Appendix 7: Predevelopment and Recent (2000) Groundwater Budget Estimates for Each Hydrographic Area within the Great Basin Carbonate and Alluvial Aquifer System Study Area

By Melissa D. Masbruch

Appendix 7 of
Conceptual Model of the Great Basin Carbonate and Alluvial Aquifer System

Edited by Victor M. Heilweil and Lynette E. Brooks

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Marcia K. McNutt, Director

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Conversion Factors

Inch/Pound to SI

Multiply	By	To obtain
	Length	
inch (in.)	2.54	centimeter (cm)
inch (in.)	25.4	millimeter (mm)
foot (ft)	0.3048	meter (m)
mile (mi)	1.609	kilometer (km)
	Area	
acre	4,047	square meter (m^2)
acre	0.4047	hectare (ha)
square mile (mi^2)	2.590	square kilometer (km^2)
	Volume	
gallon (gal)	3.785	liter (L)
gallon (gal)	0.003785	cubic meter (m^3)
gallon (gal)	3.785	cubic decimeter (dm^3)
cubic foot (ft^3)	28.32	cubic decimeter (dm^3)
cubic foot (ft^3)	0.02832	cubic meter (m^3)
acre-foot (acre-ft)	1,233	cubic meter (m^3)
acre-foot (acre-ft)	0.001233	cubic hectometer (hm^3)
	Flow rate	
acre-foot per year (acre-ft/yr)	1,233	cubic meter per year (m^3/yr)
acre-foot per year (acre-ft/yr)	0.001233	cubic hectometer per year (hm^3/yr)
foot per year (ft/yr)	0.3048	meter per year (m/yr)
cubic foot per second (ft^3/s)	0.02832	cubic meter per second (m^3/s)
cubic foot per day (ft^3/d)	0.02832	cubic meter per day (m^3/d)
gallon per minute (gal/min)	0.06309	liter per second (L/s)
	Hydraulic conductivity	
foot per day (ft/d)	0.3048	meter per day (m/d)
inch per day (in./d)	25.38	millimeter per day (mm/d)
	Transmissivity*	
foot squared per day (ft^2/d)	0.09290	meter squared per day (m^2/d)

Note: The conversion factors given above are for the entire report. Not all listed conversion factors will be in any given chapter of this report.

Temperature in degrees Celsius (°C) may be converted to degrees Fahrenheit (°F) as follows:
°F=(1.8×°C)+32

Temperature in degrees Fahrenheit (°F) may be converted to degrees Celsius (°C) as follows:
°C=(°F-32)/1.8

Temperature in kelvin (K) may be converted to degrees Fahrenheit (°F) as follows:
°F=1.8K-459.67

Temperature in kelvin (K) may be converted to degrees Celsius (°C) as follows:
°C=K-273.15

Vertical coordinate information is referenced to the North American Vertical Datum of 1988 (NAVD 88).

Horizontal coordinate information is referenced to the North American Datum of 1983 (NAD 83).

Altitude, as used in this report, refers to distance above the vertical datum.

*Transmissivity: The standard unit for transmissivity is cubic foot per day per square foot times foot of aquifer thickness [(ft^3/d)/ft^2]ft. In this report, the mathematically reduced form, foot squared per day (ft^2/d), is used for convenience.

Appendix 7: Comparison of Predevelopment and Recent (2000) Groundwater Budget Estimates for Each Hydrographic Area within the Great Basin Carbonate and Alluvial Aquifer System Study Area

By Melissa D. Masbruch

Table A7–1. Predevelopment and recent (2000) groundwater budget estimates for each hydrographic area within the Great Basin carbonate and alluvial aquifer system study area.

