5.4 REFERENCES

NOTE: For each reference either a document accession number (NNA.19xxxxxx.xxxx) or a technical information center number (TIC xxxxxx) is provided. If a number is not currently available, it is noted by TBD (to be determined). All DTNs should be considered TBV (to be verified).

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Table 5.1-1. Map Designation Number, Station Number and Name, Location by Latitude and Longitude, Drainage Area, and Site Type and Period of Record for Surface Water Data Collection Sites in the Yucca Mountain Region

Map Designation Number	Station Number	Station Name	Latitude Longitude	Drainage Area in square kilometers	Site Type/ Period of Record
1	10245270	Dry Lake Valley tributary near Caliente, NV	37°37'18" 114°46'24"	28.5	C 1967-81
2	10247010	Hot Creek tributary near Warm Springs, NV	38°12'00" 116°13'00"	5.44	C 1964-81
3	10247860	Penoyer Valley tributary near Tempiute, NV	37°35'07" 115°40'48"	3.83	C 1964-65 G 1966-77 C 1978-81
4	10247890	KP's Wash at Tippipah Highway, NTS, NV	37°10'07" 116°08'27"	2.80	M 1984
5	10248490	Indian Springs Valley tributary near Indian Springs, NV	36°34'00" 115°48'40"	75	C 1964-82 C 1984-95
6	10248970	Stonewall Flat tributary near Goldfield, NV	37°35'40" 117°12'35"	1.37	C 1964-79 C 1981 C 1983-85
7	10248980	Lida Pass tributary near Lida, NV	37°26'05" 117°33'25"	4.12	C 1968-81
8	10249050	Sarcobatus Flat tributary near Springdale, NV	37°13'18" 117°07'35"	96	C 1961-81
9	10249135	San Antonio Wash tributary near Tonopah, NV	38°19'37" 117°07'25"	8.86	C 1965-84
10	10249140	Ralston Valley tributary near Tonopah, NV	38°17'23" 117°05'59"	0.52	C 1961-81
11	10249180	Saulsbury Wash near Tonopah, NV	38°07'30" 116°48'30"	145	C 1962-81 C 1985 C 1987-95
12	10249620	Big Smokey Valley tributary near Tonopah, NV	38°01'52" 117°13'52"	6.19	C 1961-81 C 1988-89
13	10249680	Big Smokey Valley tributary near Blair Junction, NV	38°01'52" 117°42'35"	29.5	C 1961-85
14	10249850	Palmetto Wash tributary near Lida, NV	37°26'30" 117°41'25"	12.2	C 1967-78 C 1980-81
15	10249855	Palmetto Wash tributary near Oasis, CA	37°27'25" 117°46'10"	0.62	C 1968-79 C 1980
16	10251215	Beatty Wash near Beatty, NV	36°56'35" 116°43'09"	245	G 1989-95
17	10251217	Amargosa River at Beatty, NV	36°54'38" 11645'23"	1186	G 1994-95
18	10251220	Amargosa River near Beatty, NV	36°52'06" 116°45'34"	1222	G 1964-68 C 1969-81 C 1983-85 C 1987-95
19	10251242	Fortymile Wash above East Cat Canyon, NTS, NV	37°04'21" 116°20'50"	106	G 1992-95

NOTE: CA, California; NV, Nevada; NTS, Nevada Test Site; Ind, indeterminate; C, crest-stage gage; G, continuous gaging station; M, Miscellaneous Site

Table 5.1-1. Map Designation Number, Station Number and Name, Location by Latitude and Longitude, Drainage Area, and Site Type and Period of Record for Surface Water Data Collection Sites in the Yucca Mountain Region (Continued)

Map Designation Number	Station Number	Station Name	Latitude Longitude	Drainage Area in square kilometers	Site Type/ Period of Record
20	10251243	East Cat Canyon Wash at Fortymile Wash, NTS, NV	37°'19" 116°20'50"	34.4	G 1992-95
21	10251244	Stockade Wash below Stockade Road, NTS, NV	37°08'59" 116°14'45"	10.0	M 1984
22	10251248	Unnamed tributary to Stockade Wash near Rattlesnake Ridge, NTS, NV	37°10'57" 116°15'59"	10.1	G 1984-94
23	102512484	Stockade Wash at Airport Road, NTS, NV	37°07'47" 116°17'23"	71.6	C 1993-94
24	10251249	Stockade Wash near Fortymile Wash, NTS, NV	37°04'12" 116°20'23"	177	G 1992-95
25	10251250	Fortymile Wash at Narrows, NTS, NV (formerly published as Fortymile Wash cross-section 7)	36°53'13" 116°22'50"	668	C 1982-83 G 1984-95
26	10251252	Yucca Wash near mouth, NTS, NV (formerly published as Yucca Wash)	36°51'58" 116°23'38"	44	C 1982-95
27	102512531	Pagany Wash near the Prow, NTS, NV	36°52'06" 116°26'50"	1.22	G 1994-95
28	102512532	Pagany Wash #2, NTS, NV	36°51'42" 116°26'24"	1.89	M 1984
29	102512533	Pagany Wash #1 near well UZ-4, NTS, NV	36°51'39" 116°26'08"	2.12	M 1984 G 1993-95
30	102512535	Drillhole Wash above well UZ-1, NTS, NV	36°51'39" 116°26'08"	1.37	M 1984 G 1994-95
31	1025125356	Wren Wash at Yucca Mountain, NTS, NV	36°51'34" 116°27'15"	0.60	G 1994-95
32	102512536	Drillhole Wash above Well UE-25, NTS, NV	36°51'08" 116°26'25"	7.20	M 1984
33	102512537	Split Wash below Quac Canyon Wash, NTS, NV	36°50'57" 116°26'54"	0.85	M 1984 G 1994-95
34	1025125372	Split Wash at Antler Ridge, NTS, NV	36°50'36" 116°26'26"	6.09	G 1994
35	10251254	Drillhole Wash at mouth, NTS, NV (formerly published as Drill Hole Wash)	36°49'13" 116°23'52"	42.2	C 1983-95

NOTE: CA, California; NV, Nevada; NTS, Nevada Test Site; Ind, indeterminate; C, crest-stage gage; G, continuous gaging station; M, Miscellaneous Site

Table 5.1-1. Map Designation Number, Station Number and Name, Location by Latitude and Longitude, Drainage Area, and Site Type and Period of Record for Surface Water Data Collection Sites in the Yucca Mountain Region (Continued)

Map Designation Number	Station Number	Station Name	Latitude Longitude	Drainage Area in square kilometers	Site Type/ Period of Record
36	10251255	Fortymile Wash near well J-13, NTS, NV	36°48'27" 116°24'01"	787	M 1969 M 1983 G 1984-95
37	10251256	Dune Wash near Busted Butte, NTS, NV (formerly published as Busted Butte Wash)	36°47'35" 116°24'29"	17.5	C 1982-95
38	10251258	Fortymile Wash near Amargosa Valley, NV (formerly published as Fortymile Wash cross-section 1)	36°40'18" 116°26'03"	818	M 1969 C 1982-83 G 1984-95
39	10251259	Amargosa River at Highway 127, near California-Nevada State Line	36°23'12" 116°25'22"	3994	M 1993 G 1994-95
40	10251260	Topopah Wash at Little Skull Mountain, NTS, NV (formerly published as Topopah Wash near Lathrop Wells)	36°46'06" 116°19'23"	269	C 1984-95
41	10251265	Cane Spring Wash near Cane Spring, NTS, NV (formerly published as Cane Springs tributary near Mercury and Cane Spring Wash tributary near Cane Spring)	36°48'27" 116°05'41"	21.6	C 1984-95
42	102512654	Cane Spring Wash tributary below Skull Mountain, NTS, NV	36°48'23" 116°05'43"	5.93	C 1992-95
43	10251266	Frenchman Lake tributary at old Mercury Highway, NTS, NV	36°43'48" 115°59'59"	16.4	M 1984
44	10251269	Gas Station Wash at Mercury, NTS, NV	36°39'36" 116°00'01"	1.35	M 1984
45	10251270	Amargosa River tributary near Mercury, NV	36°33'40" 116°06'00"	285	C 1963-81 C 1984-95
46	10251271	Amargosa River tributary No. 1 near Johnnie, NV	36°27'36" 116°06'28"	5.72	C 1967-81 C 1984-95
47	10251272	Amargosa River tributary No. 2 near Johnnie, NV	36°26'09" 116°04'28"	6.45	C 1968-81 C 1984-95
48	10251275	Carson Slough at Ash Meadows, NV	36°25'31" 116°21'25"	Ind	G 1994-95
49	10251280	Amargosa River near Eagle Mountain below Death Valley Junction, CA (formerly published as Amargosa River at Eagle Mountain)	36°11'48" 116°22'06"	6816	C 1990-95
50	10251300	Amargosa River at Tecopa, CA	35°50'55" 116°13'45"	8003	G 1962-83 M 1990 G 1992-94
51	--	3 Springs Creek near Warm Springs, NV	37°57'38" 116°25'20"	4.20	G 1987-92
52	--	East Stewart Creek near Ione, NV	38°53'23" 117°21'37"	0.93	G 1987-92

NOTE: CA, California; NV, Nevada; NTS, Nevada Test Site; Ind, indeterminate; C, crest-stage gage; G, continuous gaging station; M, Miscellaneous Site

Table 5.1-2. Dates and Peak Discharges at Continuous Gaging Stations, Crest-Stage Gages, and Miscellaneous Sites in the Yucca Mountain Region

Map Designation Number	Station Number - Station Name	Date mm-dd-yy	Peak Discharge (cubic meters per second)	Date mm-dd-yy	Peak Discharge (cubic meters per second)	Date mm-dd-yy	Peak Discharge (cubic meter per second)
1	10245270 - Dry	07-31-67	4.42	09-19-72	0.11	77WY	*
	Lake Valley tributary	11-00-67	3.40	73WY	*	78WY	*
	near Caliente, NV	10-14-68	0.06	09-00-74	3.11	79WY	*
		08-00-70	0.03	09-10-75	0.42	80WY	*
		08-00-71	0.02	07-00-76	4.25	81WY	*
2	10247010 - Hot	64WY	*	70WY	*	08-01-76	2.83
	Creek tributary near	65WY	*	71WY	*	08-00-77	0.03
	Warm Springs, NV	66WY	*	72 WY	*	78WY	*
		67WY	*	73WY	*	79WY	*
		07-30-68	0.01	74WY	*	80WY	*
		08-12-69	0.28	75WY	*	81WY	*
3	10247860 - Penoyer	64WY	*	07-21-70	0.99	09-11-76	0.02
	Valley tributary near	07-30-65	0.06	71WY	*	10-02-76	0.01
	Tempiute, NV	66WY	*	09-18-72	0.93	78WY	*
		67WY	*	73WY	*	08-13-79	0.01
		08-06-68	3.68	74WY	*	80WY	0.01
		07-19-69	1.27	09-10-75	0.06	81WY	*
4	10247890 - KP's	07-19-84	8.50				
	Wash at Tippipah	08-19-84	0.14				
	Highway, NTS, NV						
5	10248490 - Indian	64WY	*	76WY	0.08	05-16-87	0.28-0.42
	Springs Valley	07-01-65	3.40	10-02-76	2.83	01-18-88	<0.03
	tributary near Indian	11-23-65	0.01	78WY	*	08-26-88	0.06
	Springs, NV	08-24-67	0.14	08-13-79	0.03	01-10-89	<0.003
		07-30-68	0.02	80WY	0.02	08-11-89	0.07
		01-25-69	0.71	05-27-81	0.03	09-23-90	<0.0003
		70WY	*	08-24-82	3.12	91WY	*
		07-01-71	0.34	83WY	--	92WY	*
		08-14-72	14.1	08-15-84	1.90	93WY	*
		03-03-73	0.01	08-19-84	3.68	94WY	*
		07-23-74	0.02	85WY	*	95WY	*
		10-03-74	0.06	86WY	*		
6	10248970 - Stone-	11-01-63	0.01	06-22-72	0.03	79WY	0.01
	wall Flat tributary	08-15-65	0.23	10-04-72	0.03	80WY	--
	near Goldfield, NV	09-19-66	0.03	74 WY	*	81WY	0.01
		09-04-67	1.02	75WY	*	82WY	--
		08-07-68	1.75	08-01-76	0.03	83WY	*
		06-16-69	4.25	08-00-77	0.008	07-28-84	0.74
		70WY	*	78WY	*	11-00-84	0.21
		71WY	*				
7	10248980 - Lida	08-07-68	0.003	73WY	*	78WY	0.02
	Pass tributary near	69WY	*	74WY	*	79WY	*
	Lida, NV	08-00-70	0.008	75WY	*	80WY	*
		71WY	*	09-00-76	0.03	81WY	*
		72WY	*	06-00-77	0.02		

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Table 5.1-2. Dates and Peak Discharges at Continuous Gaging Stations, Crest-Stage Gages, and Miscellaneous Sites in the Yucca Mountain Region (Continued)

Map Designation Number	Station Number - Station Name	Date mm-dd-yy	Peak Discharge (cubic meters per second)	Date mm-dd-yy	Peak Discharge (cubic meters per second)	Date mm-dd-yy	Peak Discharge (cubic meter per second)
8	10249050 - Sarcobatus Flat tributary near Springdale, NV	61WY 62WY 63WY 64WY 08-17-65 66WY 08-00-67	0.37 0.14 * * 1.08 * 0.28	08-07-68 07-00-69 70WY 08-00-71 72WY 10-04-72 08-05-74	0.71 0.82 * 0.03 * 0.17 0.003	09-10-75 07-00-76 08-00-77 09-06-78 08-13-79 09-09-80 08-10-81	0.42 0.17 0.03 0.02 0.01 1.78 0.18
9	10249135 - San Antonio Wash tributary near Tonopah, NV	65WY 66WY 07-13-67 07-31-68 07-00-69 08-00-70 09-00-71	0.03 * 0.11 0.03 0.06 0.62 0.003	08-13-72 10-04-72 74WY 75WY 76WY 08-00-77	18.7 0.20 * * * 0.03	78WY 08-00-79 80WY 81WY 82WY 08-14-84	* 0.006 * * * 3.68
10	10249140 - Ralston Valley tributary near Tonopah, NV	61WY 62WY 63WY 64WY 08-17-65 66WY 07-13-67	0.62 * * * 0.02 * 0.01	07-31-68 07-00-69 08-00-70 08-29-71 08-13-72 73WY 74WY	0.003 1.27 0.65 1.36 0.57 * *	75WY 76WY 08-00-77 78WY 79WY 80WY 81WY	* * 0.74 * * * *
11	10249180 - Saulsbury Wash near Tonopah, NV	06-15-62 63WY 64WY 65WY 03-00-66 07-30-67 11-20-67 03-27-69 08-00-70 71WY 06-06-72 10-04-72	0.28 * * * 1.16 0.28 0.03 9.63 0.06 * 0.76 0.08	74WY 07-00-75 08-01-76 77WY 03-00-78 79WY 80WY 81WY 82WY 83WY 84WY	* 0.003 2.55 * 3.40 0.25 * * -- -- --	85WY 86WY 87WY 88WY 89WY 90WY 91WY 07-11-92 93WY 07-22-94 03-11-95	* -- * * * 0.01 * 2.83 * 0.01 0.06
12	10249620 - Big Smokey Valley tributary near Tonopah, NV	61WY 62WY 06-10-63 64WY 65WY 66WY 09-24-67 68WY 69WY 70WY	0.28 * 0.08 * * * 0.06 * * *	71WY 09-05-72 73WY 74WY 75WY 09-00-76 08-00-77 03-00-78 08-00-79 80WY	* 0.003 * * * 0.01 0.03 0.01 0.01 *	81WY 82WY 83WY 84WY 85WY 86WY 87WY 88WY 89WY	* -- -- -- -- -- -- * *
13	10249680 - Big Smokey Valley tributary near Blair Junction, NV	61WY 62WY 06-10-63 64WY 65WY 09-16-66 12-06-66 07-30-68 07-00-69	2.55 * 0.06 * * 0.20 0.03 0.04 0.34	70WY 71WY 05-30-72 10-01-72 74WY 09-10-75 09-10-76 10-02-76	* * 1.78 0.40 * 0.02 2.26 4.81	78WY 79WY 80WY 06-01-81 82WY 83WY 08-14-84 07-00-85	* * * 0.01 * * 9.35 13.0

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Table 5.1-2. Dates and Peak Discharges at Continuous Gaging Stations, Crest-Stage Gages, and Miscellaneous Sites in the Yucca Mountain Region (Continued)

Map Designation Number	Station Number - Station Name	Date mm-dd-yy	Peak Discharge (cubic meters per second)	Date mm-dd-yy	Peak Discharge (cubic meters per second)	Date mm-dd-yy	Peak Discharge (cubic meter per second)
14	10249850 - Palmetto Wash tributary near Lida, NV	09-24-67 08-07-68 07-00-69 08-15-70 08-03-71	0.45 0.51 5.47 0.59 0.71	06-07-72 73WY 12-30-73 75WY 09-00-76	0.006 * 0.003 * 0.03	06-00-77 78WY 79WY 80WY 81WY	0.01 0.01 -- 0.006 0.006
15	10249855 - Palmetto Wash tributary near Oasis, CA	08-07-68 07-00-69 08-15-70 71WY 72WY	0.26 0.01 0.34 * *	73WY 74WY 75WY 08-00-76 77WY	0.003 * * 0.85 *	78WY 79WY 80WY 81WY	* * -- *
16	10251215 - Beatty Wash near Beatty, NV	08-11-89 07-14-90 91WY	0.71 8.50 *	92WY 93WY	* *	94WY 03-11-95	* 25.5
17	10251217 - Amargosa River at Beatty, NV	03-07-94 03-11-95	0.03 28.3				
18	10251220 - Amargosa River near Beatty, NV	07-26-64 09-07-65 66WY 08-30-67 02-10-68 02-24-69 08-15-70 71WY 72WY 02-11-73 74WY 09-10-75 02-00-76 06-00-77	0.71 0.57 * 120 2.55 453 0.003 * * 0.51 * 11.7 2.83 0.048	03-04-78 79WY 80WY 81WY 82WY 03-03-83 84 WY 07-19-85 86WY 03-21-87 04-15-88 89WY 07-15-90 03-02-91	18.4 * * * -- 3.40 * 0.14 -- 1.70 0.28-0.42 * 5.24 0.17	03-21-91 07-07-91 01-05-92 02-13-92 03-21-92 03-30-92 01-19-93 01-19-93 02-19-93 02-20-93 02-27-93 94WY 03-11-95	0.42 0.06 0.03 0.28 0.25 0.34 0.0008 0.03 0.14 0.01 0.28 * 36.8
19	10251242 - Fortymile Wash above East Cat Canyon, NTS, NV	92WY 01-17-93	* 7.16	94WY 03-11-95	* 85.0		
20	10251243 - East Cat Canyon Wash at Fortymile Wash, NTS, NV	92WY 01-17-93	* 0.28	94WY 03-11-95	* 1.13		
21	10251244 - Stockade Wash below Stockade Road, NTS, NV	07-19-84	0.57				
22	10251248 - Unnamed tributary to Stockade Wash near Rattlesnake Ridge, NTS, NV	07-21-84 10-02-84 02-15-86 07-21-87	0.37 0.02 0.02 0.008	08-26-88 08-09-89 09-23-90 03-21-91	0.02 0.0008 0.005 0.0003	03-30-92 02-19-93 09-20-94	0.20 0.51 0.11

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Table 5.1-2. Dates and Peak Discharges at Continuous Gaging Stations, Crest-Stage Gages, and Miscellaneous Sites in the Yucca Mountain Region (Continued)

Map Designation Number	Station Number - Station Name	Date mm-dd-yy	Peak Discharge (cubic meters per second)	Date mm-dd-yy	Peak Discharge (cubic meters per second)	Date mm-dd-yy	Peak Discharge (cubic meter per second)
23	102512484 - Stockade Wash at Airport Road, NTS, NV	02-08-93 02-10-93	4.53 0.05	03-16-93 03-16-93	0.03 0.57	94WY	*
24	10251249 - Stockade Wash near Fortymile Wash, NTS, NV	92WY 01-14-93	* 0.37	94WY 95-03-11	* 19.8		
25	10251250 - Fortymile Wash at Narrows, NTS, NV (formerly published as Fortymile Wash cross-section 7)	82WY 03-03-83 07-21-84 08-14-84 08-19-84 07-20-85	* 43.0 20.7 1.42 19.3 0.33	86WY 87WY 88 WY 89WY 90WY 91WY	* * * * * *	02-12-92 01-18-93 94WY 01-25-95 03-11-95	0.68 1.50 * 0.20 85.0
26	10251252 - Yucca Wash near mouth, NTS, NV (formerly published as Yucca Wash)	82WY 03-03-83 07-21-84 08-19-84 07-19-85 86WY	* 2.83 26.6 0.88 0.0003 *	05-07-87 88WY 89WY 90WY 91WY 02-12-92	<0.003 * * * * 0.42	02-13-92 03-30-92 01-18-93 01-18-93 94WY 01-26-95	0.10 <0.03 0.57 2.26 * 5.24
27	102512531 - Pagany Wash near the Prow, NTS, NV	03-11-95	1.70				
28	102512532 - Pagany Wash #2, NTS, NV	08-19-84	4.25				
29	102512533 - Pagany Wash #1 near well UZ-4, NTS, NV	08-19-84 01-17-93	2.83 0.0003	94WY 03-11-95	* 1.70		
30	102512535 - Drillhole Wash above well UZ-1, NTS, NV	08-19-84 03-11-95	1.19 0.85				
31	1025125356 - Wren Wash at Yucca Mountain, NTS, NV	03-11-95	0.85				
32	102512536 - Drillhole Wash above Well UE-25, NTS, NV	08-19-84	0.48				
33	102512537 - Split Wash below Quac Canyon Wash, NTS, NV	07-21-84 94WY	8.21 *	03-11-95	0.31		
34	1025125372 - Split Wash at Antler Ridge, NTS, NV	94WY	*				

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Table 5.1-2. Dates and Peak Discharges at Continuous Gaging Stations, Crest-Stage Gages, and Miscellaneous Sites in the Yucca Mountain Region (Continued)

Map Designation Number	Station Number - Station Name	Date mm-dd-yy	Peak Discharge (cubic meters per second)	Date mm-dd-yy	Peak Discharge (cubic meters per second)	Date mm-dd-yy	Peak Discharge (cubic meter per second)
35	10251254 - Drillhole Wash at mouth, NTS, NV (formerly published as Drill Hole Wash)	83WY 07-23-84 08-19-84 07-19-85 86WY	* 22.4 1.22 0.48 *	87WY 88 WY 89WY 90WY 91WY	* * * * *	92WY 93WY 94WY 03-11-95	* * * 0.003
36	10251255 - Fortymile Wash near well J-13, NTS, NV	02-25-69 03-03-83 07-21-84 08-19-84 07-19-85	570 16.1 52.7 24.4 0.17	86WY 87WY 88WY 89WY 90WY	* * * * *	91WY 92WY 93WY 94WY 03-11-95	* * * * 85.0
37	10251256 - Dune Wash near Busted Butte, NTS, NV (formerly published as Busted Butte Wash)	82WY 83WY 08-19-84 07-19-85 86WY 87WY	* * 0.40 2.66 * *	88WY 89WY 90WY 09-07-91 02-12-92 03-30-92	* * * 0.12 0.04 0.03	93WY 94WY 12-25-94 01-25-95 03-11-95	* * 0.08 0.08 0.08
38	10251256 - Fortymile Wash near Amargosa Valley, NV (formerly published as Fortymile Wash cross-section 1)	01-25-69 02-25-69 82WY 03-03-83 07-22-84 08-19-84	42.5 93.5 * 11.3 40.5 10.5	07-19-85 86WY 02-23-87 11-06-87 89WY 09-23-90	0.09 * 0.02 0.02 * 0.02	91WY 92WY 93WY 94WY 03-11-95	* * * * 34.0
39	10251259 - Amargosa River at Highway 127, near California-Nevada State Line	02-08-93 02-09-93	1.36 0.31	02-26-93 04-28-94	3.09 0.42	01-25-95	1.56
40	10251260 - Topopah Wash at Little Skull Mountain, NTS, NV (formerly published as Topopah Wash near Lathrop Wells)	07-21-84 07-31-84 08-15-84 08-19-84 11-22-84 12-19-84 11-12-85 02-15-86 11-18-86 07-20-87	3.71 3.40 2.35 15.0 0.03 0.003 0.003 0.15 0.20 0.14	04-15-88 08-25-88 08-11-89 07-15-90 08-15-90 09-23-90 03-00-91 01-06-92 02-12-92 03-07-92	<0.014 0.14 0.17 0.28-0.42 <0.03 0.08 0.02 0.08 0.07 0.006	03-30-92 12-07-92 12-08-92 01-17-93 02-08-93 02-20-93 06-06-93 94WY 12-25-94	0.04 0.20 0.02 0.21 0.10 0.02 0.15 * 0.14
41	10251265 - Cane Spring Wash near Cane Spring, NTS, NV (formerly published as Cane Springs tributary near Mercury and Cane Spring Wash tributary near Cane Spring)	07-24-84 85WY 86WY 05-16-87 10-24-87 89WY 08-14-90	0.01 * * 0.14-0.28 0.17 * 0.42	09-23-90 10-04-90 08-11-91 09-07-91 02-12-92 07-12-92	0.17 0.17 0.12 0.51 0.04 0.79	12-07-92 01-18-93 01-18-93 02-20-93 94WY 03-11-95	0.54 0.17 0.006 0.06 * 0.14
42	102512654 - Cane Spring Wash tributary below Skull Mountain, NTS, NV	92WY 01-18-93 01-18-93	* 1.60 6.80	02-20-93 94WY	0.31 *	01-26-95 03-11-95	0.42 0.42

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Table 5.1-2. Dates and Peak Discharges at Continuous Gaging Stations, Crest-Stage Gages, and Miscellaneous Sites in the Yucca Mountain Region (Continued)

Map Designation Number	Station Number - Station Name	Date mm-dd-yy	Peak Discharge (cubic meters per second)	Date mm-dd-yy	Peak Discharge (cubic meters per second)	Date mm-dd-yy	Peak Discharge (cubic meter per second)
43	10251266 - Frenchman Lake tributary at old Mercury Highway, NTS, NV	08-15-84	31.2				
44	10251269 - Gas Station Wash at Mercury, NTS, NV	07-15-84	2.83				
45	10251270 - Amargosa River tributary near Mercury, NV	09-01-63	0.28	12-04-74	0.02	85WY	*
		08-01-64	1.13	76WY	*	07-24-86	1.89
		08-18-65	1.05	10-02-76	0.68	11-18-86	2.83
		11-08-65	0.57	78WY	*	88WY	*
		08-01-67	17.0	08-13-79	0.68	89WY	*
		08-01-68	97.1	80WY	*	07-15-90	1.42
		02-25-69	1.70	81WY	*	08-14-90	20.2
		08-04-70	6.80	82WY	--	91WY	*
		08-14-71	2.55	83WY	--	92WY	*
		08-13-72	43.6	07-15-84	5.55	93WY	*
		10-04-72	5.24	08-15-84	0.74	94WY	*
		08-04-74	0.08	08-19-84	32.6	95WY	*
46	10251271 - Amargosa River tributary No. 1 near Johnnie, NV	09-04-67	2.62	10-02-76	2.10	05-16-87	<0.003
		08-01-68	5.49	02-10-78	0.31	01-17-88	<0.003
		07-28-69	0.02	79WY	*	04-15-88	<0.0003
		08-04-70	9.91	80WY	*	89WY	*
		07-00-71	2.55	81WY	*	07-14-90	0.51
		09-18-72	0.17	82WY	--	07-07-91	9.35
		10-04-72	2.77	83WY	--	92WY	*
		03-08-74	0.11	08-00-84	2.69	02-08-93	0.34
		09-10-75	0.28	85WY	*	94WY	*
		07-00-76	0.08	86WY	*	95WY	*
47	10251272 - Amargosa River tributary No. 2 near Johnnie, NV	08-01-68	3.54	02-00-78	0.03	08-29-88	0.01
		06-12-69	0.06	79WY	*	08-11-89	1.42
		08-04-70	0.08	80WY	*	07-14-90	0.05
		71WY	*	81WY	*	07-07-91	0.25
		09-18-72	0.01	82WY	--	07-31-91	0.17
		02-11-73	0.003	83WY	--	09-07-91	0.11
		74WY	*	08-00-84	0.06	01-00-92	0.06
		09-10-75	0.14	85WY	*	93WY	*
		02-00-76	0.06	86WY	*	94WY	*
		08-00-77	0.08	05-16-87	<0.003	95WY	*
48	10251275 - Carson Slough at Ash Meadows, NV	01-11-94	0.06				
		01-27-95	1.44				

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Table 5.1-2. Dates and Peak Discharges at Continuos Gaging Stations, Crest-Stage Gages, and Miscellaneous Sites in the Yucca Mountain Region (Continued)

Map Designation Number	Station Number - Station Name	Date mm-dd-yy	Peak Discharge (cubic meters per second)	Date mm-dd-yy	Peak Discharge (cubic meters per second)	Date mm-dd-yy	Peak Discharge (cubic meter per second)
49	10251280 - Amargosa River near Eagle Mountain below Death Valley Junction, California (formerly published as Amargosa River at Eagle Mountain)	07-16-90 91WY 03-27-92 07-13-93 01-07-93 01-19-93 01-20-93	39.4 * 0.11 20.5 0.01 1.36 2.38	01-26-93 02-03-93 02-08-93 02-09-93 02-09-93 02-11-93 02-11-93	0.23 0.14 12.1 4.50 4.16 1.95 1.78	02-20-93 02-23-93 03-26-93 04-07-93 07-28-94 03-11-95	2.95 0.68 0.05 0.02 3.40 2.83
50	10251300 - Amargosa River at Tecopa, California	09-26-62 02-10-63 09-21-63 07-27-64 04-10-65 07-18-65 11-23-65 12-11-65 12-31-65 09-05-67 02-14-68 08-03-68 01-25-69 02-06-69 02-26-69 06-18-69 07-20-69 02-23-70 08-16-70 11-30-70 09-18-72 10-03-72 04-18-73 01-08-74 03-09-74 07-24-74 09-11-75	8.78 20.4 8.67 0.96 2.44 8.52 12.7 68.5 12.3 2.55 3.43 7.19 48.3 10.4 142 5.49 4.28 5.86 3.06 0.88 4.13 56.6 3.74 1.22 0.59 1.50 0.68	02-11-76 05-07-76 09-11-76 09-26-76 10-02-76 01-03-77 03-02-77 05-08-77 08-17-77 12-28-77 01-05-78 01-10-78 01-19-78 02-10-78 03-04-78 04-02-78 04-16-78 01-16-79 03-21-79 01-11-80 01-29-80 02-17-80 03-03-80 05-04-80 07-01-80 01-30-81	8.58 0.62 20.5 30.0 73.6 1.33 0.45 2.72 47.6 4.62 1.59 1.47 5.58 9.09 10.3 5.86 1.84 1.95 1.53 1.95 7.39 19.4 3.77 3.91 6.34 2.44	08-12-81 09-06-81 01-21-82 02-12-82 03-15-82 04-12-82 09-12-82 11-30-82 12-23-82 01-29-83 02-08-83 03-03-83 03-24-83 08-07-83 08-18-83 84WY 85WY 86WY 87WY 88WY 89WY 08-14-90 91WY 03-30-92 02-08-93 02-08-94	5.98 33.1 1.84 1.59 5.72 2.75 1.73 2.49 2.44 2.32 2.18 35.7 2.27 1.84 300 -- -- -- -- -- -- 12.1 -- 14.4 20.4 0.05
51	-- 3 Springs Creek near Warm Springs, NV	06-07-87 04-29-88	0.005 0.06	03-19-89 90WY	0.0004 *	04-26-91 04-15-92	0.002 0.01
52	-- East Stewart Creek near Ione, NV	06-06-87 06-06-88	0.08 0.07	06-11-89 06-10-90	0.03 0.04	06-13-91 05-17-92	0.10 0.04

NOTE: CA, California; NV, Nevada; NTS, Nevada Test Site; WY, Water Year (previous October to September); 00, no day determined for indicated month and year; <, less than; *, no flow recorded during indicated Water Year; --, site not operated during indicated Water Year

Table 5.1-3. The Ten Largest Observed Peak Discharges in the Yucca Mountain Region

Station Number	Station Name	Drainage Area, in square kilometers	Date mm/dd/yy	Peak Discharge, in cubic meters per second	Unit Peak Discharge, in cubic meters per second per square kilometer
10251255	Fortymile Wash near well J-13, NTS, NV	787	02/25/69	570	0.724
10251220	Amargosa River near Beatty, NV	1222	02/24/69	453	0.371
10251300	Amargosa River at Tecopa, CA	8003	08/18/83	300	0.037
10251300	Amargosa River at Tecopa, CA	8003	02/26/69	142	0.018
10251220	Amargosa River near Beatty, NV	1222	08/30/67	120	0.098
10251270	Amargosa River Tributary near Mercury, NV	285	08/01/68	97.1	0.341
10251258	Fortymile Wash near Amargosa Valley, NV	818	02/25/69	93.5	0.114
10251242	Fortymile Wash above East Cat Canyon, NTS, NV	106	03/11/95	85.0	0.802
10251250	Fortymile Wash at Narrows, NTS, NV	668	03/11/95	85.0	0.127
10251255	Fortymile Wash near well J-13, NTS, NV	787	03/11/95	85.0	0.108

NOTE: CA, California; NV, Nevada; NTS, Nevada Test Site

Table 5.1-4. The Ten Largest Observed Unit Peak Discharges in the Yucca Mountain Region

Station Number	Station Name	Drainage Area, in Square kilometers	Date mm/dd/yy	Peak discharge, in cubic meters per second	Unit Peak Discharge, in cubic meters per second per square kilometer
102512537	Split Wash below Quac Canyon Wash, NTS, NV	0.85	07/21/84	8.21	9.66
10248970	Stonewall Flat tributary near Goldfield, NV	1.37	06/16/69	4.25	3.10
10247890	KP's Wash at Tippipah Highway, NTS, NV	2.80	07/19/84	8.50	3.04
10249140	Ralston Valley tributary near Tonopah, NV	0.52	08/29/71	1.36	2.62
10249140	Ralston Valley tributary near Tonopah, NV	0.52	07/00/69	1.27	2.44
102512532	Pagany Wash #2, NTS, NV	1.89	08/19/84	4.25	2.25
10249135	San Antonio Wash tributary near Tonopah, NV	8.86	08/13/72	18.7	2.11
10251269	Gas Station Wash at Mercury, NTS, NV	1.35	07/15/84	2.83	2.10
10251266	Frenchman Lake tributary at old Mercury Highway, NTS, NV	16.4	08/15/84	31.2	1.90
10251271	Amargosa River tributary No. 1 near Johnnie, NV	5.72	08/04/70	9.91	1.73

NOTE: NV, Nevada; NTS, Nevada Test Site; 00, no day determined for indicated month and year

Table 5.1-5. The Ten Largest Observed Unit Peak Discharges for Sites with Drainage Basin Area Greater than 10 Square Kilometers in the Yucca Mountain Region

Station Number	Station Name	Drainage Area, in square kilometers	Date mm/dd/yy	Peak Discharge, in cubic meters per second	Unit Peak Discharge, in cubic meters per second per square kilometer
10251266	Frenchman Lake tributary at old Mercury Highway, NTS, NV	16.4	08/15/84	31.2	1.90
10251242	Fortymile Wash above East Cat Canyon, NTS, NV	106	03/11/95	85.0	0.802
10251255	Fortymile Wash near well J-13, NTS, NV	787	02/25/69	570	0.724
10251252	Yucca Wash near mouth, NTS, NV	44	07/21/84	26.6	0.604
10251254	Drillhole Wash at mouth, NTS, NV	42.2	07/23/84	22.4	0.531
10249850	Palmetto Wash tributary near Lida, NV	12.2	07/00/69	5.47	0.448
10249680	Big Smokey Valley tributary near Blair Junction, NV	29.5	07/00/85	13.0	0.441
10251220	Amargosa River near Beatty, NV	1222	02/24/69	453	0.371
10251270	Amargosa River tributary near Mercury, NV	285	08/01/68	97.1	0.341
10249680	Big Smokey Valley tributary near Blair Junction, NV	29.5	08/14/84	9.35	0.317

NOTE: NV, Nevada; NTS, Nevada Test Site; 00, no day determined for indicated month and year.

Table 5.1-6. Physical Characteristics and Chemical Composition of Water Samples at Surface Water Sites in the Yucca Mountain Area

Date [mm/dd/yy]	Time	Data Source	Water Temp in C	Specific Conductance, in us/cm	pH	Calcium Dissolved [mg/L as Ca]	Magnesium Dissolved [mg/L as Mg]	Sodium Dissolved [mg/L as Na]	Potassium Dissolved [mg/L as K]	Chloride Dissolved [mg/L as Cl]	Sulfate Dissolved [mg/L as SO_4]	Fluoride Dissolved [mg/L as F]	Bicarbonate Dissolved [mg/L as HCO_3]	Silica Dissolved [mg/L as SiO_2]
10251218 - Amargosa River at Highway 95 below Beatty, Nevada - 51														
01/18/93	1710	1	10.0	3000	--	36	6.0	630	23	290	440	11	723	55
02/09/93	1014	1	14.0	2130	--	34	5.6	440	18	180	330	7.2	600	58
02/20/93	1630	1	--	2460	--	33	5.3	490	18	220	350	8.2	688	56
10251220 - Amargosa River near Beatty - 18														
02/20/93	1730	1	--	2650	--	32	5.3	540	20	230	360	9.6	736	58
10251248 - Unnamed tributary to Stockade Wash near Rattlesnake Ridge, Nevada Test Site, Nevada - 22														
03/31/92	1435	2	--	211	--	20	4.0	11	4.4	12	9.7	0.20	89	25
01/22/93	1130	1	1.0	134	--	14	2.8	10	3.2	5.1	8.4	0.10	54	20
03/23/93	1617	1	12.5	164	--	16	3.6	11	5.2	4.3	9.0	0.20	76	36
102512484 - Stockade Wash at Airport Road, Nevada Test Site, Nevada - 23														
02/10/93	1105	1	4.0	122	--	15	3.1	6.4	4.3	3.1	6.5	<0.1	55	24
365634116221501 - Pah Canyon above mouth - 52														
02/23/93	1405	3	--	140	8.0	14	2.6	9.3	--	4.3	10	0.3	54	34
01/26/95	1030	4	--	145	7.9	16	2.9	8.2	4.3	4.0	7.6	0.3	55	30
365627116223701 - Overland flow near Pah Canyon - 53														
01/06/95	1200	4	--	134	7.8	15	2.8	4.9	3.7	3.4	7.8	0.1	34	18
01/10/95	1430	4	--	109	--	--	--	--	--	--	--	--	--	--
01/24/95	1130	4	--	112	--	--	--	--	--	--	--	--	--	--
01/26/95	1135	4	--	120	--	--	--	--	--	--	--	--	--	--
365524116221201 - Delirium Canyon overland flow - 54														
01/05/95	1210	4	--	143	--	--	--	--	--	--	--	--	--	--
365513116222901 - Delirium Canyon at mouth - 55														
02/09/93	1330	3	--	118	7.8	12	2.4	7.6	--	3.2	7.8	0.3	48	33
01/26/95	1200	4	--	131	--	--	--	--	--	--	--	--	--	--

NOTE: Sites Listed by Station Number, Station Name, and Map Number.

Data Sources:
1 Emett et al. 1994
2 U.S. Geological Survey NWIS file
3 Savard 1996
4 TDIF:305288 DTN:GS960308312133
5 Perfect et al. 1995
6 Doty and Rush 1985
7 Walker and Eakin 1963
8 Hunt et al. 1966
9 Miller 1977

Table 5.1-6. Physical Characteristics and Chemical Composition of Water Samples at Surface Water Sites in the Yucca Mountain Area (Continued)

Date [mm/dd/yy]	Time	Data Source	Water Temp in C	Specific Conductance, in us/cm	pH	Calcium Dissolved [mg/L as Ca]	Magnesium Dissolved [mg/L as Mg]	Sodium Dissolved [mg/L as Na]	Potassium Dissolved [mg/L as K]	Chloride Dissolved [mg/L as Cl]	Sulfate Dissolved [mg/L as SO_4]	Fluoride Dissolved [mg/L as F]	Bicarbonate Dissolved [mg/L as HCO_3]	Silica Dissolved [mg/L as SiO_2]
365320116231501 - Overland flow in Fortymile Canyon - 56														
01/24/95	1230	4	--	164	8.1	20	2.9	8.4	4.5	2.6	8.5	0.2	72	23
10251252 - Yucca Wash near mouth, Nevada Test Site, Nevada - 26														
01/18/93	1120	1	7.0	133	--	15	2.3	11	4.1	4.4	6.0	0.2	55	24
01/26/95	0855	4	--	117	8.1	15	2.1	5.8	4.1	2.0	4.1	0.2	53	22
364908116234600 - Fortymile Wash above Drillhole Wash - 57														
08/14/84	1505	5	--	70	8.4	8.1	0.9	4.1	5.6	1.3	6.2	<0.1	44	8.7
102512533 - Pagany Wash #1 near Well UZ-4, Nevada Test Site, Nevada - 29														
12/07/92	1748	1	5.0	218	--	21	2.1	13	4.6	10	24	0.2	--	14
1025125356 - Wren Wash at Yucca Mountain, Nevada Test Site, Nevada - 31														
01/25/95	1100	4	--	258	8.2	28	3.9	16	11	5.8	16	0.2	109	21
102512537 - Split Wash below Quac Canyon Wash, Nevada Test Site, Nevada - 33														
01/25/95	1330	4	--	199	8.2	24	3.4	9.3	8.8	3.7	8.7	0.2	88	19
364911116235200 - Drillhole Wash at mouth - 58														
08/14/84	1510	5	--	100	8.3	9.5	1.3	8.6	7.4	2.2	12	0.3	51	20
364904116234700 - Fortymile Wash at H-Road - 59														
08/15/84	2230	5	21.3	170	8.0	21	2.9	8.2	9.1	1.4	10	0.2	91	24
364749116235100 - Busted Butte Wash - 60														
08/14/84	1530	5	--	120	8.3	12	1.8	7.0	8.1	1.7	7.9	0.3	57	23
364551116233700 - Fortymile Wash at J-12 - 61														
08/14/84	1600	5	--	59	8.2	6.7	0.7	2.4	6.3	2.0	6.3	<0.1	32	4.5
371209116075201 - Whiterock Creek - 62														
03/14/73	1510	5	--	116	6.2	6.2	0.2	17	3.0	3.7	12	0.1	41	24
08/02/91	--	5	--	--	--	5.3	0.4	46	6.5	13	26	0.4	--	48

NOTE: Sites Listed by Station Number, Station Name, and Map Number.

