Stratigraphic inferences derived from borehole data of Tertiary basin-filling rocks of the Pahrump Valley basin, Nevada and California

By Donald S. Sweetkind[1], Emily Taylor[1], and Heather Putnam[2]

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Abstract

This report summarizes the results from the compilation and interpretation of lithologic information from 266 driller's logs from the Pahrump Valley, NV-CA. Borehole records for the Pahrump Valley were selected from a total of several thousand available well logs as those having lithologic data and high confidence in the well locations. Driller's descriptions were reduced into one of 14 lithologic categories to produce a set of subsurface data that were internally consistent and amenable to contouring. Using the lithologic descriptors, the aggregate thickness of general lithologic types (coarse grained material, fine grained material, limestone, and volcanic material) were computed for each borehole. These data were used to compute ratios such as percent coarse-grained component of sedimentary rocks penetrated in each borehole that could be contoured.

Introduction

Management decisions regarding limited ground-water resources in the desert southwestern U.S. require knowledge of the stratigraphy and material properties of Cenozoic basin-filling rocks that are often covered with young alluvial material. Of interest is the development of methodologies for the rapid compilation and interpretation of readily available subsurface information. This report assembles the available drill-hole lithologic data for the basin-filling rocks in the Pahrump Valley, NV-CA, augmented with limited field data. Compilation and interpretation of these data represent the initial step in developing a three-dimensional understanding of the geometry and properties of the subsurface materials within this basin.

Agricultural and residential development in the Pahrump Valley has resulted in the drilling of many water wells from which lithologic information is available. This report summarizes the results from the compilation and interpretation of lithologic information from 266 driller's logs from the Pahrump Valley, NV-CA. These data were augmented by outcrop observations of alluvial fan material in Wheeler Wash, an incised drainage on the east side of the valley. This area was chosen for its relatively close spacing of boreholes and because the location of many of these boreholes at the transition from alluvial fan to basin-axis made it likely that distinct lithologic successions from each depositional environment could be recognized. This report develops a methodology for characterizing lithologic changes and variations in subsurface material properties based on analysis of lithologic information from driller's logs from wells in the Pahrump Valley.

Physiographic and Geologic Setting

The Pahrump Valley is an alluvial basin along the Nevada-California border that covers about 2700 square kilometers in Nye and Clark Counties, NV, and Inyo and San Bernardino Counties, CA (fig. 1). The Spring Mountains are the dominant topographic feature on the northeastern and eastern borders of the basin. The topographically lower Montgomermy Mountains, the Nopah Range, and the Kingston Range bound the basin to the northwest, west, and southwest, respectively. The Pahrump Valley is a closed basin with no surface outflows.

All of the ranges that surround the Pahrump Valley are composed of Paleozoic and Late Proterozoic carbonate and clastic rocks (Longwell and others, 1965; Burchfiel and others, 1974; Burchfiel and others, 1982; 1983). In addition, the Kingston Range contains a large Tertiary granitic pluton (Calzia and others, 2000). Surficial geologic maps show that the uppermost basin-fill consists of unconsolidated coarse-grained alluvial materials that have been deposited near the sides of the valley and fine-grained basin axis, playa, and spring and associated marsh or wetland deposits that occupy the central parts of the valley (Malmberg, 1967; Lundstrom and others, in press; Page and others, in press). The northeastern side of the basin is characterized by large alluvial fans, the most prominent of which are the coalesced Pahrump and the Manse Fans (fig. 1) (Malmberg, 1967; Harrill, 1986).

The right-lateral Pahrump-Stewart Valley Fault Zone (Stewart and others, 1968; Stewart and Crowell, 1992) roughly parallels the California-Nevada boundary through Stewart Valley and Pahrump Valley (PSV, fig. 2). Quaternary deposits almost everywhere bury the fault zone (Hoffard, 1991; Workman and others, 2002). Gravity data show that the fault is associated with complex variations in the elevation of the Paleozoic-Tertiary contact (Blakely and others, 1998; Blakely and others, 1999). The fault zone forms a buried transpressional bedrock ridge separating two steep-sided, probably fault-bounded basins (Wright, 1989; Blakely and others, 1998). The well data described in this report all come from the part of the Pahrump basin that lies to the northeast of the fault zone. The relatively shallow wells described here test only the upper parts of what may be kilometers-deep Tertiary basins adjacent to the fault zone (Blakely and others, 1998; Blakely and others, 1999).