[All values in acre-feet per year rounded to two significant figures. Estimated error in recharge values is ±50 percent. Estimated error in discharge values is ±30 percent. Values in blue are for predevelopment conditions. Values in red are for recent (2000) conditions. Decrease in natural discharge and/or storage: calculated as the difference of well withdrawals and recharge from unconsumed irrigation and public supply water from well withdrawals. Minimum decrease in groundwater storage: calculated as the difference of the decrease in natural discharge and/or change in storage and groundwater discharge under predevelopment conditions, if the difference is greater than zero. Abbreviations: HA, hydrographic area; #, number; —, no estimate]

HA #	HA name	Groundwater recharge for pre-development conditions	Recharge from unconsumed irrigation and public supply water from well withdrawals (2000)	Groundwater recharge for recent (2000) conditions	Groundwater discharge for pre-development conditions	Well withdrawals (2000)	Decrease in natural discharge and/or storage (net well withdrawals) (2000)	Minimum decrease in groundwater storage (2000)	Groundwater discharge for recent (2000) conditions
	Flow System 7: Humboldt System								
42	Marys River Area	51,000	630	52,000	28,000	2,100	1,500	—	29,000
43	Starr Valley Area	42,000	300	42,000	20,000	1,000	700	—	20,000
44	North Fork Area	46,000	[1]0	46,000	24,000	1,700	1,700	—	24,000
45	Lamoille Valley	17,000	360	17,000	17,000	1,200	840	—	17,000
46	South Fork Area	13,000	24	13,000	4,500	80	56	—	4,500
47	Huntington Valley	48,000	140	48,000	14,000	470	330	—	14,000
48	Tenmile Creek Area	28,000	1,000	29,000	4,000	3,400	2,400	—	5,000
49	Elko Segment	3,600	2,500	6,100	12,000	8,300	5,800	—	14,000
50	Susie Creek Area	6,100	87	6,200	1,800	290	200	—	1,900
51	Maggie Creek Area	9,000	[1]0	9,000	9,100	18,000	18,000	—	9,100
52	Marys Creek Area	1,200	220	1,400	17,000	740	520	—	17,000
53	Pine Valley	26,000	45	26,000	25,000	150	100	—	25,000
54	Crescent Valley	6,300	[1]0	6,300	13,000	32,000	32,000	—	13,000
55	Carico Lake Valley	5,200	140	5,300	7,600	460	320	—	7,700
56	Upper Reese River Valley	51,000	1,400	52,000	41,000	4,700	3,300	—	42,000
59	Lower Reese River Valley	4,600	[1]3,000	7,600	25,000	32,000	29,000	—	28,000
60	Whirlwind Valley	100	1,800	1,900	990	6,100	4,300	—	2,800
61	Boulder Flat	3,200	[1]13,000	16,000	30,000	90,000	77,000	--	43,000
62	Rock Creek Valley	2,100	18	2,100	1,100	60	42	—	1,100
63	Willow Creek Valley	13,000	48	13,000	0	160	110	—	50
	Flow System 23: Monte Cristo Valley								
136	Monte Cristo Valley	1,300	6.0	1,300	400	20	14	—	410

Table A7–1. Predevelopment and recent (2000) groundwater-budget estimates for each hydrographic area within the Great Basin carbonate and alluvial aquifer system study area.—Continued

[All values in acre-feet per year rounded to two significant figures. Estimated error in recharge values is ±50 percent. Estimated error in discharge values is ±30 percent. Values in blue are for predevelopment conditions. Values in red are for recent (2000) conditions. Decrease in natural discharge and/or storage: calculated as the difference of well withdrawals and recharge from unconsumed irrigation and public supply water from well withdrawals. Minimum decrease in groundwater storage: calculated as the difference of the decrease in natural discharge and/or change in storage and groundwater discharge under predevelopment conditions, if the difference is greater than zero. Abbreviations: HA, hydrographic area; #, number; —, no estimate]

