

Exhibit 18A: Detailed Discussion of Alternative 18—Urban Conservation

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 Myra Segal Friedman of EJJ Associates 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.

This exhibit contains some of the detail behind the findings reported in the A-18 analysis.

The estimate of total water saved through conservation is based on an assumption that the gallons per capita per day (gpcd) is reduced according to the goals presented in Table 18-1. Reduced water consumption can be realized through a combination of efforts including reduced use for residential indoor, residential outdoor, parks, golf courses, repair of leaky infrastructure, and changes in lifestyle. The tables in this exhibit are an estimate of savings that could result from these efforts.

Table 18A-1. Estimated Current Water Use by Public Water Supplies and Domestic Wells In Bernalillo, Sandoval, and Valencia Counties

Regional Water Supplies ^a	Population ^b	Estimated Current Water Use		
		Ac-Ft/Yr	% of Use in MRG Planning Region	Gallons per Person per Day ^c
<i>Bernalillo County</i>				
Albuquerque	483,053	110,388	73.9	204
Other Public Water Supply	36,588	11,836	5.3	289
Total Public Water Supply	519,641	118,377	79.2	203
Domestic wells ^d	49,413	5,573	3.7	100
Total Bernalillo County	569,054	123,950	82.9	194
<i>Sandoval County</i>				
Rio Rancho	51,765	10,744	7.2	185
Other Public Water Supply	12,346	1,743	1.2	126
Total Sandoval Public Water Supply	64,111	12,487	8.4	174
Domestic wells ^d	25,797	2,829	1.9	100
Total Sandoval County	89,908 ^e	20,910	14	152
<i>Valencia County</i>				
Belen	6,901	1,473	1.0	191
Other Public Water Supply	26,073	4,994	3.3	171
Total Valencia Public Water Supply	32,974	6,467	4.3	175
Domestic wells ^d	33,178	3,716	2.5	100
Total Valencia County	66,152	10,183	6.8	137
Total Public Water Supply Use	616,726	141,178	91.9	204
Total Domestic Wells ^d	108,388	12,118	8.1	100
Estimated Total Use in Region	725,114	149,449	100.0	184

General Sources: *Historical and Current Water Use in the Middle Rio Grande Region*, prepared for the Middle Rio Grande Council of Governments and the Water Assembly, by John Shomaker & Associates, June 2000

- Summary of water use in acre-feet, in New Mexico counties, Table 4, 2000, October 4, 2002, Compiled by Brian Wilson, Office of the State Engineer
- Public Water Supply. Withdrawals and depletions in acre-feet, in New Mexico counties, 2000 Compiled by Brian Wilson, Office of the State Engineer, October 29, 2002

^a Domestic (self-supplied) Withdrawals and depletions in acre-feet, in New Mexico counties, 2000. Compiled by Brian C. Wilson, New Mexico Office of the State Engineer, October 29, 2002

^b Census Population For Incorporated Cities, Towns, Villages And CDPs (Census Designated Places, Areas Defined to Identify Non-Incorporated Places) , U. S. Census 2000

^c Divide total water use by population

^d Domestic (self-supplied) Withdrawals and depletions in acre-feet, in New Mexico counties, 2000. Compiled by Brian C. Wilson, New Mexico Office of the State Engineer, October 29, 2002 (data sent directly from Brian Wilson)

^e 2000 Census <http://www.mrgcog.org/2000socioeconomic/2000econmhmpg.htm>

Table 18A-2. Estimate of Gallons per Person per Day Before and After Proposed Water Conservation Measures Implemented and Reduction from Current Use

Category	Albuquerque Usage Before Plan (2002) ^a		Albuquerque Usage After Plan Fully Implemented (at 2002 Population)		Reduction From Current Use to 100% Conservation Implementation	
	gpcd	%	gpcd	%	gpcd	%
Total non-ag use	204	100	120	100	84	41
Residential outdoor ^b	40	20	20	17	20	50
Residential indoor	60	29	45	38	15	25
Industrial	5	2	4	3	1	20
Commercial ^c	53	26	21	18	32	60
Parks & golf courses and other institutional uses	23	11	12	10	12	50
Unaccounted-for Water	23	11	18	15	5	22

^a Distribution of use is based on Albuquerque billing data as follows: 204 gpcd is comprised of the following elements: 100 gpcd for residential use + 23 gpcd for institutional/municipal public spaces + 33 gpcd for commercial + 20 gpcd for multi-family + 23 gpcd for unaccounted for water + 5 gpcd for industrial. Source: City of Albuquerque Public Works water billing data, personal communication with Jean Witherspoon, October 14, 2002