The other structural features of interest for this part of the Pahrump basin are the range-front faults on the western side of the Spring Mountains. These faults include the West Spring Mountains Fault (WSM, fig. 2) (Hoffard, 1991; Piety, 1994; Anderson and others, 1995) and the Grapevine Fault (GV, fig. 2) (Burchfiel and others, 1983). These faults have predominantly normal, dip-slip, west-side-down offset; the West Spring Mountains Fault has documented Quaternary offset (Hoffard, 1991; Piety, 1994; Anderson and others, 1995). These faults lie mostly to the east of the wells discussed in this report. A single well at the northern end of Pahrump Valley lies on the east side of the West Spring Mountains Fault; all of the four outcrop stations are located east of the West Spring Mountains Fault.

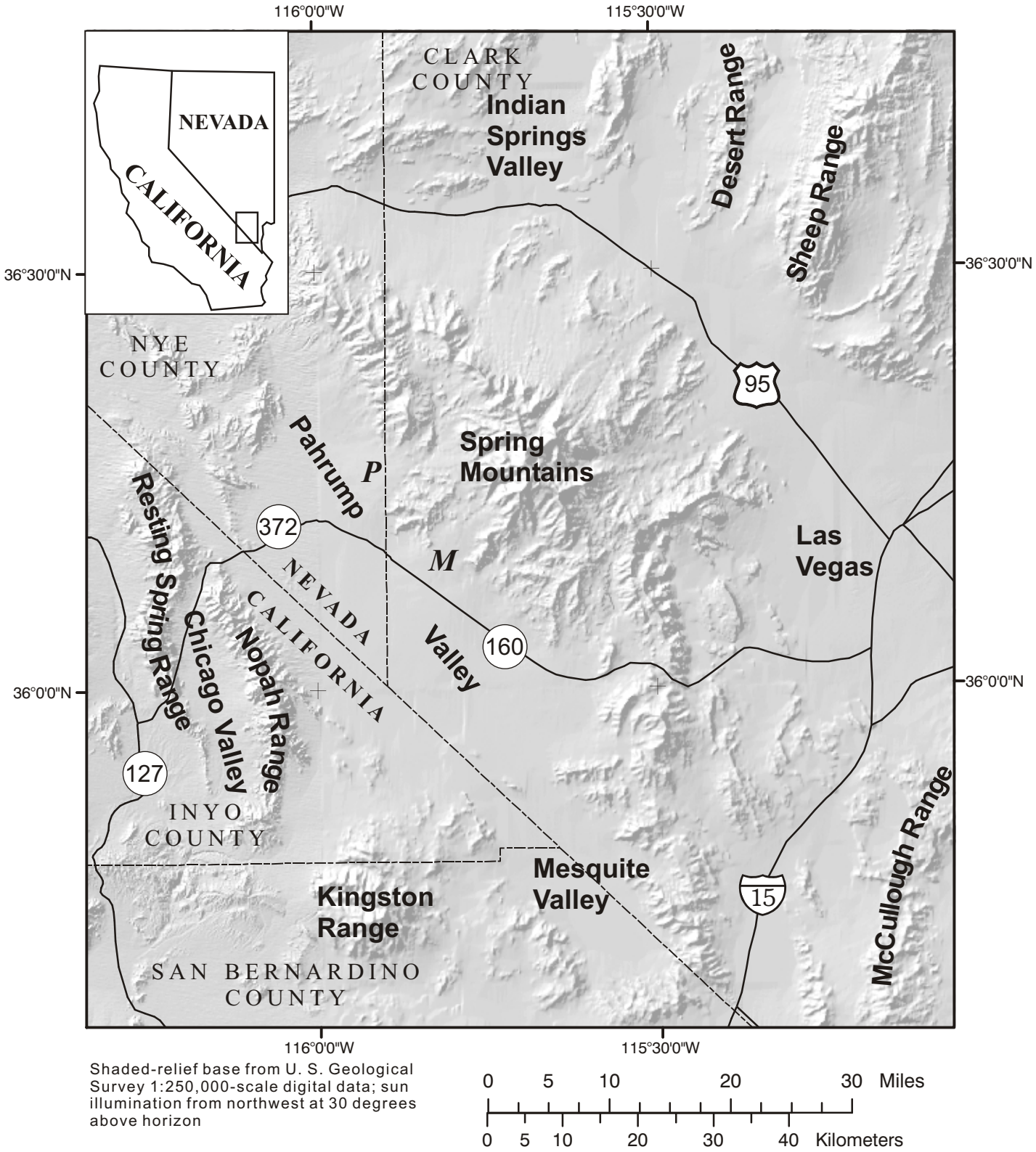

Figure 1. Location map of the Pahrump Valley. Location of the Pahrump and Manse fans are denoted by P and M, respectively.