HA #	HA name	Groundwater recharge for pre-development conditions	Recharge from unconsumed irrigation and public supply water from well withdrawals (2000)	Groundwater recharge for recent (2000) conditions	Groundwater discharge for pre-development conditions	Well withdrawals (2000)	Decrease in natural discharge and/or storage (net well withdrawals) (2000)	Minimum decrease in groundwater storage (2000)	Groundwater discharge for recent (2000) conditions
Flow System 24: South-Central Marshes									
117	Fish Lake Valley	24,000	8,700	33,000	25,000	29,000	20,000	—	34,000
118	Columbus Salt Marsh Valley	1,500	6.0	1,500	4,000	20	14	—	4,000
137A	Big Smoky Valley-Tonopah Flat	11,000	2,200	13,000	6,000	7,300	5,100	—	8,200
141	Ralston Valley	8,400	110	8,500	2,500	370	260	—	2,600
142	Alkali Spring Valley	1,100	9.0	1,100	400	30	21	—	410
143	Clayton Valley	3,600	4,200	7,800	24,000	14,000	9,800	—	28,000
149	Stone Cabin Valley	5,000	480	5,500	1,500	1,600	1,100	—	2,000
Flow System 25: Grass Valley									
138	Grass Valley	17,000	3.0	17,000	9,000	10	7.0	—	9,000
Flow System 26: Northern Big Smoky Valley									
137B	Northern Big Smoky Valley	87,000	[1]270	87,000	69,000	5,900	5,600	—	69,000
Flow System 27: Diamond Valley System									
139	Kobeh Valley	19,000	810	20,000	14,000	2,700	1,900	—	15,000
140A	Monitor Valley-Northern Part	34,000	10	34,000	2,300	35	25	—	2,300
140B	Monitor Valley-Southern Part	27,000	10	27,000	10,000	35	25	—	10,000
151	Antelope Valley	5,900	15	5,900	4,000	50	35	—	4,000
152	Stevens Basin	1,400	0	1,400	0	0	0	—	0
153	Diamond Valley	23,000	21,000	44,000	26,000	71,000	50,000	24,000	71,000
Flow System 28: Death Valley System									
Amargosa/Death Valley Subarea									
144	Lida Valley	1,100	0.42	1,100	480	1.4	1.0	—	480
145	Stonewall Flat	1,300	3	1,300	0	10	7.0	—	3
146	Sarcobatus Flat	2,300	5	2,300	13,000	18	13	—	13,000
147	Gold Flat	11,000	15	11,000	0	50	35	—	15
148	Cactus Flat	1,000	12	1,000	0	41	29	—	12
157	Kawich Valley	5,500	0	5,500	0	0	0	—	0
158A	Emigrant Valley-Groom Lake Valley	4,800	84	4,900	0	280	200	—	80
158B	Emigrant Valley-Papoose Lake Valley	270	1.3	270	0	4.3	3.0	—	1.3
159	Yucca Flat	1,800	30	1,800	0	100	70	—	30
160	Frenchman Flat	1,600	130	1,700	0	420	290	—	130
161	Indian Springs Valley	4,400	200	4,600	1,800	650	450	—	2,000
168	Three Lakes Valley-Northern Part	1,300	6.0	1,300	0	20	14	—	6
169A	Tikapoo Valley-Northern Part	4,900	13	4,900	0	44	31	—	13
169B	Tikapoo Valley-Southern Part	2,000	7.8	2,000	0	26	18	—	8
170	Penoyer Valley	5,700	3,900	9,600	3,800	13,000	9,100	5,300	13,000
173A	Railroad Valley-Southern Part	4,000	360	4,400	200	1,200	840	—	560

Table A7–1. Predevelopment and recent (2000) groundwater-budget estimates for each hydrographic area within the Great Basin carbonate and alluvial aquifer system study area.—Continued

[All values in acre-feet per year rounded to two significant figures. Estimated error in recharge values is ±50 percent. Estimated error in discharge values is ±30 percent. Values in blue are for predevelopment conditions. Values in red are for recent (2000) conditions. Decrease in natural discharge and/or storage: calculated as the difference of well withdrawals and recharge from unconsumed irrigation and public supply water from well withdrawals. Minimum decrease in groundwater storage: calculated as the difference of the decrease in natural discharge and/or change in storage and groundwater discharge under predevelopment conditions, if the difference is greater than zero. Abbreviations: HA, hydrographic area; #, number; —, no estimate]