Data Sources:
1 Emett et al. 1994
2 U.S. Geological Survey NWIS file
3 Savard 1998
4 TDIF:305288 DTN:GS960308312133
5 Perfect et al. 1995
6 Doty and Rush 1985
7 Walker and Eakin 1963
8 Hunt et al. 1966
9 Miller 1977

Table 5.1-6. Physical Characteristics and Chemical Composition of Water Samples at Surface Water Sites in the Yucca Mountain Area (Continued)

Date [mm/dd/yy]	Time	Data Source	Water Temp in C	Specific Conductance, in us/cm	pH	Calcium, Dissolved [mg/L as Ca]	Magnesium, Dissolved [mg/L as Mg]	Sodium, Dissolved [mg/L as Na]	Potassium, Dissolved [mg/L as K]	Chloride, Dissolved [mg/L as Cl]	Sulfate, Dissolved [mg/L as SO_4]	Fluoride, Dissolved [mg/L as F]	Bicarbonate, Dissolved [mg/L as HCO_3]	Silica, Dissolved [mg/L as SiO_2]
365600116010000-Yucca Lake - 63														
09/27/62	--	5	37.8	177	--	8.9	0.9	25	16	2.8	8.8	0.5	106	18
01/19/78	1020	6	4.0	140	7.5	9.2	1.1	13	12	3.6	6.5	0.2	71	8.5
102512654 - Cane Spring Wash Tributary below Skull Mountain, Nevada Test Site, Nevada - 42														
01/18/93	0851	1	3.0	168	--	19	2.7	14	5.2	9.7	2.8	0.1	340	19
362453116214501 - Carson Slough at Spring Meadows Road at Ash Meadows, Nevada - 64														
01/27/59	--	7,8	10.0	937	--	40	26	125	16	40	122	2.0	362	28
04/28/88	1350	5	--	2230	8.7	31	47	400	4.0	140	510	2.9	561	18
361910116224201 - Carson Slough at Stateline Road near Death Valley, California - 65														
04/28/88	1240	5	--	3200	--	19	51	650	39	250	780	4.2	680	17
02/10/93	1045	1	8.0	1120	--	9.0	6.7	210	30	84	210	1.4	256	25
02/23/93	1300	1	11.0	1920	--	20	17	310	37	150	390	1.8	411	19
No station number - Amargosa River in the Northwest quarter of section 18, T24N, R6E - 66														
--	--	8	4.4	1860	--	24	29	344	40	123	277	2.8	542	26
10251280 - Amargosa River near Eagle Mountain below Death Valley Junction, California - 49														
02/10/93	1130	1	9.0	1230	--	5.0	11	270	29	90	240	1.5	283	35
02/23/93	1130	1	11.5	1910	--	23	18	330	37	150	380	1.9	419	21
361012116192801 - Amargosa River near Evelyn, California - 67														
04/28/88	1130	5	--	3970	--	22	55	850	36	320	1000	4.5	796	24
353953116174501 - Amargosa River at Highway 127 - 68														
03/21/67	--	9	14.5	4870	--	22	56	1070	49	500	1010	5.3	910	22

NOTE: Sites Listed by Station Number, Station Name, and Map Number.

Data Sources:
1 Emett et al. 1994
2 U.S. Geological Survey NWIS file
3 Savard 1996
4 TDIF:305288 DTN:GS960308312133
5 Perfect et al. 1995
6 Doty and Rush 1985
7 Walker and Eakin 1963
8 Hunt et al. 1966
9 Miller 1977

Table 5.1-6. Physical Characteristics and Chemical Composition of Water Samples at Surface Water Sites in the Yucca Mountain Area (Continued)

Date [mm/dd/yy]	Time	Aluminum, Dissolved [ug/L as Al]	Iron, Dissolved [ug/L as Fe]	Lead, Dissolved [ug/L as Pb]	Lithium, Dissolved [ug/L as Li]	Manganese, Dissolved [ug/L as Mn]	Bromide, Dissolved [mg/L as Br]	Iodide, Dissolved [mg/L as I]	Strontium, Dissolved [ug/L as Sr]	TritiuM Total [pCi/L]	Delta Deuterium [permil]	Delta Oxygen-18 [permil]	Dissolved Solids Residue [mg/L]	Dissolved Solids Sum [mg/L]
10251218 - Amargosa River at Highway 95 below Betty, Nevada - 51														
01/18/93	1710	150	110	<30	330	5	0.32	0.019	240	<5.7	--	--	-	1850
02/09/93	1014	20	55	<30	280	<3	0.24	0.019	190	<5.7	--	--	--	1370
02/20/93	1630	70	79	<30	280	5	0.32	0.025	200	<5.7	--	--	--	1520
10251220 - Amargosa River near Beatty, Nevada - 18														
02/20/93	1730	80	85	<30	290	13	0.32	0.025	190	<5.7	--	--	--	1620
10251248 - Unnamed tributary to Stockade Wash near Rattlesnake Ridge, Nevada Test Site, Nevada -22														
03/31/92	2435	-	--	--	13	--	0.02	--	--	--	--	--	156	130
01/22/93	1130	50	13	<10	12	2	--	--	82	22	--	--	--	90
03/23/93	1617	140	66	<10	9	4	--	0.008	65	--	--	--	--	123
102512484 - Stockade Wash at Airport Road, Nevada Test Site, Nevada - 23														
02/10/93	1105	100	340	<10	9	1	--	--	80	19	--	--	--	90
365634116221501 - Pah Canyon above mouth - 52														
02/23/93	1405	--	19	<10	6	1	--	--	21	32	-82.3	-11.28	--	--
01/26/95	1030	--	24	20	<4	3	<0.01	--	23	--	--	--	86	100
365627116223701 - Overland flow near Pah Canyon - 53														
01/06/95	1200	--	<3	<10	8	<1	<0.01	--	--	--	--	--	106	--
01/10/95	1430	--	--	--	--	--	--	--	--	--	--	--	--	--
01/24/95	1130	--	--	--	--	--	--	--	--	--	--	--	--	--
01/26/95	1135	--	--	--	--	--	--	--	--	--	--	--	--	--
365524116221201 - Delirium Canyon overland flow - 54														
01/05/95	1210	--	--	--	--	--	--	--	--	--	--	--	--	--
365513115222901 - Delirium Canyon at mouth - 55														
02/09/93	1330	--	27	<10	5	2	--	--	18	33	-88.10	-12.37	--	--
01/26/95	1200	--	--	--	--	--	--	--	--	--	--	--	--	--

NOTE: Sites Listed by Station Number, Station Name, and Map Number.

Data Sources:
1 Emett et al. 1994
2 U.S. Geological Survey NWIS file
3 Savard 1996
4 TDIF:305288 DTN:GS960308312133
5 Perfect et al. 1995
6 Doty and Rush 1985
7 Walker and Eakin 1963
8 Hunt et al. 1966
9 Miller 1977

Table 5.1-6. Physical Characteristics and Chemical Composition of Water Samples at Surface Water Sites in the Yucca Mountain Area (Continued)

Date [mm/dd/yy]	Time	Aluminum, Dissolved [ug/L as Al]	Iron, Dissolved [ug/L as Fe]	Lead, Dissolved [ug/L as Pb]	Lithium, Dissolved [ug/L as Li]	Manganese, Dissolved [ug/L as Mn]	Bromide, Dissolved [mg/L as Br]	Iodide, Dissolved [mg/L as I]	Strontium, Dissolved [ug/L as Sr]	Tritium Total [pCi/L]	Delta Deuterium [permil]	Delta Oxygen-18 [permil]	Dissolved Solids Residue [mg/L]	Dissolved Solids Sum [mg/L]
365320116231501 - Overland flow in Fortymile Canyon - 56														
01/24/95	1230	--	9	<10	10	<1	<0.01	--	97	--	--	--	143	--
10251252 - Yucca Wash near mouth, Nevada Test Site, Nevada - 26														
01/18/93	1120	380	57	<10	10	10	--	--	45	19	--	--	--	94
01/26/95	0855	--	30	<10	<4	11	<0.01	--	44	--	--	--	100	--
364908116234600 - Fortymile Wash above Drillhole Wash - 57														
08/14/84	1505	70	18	--	6	11	<0.01	0.003	34	--	--	--	--	57
102512533 - Pagany Wash #1 near Well UZ-4, Nevada Test Site, Nevada - 29														
12/07/92	1748	20	6	<10	11	2	0.04	0.005	130	23	--	--	--	--
1025125356 - Wren Wash at Yucca Mountain, Nevada Test Site, Nevada - 31														
01/25/95	1100	--	32	<10	19	3	<0.01	--	200	--	--	--	206	--
102512537 - Split Wash below Quac Canyon Wash, Nevada Test Site, Nevada - 33														
01/25/95	1330	--	28	<10	9	3	<0.01	--	160	--	--	--	162	--
364911116235200 - Drillhole Wash at mouth - 58														
08/14/84	1510	280	100	--	14	6	<0.01	0.002	66	--	--	--	--	92
364904116234700 - Fortymile Wash at H-Road - 59														
08/15/84	2230	170	77	--	7	5	<0.01	0.005	100	--	--	--	--	122
364749116235100 - Busted Butte Wash - 60														
08/14/84	1530	810	200	--	17	10	<0.01	0.003	86	--	--	--	--	100
364551116233700 - Fortymile Wash at J-12 - 61														
08/14/84	1600	90	28	--	5	22	<0.01	0.004	31	--	--	--	--	45
371209116075201 - Whitecrock Creek - 62														
03/14/73	1510	--	30	--	<10	<10	--	--	<1-	<150	--	--	114	92
08/02/91	--	--	240	10	20	20	0.15	--	10	--	--	--	--	--

NOTE: Sites Listed by Station Number, Station Name, and Map Number.

Data Sources:
1 Emett et al. 1994
2 U.S. Geological Survey NWIS file
3 Savard 1996
4 TDIF:305288 DTN:GS960308312133
5 Perfect et al. 1995
6 Doty and Rush 1985
7 Walker and Eakin 1963
8 Hunt et al. 1966
9 Miller 1977

Table 5.1-6. Physical Characteristics and Chemical Composition of Water Samples at Surface Water Sites in the Yucca Mountain Area (Continued)

Date [mm/dd/yy]	Time	Aluminum, Dissolved [ug/L as Al]	Iron, Dissolved [ug/L as Fe]	Lead, Dissolved [ug/L as Pb]	Lithium, Dissolved [ug/L as Li]	Manganese, Dissolved [ug/L as Mn]	Bromide, Dissolved [mg/L as Br]	Iodide, Dissolved [mg/L as I]	Strontium, Dissolved [ug/L as Sr]	Tritium Total [pCi/L]	Delta Deuterium [permil]	Delta Oxygen-18 [permil]	Dissolved Solids Residue [mg/L]	Dissolved Solids Sum [mg/L]
365600116010000 - Yucca Lake - 63														
09/27/62	--	--	3-	--	--	6--	--	--	2--	--	--	--	224	--
01/19/78	1020	--	710	--	--	--	--	--	<10	<480	--	--	109	90
102512654 - Cane Spring Wash Tributary below Skull Mountain, Nevada Test Site, Nevada - 42														
01/18/93	0851	30	140	<10	13	4	--	--	110	18	--	--	--	240
362453116214501 - Carson Slough at Spring Meadows Road at Ash Meadows, Nevada - 64														
01/27/59	--	200	210	--	--	--	--	--	1800	--	--	--	566	--
04/28/88	1350	--	--	--	--	--	--	--	--	--	--	--	1490	1430
361910116224201 - Carson Slough at Stateline Road near Death Valley, California - 65														
04/28/88	1240	--	--	--	--	--	--	--	--	--	--	--	2150	2140
02/10/93	1045	1000	490	<10	57	31	0.1	0.016	510	10	--	--	--	704
02/23/93	1300	60	15	<10	99	1	0.17	0.038	1200	17	--	--	--	1150
No station number - Amargosa River in the Northwest quarter of section 18, T24N, R6E - 66														
--	--	500	450	--	--	--	--	--	800	--	--	--	1140	--
10251280 - Amargosa River near Eagle Mountain below Death Valley Junction, California - 49														
02/10/93	1130	2700	1300	<10	97	84	0.14	0.023	310	11	--	--	--	825
02/23/93	1130	40	21	<10	97	<1	0.23	0.023	1200	16	--	--	--	1170
361012116192801 - Amargosa River near Evelyn, California - 67														
04/28/88	1130	--	--	--	--	--	--	--	--	--	--	--	2720	2700
353953116174501 - Amargosa River at Highway 127 - 68														
03/21/67	--	--	120	--	--	--	--	--	--	--	--	--	3290	--

NOTE: Sites Listed by Station Number, Station Name, and Map Number.

Data Sources:
1 Emett et al. 1994
2 U.S. Geological Survey NWIS file
3 Savard 1996
4 TDIF:305288 DTN:GS960308312133
5 Perfect et al. 1995
6 Doty and Rush 1985
7 Walker and Eakin 1963
8 Hunt et al. 1966
9 Miller 1977

Table 5.1-7. Physical Characteristics and Chemical Composition of Water Samples Obtained at Surface Water Sites in the 3 Springs Basin of Central Nevada

# Date [mm/dd/yy]	Time	Data Source	Water Temp, in C	Specific Conductance, in us/cm	pH	Calcium, Dissolved [mg/L as Ca]	Magnesium, Dissolved [mg/L as Mg]	Sodium, Dissolved [mg/L as Na]	Potassium, Dissolved [mg/L as K]	Chloride, Dissolved [mg/L as Cl]	Sulfate, Dissolved [mg/L as SO_4]	Fluoride, Dissolved [mg/L as F]	Alkalinity [mg/L as $CaCO_3$]	Silica, Dissolved [mg/L as SiO_2]
375731116253800 3 Springs Creek near 3 Spring #3, near Warm Springs, Nevada														
01/19/85	1215	1	--	--	--	9.4	1.8	8.7	2.2	2.9	2.7	0.07	42	39
04/03/85	1245	1	--	--	--	<5.0	1.4	5.5	2.2	2.9	4.3	0.09	33	37
07/10/85	1634	1	--	98	--	9.4	1.7	8.6	--	2.5	3.6	0.07	40	40
01/11/86	1530	1	5.0	49	7.1	8.0	1.5	7.7	--	3.0	4.3	0.07	38	36
03/20/86	1400	1	7.0	85	8.1	6.7	1.4	7.0	1.8	2.6	5.0	0.08	30	36
375736116255201 3 Springs Creek near Warm Springs, Nevada														
04/03/85	--	1	--	--	--	>5.0	1.5	>5.0	1.9	3.4	5.2	0.09	38	39
03/04/86	1500	1	7.0	--	7.1	7.6	1.6	8.3	2.0	--	--	--	34	38
03/20/86	1317	1	8.0	95	7.2	8.0	1.5	7.0	1.6	2.8	5.7	0.11	34	38
04/01/86	1510	1	7.0	91	7.1	7.5	1.4	7.0	1.7	2.6	5.3	0.08	32	35
03/31/87	1620	1	6.5	120	6.7	9.7	1.4	1.9	1.2	4.0	5.4	0.06	43	39
05/07/87	0945	1	3.0	108	--	9.3	2.5	11	1.0	3.2	5.0	0.16	42	38
07/01/87	1745	1	8.5	130	6.7	12	1.7	12	1.2	3.4	4.8	0.11	53	40
11/18/87	1600	1	7.5	126	--	9.7	1.8	9.7	2.1	3.5	5.8	--	53	40
12/09/87	1615	1	7.0	142	6.5	10	1.6	10	1.3	3.5	5.8	--	46	40
01/09/88	1130	1	7.0	128	6.8	10	1.7	9.9	1.3	3.5	5.3	--	50	42
04/06/88	0945	1	6.0	101	6.8	8.7	1.4	11	1.0	3.3	5.4	--	47	39
06/25/88	1430	1	8.5	109	7.0	10	1.7	11	1.3	3.0	5.0	--	49	38
04/12/89	1000	1	8.0	112	6.6	11	1.5	13	1.2	3.7	6.0	0.10	49	41
05/24/89	1215	1	8.5	122	6.9	11	0.52	13	1.5	3.8	5.0	0.10	53	40
05/22/90	1000	1	8.0	123	6.8	11	1.5	13	1.0	4.6	5.2	0.10	50	41
06/06/91	0745	1	7.5	118	6.7	11	1.5	12	0.90	4.3	7.2	0.20	46	40
04/08/92	1340	2	7.0	97	6.9	7.8	1.3	9.1	1.4	4.0	7.4	0.20	32	38
375736116255201 3 Springs Creek near 3 Spring #2, near Warm Springs, Nevada														
07/10/85	1520	1	--	95	--	9.2	1.7	8.2	--	2.4	3.7	--	37	39
09/25/85	1400	1	9.5	99	7.5	8.8	1.7	7.7	--	2.6	3.5	0.07	41	36
07/08/86	1535	1	9.0	96	6.6	8.0	1.9	6.9	2.0	2.8	4.0	0.06	39	36
09/30/86	1730	1	6.5	105	7.4	7.9	1.9	8.0	2.1	3.8	3.4	--	43	--
12/30/86	1600	1	6.0	99	6.8	7.0	1.7	7.8	1.9	2.7	3.5	0.05	39	38
03/31/87	1700	1	6.5	100	6.5	8.3	1.6	8.0	0.57	3.3	3.8	0.03	39	36
07/01/87	1545	1	8.5	88	6.6	8.2	1.5	8.6	1.9	2.8	3.7	0.10	39	36
09/30/87	1230	1	9.0	103	7.1	5.9	1.8	8.2	2.4	3.2	3.2	--	43	38
01/09/88	1230	1	7.0	101	6.8	8.0	1.6	8.6	1.8	2.9	4.4	--	38	39

Data Sources: 1 McKinley and Oliver 1994, 1995

Table 5.1-7. Physical Characteristics and Chemical Composition of Water Samples Obtained at Surface Water Sites in the 3 Springs Basin of Central Nevada (Continued)

Date [mm/dd/yy]	Time	Data Source	Water Temp, in C	Specific Conductance, in us/cm	pH	Calcium, Dissolved [mg/L as Ca]	Magnesium, Dissolved [mg/L as Mg]	Sodium, Dissolved [mg/L as Na]	Potassium, Dissolved [mg/L as K]	Chloride, Dissolved [mg/L as Cl]	Sulfate, Dissolved [mg/L as SO_4]	Fluoride, Dissolved [mg/L as F]	Alkalinity [mg/L as $CaCO_3$]	Silica, Dissolved [mg/L as SiO_2]
04/06/88	1430	1	7.0	85	6.7	6.6	1.5	8.4	1.7	2.6	4.2	--	39	37
06/25/88	1315	1	8.0	85	7.0	6.5	1.5	8.2	1.8	2.6	4.1	--	36	36
09/23/88	1230	1	9.0	95	6.8	9.5	1.9	8.9	2.1	2.0	3.9	--	40	38
02/23/89	1500	1	7.0	86	7.1	7.9	1.5	7.8	2.0	3.1	3.3	0.13	37	35
04/12/89	1215	1	8.5	93	6.5	8.7	1.6	9.1	1.2	3.4	3.6	0.11	39	36
05/24/89	1415	1	8.0	97	7.0	8.4	1.6	9.4	2.1	3.4	3.9	0.11	41	37
01/30/90	1510	1	4.0	86	7.2	8.3	1.5	8.5	--	4.3	3.3	0.13	38	37
04/04/90	1051	1	8.0	90	7.1	8.2	1.6	8.8	--	3.1	5.1	0.11	38	38
05/22/90	1050	1	9.0	98	7.2	9.0	1.7	8.6	1.9	4.1	4.2	0.20	41	25
01/30/91	1130	1	2.0	--	--	9.1	1.5	9.7	1.9	3.7	5.1	<0.10	--	36
06/05/91	1500	1	8.0	97	6.8	9.1	1.7	8.8	1.8	3.8	5.8	0.12	40	38
02/18/92	1120	2	5.0	90	7.4	7.7	1.4	8.9	1.8	3.0	4.1	0.16	35	36
04/08/92	1500	2	7.0	90	6.7	7.3	1.4	7.9	1.6	3.7	7.3	0.08	34	38
06/09/92	0945	2	8.0	88	6.3	7.4	1.4	7.8	1.9	4.1	5.0	0.15	34	42
07/28/92	0930	2	11.5	95	6.7	8.2	1.5	8.1	1.9	3.6	4.8	0.17	38	39
09/17/92	1200	2	12.0	102	6.8	9.2	1.6	9.7	2.6	3.6	4.4	0.10	44	49
375742116262600 3 Springs Creek near Ledge Spring, near Warm Springs, Nevada														
09/29/87	1700	1	8.5	120	7.0	6.5	2.2	9.9	3.2	3.5	2.5	--	50	41
06/23/88	1530	1	9.0	98	7.0	10	2.0	8.2	2.8	2.7	3.9	--	43	40
09/23/88	1330	1	8.0	111	6.8	11	2.4	9.5	3.0	3.7	2.9	--	47	41
06/22/89	0930	1	--	94	7.3	9.1	1.9	8.0	2.6	3.1	2.9	0.07	42	43
09/12/89	1700	1	8.0	112	7.1	10	2.0	8.8	--	3.1	3.0	0.10	49	42
11/08/89	1330	1	4.0	106	7.0	10	2.2	11	--	3.0	3.0	0.10	50	47
05/22/80	1200	1	8.0	99	6.9	8.9	1.8	8.0	2.5	3.9	3.9	0.10	42	43
09/23/90	1330	1	9.0	126	7.3	11	2.2	9.1	3.9	4.9	2.6	<0.10	51	43
06/05/91	1400	1	7.0	94	6.6	8.4	1.7	7.7	2.4	3.5	5.7	0.11	35	7.9
09/25/91	0930	1	9.5	107	6.6	9.4	1.9	8.4	2.8	3.5	3.1	<0.10	50	42
06/09/92	1615	2	7.5	92	6.4	7.9	1.6	8.1	2.7	4.3	5.3	0.16	37	46

Data Sources: 1 McKinley and Oliver 1994, 1995

Table 5.1-7. Physical Characteristics and Chemical Composition of Water Samples Obtained at Surface Water Sites in the 3 Springs Basin of Central Nevada (Continued)

# Date [mm/dd/yy]	Time	Aluminum, Dissolved [ug/L as Al]	Iron, Dissolved [ug/L as Fe]	Lead, Dissolved [ug/L as Pb]	Lithium, Dissolved [ug/L as Li]	Manganese, Dissolved [ug/L as Mn]	Bromide, Dissolved [mg/L as Br]	Iodide, Dissolved [mg/L as I]	Strontium, Dissolved [ug/L as Sr]	Tritium Total [pCi/L]	Delta Deuterium [permil]	Delta Oxygen-18 [permil]	Dissolved Solids Residue [mg/L]	Dissolved Solids Sum [mg/L]
375731116253800 3 Springs Creek near 3 Spring #3, near Warm Springs, Nevada														
01/19/85	1215	--	--	--	--	--	0.031	--	--	--	-101.0	-13.40	--	89
04/03/85	1245	--	--	--	--	--	--	--	--	--	--	--	--	--
07/10/85	1634	--	4.0	--	--	--	--	--	77	--	-97.0	-13.37	--	--
01/11/86	1530	--	<3.0	<10	6	1.0	--	--	72	--	--	--	--	--
03/20/86	1400	--	<10	--	--	--	--	--	160	--	-101.0	-13.60	--	79
375736116255201 3 Springs Creek near Warm Springs, Nevada														
04/03/85	--	--	--	--	--	--	--	--	--	--	--	--	--	--
03/04/86	1500	--	6.0	--	--	4.0	--	--	--	--	--	--	--	--
03/20/86	1317	--	<10	--	--	--	0.039	--	260	--	-100.0	-13.20	--	85
04/01/86	1510	--	3.0	--	--	--	0.019	--	190	<200	-100.0	-13.30	--	80
03/31/87	1620	--	3.0	--	--	--	--	--	10	--	-101.5	-13.70	--	88
05/07/87	0945	<10	<10	--	--	--	0.027	--	110	--	--	--	--	96
07/01/87	1745	--	<3.0	--	--	--	0.038	--	110	--	-103.5	-13.80	--	107
11/18/87	1600	--	3.0	--	--	91	0.038	--	91	--	-102.0	-13.75	--	105
12/09/87	1615	--	<3.0	--	--	--	0.035	--	98	54	-105.0	-13.80	--	100
01/09/88	1130	--	<3.0	--	--	--	0.35	--	110	--	-103.0	-13.75	--	104
04/06/88	0945	--	<3.0	--	--	--	0.035	--	110	--	-102.0	-13.85	--	98
06/25/88	1430	--	6.0	--	--	--	--	--	100	--	-101.5	-13.80	--	99
04/12/89	1000	--	<3.0	--	--	2.0	0.030	--	90	--	-102.5	-13.80	--	107
05/24/89	1215	--	4.0	--	--	--	0.030	--	110	--	-102.5	-13.80	--	107
05/22/90	1000	--	72	--	--	1.0	0.050	--	--	--	-102.0	-13.70	--	108
06/06/91	0745	--	7.0	--	--	2.0	0.040	--	--	--	-104.0	-13.90	--	105
04/08/92	1340	--	<3.0	--	--	<1.0	0.04	--	--	--	-103.0	-13.90	--	89
375736116255201 3 Springs Creek near 3 Spring #2, near Warm Springs, Nevada														
07/10/85	1520	--	4.0	--	--	1.0	--	--	75	--	-112.0	-13.89	--	--
09/25/85	1400	--	20	--	--	23	0.040	--	77	--	-101.5	-13.85	--	--
07/08/86	1535	--	9.0	--	--	--	0.025	--	71	--	-100.5	-13.75	--	85
09/30/86	1730	--	<10	--	--	--	--	--	170	--	-100.0	-10.25	--	53
12/30/86	1600	--	7.0	--	--	--	--	--	73	--	-100.0	-13.80	--	86
03/31/87	1700	--	36	--	--	--	--	--	8.0	--	-102.0	-13.85	--	85
07/01/87	1545	--	<3.0	--	--	--	0.027	--	72	53	-103.5	-13.95	--	86
09/30/87	1230	--	5.0	--	--	--	--	--	77	--	-102.5	-13.95	--	88
01/09/88	1230	<10	<3.0	--	--	--	0.032	--	81	51	-103.5	-14.05	--	89
04/06/88	1430	--	<3.0	--	--	--	0.025	--	77	--	-104.0	-13.95	--	85

Table 5.1-7. Physical Characteristics and Chemical Composition of Water Samples Obtained at Surface Water Sites in the 3 Springs Basin of Central Nevada (Continued)

# Date [mm/dd/yy]	Time	Aluminum, Dissolved [ug/L as Al]	Iron, Dissolved [ug/L as Fe]	Lead, Dissolved [ug/L as Pb]	Lithium, Dissolved [ug/L as Li]	Manganese, Dissolved [ug/L as Mn]	Bromide, Dissolved [mg/L as Br]	Iodide, Dissolved [mg/L as I]	Strontium, Dissolved [ug/L as Sr]	Tritium Total [pCi/L]	Delta Deuterium [permil]	Delta Oxygen-18 [permil]	Dissolved Solids Residue [mg/L]	Dissolved Solids Sum [mg/L]
06/25/88	1315	--	<3.0	--	--	--	--	--	67	--	-103.0	-14.05	--	82
09/23/88	1230	<10	5.0	--	--	--	0.030	--	79	54	-102.0	-14.00	--	90
02/23/89	1500	--	5.0	--	--	<1.0	<0.010	--	50	47	-103.5	-13.95	--	83
04/12/89	1215	--	<3.0	--	--	<1.0	<0.010	--	60	--	-101.5	-14.00	--	87
05/24/89	1415	--	<3.0	--	--	--	0.030	--	78	--	-106.0	-14.00	--	91
01/30/90	1510	--	<3.0	--	--	<1.0	<0.010	--	--	44	-105.0	-13.90	--	--
04/04/90	1051	--	120	--	--	7.0	0.040	--	--	--	-103.0	-14.05	--	--
05/22/90	1050	--	34	--	--	7.0	0.030	--	--	--	-102.0	-13.95	--	79
01/30/91	1130	--	76	--	--	4.0	0.050	--	--	--	-104.0	-14.00	--	--
06/05/91	1500	--	8.0	--	--	2.0	0.040	--	--	41	-106.0	-14.30	--	93
02/18/92	1120	--	6.0	--	--	<1.0	0.040	--	--	--	-104.0	-14.25	--	84
04/08/92	1500	--	<3.0	--	--	<1.0	0.040	--	--	--	-103.0	-13.85	--	89
06/09/92	0945	--	<3.0	--	--	<1.0	0.020	--	--	--	-102.0	-14.00	--	91
07/28/92	0930	--	4.0	--	--	<1.0	0.040	--	--	--	-103.0	-14.05	--	90
09/17/92	1200	--	8.0	--	--	<1.0	0.030	--	--	--	-104.0	-14.05	--	108
375742116262600 3 Springs Creek near Ledge Spring, near Warm Springs, Nevada														
09/29/87	1700	--	9.0	--	--	--	0.095	--	91	--	-103.5	-14.00	--	99
06/23/88	1530	--	<3.0	--	--	--	--	--	82	--	-104.5	-14.20	--	95
09/23/88	1330	<10	<3.0	--	--	--	0.040	--	98	48	-103.5	-14.15	--	102
06/22/89	0930	--	6.0	--	--	<1.0	<0.010	--	70	--	-105.0	-14.15	--	96
09/12/89	1700	--	4.0	--	--	<1.0	0.020	--	--	--	-106.0	-14.10	--	--
11/08/89	1330	--	4.0	--	--	2.0	0.030	--	--	--	-104.5	-14.05	--	--
05/22/80	1200	--	46	--	--	<1.0	0.030	--	--	--	-103.0	-14.10	--	97
09/23/90	1330	--	7.0	--	--	<1.0	0.020	--	--	--	-102.0	-14.00	--	107
06/05/91	1400	--	10	--	--	7.0	<0.010	--	--	--	-106.0	-14.30	--	59
09/25/91	0930	--	9.0	--	--	<1.0	0.030	--	--	--	-104.0	-13.90	--	101
06/09/92	1615	--	<3.0	--	--	<1.0	0.040	--	--	--	-103.0	-14.25	--	98

Table 5.1-8. Physical Characteristics and Chemical Composition of Water Samples Obtained at Surface Water Sites in the Stewart Basin of Central Nevada

Date [mm/dd/yy]	Time	Data Source	Water Temp, in C	Specific Conductance, in us/cm	pH	Calcium, Dissolved [mg/L as Ca]	Magnesium, Dissolved [mg/L as Mg]	Sodium, Dissolved [mg/L as Na]	Potassium, Dissolved [mg/L as K]	Chloride, Dissolved [mg/L as Cl]	Sulfate, Dissolved [mg/L as SO_4]	Fluoride, Dissolved [mg/L as F]	Alkalinity [mg/L as$CaCO_3$]	Silica, Dissolved [mg/L as SiO_2]
385304117211300 Veg Spring near Ione, Nevada														
09/19/84	1730	1	4.5	38	7.1	2.6	0.30	3.1	--	0.76	1.2	0.04	13	16
07/09/85	1324	1	--	--	5.8	2.4	0.30	3.2	--	0.61	1.2	0.03	--	16
09/27/85	1702	1	4.0	23	6.1	2.5	0.40	2.8	--	0.56	1.2	0.04	12	16
07/10/86	1000	1	4.0	31	7.1	2.2	0.24	3.3	0.46	0.63	1.2	0.03	13	17
09/30/86	1330	1	5.0	34	6.7	2.1	0.24	3.4	0.50	0.59	1.1	--	12	--
12/30/86	0920	1	--	32	6.7	2.3	0.29	3.4	0.51	0.62	1.1	0.01	12	17
05/06/87	1230	1	4.0	40	--	3.0	0.38	3.7	0.63	1.2	1.7	0.04	--	16
06/30/87	1640	1	4.5	33	6.7	2.3	0.33	3.0	0.50	0.72	1.4	0.05	11	16
09/25/87	1420	1	4.5	33	7.0	2.4	0.31	3.1	0.50	0.64	1.3	--	12	17
06/28/88	1430	1	4.5	29	7.0	2.6	0.33	3.2	0.45	0.65	1.3	--	12	16
09/27/88	1420	1	4.5	28	6.3	2.6	0.40	3.3	0.58	0.65	1.2	--	12	16
05/25/89	1000	1	8.5	30	7.0	2.5	0.07	3.1	0.51	0.60	1.0	<0.10	13	16
09/14/89	1325	1	5.0	29	6.9	2.6	0.20	3.3	--	0.65	1.3	0.05	11	16
11/07/89	1246	1	4.0	28	6.9	2.3	0.29	3.5	--	0.68	1.2	0.05	12	17
01/31/90	1130	1	3.0	23	6.9	2.2	0.33	3.4	--	0.60	1.2	0.05	12	17
04/03/90	0945	1	4.0	27	6.9	2.4	0.27	3.1	--	0.73	1.4	0.04	12	15
05/24/90	1430	1	4.0	31	7.0	2.7	0.35	3.4	0.50	0.97	1.9	0.06	12	17
09/25/90	1215	1	4.5	33	7.0	2.4	0.31	3.4	0.50	0.66	1.2	0.05	13	16
07/24/91	1430	1	4.5	26	6.6	2.0	0.35	2.6	0.50	0.59	1.3	0.06	12	15
09/24/91	1630	1	4.5	28	6.3	2.3	0.29	3.2	0.50	0.62	1.2	0.05	12	16
06/11/92	1315	2	5.0	30	6.3	2.3	0.31	3.1	0.50	0.55	1.2	0.03	12	18
07/29/92	1000	2	4.5	28	6.6	2.2	0.27	3.2	0.40	0.56	1.1	0.07	12	17
09/16/92	1220	2	4.5	30	6.6	2.3	0.28	3.3	0.50	0.59	1.2	0.05	12	19
385318117213300 (also known as 385323117213701) East Stewart Creek near Ione, Nevada														
09/19/84	1630	1	7.5	25	7.6	3.2	0.50	3.0	--	0.99	1.6	0.05	12	14
01/19/85	0930	1	--	--	--	2.9	0.43	3.5	0.56	0.76	1.5	0.05	12	10
04/03/85	1000	1	--	--	--	2.8	0.42	3.8	0.60	0.83	1.7	0.04	--	16
07/09/85	1200	1	--	32	--	2.3	0.24	1.0	--	0.60	1.3	0.04	13	0.30
09/27/85	1630	1	5.0	52	6.5	2.9	0.40	3.0	--	0.75	1.4	0.04	14	16
01/11/86	1000	1	2.0	34	7.1	2.8	<0.40	3.1	--	0.75	1.5	0.05	13	16
03/20/86	1030	1	2.5	34	8.2	3.0	0.39	3.4	0.60	0.73	1.5	0.04	15	15
04/01/86	1000	1	3.0	30	7.1	3.0	0.38	3.3	0.70	0.76	1.5	0.04	14	16
05/29/86	1430	1	5.5	--	7.3	2.3	0.28	3.0	0.60	0.67	1.2	0.04	12	13
07/10/86	0900	1	5.5	36	7.5	2.5	0.30	2.9	0.46	0.74	1.3	0.04	13	--
09/30/86	1130	1	5.0	38	6.8	2.4	0.31	3.3	0.60	0.93	1.3	0.04	12	--
10/09/86	1200	1	--	33	--	2.5	0.31	3.3	0.60	0.78	1.3	0.02	14	--
12/30/86	1330	1	1.0	35	6.6	2.7	0.41	3.3	0.56	0.85	1.4	0.03	13	16
03/31/87	1330	1	2.0	23	6.7	2.7	0.39	1.5	0.59	0.83	1.4	0.03	12	15

Data Sources: 1 McKinley and Oliver 1994, 1995

Table 5.1-8. Physical Characteristics and Chemical Composition of Water Samples Obtained at Surface Water Sites in the Stewart Basin of Central Nevada (Continued)

Date [mm/dd/yy]	Time	Data Source	Water Temp, in C	Specific Conductance, in us/cm	pH	Calcium, Dissolved [mg/L as Ca]	Magnesium, Dissolved [mg/L as Mg]	Sodium, Dissolved [mg/L as Na]	Potassium, Dissolved [mg/L as K]	Chloride, Dissolved [mg/L as Cl]	Sulfate, Dissolved [mg/L as SO_4]	Fluoride, Dissolved [mg/L as F]	Alkalinity [mg/L as$CaCO_3$]	Silica, Dissolved [mg/L as SiO_2]
05/06/87	1300	1	3.0	34	--	2.6	0.35	3.2	0.62	0.94	1.5	0.05	13	14
06/30/87	1730	1	6.5	33	6.9	2.4	0.38	2.9	0.50	0.72	1.5	0.06	12	15
09/25/87	1530	1	8.0	38	6.9	3.0	0.41	3.1	0.57	0.97	1.5	0.65	14	16
01/09/88	1615	1	2.0	36	6.8	2.8	0.41	3.3	0.50	0.78	1.5	--	12	16
04/05/88	1400	1	4.0	28	6.7	2.8	0.41	3.2	0.64	0.89	1.6	--	12	16
06/27/88	1800	1	6.5	27	7.0	2.6	0.34	3.0	0.42	0.64	1.3	--	12	14
09/28/88	1500	1	5.5	32	6.8	2.8	0.51	3.3	0.62	0.90	1.5	--	13	16
02/22/89	1530	1	2.0	31	6.6	2.7	0.47	3.0	0.56	0.88	1.7	0.07	12	15
04/11/89	1220	1	6.0	31	7.0	2.9	0.42	3.5	0.58	0.90	1.8	0.07	12	15
05/25/89	1250	1	6.5	30	7.3	2.6	0.35	3.1	0.50	0.76	1.6	0.06	13	15
09/14/89	1500	1	7.5	33	7.0	3.0	0.39	3.4	--	0.76	1.5	0.03	15	15
11/07/89	1400	1	2.0	31	7.0	2.8	0.36	3.5	--	0.87	1.5	0.06	13	16
01/31/90	1430	1	1.0	29	6.8	2.5	0.35	3.1	--	0.84	1.6	0.07	11	16
04/03/90	1150	1	3.0	31	6.9	3.8	0.40	3.2	--	0.89	1.7	0.05	12	15
05/24/90	1000	1	2.5	28	7.3	2.7	0.35	3.9	0.60	1.0	1.7	0.05	12	15
09/25/90	0830	1	4.0	37	7.1	3.0	0.40	3.3	0.60	1.1	1.5	0.06	13	16
01/29/91	1200	1	0.5	32	6.9	2.7	0.38	3.1	0.60	0.89	1.7	0.06	14	16
06/01/91	1430	1	3.5	32	7.2	2.8	0.41	3.1	0.50	0.90	1.7	0.08	12	14
07/24/91	1100	1	6.5	27	6.8	2.0	0.34	2.8	0.50	0.62	1.5	0.07	12	15
09/24/91	0945	1	7.0	31	6.4	2.8	0.38	3.2	0.50	0.76	1.4	0.05	13	16
02/19/92	1300	2	1.0	32	7.3	2.8	0.38	3.1	0.50	0.77	1.4	0.09	12	16
04/09/92	1430	2	3.0	33	7.1	2.7	0.37	3.0	0.60	0.80	1.6	0.08	13	15
06/11/92	1200	2	8.5	30	6.4	2.4	0.33	2.9	0.50	0.56	1.3	<0.01	12	16
07/29/92	0945	2	8.5	35	6.4	2.7	0.35	3.1	0.50	0.62	1.3	0.07	14	16
09/16/92	1330	2	9.0	33	6.8	2.9	0.38	3.4	0.60	0.71	1.3	0.06	14	18
385324117213600 Hellebore Spring near Ione, Nevada														
05/29/86	1530	1	--	48	--	3.9	0.51	4.3	0.70	1.9	1.9	0.05	19	19
07/31/86	1700	1	7.5	61	--	3.8	0.49	3.8	0.80	1.0	1.8	0.09	17	21
09/30/86	1445	1	10.0	49	7.0	3.6	0.49	4.3	1.1	1.2	1.6	--	20	20
12/30/86	1100	1	3.5	47	6.9	3.8	0.55	4.2	0.66	1.2	1.6	--	17	20
05/06/87	1422	1	5.0	46	--	3.8	0.52	4.2	0.68	1.1	1.8	0.09	18	19
06/30/87	1754	1	6.0	48	6.8	4.1	0.56	3.9	0.66	1.3	1.9	0.07	17	20
09/25/87	1600	1	7.0	49	6.6	4.2	0.56	3.9	0.68	1.1	2.0	--	17	20
05/10/88	1645	1	5.0	46	--	4.0	0.59	4.2	0.67	1.2	2.0	0.10	19	20
06/28/88	1540	1	6.0	41	7.0	3.9	0.53	4.0	0.57	1.0	1.7	--	18	19
09/29/88	0745	1	6.5	43	6.4	4.2	0.68	4.1	0.81	1.2	2.0	--	17	20
04/11/89	1300	1	4.0	--	--	--	--	--	--	--	--	--	--	--
05/25/89	1310	1	5.5	43	7.2	3.8	0.54	4.0	0.65	1.2	1.9	0.08	18	19
11/07/89	1355	1	5.0	40	7.1	3.7	0.50	4.2	--	1.1	1.8	0.11	17	20
04/03/90	1130	1	4.0	40	6.9	3.8	0.55	4.0	--	1.1	1.7	0.05	17	20
05/24/90	1140	1	5.0	41	6.9	3.9	0.52	4.0	0.70	1.1	2.0	0.07	17	19
07/24/91	1030	1	6.0	40	6.6	3.8	0.57	4.0	0.60	1.1	1.9	0.08	17	20
06/11/92	1120	2	6.0	43	5.8	3.6	0.51	3.9	0.70	0.94	1.7	0.10	17	21

Data Sources: 1 McKinley and Oliver 1994, 1995

Table 5.1-8. Physical Characteristics and Chemical Composition of Water Samples Obtained at Surface Water Sites in the Stewart Basin of Central Nevada (Continued)

Date [mm/dd/yy]	Time	Aluminum, Dissolved [ug/L as Al]	Iron, Dissolved [ug/L as Fe]	Lead, Dissolved [ug/L as Pb]	Lithium, Dissolved [ug/L as Li]	Manganese, Dissolved [ug/L as Mn]	Bromide, Dissolved [mg/L as Br]	Iodide, Dissolved [mg/L as I]	Strontium, Dissolved [ug/L as Sr]	Tritium Total [pCi/L]	Delta Deuterium [permil]	Delta Oxygen-18 [permil]	Dissolved Solids Residue [mg/L]	Dissolved Solids Sum [mg/L]
385304117211300 Veg Spring near Ione, Nevada														
09/19/84	1730	--	<3.0	--	--	1.0	0.008	--	19	110	-122.0	-16.40	--	--
07/09/85	1324	--	10	--	--	1.0	<0.050	--	17	--	-118.5	-16.55	--	--
09/27/85	1702	--	52	--	--	3.0	0.007	--	21	--	-122.0	-16.55	--	--
07/10/86	1000	--	8.0	--	--	--	<0.010	--	17	--	-121.0	-16.50	--	33
09/30/86	1330	--	<10	--	--	--	--	--	70	--	-121.0	-16.50	--	15
12/30/86	0920	--	4.0	--	--	--	--	--	16	--	-121.5	-16.60	--	32
05/06/87	1230	10	<10	--	--	--	--	--	10	--	--	--	--	36
08/30/87	1640	--	<3.0	--	--	--	--	--	1.0	--	-120.5	-16.40	--	31
09/25/87	1420	--	<3.0	--	--	--	--	--	17	--	-122.0	-16.55	--	32
06/28/88	1430	--	4.0	--	--	--	--	--	18	--	-120.5	-16.45	--	32
09/27/88	1420	<10	8.0	--	--	--	--	--	17	84	-122.5	-16.60	--	32
05/25/89	1000	--	4.0	--	--	--	<0.010	--	18	--	-122.0	-16.65	--	32
09/14/89	1325	--	<3.0	--	--	<1.0	<0.010	--	--	65	-124.5	-16.65	--	--
11/07/89	1246	--	<3.0	--	--	<1.0	<0.010	--	--	78	-123.0	-16.60	--	--
01/31/90	1130	--	<3.0	--	--	<1.0	<0.010	--	--	--	-121.0	-16.65	--	--
04/03/90	0945	--	9.0	--	--	<1.0	0.030	--	--	--	-121.0	-16.65	--	--
05/24/90	1430	--	75	--	--	<1.0	<0.010	--	--	--	-119.0	-16.30	--	35
09/25/90	1215	--	<2.0	--	--	<1.0	<0.010	--	--	--	-120.0	-16.50	--	33
07/24/91	1430	--	7.0	--	--	1.0	<0.010	--	--	--	-121.0	-16.60	--	30
09/24/91	1630	--	4.0	--	--	<1.0	<0.010	--	--	--	-122.0	-16.45	--	32
08/11/92	1315	--	<3.0	--	--	<1.0	<0.010	--	--	--	-121.0	-16.45	--	34
07/29/92	1000	--	3.0	--	--	<1.0	<0.010	--	--	--	-122.0	-16.60	--	32
09/16/92	1220	--	<3.0	--	--	<1.0	<0.010	--	--	--	-121.0	-16.65	--	36
385318117213300 (also known as 385323117213701) East Stewart Creek near Ione, Nevada														
09/19/84	1630	--	7.0	--	--	3.0	--	--	26	140	-117.0	-15.70	--	--
01/19/85	0930	--	--	--	--	--	0.007	--	--	--	-120.0	-16.30	--	27
04/03/85	1000	--	--	--	--	--	0.008	--	--	--	-119.8	--	--	--
07/09/85	1200	--	5.0	<10	<4	6.0	<0.005	--	25	--	-118.2	-16.29	--	--
09/27/85	1630	--	9.0	--	--	4.0	0.006	--	26	--	-120.0	-16.35	--	--
01/11/86	1000	--	11	--	--	2.0	0.009	--	24	--	-119.0	-16.40	--	--
03/20/86	1030	--	<10	--	--	--	<0.010	--	150	--	-122.0	-16.45	--	33
04/01/86	1000	--	<10	--	--	--	0.008	--	140	--	-120.0	-16.30	--	34
05/29/86	1430	--	12	--	--	--	<0.010	--	17	--	-120.0	-16.00	--	28
07/10/86	0900	--	<10	--	--	--	<0.010	--	<10	--	-119.0	-16.30	--	16
09/30/86	1130	--	<10	--	--	--	--	--	70	--	-120.5	-16.20	--	16
10/09/86	1200	--	<10	--	--	--	--	--	70	--	--	--	--	17
12/30/86	1330	--	10	--	--	--	--	--	25	--	-119.0	-16.25	--	33