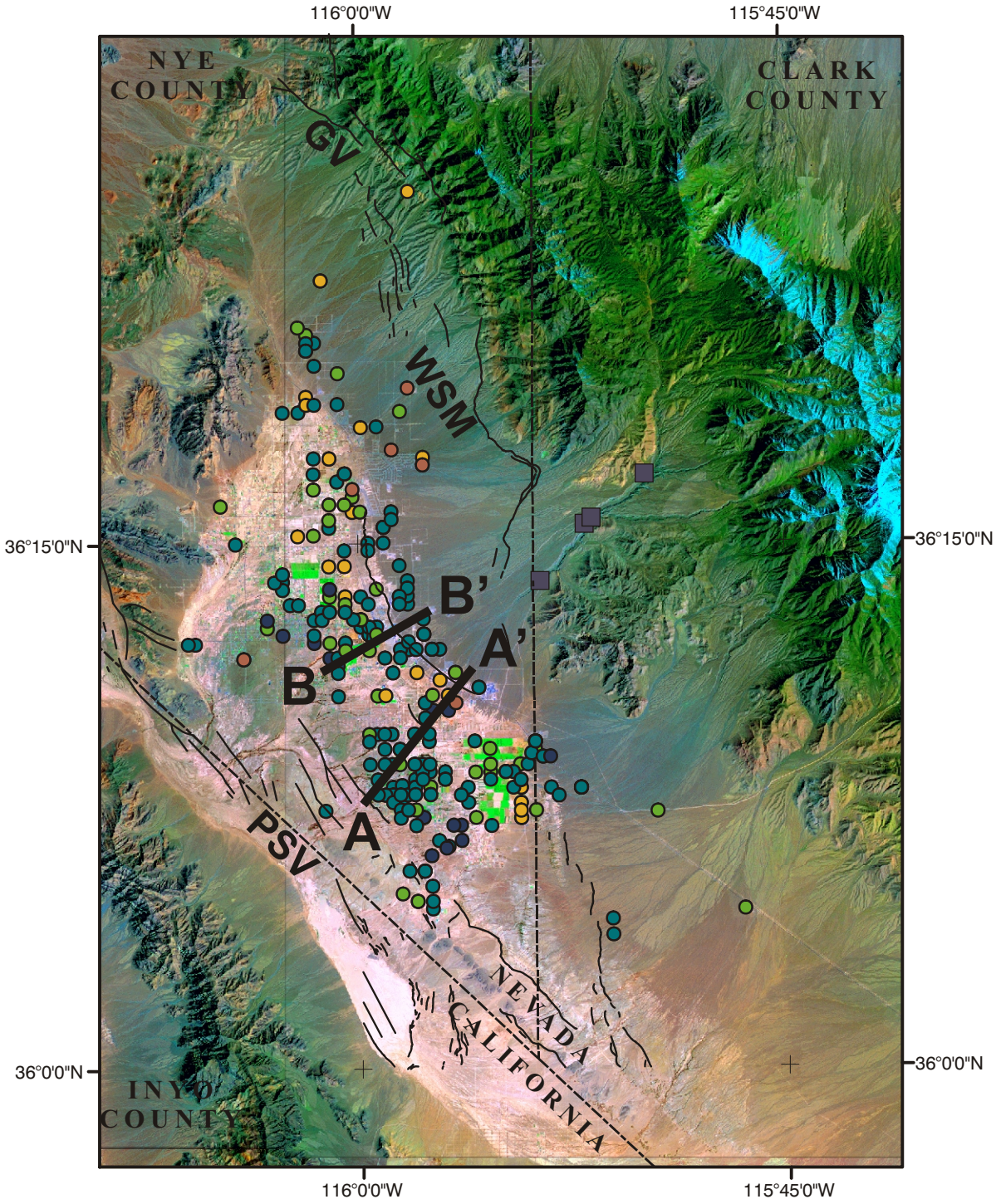

Figure 2. Location map of boreholes (circles) and outcrop stations (blue squares) in Pahrump Valley used in this study. Stratigraphic sections A-A' and B-B' are shown in figure 3. Locations of West Spring Mountains fault (WSM), Grapevine fault (GV), and Pahrump-Stewart Valley fault (PSV) after Anderson and others (1995) and Workman and others (2002).

Methods of Study

Borehole data

More than 700 borehole records for the Pahrump basin were acquired from the State of Nevada Engineer's Office. These records were selected from a total of several thousand well logs as those having lithologic data and high confidence in the well locations. These records were further reduced to a data set of 266 boreholes, using the procedures described below, to produce a set of subsurface data that were internally consistent and amenable to contouring.