HA #	HA name	Groundwater recharge for pre-development conditions	Recharge from unconsumed irrigation and public supply water from well withdrawals (2000)	Groundwater recharge for recent (2000) conditions	Groundwater discharge for pre-development conditions	Well withdrawals (2000)	Decrease in natural discharge and/or storage (net well withdrawals) (2000)	Minimum decrease in groundwater storage (2000)	Groundwater discharge for recent (2000) conditions
Flow System 28: Death Valley System—Continued									
Amargosa/Death Valley Subarea									
211	Three Lakes Valley-Southern Part	2,500	99	2,600	0	330	230	—	100
225	Mercury Valley	160	0.60	160	0	2.0	1.4	—	0.6
226	Rock Valley	75	3.0	78	0	10	7.0	—	3
227A	Fortymile Canyon-Jackass Flats	1,100	28	1,100	0	94	66	—	28
227B	Fortymile Canyon-Buckboard Mesa	7,000	14	7,000	0	48	34	—	14
228	Oasis Valley	8,700	51	8,800	6,000	170	120	—	6,000
229	Crater Flat	330	39	370	0	130	91	—	39
230	Amargosa Desert	630	4,800	5,400	19,000	16,000	11,000	—	24,000
243	Death Valley	10,000	15	10,000	37,000	50	35	—	37,000
Pahrump Valley Subarea									
162	Pahrump Valley	21,000	6,600	28,000	11,000	22,000	15,000	4,000	22,000
240	Chicago Valley	150	0	150	430	0	0	—	430
241	California Valley	440	0	440	0	0	0	—	0
242	Lower Amargosa Valley	330	8.1	340	8,500	27	19	—	8,500
244	Valjean Valley	340	0	340	200	0	0	—	200
245	Shadow Valley	840	0	840	0	0	0	—	0
Flow System 29: Newark Valley System									
154	Newark Valley	26,000	1,300	27,000	26,000	4,300	3,000	—	27,000
155A	Little Smoky Valley-Northern Part	7,700	720	8,400	6,100	2,400	1,700	—	6,800
155B	Little Smoky Valley-Central Part	460	0	460	0	0	0	—	0
Flow System 30: Railroad Valley System									
150	Little Fish Lake Valley	4,100	9.0	4,100	10,000	30	21	—	10,000
155C	Little Smoky Valley-Southern Part	1,900	0	1,900	0	0	0	—	0
156	Hot Creek Valley	4,700	450	5,200	7,500	1,500	1,000	—	8,000
173B	Railroad Valley-Northern Part	57,000	300	57,000	81,000	1,000	700	—	81,000
Flow System 32: Independence Valley System									
177	Clover Valley	12,000	2,800	15,000	19,000	9,300	6,500	—	22,000
188	Independence Valley	17,000	27	17,000	9,500	90	63	—	9,500
Flow System 33: Ruby Valley System									
176	Ruby Valley	68,000	1,500	70,000	70,000	4,900	3,400	—	72,000
178A	Butte Valley-Northern Part	11,000	290	11,000	8,400	970	680	—	8,700

Table A7–1. Predevelopment and recent (2000) groundwater-budget estimates for each hydrographic area within the Great Basin carbonate and alluvial aquifer system study area.—Continued

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HA #	HA name	Groundwater recharge for pre-development conditions	Recharge from unconsumed irrigation and public supply water from well withdrawals (2000)	Groundwater recharge for recent (2000) conditions	Groundwater discharge for pre-development conditions	Well withdrawals (2000)	Decrease in natural discharge and/or storage (net well withdrawals) (2000)	Minimum decrease in groundwater storage (2000)	Groundwater discharge for recent (2000) conditions
Flow System 34: Colorado System									
Lake Mead Subarea									
164A	Ivanpah Valley-Northern Part	1,300	29	1,300	0	98	69	—	29
164B	Ivanpah Valley-Southern Part	1,400	60	1,500	0	200	140	—	60
165	Jean Lake Valley	64	39	100	0	130	91	—	39
166	Hidden Valley South	5.8	24	30	0	80	56	—	24
167	Eldorado Valley	450	960	1,400	0	3,200	2,200	—	1,000
212	Las Vegas Valley	28,000	[2]93,000	120,000	24,000	74,000	[3]-19,000	—	120,000
215	Black Mountains Area	650	510	1,200	1,700	1,700	1,200	—	2,200
Muddy River Subarea									
171	Coal Valley	2,300	9.0	2,300	100	30	21	—	110
172	Garden Valley	6,600	9.0	6,600	0	30	21	—	9
181	Dry Lake Valley	8,900	18	8,900	0	60	42	—	18
182	Delamar Valley	4,300	9.0	4,300	0	30	21	—	9
183	Lake Valley	7,300	3,900	11,000	8,400	13,000	9,100	—	12,000
198	Dry Valley	1,700	1,600	3,300	10	5,200	3,600	—	1,600
199	Rose Valley	82	420	500	10	1,400	980	—	430
200	Eagle Valley	1,000	0	1,000	290	0	0	—	290
201	Spring Valley	7,900	6.0	7,900	1,000	20	14	—	1,000
202	Patterson Valley	5,400	660	6,100	0	2,200	1,500	—	700
203	Panaca Valley	3,000	2,900	5,900	8,400	9,800	6,900	—	11,000
204	Clover Valley	8,100	36	8,100	210	120	84	—	250
205	Lower Meadow Valley Wash	12,000	140	12,000	1,400	450	310	—	1,500
206	Kane Springs Valley	2,600	9.0	2,600	0	30	21	—	9
208	Pahroc Valley	4,200	9.0	4,200	0	30	21	—	9
209	Pahranagat Valley	3,800	840	4,600	26,000	2,800	2,000	—	27,000
210	Coyote Spring Valley	2,500	60	2,600	0	200	140	—	60
216	Garnet Valley	160	300	460	0	990	690	—	300
217	Hidden Valley North	130	3.0	130	0	10	7.0	—	3
218	California Wash	140	48	190	0	160	110	—	50
219	Muddy River Springs Area	120	2,700	2,800	35,000	8,900	6,200	—	38,000
220	Lower Moapa Valley	67	290	360	730	960	670	—	1,000
White River Valley Subarea									
174	Jakes Valley	15,000	9.0	15,000	1,900	30	21	—	1,900
175	Long Valley	31,000	12	31,000	1,000	40	28	—	1,000
180	Cave Valley	15,000	12	15,000	2,000	40	28	—	2,000
207	White River Valley	36,000	1,000	37,000	80,000	3,500	2,500	—	81,000