Table 5.1-8. Physical Characteristics and Chemical Composition of Water Samples Obtained at Surface Water Sites in the Stewart Basin of Central Nevada (Continued)

Date [mm/dd/yy]	Time	Aluminum, Dissolved [ug/L as Al]	Iron, Dissolved [ug/L as Fe]	Lead, Dissolved [ug/L as Pb]	Lithium, Dissolved [ug/L as Li]	Manganese, Dissolved [ug/L as Mn]	Bromide, Dissolved [mg/L as Br]	Iodide, Dissolved [mg/L as I]	Strontium, Dissolved [ug/L as Sr]	Tritium Total [pCi/L]	Delta Deuterium [permil]	Delta Oxygen-18 [permil]	Dissolved Solids Residue [mg/L]	Dissolved Solids Sum [mg/L]
03/31/87	1330	--	6.0	--	--	--	--	--	21	--	-119.0	-16.25	--	30
05/06/87	1300	--	<3.0	--	--	--	--	--	23	--	--	--	--	31
06/30/87	1730	--	<3.0	--	--	--	--	--	20	--	-119.0	-16.25	--	31
09/25/87	1530	--	4.0	--	--	--	0.57	--	24	--	-120.5	-16.30	--	35
01/09/88	1615	--	3.0	--	--	--	--	--	<0.50	--	-120.5	-16.45	--	33
04/05/88	1400	--	<3.0	--	--	--	--	--	26	--	-121.5	-16.35	--	33
06/27/88	1800	--	<3.0	--	--	--	--	--	19	--	-120.0	-16.40	--	29
09/28/88	1500	<10	<3.0	--	--	--	--	--	25	110	-119.5	-16.30	--	33
02/22/89	1530	--	10	--	--	<1.0	<0.010	--	<10	--	-121.0	-16.35	--	32
04/11/89	1220	--	5.0	--	--	<1.0	<0.010	--	20	--	-120.0	-16.60	--	33
05/25/89	1250	--	6.0	--	--	--	<0.010	--	22	--	-117.5	-16.55	--	32
09/14/89	1500	--	3.0	--	--	<1.0	<0.010	--	--	110	-122.0	-16.25	--	--
11/07/89	1400	--	<3.0	--	--	5.0	<0.010	--	--	98	-120.5	-16.35	--	--
01/31/90	1430	--	<3.0	--	--	<1.0	<0.010	--	--	100	-122.5	-16.35	--	--
04/03/90	1150	--	10	--	--	<1.0	<0.010	--	--	--	-123.0	-16.55	--	--
05/24/90	1000	--	5.0	--	--	<1.0	<0.010	--	--	--	-119.0	-16.25	--	32
09/25/90	0830	--	4.0	--	--	<1.0	<0.010	--	--	--	-119.0	-16.20	--	34
01/29/91	1200	--	<3.0	--	--	<1.0	<0.010	--	--	--	-122.0	-16.35	--	34
06/01/91	1430	--	5.0	--	--	1.0	0.020	--	--	--	-118.0	-16.20	--	31
07/24/91	1100	--	<3.0	--	--	<1.0	<0.010	--	--	89	-121.0	-16.35	--	30
09/24/91	0945	--	6.0	--	--	<1.0	<0.010	--	--	--	-120.0	-16.30	--	33
02/19/92	1300	--	7.0	--	--	3.0	<0.010	--	--	--	-119.0	-16.35	--	33
04/09/92	1430	--	4.0	--	--	<1.0	<0.010	--	--	--	-120.0	-16.30	--	33
06/11/92	1200	--	<3.0	--	--	<1.0	<0.010	--	--	--	-119.0	-16.25	--	32
07/29/92	0945	--	4.0	--	--	<1.0	<0.010	--	--	--	-122.0	-16.35	--	33
09/16/92	1330	--	4.0	--	--	<1.0	<0.010	--	--	--	-118.0	-16.30	--	36
385324117213600 Hellebore Spring near Ione, Nevada														
05/29/86	1530	--	6.0	--	--	--	0.023	--	33	--	-120.0	-16.00	--	44
07/31/86	1700	--	54	--	--	--	<0.010	--	37	--	-121.0	-16.20	--	44
09/30/86	1445	--	<10	--	--	--	--	--	140	--	-121.0	-16.20	--	44
12/30/86	1100	--	<3.0	--	--	--	--	--	35	--	-118.0	-16.20	--	42
385324117213600 Hellebore Spring near Ione, Nevada														
05/29/86	1530	--	6.0	--	--	--	0.023	--	33	--	-120.0	-16.00	--	44
07/31/86	1700	--	54	--	--	--	<0.010	--	37	--	-121.0	-16.20	--	44
09/30/86	1445	--	<10	--	--	--	--	--	140	--	-121.0	-16.20	--	44
12/30/86	1100	--	<3.0	--	--	--	--	--	35	--	-118.0	-16.20	--	42
05/06/87	1422	--	<3.0	--	--	--	--	--	33	--	--	--	--	42
06/30/87	1754	--	3.0	--	--	--	--	--	36	--	-120.5	-16.20	--	43
09/25/87	1600	--	<3.0	--	--	--	--	--	36	--	-120.5	-16.25	--	43

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Table 5.2-1. Correlation of Hydrogeologic Units with Other Hydrogeologic and Lithostratigraphic Units in the Death Valley Region

Hydrogeologic Units Defined for Subsection 5.2 "Regional Hydrogeology" of this Report (Faunt et al. 1997)	Hydrogeologic Units (Winograd and Thordarson 1975)	Major Hydrogeologic Units (Bedinger, Langer et al. 1989c)	Lithostratigraphic Units (Grose 1983; Grose and Smith 1989)
Playa deposits of Quaternary Age (Qp)	Valley-fill aquifer	-----------	Qp
Valley-fill of Quaternary-Tertiary Age (QTvf)	Valley-fill aquifer	Basin fill	Qa, QTa, QTs, Td, Ts
Volcanic rocks of Quaternary-Tertiary Age (QTv)	Lava-flow aquifer	Lava flows	Qv, QTb, QTv, Tim, Ti
Volcanic rocks of Tertiary Age (Tv)	Welded tuff aquifer, bedded tuff aquifer	Ash-flow tuff	Tv, Ttf, Tvr
Volcanic and volcaniclastic rocks of Tertiary Age (Tvs)	Tuff aquitard, lava-flow aquitard	Undifferentiated volcanic rocks	Tvs
Granitic Rocks of Tertiary-Late Jurassic Age (TJg)	Granitic stock minor aquitard	Crystalline rocks (upper part)	Tg, TJg
Sedimentary and metavolcanic rocks of Mesozoic Age (Mvs)	-----------	Coarse-grained clastic rocks	TRPdc, JTRPd, Mmv, Ms, P3
Carbonate rocks of Paleozoic-Precambrian Age (P2)	Upper carbonate aquifer, Upper clastic aquitard, and Lower carbonate aquifer	Carbonate rocks	P2, Pmd, Od, Ꞓdc
Clastic rocks of Paleozoic-Precambrian Age (P1)	Lower clastic aquitard	Fine-grained clastic rocks	P1, pCd, Pcc, pꞒs
Igneous and metamorphic rocks of Precambrian Age (pꞒgm)	-----------	Crystalline rocks (lower part)	pꞒm, pꞒg

NOTE: Hydrogeologic unit not defined.

Table 5.2-2. Generalized Stratigraphic and Hydrogeologic Units in the Death Valley Region

[A]Stratigraphic unit	[A]Hydrogeologic Unit	[A]Major Lithology	[A]Maximum Thickness (meters)	Hydrogeologic Units Defined for the Regional Hydrogeology of this Report (Faunt et al. 1997)
Valley fill	Valley-fill aquifer	Alluvial fan, fluvial, fanglomerate, lakebed, and mudflow deposits	610	Playa deposits of Quaternary Age (Qp) Valley-fill of Quaternary-Tertiary Age (QTvf)
Basalt of Kiwi Mesa	Lava-flow aquifer	Basalt flows, dense and vesicular	76	Volcanic rocks of Quarternary-Tertiary Age (QTv)
Rhyolite of Shoshone Mountain		Rhyolite flows	610	
Basalt of Skull Mountain		Basalt flows	76	
Ammonia Tanks Member	Welded-tuff aquifer	Ash-flow tuff, moderately to densely welded; thin ashfall tuff at base	76	Volcanic rocks of Tertiary Age (Tv)
Rainier Mesa Member		Ash-flow tuff, nonwelded to densely welded; thin ashfall tuff at base	183	
Tiva Canyon Member		Ash-flow tuff, nonwelded to densely welded; thin ashfall tuff near base	107	
Topopah Spring Member		Ash-flow tuff, nonwelded to densely welded; thin ashfall tuff near base	271	
Bedded tuff (informal unit)	Bedded-tuff aquifer	Ash-fall tuff and fluvially reworked tuff	305	
Wahmonie Formation	Lava-flow aquitard	Lava-flow and interflow tuff and breccia; locally hydrothermally altered	1219	Volcanic and volcaniclastic rocks of Tertiary Age (Tvs)
	Tuff aquitard	Ash-fall tuff, tuffaceous sandstone, and tuf breccia, all interbedded; matrix commonly clayey or zeolitic	518	
Salyer Formation		Breccia flow, lithic breccia and tuff breccia, interbedded with ashfall tuff, sandstone, siltstone, claystone, matrix commonly clayey or calcareous	610	
Grouse Canyon Member		Ash-flow tuff, densely welded	61	
Tub Spring Member		Ash-flow tuff, nonwelded to welded	91	
Local informal units		Ash-fall tuff, nonwelded to semiwelded ashflow tuff, tuffaceous sandstone, siltstone, and claystone; all massively altered to zeolite or clay minerals; locally, minor welded tuff near base; minor rhyolite and basalt	610	
Rhyolite flows and tuffaceous beds of Calico Hills		Rhyolite, nonwelded and welded ashflow, ashfall tuff, tuff breccia, tuffaceous sandstone, hydrothermally altered at Calico Hills; matrix of tuff and sandstone commonly clayey or zeolitic	> 610	
Tuff of Crater Flat		Ashflow tuff, nonwelded to partly welded, interbedded with ashfall tuff; matrix commonly clayey or zeolitic	91	
Rocks of Pavits Spring		Tuffaceous sandstone and siltstone, claystone; fresh-water limestone and conglomerate; minor gypsum; matrix commonly clayey, zeolitic, or calcareous	427	
Horse Spring Formation		Fresh-water limestone, conglomerate, tuff	305	

Table 5.2-2. Generalized Stratigraphic and Hydrogeologic Units in the Death Valley Region (Continued)

[A] Stratigraphic Unit	[A] Hydrogeologic Unit	[A] Major Lithology	[A] Maximum Thickness (meters)	Hydrogeologic Units Defined for the Regional Hydrogeology of this Report (Faunt et al. 1997)
Granitic stocks	A minor aquitard	Granodiorite and quartz monzonite in stocks, dikes, and sills	**DATA NOT AVAILABLE**	Granitic Rocks of Tertiary-Late Jurassic Age (TJg)
STRATIGRAPHIC UNIT NOT DEFINED	**HYDROGEOLOGIC UNIT NOT DEFINED**	**NOT DEFINED BY WINOGRAD and THORDARSON (1975)**	**DATA NOT AVAILABLE**	Sedimentary and metavolcanic rocks of Mesozoic Age (Mvs)
Tippipah Limestone	Upper carbonate aquifer	Limestone	1,097	
Eleana Formation	Upper clastic aquitard	Argillite, quartzite, conglomerate, conglomerite, limestone	2,408	
Devils Gate Limestone		Limestone, dolomite, minor quartzite	>421	
Nevada Formation		Dolomite	>465	
Undifferentiated		Dolomite	431	
Ely Springs Dolomite		Dolomite	93	
Eureka Quartzite		Quartzite, minor limestone	104	
Antelope Valley Limestone		Limestone and silty limestone	466	
Ninemile Formation		Claystone and limestone, interbedded	102	
Goodwin Limestone		Limestone	>274	Carbonate rocks of Paleozoic Age (P2)
Nopah Formation Smoky Member Halfpint Member Dunderberg Shale Member	Lower carbonate aquifer	Dolomite, limestone Limestone, dolomite, silty limestone Shale, minor limestone	326 218 69	
Bonanza King Formation Banded Mountain Member Papoose Lake Member		Limestone, dolomite, minor siltstone Limestone, dolomite, minor siltstone	744 658	
Carrara Formation		Siltstone, limestone, interbedded. Upper 320 m predominantly limestone; lower 290 m predominantly siltstone.	320 950	
Zabriskie Quartzite		Quartzite	67	
Wood Canyon Formation	Lower clastic aquitard	Quartzite, siltstone, shale, minor dolomite	696	Clastic rocks of Paleozoic-Precambrian Age (P1)
Stirling Quartzite		Quartzite, siltstone	1,036	
Johnnie Formation		Quartzite, sandstone, siltstone, minor limestone and dolomite	975	
STRATIGRAPHIC UNIT NOT DEFINED	**HYDROGEOLOGIC UNIT NOT DEFINED**	**NOT DEFINED BY WINOGRAD and THORDARSON (1975)**	**DATA NOT AVAILABLE**	Igneous and metamorphic rocks of Precambrian Age (p€gm)

[A] Stratigraphic units, hydrogeologic units, major lithology, and thickness, defined by Winograd and Thordarson (1975, Table 1) for the Nevada Test Site and vicinity.

Table 5.2-3. Hydrostratigraphic Units Used in the ITC Model ("Underground Test Area Project Phase I Data Analysis Task", Volume VI, Draft, April 1996, p. 2-2)

Hydrostratigraphic Units
Alluvial Aquifer (AA)
Uppermost Welded Tuffs (TMA)
Tuff Cone (TC)
Non-welded Tuffs (TCB)
Welded Tuffs above BCU (TBA)
Non-welded Tuffs (BCU)
Welded Tuffs (BAQ)
Volcanic Tuff Aquifer (VA)
Volcanic Tuff Confining Unit (VCU)
Volcanics Undifferentiated (VU)
Tertiary Sediments, Death Valley Subsection (TSDVS)
Lower Carbonate Aquifer (Yucca Flat Upper Plate) (LCA3) (Upper Carbonate Aquifer (VCA) in the Nevada Test Site area)
Upper Clastic Confining Unit (UCCU)
Lower Carbonate Aquifer (LCA)
Lower Clastic Confining Unit (LCCU)
Lower Carbonate Aquifer (Upper Plate) (LCA1)
Lower Clastic Confining Unit (Upper Plate) (LCCU1)
Lower Carbonate Aquifer (Lower Plate) (LCA2)
Lower Clastic Confining Unit (Lower Plate) (LCCU2)
Intrusives (I)

Table 5.2-4. Correlation of Hydrogeologic Units Used by Faunt et al. (1997) with Hydrostratigraphic Units Used in the ITC Model

Hydrogeologic Unit (Faunt et al., in press)	**Hydrostratigraphic Unit (ITC Model)**
Playa deposits of Quaternary Age (Qp) and Valley-fill of Quaternary-Tertiary Age (QTvf)	Alluvial Aquifer (AA)
Volcanic rocks of Quaternary-Tertiary Age (QTv)	Volcanic Tuff Aquifer (VA)
Volcanic rocks of Tertiary Age (Tv)	Volcanic Tuff Aquifer (VA) Tuff Cone (TC) Non-welded Tuffs (TCB) Welded Tuffs above BCU (TBA) Non-welded Tuffs (BCU) Welded Tuffs (BAQ)
Volcanic and volcaniclastic rocks of Tertiary Age (Tvs)	Tertiary Sediments, Death Valley Section (TSDVS)
Granitic rocks of Tertiary-Late Jurassic Age (TJg)	Intrusives (I)
Sedimentary and metavolcanic rocks of Mesozoic Age(Mvs)	**This unit was not in the area modeled in the ITC Model.**
Carbonate rocks of Paleozoic Age (P2)	Lower Carbonate Aquifer (LCA3) (Upper Carbonate Aquifer in the Nevada Test Site area (VCA)) Upper Clastic Confining Unit (UCCU) Lower Carbonate Aquifer (LCA) Lower Carbonate Aquifer (Upper Plate) (LCA1) Lower Carbonate Aquifer (Lower Plate) (LCA2)
Clastic rocks of Paleozoic-Precambrian Age (P1)	Lower Clastic Confining Unit (LCCU) Lower Clastic Confining Unit (Upper Plate) (LCCU1) Lower Clastic Confining Unit (Lower Plate) (LCCU2)
Igneous and metamorphic rocks of Precambrian Age (pΣgm)	Lower Clastic Confining Unit (LCCU) Lower Clastic Confining Unit (Upper Plate) (LCCU1) Lower Clastic Confining Unit (Lower Plate) (LCCU2)

Table 5.2-5. Estimated Hydraulic Conductivity of Hydrogeologic Units (Faunt et al. 1997)

Hydrogeologic Unit	Description	Approximate Hydraulic Conductivity (meters per day)
Playa deposits of Quaternary Age (Qp)	Lake bed deposits of silt and clay	$2x10^{-04}$ (all depths fractured and or unfractured)
Valley-fill of Quaternary-Tertiary Age (QTvf)	Alluvial (stream channel and fan gravels), colluvial, ashfall, and lake deposits	$1x10^{-01}$ (all depths fractured or unfractured)
Volcanic rocks of Quaternary-Tertiary Age (QTv)	Rhyolitic, andesitic, and basaltic lava flows	$4x10^{-04}$ (unfractured > 150 m deep) $5x10^{-01}$ (unfractured < 150 m deep; fractured)
Volcanic rocks of Tertiary Age (Tv)	Dominantly rhyolitic ashflow tuffs	$1x10^{+00}$ (unfractured <150 m deep; fractured < 3 km deep) $4x10^{-04}$ (unfractured >150 m deep; fractured > 3 km deep)
Volcanic and volcaniclastic rocks of Tertiary Age (Tvs)	Tuffs and tuffaceous clastic rocks	$4x10^{-05}$ (all depths fractured or unfractured)
Granite rocks of Tertiary-Late Jurassic Age (TJg)	Granitic rocks	$3x10^{-07}$ (unfractured > 300 m deep) $3x10^{-02}$ (weathered < 300 m deep) $5x10^{-04}$ (fractured < 300 m deep)
Sedimentary and metavolcanic rocks of Mesozoic Age (Mvs)	Dominantly sandstones	$3x10^{-02}$ (all depths fractured or unfractured)
Carbonate rocks of Paleozoic Age (P2)	Limestones, dolomites, and calcareous shales	$3x10^{-03}$ (unfractured > 150 m deep) $6x10^{-01}$ (unfractured < 150 m deep; fractured < 5 km deep)
Clastic rocks of Paleozoic-Precambrian Age (P1)	Conglomerates, argillites, and quartzites	$5x10^{-07}$ (unfractured) $1x10^{-02}$ $3x10^{+01}$ (fractured)
Igneous and metamorphic rocks of Precambrian Age (pΣgm)	Crystalline rocks (gneisses, schists, and migmatites)	$3x10^{-07}$ (fractured > 300 m deep) $3x10^{-02}$ (weathered < 300 m deep) $5x10^{-04}$ (fractured < 300 m deep)

Table 5.2-6. Rainfall Recharge Area-Altitude Classes Modified by D'Agnese et al. (1997) from Maxey and Eakin (1949)

Area-Altitude Class	Precipitation Percentage that Becomes Recharge
> 2,439 m	25 percent
2,134 - 2,439 m	15 percent
1,829 - 2,134 m	7 percent
1,524 - 1,829 m	3 percent
< 1,524 m	0 percent

NOTE: Datum is sea level; >, greater than; <, less than.

Table 5.2-7. Final Recharge Potential Zones and Relative Recharge Percentages

Class Number	Recharge Potential	Estimated Average Rate (Percentage of Precipitation)
5	High	30
4	High-moderate	25
3	Moderate	15
2	Moderate-low	7
1	Low	3
0	No recharge	0

Table 5.2-8. Comparisons of Recharge Estimates Determined with the Refined Maxey-Eakin Method and with Previously Determined Maxey-Eakin Estimates (D'Agnese et al. 1997)

Hydrographic Area Number	Hydrographic Area	Recharge Estimate	
		Maxey-Eakin (cubic meters per day)	**Refined Maxey-Eakin (cubic meters per day)**
144	Lida Valley	1,600	6,600
145	Stonewall Flat	300	2,800
146	Sarcobatus Flat	4,100	5,000
147	Gold Flat	12,800	22,400
148	Cactus Flat	2,000	10,400
157	Kawich Valley	11,800	25,500
158	Emigrant Valley	10,800	43,900
159	Yucca Flat	2,400	6,300
160	Frenchman Flat	300	3,300
161	Indian Springs Valley	33,800	27,600
162	Pahrump Valley	74,300	68,400
163	Mesquite Valley	9,800	7,300
168	N. Three Lakes Valley	6,800	4,000
169	Tikaboo Valley	20,300	33,200
211	S. Three Lakes Valley	20,300	24,800
225/226	Mercury/Rock Valleys	1,000	1,300
227	Fortymile Canyon	7,800	2,300
228	Oasis Valley	3,400	10,300
229	Crater Flat	700	400
230	Amargosa Valley	5,100	1,400
241	California/Chicago Valleys	1,000	1,600
242	Lower Amargosa Valley	300	100
243	Death Valley	32,400	32,400

Table 5.2-9. Estimated Evapotranspiration and Spring Discharge Rates by Discharge Area

Discharge Area Number	Discharge Area	Springs (m^3/d)	Evapotranspiration (m^3/d)	Discharge Estimated (m^3/d)
1	Sand Springs/North Death Valley	100	Unknown	[a]100
2	Stonewall Flats East Playa	0	300	[b]300
3	Stonewall Flats West Playa	0	100	[b]100
4	Lida Junction Playa	0	600	[b]600
5	Sarcobatus Flats Main Playa	0	12,900	[b]12,900
6	Coyote Holes Playas	0	200	[b]200
7	Oasis Valley	3,100	14,500	[c,d]16,000
8	Bonnie Calire Playa	0	400	[b]400
9	Grapevine Canyon	3,600	2,900	[c, d]5,000
10	Mesquite Flat/Stovepipe Wells	Unknown	38,100	[b]38,100
11	Main Salt Pan	3,000	100,000	[b,e]100,000
12	Saratoga Springs	700	33,200	[c,e]33,200
13	Furnace Creek Ranch	11,100	Unknown	[a]11,000
14	Salt Creek Hills	Unknown	3,800	[b]3,800
15	Amargosa River	0	1,500	[b]1,500
16	Peter's Playa-Amargosa Flats	0	28,300	[b]28,300
17	Ash Meadows	100,400	91,700	[c,e]91,700
18	Carson Slough	Unknown	8,100	[c]8,100
19	Alkali Flat	Unknown	17,200	[c]17,200
20	Indian/Cactus Springs	4,100	2,400	[c,d]4,500
21	Stewart Valley Playa	0	20,800	[b]20,800
22	Pahrump Valley	0	18,000	[b]18,000
23	Shoshone/Tecopa	1,000	24,200	[c]24,200
24	Chicago Valley	0	8,700	[b]8,700
25	South Chicago Valley	1,400	4,800	[c]4,800
26	California Valley	0	1,300	[b]1,300
27	China Ranch	Unknown	2,500	[c]2,500
28	Tecopa Pass	Unknown	1,800	[c]1,800
29	Sperry Hills (Amargosa Canyon)	Unknown	6,000	[c]6,000
30	Mesquite Lake	0	29,000	[b]29,000

NOTE: m^3/d = cubic meters per day.

[a]Dominantly spring.
[b]Dominantly evapotranspiration.
[c]Combined spring and evapotranspiration.
[d]Spring discharge is partially (50 percent) consumed as domestic water use and not recirculated.
[e]Spring discharge is recirculated and consumed as evapotranspiration.

Table 5.2 -10. Reported Regional Spring Data for the Death Valley Region

Discharge Area Number	Spring	Discharge (cubic meters per day)
9	Grapevine Springs[1]	2,452
9	Staininger Spring[3]	1,090
9	Surprise Springs[4]	27
1	Sand Spring[4]	2
1	Little Sand Spring	Data not available
12	Saratoga Springs[1]	684
7	Amargosa Narrows Spring[2]	544
7	Beatty Spring	Data not available
7	Landing Strip[2]	136
7	Beatty Valley #2[2]	544
7	Beatty Valley #1[2]	544
7	Hicks Hot Springs	Data not available
7	North Oasis Valley Spring[2]	273
7	South Oasis Valley Spring[2]	82
7	Goss Springs	Data not available
7	Springdale Springs[2]	136
7	Oasis Valley Hills[2]	55
7	East Oasis Valley Hill[2]	343
20	Indian Springs[1]	4,049
20	Cactus Springs	Data not available
13	Keane Wonder Spring[1]	164
13	Nevares Springs[1]	1,908
13	Cow Creek Springs[1]	1,200
13	Salt Springs[5]	25
13	Texas Spring[1]	1,145
13	Travertine Springs[1]	6,486
13	Navel Springs	Data not available
27	Willow Springs	Data not available
29	Amargosa Canyon Springs	Data not available
23	Tecopa Hot Springs[1]	491
24	Twelvemile Springs	Data not available
23	Shoshone Spring	Data not available
23	Chappo Spring[1]	547
24	Resting Springs	Data not available
26	Tule Spring	Data not available

Table 5.2 -10. Reported Regional Spring Data for the Death Valley Region (Continued)

Discharge Area Number	Spring	Discharge (cubic meters per day)
17	Fairbanks Springs[2]	17,960
17	Rogers Springs[1]	431
17	Longstreet Springs[2]	10,743
17	Crystal Pool[1]	17,933
17	Devil's Hole Area[2]	856
17	Devil's Hole	Data not available
17	Point of Rocks #1[2]	2,164
17	Point of Rocks #2[2]	164
17	Point of Rocks #4[2]	3,080
17	Point of Rocks #3[2]	60
17	Point of Rocks #5[2]	8,177
17	Point of Rocks #6[2]	8,166
17	Jack Rabbit Spring[1]	3,200
17	Big Spring[1]	5646
17	Bole Spring[2]	4807
17	Last Chance Spring[2]	8,176
17	Grapevine Springs[2]	8,846
18	Ash Tree Spring	Data not available
18	Barrel Seep	Data not available
18	King Spring	Data not available
18	North of King Spring	Data not available
18	East Carson Slough Spring	Data not available
18	Carson Flowing Well	Data not available
18	Southeast Carson Spring	Data not available

[1] Data compiled from Bedinger, Langer et al. (1989c)
[2] Data compiled from Bedinger, Langer et al. (1984)
[3] Data compiled from Langer et al. (1984)
[4] Data compiled from Miller (1977)
[5] Data compiled from Pistrang and Kunkel (1964)

Table 5.2-11. Water-Use Estimates for Selected Hydrographic Areas

Hydrographic Area Number	Hydrographic Area	Year	Total m³/d	Source
144	Lida Valley	1975	<3,380	Bedinger, Harrill et al. 1984b
146	Sarcobatus Flat	1975	<3,380	Bedinger, Harrill et al. 1984b
159	Yucca Flat	1975	<3,380	Bedinger, Harrill et al. 1984b
161	Indian Springs Valley	1975	3,379	Bedinger, Harrill et al. 1984b
161	Indian Springs Valley	1984	2,093	Nevada State Engineer files
161	Indian Springs Valley	1985	2,294	Nevada State Engineer files
161	Indian Springs Valley	1986	2,792	Nevada State Engineer files
161	Indian Springs Valley	1987	2,456	Nevada State Engineer files
161	Indian Springs Valley	1988	1,933	Nevada State Engineer files
161	Indian Springs Valley	1989	2,102	Nevada State Engineer files
161	Indian Springs Valley	1991	1,728	Nevada State Engineer files
161	Indian Springs Valley	1992	2,237	Nevada State Engineer files
162	Pahrump Valley	1962	98,663	Nevada State Engineer files
162	Pahrump Valley	1963	107,882	Nevada State Engineer files
162	Pahrump Valley	1964	126,730	Harrill, 1986
162	Pahrump Valley	1965	123,350	Harrill, 1986
162	Pahrump Valley	1966	128,791	Nevada State Engineer files
162	Pahrump Valley	1967	140,251	Nevada State Engineer files
162	Pahrump Valley	1968	162,043	Nevada State Engineer files
162	Pahrump Valley	1969	138,220	Harrill, 1986
162	Pahrump Valley	1970	144,032	Nevada State Engineer files
162	Pahrump Valley	1971	128,362	Nevada State Engineer files
162	Pahrump Valley	1972	123,894	Nevada State Engineer files
162	Pahrump Valley	1973	133,119	Nevada State Engineer files
162	Pahrump Valley	1974	139,867	Nevada State Engineer files
162	Pahrump Valley	1975	137,702	Nevada State Engineer files
162	Pahrump Valley	1976	150,382	Nevada State Engineer files
162	Pahrump Valley	1977	145,011	Nevada State Engineer files
162	Pahrump Valley	1978	116,033	Nevada State Engineer files
162	Pahrump Valley	1983	78,245	Nevada State Engineer files
162	Pahrump Valley	1984	82,293	Nevada State Engineer files
162	Pahrump Valley	1985	77,907	Nevada State Engineer files
162	Pahrump Valley	1986	65,588	Nevada State Engineer files
162	Pahrump Valley	1987	64,704	Nevada State Engineer files
162	Pahrump Valley	1988	66,386	Nevada State Engineer files
162	Pahrump Valley	1989	68,035	Nevada State Engineer files
162	Pahrump Valley	1990	70,741	Nevada State Engineer files
162	Pahrump Valley	1991	83,966	Nevada State Engineer files
162	Pahrump Valley	1992	78,704	Nevada State Engineer files
163	Mesquite Valley	1975	<3,380	Bedinger, Harrill et al. 1984b
163	Mesquite Valley	1983	1,786	Nevada State Engineer files
163	Mesquite Valley	1984	1,245	Nevada State Engineer files
163	Mesquite Valley	1985	879	Nevada State Engineer files
163	Mesquite Valley	1986	1,328	Nevada State Engineer files
163	Mesquite Valley	1987	1,302	Nevada State Engineer files
163	Mesquite Valley	1988	1,487	Nevada State Engineer files
163	Mesquite Valley	1989	1,606	Nevada State Engineer files

NOTE: m³/d = cubic meters per day.

Table 5.2-11. Water-Use Estimates for Selected Hydrographic Areas (Continued)

Hydrographic Area Number	Hydrographic Area	Year	Total m^3/d	Source
163	Mesquite Valley	1990	1,606	Nevada State Engineer files
163	Mesquite Valley	1991	649	Nevada State Engineer files
163	Mesquite Valley	1992	778	Nevada State Engineer files
225/226	Mercury/Rock Valley	1975	<3,380	Bedinger, Harrill et al. 1984b
228	Oasis Valley	1975	<3,380	Bedinger, Harrill et al. 1984b
230	Amargosa Valley	1967	31,561	Nevada State Engineer files
230	Amargosa Valley	1968	30,550	Nevada State Engineer files
230	Amargosa Valley	1973	24,373	Nevada State Engineer files
230	Amargosa Valley	1985	31,910	Nevada State Engineer files
230	Amargosa Valley	1986	24,460	Nevada State Engineer files
230	Amargosa Valley	1987	20,740	Nevada State Engineer files
230	Amargosa Valley	1988	13,886	Nevada State Engineer files
230	Amargosa Valley	1989	13,250	Nevada State Engineer files
230	Amargosa Valley	1990	26,384	Nevada State Engineer files
230	Amargosa Valley	1991	20,098	Nevada State Engineer files
230	Amargosa Valley	1992	27,588	Nevada State Engineer files
240/241	California/Chicago Valley	1975	<3,380	Bedinger, Langer et al. 1984c
242	Lower Amargosa Valley	1962	10,476	Bedinger, Langer et al. 1984c
243/244/245	Death Valley	1975	<3,380	Bedinger, Langer et al. 1984c
Water use estimates are not available for hydrographic areas 145, 147, 148, 157, 158, 160, 168, 169, 211, 227, and 229.				

NOTE: m^3/d = cubic meters per day.

Table 5.2-12. Divisions of the Death Valley Regional Groundwater Flow System

Subregion	Groundwater Basin	Groundwater Section
Northern Death Valley	NONE	a. Lida-Stonewall b. Sarcobatus Flats c. Grapevine Canyon d. Oriental Wash
Central Death Valley	Pahute Mesa - Oasis Valley	a. Kawich Valley b. Oasis Valley
	Ash Meadows	a. Pahranagat Valley b. Tikaboo Valley c. Indian Springs Valley d. Emigrant Valley e. Yucca-Frenchman Flat f. Specter Range
	Alkali Flat-Furnace Creek	a. Fortymile Canyon b. Amargosa River c. Crater Flat d. Funeral Mountains
Southern Death Valley	NONE	a. Pahrump Valley b. Shoshone-Tecopa c. California Valley d. Ibex Hills

Table 5.2-13. Water Budget for the Death Valley Regional Groundwater Flow System

	Cubic Meters Per Day
INFLOW	
Recharge (infiltration)	312,300
Flux In	
Pahranagat Valley	20,000
Sand Spring Valley	1,700
Railroad Valley	3,400
Stone Cabin Valley	3,400
Ralston Valley	3,400
TOTAL INFLOW	344,200
OUTFLOW	
Discharge	
(evapotranspiration)	148,600
(Springs)	125,400
Flux Out	
(Death Valley/Saratoga Springs)	100,000
TOTAL OUTFLOW	374,000
CHANGE IN STORAGE (from pumpage)	29,800

Table 5.2-14. Comparison of Simulated and Estimated Regional Water-Budget Components (D'Agnese et al. 1997, Table 17)

	Simulated (m^3/d)	Estimated (m^3/d)
IN:		
Constant head (north and east boundaries)	69,000	31,900
Recharge	338,000	312,300
OUT:		
Wells	88,000	89,400
Evapotranspiration	173,000	148,600
Springs (regional)	51,700	125,400
Constant head	98,000	100,000

NOTE: m^3/d = cubic meters per day.

Table 5.3-1. Correlation of Generalized Stratigraphy with Unsaturated and Saturated Hydrogeologic Units in the Vicinity of Yucca Mountain (Adapted from Czarnecki, Faunt et al. 1997; Luckey, Tucci et al. 1996; and Montazer and Wilson 1984)

SYSTEM and Series	Stratigraphic Unit	Hydrogeologic Units		Comments
		Unsaturated	Saturated	
QUATERNARY and TERTIARY	alluvium, colluvium, eolian deposits, spring deposits, basalt lavas, lacustrine deposits, playa deposits	QAL Alluvium	QTa Valley-fill aquifer QTc Valley-fill confining unit	QAL restricted to stream channels on Yucca Mountain QTa occurs mainly in Amargosa Desert; major water-supply source
TERTIARY Miocene	TIMBER MOUNTAIN GROUP Rainier Mesa Tuff	--	--	Minor erosional remnants at Yucca Mountain
	PAINTBRUSH GROUP Tiva Canyon Tuff	TCw Tiva canyon welded unit	--	Mainly densely welded; caprock on Yucca Mountain. Not known in SZ at or near Yucca Mountain
	(bedded Tuff) Yucca Mountain Tuff Pah Canyon Tuff	PTn Paintbrush nonwelded unit	--	PTn includes bedded and nonwelded tuffs between basal part of Tiva Canyon Tuff and upper part of Topopah Spring Tuff
	Topopah Spring Tuff (Vitrophyre and nonwelded tuffs at base)	TSw Topopah Spring welded unit	uva Upper volcanic aquifer	About 300 m of densely welded tuff in UZ. Host rock for repository. In SZ where downfaulted to east, south, and west of site
	Calico Hills Formation	CHn Calico Hills nonwelded unit	uvc Upper volcanic confining unit	Mainly nonwelded tuff, with thin rhyolite lavas in northern site area. Varies from vitric in southwest site area to zeolitic where near or below water table
	CRATER FLAT GROUP Prow Pass Tuff Bullfrog Tuff Tram Tuff	CFu Crater Flat undifferentiated unit	mva Middle volcanic aquifer	Small occurrence in UZ. Widespread in SZ. Variably welded ashflow tuffs and rhyolite lavas. Commonly zeolitized. Most permeable zones are fracture-controlled
	Unnamed flow breccia Lithic Ridge Tuff	--	mvc Middle volcanic confining unit	Nonwelded tuff, pervasively zeolitized
	Volcanics of Big Dome	--	lva Lower volcanic aquifer	Lava flows and welded tuff. Not known at Yucca Mountain

Table 5.3-1. Correlation of Generalized Stratigraphy with Unsaturated and Saturated Hydrogeologic Units in the Vicinity of Yucca Mountain (Adapted from Czarnecki, Faunt et al. 1997; Luckey, Tucci et al. 1996; and Montazer and Wilson 1984) (Continued)

SYSTEM and Series	Stratigraphic Unit	Hydrogeologic Units		Comments
		Unsaturated	Saturated	
TERTIARY Miocene (continued) (Lower Tertiary?)	Older volcanics	--	lvc Lower volcanic confining unit	Nonwelded tuff, pervasively zeolitized. Tuffaceous sediments in lower part
PERMIAN PENNSYL-VANIAN	Bird Spring Fm Tippipah Limestone	--	uca Upper carbonate aquifer	Limited distribution in SZ north and east of Yucca Mountain
MISSISSIPIAN-DEVONIAN	Eleana Formation (Chainman Shale)	--	ecu Eleana confining unit	Argillite (mudstone) and siltstone. Occurrence inferred beneath volcanics of northern Yucca Mountain
DEVONIAN SILURIAN ORDOVICIAN CAMBRIAN	Devils Gate Ls, Nevada Fm, Ely Springs Dol, Eureka Qtzt., Pogonip Gp, Nopah Fm, Dunderberg Sh, Bonanza King Fm, Upper Carrara Fm	--	lca Lower carbonate aquifer	Mainly limestone and dolomite with relatively thin shales and quartzites. Major regional aquifer, >5 km thick
	Lower Carrara Fm	--	qcu Precambrian confining unit	Dolomite, shale.
PROTEROZOIC (Upper Precambrian)	Proterozoic rocks			Quartzite, slate, marble. Fractures commonly healed by mineralization

Table 5.3-2. Identification of Data Packages Containing Data Used in the Infiltration Study

Neutron Logging Data	
GS940708312212.010*	Volumetric water content from neutron moisture meter counts for 74 boreholes from time they were drilled until 5/2/89.
GS940708312212.011	Volumetric water content from neutron moisture meter counts for 99 boreholes from 5/3/89 or from the time they were drilled, until 12/31/93.
GS941408312212.017	Subsurface water content at Yucca Mountain--neutron logging data from 1/1/94 through FY 94.
GS950808312212.001	Volumetric water content calculated from field calibration equations using neutron counts from 99 boreholes at Yucca Mountain from 1-Oct-94 to 31-May-95.
GS960108312212.001	Volumetric water content calculated from field calibration equations using neutron counts from 99 boreholes at Yucca Mountain from 1-Jun-95 to 30-Sep-96.
Soil Properties and Coverages	
GS940108315142.004	Preliminary Surficial Deposits Map of the Northeast Quarter of the Busted Butte 7.5 Minute Quadrangle
GS940708315142.008	Preliminary Surficial Deposits Map of the Northwest Quarter of the Busted Butte 7.5 Minute Quadrangle
GS940108315142.005	Preliminary Map of the Surficial Deposits of the Southern Half of the Topopah Spring NW 7.5 Minute Quadrangle
GS950408315142.004	Preliminary Map of the Surficial Deposits of the Southern Half of the Busted Butte 7.5 Minute Quadrangle
GS960108312211.001	FY 95 Laboratory Measurements of Physical Properties of Surficial Materials at Yucca Mt, Part II
GS960108312211.002	Gravimetric and Volumetric Water Content and Rock Fragment Content of 31 Selected Sites at Yucca Mt, NV, FY 95 Laboratory Measurements of Physical Properties of Surficial Materials at Yucca Mt, NV Part III
GS950708312211.002	FY 95 Laboratory Measurements of Physical Properties of Surficial Materials at Yucca Mt, NV
GS930883117421.002	Quaternary Deposits Subsurface Soil Data from Soil Pits at Midway Valley
GS940783117421.001	Quaternary Deposits Subsurface Soil Data from Midway Valley Soil Pits
GS960408312212.005	Preliminary surficial materials properties map
GS930883117421.002	Quaternary deposits subsurface soil data from soil pits MWV-P1 through MWV-P7, MWVP-12 through MWVP-17, MWV-P22 through MWVP-26, MWVP-28 through MWVP-33 and MWVP-37 through MWV-P40.
GS940783117421.001	Quaternary deposits subsurface soil data from Midway Valley soil pits MWV-P9, MWV-P19 through MWV-P21, Collected by S. Lundstrom
GS960908312212.009	Cumulative infiltration and surface flux rates calculated from raw millivolt readings for FY 95

NOTE: All data are qualified except as noted.

Table 5.3-2. Identification of Data Packages Containing Data Used in the Infiltration Study (Continued)

Soil Properties and Coverages	
GS950308312213.004	Cumulative infiltration and surface flux rates conducted in 40 Mile Wash and near UE-25 UZN#7 calculated from raw millivolt readings.
GS950908312211.004	Laboratory measurements of water-retention data.
Site Area Precipitation and Evaporation	
GS940808312111.005*	Precipitation data for water years 1992 and 1993 from a network of nonrecording gauges at Yucca Mountain, Nevada, by Dale S. Ambos, Alan L. Flint and Joseph A. Hevesi.
GS920708312111.006	Precipitation data collected from 5 weather stations August 1991.
GS950908312211.004	FY 95 meteorology data. Data collected at 5 weather stations during FY 95.
GS950108312210.001*	Class A pan Evaporation depth for 1/1/90 to 09/30/94.
GS960908312211.004	Heat dissipation probe data: Bleach Bone Ridge 3/95 - 11/95.
Infiltration Interpretations	
GS960500312212.006*	Estimation of shallow infiltration and presence of potential fast pathways for shallow infiltration in the Yucca Mountain Area, NV by D.B. Hudson and A.L. Flint.

NOTE: All data are qualified except as noted.

(No conclusions in this report are dependent on the data from the above paper. Because information used from this paper is for corroborative purposes only, this paper is not considered as source data.)

