

Table 1.--Rio Grande seepage investigation from Radium Springs, New Mexico, to El Paso, Texas, February 14-15, 2006

EXPLANATION

REACH--The seepage investigation was conducted along a 62.4-mile reach from the Rio Grande below Leasburg Dam near Radium Springs, New Mexico, to the Rio Grande at El Paso, Texas (08364000). River miles are referenced upstream from the Rio Grande at El Paso, Texas, which is designated as river mile 1,249.9 (Hendricks, 1964).

WEATHER--Weather was favorable for the seepage investigation; no precipitation occurred. The mean daily temperature at Las Cruces, New Mexico was 12 and 14 degrees Celsius on February 14 and 15, 2006, with a low of 3 degrees Celsius on February 14 and a high of 20 degrees Celsius on February 15.

STREAMFLOW--The seepage investigation was conducted during the non-irrigation season at low flow. Intermittent streamflow occurred along 55.6 of 62.4 river miles, with dry conditions observed along a 6.8 mile reach below Mesilla Dam. Discharge measurements indicate a net seepage loss of 36.2 cubic feet per second, with side-channel inflows of 52.4 cubic feet per second. Indicated gains (+) and losses (-) throughout the reach are shown below. Tributary flow recorded as inflow is considered a contribution and not a gain; no outflow (diversions) occurred within the study reach during the investigation. Channel gain or loss includes seepage to or from the streambed, evaporation from the water surface, and transpiration by vegetation along the channel banks. Evaporation from the water surface and transpiration by vegetation in February is considered negligible.

WATER QUALITY--Surface-water-quality samples were collected during the seepage investigation at five sites for chemical analyses to determine dissolved solids (salinity), and concentrations of major ions and selected nutrients. Results of the chemical analyses and field determinations are listed in table 2.

REMARKS-- The seepage investigation is rated good based upon steady streamflow with minor diurnal fluctuation at low flow conditions. Intermittent river flow occurred during the 2005 non-irrigation season, with dry river conditions observed at site 13 to site 16. The Picacho Flume construction project required streamflow diversion above the study reach and dewatering wells at site 4A. Streamflow diversion (outflow) occurred at the Leasburg Canal Heading approximately 2.0 river miles above site 1. Shallow wells at site 4A were pumped for the purpose of dewatering riverbed sediments at the Picacho Flume construction site. The sediment removal project resulted in extensive channel excavation above Mesilla Dam from river miles 1,292.0 through 1290.2.

Discharge measurements were conducted at 20 mainstream sites and 12 inflow sites with specific conductance and water temperature measured at each site. Dry channel conditions were observed at 3 mainstream sites and 4 inflow sites. Individual discharge measurements were rated good (within 5 percent) throughout most of the stream reach. Individual discharge measurements were rated fair (within 8 percent) at sites 20, 24, and 28 due to poor channel conditions. Accuracy of discharge measurements needs to be considered when evaluating indicated gains and losses. The seepage investigation was coordinated with the New Mexico Environment Department in conjunction with the Lower Rio Grande Water Quality Monitoring Program.

°C, degrees Celsius; $\mu\text{S}/\text{cm}$, microsiemens per centimeter at 25 degrees Celsius; ft^3/s , cubic feet per second; --, no data or not applicable. Locations are in New Mexico unless otherwise indicated. Horizontal coordinates in latitude and longitude are referenced to the North American Datum of 1927 (NAD27).

Table 1.--Rio Grande seepage investigation from Radium Springs, New Mexico, to El Paso, Texas, February 14-15, 2006--Continued