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HA #	HA name	Groundwater recharge for pre-development conditions	Recharge from unconsumed irrigation and public supply water from well withdrawals (2000)	Groundwater recharge for recent (2000) conditions	Groundwater discharge for pre-development conditions	Well withdrawals (2000)	Decrease in natural discharge and/or storage (net well withdrawals) (2000)	Minimum decrease in groundwater storage (2000)	Groundwater discharge for recent (2000) conditions
Flow System 34: Colorado System—Continued									
Virgin River Valley Subarea									
221	Tule Desert	4,200	6.0	4,200	0	20	14	—	6
222	Virgin River Valley	34,000	12,000	46,000	39,000	40,000	28,000	—	51,000
Flow System 35: Goshute Valley System									
178B	Butte Valley-Southern Part	21,000	810	22,000	12,000	2,700	1,900	—	13,000
179	Steptoe Valley	86,000	1,900	88,000	110,000	6,400	4,500	—	110,000
187	Goshute Valley	20,000	720	21,000	6,600	2,400	1,700	—	7,300
Flow System 36: Mesquite Valley									
163	Mesquite Valley	1,900	3,900	5,800	2,200	13,000	9,100	—	6,100
Flow System 37: Great Salt Lake Desert System									
184	Spring Valley	110,000	1,300	110,000	82,000	4,300	3,000	—	83,000
185	Tippett Valley	14,000	6.0	14,000	2,000	20	14	—	2,000
186A	Antelope Valley-Southern Part	3,300	11	3,300	210	38	27	—	220
186B	Antelope Valley-Northern Part	10,000	25	10,000	100	82	57	—	120
189A	Thousand Springs Valley-Herrell-Brush Creek	6,100	0	6,100	2,000	0	0	—	2,000
189B	Thousand Springs Valley-Toano-Rock Spring	14,000	0	14,000	1,600	0	0	—	1,600
189C	Thousand Springs Valley-Rocky Butte Area	9,000	0	9,000	1,200	0	0	—	1,200
189D	Thousand Springs Valley-Montello-Crittenden	18,000	1,200	19,000	15,000	4,100	2,900	—	16,000
191	Pilot Creek Valley	4,800	90	4,900	5,400	300	210	—	5,500
251	Grouse Creek Valley	13,000	1,200	14,000	13,000	4,100	2,900	—	14,000
252	Pilot Valley	1,600	0	1,600	7,400	0	0	—	7,400
253	Deep Creek Valley	17,000	180	17,000	18,000	600	420	—	18,000
254	Snake Valley	160,000	3,300	160,000	130,000	11,000	7,700	—	130,000
255	Pine Valley	27,000	0	27,000	0	0	0	—	0
256	Wah Wah Valley	6,000	0	6,000	1,500	0	0	—	1,500
257	Tule Valley	13,000	0	13,000	38,000	0	0	—	38,000
258	Fish Springs Flat	1,600	0	1,600	34,000	0	0	—	34,000
259	Dugway-Government Creek Valley	13,000	570	14,000	6,100	1,900	1,300	—	6,700
260A	Park Valley-West Park Valley	4,400	0	4,400	5,300	0	0	—	5,300
261A	Great Salt Lake Desert-West Part	29,000	0	29,000	74,000	0	0	—	74,000
Flow System 38: Great Salt Lake System									
260B	Park Valley-East Park Valley	3,800	780	4,600	12,000	2,600	1,800	—	13,000
261B	Great Salt Lake Desert-East Part	200	0	200	7,400	0	0	—	7,400