All regional precipitation data (specifically station 4JA and station Area 12)*

* Indicates data that are not qualified for site characterization. Because all stochastic simulations are based on regional precipitation data that is considered non-QA, the model results may be considered as non-QA. However, because all other data used to develop the model is considered as "QA", and each stochastic rainfall simulation which is based on non-QA data, is simply a realization of a possible rainfall distribution, the resultant model should be considered as "QA" for that realization. The model results of net infiltration are simply realizations of a defined precipitation pattern, which does not imply that the precipitation pattern is real, but has a calculated probability of occurring. Therefore, all data and model realizations should be considered as "QA" with the exception of the parameters listed in this table. Other unqualified data, such as pan evaporation data, and neutron moisture meter data collected prior to May of 1989, are used for discussion of processes only and in support of conclusions based on site characterization data. No major conclusions are based solely on any unqualified data.

Table 5.3-3. Identification of Data Packages Containing Matrix-Properties Data

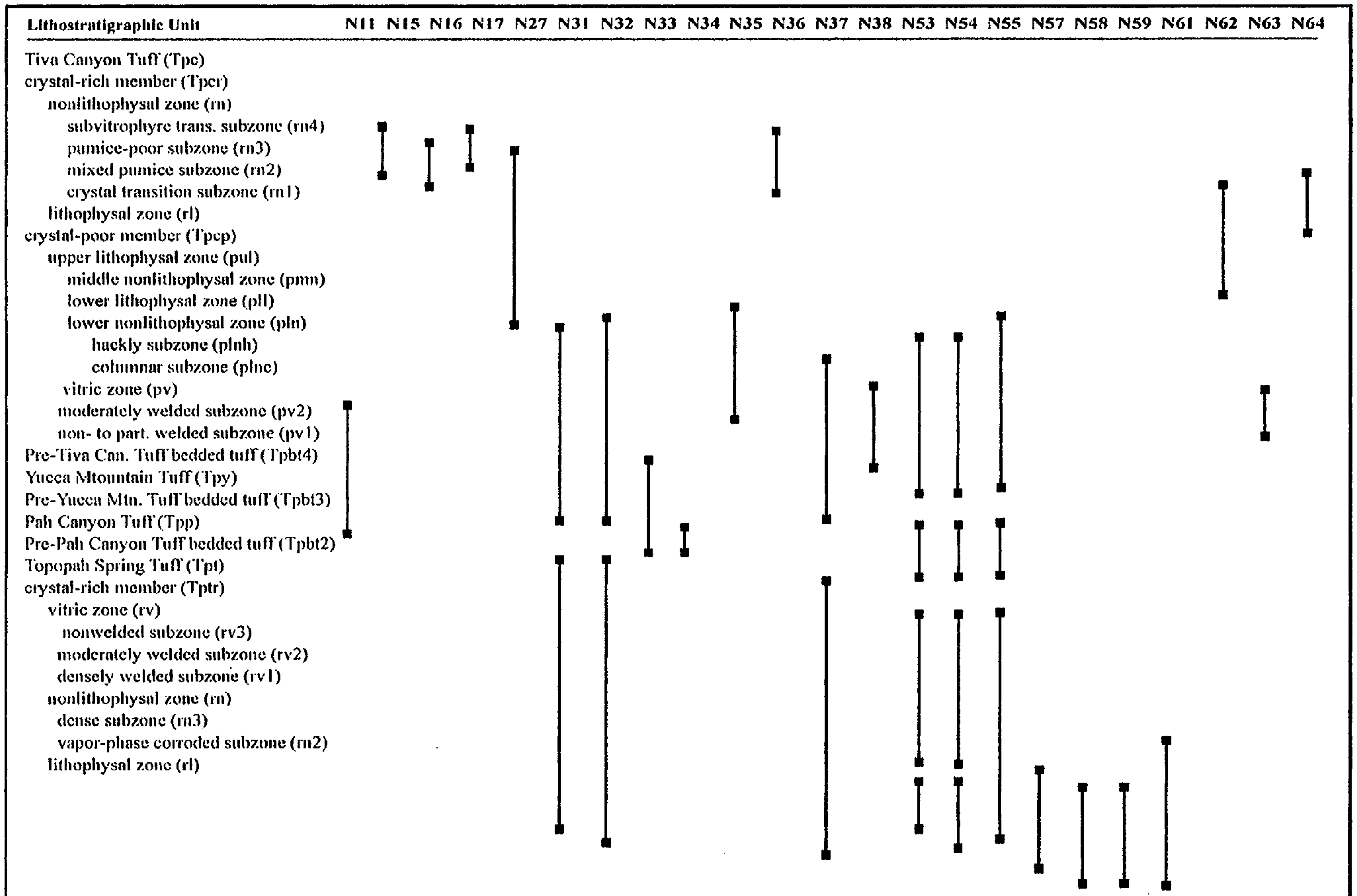
Core Properties	
Tracking Number	**Title of Technical Data Information Form**
DTN GS920508312231.012	USW UZ-N54 and USW UZ-N55 core analysis: bulk density, porosity, particle density, and in situ saturation for core dried in 105°C oven.
DTN GS930108312231.006	USW UZ-N53 core analysis: bulk density, porosity, particle density, and in situ saturation for core dried in 105°C oven.
DTN GS940408312231.004	Core analysis of bulk density, porosity, particle density, and in situ saturation for three neutron boreholes USW UZ-N57, UZ-N61 and UZ-N62.
DTN GS940108312231.002	Core analysis of bulk density, porosity, particle density, and in situ saturation for seventeen neutron boreholes: Data for core dried in RH oven and 105°C oven for USW UZ-N31, UZ-N32, UZ-N33, UZ-N34, UZ-N35, UZ-N38, UZ-N58, UZ-N59, UE-25 UZN#63 and USW UZ-N64; data for core dried in 105°C only for USW UZ-N11, UZ-N15, UZ-N16, UZ-N17, UZ-N27, UZ-N36, and UZ-N37.
DTN GS940508312231.006	Core analysis of bulk density, porosity, particle density, and in situ saturation for borehole UE-25 UZ#16.
DTN GS950608312231.007	Physical properties and water potentials of core from borehole USW NRG-6
DTN GS950308312231.004	Physical properties and water potentials of core from borehole USW SD-9
DTN GS950608312231.005	Physical properties and water potentials of core from borehole USW UZ-14
DTN GS950308312231.003	UE -25 UZ#16 pycnometer data
DTN GS951108312231.009	Physical properties, water content, and water potential for borehole USW SD-7
DTN GS951108312231.011	Physical properties, water content, and water potential for borehole USW UZ-7a
DTN GS951108312231.010	Physical properties and water content for borehole USW NRG-7/7A
DTN GS950308312231.002	Laboratory measurements of bulk density, porosity, and water content for USW SD-12
DTN GS960808312231.004	Physical properties, water content, and water potential for lower depths in boreholes USW SD-12 and USW SD-7
Permeability and Moisture-Retention Measurements	
DTN GS950608312231.006	Water permeability of core from SD-9
DTN GS960808312231.002	Relative-humidity-calculated porosity measurements on samples from borehole USW SD-9 used for saturated hydraulic conductivity.
DTN GS960808312231.001	Saturated hydraulic-conductivity measurements and relative-humidity-calculated porosity measurements on samples from boreholes USW UZ-N27 and UE-25 UZ#16
DTN GS950608312231.008	Moisture retention data from boreholes USW UZ-N27 and UE-25 UZ#16.
DTN GS960808312231.005	Water permeability and relative-humidity-calculated porosity measurements on samples from boreholes USW SD-7, USW SD-9, USW SD-12, and USW UZ-14
DTN GS960808312231.003	Moisture-retention data for samples from boreholes USW SD-7, USW SD-9, USW SD-12, and USW UZ-14

NOTE: All data are qualified.

Table 5.3-4. Boreholes from Which Core Samples Were Collected for Matrix-Property Measurements

Borehole Designation	Location	Northing (meters)	Easting (meters)	Altitude (meters)	Date Drilling Began	Date Drilling Completed	Total Depth (meters)
UE-25 UZ #16	WT-2 Wash	231811	172169	1220	5/27/92	3/11/93	514.0
USW UZ-14	Drill Hole Wash	235155	170774	1350	4/15/93	5/13/94	672.6
USW UZ-7a	WT-2 Wash	231845	171397	1290	3/22/95	6/12/95	234.7
USW SD-7	Highway Ridge	231328	171066	1363	10/3/94	11/9/95	497.5
USW SD-9	Wren Wash	234083	171242	1302	5/6/94	9/26/94	677.6
USW SD-12	H-5 Wash	232244	171178	1321	1/28/94	8/16/95	609.6
USW NRG-6	Drill Hole Wash	233758	172008	1248	12/23/92	3/4/93	335.3
USW NRG-7/7A	Drill Hole Wash	234355	171598	1282	10/25/93	3/4/94	461.3
USW UZ-N11	Mile High Mesa	237919	170390	1592	2/5/92	2/25/92	25.7
USW UZ-N15	Bleach Bone Ridge	237162	170643	1557	3/20/92	3/25/92	18.3
USW UZ-N16	Bleach Bone Ridge	237180	170574	1560	3/25/92	3/30/92	18.3
USW UZ-N17	Bleach Bone Ridge	237203	170687	1563	3/17/92	3/19/92	18.3
USW UZ-N27	Yucca Crest	235174	170344	1481	4/21/92	4/30/92	61.7
USW UZ-N31	Split Wash	232942	171527	1266	9/3/92	9/22/92	58.7
USW UZ-N32	Split Wash	232959	171541	1267	9/23/92	10/9/92	63.2
USW UZ-N33	Drill Hole Wash	234717	171051	1320	8/13/92	8/18/92	22.9
USW UZ-N34	Drill Hole Wash	234744	171069	1318	8/18/92	8/24/92	25.6
USW UZ-N35	H-5 Wash	232338	171392	1295	10/13/92	10/26/92	52.0
USW UZ-N36	Bleach Bone Ridge	235885	171780	1415	2/28/92	3/2/92	18.2
USW UZ-N37	Wren Wash	233934	171820	1257	1/6/92	1/30/92	82.7
USW UZ-N38	Wren Wash	233924	171707	1265	4/8/92	4/13/92	27.2
USW UZ-N53	WT-2 Wash	231677	171979	1236	5/19/92	6/12/92	71.5
USW UZ-N54	WT-2 Wash	231731	171987	1233	11/12/92	12/10/92	74.6
USW UZ-N55	WT-2 Wash	231801	171983	1241	9/23/91	11/8/91	77.8
USW UZ-N57	Abandoned Wash	230174	170941	1276	10/28/92	11/4/92	36.2
USW UZ-N58	Abandoned Wash	230197	170951	1274	11/5/92	11/10/92	36.2
USW UZ-N59	Abandoned Wash	230222	170959	1274	11/18/92	12/8/92	36.2
USW UZ-N61	Abandoned Wash	230239	170960	1275	12/9/92	12/17/92	36.2
USW UZ-N62	Yucca Crest	230772	170171	1489	3/5/93	3/10/93	18.3
UE-25 UZN #63	Pagany Wash	234341	172568	1202	8/3/92	8/10/92	18.3
USW UZ-N64	Yucca Crest	233394	170516	1460	4/16/92	4/17/92	18.3

Table 5.3-5. Lithostratigraphic Units Sampled for Matrix-Property Measurements in 23 Neutron Boreholes



NOTE: Lithostratigraphic units from Buesch, Spengler et al. 1996; gaps in vertical lines indicate that the unit was not present or that core was not recovered.

Table 5.3-6. Lithostratigraphic Units Sampled for Matrix-Property Measurements in Eight Deep Boreholes

Lithostratigraphic Unit	SD7	UZ16	SD12	UZ7a	SD9	NRG7A	NRG6	UZ14
Tiva Canyon Tuff (Tpc)								
middle nonlithophysal zone (pmn)	X							
lower lithophysal zone (pll)	X	X						
lower nonlithophysal zone (pln)	X	X					X	
hackly subzone (plnh)	X	X	X	X			X	
columnar subzone (plnc)	X	X	X	X		X	X	
vitric zone (pv)	X	X	X	X		X	X	
moderately welded subzone (pv2)		X	X	X	X	X	X	
non- to partially welded subzone (pv1)	X	X	X	X	X	X	X	
Pre-Tiva Canyon Tuff bedded tuff (Tpbt4)	X	X	X	X	X	X	X	
Yucca Mountain Tuff (Tpy)	X	X	X	X	X	X	X	
Pre-Yucca Mountain Tuff bedded tuff (Tpbt3)	X	X	X	X	X	X	X	X
Pah Canyon Tuff (Tpp)	X	X	X	X	X	X	X	X
Pre-Pah Canyon Tuff bedded tuff (Tpbt2)	X	X	X	X	X	X	X	X
Topopah Spring Tuff (Tpt)	X	X	X	X	X	X	X	X
crystal-rich member (Tptr)	X	X	X	X	X	X	X	X
vitric zone (rv)	X	X	X	X	X	X	X	X
nonwelded subzone (rv3)	X	X	X	X	X	X	X	X
moderately welded subzone (rv2)		X	X	X	X	X	X	X
densely welded subzone (rv1)		X	X	X		X	X	X
nonlithophysal zone (rn)	X	X	X	X	X	X	X	X
dense subzone (rn3)	X	X	X	X	X	X	X	X
vapor-phase corroded subzone (rn2)	X	X	X	X	X	X	X	X
lithophysal zone (rl)	X	X	X	X	X	X	X	X
crystal-poor member (Tptp)	X	X	X	X	X	X	X	X
upper lithophysal zone (pul)	X	X	X	X	X	X	X	X
middle nonlithophysal zone (pmn)	X	X	X	X	X	X	X	X
lower lithohysal zone (pll)	X	X	X	X	X	X	X	X
lower nonlithophysal zone (pln)	X	X	X		X	X		X
vitric zone (pv)	X	X	X		X	X		X
densely welded subzone (pv3)	X	X	X		X	X		X
moderately welded subzone (pv2)	X	X	X		X	X		X
nonwelded subzone (pv1)	X	X	X		X	X		X
Pre-Topopah Spring Tuff bedded tuff (Tpbt1)	X	X	X		X	X		X
CALICO HILLS FORMATION (Tac)	X		X					
Unit 4 vitric/zeolitic	X		X					
Unit 3 zeolitic	X	X	X		X	X		X
Unit 2 zeolitic	X	X	X		X	X		X
Unit 1 zeolitic	X	X	X		X	X		X
Bedded tuff (Tacbt)	X	X	X		X			X
Basal sandstone (Tacbs)	X	X	X		X			X
Prow PassTuff (Tcp)	X	X	X		X			X
Unit 4 Pyroxene rich	X	X	X		X			X
Unit 3 Welded pyroclastic flow	X	X	X		X			X
Unit 2 Lithic-rich pyroclastic flow	X	X	X		X			
Unit 1 Pumicious pyroclastic flow	X	X	X		X			
Pre-Prow Pass bedded tuff (Tcpbt)	X	X	X		X			
Bullfrog Tuff (Tcb)	X							
Tram Tuff (Tct)	X							

NOTE: Lithostratigraphic units from Buesch, Spengler et al. 1996 and Moyer and Geslin 1995; gaps in vertical lines indicate that the unit was not present or that core was not recovered.

Table 5.3-7. Periods of Record for Pneumatic-Pressure Measurements in Instrumented Boreholes at Yucca Mountain

Borehole	Beginning Date	Ending Date
UE-25 NRG#5	6/22/95	1/30/97
USW NRG-6	11/17/94	9/3/96[1]
USW NRG-7a	10/29/94	Ongoing
UE-25 UZ#4	6/27/95	Ongoing
UE-25 UZ#5	6/26/95	Ongoing
USW UZ-7a	10/20/95	Ongoing
USW SD-7	4/4/96	12/13/96
USW SD-9	11/9/94	12/22/95
USW SD-12	11/20/95	Ongoing

[1] Pneumatic monitoring in borehole NRG-6 was scheduled to resume in December 1997.

Table 5.3-8. Boreholes from which Unsaturated-Zone Water Samples were Collected

Borehole Designation	Borehole Abbreviation	Drilling Start (Date)	Drilling Finish (Date)	Depth of Borehole (m)	Sampling Depth(s) of Perched Water (m)
USW NRG-6	NRG-6	11-23-92	03-03-93	335.3	NF
USW NRG-7a	NRG-7a	10-21-93	05-06-94	461.3	460.3
USW SD-7	SD-7	10-03-94	11-09-95	815.3	479.8 488.3
USW SD-9	SD-9	05-10-94	09-26-94	677.6	453.9
USW SD-12	SD-12	01-23-94	09-14-94	660.3	NS
USW UZ-14	UZ-14	04-15-93	05-06-94	677.8	384.6 387.7 390.8

Source of information: Drilling Support Division, Drilling Support and Sample Management Dept, T&MSS, Yucca Mountain Project.
m: meter; NF: not found; NS: not sampled.

Table 5.3-9. Drill Depth and Date Completed of Wells Monitored in the Saturated Zone in the Yucca Mountain Area

Well Name	Drilled Depth (meters)	Date Completed (month-year)	Well Name	Drilled Depth (meters)	Date Completed (month-year)
USW WT-1	515	5-83	USW G-4	915	11-82
USW WT-2	628	7-83	USW H-1 (well monitors four depth intervals)	1,829	1-81
UE-25 WT#3	348	5-83	USW H-3 (well monitors two depth intervals)	1,219	3-82
UE-25 WT#4	482	6-83	USW H-4 (well monitors two depth intervals)	1,219	6-82
UE-25 WT#6	383	6-83	USW H-5 (well monitors two depth intervals)	1,219	8-82
USW WT-7	491	7-83	USW H-6 (well monitors two depth intervals)	1,220	10-82
USW WT-10	431	8-83	USW VH-1	762	2-81
USW WT-11	441	8-83	UE-25 a#1	762	9-78
UE-25 WT#12	399	8-83	UE-25 b#1 (well monitors two depth intervals)	1,220	9-81
UE-25 WT#13	354	7-83	UE-25 c#1	914	10-83
UE-25 WT#14	399	9-83	UE-25 c#2	914	3-84
UE-25 WT#15	415	11-83	UE-25 c#3	914	6-84
UE-25 WT#16	521	11-83	UE-25 p#1	1,805	5-83
UE-25 WT#17	443	10-83	UE-25 J-11	405	7-57
UE-25 WT#18	623	5-84	UE-25 J-12	3,472	8-68
USW G-2	1,831	10-81	UE-25 J-13	1,063	1-63
USW G-3	1,533	3-82			

Table 5.3-10. Types of Single-Well and Multiple-Well Tests and Methods of Analysis Used at Yucca Mountain

Type of Test	Method of Analysis	Analysis Reference
Single-well, constant-rate discharge ("pumping") or injection	Specific capacity, steady-state drawdown	Brown 1963; Ahrens et al. 1981; ASTM D5472
	Straight-line fit to drawdown, buildup, or recovery in uniform, isotropic aquifer	Cooper and Jacob 1946; Jacob 1947; Ferris et al. 1962; Lohman 1979; Raghavan and Hadinoto 1978
	Straight-line fit to drawdown in dual-porosity aquifer	Cooper and Jacob 1946; Moench 1984
	Type curve: nonequilibrium drawdown, buildup, or recovery in uniform, isotropic, confined aquifer	Theis 1935; Ferris et al. 1962; Lohman 1979
	Type curve: drawdown in well of large diameter	Papadopulos and Cooper 1967
	Type curve: drawdown in anisotropic, unconfined aquifer	Stallman 1965
	Type curve: drawdown or recovery in anisotropic, unconfined aquifer, with delayed yield from storage	Neuman 1975
	Computer-generated curve match; drawdown, buildup, or recovery with variable aquifer properties and boundaries	Barr 1985; Barr 1991
Single-well, variable-rate discharge	Cyclic-rate drawdown and recovery (Brown's method)	Ferris et al. 1962
	Multiple-swabbing drawdown recovery; analyzed as recovery from constant-flux withdrawal by straight-line or type-curve methods	Cooper and Jacob 1946; Jacob 1947; Ferris et al. 1962; Lohman 1979; Raghavan and Hadinoto 1978; Theis 1935
Single-well, instantaneous slug-injection or withdrawal, with change or storage in well (also approximated by single-swab withdrawal)	Type curve: falling-head or rising-head recovery from instant head change	Cooper et al. 1967; Papadopulos et al. 1973
	Harmonic analysis of underdamped, oscillatory response to sudden head change	Van der Kamp 1976
Single-well, pressure-pulse injection, without change of storage in well	Type curve: pressure decay, multiple shut-in cycles	Bredehoeft and Papadopulos 1980; Neuzil 1982
Multiple-well, constant-rate discharge ("pumping") or injection, with response in observation well(s)	Straight-line fit to head change as function of time at specified distance	Cooper and Jacob 1946
	Straight-line fit to head change as function of distance at specified time or steady-state	Cooper and Jacob 1946
	Type curve: nonequilibrium head change at specified distance in uniform, isotropic, confined aquifer	Theis 1935; Ferris et al. 1962; Lohman 1979
	Type curve: drawdown in leaky, confined aquifer without confining-bed storage	Cooper 1963
	Type curve: drawdown in fissure-block (dual-porosity) aquifer	Streltsova-Adams 1978
	Type curve: drawdown or recovery in anisotropic, unconfined aquifer with delayed yield from storage	Neuman 1975

Table 5.3-11. Geophysical Logs Obtained for Site Boreholes

Borehole	Reference	Survey/Tools[1]
UE-25 a #1	Sass, Lachenbruch et al. 1980	Temp
UE-25 a #1	Spengler, Muller et al. 1979; Nelson et al. 1991	DS, SP, CAL, GAM, Neutron, DL, RES, 3-DV, VIBSEIS
UE-25 a #3	Sass, Lachenbruch et al. 1980	Temp
UE-25 b #1	Lahoud et al. 1984; Nelson et al. 1991	Acoustic, CAL, DL, BCD, BCN, 3-DV, 3-DVD, EL, ENP, GAM, GS, GYRO, IES, NAI, NCTL, Seisviewer, SPC, Televiewer, Temp, Tracer, VIBSEIS
Do	Lobmeyer, Whitfield et al. 1983	BCD, CAL, DL, 3-DV, EL, ENP, GAM, GS, GYRO, IES, NAI, Neutron, NCTL, Seisviewer, SPC, Televiewer, Temp, Tracer
UE-25 c #1	Geldon 1993; Nelson et al. 1991	AFRAC, AS, BCGG, BCA, BCF, CAL, Camera, DEL, DL, 3-DV, ENP, FLD, GAM, GS, GYRO, NAI, NCTL, RES, SPC, SP, Temp, Televiewer, Tracer
Do	Healey, D.L., Clutsom et al. 1984	GRAV
UE-25 c #2	Geldon 1993; Nelson et al. 1991	AFRAC, AS, BCGG, BCA, BCF, CAL, DEL, DL, 3-DV, ENP, FLD, GAM, GS, GYRO, NAI, NCTL, RES, SPC, SP, Temp, Tracer
UE-25 c #3	Geldon 1993; Nelson et al. 1991	AFRAC, AS, BCGG, BCA, BCF, CAL, DEL, DL, 3-DV, ENP, FLD, GAM, GS, GYRO, NAI, NCTL, RES, SPC, SP, Temp, Tracer
UE-25 c #1, UE-25 c #2, UE-25 c #3	Geldon 1996	Camera, Flowmeter, Televiewer,
USW G-1	Nelson et al. 1991	ENP, Gamma-Gamma
Do	Muller and Kibler 1983; Nelson et al. 1991	BCD, BCN, CAL, 3-DV, DL, ENP, GAM, RES, SP
Do	Ellis and Swolfs 1983	Televiewer
Do	Healy, J.H., Hickman et al. 1984	Televiewer
USW G-2	Nelson et al. 1991	ENP, Gamma-Gamma
Do	Nelson and Schimschal 1993; Nelson et al. 1991	BCD, BCN, CAL, DEL, DPT, ENP, GAM, GRAV, PHSIND, SPC, TDTP
Do	Fenix and Scisson 1987b	AFRAC, BCA, BCD, BCN, CAL, Camera, CCL, DEL, DL, EL, ENP, FLD, GAM, GAMN, GRAV, GYRO, IEL, NAI, PHSIND, SPC, TDTP, Televiewer, Temp, Tracer, 3-DV, VIBSEIS, Water Locator
Do	Stock et al. 1984	Televiewer
Do	Stock et al. 1986	Televiewer

Table 5.3-11. Geophysical Logs Obtained for Site Boreholes (Continued)

Borehole	Reference	Survey/Tools[1]
USW GU-3/USW G-3	Scott and Castellanos 1984; Nelson et al. 1991	BCD, BCN, CAL, 3-DV, DL, EL, ENP, IES, SPC, GAM, GAMN, GS, GYRO, NAI, Camera
Do	Healey, D.L., Clutsom et al. 1984	GRAV
USW G-4	Bentley 1984; Nelson et al. 1991	AFRAC, CAL, BCD, BCN, 3-DV, GAM, GS, GYRO, SP, SPC, Temp, Tracer
Do	Lobmeyer 1986	Temp, Flow Survey
USW H-1	Nelson et al. 1991	ENP, Gamma-Gamma
Do	Rush et al. 1984; Nelson et al. 1991	BCD, BCN, CAL,DL, DIF, 3-DV, EL, ENP, FLD, FMD, GAMN, GYRO, IND, MAG, NAI, Neutron, N-N, Seismic, SPC, Temp, Tracer
USW H-3	Thordarson et al. 1984; Nelson et al. 1991	AFRAC, BCD, BCG, BCN, CAL, 3-DV, EL, ENP, FLD, GAMN, GYRO, IND, 3-DMAG, SPC, VIBSEIS (GS & VSP), Temp, Tracer
USW H-4	Erickson and Waddell 1985	Camera, Televiewer, Temp, Tracer
Do	Whitfield, Eshom et al. 1985; Nelson et al. 1991	BCA, BCF, CAL, Camera, DL, EL, ENP, FLD, GAM, GS, IES, Neutron, SPC, Temp, Tracer
Do	Whitfield, Thordarson et al. 1984	AFRAC, BCA, BCD, BCN, CAL, DLG, EL, ENP, FLD, GAM, GS, IES, IND, SPC, Temp, Camera, Tracer
USW H-5	Robison and Craig 1991	BCA, BCF, BCN, CAL, CFD, ENP, FLD, GYRO, IES, SPC, Temp, Tracer, VIBSEIS
Do	Bentley et al. 1983; Nelson et al. 1991	Acoustic, AFRAC, BCD, BCN, CAL, Camera, DL, EL, ENP, GAM, GS, GYRO, MAG, SPC, Temp, Tracer
USW H-6	Craig, R.W. and Reed 1991	Camera, Tracer
Do	Craig, R.W. et al. 1983; Nelson et al. 1991	BCA, BCD, BCN, CAL, Camera, CCL, DS, ENP, FLD, GAM, GS, IND, IES, MAG, NAI, NCTL, SPC, Temp, Televiewer, Tracer
UE-25 J-13	Thordarson 1983; Nelson et al. 1991	Acoustic-SP, CAL, DL, EL, GAM-Neutron, IND, Laterolog, MAG, Perforation, Sonic
UE-25 p #1	Healey, D.L., Clutsom et al. 1984	GRAV
Do	Stock et al. 1986	Televiewer
Do	Craig, R.W. and Robison 1984	CAL, Tracer
Do	Muller and Kibler 1984; Nelson et al. 1991	BCA, BCD, BCGG, BCN, BCSV ,CAL, DEL, DIF, ENP, GAM, GS, IES, RES, SPC, Teleview, Temp
Do	Craig, R.W. and Johnson 1984	Acoustic, AFRAC, AGL, BCA, BCD, BCN, Acoustic-GAM, CAL, Camera, CCL, 3-DV, GAM, DEL, DS, DIF, DLG, EL, ENP, FLD, GS, IND, IES, MAG, NAI, NCTL, SPC, SS, Temp, Tracer,
USW SD-7	Rautman and Engstrom 1996b	BDL, CAL, DIL, ENP, GAM, TNP
USW SD-9	Engstrom and Rautman 1996	BDL, CAL, DIL, ENP, GAM, TNP

Table 5.3-11. Geophysical Logs Obtained for Site Boreholes (Continued)

Borehole	Reference	Survey/Tools[1]
USW SD-12	Rautman and Engstrom 1996a	BDL, CAL, DIL, ENP, GAM, TNP
USW VH-1	Thordarson and Howells 1987; Nelson et al. 1991	BCD, BCN, CAL, CFD, 3-DV, EL, ENP, GAM, GYRO, IND, NAI, N-N-GAM, Temp, VIBSEIS
USW VH-2	Carr and Parish 1985; Nelson et al. 1991	CAL, DL, 3-DV, EL, ENP, IND, MAG, SPC
USW WT-1	Muller and Kibler 1986; Nelson et al. 1991	BCD, CAL, DEL, ENP, GAM, IES, SPC
USW WT-2	Muller and Kibler 1986; Nelson et al. 1991	BCD, CAL, DEL, ENP, GAM, GS, IES, SPC
UE-25 WT #3	Muller and Kibler 1986; Nelson et al. 1991	BCD, CAL, DEL, ENP, GAM, GS, IES, SPC
UE-25 WT #4	Muller and Kibler 1986; Nelson et al. 1991	BCD, CAL, DEL, ENP, GAM, GS, IES, SPC
UE-25 WT #6	Muller and Kibler 1986; Nelson et al. 1991	BCD, CAL, DEL, ENP, GAM, GS, IES, SPC
USW WT-7	Muller and Kibler 1986; Nelson et al. 1991	BCD, CAL, DEL, ENP, GAM, GS, IES, SPC
USW WT-10	Muller and Kibler 1986; Nelson et al. 1991	BCD, CAL, DEL, ENP, GAM, GS, IES, SPC
USW WT-11	Nelson et al. 1991	ENP, Gamma-Gamma
Do	Muller and Kibler 1986; Nelson et al. 1991	BCD, CAL, DEL, ENP, GAM, GS, IES, SPC
UE-25 WT #12	Muller and Kibler 1986; Nelson et al. 1991	BCD, CAL, DEL, ENP, GAM, GS, IES, SPC
UE-25 WT #13	Muller and Kibler 1986; Nelson et al. 1991	BCD, CAL, DEL, ENP, GAM, GS, IES, SPC
UE-25 WT #14	Muller and Kibler 1986; Nelson et al. 1991	BCD, CAL, DEL, ENP, GAM, GS, IES, SPC
UE-25 WT #15	Muller and Kibler 1986; Nelson et al. 1991	BCD, CAL, DEL, ENP, GAM, GS, IES, SPC
UE-25 WT #16	Muller and Kibler 1986; Nelson et al. 1991	BCD, CAL, DEL, ENP, GAM, GS, IES, SPC
UE-25 WT #17	Muller and Kibler 1986; Nelson et al. 1991	BCD, CAL, DEL, ENP, GAM, GS, IES, SPC
UE-25 WT #18	Muller and Kibler 1986; Nelson et al. 1991	BCD, CAL, DEL, ENP, GAM, GS, IES, SPC

[1]Many of the names of tools listed are proprietary names used by individual well-logging service contractors. SeeTable 5.3.3.2.2.1-2 for key to symbols.

Table 5.3-12. Symbols Used for Geophysical Logging Tools Listed in Table 5.3-11

Identify Borehole Construction and Integrity	
Acoustic cement bond	ACB
Caliper	CAL
Casing-colar locator	CCL
Directional survey	DS
Gyroscope: identify deviation from vertical	GYRO
Nuclear annulus investigation - locate channels in cement	NAI
Nuclear cement top locator	NCTL
Spinner survey	SS
Characterize Fluid Flow Rates	
Radioactive tracer flow survey	Tracer
Temperature log - determine changes in temperture gradient to identify entrance and movement of water	Temp
Three-dimensional velocity logs - determine rate of flow	3-DV
Determine Porosity and Production Zones	
Acoustilog, Gamma	AGL
Acoustic density (responds only to matrix porosity)	Acoustic
Acoustic fracture	AFRAC
Acoustic impedence	AI
Borehole-compensated acoustic - determine total porosity, lithology, storativity	BCA
Borehole-compensated density (responds to matrix and fracture porosity)	BCD
Borehole-compensated fracture	BCF
Borehole-compensated tgamma	BCG
Borehole-compensated gamma-gamma - bulk density, total porosity, storativity	BCGG
Borehole-compensated neutron	BCN
Borehole-compensated sonic velocity	BCSV
Compensation formation density	CFD
Densilog, GAM	DLB
Density log	DL
Epithermal neutron - total porosity and water content	ENP
Fluid density log - locate water table	FLD
Neutron-neutron	N-N
Sidewall neutron	SWN

Table 5.3-12. Symbols Used for Geophysical Logging Tools Listed in Table 5.3-11 (Continued)

Determine Porosity and Production Zones	
Thermal decay neutron	TDTP
Thermal decay porosity	TNP
Three-dimensional density	3-DVD
Determine Lithology	
Acoustic shear - determine elasticity	AS
Bulk density - determine welding, lithophysal alteration	BDL
Geophone survey	GS
Gravity survey	GRAV
Self-potential	SP
Vibroseismic - velocity survey combining GS and VSP tool	VIBSEIS
Vertical seismic profile	VSP
Identify Stratigraphic Unit Contacts and Water-Bearing Zones	
Electric log	EL
Formation density	FMD
Dual-induction focus	DIF
Dual induction log	DIL
Gamma ray	GAM
Gamma ray and neutron tools combined	GAMN
Induction electric survey	IES
Magnetometer	MAG
Lineation (Structures)	
Acoustic televiewer logs - location and orientation	
Television camera - location and strike	Camera
Seisviewer	Seisview
Other	
Dielectric constant - effective porosity and water quality	DEL
Deep propogation tool	DPT
Induction - effective porosity, water quality	IND
Phasor-induction	PHSIND
Spectral gamma ray - radionuclide indicator	SPC

Table 5.3-13. Generalized Lithostratigraphy (after Buesch, Spengler et al. 1996; Moyer and Geslin 1995), Previously Used Informal Stratigraphic Nomenclature (after Scott and Bonk 1984), Corresponding Detailed Hydrogeologic Units (Flint, L.E. 1998), and Major Hydrogeologic Units (Montazer and Wilson 1984) at Yucca Mountain, Nevada

Currently Used Formal and Informal Nomenclature	Previously Used Informal Nomenclature	Hydrogeologic Units	
		Detailed	**Major**
PAINTBRUSH GROUP **Tiva Canyon Tuff (Tpc)** crystal-rich member (Tpcr) vitric zone (rv) nonlithophysal zone (rn) subvitrophyre transition subzone (rn4)	vitrophyre (ccr)	**CCR** (< 10%)	Tiva Canyon welded (TCw)
pumice-poor subzone (rn3) mixed pumice subzone (rn2) crystal transition subzone (rn1) lithophysal zone (rl) crystal-poor member (Tpcp)	upper cliff (cuc)	**CUC** (> 9%)	
upper lithophysal zone (pul)	upper lithophysal (cul)	**CUL** (< 20%)	
middle nonlithophysal zone (pmn) lower lithophysal zone (pll) lower nonlithophysal zone (pln) hackly subzone (plnh) columnar subzone (plnc)	clinkstone(cks), rounded step(crs) lower lithophysal (cll) hackly (ch) columnar (cc)	CW	
argillic pumice interval (plnc2) vitric zone (pv) densely welded subzone (pv3v)	vitrophyre	**CMW** (> 15%)	
moderately welded subzone (pv2)	nonwelded base (ccs)	**CNW** (> 28%)	
non- to partially welded subzone (pv1)			Paintbrush nonwelded (PTn)
Pre-Tiva Canyon Tuff bedded tuff (Tpbt4)		BT4	
Yucca Mountain Tuff (Tpy)		**TPY** (< 30%)	
Pre-Yucca Mountain Tuff bedded tuff (Tpbt3)		BT3	
Pah Canyon Tuff (Tpp)		TPP	
Pre-Pah Canyon Tuff bedded tuff (Tpbt2) **Topopah Spring Tuff (Tpt)** crystal-rich member (Tptr) vitric zone (rv) nonwelded subzone (rv3) moderately welded subzone (rv2)		BT2	
densely welded subzone (rv1) nonlithophysal zone (rn) dense subzone (rn3)	vitrophyre (tc) rounded (tr)	**TC** (< 9%)	Topopah Spring welded (TSw)
vapor-phase corroded subzone (rn2)		TR	
lithophysal zone (rl) crystal-poor member (Tptp) upper lithophysal zone (pul)	upper lithophysal (tul)	TUL	
middle nonlithophysal zone (pmn)	middle nonlithophysal (tmn)	TMN	
lower lithophysal zone (pll)	lower lithophysal (tll)	TLL	
lower nonlithophysal zone (pln)	mottled (tm)	**TM2** (upper 2/3)	
		TM1 (lower 1/3)	

NOTE: <, less than; > greater than; %, percentage of matrix porosity

Table 5.3-13. Generalized Lithostratigraphy (after Buesch, Spengler et al. 1996; Moyer and Geslin 1995), Previously Used Informal Stratigraphic Nomenclature (after Scott and Bonk 1984), Corresponding Detailed Hydrogeologic Units (Flint, L.E. 1998), and Major Hydrogeologic Units (Montazer and Wilson 1984) at Yucca Mountain, Nevada (Continued)

Currently Used Formal and Informal Nomenclature	Previously Used Informal Nomenclature	Hydrogeologic Units	
		Detailed	Major
vitric zone (pv)			
densely welded subzone (pv3)	basal vitrophyre (tv)	PV3	
moderately welded subzone (pv2)	nonwelded base	PV2	Calico Hills nonwelded (CHn)
nonwelded subzone (pv1)			
Pre-Topopah Spring Tuff bedded tuff (Tpbt1)		**BT1a** (altered) **BT1** (unaltered)	
CALICO HILLS FORMATION (Tac)			
Unit 4 Pumiceous pyroclastic flow	Calico Hills vitric (CHv)	**CHV** (vitric)	
Unit 3 Lithic-rich pyroclastic flow	Calico Hills zeolitized (CHz)	**CHZ** (zeolitic)	
Unit 2 Pumiceous pyroclastic flow			
Unit 1 Lithic-rich pyroclastic flow			
Bedded tuff (Tacbt)		**BT** (zeolitic)	
Basal sandstone (Tacbs)			
CRATER FLAT GROUP			
Prow Pass Tuff (Tcp)			
Unit 4 Pyroxene rich		**PP4** (zeolitic)	
Unit 3 Welded pyroclastic flow		**PP3** (welded, altered)	
		PP2 (welded)	
Unit 2 Lithic-rich pyroclastic flow		**PP1** (zeolitic)	
Unit 1 Pumiceous pyroclastic flow			
Pre-Prow Pass bedded tuff (Tcpbt)			
Bullfrog Tuff (Tcb)			
Unit 4		**BF3** (welded)	Crater Flat (Cfu)
Unit 3			
Unit 2		**BF2** (zeolitic)	
Unit 1			
Pre-Bullfrog Tuff basal sandstone (Tcbbs)			
Tram Tuff (Tct)			

NOTE: <, less than; > greater than; %, percentage of matrix porosity

Table 5.3-14. Mean Values and Standard Deviations for Measured Core Properties and Estimated Saturated Hydraulic Conductivity for Each Hydrogeologic Unit

Hydro-geologic Unit	Relative Humidity Porosity (v/v)		N	Bulk Density (g/cm³)		Porosity (v/v)		Particle Density (g/cm³)		N	Volumetric Water content (v/v)		Saturation		N	Water Potential (-bars)		N	Saturated Hydraulic Conductivity (m/s)		Saturated Hydraulic Conductivity (m/s)		N	Estimated Saturated Hydraulic Conductivity (m/s)		N
	Mean	SD		Mean	SD	Mean	SD	Mean	SD		Mean	SD	Mean	SD		Geom. mean	SD		Geom. mean	SD	PL mean	SD		Geom. mean	SD	
CCR	--	--	0	2.39	0.07	0.062	0.020	2.55	0.04	9	0.046	0.015	0.75	0.13	9	--	--	0	--	--	--	--	0	1.5E-12	2.1E-12	9
CUC	0.235	0.025	17	1.91	0.13	0.253	0.060	2.56	0.09	101	0.098	0.048	0.40	0.17	101	--	--	0	3.8E-08	2.2E-08	3.3E-08	5.9E-08	3	3.9E-08	1.4E-07	101
CUL	0.126	0.038	31	2.10	0.14	0.164	0.062	2.52	0.03	98	0.094	0.021	0.61	0.15	98	--	--	0	1.2E-08	--	1.2E-08	--	1	5.7E-10	1.2E-07	98
CW	0.066	0.026	405	2.30	0.06	0.082	0.030	2.51	0.05	599	0.064	0.026	0.80	0.14	599	8.8	8.9	183	5.4E-11	5.2E-12	4.6E-11	1.0E-10	6	3.8E-12	4.1E-09	599
CMW	0.140	0.044	61	1.97	0.14	0.203	0.054	2.47	0.06	90	0.185	0.062	0.90	0.13	90	0.9	16.0	13	5.0E-10	5.6E-08	1.6E-10	4.7E-08	4	8.8E-12	1.0E-11	90
CNW	0.300	0.088	59	1.46	0.17	0.387	0.070	2.38	0.10	101	0.259	0.081	0.69	0.24	101	0.2	0.5	25	3.1E-08	4.1E-06	7.6E-10	4.8E-07	8	2.6E-07	2.2E-06	101
BT4	0.369	0.120	24	1.31	0.29	0.439	0.123	2.34	0.14	33	0.220	0.097	0.51	0.19	33	0.1	0.0	5	1.6E-07	2.4E-04	2.6E-09	6.5E-06	3	4.1E-07	1.8E-05	33
TPY	0.234	0.082	37	1.79	0.23	0.254	0.082	2.40	0.11	43	0.163	0.046	0.68	0.20	43	0.1	0.0	9	3.3E-08	2.0E-07	1.2E-08	2.5E-07	2	1.7E-08	7.4E-07	43
BT3	0.353	0.079	60	1.39	0.18	0.411	0.079	2.37	0.10	85	0.216	0.065	0.54	0.16	85	0.1	0.1	34	5.4E-07	1.2E-06	1.7E-07	2.3E-06	17	7.8E-07	1.1E-06	85
TPP	0.469	0.038	132	1.13	0.09	0.499	0.041	2.26	0.09	164	0.178	0.064	0.36	0.13	156	0.1	0.1	64	8.8E-07	4.2E-07	7.3E-07	6.7E-07	10	3.6E-06	1.2E-06	164
BT2	0.464	0.093	118	1.20	0.26	0.489	0.105	2.37	0.23	171	0.185	0.069	0.39	0.15	171	0.3	0.7	41	3.2E-06	5.6E-06	8.8E-07	9.6E-06	19	1.7E-06	2.9E-06	171
TC	0.042	0.036	50	2.38	0.10	0.054	0.036	2.51	0.04	66	0.034	0.024	0.62	0.17	66	9.4	186.7	21	7.6E-10	7.5E-09	1.5E-10	1.3E-08	3	6.2E-13	7.1E-10	66
TR	0.146	0.034	435	2.15	0.08	0.157	0.030	2.55	0.03	439	0.078	0.019	0.51	0.13	439	1.2	4.5	159	1.7E-09	1.6E-07	8.6E-10	1.4E-06	45	3.9E-10	1.0E-09	439
TUL	0.135	0.032	455	2.13	0.08	0.154	0.031	2.51	0.02	455	0.108	0.022	0.72	0.15	455	1.4	4.7	246	2.0E-10	3.0E-08	9.7E-11	2.5E-07	33	2.3E-10	5.2E-10	455
TMN	0.089	0.021	266	2.25	0.05	0.110	0.020	2.53	0.03	266	0.093	0.019	0.85	0.12	266	8.6	10.1	176	4.0E-11	4.3E-11	2.2E-11	4.4E-10	11	1.5E-11	2.3E-11	266
TLL	0.115	0.032	453	2.21	0.17	0.130	0.031	2.54	0.17	453	0.101	0.024	0.78	0.14	453	1.3	3.6	253	2.3E-10	2.2E-09	8.7E-11	9.3E-09	43	7.0E-11	4.5E-10	453
TM2	0.092	0.033	225	2.27	0.08	0.112	0.031	2.56	0.03	225	0.095	0.026	0.85	0.10	225	3.0	9.2	157	9.6E-10	8.8E-07	1.9E-10	2.4E-06	15	1.8E-11	2.1E-09	225
TM1	0.071	0.019	102	2.30	0.05	0.094	0.019	2.54	0.03	102	0.081	0.016	0.87	0.09	102	12.8	12.8	70	7.5E-11	4.5E-12	6.5E-11	8.2E-11	2	4.8E-12	5.8E-12	102
PV3	0.020	0.018	89	2.27	0.26	0.036	0.039	2.36	0.25	89	0.034	0.039	0.88	0.14	87	4.9	66.2	70	5.0E-11	2.7E-10	2.6E-11	8.5E-10	7	1.5E-13	2.1E-12	89
PV2	0.123	0.079	39	1.96	0.25	0.173	0.106	2.37	0.03	39	0.148	0.107	0.84	0.16	39	3.3	15.9	30	7.3E-10	3.5E-08	1.5E-10	2.4E-08	4	7.4E-11	2.0E-07	39
BT1a	0.193	0.077	36	1.66	0.16	0.288	0.072	2.34	0.05	36	0.267	0.076	0.93	0.16	36	0.3	1.6	29	5.4E-09	1.6E-08	1.4E-09	4.3E-08	4	6.0E-11	8.0E-10	36
BT1	0.265	0.065	43	1.66	0.14	0.273	0.067	2.28	0.07	43	0.083	0.020	0.32	0.10	43	0.1	0.4	43	1.6E-05	--	1.6E-05	--	1	6.1E-08	3.2E-07	43
CHV	0.321	0.037	69	1.47	0.06	0.345	0.034	2.24	0.10	69	0.168	0.078	0.50	0.24	69	0.2	0.2	62	5.5E-07	2.9E-06	1.0E-07	3.2E-06	6	2.1E-07	5.5E-07	69
CHZ	0.240	0.049	293	1.57	0.10	0.331	0.039	2.35	0.05	293	0.320	0.041	0.97	0.07	293	0.5	1.8	206	4.5E-11	6.5E-10	3.2E-11	9.9E-08	69	1.1E-10	1.3E-10	293
BT	0.169	0.050	69	1.79	0.13	0.266	0.041	2.44	0.08	69	0.265	0.040	1.00	0.03	69	0.2	2.3	59	8.4E-11	8.5E-12	7.4E-11	1.0E-07	3	1.4E-11	2.1E-11	69
PP4	0.236	0.055	47	1.62	0.09	0.325	0.045	2.41	0.04	47	0.308	0.051	0.94	0.08	47	0.3	10.9	43	7.5E-11	3.4E-11	5.9E-11	1.0E-07	5	9.6E-11	1.4E-10	47
PP3	0.274	0.053	166	1.79	0.12	0.303	0.043	2.58	0.05	166	0.165	0.092	0.55	0.29	166	0.6	0.8	141	1.9E-08	2.9E-08	3.2E-09	7.0E-08	29	2.9E-10	4.0E-10	166
PP2	0.217	0.060	140	1.85	0.21	0.263	0.072	2.51	0.06	140	0.248	0.081	0.93	0.10	140	0.4	1.7	124	2.8E-10	1.2E-09	1.4E-10	9.9E-08	25	5.6E-11	1.1E-10	140
PP1	0.197	0.055	245	1.74	0.15	0.280	0.053	2.42	0.07	245	0.269	0.051	0.96	0.08	245	0.6	5.5	226	9.4E-11	1.6E-10	5.5E-11	1.0E-07	21	3.1E-11	5.6E-11	245
BF3	0.102	0.038	86	2.28	0.09	0.115	0.040	2.57	0.03	86	0.112	0.039	0.98	0.07	86	0.6	4.5	86	8.7E-11	--	8.7E-11	--	1	2.1E-12	2.4E-12	86
BF2	0.213	0.083	65	1.79	0.21	0.259	0.084	2.41	0.05	65	0.261	0.089	1.00	0.08	65	0.1	3.4	61	8.8E-10	5.4E-10	5.3E-10	9.8E-08	2	5.0E-11	7.0E-10	65