Paper borehole records were transcribed into digital files. Data that were transcribed from the driller's logs include well name, owner, location, total depth, water table elevation, and a series of downhole intervals for which the elevation of the top and bottom of the interval and the lithologic description for each interval was recorded. Borehole locations as reported in Section, Township, Range format were converted to latitude and longitude and easting and northing (in UTM meters, using UTM zone 11, NAD 27 coordinates). Borehole collar elevations were assigned by intersecting the collar location with a grid based on a USGS 7.5' digital elevation model of the area.

From the initial set of more than 700 logs for the Pahrump basin, several criteria were used to reduce the number of holes. Boreholes were chosen to provide a broad spatial distribution, include the deepest boreholes, include holes with the most continuous data, and include those holes that were representative of a closely spaced group of boreholes. Wells drilled into the basin-fill aquifer range from several tens of meters to more than 300 meters deep (fig. 2). With the exception of one or two wells near the margin of the basin, the wells do not fully penetrate the basin fill. Most boreholes less than 90 m were discarded; care was taken to ensure that this did not result in data gaps. Holes were discarded where the borehole location was uncertain, for example, where a hole could not be located to greater precision than a full section. Holes were discarded where lithologic information was unavailable or where there were large intervals that lacked lithologic descriptions. Table 1 contains location data for the resulting boreholes; figure 2 shows their location in Pahrump Valley.

Table 1. Location and depth of Pahrump Valley boreholes

[Data are compiled from the State of Nevada, Division of Water Resources, Well Driller's Reports; Easting and northing are in UTM meters, using UTM zone 11, NAD 27 coordinates; corrected thickness is computed by subtracting from the total depth of the hole any intervals that lacked lithologic descriptions and intervals described as soil]

Index	Well name	Easting (UTM m)	Northing (UTM m)	Total depth (m)	Corrected depth (m)
1	PB10033	594469	3999910	91.4	89.3
2	PB10059	592137	3998282	111.3	111.3
3	PB10088	592082	4001086	93.6	93.6
4	PB1013	589546	4014402	199.6	199.6
5	PB10142	582589	4013871	155.4	154.5
6	PB1024	590016	4007535	93.0	90.6
7	PB10274	590000	4009138	125.0	125.0
8	PB10369	581285	4006587	167.9	146.7
9	PB10371	591649	4001883	129.8	128.9
10	PB10402	591649	4001883	110.9	109.1
11	PB10403	590874	4001874	121.9	121.3
12	PB10456	593847	3992661	92.0	90.8
13	PB10641	596026	4001529	137.8	130.2
14	PB10706	586284	4008669	99.1	97.6
15	PB10770	592899	3999492	117.3	117.3
16	PB10792	587540	4007880	121.9	120.7
17	PB10916	591728	3999079	124.7	122.9
18	PB10918	592202	3999177	106.4	105.8
19	PB10920	591691	4000281	106.4	106.4
20	PB1093	599225	4001534	222.5	221.6
21	PB10951	588385	4005886	106.7	70.1
22	PB10952	587552	4006678	106.7	70.1
23	PB10953	593834	4003138	106.7	70.1
24	PB10954	594634	4003147	106.7	68.2
25	PB10977	588813	4005489	106.7	70.1
26	PB11018	599225	4001534	137.2	137.2
27	PB11205	590840	4007544	91.4	90.2
28	PB11301	595678	3999091	106.7	105.5
29	PB11348	585872	4009897	99.1	93.0
30	PB11478	599225	4001534	198.7	55.4
31	PB11806	590445	4007139	128.0	126.8
32	PB11973	588352	4009121	184.4	182.9
33	PB12038	599229	4001133	222.5	217.0
34	PB12163	593703	3999100	152.4	152.4
35	PB12187	585877	4009466	128.6	124.0
36	PB12494	592526	4006360	91.4	91.4
37	PB12761	589201	4006695	106.7	105.5
38	PB12762	591715	4005119	106.7	98.8
39	PB12763	588809	4005890	106.7	105.5
40	PB12765	588817	4005089	106.7	105.2
41	PB12928	592526	4006360	91.4	91.4
42	PB12996	593669	3999901	91.4	91.1

Table 1. Location and depth of Pahrump Valley boreholes – Continued.