Site num- ber	River mile	Stream	Location	Time	Water temper- ature (°C)	Specific conduct- ance (µS/cm)	Discharge, in ft ³ /s		
							Main stream	Inflow	Gain or loss
<u>February 14, 2006</u>									
¹ 1	1,312.3	Rio Grande	Below Leasburg Dam, Radium Springs Lat 32°28'41", long 106°55'10"	0950	5.5	1,850	6.67	--	--
2	1,310.2	Rio Grande	Near Leasburg Lat 32°27'21", long 106°54'08"	1130	10.5	1,810	6.92	--	+0.25
3	1,307.6	Selden Drain	Near Leasburg Lat 32°25'38", long 106°52'50"	1212	--	--	--	0	--
4	1,306.3	Rio Grande	Near Hill Lat 32°25'05", long 106°52'01"	1245	10.5	2,060	11.1	--	+4.2
² 4A	1,302.9	Temporary Well Outflow	At Picacho Flume above Shalem Bridge Lat 32°22'38", long 106°51'29"	--	--	--	--	--	--
5	1,302.7	Rio Grande	At Shalem Bridge near Doña Ana Lat 32°22'34", long 106°51'16"	1430	14.5	1,930	8.65	--	-2.4
6	1,301.2	Wasteway No. 5	Near Doña Ana Lat 32°22'14", long 106°50'14"	1500	--	--	--	0	--
7	1,298.8	Rio Grande	Near Picacho Lat 32°20'18", long 106°50'09"	0930	6.0	1,870	5.57	--	-3.08
8	1,295.6	Rio Grande	Below Picacho Bridge near Las Cruces Lat 32°17'45", long 106°49'25"	1120	9.5	1,880	³ 0.14	--	-5.43
9	1,295.4	Wastewater Inflow	City of Las Cruces Lat 32°17'35", long 106°49'26"	1000	18.5	1,310	--	⁴ 18.6	--
10	1,293.1	Rio Grande	At NM-359 Bridge near Mesilla Lat 32°15'49", long 106°49'29"	1310	20.0	1,310	10.7	--	-8.0
10A	1,292.0	Rio Grande	Above Picacho Drain Lat 32°14'48", long 106°49'00"	1353	21.0	1,330	³ 0.03	--	-10.7
11	1,291.8	Picacho Drain	Above Mesilla Dam Lat 32°14'34", long 106°48'56"	1415	--	--	--	0	--
⁵ 12	1,291.7	Rio Grande	Below Picacho Drain Lat 32°14'30", long 106°48'49"	--	--	--	--	--	--
13	1,289.5	Rio Grande	Below Mesilla Dam Lat 32°13'17", long 106°47'15"	0800	--	--	0	--	-0.03
14	1,287.3	Rio Grande	At NM-28 Bridge near San Pablo Lat 32°12'24", long 106°45'32"	0835	--	--	0	--	--
15	1,283.6	Santo Tomas River Drain	Near San Miguel Lat 32°10'16", long 106°43'11"	0900	--	--	--	0	--

Table 1.--Rio Grande seepage investigation from Radium Springs, New Mexico, to El Paso, Texas, February 14-15, 2006--Continued

Site number	River mile	Stream	Location	Time	Water temperature (°C)	Specific conductance (µS/cm)	Discharge, in ft ³ /s		Gain or loss
							Main stream	Inflow	
16	1,282.7	Rio Grande	At NM-228 Bridge near San Miguel Lat 32°09'43", long 106°42'58"	0920	--	--	0	--	--
17	1,277.8	Rio Grande	At NM-227 Bridge near Vado Lat 32°06'48", long 106°40'05"	0950	8.0	1,450	³ 0.09	--	+0.09
18	1,276.6	Del Rio Drain	Near Vado Lat 32°06'09", long 106°39'27"	1050	8.0	1,470	--	5.32	--
18A	1,275.7	Wastewater Inflow	Doña Ana County South Central Plant Lat 32°05'25", long 106°39'34"	1615	17.0	1,400	--	⁶ 0.37	--
19	1,273.8	Rio Grande	At NM-226 Bridge near Berino Lat 32°03'56", long 106°39'45"	1240	13.5	1,480	5.77	--	-0.01
20	1,271.6	La Mesa Drain	Near Chamberino Lat 32°02'15", long 106°39'23"	1450	9.5	2,140	--	4.05	--
21	1,271.5	Rio Grande	Below La Mesa Drain near Chamberino Lat 32°02'12", long 106°39'18"	1542	13.0	1,800	12.0	--	+2.2
22	1,268.5	Rio Grande	At NM-225 Bridge near Anthony Lat 31°59'58", long 106°38'07"	1612	16.0	1,760	12.3	--	+0.3
<u>February 15, 2006</u>									
22	1,268.5	Rio Grande	At NM-225 Bridge near Anthony Lat 31°59'58", long 106°38'07"	0920	9.0	1,770	11.5	--	--
23	1,268.5	Pipe Inflow	At NM-225 Bridge near Anthony Lat 31°59'58", long 106°38'07"	1135	--	--	--	³ 0.004	--
24	1,265.4	East Drain	Near Vinton, Tex. Lat 31°58'09", long 106°36'17"	1022	9.0	2,180	--	2.28	--
25	1,264.7	Rio Grande	At Vinton Bridge near Vinton, Tex. Lat 31°57'33", long 106°36'16"	1225	14.5	1,880	12.6	--	-1.2
25B	1,263.8	Temporary Well Inflow	Below Vinton Bridge near Vinton, Tex. Lat 31°56'52", long 106°36'17"	1240	21.5	1,800	--	^{6,7} 2.23	--