NOTE: N, number of samples; v/v, dimensionless volume; g/cm³, grams per cubic centimeter; m/s, meters per second; SD, standard deviation; Geom., geometric; PL, power-law mean; --, no samples]

Table 5.3-15. Moisture-Retention van Genuchten Curve-fit Parameters, Alpha and n, for Each Hydrogeologic Unit

Hydro-geologic Unit	Laboratory Desorption Curves van Genuchten Parameters: N	Alpha (1/bars)	SE	95 Percent Confidence Limits: Upper	Lower	n	SE	95 Percent Confidence Limits: Upper	Lower	m	Composite Curves van Genuchten Parameters: Alpha (1/bars)	SE	95 Percent Confidence Limits: Upper	Lower	n	SE	95 Percent Confidence Limits: Upper	Lower	m	Residual Saturation (v/v)
CCR		0.335	0.140	--	--	1.254	0.037	--	--	0.203	--	--	--	--	--	--	--	--	--	0.20
CUC	3	0.827	0.227	1.290	0.364	1.840	0.221	2.291	1.388	0.457	--	--	--	--	--	--	--	--	--	0.04
CUL	3	1.404	0.462	2.344	0.463	1.529	0.110	1.752	1.306	0.346	--	--	--	--	--	--	--	--	--	0.06
CW	7	0.115	0.029	0.173	0.056	1.300	0.041	1.383	1.219	0.231	0.124	0.024	0.176	0.072	1.690	0.171	2.068	1.321	0.408	0.13
CMW	2	0.023	0.008	0.039	0.007	1.776	0.309	2.417	1.135	0.437	0.028	0.011	0.054	0.002	1.890	0.337	2.692	1.098	0.471	0.33
CNW	4	7.522	6.465	20.610	undef.	1.203	0.047	1.299	1.107	0.169	2.420	1.647	6.197	undef.	1.380	0.124	1.666	1.095	0.275	0.10
BT4	5	3.652	1.930	7.516	undef.	1.285	0.052	1.389	1.181	0.222	17.889	11.110	43.509	undef.	1.233	0.049	1.346	1.120	0.189	0.10
TPY	2	0.756	0.296	1.380	0.131	1.953	0.377	2.747	1.158	0.488	2.638	1.812	7.296	undef.	1.507	0.171	1.947	1.067	0.336	0.14
BT3	3	2.590	1.500	5.659	undef.	1.310	0.067	1.443	1.168	0.237	41.540	19.147	85.691	undef.	1.234	0.044	1.336	1.133	0.190	0.17
TPP	1	3.412	2.145	8.265	undef.	1.427	0.129	1.719	1.136	0.299	40.016	15.204	77.217	2.815	1.494	0.140	1.837	1.151	0.331	0.10
BT2	2	9.800	8.695	27.939	undef.	1.294	0.072	1.445	1.144	0.227	52.638	41.468	148.261	undef.	1.278	0.076	1.454	1.103	0.218	0.10
TC	2	0.335	0.140	0.632	0.039	1.254	0.037	1.332	1.175	0.203	0.885	0.418	1.907	undef.	1.249	0.043	1.354	1.145	0.199	0.11
TR	3	2.037	0.754	3.576	0.499	1.335	0.051	1.439	1.231	0.251	3.776	2.399	9.151	undef.	1.317	0.106	1.553	1.081	0.241	0.04
TUL	4	0.657	0.150	0.958	0.355	1.331	0.032	1.396	1.267	0.249	--	--	--	--	--	--	--	--	--	0.06
TMN	3	0.064	0.013	0.091	0.038	1.470	0.076	1.624	1.316	0.320	--	--	--	--	--	--	--	--	--	0.18
TLL	3	0.273	0.105	0.485	0.060	1.294	0.051	1.398	1.189	0.227	--	--	--	--	--	--	--	--	--	0.08
TM2	1	0.047	0.005	0.060	0.034	1.713	0.078	1.897	1.530	0.416	--	--	--	--	--	--	--	--	--	0.18
TM1	1	0.022	0.002	0.026	0.017	2.141	0.267	2.727	1.554	0.533	--	--	--	--	--	--	--	--	--	0.32
PV3	3	0.010	0.003	0.016	0.004	1.582	0.127	1.845	1.319	0.368	--	--	--	--	--	--	--	--	--	0.50
PV2	1	1.255	0.652	2.797	undef.	1.310	0.075	1.488	1.133	0.237	--	--	--	--	--	--	--	--	--	0.12
BT1a	3	0.019	0.008	0.035	0.003	1.561	0.180	1.931	1.191	0.359	--	--	--	--	--	--	--	--	--	0.36
BT1		9.800	8.695	27.939	undef.	1.294	0.072	1.445	1.144	0.227	--	--	--	--	--	--	--	--	--	0.04
CHV		9.800	8.695	27.939	undef.	1.294	0.072	1.445	1.144	0.227	--	--	--	--	--	--	--	--	--	0.06
CHZ	4	0.394	0.125	0.647	0.142	1.290	0.037	1.365	1.215	0.225	--	--	--	--	--	--	--	--	--	0.20
BT	1	0.015	0.001	0.018	0.012	1.909	0.111	2.151	1.667	0.476	--	--	--	--	--	--	--	--	--	0.33
PP4	1	0.010	0.001	0.009	0.007	3.035	0.404	3.967	2.104	0.671	--	--	--	--	--	--	--	--	--	0.25
PP3	3	1.817	0.599	3.032	0.601	1.455	0.071	1.599	1.311	0.313	--	--	--	--	--	--	--	--	--	0.07
PP2	3	0.072	0.012	0.097	0.046	1.603	0.081	1.768	1.439	0.376	--	--	--	--	--	--	--	--	--	0.10
PP1	2	0.179	0.060	0.305	0.054	1.454	0.078	1.616	1.292	0.312	--	--	--	--	--	--	--	--	--	0.18
BF3	1	0.036	0.010	0.063	0.009	1.680	0.202	2.240	1.119	0.405	--	--	--	--	--	--	--	--	--	0.09
BF2	1	0.012	0.001	0.014	0.010	2.477	0.275	3.353	1.602	0.596	--	--	--	--	--	--	--	--	--	0.19

NOTE: SE, standard error; v/v, dimensionless volume; undef., undefined values of less than or equal to zero on a log scale; N, number of data sets; m= 1-(1/n); parameters for unit CCR are from unit TC; parameters for units BT1 and CHV are from unit BT2

Table 5.3-16. Statistical Summary of Total Porosity Data Taken from Rautman and McKenna (1997)

PTn		TSw		CH-PP		
		Matrix	Lithophysal	All Data	Unaltered	Altered
Mean	0.437	0.152	0.205	0.322	0.309	0.323
Std.Dev.	0.118	0.053	0.080	0.086	0.088	0.074
Minimum	0.034	0.011	0.010	0.029	0.029	0.110
Maximum	0.742	0.553	0.616	0.630	0.537	0.630
N	1863	8195	8854	4824	2878	1525

NOTE: All values are porosity as a fraction except N (number of data values)

Table 5.3-17. Modeled Variogram Parameters for Total Porosity Normal Scores in the PTn Model Unit

Nest No.	Model Type	Range (feet)			Sill	Rotation Angle (degrees)			Anisotropy Ratio	
		Maximum (Horizontal)	Inter-mediate	Minimum (Vertical)		1	2	3	1	2
	Nugget				0.01					
1	Spherical	3500	3000	25	0.30	135	0	0	0.857	0.00714
2	Spherical	17000	5000	60	0.40	135	0	0	0.294	0.00350
3	Spherical	35000	25000	100	0.29	135	0	0	0.714	0.00286

Table 5.3-18. Modeled Variogram Parameters for Lithophysal Porosity Normal Scores in the TSw Model Unit

Nest No.	Model Type	Range (feet)			Sill	Rotation Angle (degrees)			Anisotropy Ratio	
		Maximum (Horizontal)	Inter mediate	Minimum (Vertical)		1	2	3	1	2
	Nugget				0.01					
1	Spherical	2000	1000	30	0.20	0	0	0	0.500	0.0150
2	Spherical	7000	3000	200	0.40	0	0	0	0.429	0.0286
3	Spherical	50000	50000	400	0.39	0	0	0	1.000	0.0080

Table 5.3-19. Modeled Variogram Parameters for Total Porosity Normal Scores in the CH-PP Model Unit

Nest No.	Model Type	Range (feet)			Sill	Rotation Angle (degrees)			Anisotropy Ratio	
		Maximum (Horizontal)	Inter-mediate	Minimum (Vertical)		1	2	3	1	2
	Nugget				0.01					
1	Spherical	2500	2500	60	0.30	0	0	0	1.000	0.0240
2	Spherical	20000	5500	175	0.30	0	0	0	0.275	0.0088
3	Spherical	30000	11700	800	0.39	0	0	0	0.267	0.0267

Table 5.3-20. Statistical Summary of Tiva Canyon Tuff Air-Injection Permeability Values by Lithostratigraphic Unit and Borehole

Lithostratigraphic Unit	Borehole UZ-16 Mean (#) st. dev.	Borehole SD-12 Mean (#) st. dev.	Borehole NRG-6 Mean (#) st. dev.	Borehole NRG-7a Mean (#) st. dev.
lower lithophysal (Tpcpll)	5.5 (1) NA	19.6 (2) 18.7	14.0 (1) NA	--
lower nonlithophysal hackly (Tpcplnh)	--	1.7 (1) NA	28.0 (1) NA	--
lower nonlithophysal columnar (Tpcplnc)	15.0 (1) NA	2.9 (3) 2.2	1.3 (2) 1.0	25.7 (2) 14.9
crystal-poor vitric (Tpcpv)	--	--	--	0.2 (2) 0.1

NOTE: Permeability values are x10^{-12} m^2. Mean is arithmetic mean. # is number of test intervals. st.dev. is standard deviation. NA is not applicable. -- is no data.

Table 5.3-21. Statistical Summary of Tiva Canyon Tuff Air-Injection Permeability Values by Borehole

Borehole	Number of Test Intervals	Arithmetic Mean	Geometric Mean	Maximum Value	Minimum Value
UZ-16	4	12.3	7.6	27.0	1.5
SD-12	11	7.0	3.4	38.0	0.8
NRG-6	4	11.2	4.1	28.0	0.3
NRG-7a	* 4	26.6	8.4	54.0	0.24

NOTE: Permeability values are x10^{-12} m^2.

Table 5.3-22. Statistical Summary of the Air-Injection Permeability Values of the PTn Hydrogeologic Unit

Borehole	Number of test intervals	Arithmetic Mean	Geometric Mean	Maximum	Minimum
NRG-7a	* 18	0.54	0.30	3.0	0.12

* Includes two test intervals from the crystal-poor vitric nonwelded subzone of the Tiva Canyon Tuff, which is considered part of the PTn.

NOTE: Permeability values are × 10^{-12} m^2

Table 5.3-23. Statistical Summary of the Air-Injection Permeability Values for Individual Lithostratigraphic Units Within the PTn Hydrogeologic Unit

Lithostratigraphic Unit	Borehole NRG-7a Arithmetic Mean (Number of Intervals) Standard Deviation
Tiva Canyon crystal-poor vitric (Tpcpv1)	0.2 (2) 0.12
Pre-Tiva Canyon Tuff bedded tuff (Tpbt4)	0.2 (1) NA
Yucca Mountain Tuff (Tpy)	0.3 (4) 0.2
Pre-Yucca Mountain Tuff bedded tuff (Tpbt3)	3.0 (1) NA
Pah Canyon Tuff (Tpp)	0.2 (7) 0.04
Pre-Pah Canyon Tuff bedded tuff (Tpbt2)	0.7 (1) NA

NOTE: Permeability values 1are × 10^{-12} m^2. NA is not applicable.

Table 5.3-24. Statistical Summary of Topopah Spring Tuff Air-Injection Permeability Values by Borehole

Borehole	Number of Test Intervals	Arithmetic Mean	Geometric Mean	Maximum Value	Minimum Value
UZ-16	54	1.8	0.9	9.5	0.02
SD-12	27	4.7	1.7	33.0	0.12
NRG-6	34	2.1	0.8	24.0	0.08
NRG-7a	38	0.4	0.3	2.4	0.04

NOTE: Permeability values are × 10^{-12} m^2

Table 5.3-25. Statistical Summary of Topopah Spring Tuff Air-Injection Permeability Values by Lithostratigraphic Unit and Borehole

	Borehole UZ-16	**Borehole SD-12**	**Borehole NRG-6**	**Borehole NRG-7a**
Lithostratigraphic Unit	**Mean (#) st. dev.**	**Mean (#) st. dev.**	**Mean (#) st. dev.**	**Mean (#) st. dev.**
Crystal-Rich vitric	--	--	--	--
Crystal-Rich nonlithophysal	0.65 (1) NA	5.8 (7) 10.0	2.2 (20) 5.0	0.23 (3) 0.13
Crystal-Rich lithophysal	--	--	0.25 (1) NA	0.15 (3) 0.08
Upper lithophysal	1.8 (4) 0.34	5.4 (5) 6.6	4.1 (5) 4.4	0.32 (9) 0.10
Middle nonlithophysal	0.37 (17) 0.35	2.7 (7) 2.9	1.1 (7) 0.89	0.57 (6) 0.82
Lower lithophysal	3.2 (16) 2.5	--	--	0.40 (15) 0.27
Lower nonlithophysal	1.9 (13) 1.5	1.3 (6) 0.40	--	--
Crystal-Poor vitric	--	--	--	--

NOTE: Permeability values are x10^{-12} m^2. Mean is arithmetic mean. # is number of test intervals. st.dev. is standard deviation. NA is not applicable. -- is no data.

Table 5.3-26. Average Number of Natural Fractures per Test Interval by Lithostratigraphic Unit and Borehole

Lithostratigraphic Unit	Borehole UZ-16 # Fractures (# Intervals)	Borehole SD-12 # Fractures (# Intervals)	Borehole NRG-6 # Fractures (# Intervals)	Borehole NRG-7a # Fractures (# Intervals)
Tiva Canyon Tuff	16 (4)	11 (11)	23 (4)	19 (4)
PTn	--	--	--	2 (18)
Topopah Spring Tuff	14 (54)	16 (27)	6 (34)	4 (38)

NOTE: Permeability values are x10^{-12} m^2. Mean is arithmetic mean. # is number of test intervals. st.dev. is standard deviation. NA is not applicable. -- is no data.

Table 5.3-27. Statistical Summary of Air-Injection Permeability Values for the Tiva Canyon Crystal-Poor Upper Lithophysal Unit (Tpcpul) in the Upper Tiva Canyon Alcove

Borehole Number	Arithmetic Mean (Standard Deviation)	Geometric Mean
RBT#1	11.0 (10.4)	7.2
RBT#2	38.5 (24.0)	27.1
RBT#3	27.8 (26.9)	13.3

NOTE: Units are $\times 10^{-12}$ m^2

Table 5.3-28. Statistical Summary of the Air-Permeability Values From the Bow Ridge Fault Alcove Hydrologic Properties of Faults Borehole HPF#1, Tiva Canyon Tuff Crystal-Poor Middle Nonlithophysal and Lower Lithophysal Zones

Lithostratigraphic Unit	Tiva Canyon Tuff Crystal-Poor Middle Nonlithophysal (Tpcpmn)	Tiva Canyon Tuff Crystal-Poor Lower Lithophysal (Tpcpll)
Number of Test Intervals	8	5
Arithmetic Mean	13.9	1.3
Arithmetic Standard Deviation	8.1	0.6
Geometric Mean	12.2	1.2

NOTE: Permeability values are $\times 10^{-12}$ m^2

Table 5.3-29. Air-Permeability and Porosity Values from Cross-Hole Pneumatic Tests Conducted in the Bow Ridge Fault Alcove

Test Number	Injection Interval	Monitor Interval	Type Curve Analysis k ×10^{-12} (m^2) ϕ (m^3/m^3)	Steady-State Analysis k ×10^{-12} (m^2)
4	Bow Ridge fault zone	Bow Ridge fault zone	k = 27.8 ϕ = 0.13	k = 12.7
5	Bow Ridge fault zone	Bow Ridge fault zone	k = 25.9 ϕ = 0.20	k = 6.8
6	pre-Rainier Mesa bedded tuff #1 (Tmbt1)	pre-Rainier Mesa bedded tuff #1 (Tmbt1)	k = 23.2 ϕ = 0.27	k = 16.0
8	Tiva Canyon Tuff lower lithophysal	Tiva Canyon Tuff lower lithophysal	NA	k = 2.0
11	Tiva Canyon Tuff middle nonlithophysal	Tiva Canyon Tuff middle nonlithophysal	NA	k = 21.7

NOTE: k is permeability × 10^{-12} meter square, ϕ is porosity, NA is not analyzable

Table 5.3-30. Results from Cross-Hole Gaseous Tracer Tests Conducted in the Bow Ridge Fault Alcove

Test Number	Pumped Interval HPF #1	Release Interval HPF #2	First Arrival (minutes)	Peak Arrival (minutes)	Tracer Velocity (× 10^{-4}m/s)	Darcy Velocity (× 10^{-4}m/s)	ϕ_{eff}
2	Fault	Fault	16	80	6.5	3.1-3.4	0.48 to 0.52
3	Fault	Fault	16	36	14.4	3.1-3.4	0.22 to 0.24
5	Tpcpll	Tpcpll	8	41	12.3	1.5	0.12
6	Tpcpmn	Tpcpmn	6	28	18.1	0.7	0.04

NOTE: m/s is meters per second, ϕ_{eff} is effective porosity

Table 5.3-31. Statistical Summary of the Air-Permeability Values from the Upper Paintbrush Contact Alcove

Lithostratigraphic Unit	Tiva Canyon Crystal-Poor Lower Nonlithophysal Hackly Subzone (Tpcplnh)	Tiva Canyon Crystal-Poor Lower Nonlithophysal Columnar Subzone (Tpcplnc)	Tiva Canyon Crystal-Poor Vitric Subzones 2 and 1 (Tpcpv2 and Tpcv1)
Number of Test Intervals	11	6	12
Arithmetic Mean	3.69	0.71	16.5
Geometric Mean	2.07	0.26	7.01

NOTE: Permeability values are × 10^{-12} m^2

Table 5.3-32. Arithmetic Mean Air-Permeability Values for Lithostratigraphic and Hydrogeologic Units from Exploratory Studies Facility Air-Injection Tests, Surface-Based Air-Injection Tests, and Pneumatic Monitoring

Unit [1]	UTCA (ESF)	BRFA (ESF)	UPCA (ESF)	UZ-16 (SB)	SD-12 (SB)	NRG-6 (SB)	NRG-7 (SB)	NRG-6 (PM)	NRG-7a (PM)	SD-12 (PM)
Tpcpul	28.6 (27)									
Tpcpmn		13.9 (8)								100
Tpcpll		1.3 (5)		5.5 (1)	19.5 (2)	14.0 (1)		3.1		100
Tpcpln			2.6 (17)	15.0 (1)	2.6 (4)	10.2 (3)	25.7 (2)	3.1	1.3	100
Tpcpv			16.5 (12)				0.20 (2)	0.5-2.1	0.65-1.3	
PTn [1]							0.54 (18)	0.5-2.1	0.65-1.3	1.0
Tptrv								0.5-2.1	0.65-1.3	10.0
Tptrn				0.65 (1)	5.8 (7)	2.2 (20)	0.23 (3)	14.7-50.0	10.0	10.0
Tptrl						0.25 (1)	0.15 (3)	10.0	10.0	
Tptpul				1.8 (4)	5.3 (5)	4.6 (5)	0.32 (9)	10.0	10.0	10.0
Tptpmn				0.37 (17)	2.7 (7)	1.1 (7)	0.57 (6)			10.0
Tptpll				3.2 (16)			0.40 (15)			10.0
Tptpln				1.9 (13)	1.3 (6)					10.0

NOTE: Air-permeability values are times 10^{-12} m^2 and the number of test intervals is in parenthesis.
PM=Pneumatic Monitoring
SB=Surface Based
[1]PTn is a composite hydrogeologic unit; all others are lithostratigraphic units (see Table 5.3-13)

Table 5.3-33. Nevada Central Zone Coordinates of Drillholes from Which Core Samples Were Recovered

Drillhole	North Coordinate	East Coordinate
USW G-2	778,825	560,503
USW G-1	770,500	561,000
USW H-1	770,254	562,416
USW SD-9	767,989	561,818
UE 25a#4	767,972	563,081
UE 25a#5	766,956	564,755
UE 25a#7	766,249	565,468
UE 25a#6	765,899	564,500
USW G-4	765,807	563,081
UE 25b#1	765,243	566,416
UE-25a#1	764,900	566,350
USW SD-12	761,956	561,680
USW SD--7	758,949	561,240
UE 25c#1	757,114	569,633
UE 25c#3	756,909	569,554
UE 25c#2	756,849	569,655
USW H-3	756,542	558,451
UE 25p#1	756,171	571,483
USW G-3	752,779	558,484
J-13	749,209	579,651

NOTE: Coordinates in feet

Table 5.3-34. Characteristic Hydrologic Properties Estimated from Core Analyses for Stratigraphic Units in the Site Area Saturated Zone

Stratigraphic Unit	Parameter Estimation	Saturated Hydraulic Conductivity Horizontal (m/day)	Saturated Hydraulic Conductivity Vertical (m/day)	Permeability Horizontal (mD)	Permeability Vertical (mD)	Matrix Porosity (Percent)
Upper Volcanic Aquifer						
Topopah Spring Tuff	Mean	1.0e-5	2.0e-6	1.16	2.4e-1	17.9
	Standard Deviation	4.0e-5		4.76	9.9e-1	11.1
	Number of Samples	28	1	65	22	30
Upper Volcanic Confining Unit						
Calico Hills	Mean	6.0e-1	5.7e-5	2.3	2.6	27.6
	Standard Deviation	1.5e-1	1.4e-1	5.6	7.5	7.5
	Number of Samples	19	1	47	17	49
Middle Volcanic Aquifer						
Prow Pass	Mean	7.4e-4	3.5e-5	1.88	3.07	23.9
	Standard Deviation	2.8e-3	3.1e-5	5.28	10.1	6.4
	Number of Samples	32	4	89	26	59
Bullfrog	Mean	2.0e-4	1.7e-4	6.1e-1	1.3	19
	Standard Deviation	3.1e-4	1.8e-4	1.09	2.5	7.9
	Number of Samples	21	14	108	26	46
Tram	Mean	1.6e-4	1.4e-4	1.3e-1	1.3e-1	20.6
	Standard Deviation	1.4e-4	1.5e-4	6.6e-1	6.2	6.1
	Number of Samples	16	14	63	29	42
	Number of Samples			1	1	1

NOTE: Mean, mean value; m/day, meters per day; mD, milli-Darcy; n/a, none available.

Table 5.3-34. Characteristic Hydrologic Properties Estimated from Core Analyses for Stratigraphic Units in the Site Area Saturated Zone (Continued)

Stratigraphic Unit	Parameter Estimation	Saturated Hydraulic Conductivity Horizontal (m/day)	Saturated Hydraulic Conductivity Vertical (m/day)	Permeability Horizontal (mD)	Permeability Vertical (mD)	Matrix Porosity (Percent)
Middle Volcanic Confining Unit						
Flow Breccia	One Sample	8.0e-7	8.0e-7			
	Standard Deviation	n/a	n/a			
	Number of Samples	1	1			
Lithic Ridge						
	Mean			3.0e-2	7.0e-2	20
	Standard Deviation			4.3e-2	1.1e-1	3.2
	Number of Samples			17	15	18
Lower Volcanic Confining Unit						
Older Tuffs	Mean	1.8e-4	2.1e-4	2.1e-2	2.2e-2	15.3
	Standard Deviation	1.7e-2	2.6e-4	1.7e-2	1.5e-2	3.4
	Number of Samples	2	2	3	3	5
Calcified Tuff	One Sample				32.8	15.8
	Standard Deviation				n/a	n/a
	Number of Samples				1	1
Lower Carbonate Aquifer						
Lone Mountain Dolomite	Mean			4.2	19.1	5.2
	Standard Deviation			8.6	49.0	4.2
	Number of Samples			11	11	14
Roberts Mountain Fm.	One Sample			2.1e-3	3.4e-2	3.0e-1
	Standard Deviation			n/a	n/a	n/a
	Number of Samples			1	1	1

NOTE: Mean, mean value; m/day, meters per day; mD, milli-Darcy; n/a, none available

Table 5.3-35. Estimated Transmissivity Values Obtained from Single-Borehole Aquifer Tests in the Vicinity of Yucca Mountain (from Luckey, Tucci et al. 1996, Table 5)

Borehole Name	Transmissivity, in Meters Squared per Day					Reference
	Upper Volcanic Aquifer	Upper Volcanic Confining Unit	Lower Volcanic Aquifer	Lower Volcanic Confining Unit	Carbonate Aquifer	
USW H-1	--	--	152	5.0×10^{-3}	--	Rush et al. (1984)
USW H-3	--	--	<1.1	$<4.1 \times 10^{-1}$	--	Thordarson et al. (1985)
USW H-4	--	--	178	23	--	Whitfield, Eshom et al. (1985)
USW H-5	--	--	35	--	--	Robison and Craig (1991)
USW H-6	--	--	229	6.3×10^{-2}	--	Craig, R.W. and Reed (1991)
USW G-2	--	9 a	--	--	--	O'Brien (1998)
USW G-4	--	--	589b	--	--	Lobmeyer (1986)
UE-25 b#1	--	26	297	$<3.0 \times 10^{-3}$	--	Lahoud et al. (1984); Moench (1984)
C-Hole Complex	--	2.0	21 1,600 - 3,200?bb	--	--	Geldon (1996) Geldon et al. (1998)
UE-25 p#1	--	--	15	2.0	118	Craig, R.W. and Robison (1984)
USW W.T.-10	1,600c	--	--	--	--	O'Brien (1997)
UE-25 W.T.#12	7?d	7?d	--	--	--	O'Brien (1997)
UE-25 J-13	120	3.7 e	1.4	6.3×10^{-1}f	--	Thordarson (1983)

NOTE: --, no data; <, less than

a Though the top 3 m of the water column in borehole USW G-2 were in the upper volcanic aquifer, the upper volcanic confining unit (saturated interval of 256 m) is considered to be the interval tested.

b Average determined from four tests.

bb It is assumed that this range of transmissivity is for the lower volcanic aquifer. However, pumping and monitoring wells were completed in saturated intervals of both the lower volcanic aquifer and lower volcanic confining unit.

c Average determined from three tests.

d Of the saturated interval tested in borehole UE-25 W.T.#12, 41 m were completed in the upper volcanic aquifer and 12 m were completed in the upper volcanic confining unit. The low transmissivity could indicate the lowest limit of transmissivity values for the upper volcanic aquifer, or, that the degree of fracturing in the interval tested of the upper volcanic aquifer was very low and the transmissivity is more representative of the upper volcanic confining unit (O'Brien 1997, pp. 22-23).

e Average determined from two tests.

f Includes part of the lower volcanic aquifer.

Table 5.3-36. Estimated Apparent Hydraulic-Conductivity Values Obtained from Single-Borehole Tests in the Vicinity of Yucca Mountain (from Luckey, Tucci et al. 1996, Table 4)

Borehole Name	Apparent Hydraulic Conductivity, in Meters per Day					Reference
	Upper Volcanic Aquifer	Upper Volcanic Confining Unit	Lower Volcanic Aquifer	Lower Volcanic Confining Unit	Carbonate Aquifer	
USW H-1	--	--	4.3×10^{-1}	5.5×10^{-6}	--	Rush et al. (1984)
USW H-3	--	--	$<3.7 \times 10^{-3}$	$<3.2 \times 10^{-3}$	--	Thordarson et al. (1985)
USW H-4	--	--	4.3×10^{-1}	1.1×10^{-1}	--	Whitfield, Eshom et al. (1985)
USW H-5	--	--	6.0×10^{-1}	--	--	Robison and Craig (1991)
USW H-6	--	--	8.0×10^{-1}	1.8×10^{-4}	--	Craig, R.W. and Reed (1991)
USW G-2	--	3.5×10^{-2} a	--	--	--	O'Brien (1998)
USW G-4	--	--	1.4	--	--	Lobmeyer (1986)
UE-25 b#1	--	2.6×10^{-1}	4.9×10^{-1}	$<1.0 \times 10^{-4}$	--	Lahoud et al. (1984); Moench (1984)
C-Hole Complex	--	2.0×10^{-2}	7.0×10^{-2} 6.5 - 13 ?aa	--	--	Geldon (1996) Geldon, et al. (1998)
UE-25 p#1	--	--	3.3×10^{-2}	5.8×10^{-3}	1.9×10^{-1}	Craig, R.W. and Robison (1984)
USW W.T.-10	19 b	--	--	--	--	O'Brien (1997)
UE-25 W.T. #12	1.3×10^{-1}?c	1.3×10^{-1}?c	---	---	---	O'Brien (1997)
UE-25 J-13	1.0	1.2×10^{-1} d	7.6×10^{-3}	2.6×10^{-3} e	--	Thordarson (1983)

NOTE: --, no data available; <, less than

a Though the top 3 m of the water column in borehole USW G-2 were in the upper volcanic aquifer, the upper volcanic confining unit (saturated interval of 256 m) is considered to be the interval tested.

aa It is assumed that this range of hydraulic conductivity is for the lower volcanic aquifer. However, pumping and monitoring wells were completed in saturated intervals of both the lower volcanic aquifer and lower volcanic confining unit.

b Average determined from three tests.

c Of the saturated interval tested in borehole UE-25 W.T.#12, 41 m were completed in the upper volcanic aquifer and 12 m were completed in the upper volcanic confining unit. The low hydraulic conductivity could indicate the lowest limit of hydraulic conductivity for the upper volcanic aquifer, or, that the degree of fracturing in the interval tested of the upper volcanic aquifer was very low and the hydraulic conductivity is more representative of the upper volcanic confining unit (O'Brien 1997, pp. 22-23).

d Average determined from two tests.

e Includes part of the lower volcanic aquifer.

Table 5.3-37. Selected Statistics for the Developed Record of Daily Precipitation for 1980 to 1995 at an Elevation of 1,400 m for the Area of the Potential Repository

Calender Year	Total Annual Precip. (mm).	Max. Daily Precip. (mm)	Number of Days Precip. Measured	Number of Days Precip. > 1 mm	Number of Days Precip. > 10 mm	Number of Days Precip. > 20 mm	Number of Days Precip. > 50 mm
1980	163	13	37	26	4	0	0
1981	104	16	30	20	2	0	0
1982	169	30	48	32	1	1	0
1983	294	58	53	39	7	2	1
1984	220	38	40	24	7	2	0
1985	85	16	26	14	1	0	0
1986	147	21	35	27	2	1	0
1987	207	32	46	35	4	1	0
1988	142	26	40	24	2	1	0
1989	27	3	16	7	0	0	0
1990	79	11	20	13	1	0	0
1991	194	19	34	25	8	0	0
1992	324	41	48	36	9	4	0
1993	255	30	41	31	8	1	0
1994	123	15	30	18	3	0	0
1995[1]	347	36	39	33	9	4	0
Averages	180	25	36.4	25.3	4.3	1.1	0.1

[1]Record for 1995 is through 9-30-95, but little or no precipitation occurred between then and the end of the calendar year.

Table 5.3-38. Comparison of Results for a Scaled One-Year Numerical Simulation of Net Infiltration and a 100-Year-Stochastic Numerical Simulation of Net Infiltration for Yucca Mountain

Model-Area Descriptions:	Modeled Areas		
	Area 1	**Area 5**	**Area 3**
Number of cells	253,597	12,900	5,040
Total area (km^2)	228.24	11.61	4.54
Average elevation (m)	1,237	1,346	1,294
Maximum elevation (m)	1,969	1,506	1,471
Minimum elevation (m)	918	1,195	1,162
Scaled 1-Year Simulation: (Flint, A.L. et al. 1996)			
Average annual precipitation (mm/yr)	169	N/A[1]	N/A[1]
Mean net infiltration rate (mm/year)	3.0	5.2	4.1
Maximum net infiltration rate (mm/year)	81.9	29.2	23.4
Minimum net infiltration rate (mm/year)	0.0	0.0	0.0
Coefficient of variation	2.2	1.1	1.2
100-Year Stochastic Simulation			
Average annual precipitation (mm/yr)	150	163	157
Mean net infiltration rate (mm/year)	3.2	6.0	5.1
Maximum net infiltration rate (mm/year)	63.2	29.7	29.7
Minimum net infiltration rate (mm/year)	0.0	0.0	0.0
Coefficient of variation	1.7	0.9	1.1

[1]N/A (not available)

Table 5.3-39. Numerical-Infiltration Model Results for Five-Year Periods of the 100-Year Stochastic Simulation for Yucca Mountain Under Current Climatic Conditions

Simulation Year	5-Year Average Precipitation (mm)	15-Year Sliding Average Precipitation (mm)	5-Year Average Runoff (mm)	15-Year Sliding Average Runoff (mm)	5-Year Average Net Infiltration (mm)	15-Year Sliding Average Net Infiltration (mm)
5	143.11		0.07		2.67	
10	146.22		0.00		0.45	
15	154.71	148.01	0.07	0.05	2.11	1.74
20	133.63	144.85	0.01	0.03	1.38	1.31
25	161.30	149.88	0.03	0.03	2.22	1.90
30	135.63	143.52	0.59	0.21	3.96	2.52
35	130.18	142.37	0.02	0.21	1.35	2.51
40	159.96	141.92	1.19	0.60	5.30	3.54
45	168.00	152.71	0.03	0.41	1.35	2.67
50	184.95	170.97	1.18	0.80	6.45	4.37
55	120.32	157.76	0.01	0.40	1.39	3.06
60	108.22	137.83	0.00	0.39	0.17	2.67
65	179.01	135.85	3.07	1.03	7.95	3.17
70	138.34	141.86	0.00	1.02	0.45	2.86
75	126.00	147.79	0.00	1.03	0.54	2.98
80	195.29	153.21	3.09	1.03	10.95	3.98
85	134.68	151.99	0.00	1.03	0.69	4.06
90	174.29	168.08	1.22	1.44	7.82	6.49
95	151.67	153.55	0.02	0.41	1.61	3.37
100	158.23	161.40	0.96	0.73	6.13	5.19
Average	150.19	150.20	0.58	0.60	3.25	3.24
Maximum	195.29	170.97	3.09	1.44	10.95	6.49
Minimum	108.22	135.85	0.00	0.03	0.17	1.31
Standard Deviation	22.77	9.72	0.97	0.43	3.11	1.25
Coefficient of Variation	0.15	0.06	1.68	0.71	0.96	0.39

Table 5.3-40. Summary of Annual Results for Simulated Net Infiltration and Runoff Obtained Using the 1980 to 1995 Developed Daily Precipitation Record for Yucca Mountain

Calendar Year	Average Precipitation (mm)	Maximum Precipitation (mm)	Minimum Precipitation (mm)	Average Net Infiltration (mm)	Maximum Net Infiltration (mm)	Minimum Net Infiltration (mm)	Average Runoff (mm)	Maximum Runoff (mm)	Minimum Runoff (mm)
1980	144.0	229.2	106.9	1.70	51.20	0.00	0.00	0.00	0.00
1981	91.9	146.3	68.2	0.00	0.00	0.00	0.00	0.00	0.00
1982	149.3	237.7	110.8	0.00	9.93	0.00	0.00	0.00	0.00
1983	259.7	413.5	192.8	7.11	169.93	0.00	0.12	56.45	0.00
1984	193.5	308.0	143.6	2.59	104.87	0.00	0.01	31.80	0.00
1985	75.1	119.5	55.7	2.07	61.60	0.00	0.01	9.78	0.00
1986	129.9	206.7	96.4	0.03	30.05	0.00	0.00	0.00	0.00
1987	182.9	291.1	135.7	0.05	52.29	0.00	0.00	0.00	0.00
1988	125.4	199.7	93.1	0.53	54.81	0.00	0.00	5.10	0.00
1989	32.7	52.0	24.3	0.00	0.00	0.00	0.00	0.00	0.00
1990	69.8	111.1	51.8	0.00	0.00	0.00	0.00	0.00	0.00
1991	171.4	272.8	127.2	0.51	38.11	0.00	0.00	0.00	0.00
1992	287.1	457.1	213.1	25.96	252.54	0.00	9.25	150.07	0.00
1993	225.3	358.6	167.2	38.20	211.75	0.00	18.00	183.90	0.00
1994	108.7	173.0	80.7	0.00	29.12	0.00	0.00	0.00	0.00
1995	273.0	434.6	202.6	43.58	247.55	0.00	23.77	181.77	0.00
Average	157.5	250.7	116.9	7.64	82.11	0.00	3.20	38.68	0.00
Maximum	287.1	457.1	213.1	43.58	252.54	0.00	23.77	183.90	0.00
Minimum	32.7	52.0	24.3	0.00	0.00	0.00	0.00	0.00	0.00
Standard Deviation	75.8	120.6	56.2	14.52	88.45	0.00	7.35	68.20	0.00
Coefficient of Variation	0.5	0.5	0.5	1.90	1.08	--	2.30	1.76	--

Table 5.3-41. Infiltration Fluxes Estimated by the Chloride Mass-Balance Method (Adapted from Fabryka-Martin, Wightman et al. 1994) Compared to Point and Spatially Averaged Estimates of Net Infiltration Derived from the Numerical Infiltration Model

Borehole (Infiltration Zone)	Unit	Depth Interval (m)	Infiltration Flux, Chloride Mass Balance (mm/yr)	Point Estimate of Net Infiltration, Numerical Model (mm/yr)	3600 m^2 Areal Average of Net Infiltration, Numerical Model (mm/yr)
USW UZ-N37 (moderately-active channel)	Soil	0-13	0.5	0.0	0.0
USW UZ-N53 (north-facing sideslope)	PTn		3.3	6.1	2.9
USW UZ-N54 (alluvium-filled channel)	Soil	0-7.8	0.02	0.0	0.0
	PTn		3.3		
USW UZ-N55 (south-facing sideslope)	PTn		2.4	0.6	0.3
USW UZ-N11 (ridgetop)	PTn		3.2	3.3	3.1
UE-25 UZ#16 (terrace)	Soil	0-7.4	0.02	0.0	0.0
	PTn	50-55	3.0		
	CHn	368-440	3.5		
USW UZ-14 (terrace)	PTn	44-75	1.2	7.3	3.1
	CHn	470-477	5.9		
UE-25 UZ#4 (active channel)	PTn	91-96	1.1	5.0	2.5
UE-25 UZ#5 (north-facing sideslope)	PTn	29-36	2.5	5.0	2.9
	PTn	94-97	1.4		

Table 5.3-42. Numerical-Infiltration Model Results for Five-Year Periods of the 100-Year Stochastic Simulation for Yucca Mountain Using the Nevada Test Site Area 12 Wetter-Climate Analog

