO

STREAM DEPLETION TABLE

Stream Depletion (AFY)						
River Basin	Year 2000 - 136.800 Existing Domestic Wells Producing 41.000 AFY	Year 2040 Existing + Growth = 203.000 Wells Producing 60.900 AFY	Year 2040 w/o Grown 136,800 Wells Producing 41,000 AFY	Salvaged Streamflow by Curtailing Growth of 66 200 Wells Producing 19 700 AFY		
Rio Grande	8030	14580	10150	4430		
Pecos	1290	1980	1780	200		
San Juan	1010	1520	1270	250		
Gila- San Francisco	780	1250	1090	160		
Canadian	480	700	580	120		
Other	190	280	300	-20		
	11780	20310	15170			

Interstate Stream	Year 2000 – 2040 Impact Subject to Curtailment (AFY)	Average Flow (AFY)	Domestic Well Impact Ratio
Rio Grande			
Pecos	200	134,000	0.0015
San Juan	250	1,598,000	0.0001
Gila	160	44,900	0.0011

THE MIDDLE RIO GRANDE WATER SUPPLY FROM OTOWI AND INTERNAL TRIBUTARIES

- 650,000 AFY delivered to Texas under the Compact
- 243,000 AFY consumed by unmanaged riparian losses
- 479,000 AFY consumed by permitted uses
- 19,000 AFY or more due to occasional spills from Elephant Butte

Source: S.S. Papadopulous & Associates, Inc., June 16, 2000, Draft Middle Rio Grande Water Supply Study.

INTERVENTIONS

- Impairment
 Critical Management Area
 Deny Domestic Well Permits
 Require Rights
 Cut 3 AF Allowance
 Indoor Use Only
 Metering
- Properly-Constructed Wells

CHANGE IN HYDROLOGY

None < 5 ft 0 Net None Change in Gardens Only 1000 AFY, Lose Consumer Utility \$4 Million/yr, Nil Water \$4Million/yr, Reliable Domestic wells are among the most valuable, safest, and least harmful water uses in the state.

Reference: W. Peter Balleau and Steven E. Silver

HYDROLOGY AND ADMINISTRATION OF DOMESTIC WELLS IN NEW MEXICO

Fall 2005 Natural Resources Journal (In-press)

Statewide Model at: http://www.balleau.com/materials/Dom_Wells.pdf