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Flow System 38: Great Salt Lake System—Continued									
262	Tooele Valley	46,000	7,200	53,000	62,000	24,000	17,000	—	69,000
263	Rush Valley	77,000	1,600	79,000	36,000	5,400	3,800	—	38,000
264	Cedar Valley	29,000	1,800	31,000	4,100	6,100	4,300	—	5,900
265	Utah Valley Area	410,000	36,000	450,000	410,000	120,000	84,000	—	450,000
266	Northern Juab Valley	38,000	5,400	43,000	38,000	18,000	13,000	—	43,000
267	Salt Lake Valley	230,000	42,000	270,000	360,000	140,000	98,000	—	400,000
268	East Shore Area	290,000	18,000	310,000	120,000	60,000	42,000	—	140,000
269	West Shore Area	350	0	350	7,100	0	0	—	7,100
270	Skull Valley	25,000	1,700	27,000	35,000	5,700	4,000	—	37,000
271	Sink Valley	240	0	240	0	0	0	—	0
272	Cache Valley	720,000	11,000	730,000	540,000	37,000	26,000	—	550,000
273	Malad-Lower Bear River Area	440,000	7,200	450,000	370,000	24,000	17,000	—	380,000
274	Pocatello Valley	2,800	0	2,800	0	0	0	—	0
275	Blue Creek Valley	6,300	0	6,300	8,400	0	0	—	8,400
276	Hansel and North Rozel Flat	2,400	0	2,400	7,600	0	0	—	7,600
277	Promontory Mountains Area	5,400	600	6,000	11,000	2,000	1,400	—	12,000
278	Curlew Valley	12,000	22,000	34,000	76,000	72,000	50,000	—	98,000
279	Great Salt Lake	2,900	0	2,900	58,000	0	0	—	58,000
Flow System 39: Sevier Lake System									
280	Beryl-Enterprise Area	94,000	25,000	120,000	26,000	84,000	59,000	33,000	84,000
281	Parowan Valley	40,000	9,000	49,000	43,000	30,000	21,000	—	52,000
282	Cedar City Valley	32,000	10,000	42,000	32,000	35,000	25,000	—	42,000
283	Beaver Valley	80,000	2,400	82,000	68,000	8,000	5,600	—	70,000
284	Milford Area	13,000	15,000	28,000	33,000	49,000	34,000	1,000	49,000
285	Leamington Canyon	36,000	2,700	39,000	19,000	9,000	6,300	—	22,000
286	Pavant Valley	69,000	24,000	93,000	72,000	80,000	56,000	—	96,000
287	Sevier Desert	41,000	4,500	46,000	110,000	15,000	10,000	—	120,000

[1]Adjusted to exclude recharge from unconsumed irrigation from well withdrawals for mining operations, which are assumed to not be applied as irrigation and, therefore, do not contribute to groundwater recharge.

[2]Amount includes an additional 30,000 acre-ft of recharge from injected Colorado River water (Nevada Division of Water Resources (NDWR) pumpage inventory) and 41,000 acre-ft of recharge from imported Colorado River Water (calculated as 10 percent of total imported Colorado water (440,000 acre-ft reported in NDWR pumpage inventory) minus amount injected (30,000 acre-ft)); imported surface water included in this estimate because HA 212 is the only HA with postdevelopment surface water importation.

[3]Due to injection of Colorado River water, amount of groundwater in storage has been increased in this HA and, therefore, estimate is negative.