Simulation Year	5-Year Average Precipitation (mm)	15-Year Sliding Average Precipitation (mm)	5-Year Average Runoff (mm)	15-Year Sliding Average Runoff (mm)	5-Year Average Net Infiltration (mm)	15-Year Sliding Average Net Infiltration (mm)
5	274.87		7.07		15.76	
10	285.41		5.34		16.30	
15	269.27	276.52	2.32	4.91	13.10	15.05
20	274.23	276.31	9.34	5.67	17.71	15.70
25	384.50	309.34	25.36	12.34	45.08	25.29
30	289.55	316.09	11.01	15.24	27.05	29.95
35	308.71	327.59	17.32	17.89	26.81	32.98
40	286.39	294.88	10.03	12.79	23.42	25.76
45	316.60	303.90	14.71	14.02	25.05	25.09
50	292.76	298.59	8.37	11.04	23.10	23.85
55	292.18	300.52	1.59	8.22	10.99	19.71
60	280.37	288.44	5.20	5.05	15.60	16.56
65	235.85	269.47	1.15	2.65	8.13	11.58
70	318.12	278.12	8.48	4.94	23.84	15.86
75	280.76	278.25	8.04	5.89	16.62	16.20
80	306.04	301.64	17.41	11.31	30.24	23.57
85	227.77	271.53	0.28	8.58	4.16	17.01
90	284.82	272.88	9.76	9.15	19.52	17.97
95	270.47	261.02	3.62	4.55	12.32	12.00
100	295.25	283.51	7.47	6.95	19.78	17.21
Average	288.70	289.37	8.69	8.96	19.73	20.07
Maximum	384.50	327.59	25.36	17.89	45.08	32.98
Minimum	227.77	261.02	0.28	2.65	4.16	11.58
Standard Deviation	31.93	18.13	6.26	4.29	9.00	6.06
Coefficient of Variation	0.11	0.06	0.72	0.48	0.46	0.30

Table 5.3-43. Numerical-Infiltration Model Results for Five-Year Periods of the 100-Year Stochastic Simulation for Yucca Mountain Using the South Lake "Super Pluvial" Analog

Simulation Year	5-Year Average Precipitation (mm)	15-Year Sliding Average Precipitation (mm)	5-Year Average Runoff (mm)	15-Year Sliding Average Runoff (mm)	5-Year Average Net Infiltration (mm)	15-Year Sliding Average Net Infiltration (mm)
5	438.10		41.07		60.80	
10	448.77		70.38		110.08	
15	378.98	421.95	40.21	50.55	57.47	76.12
20	464.39	430.71	59.95	56.85	92.48	86.68
25	428.03	423.80	50.96	50.37	80.78	76.91
30	449.97	447.47	60.71	57.20	98.05	90.43
35	459.05	445.69	75.57	62.41	102.20	93.68
40	434.50	447.84	66.63	67.64	99.31	99.85
45	450.64	448.06	56.32	66.17	83.68	95.06
50	399.58	428.24	47.03	56.66	67.87	83.62
55	397.52	415.91	38.50	47.28	65.79	72.45
60	419.99	405.69	44.78	43.44	74.81	69.49
65	432.83	416.78	45.49	42.92	74.64	71.75
70	385.09	412.64	41.57	43.95	69.67	73.04
75	414.82	410.91	53.83	46.97	74.53	72.94
80	395.37	398.42	39.29	44.90	63.06	69.09
85	388.35	399.51	35.98	43.03	59.09	65.56
90	394.65	392.79	33.93	36.40	58.83	60.33
95	442.77	408.59	54.11	41.34	85.05	67.66
100	517.79	451.73	89.98	59.34	142.27	95.39
Average	427.06	422.60	52.31	50.97	81.02	78.89
Maximum	517.79	451.73	89.98	67.64	142.27	99.85
Minimum	378.98	392.79	33.93	36.40	57.47	60.33
Standard Deviation	34.12	19.08	14.74	9.14	21.45	11.92
Coefficient of Variation	0.08	0.05	0.28	0.18	0.26	0.15

Table 5.3-44. Comparison of Mean Air Permeability and Mean Air-Filled Porosity Values Derived from Pneumatic Diffusivities Determined by Three Methods Using Pneumatic-Pressure Data from Instrumented Boreholes

Analysis Method (Boreholes)	**Rousseau, Kwicklis et al. 1996 (NRG-6, NRG-7a, UZ#4, UZ#5)**		**Patterson et al. 1996 (NRG#5, NRG-6, NRG-7a, SD-7, and SD-9)**		**Rousseau, Loskot et al. 1997 (SD-7, SD-12, and UZ-7a)**	
Hydrogeologic Unit	**Mean Air Permeability, $\times 10^{12}\ m^2$ (number of intervals)**	**Mean Air-Filled Porosity**	**Mean Air Permeability, $\times 10^{12}\ m^2$ (number of intervals)**	**Mean Air-Filled Porosity**	**Mean Air Permeability, $\times 10^{12}\ m^2$ (number of intervals)**	**Mean Air-Filled Porosity**
Tiva Canyon Welded	3.7 (4)	0.13	801.0 (4)	0.09	303.0 (3)	0.14
Paintbrush Nonwelded	2.2 (14)	0.25	1.2 (13)	0.33	50.7 (3)	0.25
Topopah Spring Welded	14.5 (8)	0.06	146.0 (5)	0.05	16.0 (14)	0.07

Table 5.3-45. Summary of Pneumatic-Interference Events at Instrumented Boreholes Caused by Exploratory Studies Facility Excavation

Borehole	Event Producing First Interference (Date)	Position of the TBM Referenced to Exploratory Studies Facility Stations (Distance from North Portal)	Horizontal Distance From TBM Advance Point to Borehole, in feet (meters)	Lithostratigraphic Unit Exposed at the Face of Exploratory Studies Facility Tunnel
NRG#4	Penetration of PTn (06/16/95)	10 + 68.3 (1,068.3 meters)	82 (25)	pre-Pah Canyon tuff (Tpbt2)
UZ#4	Crossing of fault zone (08/12/95)	12 + 61.8	1,361 (415)	Topopah Spring Crystal-Rich Nonlithophysal (Tptrn)
UZ#5	Crossing of fault zone (08/12/95)	12 + 61.8	1,237 (377)	Topopah Spring Crystal-Rich Nonlithophysal (Tptrn)
NRG#5	Close approach of TBM (09/14/95)	16 + 56.3	305 (93)	Topopah Spring Crystal-Rich Nonlithophysal (Tptrn)
NRG-6	Crossing of Drill Hole Wash Fault (10/01/95)	20 + 02.1	1,807 (551)	Topopah Spring Upper Lithophysal (Tptrl, Tptpul)
NRG-7a	Crossing of Drill Hole Wash Fault (10/21/95)	23 + 46.8	85 (26)	Topopah Spring Upper Lithophysal (Tptrl, Tptpul)
SD-9	Close approach of TBM (11/07/95)	26 + 54.7	603 (184)	Topopah Spring Middle Nonlithophysal (Tptpmn)
SD-12	Close approach of TBM (03/26/96)	46 + 23.0	161 (49)	Topopah Spring Middle Nonlithophysal (Tptpmn)
SD-7	Passage of TBM (06/05/96)	55 + 98.0	348 (106)	Topopah Spring Middle Nonlithophysal (Tptpmn)

Table 5.3-46. Summary of Numerical Simulations Used to Estimate Permeabilities Near Boreholes NRG#5, NRG-6, and NRG-7a Using the Modflowp Gas-Flow Mode

Borehole(s)	Topopah Spring Welded Unit (TSW)		Paintbrush Nonwelded Unit (PTn)
	Horizontal Air Permeability $\times 10^{-12}$ m^2	Vertical Air Permeability $\times 10^{-12}$ m^2	Isotropic Air Permeability $\times 10^{-12}$ m^2
NRG-6	30	NA	0.90
NRG#5/NRG-6	49	94	0.54
NRG#5/NRG-6	42	80	0.7 (fixed)
NRG-6/NRG-7a	34	68	0.67
NRG#5/NRG-6/NRG-7a	56	83	0.50
NRG#5/NRG-6/NRG-7a	45	72	0.7 (fixed)

Table 5.3-47. Summary of Numerical Simulations to Estimate Permeabilities Near Boreholes UZ#4 and UZ#5 Using the Modflowp Gas-Flow Mode

Borehole(s)	Permeability, $\times 10^{-12}$ m^2	
	Topopah Spring Welded Unit (TSw)	Paintbrush Nonwelded Unit (PTn)
UZ#4	800	0.22
UZ#5	2,200	0.23
UZ#4 and UZ#5	1,100	0.23

Table 5.3-48. Temperature Gradients and Heat Fluxes in the Topopah Spring Tuff for Boreholes at Yucca Mountain and Vicinity, with 95 Percent Confidence Limits

Borehole	Temperature Gradient (°C/m)	Heat Flux (W/m^2)	Temperature Gradient+2σ (°C/m)	Temperature Gradient-2σ (°C/m)	Heat Flux +2σ (W/m^2)	Heat Flux -2σ (W/m^2)
H-1	0.01850	0.03561	0.01980	0.01720	0.04959	0.02315
H-3	0.01662	0.03199	0.01710	0.01614	0.04282	0.02172
H-4	0.01797	0.03459	0.01851	0.01743	0.04635	0.02346
H-5	0.01743	0.03355	0.01934	0.01552	0.04843	0.02088
H-6	0.02288	0.04404	0.02324	0.02252	0.05820	0.03030
G-1	0.01596	0.03072	0.01605	0.01587	0.04020	0.02135
G-2	0.02288	0.04404	0.02294	0.02281	0.05746	0.03070
G-3	0.01286	0.02476	0.01525	0.01048	0.03820	0.01410
G-4	0.01744	0.03358	0.01747	0.01742	0.04375	0.02344
UZ-1	0.01713	0.03298	0.01756	0.01671	0.04397	0.02248
WT-1	0.02189	0.04214	0.02416	0.01962	0.06051	0.02640
WT-2	0.01871	0.03602	0.01921	0.01822	0.04812	0.02451
WT-3	0.05873	0.11305	NA	NA	NA	NA
WT-4	0.02637	0.05077	0.02784	0.02491	0.06972	0.03352
WT-5	0.04828	0.09293	0.04914	0.04741	0.12308	0.06380
WT-6	0.02264	0.04358	NA	NA	NA	NA
WT-7	0.02791	0.05372	0.02954	0.02627	0.07398	0.03535
WT-10	0.04551	0.08760	0.04773	0.04328	0.11954	0.05824
WT-11	0.02977	0.05730	0.03215	0.02739	0.08051	0.03685
WT-12	0.03375	0.06497	0.03651	0.03099	0.09143	0.04171
WT-13	0.01969	0.03789	0.02650	0.01287	0.06637	0.01731
WT-14	0.03074	0.05917	0.03237	0.02910	0.08107	0.03916
WT-15	0.02640	0.05082	0.02879	0.02401	0.07209	0.03231
WT-16	0.02503	0.04819	0.02528	0.02478	0.06332	0.03335
WT-17	0.02969	0.05716	0.03234	0.02704	0.08100	0.03639
WT-18	0.01762	0.03391	0.01785	0.01739	0.04470	0.02340
a#1	0.02352	0.04528	0.02358	0.02347	0.05904	0.03157
a#4	0.01586	0.03052	0.01606	0.01565	0.04022	0.02106
a#5	0.01643	0.03163	0.01667	0.01619	0.04174	0.02179
a#6	0.02491	0.04795	0.02510	0.02472	0.06286	0.03326
a#7	0.02373	0.04568	0.02424	0.02323	0.06070	0.03125
b#1	0.02310	0.04447	0.02366	0.02255	0.05926	0.03034
p#1	0.03326	0.06403	0.03346	0.03307	0.08380	0.04450
SD-12	0.01832	0.03527	0.01963	0.01701	0.04915	0.02289
NRG-6	0.02031	0.03909	0.02115	0.01946	0.05298	0.02619
UZ-7a	0.02143	0.04126	0.02352	0.01935	0.05890	0.02603
NRG-7a	0.02061	0.03967	0.02129	0.01993	0.05333	0.02681

Table 5.3-49. Chemical Composition of Pore Water Samples from Boreholes at Yucca Mountain, Nevada

Sample Identification (Borehole/Depth in ft.)	Average Depth (m)	pH	Specific Conductance (µS/cm)	Ca (mg/L)	Mg (mg/L)	Na (mg/L)	SiO_2 (mg/L)	Al (mg/L)	K (mg/L)	HCO_3 (mg/L)	CO_3 (mg/L)	Cl (mg/L)	Br (mg/L)	NO_3 (mg/L)	SO_4 (mg/L)	Charge Balance	Total Dissolved Solids
UZ-14/45.0-45.4/up1	13.78	8.6	1,320	19.6	6.1	249.3	59.5	1	N/A	245	18	245	0	35	33	-1.8	911.5
UZ-14/85.2-85.6/up1	26.03	6.9	630	49.9	13.2	43.5	89.8	0.3	N/A	131	0	60	0	22	66	-0.9	475.7
UZ-14/91.0-91.3/up1	27.80	7.6	530	40.7	10.1	37.1	80.6	0	N/A	87	0	47	0	26	81	-4.1	409.5
UZ-14/95.5-95.9/up1	29.17	7.2	600	53.3	13.2	38.1	81.5	0	N/A	73	0	79	0	29	83	-1.9	450.1
UZ-14/96.2-96.6/up1	29.38	6.9	550	46.9	12.7	33.6	79.6	0	N/A	79	0	59	0	26	75	-0.9	408.7
UZ-14/100.4-100.8/up1	30.66	7.0	600	51.1	13.8	41.3	91.8	0	N/A	128	0	44	0	23	83	0.5	476.0
UZ-14/114.8-115.0/up1	35.02	6.6	540	49.0	10.5	35.9	93.9	0	N/A	67	0	61	0	25	90	-2.1	432.3
UZ-14/135.5-135.8/up1	41.36	6.9	690	68.5	14.3	56.2	92.0	0	N/A	105	0	83	0	23	96	4.6	538.0
UZ-14/144.8-145.2/up1	44.20	7.7	650	65.5	12.0	48.2	81.5	0	N/A	118	0	77	0	22	102	-1.7	526.2
UZ-14/ 147.7-148.1/up1,2	45.08	6.9	640	54.8	11.5	51.6	77.3	0	N/A	79	0	83	0	22	102	-1.5	481.2
UZ-14/177.6-177.9/up1	54.19	6.5	730	67.8	11.3	48.7	77.5	0	N/A	49	0	100	0	23	130	-2.0	507.3
UZ-14/178.1-178.4/up1	54.35	6.8	740	64.0	10.6	49.1	93.1	0	N/A	62	0	97	0	21	120	-3.0	516.8
UZ-14/215.7-216.1/up2	65.81	6.9	710	65.5	10.7	39.4	97.8	0	N/A	55	0	85	0	14	130	-3.0	497.4
UZ-14/225.9-226.2/up1	68.92	7.9	640	58.6	10.4	48.4	91.2	0	N/A	55	0	93	0	16	116	-2.6	488.6
UZ-14/235.1-235.4/up1	71.72	7.1	630	67	10.5	29	63	0	N/A	96	N/S	84	0	15	94	-5.7	458.5
UZ-14/240.8-241.1/up1	73.46	7.6	810	32	1	103	61	3	N/A	162	N/S	99	0	17	100	-11.7	578.0
UZ-14/245.5-245.8/up1	74.89	6.8	580	65	12	9	46	0	N/A	66	N/S	77	0	12	79	-4.7	366.0
UZ-14/ 1258.5-1258.8/up1	383.65	---	---	43	3.7	67	35	0	N/A	170	N/S	88	0	16	19	-4.9	441.7
UZ-14/ 1277.4-1277.7/up1	389.41	N/A	N/A	62	4.5	49	44	0	N/A	170	N/S	87	0	17	45	-7.1	478.5
UZ-14/ 1277.7-1278.0/up1	389.50	N/A	N/A	74	5.1	45	38	0	N/A	170	N/S	130	0	15	38	-10.3	515.1
UZ-14/ 1409.4-1409.8/up1	429.65	7.8	720	30.0	0.7	88.0	57.0	0.1	N/A	160	0	75	0	5	106	-13.2	521.8
UZ-14/ 1419.5-1419.8/up1	432.72	8.3	410	20.0	0.6	68.0	60.0	1.4	N/A	166	0	24	0	6	21	1.0	367.0

NOTE: ---, data not available; 0, values below detection limit; <, less than; N/S, not sampled; N/A not analyzed; /up1, uniaxial pressure stage #1; charge balance, (meq cation - meq anion)/(meq cation + meq anion)*100

Table 5.3-49. Chemical Composition of Pore Water Samples from Boreholes at Yucca Mountain, Nevada (Continued)

Sample Identification (Borehole/Depth in ft.)	Average Depth (m)	pH	Specific Conductance (µS/cm)	Ca (mg/L)	Mg (mg/L)	Na (mg/L)	SiO_2 (mg/L)	Al (mg/L)	K (mg/L)	HCO_3 (mg/L)	CO_3 (mg/L)	Cl (mg/L)	Br (mg/L)	NO_3 (mg/L)	SO_4 (mg/L)	Charge Balance	Total Dissolved Solids
UZ-14/ 1461.9-1462.1/up1	445.62	7.6	570	9.2	0.1	128	68.7	1.2	N/A	265	0	24.2	0	6.2	37.3	1.1	539.9
UZ-14/ 1495.8-1496.0/up1	455.95	8.4	500	2.1	0	122	56.7	0.3	N/A	228	0	28.0	0	10.8	14.3	3.9	462.2
UZ-14/ 1524.55-1524.75/up1	464.73	7.7	560	1.1	0.1	137	54.8	1.1	N/A	232	0	26.2	0	12.5	22.3	7.2	487.1
UZ-14/ 1542.3-1542.8/up1,2,3	470.18	8.6	760	3.6	0.5	207	143.0	13.8	N/A	384	46	20	0	4	28	1.0	849.9
UZ-14/ 1563.6-1563.8/up1,2,3	476.62	8.7	660	1.2	0.2	155.0	72.0	13.9	N/A	160	97	16	0	4	14	1.2	533.3
UZ-14/ 1564.6-1564.8/up1,2,3	476.92	9.0	590	1.3	0.2	129	140.4	9.4	N/A	61	113	16	0	4	17	0.4	361.3
UZ-14/ 1564.9-1565.0/up1	477.01	8.3	690	1.7	0.5	169.0	54.0	15.5	N/A	376	0	23	0	1	30	0.1	560.7
UZ-14/ 1585.0-1585.2/up1	483.14	8.9	460	0.9	0.3	106.8	74.5	5	N/A	98	67	14	0	7	10	1.6	324.5
UZ-14/ 1585.3-1585.6/up1,5	483.23	9.3	400	1.2	0.5	85.0	75.0	16.3	N/A	148	18	11	0	6	9	2.4	371.0
UZ-14/ 1605.9-1606.1/up1	489.51	8.9	470	1.0	0.3	87.8	67.2	6	N/A	178	0	18	0	6	9	2.4	373.3
UZ-14/ 1644.3-1644.5/up1	501.21	8.8	420	2.2	0.7	110.0	74	30.9	N/A	74.0	79	14	0	0	9	5.5	393.8
UZ-14/ 1674.8-1675.1/up1	510.54	7.2	N/S	1.8	0.6	58.0	64.6	18	N/A	104	0	10	0	4	9	8.6	270.0
UZ-14/ 1695.4-1695.6/up1	516.79	7.9	N/A	1.4	1.1	115.8	55.9	10	N/A	203	18	21	0	5	26	0.6	457.2
UZ-14/ 1715.0-1715.3/up1	522.79	7.3	390	0.2	0	88	52.9	0.6	N/A	168	0	11.9	0	3.1	16.0	5.1	340.7
UZ-14/ 1734.5-1734.7/up1	528.71	8.7	750	2.0	0.3	184	50.7	0.1	N/A	211	79	39.4	0	5.6	17.5	2.9	589.6
UZ-14/ 1735.3-1735.5/up1	528.95	9.0	700	1.7	0.0	158	46.9	0.0	N/A	288	18	37.4	0.0	3.4	15.4	1.5	568.8
UZ-14/ 1804.5-1804.7/up1	550.04	8.7	480	0.5	0.2	111	43.0	1.0	N/A	181	12	25.1	0.0	15.3	14.9	2.5	404
UZ-14/ 1825.8-1826.0/up1	556.53	9.4	590	0.6	0.1	138	47.9	0.9	N/A	42	112	23.5	0.0	11.8	12.9	4.3	389.7
UZ-14/ 1854.9-1855.1/up1	565.4	9.2	460	0.5	0.2	107	34.5	1.6	N/A	181	23	18.8	0.0	13.7	15.9	-1.4	396.2

NOTE: ---, data not available; 0, values below detection limit; <, less than; N/S, not sampled; N/A not analyzed; /up1, uniaxial pressure stage #1; charge balance, (meq cation - meq anion)/(meq cation + meq anion)*100

Table 5.3-49. Chemical Composition of Pore Water Samples from Boreholes at Yucca Mountain, Nevada (Continued)

Sample Identification (Borehole/Depth in ft.)	Average Depth (m)	pH	Specific Conductance (μS/cm)	Ca (mg/L)	Mg (mg/L)	Na (mg/L)	SiO_2 (mg/L)	Al (mg/L)	K (mg/L)	HCO_3 (mg/L)	CO_3 (mg/L)	Cl (mg/L)	Br (mg/L)	NO_3 (mg/L)	SO_4 (mg/L)	Charge Balance	Total Dissolved Solids
UZ-14/ 1865.7-1865.9/up1	568.7	9.1	480	0.3	0.0	115	30.4	0.8	N/A	204	18	17.3	0.0	11.7	12.6	1.4	410.1
UZ-14/ 2014.7-2014.9/up1	614.11	9.3	1520	3.2	0.2	392	37.7	0.2	N/A	409	219	32.1	0.0	1.8	22.2	5.6	1117.4
UZ-14/ 2015.2-2025.7/up1	615.85	9.2	1450	0.9	0.0	312.7	68.6	---	N/A	339	176	23.2	0.1	0.5	21.7	4.2	942.7
UZ-14/ 2025.1-2025.3/up1	617.28	9.3	1550	4.0	0.2	414	54.8	0.2	N/A	493	189	36.5	0.0	6.9	26.3	6.3	1224.9
UZ-14/ 2095.6-2095.8/up1	638.71	9.0	530	0.0	0.0	112.8	63.0	---	N/A	143	29	30.0	0.1	0.3	29.0	1.3	407.2
UZ-14/ 2104.05/well bottom	641.33	9.4	---	2.1	0.7	143	352	38	N/A	229	19	10	0	4	23	10.1	820.8
UZ-16/163.5-163.9	49.90	7.6	425	42.5	13.4	21.5	77.5	0.5	N/A	114.7	45.0	32.4	0	23.1	72.3	-19.5	442.9
UZ-16/180.9-181.3	55.20	7.5	430	55	11	20	83	0.1	N/A	120	0	38	<1	33	38	1.8	398.1
UZ-16/ 1166.19-1166.47	355.48	8.7	710	28.9	13.7	83.6	57.1	0	N/A	196	0	82	0	17	28	-1.4	506.3
UZ-16/1227.4-1227.7	374.17	8.1	430	26.5	6.2	47.9	62.2	0.3	N/A	137.0	0	24	0	23	26	1.2	353.1
UZ-16/1235.1-1235.41	376.52	8.2	480	33.5	7.9	51.3	52.9	0	N/A	154	0	52	0	26	29	-4.7	406.6
UZ-16/1269.6-1269.9	387.04	8.5	430	14.1	2.4	67.5	57.1	0	N/A	139	13	27	0	18	14	-2.7	352.1
UZ-16/1280.4-1280.8	390.33	8.3	530	20.5	3.7	92.0	71.8	1.5	N/A	192.0	0	28	0	19	19	6.9	447.5
UZ-16/1296.8-1297.06	395.33	7.4	930	32.4	19.7	98.2	46.7	0	N/A	324	12	50	0	19	18	-1.9	620.0
UZ-16/1317.9-1318.2	401.76	7.3	420	20.6	5.1	60.1	131.6	1.1	N/A	171	0	32	0	20	18	-4.0	459.5
UZ-16/1343.7-1344.0	409.62	8.4	530	17	2.4	99	62.1	1.7	N/A	47.6	58.8	56	0.0	18	23	2.5	385.6
UZ-16/1358.0-1358.4	413.98	7.5	550	3.4	0.3	76.7	47.9	1.1	N/A	140.3	0	22.8	0.0	16.1	18.7	-0.8	351.7
UZ-16/1379.6-1379.9	420.56	8.6	490	4.4	0.6	95	66.3	2.6	N/A	72	46.8	21	0.0	18	25	3.0	351.7
UZ-16/1389.3-1389.6	423.52	7.0	530	3.6	0.9	114.6	62.5	2.0	N/A	122	36.0	23.5	0.0	18.5	23.8	5.9	407.4
UZ-16/1395.5-1395.9	425.41	7.8	710	5.4	0.3	155	88.0	3.9	N/A	216.0	24.0	17	0	16	22	11.9	547.6
UZ-16/1397.7-1398.0	426.08	8.7	550	5	0.5	124	79.2	4.7	N/A	131.8	35.4	45	0.0	25	45	-2.3	495.6
UZ-16/1398.5-1398.7	426.29	8.0	710	5	0.4	145	123	7.8	N/A	237.0	31.0	14	0	16	20	4.8	599.2
UZ-16/1408.2-1408.6	429.28	9.2	580	3.3	0.3	104	68.5	3.4	N/A	72	70.8	20	0.0	14	16	0.5	372.3
UZ-16/1412.9-1413.2	430.71	8.7	450	1.2	0.1	101	75.9	1.0	N/A	165.0	0	26	0	24	30	0.1	424.2

NOTE: ---, data not available; 0, values below detection limit; <, less than; N/S, not sampled; N/A not analyzed; /up1, uniaxial pressure stage #1; charge balance, (meq cation - meq anion)/(meq cation + meq anion)*100

Table 5.3-49. Chemical Composition of Pore Water Samples from Boreholes at Yucca Mountain, Nevada (Continued)

Sample Identification (Borehole/Depth in ft.)	Average Depth (m)	pH	Specific Conductance (µS/cm)	Ca (mg/L)	Mg (mg/L)	Na (mg/L)	SiO_2 (mg/L)	Al (mg/L)	K (mg/L)	HCO_3 (mg/L)	CO_3 (mg/L)	Cl (mg/L)	Br (mg/L)	NO_3 (mg/L)	SO_4 (mg/L)	Charge Balance	Total Dissolved Solids
UZ-16/1428.1-1428.4	435.35	8.8	570	1.9	0.1	134	80.5	3.4	N/A	160.0	43.0	23	0	19	23	3.9	487.9
UZ-16/1434.2-1434.6	437.21	8.5	550	3.2	0.6	113	109.1	6.1	N/A	72	70.8	23	0.0	16	19	2.8	467.0
UZ-16/1442.8-1443.2	439.83	7.6	550	1.7	0.8	79.9	68.9	1.2	N/A	18.3	87.6	18.9	0.0	11.3	13.7	-7.6	357.4
UZ-16/1486.9-1487.3	453.27	9.2	360	6.3	0.8	79.5	233.3	26.2	N/A	137.0	0	38	0	6	11	2.7	511.9
UZ-16/1601.1-1601.5	488.08	8.9	570	10	0.3	100	36	0.7	N/A	181.0	0	53	0.0	13	27	-3.6	421.0
UZ-16/1607.7-1608.1	490.09	9.0	660	25	0.3	108	34	1.0	N/A	170.0	0	71	0.0	10	33	2.8	452.3
UZ-16/1643.4-647.2	501.49	9.0	490	91	12	34	70	3	N/A	162.0	0	70	0.0	8	28	13.6	478.0
UZ-16/1651.6-1651.7	503.44	8.4	420	17.3	0.3	66	47.4	0.7	N/A	87.0	19.0	27	0	6	20	6.1	290.7
SD-7/339.7-340.2	103.63	7.2	720	110	15	20	82.8	N/A	---	220	0	77.2	0.5	1.5	76.7	1.3	603.7
SD-7/370.3+370.6	112.93	6.7	1420	289	0.2	39	25.9	N/A	---	73	0	133	0.4	0.6	650	-6.7	1211.1
SD-7/1498.4-1498.6	456.74	7.4	405	31	0.6	67	63.5	N/A	---	171	0	28.9	0.4	13.6	14.1	4.4	390.1
SD-7/1524.6-1525.7	464.85	7.7	490	38.7	0.9	57.6	68.6	N/A	7	203	0	30.1	0.1	12.4	15.9	-0.2	434.3
SD-7/1558.4-1558.6	475.03	7.4	370	39	0.9	43	69.3	N/A	---	171	0	25.1	0.1	9.0	14.9	-1.0	372.3
SD-7/1617.0-1617.2	492.87	7.2	570	40.2	0.4	79	67.2	N/A	---	194	0	65	0.1	11.0	14	0.0	465.9
SD-7/1890.9	576.35	8.7	850	0	0.2	206	67	N/A	---	334	78	18	0.0	4.8	10	0.6	718
SD-7/1952.6	595.15	8.8	980	0	0.3	251	67.4	N/A	---	353	120	22	0.0	6.7	11	0.9	831.4
SD-7/2596.1-2596.3	791.28	9.1	670	0.6	0.2	158	64.3	N/A	---	79	65	83	0.1	3.2	12	6.4	465.4
SD-7/2598.3-2598.5	791.95	8.8	630	0.9	0.0	152	94.8	N/A	---	231	59	22	0.1	4.0	18	-1.2	581.8
SD-9/94.2-94.4	28.74	6.2	1050	125	24	43	74	N/A	---	37	0	170	0.9	11	260	-4.3	744.9
SD-9/154.0-154.2	46.97	6.9	650	72	13	36	55	N/A	---	90	0	93	0.9	4.7	106	-1.1	470.6
SD-9/1452.6-1452..8	442.78	7.5	520	6.9	0.0	112	62.5	N/A	---	256	0	15.7	0.1	10.6	62.5	1.4	526.3
SD-9/1535.2-1535.4	467.96	7.4	530	0.8	0.1	112	54.9	N/A	7	226	0	15.6	0.9	10.6	15.5	4.7	443.4
SD-9/1619.9-1661.4	500.09	8.9	610	0.4	0	136.6	55.6	N/A	4	232	12	50.2	0.1	9	18.3	-0.7	518.2
SD-9/1661.1-1661.3	506.33	9.1	670	0.7	0.0	164	48.8	N/A	---	317	0	42.0	0.1	8.2	18.9	1.9	599.7
SD-9/1741.0-1741.2	530.69	9.1	520	0.2	0	125	52	N/A	---	185	41	19	1.1	4.4	10	2.2	437.7
SD-9/1741.7-1741.9	530.90	8.8	310	0.2	0	74	53	N/A	---	113	12	15	0.2	3.8	8.7	5.0	279.9
SD-9/1800.8	548.88	9.3	790	0.8	0	180.7	59.6	N/A	6	137	106	32.3	0.4	4.6	20.9	5.6	548.3

NOTE: ---, data not available; 0, values below detection limit; <, less than; N/S, not sampled; N/A not analyzed; /up1, uniaxial pressure stage #1; charge balance, (meq cation - meq anion)/(meq cation + meq anion)*100

Table 5.3-49. Chemical Composition of Pore Water Samples from Boreholes at Yucca Mountain, Nevada (Continued)

Sample Identification (Borehole/Depth in ft.)	Average Depth (m)	pH	Specific Conductance (µS/cm)	Ca (mg/L)	Mg (mg/L)	Na (mg/L)	SiO_2 (mg/L)	Al (mg/L)	K (mg/L)	HCO_3 (mg/L)	CO_3 (mg/L)	Cl (mg/L)	Br (mg/L)	NO_3 (mg/L)	SO_4 (mg/L)	Charge Balance	Total Dissolved Solids
SD-12/265.8-266.1	81.08	7.2	470	48.9	7.6	28.6	62.7	N/A	3	107	0	49.6	0.9	15.9	47.5	-0.1	371.7
SD-12/278.6-278.8	84.5	7.3	580	74	12.7	27	71.2	N/A	---	159	0	46	0.2	16.0	75	1.7	481.1
SD-12/296.1-296.6	90.34	7.1	490	75	8.0	21	72.2	N/A	---	163	0	60	0.2	18.0	21	2.2	438.4
SD-12/1460.7-1461.0	445.28	8.5	490	31	0	89	65.5	N/A	---	98	30	55.9	0.1	7.3	30.1	4.7	406.9
SD-12/1495.5-1495.8	455.89	8.5	550	16	0.2	108	87.3	N/A	---	49	57	57	0.3	8.1	55	-0.7	437.9
SD-12/1517.0-1517.4	462.44	8.3	660	14	0	150	56.9	N/A	---	323	0	35.6	0.1	6.4	22.5	2.5	608.5
SD-12/1600.6-1603.0	488.23	9.1	540	2.6	0	129	65.7	N/A	---	79	90	27.8	0.1	2.6	12.6	3.2	409.4
SD-12/1636.9	498.93	9.0	535	3.8	0	129	64.6	N/A	---	67	102	15.2	0	1.7	11.2	5.6	394.5
SD-12/1901.5	579.55	9.1	470	1.3	0	122	90.7	N/A	---	151	59	22	0.1	5.7	9.3	0.2	461.1
SD-12/1938.8	590.93	8.8	625	1.4	0	165	55.0	N/A	---	171	66	34.0	0.1	1.0	26.1	5.2	519.6
SD-12/1942.4	592.04	9.1	520	1.3	0	140	60.1	N/A	---	134	66	24.0	0.1	3.5	24.4	4.3	453.4
NRG-6/158.2-158.6	48.28	6.8	1070	122	23.3	35.6	97.4	0	N/A	34	0	185	1	32	159	-0.2	689.3
NRG-6/160.8-161.2	49.07	8.0	860	104	18	35.0	84.0	1.6	N/A	55	0	148	0.9	35	139	-2.0	620.5
NRG-6/171.0-171.3	52.18	7.4	620	70.5	11.5	29.2	79.4	0	N/A	48	13	58	0	43	94	2.0	446.3
NRG-6/175.6-176.0	53.58	7.3	520	49.2	8.6	29.4	78.1	0	N/A	60	0	47	0	42	64	1.5	378.3
NRG-6/219.9-220.2	67.09	7.4	660	24.3	4.2	99.3	61.4	1	N/A	92	0	77	0	47	77	-1.3	483.2
NRG-6/244.6-245.0	74.62	7.2	630	33	4.9	72.0	51.0	0.6	N/A	61	0	49	0.1	40	115	-2.3	426.6
NRG-6/255.9-256.1	78.03	6.7	1920	176	19	215.0	68.0	0.9	N/A	61	0	115	0.0	35	840	-6.2	1529.9
NRG7A/165.8-166.0	50.57	7.3	500	55.3	5.6	31.7	68.3	0	N/A	89.0	0	38.9	1.3	45.5	63.4	0	399
NRG7A/258.0-258.4	78.7	8.3	595	43	3.7	82	68.9	1.0	N/A	128	0	53.6	0.3	43.7	65.5	2.9	489.7
NRG7A/1483.6	452.22	8.0	580	61	0.6	94	48.6	0.3	N/A	323	0	33.1	0.1	16.7	24.4	1.3	601.8
NRG7A/1492.9	455.04	8.6	510	30.6	0.3	74.7	71.5	0.0	N/A	104	34	39	0	18	23	0.9	489.7
NRG7A/1498.8	456.83	8.3	500	28.7	0.5	73.2	83.0	1	N/A	156	0	50	0	17	18	0.4	601.8

NOTE: ---, data not available; 0, values below detection limit; <, less than; N/S, not sampled; N/A not analyzed; /up1, uniaxial pressure stage #1; charge balance, (meq cation - meq anion)/(meq cation + meq anion)*100

Table 5.3-50. Chemical Composition of Perched Water at Yucca Mountain, Nevada

Sample Identification	Average Depth (m)	pH	Specific Conductivity (µS/cm)	Al (mg/L)	Ca (mg/L)	Mg (mg/L)	K (mg/L)	Na (mg/L)	SiO_2 (mg/L)	HCO_3 (mg/L)	CO_3 (mg/L)	Cl (mg/L)	Br (mg/L)	NO_3 (mg/L)	SO_4 (mg/L)	Charge Balance
NRG-7A	460.25	8.7	224	0.0	3	0	6.8	42	9	114	- - -	7	0	1	4	-0.2
SD-9/TS	453.85	8.6	445	2.1	2.9	0.2	9.8	98	64.2	197	10	5.6	0	3.3	27.6	3.5
UZ-14 A	384.60	7.6	312	0.7	23	1.8	5.6	39	34.2	150	0	7.9	0.2	8.6	14.3	0.3
UZ-14 A2	384.60	7.8	308	1.0	24	1.8	3.9	38	36.4	148.8	0	9.1	0.1	12.5	13.8	-1.3
UZ-14 B	387.68	8.1	335	6.1	31	2.7	4.4	40	51.4	147.6	0	8.3	0.4	16.9	16.3	5.1
UZ-14 C	390.75	8.3	518	0.0	45	4.1	5.8	88	7.7	106.1	0	15.5	0.4	0	223	-1.9
UZ-14 PT-1	390.75	- - -	- - -	0.0	37	3.1	6.3	40	21.4	144	0	7.2	0.1	12.7	57.3	0.6
UZ-14 PT-2	390.75	- - -	- - -	0.0	30	2.4	3.3	35	25.7	144	0	7.0	0.1	15.4	22.9	0.3
UZ-14 PT-4	390.75	- - -	- - -	0.0	27	2.1	1.8	34	32.1	141.5	0	6.7	0.1	14.5	14.1	0.2
UZ-14 D	390.75	7.8	- - -	0.0	31	2.5	4.1	35	40.7	146.4	0.	7.0	0.1	17.1	24.2	0.0
ONC#1	432.97	8.7	302	11	13.3	1.1	3.6	50.6	26.5	115	8.8	7.1	0	5.2	23.6	1.7
USW G-2	649.22	7.7	259	- - -	7.9	0.5	5.2	46	51	116	- - -	6.5	0.1	- - -	13	4.3
SD-7(3/8)	479.76	- - -	- - -	0.28	14.2	0.13	5.3	45.5	62.3	112	0	4.4	0	33.8	9.1	2.5
SD-7(3/16)	488.29	8.1	239	0.44	13.3	0.13	5.3	45.3	57.4	128	0	4.1	0	33.8	9.1	-3.0
SD-7(3/17)	488.29	8.2	285	0	12.8	0.08	5.5	45.8	50.9	130	0	4.1	0	22.8	8.6	-0.2
SD-7(3/20)	488.29	8.0	265	0	12.9	0.07	5.4	45.5	55	127	0	4.1	0	13.4	8.5	3.4
SD-7(3/21)	488.29	8.2	259	0	13.5	0.08	5.5	44.6	55.9	128	0	4.1	0	13.2	10.3	2.2

NOTE: - - -, data not available; 0, values below detection limit; charge balance, (meq cation - meq anion)/(meq cation + meq anion)*100.

Table 5.3-51. Isotopic Composition of Perched Water at Yucca Mountain, Nevada

Sample Identification	Depth (m)	$\delta^{13}C$ (‰)	^{14}C (%MC)	^{3}H (TU)	δ D (‰)	$\delta^{18}O$ (‰)
SD-7(3/8)	479.76	-10.4	34.4	6.2	-99.8	-13.40
SD-7(3/16)	488.29	-9.4	28.6	---	-99.7	-13.30
SD-7(3/17)	488.29	-9.5	28.4	---	-99.6	-13.40
SD-7(3/20)	488.29	-9.5	27.9	---	-99.6	-13.40
SD-7(3/21)	488.29	-9.5	28.4	---	-99.6	-13.30
SD-9/TS	453.85	-14.4	41.8	0	-97.8	-13.30
UZ-14 A	384.60	-10.2	41.7	0.3	-98.6	-13.80
UZ-14 A2	384.60	-10.1	40.6	3.1	-97.5	-13.50
UZ-14 B	387.68	-9.5	36.6	0	-97.1	-13.40
UZ-14 C	390.75	-9.2	66.8	0.4	-87.4	-12.10
UZ-14 PT-1	390.75	-9.8	32.3	1.8	-97.8	-13.30
UZ-14 PT-2	390.75	---	28.9	3.1	-97.9	-13.40
UZ-14 PT-4	390.75	-9.6	27.2	0	-97.3	-13.40
UZ-14 D	390.75	-11.3	29.2	0	-97.6	-13.10
NRG-7a	460.25	-16.6	66.9	10.4	-93.9	-12.80

NOTE: m, meter; ‰, parts per mil; percent MC, percent modern carbon; TU, tritium unit; - - - not available.

