

Exhibit 2007 Groundwater Pumping Estimates

Table 1 - Acres Irrigated by Groundwater in 2006

County (or portion of County in the Republican River Basin study area)									
Item	Cheyenne	Kit Carson	Lincoln	Logan	Phillips	Sedgwick	Washington	Yuma	Total
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Sprinkler	10,635	138,343	2,367	5,721	66,374	21,859	37,047	257,698	540,045
Flood	102	1,748	0	0	2,262	584	0	1,206	5,902
Total	10,737	140,090	2,367	5,721	68,636	22,442	37,047	258,904	545,947

Source: 2005 Aerial Photographs

Table 2 - Efficiency Factors for Estimating Pumping In Colorado

Year	Percent of CIR Met by Pumping (%)	Sprinkler Irrigation			Flood/Gated Pipe/Furrow Irrigation		
		Maximum Farm Efficiency	Pumping Lost to Spray Loss	Pumping to Deep Percolation	Maximum Farm Efficiency	Net Surface Water Runoff	Pumping to Deep Percolation
		(%)	(%)	(%)	(%)	(%)	(%)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
2006	75%	80%	3%	17%	65%	5%	30%

Source:

- (2) Data from "150 Well Water Right Change Study" (See Table 5 of Helton & Williamsen memorandum entitled)
- (3) Estimated
- (4) Estimated
- (5) Calculated as 100% - Column(3) - Column(4)
- (6) Estimated
- (7) Initial surface water runoff is estimated to be 10%. Estimated that 5% deep percolates back into aquifer after it leaves the end of the field and 5% returns to the stream or is consumed.
- (8) Calculated as 100% - Column(6) - Column(7)

Table 3 - Crop Irrigation Requirement (units of inches)

County (or portion of County in the Republican River Basin study area)									Weighted Average Using Acres in Table 1
Year	Cheyenne	Kit Carson	Lincoln	Logan	Phillips	Sedgwick	Washington	Yuma	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
2006	19.85	21.79	23.66	21.79	18.20	19.57	20.79	13.03	16.99

Sources:

- Potential consumptive use estimated using the Hargreaves equation calibrated to the Penman-Monteith equation.
- Effective rainfall estimated using procedure outlined in TR-21.
- Crop mix from NASS data was used to weight the CIR for each county.
- See memorandum by Helton & Williamsen entitled "Crop Consumptive Use Requirements - Republican River Basin in Colorado" dated November 19, 2002.

Table 4 - Gain in Soil Moisture from Winter and Spring Precipitation (units of inches)

County (or portion of County in the Republican River Basin study area)									Average
Year	Cheyenne	Kit Carson	Lincoln	Logan	Phillips	Sedgwick	Washington	Yuma	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
2006	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00

Source:

- 1) "Republican River Basin Water Management Study - Working Paper - Farm Water Management", Steven J. Vandas, United States Bureau of Reclamation, March 1983
- 2) As a check on reasonableness
 - Average Monthly Precipitation for Yuma County in April and May = 4.8 inches
 - Average Monthly Consumptive Water Requirement for Corn Grain in Yuma County in April and May = 1.2 inches
 - Which results in 4.8" - 1.2" = 3.6" of precipitation that becomes surface water runoff, deep percolation, soil evaporation, or a gain to soil moisture storage.

Table 5 - Net Crop Irrigation Requirement (units in inches)

County (or portion of County in the Republican River Basin study area)									Weighted Average Using Acres in Table 3
Year	Cheyenne	Kit Carson	Lincoln	Logan	Phillips	Sedgwick	Washington	Yuma	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
2006	17.85	19.79	21.66	19.79	16.20	17.57	18.79	11.03	14.99

Calculated as Table3 minus Table 4

Table 6 - Irrigation Groundwater Pumping (acre-feet)

County (or portion of County in the Republican River Basin study area)									
Year	Cheyenne	Kit Carson	Lincoln	Logan	Phillips	Sedgwick	Washington	Yuma	Total
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Sprinkler	14,829	213,876	4,006	8,846	84,002	30,001	54,395	222,034	631,990
Flood	175	3,326	0	0	3,524	986	0	1,279	9,289
Total	15,004	217,202	4,006	8,846	87,526	30,988	54,395	223,314	641,279

For each county pumping is calculated as

- Sprinkler Pump = Sprinkler Irrig Acres (Table 1) x % CIR (Table 2, column2) x Net CIR/12 (Table 5) / Sprinkler Efficiency (Table2, column3)
- Flood Pump = Flood Irrig Acres (Table 1) x % CIR (Table 2, column2) x Net CIR/12 (Table 5) / Flood Efficiency (Table2, column6)

Table 7 - Recharge From Groundwater Pumping in Colorado (acre-feet)

County (or portion of County in the Republican River Basin study area)									Total
Year	Cheyenne	Kit Carson	Lincoln	Logan	Phillips	Sedgwick	Washington	Yuma	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Sprinkler	2,521	36,359	681	1,504	14,280	5,100	9,247	37,746	107,438
Flood	52	998	0	0	1,057	296	0	384	2,787
Total	2,573	37,357	681	1,504	15,337	5,396	9,247	38,130	110,225

For each county recharge is calculated as

- Sprinkler Recharge = Sprinkler Pump (Table 6) x Sprinkler Pump to Deep Percolation (Table2, column5)
- Flood Recharge = Flood Pump (Table 6) x Flood Pump to Deep Percolation (Table2, column8)