^b Includes multi-family use, though Albuquerque data often accounts for water use by multi-family residences in the commercial category. Multi-family usage accounts for approximately 40% of commercial billing amounts. Personal Communication with Jean Witherspoon, April 17, 2001

^c Multi-family use is combined with Residential

Table 18A-3. Estimated Savings and Costs Attributed to Installation of Water Conserving Fixtures and Appliances

Non-Conserving Fixture From Installed From 1980-1990: Water Use Rating	Average Use	Estimated Use of Older Fixtures	Estimated Water Use of Conserving Fixture in Gallons/Use and gpcd for Fixture ^a	Estimated Water Savings When Replaced With a Water Conserving Fixture (gpcd)	Estimated Cost of Replacement ^b
Toilet 3.5 gal/flush ^c	5.1 flushes/ person/day	17.9 gpcd	1.6 gpf (gal/flush) = 8.2 gpcd	9.7	\$100
Toilet 5.0 gal/flush ^c	"	25.5 gpcd	(1.6 gpf = 8.2 gpcd)	17.3	\$100
Showerhead 4.0 gal/minute ^c	5.3 minutes/ person/day	14.1 gpcd	1.8 g/m (gal/minute) for 3.5 gpm rated = 9.5 gpcd	5.3	\$25
Faucets 3.0 gal/minute ^c	8 minutes/ person/day	16.2 gpcd	1.0 g/m = 8 gpcd	8.1	\$100
Dishwasher 14gal/load ^a	322 loads /year	4.8 gpcd	7 gal/load = 2.4gpcd	0.7	\$500-\$1,000 \$100-500 more than standard model
Clothes washer 51 gal/load ^c	392 loads /year	21 gpcd	27 gal/load = 11.2 gpcd	8.9	\$600-\$1,100 \$200-\$700 more than standard model
Misc. (leaks, guests, etc.) ^c			5.7 gpcd		
Total potential savings of low- water-use indoor fixtures & lifestyle			45 gpcd	40.3 gal/person/day	
Evaporative Cooling ^d	10,758 gal. for 1,130 cooling season = 29 gal/day spread over yr.	11.3 gpcd	6 gpcd w/reduced use and eliminate bleed-off coolers		

^a Assume average of 2.6 persons/household (<http://www.mrgcog.org>)

^b <http://www.waterwiser.org> and associated links

^c Source: Amy Vickers & Assoc Inc, Handbook of Water Use & Conservation ¹

^d Source: B. C. Wilson, P.E. Office of State Engineer Technical Report 48 ²

Table 18A-4. Estimated Water Savings from Reducing the Size, Plantings and Water Rate for Residential Landscapes After 100% Implementation of OSE Conservation Subdivision Guidelines ^a

Municipality	Single Family Units ^b	Multi-Family Units ^b	Estimated Average Yard Size per Household in 2000 (ft ²) ^c	Estimated Yard Size Single Family After Conservation Plan Fully Implemented (ft ²)	Annual Gal/ft ² for Bluegrass ^d	Gal/ft ² Yr for Buffalo Grass or Xeriscape ^d	Low-Water Landscape Gallons /Dwelling Unit/ Person/ Day ^d
<i>Bernalillo County</i>							
Albuquerque	126,643	63,285	3,500	800	50	25	21
Los Ranchos	1,252	103	4,000	800	44	15	13
Tijeras	143	0	100	100	45	15	2
Bernalillo County Total	158,115	65,084					
<i>Sandoval County</i>							
Bernalillo town	1,276	126	1,250	800	43	15	13
Corrales	2,462	247	900	800	45	15	13
Cuba	137	34	100	100	45	15	2
Jemez Sp	133	9	900	800	45	15	13
Rio Rancho	17,641	2,152	1,750	800	45	15	13
San Ysidro	51	2	100	100	45	15	2
Sandoval County Total	28,646	2,469					
<i>Valencia County</i>							
Belen	1,828	431	1,500	800	48	15	13
Bosque Farms	1,076	4	900	800	45	15	13
Los Lunas	2,670	467	1,500	800	45	15	13
Valencia County Total	14,913	1,124					
Three County Total	201,674	68,677					

Source: 2000 census on mrgcog.org, Office of State Engineer, Technical Report 48, By Brian Wilson, Personal Communication with Claude Cisneros, City of Albuquerque Conservation Office

^a Recommended Guidelines for County Subdivision Regulations for Water Supply and Demand, Brian Wilson, P.E., New Mexico Office of the State Engineer, May 2000

^b 2000 Census as reported on www.mrgcog.org summaries for member counties

^c Personal Communication with Claude Cisneros, xeriscape and rebate specialist, City of Albuquerque Public Works, October 30, 2002