Table 5.3-52. Dry Gas Composition (Percent By Volume) in Borehole UZ-1

Probe No.	Depth (m)	April 1984				September 1986				July 1994		
		N_2	O_2	Ar	CO_2	N_2	O_2	Ar	CO_2	N_2	O_2	CO_2
1.00	12.8	79.6	18.5	0.99	0.83	78.4	19.4	0.97	1.30	78.2	20.8	0.79
2.00	18.9	79.7	19.3	1.01	0.02	79.0	19.7	0.98	0.39	77.8	20.6	0.53
3.00	28.3	79.2	19.8	1.01	0.03	79.1	19.9	0.99	0.05	77.1	20.4	0.22
4.00	39.9	79.1	20.1	0.90	0.03	- - -	- - -	- - -	- - -	77.1	20.4	0.41
5.00	61.3	78.5	20.3	0.92	0.24	- - -	- - -	- - -	- - -	77.7	20.4	0.23
6.00	81.1	78.4	20.5	0.98	0.08	- - -	- - -	- - -	- - -	78.5	20.8	0.20
7.00	106.1	78.4	20.6	0.95	0.07	78.4	20.6	0.97	0.10	78.1	20.8	0.11
8.00	128.3	78.4	20.5	1.01	0.09	- - -	- - -	- - -	- - -	77.9	20.8	0.10
9.00	152.7	78.4	20.6	0.96	0.05	- - -	- - -	- - -	- - -	78.0	20.8	0.08
10.00	189.3	78.6	20.4	0.96	0.04	- - -	- - -	- - -	- - -	77.7	20.6	0.08
11.00	227.7	78.7	20.3	0.96	0.03	- - -	- - -	- - -	- - -	77.4	20.4	0.11
12.00	265.5	78.5	20.6	0.98	0.00	- - -	- - -	- - -	- - -	76.7	20.5	0.11
13.00	304.2	78.5	20.5	1.02	0.01	78.5	20.6	0.96	0.02	76.9	20.5	0.05
14.00	335.3	- - -	- - -	- - -	- - -	78.6	20.4	0.97	0.07	78.1	20.9	0.13
15.00	367.9	- - -	- - -	- - -	- - -	80.3	18.5	0.99	0.26	78.1	20.6	0.36

NOTE: - - -, data not available

Table 5.3-53. Data for Carbon Isotopes in Pore Water of the Unsaturated Zone in Boreholes UZ-14, UZ-16, NRG-6, NRG-7a, SD-7, SD-9, and SD-12

Borehole	Depth (m)	$\delta^{13}C$ (‰)	^{14}C (% MC)
UZ-14	85.9	-17.1	83.2
UZ-14	95.9	-15	83.3
UZ-14	221	-25	96.2
UZ-14	240.8	-10.5	89.6
UZ-14	615.7	-14.7	94
UZ-14	638.7	-15.7	84.6
UZ-14	1414.9	-12.4	81.8
UZ-14	1430	-11.1	69.9
UZ-14	1461.4	-13.4	96.3
UZ-14	1525.4	-11.8	93.4
UZ-14	1564	-15.8	76.8
UZ-14	1564.5	-15.2	80
UZ-14	1585.4	-11.3	93.7
UZ-14	1606	-14.6	81.1
UZ-14	1644.8	-16	86.3
UZ-14	1674.8	-13.7	91.3
UZ-14	1695.5	-10.3	92.3
UZ-14	1715.2	-11.6	96.3
UZ-16	158.3	-9.3	87
UZ-16	180.9	-9	89.8
UZ-16	219.5	-9.4	87.3
UZ-16	1357	-17.5	58.2
UZ-16	1380	-23.3	71.8
UZ-16	1397.2	-12.6	97.7

Table 5.3-53. Data for Carbon Isotopes in Pore Water of the Unsaturated Zone in Boreholes UZ-14, UZ-16, NRG-6, NRG-7a, SD-7, SD-9, and SD-12 (Continued)

Borehole	Depth (m)	$\delta^{13}C$ (‰)	^{14}C (% MC)
UZ-16	1421.5	-16.6	53.1
UZ-16	1443	-10.3	61.5
NRG-6	235.3	-14.9	92.1
NRG-7a	1495.8	-18.6	58.4*
NRG-7a	293.2	-11.6	98.8*
NRG-7a	117.9	-13.5	105.4*
SD-7	50.8	-12.9	50.8*
SD-7	103.5	-18.1	74.1
SD-7	125.4	-17.7	45.1*
SD-7	345.2	-16.2	59*
SD-7	456.8	-15.1	73.5
SD-7	464.8	-17.5	62.8
SD-7	475	-27.4	60.6
SD-7	552.3	-17.8	54.9*
SD-9	415.1	-11.4	96.3*
SD-9	442.8	-14.1	85.9
SD-9	468	-15.3	88.9
SD-9	500	-14.5	95.3
SD-9	549.1	-16.4	82.3
SD-12	82.8	-14	80.3
SD-12	211.0	-13.7	62.6*
SD-12	384.9	-17	62.5*
SD-12	462.5	-17.4	69.9
SD-12	499.5	-16.9	66.5
SD-12	591.7	-16.3	59.2
ESF		-22.4	69.3*
ESF		-23.2	-51.7*

Table 5.3-54. Carbon-14 (^{14}C) and $\delta^{13}C$ (gas) Data from Boreholes NRG-6, NRG-7a, UZ#16, and SD-12, Yucca Mountain, Nevada

Borehole	Depth (m)	Lithologic Unit	CO_2 (%)	^{14}C (%MC)	$\delta^{13}C$ (‰)	Isotopic Analytical Lab
NRG-6	6.1	Tiva Canyon	0.07	- - -	-12.83	USGS stable isotope
NRG-6	6.1	Tiva Canyon		- - -	-15.18	USGS stable isotope
NRG-6	6.1	Tiva Canyon		- - -	-15.15	USGS stable isotope
NRG-6	24.4	Tiva Canyon	0.11	- - -	-14.25	USGS stable isotope
NRG-6	24.4	Tiva Canyon		92.1	-15.20	Geochron
NRG-6	26.8-38.1	Tiva Canyon	0.07	- - -	-14.60	USGS stable isotope
NRG-6	26.8-38.1	Tiva Canyon		61.0	-13.90	Geochron
NRG-6	26.8-38.1	Tiva Canyon		- - -	-14.62	USGS stable isotope
NRG-6	26.8-38.1	Tiva Canyon		- - -	-14.61	USGS stable isotope
NRG-6	26.8-38.1	Tiva Canyon		- - -	-14.63	USGS stable isotope
NRG-6	26.8-38.1	Tiva Canyon		- - -	-14.99	USGS stable isotope
NRG-6	26.8-38.1	Tiva Canyon		- - -	-15.02	USGS stable isotope
NRG-6	61.0	Pah Canyon	0.10	- - -	-14.14	USGS stable isotope
NRG-6	61.0	Pah Canyon		- - -	-14.24	USGS stable isotope
NRG-6	61.0	Pah Canyon		91.0	-14.90	Geochron
NRG-6	83.8	Topopah Spring	0.05	- - -	-15.05	USGS stable isotope
NRG-6	83.8	Topopah Spring		- - -	-15.05	USGS stable isotope
NRG-6	107	Topopah Spring		- - -	-17.24	USGS stable isotope
NRG-6	183	Topopah Spring	0.10	83.2	-15.50	Geochron
NRG-6	183	Topopah Spring		- - -	-14.06	USGS stable isotope
NRG-6	183	Topopah Spring		- - -	-15.18	USGS stable isotope
NRG-6	221	Topopah Spring	0.07	- - -	-14.69	USGS stable isotope
NRG-6	221	Topopah Spring		- - -	-14.69	USGS stable isotope
NRG-6	233-238	Topopah Spring		- - -	-10.14	USGS stable isotope
NRG-6	233-238	Topopah Spring		- - -	-10.31	USGS stable isotope
NRG-6	282	Topopah Spring	0.11	94.2	-16.10	Geochron
NRG-6	282	Topopah Spring	- - -	- - -	-14.14	USGS stable isotope
NRG-6	305	Topopah Spring	0.07	- - -	-14.43	USGS stable isotope
NRG-6	305	Topopah Spring	- - -	- - -	-14.34	USGS stable isotope
NRG-7a	42.7	Yucca Mountain	0.12	108.0	-16.80	Geochron
NRG-7a	42.7	Yucca Mountain	- - -	- - -	-17.24	USGS stable isotope
NRG-7a	149	Topopah Spring	0.19	- - -	-17.69	USGS stable isotope
NRG-7a	149	Topopah Spring	- - -	- - -	-17.68	USGS stable isotope
NRG-7a	149	Topopah Spring	- - -	111.7	-18.20	Geochron
NRG-7a	271	Topopah Spring	0.15	111.0	-19.00	Geochron
NRG-7a	271	Topopah Spring	- - -	- - -	-17.75	USGS stable isotope
NRG-7a	271	Topopah Spring	- - -	- - -	-17.73	USGS stable isotope
NRG-7a	370	Topopah Spring	0.19	- - -	-17.61	USGS stable isotope
UZ#16	45.7	Tiva Canyon	- - -	73.2	-15.50	Geochron
UZ#16	45.7	Tiva Canyon	- - -	- - -	-13.82	USGS stable isotope
UZ#16	45.7	Tiva Canyon	- - -	- - -	-13.72	USGS stable isotope
UZ#16	14.3-74.1	Tiva to Topopah	- - -	72.7	-14.00	Geochron

NOTE: - - -, data not analyzed; %MC, percent modern carbon; ‰, parts per mil

Table 5.3-54. Carbon-14 (^{14}C) and $\delta^{13}C$ (Gas) Data from Boreholes NRG-6, NRG-7a, UZ#16, and SD-12, Yucca Mountain, Nevada (Continued)

Borehole	Depth (m)	Lithologic Unit	CO_2 (%)	^{14}C (%MC)	$\delta^{13}C$ (‰)	Isotopic Analytical Lab
UZ#16	14.3-74.1	Tiva to Topopah	---	---	-12.32	USGS stable isotope
UZ#16	73.1	Topopah Spring	---	---	-13.19	USGS stable isotope
UZ#16	73.1	Topopah Spring	---	---	-13.14	USGS stable isotope
UZ#16	82.3	Topopah Spring	---	---	-12.97	USGS stable isotope
UZ#16	82.3	Topopah Spring	---	---	-12.94	USGS stable isotope
UZ#16	74.1-148	Topopah Spring	---	87.0	-16.50	Geochron
UZ#16	74.1-148	Topopah Spring	---	---	-19.71	USGS stable isotope
UZ#16	74.1-148	Topopah Spring	---	---	-20.07	USGS stable isotope
UZ#16	74.1-148	Topopah Spring	---	---	-20.86	USGS stable isotope
UZ#16	148-163	Topopah Spring	---	81.6	-14.70	Geocrhon
UZ#16	148-163	Topopah Spring	---	---	-18.31	USGS stable isotope
UZ#16	163-512	Topopah Spring to Prow Pass	---	89.2	-17.00	Geocrhon
UZ#16	163-512	Topopah Spring to Prow Pass	---	---	-15.63	USGS stable isotope
UZ#16	477-481	Prow Pass	---	---	-17.60	USGS stable isotope
UZ#16	477-481	Prow Pass	---	25.8	-18.40	Geocrhon
UZ#16	477-481	Prow Pass	---	---	-16.32	USGS stable isotope
UZ#16	477-481	Prow Pass	---	---	-16.26	USGS stable isotope
UZ#16	477-481	Prow Pass	---	---	-15.51	USGS stable isotope
SD-7	508-633	Calico Hills	---	41.5	-25.0	DRI
SD-9	0-453.7	Tiva-Topopah	---	96.7	-16.1	DRI
SD-9	453.7-560	Calico Hills	---	51.0	-16.1	DRI
SD-12	24.7	Tiva Canyon	---	91.0	-22.6	DRI
SD-12	43.9	Tiva Canyon	---	49.2	-20.2	DRI
SD-12	65.2	Tiva Canyon	---	87.4	-22.0	DRI
SD-12	91.7	Topopah Spring	---	82.7	-16.4	DRI
SD-12	107.0	Topopah Spring	---	77.8	-21.6	DRI
SD-12	128.9	Topopah Spring	---	58.0	-22.1	DRI
SD-12	171.0	Topopah Spring	---	39.0	-23.6	DRI
SD-12	208.2	Topopah Spring	---	36.9	-24.7	DRI
SD-12	216-220	Topopah Spring	---	74.33	-11.60	Geochron
SD-12	236.8	Topopah Spring	---	31.6	-25.6	DRI
SD-12	256.3	Topopah Spring	---	34.1	-24.4	DRI
SD-12	285	Topopah Spring	---	52.4	-21.9	DRI
SD-12	322.5	Topopah Spring	---	34.3	-23.8	DRI
SD-12	342-347	Topopah Spring	---	60.17	-16.1	Geochron
SD-12	385.6	Topopah Spring	---	88.7	-22.9	DRI
SD-12	407.2	Topopah Spring	---	24.4	-24.6	DRI
SD-12	435.9	Calico Hills	---	84.5	-17.3	DRI

NOTE: - - -, data not analyzed; %MC, percent modern carbon; ‰, parts per mil.

Table 5.3-55. Comparison of Carbon Isotopes in Pore Water and Gas Samples Collected from Similar Intervals of Boreholes SD-12, NRG-6, and NRG-7a

Borehole and Depth (m)	$\delta^{13}C$ in Pore Water	$\delta^{13}C$ in Borehole Gas
SD-12 (82)*	-14	-22.4 & -16.4
SD-12 (211)	-13.7	-24.7
SD-12 (384)	-17	-22.9
SD-12 (462)	-17.4	-17.3
NRG-6 (235)	-14.9	-10.2
NRG-7a (50)	-12.9	-17.2
NRG-7a (50)	-13.5	-17.0
NRG-7a (50)	-11.6	-17.5

* Pore water sample is bracketed by gas samples at 65.2 and 91.7 m.

Table 5.3-56. Estimates of Average Net Infiltration for Different Areas Centered on Boreholes at Yucca Mountain and Vicinity

Borehole ID	Nevada State Plane Coordinates		UTM Coordinates		Net Infiltration Based on Flint, A.L. et al. (1996)		
	Easting (m)	Northing (m)	Easting (m)	Northing (m)	30x30m Average	90x90m Average	150x150m Average
H-1	171416	234774	548721.6	4079945	0.0	2.1	1.5
H-3	170216	230594	547536.5	4075762	7.9	7.8	9.8
H-4	171880	232149	549194.6	4077322	5.0	1.9	1.4
H-5	170356	233671	547665.7	4078838	6.8	11.4	10.7
H-6	168882	232654	546195.7	4077816	5.0	2.4	3.6
G-1	170993	234849	548298.4	4080018	6.7	3.0	2.0
G-2	170842	237386	548138.6	4082554	3.1	3.0	3.0
G-3	170225	229448	547549.5	4074616	8.5	8.1	10.2
G-4	171628	233418	548938.2	4078590	0.0	0.1	0.5
UZ-1	170756	235085	548060.7	4080253	6.7	3.2	2.7
WT-1	171828	229802	549150.8	4074975	0.0	0.0	0.3
WT-2	171275	231850	548590.8	4077021	0.0	1.9	2.3
WT-3	174767	227380	552097.4	4072564	0.0	0.7	0.7
WT-4	173139	234243	550445.9	4079420	0.0	0.9	1.2
WT-5	175032	232205	552345.5	4077389	0.0	0.0	0.0
WT-6	172067	237920	549361.4	4083092	0.0	0.0	0.0
WT-7	168860	230276	546182.0	4075439	0.0	0.0	0.0
WT-10	168647	228226	545976.2	4073389	0.0	0.0	0.0
WT-11	170194	225269	547533.0	4070438	0.0	1.7	1.7
WT-12	172825	225469	550162.6	4070647	6.7	2.2	1.3
WT-13	176405	230647	553723.6	4075836	0.0	2.0	1.4
WT-14	175324	232152	552637.6	4077337	0.0	0.0	0.4
WT-15	176725	233513	554033.5	4078702	0.0	0.0	0.0
WT-16	173857	236043	551157.4	4081222	0.0	0.0	0.0
WT-17	172581	228119	549909.4	4073295	0.0	1.9	1.2
WT-18	172168	235052	549472.4	4080225	2.8	2.3	3.2
a#1	172624	233142	549934.9	4078319	0.0	0.0	3.2
a#4	172051	234078	549358.8	4079251	0.5	0.4	0.3
a#5	172138	233769	549446.9	4078942	0.0	1.9	1.5
a#6	172060	233447	549370.0	4078620	0.0	0.0	2.0
a#7	172355	233533	549664.6	4078707	0.0	1.7	1.1
b#1	172644	233247	549954.5	4078422	0.0	1.9	1.2
p#1	174189	230481	551508.8	4075662	0.0	0.0	1.3
SD-12	171178	232245	548492.4	4077415	0.0	1.3	2.0
NRG-6	171965	233699	549274.2	4078872	0.0	1.0	1.2
UZ-7a	171434	231875	548749.7	4077046	0.0	2.3	1.9
NRG-7a	171598	234355	548905.0	4079526	0.0	0.0	0.6

Table 5.3-57. Boreholes, Estimated Height of the Column of Water Overlying the Sample, ^{14}C Activities and Percolations Fluxes, with Remarks

Borehole	h_w (m)	^{14}C Activity (pmc)	Flux Rate (mm/yr)	Remarks
UZ-1	50	20	4	Rock gas at base of Tpt
UZ-14	50	29	5	Perched water at base of Tpt
[1]NRG-7A	40	60	9	Perched water at base of Tpt
SD-7	45	29	4	Perched water in Tac
UZ-6	80	[2]40	11	All water in UZ to 560 m depth
UZ-6	40	[2]40	5	Water in PTn and Tpt only
UZ-13	6	[3]55	1	Rock gas from top of Tpt
SD-9	45	50	8	Rock gas from Tac (below perched water)
SD-12	40	32	4	Rock gas from base of Tpt
UZ-16	70	25	6	Rock gas from Tcp

After E.P. Weeks, written communication, presentation at the Unsaturated Zone Flow Model Expert Elicitation Workshop, February 1997.

NOTE: h_w is the estimated height of the water column overlying the sample depth; Tpt is the Topopah Spring Tuff; Tac is the Calico Hills Formation; Tcp is the Prow Pass Tuff; PTn are the nonwelded and bedded tuffs overlying the Tpt.

[1] Bailed sample that also showed high tritium activity.

[2] Gas sampled from open borehole - represents some combination of Tac and Tcp rock gas.

[3] Unpublished data, written communication from D.C. Thorstenson (USGS) to E.P. Weeks (USGS), 1993.

Table 5.3-58. Average Pore Water Chloride Concentration Within Various Hydrostratigraphic or Lithostratigraphic Units, and Perched or Saturated Zone Water

	Borehole						
Unit	**UZ #16**	**UZ-14**	**NRG-6**	**NRG-7a**	**SD-7**	**SD-9**	**SD-12**
Ptn	35.5 (2)	86.6 (17)	97.0 (7)	46.2 (2)	77.2 (1)	131.5 (2)	49.61 (1)
Tptpv 1, 2	NA	101.7 (3)	NA	NA	NA	15.8 (1)	NA
perched	NA	8.6 (8)	NA	7.0 (1)	4.2 (5)	5.6 (1)	NA
Tac	32.2 (20)	23.8 (18)	NA	40.7 (3)	28.0 (3)	32.9 (6)	33.6 (4)
Tcp	55.3 (4)	24.1 (9)	NA	NA	NA	NA	29.0 (2)
SZ	10.8 (4)	NA	NA	NA	NA	NA	NA

NOTE: Number of samples used to compute average values are in parentheses. Concentrations are in milligrams per liter. NA indicates no measurements were available.

Table 5.3-59. Apparent Vertical Percolation Rate Based on Average Pore Water Chloride Concentration Within Hydrostratigraphic or Lithostratigraphic Units, and Perched or Saturated Zone Water

	Borehole						
Unit	**UZ #16**	**UZ-14**	**NRG-6**	**NRG-7a**	**SD-7**	**SD-9**	**SD-12**
Ptn	3.0	1.2	1.1	2.3	1.4	0.8	2.1
Tptpv 1, 2	NA	1.0	NA	NA	NA	6.7	NA
perched	NA	12.3	NA	15.1	25.1	18.8	NA
Tac	3.3	4.4	NA	2.6	3.8	3.2	3.1
Tcp	1.9	4.4	NA	NA	NA	NA	3.6
SZ	9.8	NA	NA	NA	NA	NA	NA

NOTE: Percolation flux rates are in millimeters per year. NA indicates no measurements were available.

Table 5.3-60. Comparison of Values of Percolation Flux Estimated at Yucca Mountain Borehole Locations from Various Methods

Borehole ID	Nevada State Plane Coordinate		Infiltration Rate (in mm/yr) for Different Average Areas			Percolation Rates (in mm/yr) from Different Techniques								
	Easting (m)	Northing (m)	30x30m	90x90m	150x150m	1	2	3	4	5	6	7	8	9
H-1	171416	234774	0.0	2.1	1.5	10	9	---	0.02	---	---	---	---	---
H-3	170216	230594	7.9	7.8	9.8	10	3	---	---	---	---	---	---	---
H-4	171880	232149	5.0	1.9	1.4	---	0	---	---	---	---	---	---	---
H-5	170356	233671	6.8	11.4	10.7	20	5	---	---	---	---	---	---	---
H-6	168882	232654	5.0	2.4	3.6	---	4	---	---	---	---	---	---	---
G-1	170993	234849	6.7	3.0	2.0	---	5	---	0.02	---	---	---	---	---
G-2	170842	237386	3.1	3.0	3.0	---	11	---	---	---	---	---	---	---
G-3	170225	229448	8.5	8.1	10.2	10	4	---	---	---	---	---	---	---
G-4	171628	233418	0.0	0.1	0.5	10	5	---	---	---	---	---	---	---
UZ-1	170756	235085	6.7	3.2	2.7	15	8	---	---	4	---	---	---	---
WT-1	171828	229802	0.0	0.0	0.3	---	7	---	---	---	---	---	---	---
WT-2	171275	231850	0.0	1.9	2.3	0.5	0.5	---	---	---	---	---	---	---
WT-4	173139	234243	0.0	0.9	1.2	---	7	---	---	---	---	---	---	---
WT-7	168860	230276	0.0	0.0	0.0	---	3	---	---	---	---	---	---	---
WT-12	172825	225469	6.7	2.2	1.3	1	---	---	---	---	---	---	---	---
WT-17	172581	228119	0.0	1.9	1.2	---	0	---	---	---	---	---	---	---
WT-18	172168	235052	2.8	2.3	3.2	13	12	---	---	---	---	---	---	---
a#1	172624	233142	0.0	0.0	0.3	7.5	---	---	0.02					
a#7	172355	233533	0.0	1.7	1.1	---	7							
SD-12	171178	232245	0.0	1.3	2.0	---	15	0.1	0.02	4	---	2.1	3.6	---
NRG-6	171965	233699	0.0	1.0	1.2	---	---	---	0.02	---	---	1.1	---	---
NRG-7a	171598	234355	0.0	0.0	0.6	---	---	---	---	9	---	2.3	2.6	15.1
UZ-4	172560	234305	5.0	3	---	18	25	---	0.02	---	---	1.1	---	---
UZ-5	172558	234267	5.0	3	---	5	0	---	0.02	---	---	2	---	---

NOTE: A Value of --- signifies that no estimate is available using this technique.

Table 5.3-60. Comparison of Values of Percolation Flux Estimated at Yucca Mountain Borehole Locations from Various Methods (Continued)

Borehole ID	Nevada State Plane Coordinate		Infiltration Rate (in mm/yr) for Different Average Areas			Percolation Rates (in mm/yr) from Different Techniques								
	Easting (m)	Northing (m)	30x30m	90x90m	150x150m	1	2	3	4	5	6	7	8	9
SD-7	171066	231328	8	6	---	---	---	0.1	0.02	4	0.90	1.4	3.8	25.1
SD-9	171242	234086	10	5	---	---	---	0.1	0.02	8	---	0.8	3.2	18.8
UZ-14	170731	235096	7	3	---	---	---	0.1	0.02	5	0.15	1.2	4.4	12.3
UZ-16	172169	231812	0	0	---	---	---	0.1	0.02	6	---	3	3.3	---
UZ#6	170178	231566	9	14	---	---	---	---	---	11	---	---	---	---
UZ#13	170227	229195	7	9	---	---	---	---	0.02	1	---	---	---	---
UZ#6S	170086	231609	---	---	---	---	---	---	0.02	---	---	---	---	---
UZ#7	171575	231903	---	---	---	---	---	---	0.02	---	---	---	---	---
MEAN						10.0	7.7	0.1	0.02	5.8	0.5	1.7	3.5	17.8
STANDARD DEVIATION						6.0	5.8	---	---	3.1	---	0.7	0.6	5.5

NOTE: A value of --- signifies that no estimate is available using this technique.

1 Percolation rates estimated from borehole temperature logs by Kwicklis et al. (Kwicklis et al., *A Conceptual Model of Unsaturated Zone Flow and Transport, Yucca Mountain, Nevada*, Milestone Report 3GUM612M, U.S. Geological Survey, in preparation).
2 Percolation rates estimated from borehole temperature logs by Bodvarsson et al. (1997).
3 Percolation rates estimated from matrix saturations and water potentials by Bandurraga et al. (1996).
4 Percolation rates estimated from matrix saturations and water potentials by Ahlers, Bandurraga et al. (1995a).
5 Percolation rates estimated from gaseous and aqueous C-14 data by Weeks (E.P. Weeks, written communication, presentation at the Unsaturated Zone Flow Model Expert Elicitation Workshop, February 1997).
6 Percolation rates estimated from perched water volumes and residence times by Kwicklis et al. (Kwicklis et al., *A Conceptual Model of Unsaturated Zone Flow and Transport, Yucca Mountain, Nevada*, Milestone Report 3GUM612M, U.S. Geological Survey, in preparation.
7 Percolation rates estimated from the Ptn matrix chloride concentrations by Kwicklis et al. (Kwicklis et al., *A Conceptual Model of Unsaturated Zone Flow and Transport, Yucca Mountain, Nevada*, Milestone Report 3GUM612M, U.S. Geological Survey, in preparation).
8 Percolation rates estimated from the Tac matrix chloride concentrations by Kwicklis et al. (Kwicklis et al., *A Conceptual Model of Unsaturated Zone Flow and Transport, Yucca Mountain, Nevada*, Milestone Report 3GUM612M, U.S. Geological Survey, in preparation).
9 Percolation rates estimated from the perched water chloride concentrations by Kwicklis et al. (Kwicklis et al., *A Conceptual Model of Unsaturated Zone Flow and Transport, Yucca Mountain, Nevada*, Milestone Report 3GUM612M, U.S. Geological Survey, in preparation).

Table 5.3-61. Relationship Between Geological and Hydrogeological Nomenclatures and UZ Model Layers

Geological Unit	Welding Intensity/Formation Name (Buesch, Spengler et al. 1995)	UZ Model Layer Name	Hydrogeological Unit
	PAINTBRUSH GROUP		
Tiva Canyon Tuff	M, D[1] (Tpc)	tcw11 tcw12	Tiva Canyon (TCw)
	D- Basal vitrophyre (Tpcpv3) M (Tpcpv2)	tcw13	
	N,P (Tpcpv1)	ptn21	Paintbrush (PTn)
Bedded Tuff	N (Tpbt4)		
Yucca Mountain Tuff	N,P,M (Tpy)	ptn22	
Bedded Tuff	N (Tpbt3)	ptn23	
Pah Canyon Tuff	N,P,M (Tpp)	ptn24	
Bedded Tuff	N (Tpbt2)	ptn25	
Tonopah Spring Tuff	N,P (Tptrv3)		
	M (Tprv2) D- Upper vitrophyre (Tptrv1)	tsw31	Tonopah Spring (TSw)
	M,D (Tptrn)	tsw32	
	M,D,L[2] (Tptrl) M,D,L (Tptpul)	tsw33	
	D (Tptpmn)	tsw34	
	M,D,L (Tptpll)	tsw35	
	D (Tptpln)	tsw36	
	D- Basal vitrophyre (Tptpv3)	tsw37	
	N,P,M; may be altered (Tptpv1, Tptpv2)	ch1 (vc or zc)	Calico Hills (CHn)
Bedded Tuff	N; may be altered (Tpbt1)		
Calico Hills Formation	N; unaltered (Tac - vitric)	ch2 (vc or zc)	
Bedded Tuff	N; altered (Tac - zeolitic)	ch3 (vc or zc)	
	N; may be altered (Thtbt)	ch4 (vc or zc)	
CRATER FLAT GROUP			
Prow Pass Tuff	N; may be altered (Tcp) Unit 4[3]		
	P,M Unit 3	pp3vp	
	N,P; generally altered Units 2,1		
Bedded Tuff	N; generally altered (Tcpbt)	pp2zp	
Upper Bulldog Tuff	N,P; generally altered (Tcb)		
Middle Bullfrog Tuff	P,M	bf3vp	
Lower Bullfrog Tuff	N,P; generally altered		Crater Flat Undifferentiated (CFu)
Bedded Tuff	N; generally altered (Tcbbt)	bf2zp	
Upper Tram Tuff	N,P; generally altered (Tct)		
Older tuffs and lavas	Generally altered (Tct)	tr3zp tr2zp	

[1] Welding Intensity N=Non-; P=Partially; M=Moderately; D=Densely
[2] L=Lithophysal Zone
[3] Units per Moyer and Geslin (1995)

Table 5.3-62a. Base Case Matrix Parameters

Model Layer/Block Name	Matrix Permeability (k_m) (m^2)	Matrix Porosity ϕ_m (-)	Matrix van Genuchten alpha (α_m) (1/Pa)	Matrix van Genuchten m (λ) m_m (-)	Matrix Residual Saturation S_{lrm} (-)	Matrix Satiated Saturation S_{lsm} (-)
tcw11	5.37E-18	0.066	1.18E-06	0.232	0.13	1.00
tcw12	5.37E-18	0.066	1.32E-06	0.236	0.13	1.00
tcw13	4.90E-17	0.140	6.46E-07	0.427	0.33	1.00
ptn21	3.09E-14	0.369	3.80E-05	0.231	0.10	1.00
ptn22	3.02E-15	0.234	8.71E-06	0.488	0.14	1.00
ptn23	8.32E-14	0.353	4.57E-05	0.287	0.17	1.00
ptn24	1.15E-13	0.469	4.27E-05	0.349	0.10	1.00
ptn25	2.46E-13	0.464	1.95E-04	0.279	0.10	1.00
tsw31	4.90E-17	0.042	1.00E-05	0.237	0.11	1.00
tsw32	2.75E-16	0.146	2.29E-05	0.273	0.04	1.00
tsw33	1.15E-17	0.135	6.76E-06	0.248	0.06	1.00
tsw34	4.07E-18	0.089	1.02E-06	0.322	0.18	1.00
tsw35	1.55E-17	0.115	3.31E-06	0.229	0.08	1.00
tsw36	8.91E-17	0.092	7.41E-07	0.414	0.18	1.00
tsw37	1.29E-17	0.020	1.55E-06	0.387	0.50	1.00
ch1zc	1.38E-17	0.193	8.32E-07	0.366	0.36	1.00
ch2zc	9.12E-18	0.240	1.95E-06	0.220	0.20	1.00
ch3zc	9.12E-18	0.240	1.95E-06	0.220	0.20	1.00
ch4zc	1.55E-17	0.169	7.76E-07	0.477	0.33	1.00
ch1vc	1.32E-12	0.265	6.61E-05	0.190	0.04	1.00
ch2vc	2.57E-13	0.321	7.41E-05	0.224	0.06	1.00
ch3vc	2.57E-13	0.321	7.41E-05	0.224	0.06	1.00
ch4vc	2.57E-13	0.321	7.41E-05	0.224	0.06	1.00
pp3vp	2.82E-15	0.274	1.74E-05	0.311	0.07	1.00
bf3vp	2.82E-15	0.274	1.74E-05	0.311	0.07	1.00
tr3vp	2.82E-15	0.274	1.74E-05	0.311	0.07	1.00
pp2zp	5.75E-17	0.197	1.66E-06	0.316	0.18	1.00
bf2zp	5.75E-17	0.197	1.66E-06	0.316	0.18	1.00
tsw37/pcM37*	6.08E-18	0.036	3.37E-07	0.372	0.20	1.00
ch1zc/pcM1z	5.40E-18	0.288	1.90E-07	0.359	0.36	1.00
ch2zc/pcM2z	4.50E-19	0.332	4.21E-06	0.228	0.20	1.00
ch2zc/pcM62	4.50E-18	0.332	4.21E-06	0.228	0.20	1.00
ch3zc/pcM3z	4.50E-18	0.332	4.21E-06	0.228	0.20	1.00
ch4zc/pcM4z	8.40E-18	0.266	1.50E-07	0.476	0.33	1.00

*pcM-- indicates that values were calibrated with perched water data (in addition to saturation, water potential, and pneumatic data).

Table 5.3-62b. Base Case Fracture Parameters

Model Layer/Block Name	Vertical Fracture Permeability (k_f) (m^2)	Horizontal Fracture Permeability (k_f) (m^2)	Fracture Porosity ϕ_f (-)	Fracture van Genuchten Alpha (α_f) (1/Pa)	Fracture van Genuchten m (λ) m_f (-)	Fracture Residual Saturation S_{lrm} (-)	Fracture Satiated Saturation S_{lsm} (-)	Fracture Frequency f (1/m)	Fracture-Matrix Connection Area Modification Factor (Λ) (-)
tcw11	2.29E-11	6.21E-12	2.33E-04	2.95E-04	0.492	0.01	1.00	1.020	4.9E-04
tcw12	1.38E-11	6.03E-12	2.99E-04	2.95E-04	0.492	0.01	1.00	1.830	4.9E-04
tcw13	2.82E-12	2.40E-13	7.05E-05	9.12E-05	0.492	0.01	1.00	1.270	4.9E-04
ptn21	5.25E-13	5.25E-13	4.84E-05	1.10E-03	0.492	0.01	1.00	0.870	1.1E-01
ptn22	1.95E-13	1.95E-13	4.83E-05	1.82E-03	0.492	0.01	1.00	0.290	7.1E-01
ptn23	2.57E-13	2.57E-13	1.30E-04	3.39E-03	0.492	0.01	1.00	0.290	6.9E-01
ptn24	6.17E-14	6.17E-14	6.94E-05	9.33E-04	0.492	0.01	1.00	0.630	4.8E-01
ptn25	7.76E-14	7.76E-14	3.86E-05	1.95E-04	0.279	0.01	1.00	0.650	4.8E-01
tsw31	1.07E-11	1.00E-12	8.92E-05	3.98E-05	0.481	0.01	1.00	1.100	5.0E-01
tsw32	1.51E-11	7.08E-13	1.29E-04	9.33E-05	0.488	0.01	1.00	1.010	2.9E-05
tsw33	2.63E-11	8.91E-13	1.05E-04	1.78E-04	0.492	0.01	1.00	0.690	7.9E-05
tsw34	6.76E-12	4.27E-13	1.24E-04	9.77E-05	0.492	0.01	1.00	1.880	1.5E-04
tsw35	3.80E-12	9.12E-13	3.29E-04	1.10E-04	0.492	0.01	1.00	1.810	7.8E-02
tsw36	1.20E-12	1.20E-12	3.99E-04	1.32E-04	0.492	0.01	1.00	2.100	4.8E-05
tsw37	1.20E-12	1.20E-12	4.92E-04	1.18E-04	0.492	0.01	1.00	2.880	4.9E-04
ch1zc	2.40E-14	2.40E-14	1.10E-05	1.12E-03	0.492	0.01	1.00	0.067	1.8E-01
ch2zc	1.18E-14	1.18E-14	1.10E-05	1.23E-03	0.492	0.01	1.00	0.067	1.0E+00
ch3zc	1.18E-14	1.18E-14	1.10E-05	1.23E-03	0.492	0.01	1.00	0.067	1.0E+00
ch4zc	1.55E-14	1.55E-14	1.10E-05	1.15E-03	0.492	0.01	1.00	0.067	5.0E-01
ch1vc	1.74E-13	1.74E-13	7.14E-05	1.18E-03	0.492	0.01	1.00	0.420	4.9E-01
ch2vc	2.88E-13	2.88E-13	7.14E-05	1.18E-03	0.492	0.01	1.00	0.420	4.9E-01
ch3vc	2.88E-13	2.88E-13	7.14E-05	1.18E-03	0.492	0.01	1.00	0.420	4.9E-01
ch4vc	2.88E-13	2.88E-13	7.14E-05	1.18E-03	0.492	0.01	1.00	0.420	4.9E-01
pp3vp	6.92E-13	6.92E-13	7.14E-05	1.41E-03	0.492	0.01	1.00	0.420	5.1E-04
bf3vp	6.92E-13	6.92E-13	7.14E-05	1.41E-03	0.492	0.01	1.00	0.420	5.1E-04
tr3vp	6.92E-13	6.92E-13	7.14E-05	1.41E-03	0.492	0.01	1.00	0.420	5.1E-04
pp2zp	6.46E-14	6.46E-14	1.10E-05	3.72E-04	0.492	0.01	1.00	0.067	4.9E-01
bf2zp	6.46E-14	6.46E-14	1.10E-05	3.72E-04	0.492	0.01	1.00	0.067	4.9E-01
tsw37/pcF37*	3.04E-18	3.04E-18	1.10E-05	3.37E-07	0.372	0.20	1.00	0.067	1.0E+00
ch1zc/pcF1z	1.20E-17	1.20E-17	1.10E-05	1.90E-07	0.359	0.36	1.00	0.067	1.0E+00
ch2zc/pcF2z	3.50E-18	3.50E-18	1.10E-05	4.21E-06	0.228	0.20	1.00	0.067	1.0E+00
ch2zc/pcF62	4.50E-18	4.50E-18	1.10E-05	4.21E-06	0.228	0.20	1.00	0.067	1.0E+00
ch3zc/pcF3z	4.50E-18	4.50E-18	1.10E-05	4.21E-06	0.228	0.20	1.00	0.067	1.0E+00
ch4zc/pcF4z	8.40E-18	8.40E-18	1.10E-05	1.50E-07	0.476	0.33	1.00	0.067	1.0E+00

*pcF-- indicates that values were calibrated with perched water data (in addition to saturation, water potential, and pneumatic data).

Table 5.3-63a. Base Case Infiltration Multiplied by 5–Matrix Parameters

Model Layer/Block Name	Matrix Permeability (k_m) (m^2)	Matrix Porosity ϕ_m (-)	Matrix van Genuchten Alpha (α_m) (1/Pa)	Matrix van Genuchten m (λ) m_m (-)	Matrix Residual Saturation S_{lrm} (-)	Matrix Satiated Saturation S_{lsm} (-)
tcw11	5.40E-18	0.066	1.18E-06	0.232	0.13	1.00
tcw12	5.40E-18	0.066	1.32E-06	0.236	0.13	1.00
tcw13	5.00E-17	0.140	4.18E-07	0.429	0.33	1.00
ptn21	1.31E-13	0.369	3.86E-05	0.233	0.10	1.00
ptn22	3.30E-15	0.234	9.43E-06	0.516	0.14	1.00
ptn23	3.41E-13	0.353	4.45E-05	0.292	0.17	1.00
ptn24	2.14E-13	0.469	4.09E-05	0.372	0.10	1.00
ptn25	1.23E-12	0.464	1.64E-04	0.286	0.10	1.00
tsw31	1.99E-16	0.042	1.31E-05	0.230	0.11	1.00
tsw32	3.74E-16	0.146	2.86E-05	0.280	0.04	1.00
tsw33	2.51E-17	0.135	6.78E-06	0.248	0.06	1.00
tsw34	5.05E-18	0.089	1.26E-06	0.323	0.18	1.00
tsw35	1.49E-17	0.115	3.10E-06	0.226	0.08	1.00
tsw36	5.01E-17	0.092	7.39E-07	0.414	0.18	1.00
tsw37	1.86E-17	0.020	1.80E-06	0.379	0.50	1.00
ch1zc	4.81E-17	0.193	4.86E-07	0.360	0.36	1.00
ch2zc	3.95E-17	0.240	2.02E-06	0.224	0.20	1.00
ch3zc	3.95E-17	0.240	2.02E-06	0.224	0.20	1.00
ch4zc	4.23E-17	0.169	6.53E-07	0.477	0.33	1.00
ch1vc	1.60E-12	0.265	6.16E-05	0.197	0.04	1.00
ch2vc	9.07E-13	0.321	6.05E-05	0.227	0.06	1.00
ch3vc	9.07E-13	0.321	6.05E-05	0.227	0.06	1.00
ch4vc	9.07E-13	0.321	6.05E-05	0.227	0.06	1.00
pp3vp	6.80E-15	0.274	1.66E-05	0.313	0.07	1.00
bf3vp	6.80E-15	0.274	1.66E-05	0.313	0.07	1.00
tr3vp	6.80E-15	0.274	1.66E-05	0.313	0.07	1.00
pp2zp	9.40E-18	0.197	1.80E-06	0.311	0.18	1.00
bf2zp	9.40E-18	0.197	1.80E-06	0.311	0.18	1.00
tsw37/pcM37*	6.08E-18	0.036	3.37E-07	0.372	0.20	1.00
ch1zc/pcM1z	5.40E-18	0.288	1.90E-07	0.359	0.36	1.00
ch2zc/pcM2z	4.50E-19	0.332	4.21E-06	0.228	0.20	1.00
ch2zc/pcM62	4.50E-18	0.332	4.21E-06	0.228	0.20	1.00
ch3zc/pcM3z	4.50E-18	0.332	4.21E-06	0.228	0.20	1.00
ch4zc/pcM4z	8.40E-18	0.266	1.50E-07	0.476	0.33	1.00

*pcM-- indicates that values were calibrated with perched water data (in addition to saturation, water potential, and pneumatic data).

Table 5.3-63b. Base Case Infiltration Multiplied by 5--Fracture Parameters

Model Layer/ Block Name	Vertical Fracture Permeability	Horizontal Fracture Permeability	Fracture Porosity	Fracture van Genuchten alpha	Fracture van Genuchten m (λ)	Fracture Residual Saturation	Fracture Satiated Saturation	Fracture Frequency	Fracture-Matrix Connection Area Modification Factor
	(k_f) (m^2)	(k_f) (m^2)	ϕ_f (-)	(α_f) (1/Pa)	m_f (-)	S_{lrm} (-)	S_{lsm} (-)	f (1/m)	(Λ) (-)
tcw11	2.29E-11	6.21E-12	2.33E-04	2.37E-04	0.492	0.01	1	1.020	5.0E-04
tcw12	1.38E-11	6.03E-12	2.99E-04	2.37E-04	0.492	0.01	1	1.830	5.0E-04
tcw13	2.82E-12	2.40E-13	7.05E-05	9.12E-05	0.492	0.01	1	1.270	5.0E-04
ptn21	5.25E-13	5.25E-13	4.84E-05	1.10E-03	0.492	0.01	1	0.870	5.0E-01
ptn22	1.95E-13	1.95E-13	4.83E-05	1.85E-03	0.492	0.01	1	0.290	5.0E-01
ptn23	2.57E-13	2.57E-13	1.30E-04	3.45E-03	0.492	0.01	1	0.290	5.0E-01
ptn24	6.17E-14	6.17E-14	6.94E-05	9.13E-04	0.492	0.01	1	0.630	5.0E-01
ptn25	7.76E-14	7.76E-14	3.86E-05	1.64E-04	0.286	0.01	1	0.650	5.0E-01
tsw31	1.07E-11	1.00E-12	8.92E-05	1.36E-04	0.491	0.01	1	1.100	5.0E-04
tsw32	1.51E-11	7.08E-13	1.29E-04	6.13E-05	0.484	0.01	1	1.010	4.9E-01
tsw33	2.63E-11	8.91E-13	1.05E-04	1.68E-04	0.492	0.01	1	0.690	1.6E-04
tsw34	6.76E-12	4.27E-13	1.24E-04	9.50E-05	0.492	0.01	1	1.880	5.0E-03
tsw35	3.80E-12	9.12E-13	3.29E-04	1.27E-04	0.492	0.01	1	1.810	5.0E-04
tsw36	1.20E-12	1.20E-12	3.99E-04	1.32E-04	0.492	0.01	1	2.100	1.7E-04
tsw37	1.20E-12	1.20E-12	4.92E-04	1.19E-04	0.492	0.01	1	2.880	5.0E-04
ch1zc	2.51E-14	2.51E-14	1.10E-05	1.14E-03	0.492	0.01	1	0.067	5.0E-01
ch2zc	2.51E-14	2.51E-14	1.10E-05	1.14E-03	0.492	0.01	1	0.067	1.0E+00
ch3zc	2.51E-14	2.51E-14	1.10E-05	1.14E-03	0.492	0.01	1	0.067	1.0E+00
ch4zc	2.51E-14	2.51E-14	1.10E-05	1.14E-03	0.492	0.01	1	0.067	5.0E-01
ch1vc	1.74E-13	1.74E-13	7.14E-05	1.18E-03	0.492	0.01	1	0.420	5.0E-01
ch2vc	2.88E-13	2.88E-13	7.14E-05	1.18E-03	0.492	0.01	1	0.420	5.0E-01
ch3vc	2.88E-13	2.88E-13	7.14E-05	1.18E-03	0.492	0.01	1	0.420	5.0E-01
ch4vc	2.88E-13	2.88E-13	7.14E-05	1.18E-03	0.492	0.01	1	0.420	5.0E-01
pp3vp	7.08E-13	7.08E-13	7.14E-05	1.42E-03	0.492	0.01	1	0.420	5.0E-04
bf3vp	7.08E-13	7.08E-13	7.14E-05	1.42E-03	0.492	0.01	1	0.420	5.0E-04
tr3vp	7.08E-13	7.08E-13	7.14E-05	1.42E-03	0.492	0.01	1	0.420	5.0E-04
pp2zp	2.51E-14	2.51E-14	1.10E-05	1.14E-03	0.492	0.01	1	0.067	5.0E-01
bf2zp	2.51E-14	2.51E-14	1.10E-05	1.14E-03	0.492	0.01	1	0.067	5.0E-01
tsw37/pcF37*	6.08E-17	6.08E-18	1.10E-05	3.37E-07	0.372	0.20	1	0.067	1.0E+00
ch1zc/pcF1z	1.20E-16	1.20E-17	1.10E-05	1.90E-07	0.359	0.36	1	0.067	1.0E+00
ch2zc/pcF2z	3.50E-17	3.50E-18	1.10E-05	4.21E-06	0.228	0.20	1	0.067	1.0E+00
ch2zc/pcF62	4.50E-17	4.50E-18	1.10E-05	4.21E-06	0.228	0.20	1	0.067	1.0E+00
ch3zc/pcF3z	4.50E-18	4.50E-18	1.10E-05	4.21E-06	0.228	0.20	1	0.067	1.0E+00
ch4zc/pcF4z	8.40E-18	8.40E-18	1.10E-05	1.50E-07	0.476	0.33	1	0.067	1.0E+00

*pcF-- Indicates that values were calibrated with perched water data (in addition to saturation, water potential, and pneumatic data).