Table 1.--Rio Grande seepage investigation from Radium Springs, New Mexico, to El Paso, Texas, February 14-15, 2006--Concluded

Site num- ber	River mile	Stream	Location	Time	Water temper- ature (°C)	Specific conduct- ance (µS/cm)	Discharge, in ft ³ /s		Gain or loss
							Main stream	Inflow	
26	1,261.6	Rio Grande	At TX-259 Bridge, Cañutillo, Tex. Lat 31°54'54", long 106°36'18"	1320	17.0	1,830	8.66	--	-6.2
27	1,259.3	Rio Grande	At Borderland Bridge near Borderland, Tex. Lat 31°53'09", long 106°35'55"	1415	18.0	1,820	6.14	--	-2.52
28	1,256.2	Rio Grande	At TX-260 Bridge near Santa Teresa Lat 31°50'46", long 106°36'18"	0920	10.0	1,810	3.40	--	-2.74
29	1,252.8	Rio Grande	Near Sunland Park Lat 31°48'24", long 106°34'57"	1112	12.0	1,850	2.41	--	-0.99
30	1,251.0	Wastewater Inflow	Sunland Plant, City of Sunland Park Lat 31°47'55", long 106°33'25"	1129	20.0	2,070	--	⁴ 2.54	--
31	1,250.9	Rio Grande	At Sunland Park Bridge, Sunland Park Lat 31°47'56", long 106°33'16"	1138	17.0	1,940	4.59	--	-0.36
32	1,250.3	Montoya Drain	Near Sunland Park Lat 31°48'10", long 106°32'47"	1300	15.5	3,260	--	16.3	--
32A	1,250.2	El Paso Electric Discharge Inlet	Near Sunland Park Lat 31°48'12", long 106°32'44"	1450	17.5	4,870	--	⁴ 0.57	--
33	1,250.1	Keystone Reservoir Inlet	Near El Paso, Tex. Lat 31°48'18", long 106°32'39"	1455	18.0	3,650	--	³ 0.08	--
33A	1,250.0	Side-channel Inlet	Above Courchesne Bridge Near El Paso, Tex. Lat 31°48'13", long 106°32'28"	1525	17.0	4,360	--	³ 0.02	--
34	1,249.9	Rio Grande	At Courchesne Bridge, El Paso, Tex. Lat 31°48'09", long 106°32'26"	1610	17.0	3,690	22.0	--	+0.4

¹ Streamflow diversion (outflow) above the study reach resulted in a lower initial discharge at site 1. Streamflow diversion at the Leasburg Canal Heading, approximately 2.0 river miles above site 1, was measured at a discharge of 6.56 cubic feet per second on February 14 at 1020 hours.

² Temporary well outflow from shallow wells completed in riverbed sediments for the purpose of dewatering at the Picacho Flume construction site. Ground-water discharge was measured at 1.47 ft³/s with a specific conductance of 1,350 uS/cm on February 14 at 1345 hours.

³ Parshall Flume

⁴ Reported instantaneous discharge

⁵ Channel excavation; no discharge measurement

⁶ Reported mean daily discharge

⁷ Temporary well inflow from shallow wells completed along Bosque Road for the purpose of dewatering at a pipeline construction site.