^d Recommended Guidelines for County Subdivision Regulations for Water Supply and Demand, Brian Wilson, P.E., New Mexico Office of the State Engineer, May 2000

Parks and Golf Courses

- Assumptions: new acreage of green space is not added; savings estimate is at 100% implementation; changes are phased in over 10 years.
- Assume the cost per square foot is the same for changing out public or privately-owned landscapes. Cost would include labor, low-water plantings, mulch and conversion of the irrigation system. Assume cost to reduce grass to mulch involves labor and materials for removal of grass and excavating down so mulch will not slip off.
- Assume current water use for high-water horticulture and turf is 43 and 50 gallons/square foot, respectively. Low water landscape would use 13 and 21 gallons/square foot for drip irrigated horticulture and buffalo grass, respectively³.

Table 18A-5. Estimated Water Savings by Reducing the Amount of Watering and Reducing Turf Areas for Parks and Golf Courses in Albuquerque

	Estimated Water Use in 2000(ac-ft/yr)	Estimated Water Savings with Turf Area Reduced 30% and Water at 32 in/ft ² ^a	Estimated % Savings Reduce Turf Area and Reduce Amount of Watering
Private Golf Courses in Albuquerque	3,060	1,480	48%
Public Golf Courses in Albuquerque	1,850	920	50%
Parks and Medians in Albuquerque	5,090	1,390	27%
Estimated Total	10,000	3,790	38%

Source: Jean Witherspoon, City of Albuquerque Conservation Office Billing Data, April 2001

^a Water use at the three types of listed golf courses/parks is currently 46, 45 and 35 inches per ft², respectively) (ac-ft/yr)

**Table 18A-6. Estimated Water Savings Resulting from
Reduced Residential Landscape Area and Watering Rates**

	Single Family Dwelling Units ^a	Multi-Family Units ^b	Estimated Existing Average Area of High Water Use Residential Landscape Per Household ^c	Estimated Best Case Potential Savings (ac-ft/yr) ^d
Albuquerque	126,643	63,285	3500	90,344
Rio Rancho	17,641	2,152	1250	2,396
Other Locations in Water Planning Area	57,390	3240	100 to 1,250	1,899
Regional Total	201,674	68,677		94,639

^a 2000 census on mrgcog.org

^b Wilson, 1997. Technical Report 48, Appendix C

^c Personal Communication with Claude Cisneros, City of Albuquerque Conservation Office, October 29, 2002

^d Obtained by reducing new and existing irrigated landscape from current average area (in 4th column) to 800 ft² and converting to low-water-use plants and irrigation at suggested rates in Table 18-4A (Wilson, 1997, Technical Report 48)

Estimated Cost to Reduce Existing High Water Use Turf, Landscaping and Sprinkler Systems to Low Water Plantings or Mulch and Drip Irrigation System

The following Table (18A-7) estimates the existing acreage of high–water-use landscapes in the region. Landscape area covered in this table includes Albuquerque golf courses, parks and irrigated medians and residential landscapes in the water planning region. Reductions are assumed to be as follows:

- Parks and golf courses reduce their high-water turf by 30 percent. Residential landscapes reduce their irrigated area to an equivalent of 800 ft². The cost to change out landscape and irrigation systems for these areas is assumed to be \$2.00/ft². It is assumed that reduction in turf area results in planting of low-water drought-tolerant plants and drip irrigation systems (not "zeroscape").

Table 18-7. Estimated Cost to Reduce the Area and Change Out Plantings and Irrigation Systems for Residential Landscapes, Golf Courses, and Parks/Medians

Cost to implement	Existing area in acres	Number of acres to convert from high water use to low or no water use (30%)	Estimated cost (at \$2.00/ft ² .) to change out plantings & irrigation system for converted acreage ^a
Residential Landscaping	21,700	16,735	\$433,000,000
Private Golf Courses	850	255	\$22,000,000
Public Golf Courses	500	150	\$13,000,000
Parks	2000	600	\$52,000,000
Total	25,050	17,740	\$520,000,000

^a Estimated cost/ft² as provided by City of Albuquerque Conservation Office and Office of the State Engineer Conservation Office. One acre = 43,560 ft².

Conversion Factors Used for A-18

1 acre-foot =	325,851	gallons
1 inch of water =	27,200	gal/acre
1 acre =	43,560	sq ft
Average household =	2.6	persons

¹ *Handbook of Water Use and Conservation*, pages 25,27,88,103,118,128

² *Water Conservation and Quantification of Water Demand in Subdivision, A Guidance Manual for Public Officials and Developers Technical Report 48*; Prepared by Brian C. Wilson, P.E., Office of the State Engineer, May 1996

³ *Technical Report 48*, B. Wilson, Office of the State Engineer, Appendix C