Table 5.3-64a. Base Case Infiltration Divided by 5–Matrix Parameters

Model Layer/ Block Name	Matrix Permeability	Matrix Porosity	Matrix van Genuchten alpha	Matrix van Genuchten m (λ)	Matrix Residual Saturation	Matrix Satiated Saturation
	(k_m) (m^2)	ϕ_m (-)	(α_m) (1/Pa)	m_m (-)	S_{lrm} (-)	S_{lsm} (-)
tcw11	5.40E-18	0.066	1.15E-06	0.232	0.13	1.00
tcw12	5.40E-18	0.066	1.29E-06	0.231	0.13	1.00
tcw13	5.00E-17	0.140	7.30E-07	0.426	0.33	1.00
ptn21	1.60E-14	0.369	3.65E-05	0.228	0.10	1.00
ptn22	3.30E-15	0.234	7.56E-06	0.492	0.14	1.00
ptn23	5.40E-14	0.353	3.66E-05	0.279	0.17	1.00
ptn24	8.80E-14	0.469	4.30E-05	0.326	0.10	1.00
ptn25	7.73E-14	0.464	1.96E-04	0.272	0.10	1.00
tsw31	6.87E-16	0.042	1.33E-05	0.230	0.11	1.00
tsw32	3.63E-16	0.146	2.32E-05	0.278	0.04	1.00
tsw33	2.11E-17	0.135	6.44E-06	0.248	0.06	1.00
tsw34	6.75E-18	0.089	1.14E-06	0.323	0.18	1.00
tsw35	7.97E-18	0.115	3.16E-06	0.232	0.08	1.00
tsw36	9.62E-17	0.092	6.92E-07	0.414	0.18	1.00
tsw37	6.69E-18	0.020	1.34E-06	0.372	0.50	1.00
ch1zc	6.00E-17	0.193	6.90E-07	0.359	0.36	1.00
ch2zc	1.88E-18	0.240	2.49E-06	0.221	0.20	1.00
ch3zc	1.88E-18	0.240	2.49E-06	0.221	0.20	1.00
ch4zc	1.33E-17	0.169	7.83E-07	0.476	0.33	1.00
ch1vc	1.60E-12	0.265	9.80E-05	0.187	0.04	1.00
ch2vc	5.50E-14	0.321	8.65E-05	0.222	0.06	1.00
ch3vc	5.50E-14	0.321	8.65E-05	0.222	0.06	1.00
ch4vc	5.50E-14	0.321	8.65E-05	0.222	0.06	1.00
pp3vp	1.24E-15	0.274	1.81E-05	0.310	0.07	1.00
bf3vp	1.24E-15	0.274	1.81E-05	0.310	0.07	1.00
tr3vp	1.24E-15	0.274	1.81E-05	0.310	0.07	1.00
pp2zp	9.40E-18	0.197	1.71E-06	0.312	0.18	1.00
bf2zp	9.40E-18	0.197	1.71E-06	0.312	0.18	1.00
tsw37/pcM37*	6.08E-18	0.036	3.37E-07	0.372	0.20	1.00
ch1zc/pcM1z	5.40E-18	0.288	1.90E-07	0.359	0.36	1.00
ch2zc/pcM2z	4.50E-19	0.332	4.21E-06	0.228	0.20	1.00
ch2zc/pcM62	4.50E-18	0.332	4.21E-06	0.228	0.20	1.00
ch3zc/pcM3z	4.50E-18	0.332	4.21E-06	0.228	0.20	1.00
ch4zc/pcM4z	8.40E-18	0.266	1.50E-07	0.476	0.33	1.00

*pcM-- indicates that values were calibrated with perched water data (in addition to saturation, water potential, and pneumatic data).

Table 5.3-64b. Base Case Infiltration Divided by 5–Fracture Parameters

Model Layer/Block Name	Vertical Fracture Permeability	Horizontal Fracture Permeability	Fracture Porosity	Fracture van Genuchten Alpha	Fracture van Genuchten m (λ)	Fracture Residual Saturation	Fracture Satiated Saturation	Fracture Frequency	Fracture-Matrix Connection Area Modification Factor
	(k_f) (m^2)	(k_f) (m^2)	ϕ_f (-)	(α_f) (1/Pa)	m_f (-)	S_{lrm} (-)	S_{lsm} (-)	f (1/m)	(Λ) (-)
tcw11	2.28E-11	6.02E-12	2.33E-04	2.37E-04	0.492	0.01	1.00	1.020	5.0E-04
tcw12	1.38E-11	6.02E-12	2.99E-04	2.37E-04	0.492	0.01	1.00	1.830	5.0E-04
tcw13	2.81E-12	2.40E-13	7.05E-05	9.12E-05	0.492	0.01	1.00	1.270	5.0E-04
ptn21	5.19E-13	5.19E-13	4.84E-05	1.10E-03	0.492	0.01	1.00	0.870	5.0E-01
ptn22	1.96E-13	1.96E-13	4.83E-05	1.85E-03	0.492	0.01	1.00	0.290	5.0E-01
ptn23	2.55E-13	2.55E-13	1.30E-04	3.45E-03	0.492	0.01	1.00	0.290	5.0E-01
ptn24	6.12E-14	6.12E-14	6.94E-05	9.13E-04	0.492	0.01	1.00	0.630	5.0E-01
ptn25	7.73E-14	7.73E-14	3.86E-05	1.96E-04	0.272	0.10	1.00	0.650	5.0E-01
tsw31	1.06E-11	1.00E-12	8.92E-05	1.49E-04	0.491	0.01	1.00	1.100	5.0E-04
tsw32	1.50E-11	7.08E-13	1.29E-04	9.13E-05	0.487	0.01	1.00	1.010	1.6E-02
tsw33	2.65E-11	8.91E-13	1.05E-04	1.63E-04	0.492	0.01	1.00	0.690	5.0E-04
tsw34	6.69E-12	4.27E-13	1.24E-04	9.73E-05	0.492	0.01	1.00	1.880	5.0E-04
tsw35	3.79E-12	9.12E-13	3.29E-04	1.26E-04	0.492	0.01	1.00	1.810	5.0E-04
tsw36	1.20E-12	1.20E-12	3.99E-04	1.32E-04	0.492	0.01	1.00	2.100	5.0E-04
tsw37	1.20E-12	1.20E-12	4.92E-04	1.19E-04	0.492	0.01	1.00	2.880	5.0E-04
ch1zc	2.51E-14	2.51E-14	1.10E-05	1.14E-03	0.492	0.01	1.00	0.067	5.0E-01
ch2zc	2.51E-14	2.51E-14	1.10E-05	1.14E-03	0.492	0.01	1.00	0.067	5.0E-01
ch3zc	2.51E-14	2.51E-14	1.10E-05	1.14E-03	0.492	0.01	1.00	0.067	5.0E-01
ch4zc	2.51E-14	2.51E-14	1.10E-05	1.14E-03	0.492	0.01	1.00	0.067	5.0E-01
ch1vc	1.74E-13	1.74E-13	7.14E-05	1.18E-03	0.492	0.01	1.00	0.420	5.0E-01
ch2vc	2.88E-13	2.88E-13	7.14E-05	1.18E-03	0.492	0.01	1.00	0.420	5.0E-01
ch3vc	2.88E-13	2.88E-13	7.14E-05	1.18E-03	0.492	0.01	1.00	0.420	5.0E-01
ch4vc	2.88E-13	2.88E-13	7.14E-05	1.18E-03	0.492	0.01	1.00	0.420	5.0E-01
pp3vp	7.08E-13	7.08E-13	7.14E-05	1.42E-03	0.492	0.01	1.00	0.420	5.0E-04
bf3vp	7.08E-13	7.08E-13	7.14E-05	1.42E-03	0.492	0.01	1.00	0.420	5.0E-04
tr3vp	7.08E-13	7.08E-13	7.14E-05	1.42E-03	0.492	0.01	1.00	0.420	5.0E-04
pp2zp	2.51E-14	2.51E-14	1.10E-05	1.14E-03	0.492	0.01	1.00	0.067	5.0E-01
bf2zp	2.51E-14	2.51E-14	1.10E-05	1.14E-03	0.492	0.01	1.00	0.067	5.0E-01
tsw37/pcF37*	3.04E-19	3.04E-18	1.10E-05	3.37E-07	0.372	0.20	1.00	0.067	1.0E+00
ch1zc/pcF1z	1.20E-18	1.20E-17	1.10E-05	1.90E-07	0.359	0.36	1.00	0.067	1.0E+00
ch2zc/pcF2z	3.50E-19	3.50E-18	1.10E-05	4.21E-06	0.228	0.20	1.00	0.067	1.0E+00
ch2zc/pcF62	4.50E-19	4.50E-18	1.10E-05	4.21E-06	0.228	0.20	1.00	0.067	1.0E+00
ch3zc/pcF3z	4.50E-19	4.50E-18	1.10E-05	4.21E-06	0.228	0.20	1.00	0.067	1.0E+00
ch4zc/pcF4z	8.40E-19	8.40E-18	1.10E-05	1.50E-07	0.476	0.33	1.00	0.067	1.0E+00

*pcF-- indicates that values were calibrated with perched water data (in addition to saturation, water potential, and pneumatic data).

Table 5.3-65a. Base Case Fault Matrix Parameters

Model Block	Matrix Permeability (k_m) (m^2)	Matrix Porosity ϕ_m (-)	Matrix van Genuchten Alpha (α_m) (1/Pa)	Matrix van Genuchten m (λ) m_m (-)	Matrix Residual Saturation S_{lrm} (-)	Matrix Satiated Saturation S_{lsm} (-)
tcwM (ghostdance)	1.00E-13	0.200	6.10E-05	0.500	0.00	1.00
ptnM (ghostdance)	1.00E-13	0.200	6.10E-05	0.500	0.00	1.00
tswM (ghostdance)	1.00E-13	0.200	6.10E-05	0.500	0.00	1.00
chnM (ghostdance)	5.00E-15	0.200	6.10E-05	0.500	0.00	1.00
tcwM (ironridge)	1.00E-13	0.200	6.10E-05	0.500	0.00	1.00
ptnM (ironridge)	1.00E-13	0.200	6.10E-05	0.500	0.00	1.00
tswM (ironridge)	1.00E-13	0.200	6.10E-05	0.500	0.00	1.00
chnM (ironridge)	5.00E-15	0.200	6.10E-05	0.500	0.00	1.00
tcwM (dunewash)	1.00E-13	0.200	6.10E-05	0.500	0.00	1.00
ptnM (dunewash)	1.00E-13	0.200	6.10E-05	0.500	0.00	1.00
tswM (dunewash)	1.00E-13	0.200	6.10E-05	0.500	0.00	1.00
chnM (dunewash)	5.00E-15	0.200	6.10E-05	0.500	0.00	1.00
chaM (dunewash)	2.55E-13	0.100	1.39E-06	0.225	0.06	1.00
tcwM (solitario)	1.00E-13	0.050	2.00E-05	0.500	0.00	1.00
ptnM (solitario)	1.00E-13	0.050	2.00E-05	0.500	0.00	1.00
tswM (solitario)	1.00E-13	0.050	2.00E-05	0.500	0.00	1.00
chnM (solitario)	5.00E-14	0.100	2.00E-05	0.500	0.00	1.00

Table 5.3-65b. Base Case Fault Fracture Parameters

Model Block	Vertical Fracture Permeability (kf) (m2)	Horizontal Fracture Permeability (kf) (m2)	Fracture Porosity ϕf (-)	Fracture van Genuchten alpha (αf) (1/Pa)	Fracture van Genuchten m (λ) mf (-)	Fracture Residual Saturation Slrm (-)	Fracture Satiated Saturation Slsm (-)	Fracture Frequency f (1/m)	Fracture-Matrix Connection Area Modification Factor (Λ) (-)
tcwF (ghostdance)	9.90E-12	2.00E-11	3.34E-04	1.00E-03	0.500	0.00	1.00	4.51	5.0E-04
ptnF (ghostdance)	2.00E-13	2.00E-13	3.34E-04	1.00E-03	0.500	0.00	1.00	4.51	5.0E-01
tswF (ghostdance)	2.00E-11	2.00E-11	3.34E-04	1.00E-03	0.500	0.00	1.00	4.51	5.0E-02
chnF (ghostdance)	5.00E-14	5.00E-14	3.34E-04	1.00E-03	0.500	0.00	1.00	4.51	5.0E-01
tcwF (ironridge)	2.00E-11	2.00E-11	3.34E-04	1.00E-03	0.500	0.00	1.00	4.51	5.0E-04
ptnF (ironridge)	2.00E-13	2.00E-13	3.34E-04	1.00E-03	0.500	0.00	1.00	4.51	5.0E-01
tswF (ironridge)	2.00E-11	2.00E-11	3.34E-04	1.00E-03	0.500	0.00	1.00	4.51	5.0E-02
chnF (ironridge)	5.00E-14	5.00E-14	3.34E-04	1.00E-03	0.500	0.00	1.00	4.51	5.0E-01
tcwF (dunewash)	2.00E-11	2.00E-11	3.34E-04	1.00E-03	0.500	0.00	1.00	4.51	5.0E-04
ptnF (dunewash)	2.00E-13	2.00E-13	3.34E-04	1.00E-03	0.500	0.00	1.00	4.51	5.0E-01
tswF (dunewash)	2.00E-11	2.00E-11	3.34E-04	1.00E-03	0.500	0.00	1.00	4.51	5.0E-02
chnF (dunewash)	5.00E-14	5.00E-14	3.34E-04	1.00E-03	0.500	0.00	1.00	4.51	5.0E-01
chaF (dunewash)	2.88E-13	2.88E-13	1.14E-05	7.39E-06	0.225	0.06	1.00	4.51	5.0E-01
tcwF (solitario)	2.00E-11	2.00E-11	3.34E-04	1.00E-03	0.500	0.00	1.00	4.51	1.0E-02
ptnF (solitario)	1.00E-12	1.00E-12	3.34E-04	1.00E-03	0.500	0.00	1.00	4.51	1.0E-02
tswF (solitario)	2.00E-11	2.00E-11	3.34E-04	1.00E-03	0.500	0.00	1.00	4.51	1.0E-02
chnF (solitario)	5.00E-13	5.00E-13	3.34E-04	1.00E-03	0.500	0.00	1.00	4.51	1.0E-02

Table 5.3-66. Statistical Information, 1985 to 1995, for Wells and Well Intervals Monitored in the Yucca Mountain Area (from Graves et al. 1997, Table 2)

Well Name	Minimum Water-Level Altitude (meters)	Maximum Water-Level Altitude (meters)	Range (meters)	Mean Water-Level Altitutde (meters)	Median Water-Level Altitude (meters)	Standard Deviation (meters)	Number of Data Points Used
USW WT-1	729.98	730.50	0.52	730.35	730.35	0.092	128
USW WT-2	730.14	730.81	0.67	730.65	730.70	0.128	106
UE-25 WT#3	729.41	729.85	0.44	729.64	729.70	0.126	119
UE-25 WT#4	730.28	731.17	0.89	730.78	730.81	0.118	131
UE-25 WT#6	1,033.29	1,036.09	2.80	1,034.60	1,034.52	0.553	117
USW WT-7	775.47	775.99	0.52	775.83	775.85	0.096	113
USW WT-10	775.56	776.21	0.65	776.00	776.00	0.114	132
USW WT-11	730.21	730.81	0.60	730.66	730.69	0.099	119
UE-25 WT#12	729.11	729.58	0.47	729.47	729.48	0.074	123
UE-25 WT#13	728.53	729.43	0.90	729.11	729.14	0.119	118
UE-25 WT#14	729.29	729.98	0.69	729.68	729.69	0.073	135
UE-25 WT#15	728.98	729.42	0.44	729.22	729.22	0.070	124
UE-25 WT#16	737.82	738.57	0.75	738.27	738.29	0.147	123
UE-25 WT#17	729.45	729.84	0.39	729.70	729.72	0.083	117
UE-25 WT#18	730.52	730.92	0.40	730.75	730.76	0.095	38
UE-25 b#1							
upper interval	730.48	730.79	0.31	730.65	730.63	0.065	99
lower interval	728.52	730.25	1.73	729.67	729.77	0.425	67
UE-25 p#1	751.92	752.69	0.77	752.44	752.49	0.161	120
USW VH-1	779.30	779.60	0.30	779.44	779.45	0.048	147
USW G-2	1,019.58	[1]1,020.56	0.98	1,020.17	1,020.12	0.241	28
USW G3	729.96	730.83	0.87	730.50	730.51	0.169	113
J-11	732.09	732.40	0.31	732.21	732.20	0.055	71
J-12	727.81	728.15	0.34	727.93	727.94	0.053	100
J-13	728.30	728.69	0.39	728.44	728.44	0.065	121
USW H-1							
tube 1	785.00	786.05	1.05	785.49	785.49	0.272	101
tube 2	735.67	736.28	0.61	735.97	735.95	0.161	75
tube 3	730.35	730.81	0.46	730.60	730.62	0.098	108
tube 4	730.51	731.04	0.53	730.85	730.90	0.126	124
USW H-3							
upper interval	731.07	731.93	0.86	731.52	731.41	0.287	128
lower interval	747.39	759.61	12.22	755.91	756.80	3.098	59
USW H-4							
upper interval	730.20	730.52	0.32	730.40	730.40	0.061	128
lower interval	730.18	730.83	0.65	730.51	730.52	0.108	101
USW H-5							
upper interval	774.96	775.72	0.76	775.46	775.47	0.139	106
lower interval	774.95	775.86	0.91	775.62	775.64	0.186	54
USW H-6							
upper interval	775.83	776.20	0.37	776.02	776.03	0.087	118
lower interval	775.71	776.08	0.37	775.94	775.95	0.070	79

[1]The water level in well USW G-2 has been declining since the well was completed on 10-24-81. Altitude of water level on 11-10-81 was 1,031.82 meters (U.S. Geological Survey historical records). Altitude of water level on 09-17-82 was 1,028.84 meters (Robison et al. 1988). Range of water-level change since 11-01-81 is 12.24 meters.

Table 5.3-67. Altitudes of Hydrogeologic Units in Deep Boreholes at Yucca Mountain (from Luckey, Tucci et al. 1996, Table 2)

Borehole Name	Altitude Of Water Level	Altitude of Bottom of Borehole	Altitude of Base of Hydrogeologic Unit			
			Upper Volcanic Aquifer	Upper Volcanic Confining Unit	Lower Volcanic Aquifer	Lower Volcanic Confining Unit
USW G-2	1,020	-277	1,056	730	361	>TD
USW G-3	730	-53	1,119	1,005	307	>TD
USW G-4	731	355	875	733	>TD	>TD
USW H-1	731	-526	871	736	200	>TD
USW H-3	731	264	1,119	1,030	387	>TD
USW H-4	730	30	888	753	94	>TD
USW H-5	776	259	996	886	439	>TD
USW H-6	776	82	931	843	427	>TD
UE-25 b#1	731	-19	806	631	12	>TD
UE-25 c#1	730	216	758	615	>TD	>TD
UE-25 p#1	752	-691	780	678	241	-130
UE-25 J-13	728	-52	612	481	36	>TD

NOTE: All altitudes are in meters above sea level; water level is for uppermost interval monitored; base of hydrogeologic unit is shown even if it is above the saturated zone; >TD indicates that at the total depth borehole was still in or had not reached this hydrogeologic unit.

Table 5.3-68. Potentiometric Levels at Varying Depth Intervals in Boreholes at Yucca Mountain (Luckey, Tucci et al. 1996, Table 3)

Borehole Name	Depth Interval (meters)	Primary Hydrogeologic Unit	Potentiometric Level Altitude (meters)	Remarks
UE-25 b#1	488 - 1,199	Lower volcanic aquifer	730.71	1991 mean level
	1,199 - 1,220	Lower volcanic confining unit	729.69	1991 mean level
UE-25 c#3	692 - 753	Lower volcanic aquifer	730.22	1990 mean level
	753 - 914	Lower volcanic aquifer	730.64	1990 mean level
UE-25 p#1	384 - 500	Lower volcanic aquifer	729.90	Craig, R.W. and Robison (1984)
	1,297 - 1,805	Carbonate aquifer	751.26	Average value; Craig, R.W. and Robison (1984)
USW G-4	615 - 747	Lower volcanic aquifer	730.3	Average value; Bentley (1984)
	747 - 915	Lower volcanic aquifer	729.8	Average value; Bentley (1984)
USW H-1	573 - 673	Lower volcanic aquifer	730.94	1991 mean level
	716 - 765	Lower volcanic aquifer	730.75	1991 mean level
	1,097 - 1,123	Lower volcanic aquifer	736.06	1991 mean level
	1,783 - 1,814	Lower volcanic confining unit	785.58	1991 mean level
USW H-3	762 - 1,114	Lower volcanic aquifer	731.35	1991 mean level
	1,114 - 1,219	Lower volcanic confining unit	753.05	[a]Mean for 12/91
USW H-4	525 - 1,188	Lower volcanic aquifer	730.41	1991 mean level
	1,188 - 1,219	Lower volcanic confining unit	730.56	1991 mean level
USW H-5	708 - 1,091	Lower volcanic aquifer	775.43	1991 mean level
	1,091 - 1,219	Lower volcanic confining unit	775.65	1991 mean level
USW H-6	533 - 752	Lower volcanic aquifer	775.99	1991 mean level
	752 - 1,220	Lower volcanic aquifer	775.91	1991 mean level
	533 - 1,193	Lower volcanic aquifer	776.09	Jan. - May 1984 mean level
	1,193 - 1,220	Lower volcanic confining unit	778.18	Jan. - May 1984 mean level
UE-25 J-13	282 - 451	Upper volcanic aquifer	728.8	Thordarson (1983)
	471 - 502	Upper volcanic confining unit	728.9	Thordarson (1983)
	585 - 646	Lower volcanic aquifer	728.9	Thordarson (1983)
	820 - 1,063	Lower volcanic aquifer	728.0	Thordarson (1983)

[a] Potentiometric levels rising throughout 1991 in response to reconfiguration of the packer that isolates the lower interval.

Table 5.3-69. Site Saturated-Zone Hydrogeologic Units, Equivalent Units, and Associated Lithologies in the Vicinity of Yucca Mountain

Hydrogeologic Unit (Age)	Model Unit Number (Parameter Name)	Equivalent Unit: Winograd and Thordarson (1975)	Equivalent Unit: Laczniak et al. (1996)	Equivalent Unit: Luckey, Tucci et al. (1996)	Lithology	Data-Availability Rating
Valley-fill aquifer (Q, T)	19 (qal)	Valley Fill (Valley-fill aquifer)	Alluvial deposits (Valley-fill aquifer)	Alluvium	Alluvial fan, fluvial, fanglomerate, lakebed, eolian and mudflow deposits	9.0
Valley-fill confining unit (Q, T)	18 (tpla)	Valley Fill (Valley-fill aquifer)	Alluvial deposits (Valley-fill aquifer)	Alluvium	Playa deposits	5.0
Limestone aquifer (T)	17 (tlim)	--	--	--	Lacustrine limestones, calcareous spring deposits	0.9
Lava-flow aquifer (Q, T)	16 (B)	Basalt of Kiwi Mesa Basalt of Skull Mountain (Lava-flow aquifer)	Basalt	--	Basalt flows, dikes and cinder cones, latite dikes	1.0
Upper volcanic aquifer (T)	15 (uva)	Timber Mountain Tuff Paintbrush Tuff (Welded-tuff aquifer)	Thirsty Canyon Group Timber Mountain Group Paintbrush Group (Welded-tuff and lava-flow aquifers)	Paintbrush Group (Upper volcanic aquifer)	Variably welded ash-flow tuffs and rhyolite lavas (non-welded tuffs)	6.0
Upper volcanic confining unit (T)	14 (uvcu)	Wahmonie Formation Salyer Formation Rhyolite flows and tuffaceous beds of Calico Hills (Lava-flow aquitard - Tuff acquitard)	Volcanics of Area 20 Wahmonie Formation (Lava-flow aquifers)	Calico Hills Formation (Upper VolcanicConfining Unit)	Rhyolite lavas, volcanic breccias, non-welded to welded tuffs, commonly argillaceous or zeolitic	1.0
Middle volcanic acquifer (T)	13 (mva)	Grouse Canyon Member Tuff of Crater Flat (Tuff aquitard)	Crater Flat Group Belted Range Group (Welded-tuff and lava-flow aquifers)	Crater Flat Group (Lower Volcanic Aquifer)	Variably welded ash-flow tuffs and rhyolite lavas	0.8
Middle volcanic confining unit (T)'	12 (mvcu)	Local informal units of Indian Trail Formation (Tuff aquitard)	Tunnel Formation (Tuff confining unit)	Flow Breccia Lithic Ridge Tuff (Lower Volcanic Confining Unit)	Non-welded tuff, commonly zeolitized	0.8

NOTE: --, no units identified; hydrologic names listed in parenthesis; Q, Quaternary; T, Tertiary; Pz, Paleozoic; pC, Precambrian; data-availability rating: 0.1, poor; 10.0, excellent.

Table 5.3-69. Site Saturated-Zone Hydrogeologic Units, Equivalent Units, and Associated Lithologies in the Vicinity of Yucca Mountain (Continued)

Hydrogeologic Unit (Age)	Model Unit Number (Parameter Name)	Equivalent Unit			Lithology	Data-Availability Rating
		Winograd and Thordarson (1975)	Laczniak et al. (1996)	Luckey, Tucci et al. (1996)		
Lower volcanic aquifer (T)	11 (lva)	Tub Spring Member (Tuff aquitard)	Volcanics of Big Dome (Lava-flow and welded-tuff aquifer)	--	Variably welded ash-flow tuffs, rhyolite lavas	0.1
Lower volcanic confining unit (T)	10 (lvcu)	?(Tuff acquitard)	Older Volcanics (Tuff confining unit)	--	Non-welded tuff, commonly zeolitized	0.1
Undifferentiated valley fill (T)	9 (lcu)	Rocks of Pavits Spring Horse Spring Formation (Tuff aquitard)	Pavits Spring Formation Horse Spring Formation Paleocolluvium	--	Tuffaceous sandstone, tuff breccia, siltstone, claystone, conglomerate, lacustrine limestone, commonly argillaceous or calcareous. Sedimentary breccia.	5.0
Upper carbonate aquifer (Pz)	8 (uca)	Tippipah Limestone (Upper carbonate aquifer)	Bird Spring Formation (Upper carbonate aquifer)	--	Limestone	0.3
Upper clastic confining unit (Pz)	6 (ecu)	Eleana Formation (Upper clastic aquitard)	Eleana Formation (Eleana confining unit)	--	Siliceous siltstone, sandstone, quartzite, conglomerate, limestone	0.5
Lower carbonate aquifer (Pz)	3, 5, 7, (lca)	Devils Gate Limestone Nevada Formation Ely Springs Dolomite Eureka Quartzite Pogonip Group Nopah Formation Dunderberg Shale Bonanza King Upper Carrara Formation (Lower carbonate aquifer)	Guilmette Formation Simonson Dolomite Sevy, Laketown, and Lone Mountain Dolomite Roberts Mountain Formation Dolomite of the Spotted Range Ely Springs Dolomite Eureka Quartzite Pogonip Group Nopah Formation Bonanza King Formation Upper Carrara Formation (Lower carbonate aquifer)	Lone Mt. Dolomite Roberts Mt. Dolomite (Carbonate Aquifer)	Dolomite and limestone, locally cherty and silty	0.5

NOTE: --, no units identified; hydrologic names listed in parenthesis; Q, Quaternary; T, Tertiary; Pz, Paleozoic; pC, Precambrian; data-availability rating: 0.1, poor; 10.0, excellent.

Table 5.3-69. Site Saturated-Zone Hydrogeologic Units, Equivalent Units, and Associated Lithologies in the Vicinity of Yucca Mountain (Continued)

Hydrogeologic Unit (Age)	Model Unit Number (Parameter Name)	Equivalent Unit			Lithology	Data-Availability Rating
		Winograd and Thordarson (1975)	Laczniak et al. (1996)	Luckey, Tucci et al. (1996)		
Lower clastic confiing unit (Pz, pC)	4 (qcu)	Lower Carrara Formation Zabriskie Quartzite Wood Canyon Formation Stirling Quartzite Johnnie Formation (Lower clastic aquitard)	Lower Carrara Formation Zabriskie Quartzite Wood Canyon Formation Stirling Quartzite Johnnie Formation Noonday (?) Dolomite (Quartzite confining unit)	--	Quartzite, siltstone, shale, dolomite	0.8
Granitic confining unit (T)	2 (gran)	Granitic Stocks (A minor aquitard)	Granite	--	Granodiorite and quartz monzonite in stocks, dikes and sills	0.1

Table 5.3-70. Correlation of RIB and ISM2.0 to Hydrogeologic Units

Site Saturated Zone Hydrogeologic Unit	Geologic/Lithologic Stratigraphy (RIB Item 1.1.2.1) Definition/Buesch, Spengler et al. (1996)	Group	Formation	Member	Zone	Subzone	ISM2.0
Valley-Fill Aquifer							
Valley-Fill Confining Unit							
Limestone Aquifer							
Lava-Flow Aquifer							
Upper Volcanic Aquifer	Timber Mountain Group	tm					
Upper Volcanic Aquifer	Rainier Mesa Tuff		Tmr				44tmr
Upper Volcanic Aquifer	Paintbrush Group	Tp					
Upper Volcanic Aquifer	Post tuff unit "x" bedded tuff			Tpbt6			
Upper Volcanic Aquifer	Tuff unit "x"			Tpki (informal)			44tpk
Upper Volcanic Aquifer	Pre-tuff unit "x" bedded tuff			Tpbt5			44tpc
Upper Volcanic Aquifer	Tiva Canyon Tuff		Tpc				
Upper Volcanic Aquifer	Crystal Rich Member			Tpcr			
Upper Volcanic Aquifer	Vitric zone				Tpcrv		
Upper Volcanic Aquifer	Nonwelded subzone					Tpcrv3	
Upper Volcanic Aquifer	Moderately welded subzone					Tpcrv2	
Upper Volcanic Aquifer	Densely welded subzone					Tpcrv1	
Upper Volcanic Aquifer	Nonlithophysal zone				Tpcrn		
Upper Volcanic Aquifer	Subvitrophyre transition subzone					Tpcrn4	
Upper Volcanic Aquifer	Pumice poor subzone					Tpcrn3	
Upper Volcanic Aquifer	Mixed pumice subzone					Tpcrn2	
Upper Volcanic Aquifer	Crystal transition subzone (not always present)					Tpcrn1	
Upper Volcanic Aquifer	Lithophysal zone				Tpcr1		
Upper Volcanic Aquifer	Crystal transition subzone (not always present)					Tpcrl1	
Upper Volcanic Aquifer	Crystal-Poor Member			Tpcp			
Upper Volcanic Aquifer	Upper lithophysal zone				Tpcpul		
Upper Volcanic Aquifer	Spherulite-rich subzone					Tpcpul1	
Upper Volcanic Aquifer	Middle nonlithophysal zone				Tpcpmn		
Upper Volcanic Aquifer	Upper subzone					Tpcpmn3	
Upper Volcanic Aquifer	Lithophysal subzone					Tpcplnn2	
Upper Volcanic Aquifer	Lower subzone					Tpcpmn1	
Upper Volcanic Aquifer	Lower lithophysal zone				Tpcpl1		
Upper Volcanic Aquifer	Hackly-fractured subzone					Tpcpllh	
Upper Volcanic Aquifer	Lower nonlithophysal zone				Tpcpln		
Upper Volcanic Aquifer	Hackly subzone					Tpcplnh	
Upper Volcanic Aquifer	Columnar subzone					Tpcplnc	
Upper Volcanic Aquifer	Vitric zone				Tpcpv		
Upper Volcanic Aquifer	Densely welded subzone					Tpcpv3	44tpcpv3
Upper Volcanic Aquifer	Moderately welded subzone					Tpcpv2	44tpcpv12
Upper Volcanic Aquifer	Nonwelded subzone					Tpcpv1	44tpcpv12
Upper Volcanic Aquifer	Pre-Tiva Canyon bedded tuff			Tpbt4			44tpbt4
Upper Volcanic Aquifer	Yucca Mountain Tuff		Tpy				44tpy
Upper Volcanic Aquifer	Pre-Yucca Mountain bedded tuff			Tpbt3			44tpbt3
Upper Volcanic Aquifer	Pah Canyon Tuff		Tpp				44tpp
Upper Volcanic Aquifer	Pre-Pah Canyon bedded tuff			Tpbt2			44tpbt2
Upper Volcanic Aquifer	Topopah Spring Tuff		Tpt				

Table 5.3-70. Correlation of RIB and ISM2.0 to Hydrogeologic Units (Continued)

Site Saturated Zone Hydrogeologic Unit	Geologic/Lithologic Stratigraphy (RIB Item 1.1.2.1)						ISM2.0
	Definition/Buesch, Spengler et al. (1996)	Group	Formation	Member	Zone	Subzone	
Upper Volcanic Aquifer	Crystal-Rich Member			Tptr			
Upper Volcanic Aquifer	Vitric zone				Tptrv		
Upper Volcanic Aquifer	Nonwelded subzone					Tptrv3	44ptprv23
Upper Volcanic Aquifer	Moderately welded subzone					Tptrv2	44tptrv23
Upper Volcanic Aquifer	Densely welded subzone					Tptrv1	44tptrv1
Upper Volcanic Aquifer	Nonlithophysal zone				Tptrn		
Upper Volcanic Aquifer	Dense subzone					Tptrn3	
Upper Volcanic Aquifer	Vapor-phase corroded subzone					Tptrn2	
Upper Volcanic Aquifer	Crystal transition subzone (not always present)					Tptrn1	
Upper Volcanic Aquifer	Lithophysal zone				Tptrl		
Upper Volcanic Aquifer	Crystal transition subzone (not always present)					Tptrl1	44tptr1
Upper Volcanic Aquifer	Crystal-Poor Member			Tptp			
Upper Volcanic Aquifer	Lithic-rich zone			Tptpf or Tptrf			44tptf
Upper Volcanic Aquifer	Upper lithophysal zone				Tptpul		44tptpul
Upper Volcanic Aquifer	Middle nonlithophysal zone				Tptpmn		44tptpmmn
Upper Volcanic Aquifer	Nonlithophysal subzone					Tptpmn3	
Upper Volcanic Aquifer	Lithophysal bearing subzone					Tptpmn2	
Upper Volcanic Aquifer	Nonlithophysal subzone					Tptpmn1	
Upper Volcanic Aquifer	Lower lithophysal zone				Tptpll		44tptpll
Upper Volcanic Aquifer	Lower nonlithophysal zone				Tptpln		44tptpln
Upper Volcanic Aquifer	Vitric zone				Tptpv		
Upper Volcanic Aquifer	Densely welded subzone					Tptpv3	44tptpv3
Upper Volcanic Aquifer	Moderately welded subzone					Tptpv2	44tptpv12
Upper Volcanic Aquifer	Nonwelded subzone					Tptpv1	44tptpv12
Upper Volcanic Aquifer	Pre-Topopah Spring bedded tuff			Tpbt1			44tpbt
Upper Volcanic Confining Unit	Calico Hills Formation		Ta				44tac
Upper Volcanic Confining Unit	Bedded tuff			Thtbt			44tacbt
Upper Volcanic Aquifer	Nonwelded subzone					Tptpv1	44tptpv12
Upper Volcanic Aquifer	Pre-Topopah Spring bedded tuff			Tpbt1			44tpbt
Upper Volcanic Confining Unit	Calico Hills Formation		Ta				44tac
Upper Volcanic Confining Unit	Bedded tuff			Thtbt			44tacbt
Upper Volcanic Aquifer	Nonwelded subzone					Tptpv1	44tptpv12
Upper Volcanic Aquifer	Pre-Topopah Spring bedded tuff			Tpbt1			44tpbt
Upper Volcanic Confining Unit	Calico Hills Formation		Ta				44tac
Upper Volcanic Confining Unit	Bedded tuff			Thtbt			44tacbt

Table 5.3-70. Correlation of RIB and ISM2.0 to Hydrogeologic Units (Continued)

Site Saturated Zone Hydrogeologic Unit	Geologic/Lithologic Stratigraphy (RIB Item 1.1.2.1)						ISM2.0
	Definition/Buesch, Spengler et al. (1996)	Group	Formation	Member	Zone	Subzone	
Middle Volcanic Aquifer	Crater Flat Group	Tc					
Middle Volcanic Aquifer	Prow Pass		Tcp				44tcplnw, 44cpunw, 44tcpw
Middle Volcanic Aquifer	Bedded tuff			Tcpbt			44tcpbt
Middle Volcanic Aquifer	Bullfrog Tuff		Tcb				44tcblnw, 44tcbunw, 44tcbw
Middle Volcanic Aquifer	Bedded tuff			Tcbbt			44tcbbt
Middle Volcanic Aquifer	Tram Tuff		Tcf				44tct
Middle Volcanic Aquifer	Bedded tuff			Tctbt			444tctbt
Middle Volcanic Aquifer	Lava and flow breccia (informal)			Tll			
Middle Volcanic Aquifer	Bedded tuff			Tllbt			
Middle Volcanic Aquifer	Lithic Ridge Tuff		Tr				
Middle Volcanic Aquifer	Bedded tuff			Tlrbt			
Middle Volcanic Aquifer	Lava and flow breccia (informal)			Tll2			
Middle Volcanic Aquifer	Bedded tuff			Tll2bt			
Middle Volcanic Aquifer	Lava and flow breccia (informal)			T113			
Middle Volcanic Aquifer	Bedded tuff			T113bt			
Middle Volcanic Aquifer	Older tuffs (informal			Tt			
Middle Volcanic Aquifer	Unit a (informal)			Tta			
Middle Volcanic Aquifer	Unit b (informal)			Ttb			
Middle Volcanic Aquifer	Unit c (informal)			Ttc			
Middle Volcanic Aquifer	Sedimentary rocks and calcified tuff (informal)			Tca			
Middle Volcanic Aquifer	Tuff of Yucca Flat (informal)			Tyf			
Middle Volcanic Confining Unit							
Lower Volcanic Aquifer							
Lower Volcanic Confining Unit							
Undifferentiated Valley Fill							
Upper Carbonate Aquifer							
Upper Clastic Confining Unit							
Lower Carbonate Aquifer	Lone Mountain Dolomite		Sim				paleozoic-Grav (not used)
Lower Carbonate Aquifer	Roberts Mountain Formation		Sim				paleozoic-Grav (not used)
Lower Clastic Confining Unit							
Granitic Confining Unit							

Table 5.3-71. Hydrologic Properties of Site Saturated-Zone Hydrogeologic Units

Hydrogeologic Unit	Model Unit Number	Model Variable Name	Hydraulic Conductivity (meters/second)		Permeability (meters^2)		Permeability Specified in Simulation 40 (meters^2)	Porosity (percent)	
			High	Low	High	Low		High	Low
Valley-fill aquifer	19	qal	6.0×10^{-05} [m]	9.2×10^{-07} [m]	6.0×10^{-12} [m,3]	9.2×10^{-14} [m,3]	8.8×10^{-14}	23 [b]	12 [b]
Valley-fill confining unit	18	tpla	3.9×10^{-05} [c]	1.2×10^{-10} [b]	3.9×10^{-12} [c,3]	1.2×10^{-17} [b,3]	3.0×10^{-16}	66 [b]	29 [b]
Lava-flow aquifer	16	b	1.2×10^{-06} [b]	5.8×10^{-10} [b]	1.2×10^{-13} [b,3]	1.1×10^{-18} [g,4]	4.5×10^{-14}	19 [b]	0.4 [b]
Upper volcanic aquifer	15	uva	3.2×10^{-04} [m]	9.6×10^{-12} [h]	1.8×10^{-13} [f]	0.0×10^{-00} [a]	1.6×10^{-14}	54.4 [k]	1.4 [g]
Upper volcanic confining unit	14	uvcu	4.6×10^{-05} [m]	2.9×10^{-11} [f]	3.9×10^{-14} [a]	3.0×10^{-18} [f]	1.0×10^{-18}	50.3 [c]	12.3 [c]
Middle volcanic aquifer	13	mva	1.6×10^{-05} [l,n]	9.6×10^{-12} [h]	4.5×10^{-14} [a]	0.0×10^{-00} [a]	1.6×10^{-14}	43.6 [g]	1.8 [g]
Middle volcanic confining unit	12	mvcu	1.3×10^{-06} [l,n]	6.4×10^{-11} [j,n]	2.6×10^{-16} [a]	0.0×10^{-00} [a]	1.9×10^{-16}	27.4 [a]	9.2 [g]
Lower volcanic aquifer	11	lva	no data available	no data available	no data available	no data available	5.0×10^{-13}	38.4 [c]	8.1 [c]
Lower volcanic confining unit	10	lvcu	1.7×10^{-08} [d,4]	1.7×10^{-08} [d,4]	4.0×10^{-16} [g]	8.3×10^{-18} [a]	1.0×10^{-16}	17 [g]	8.8 [j]
Undifferentiated valley fill	9	lcu	3.5×10^{-06} [b]	3.5×10^{-13} [b]	3.5×10^{-13} [b,3]	3.5×10^{-20} [b,3]	2.9×10^{-14}	30 [b]	10 [b]
Limestone aquifer	17	tlim	no data available	no data available	no data available	no data available	1.0×10^{-14}	no data available	no data available
Granitic confining unit	2	gran	4.6×10^{-06} [b]	2.3×10^{-13} [b]	4.6×10^{-13} [b,3]	2.3×10^{-20} [b,3]	3.5×10^{-14}	7 [b]	0.004 [b]
Upper carbonate aquifer	8	uca	4.6×10^{-05} [b]	5.8×10^{-09} [b]	4.6×10^{-12} [b,3]	5.8×10^{-16} [b,3]	6.7×10^{-13}	16 [b]	0.5 [b]
Upper clastic confining unit	6	ecu	no data available	no data available	no data available	no data available	5.5×10^{-19}	15.1 [g]	0.6 [g]
Lower carbonate aquifer	3, 5, 7	lca	2.6×10^{-03} [m]	5.8×10^{-09} [b]	5.4×10^{-15} [g]	1.1×10^{-18} [g]	4.4×10^{-12}	16 [b]	0 [g]
Lower clastic confining unit	4	qcu	4.6×10^{-06} [b]	2.3×10^{-13} [b]	5.5×10^{-19} [g]	3.9×10^{-20} [g]	2.0×10^{-15}	7 [b]	0.004 [b]

NOTE: High and low values taken from 16.5 (low) and 83.5 (high) percentiles of probability distribution. References denoted by superscripts: a) Anderson 1994; b) Bedinger et al. 1989c; c) Blankennagel and Weir 1973; d) Craig, R.W. and Robison 1984; e) Czarnecki 1990; f) Flint, L.E. and Flint 1990; g) Geldon 1993; h) Lahoud et al. 1984; i) Lobmeyer 1986; j) Rush et al. 1984; k) Thordarson 1983; l) Whitfield, Eshom et al. 1985; m) Winograd and Thordarson 1975; n) Luckey, Tucci et al. 1996. 1) Hydraulic properties compiled from laboratory and hydraulic testing data. 2) Anderson 1981; Craig, R.W. and Reed 1991; Garber and Thordarson 1962; Moore and Garber 1962; Robison and Craig 1991; Thordarson et al. 1985; Waddell et al. 1984; and Weeks and Wilson 1984 were used in the compilation of the table, but are not cited because values from these reports fall within the high and low values for respective units. 3) Permeability value obtained by converting reported hydraulic conductivity value if no explicit permeability value was available.4) Only one value available.

Table 5.3-72. Comparison of Groundwater Fluxes Derived from the Regional and Site Saturated-Zone Flow Models

Flux Location	Net Flux from Regional Model (D'Agnese et al. 1997) [kg/s]	Flux Total from Site Model (kg/s)		Percent Increase in Flux Between 20°C and 44°C Simulations	Percent Difference in Flux Between Regional and Site Model (Simulation 40)
		At 20°C (Simulation 40 with Temperature Modified)	At 44°C (Simulation 40)		
North	-174.0	-4235.7	-6946.9	64	
North (eastern half)	--	--	-6826.6	--	31
West	-90.7	-18.3	10.7	159	-112
East	-167.1	3643.7	6056.5	60	
East (northern third)	--	--	6807.3	--	340
South	323.38	610.5	879.9	44	172
Bottom	57.85	0	0	0	--
Wells	73.1	0	0	0	--
Fortymile Wash	-22.4*	-0.13	-0.22	69	99