[Data are compiled from the State of Nevada, Division of Water Resources, Well Driller's Reports; Easting and northing are in UTM meters, using UTM zone 11, NAD 27 coordinates; corrected thickness is computed by subtracting from the total depth of the hole any intervals that lacked lithologic descriptions and intervals described as soil]

Index	Well name	Easting (UTM m)	Northing (UTM m)	Total depth (m)	Corrected depth (m)
43	PB12999	592101	4006355	91.4	90.5
44	PB13014	587495	4012348	198.1	167.6
45	PB13351	596245	4004366	91.4	89.6
46	PB13425	593265	4000297	91.4	90.8
47	PB14191	585072	4007455	243.8	152.4
48	PB14429	593627	4001503	91.4	89.6
49	PB14886	593414	4002733	106.7	105.2
50	PB14887	593405	4003534	106.7	104.3
51	PB14888	588348	4009521	167.6	149.9
52	PB15366	583382	4011876	91.7	90.8
53	PB1588	598439	4000323	204.2	204.2
54	PB16088	583839	4005810	91.4	90.5
55	PB16112	596869	3999905	152.4	152.4
56	PB16144	590441	4007540	96.3	94.8
57	PB16282	597668	3999914	122.5	121.6
58	PB16283	591332	3998675	91.4	88.4
59	PB1664	598478	3999091	227.1	216.7
60	PB1702	598487	3998290	242.3	204.2
61	PB1826	589134	4010731	234.4	234.4
62	PB18551	598478	3999091	243.8	243.8
63	PB1880	590453	4006307	192.6	162.2
64	PB1900	586672	4012309	262.1	253
65	PB19077	595712	3998290	106.7	105.5
66	PB1923	595029	4003552	326.1	324
67	PB1933	589554	4013601	261.2	228.6
68	PB19508	588830	4003856	106.7	106.4
69	PB2109	589542	4014803	335.9	335.9
70	PB2114	588328	4016424	181.4	177.1
71	PB2135	596864	4000306	153.9	153.9
72	PB21572	592522	4006760	121.9	121.9
73	PB21613	591732	3998679	91.4	90.2
74	PB22211	587548	4007079	121.9	121.9
75	PB22728	588739	4015195	123.1	121.6
76	PB2308	596120	3997493	155.4	154.2
77	PB2309	580910	4006583	91.4	90.8
78	PB23093	590012	4007936	121.9	120.1
79	PB23480	589176	4009129	249.9	249.6
80	PB25276	598487	3998290	246.9	246.3
81	PB257	587098	4019678	227.4	227.4
82	PB2640	593707	3998700	152.7	150.3
83	PB26840	590445	4007139	91.4	91.4
84	PB26870	590903	4003908	152.4	152.1

Table 1. Location and depth of Pahrump Valley boreholes – Continued.

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Index	Well name	Easting (UTM m)	Northing (UTM m)	Total depth (m)	Corrected depth (m)
85	PB26880	596245	4004366	106.7	105.5
86	PB2703	596830	4001137	180.4	172.8
87	PB2760	592507	3998687	106.7	104.0
88	PB27606	585448	4009862	96.0	96.0
89	PB27616	595012	4005154	153.9	153.9
90	PB27617	595012	4005154	153.9	153.9
91	PB27621	593345	3997494	100.0	100.0
92	PB2774	590445	4007139	119.5	119.5
93	PB28189	593345	3997494	160.0	60.0
94	PB28192	592926	4006364	121.9	121.9
95	PB28415	588311	4010723	226.2	226.2
96	PB28424	593246	4016105	281.9	281.9
97	PB2871	585868	4010298	112.8	101.8
98	PB29418	601652	3999097	104.9	100.6
99	PB29438	592865	4000293	91.4	90.2
100	PB29817	589134	4015631	182.9	182.9
101	PB2985	585068	4007855	91.4	60.9
102	PB3011	598068	3999918	100.6	100.6
103	PB3075	588360	4008320	91.4	91.4
104	PB30978	598839	4000328	91.4	91.4
105	PB3166	589126	4013997	163.7	161.9
106	PB32328	591328	4003913	274.3	274.3
107	PB32663	590441	4007540	91.4	90.2
108	PB32959	585900	4007062	91.4	53.3
109	PB3314	599291	3997898	153.0	153.0
110	PB33981	592030	4010792	109.7	108.5
111	PB33992	592047	4009159	91.4	90.2
112	PB3445	592848	4001895	91.4	89.9
113	PB35236	588747	4019294	103.6	103.6
114	PB35716	591193	4011985	91.4	91.4
115	PB3580	589180	4008729	198.1	176.5
116	PB36142	588348	4009521	106.7	49.1
117	PB3634	589134	4015631	149.4	148.2
118	PB36494	593400	3994660	91.4	42.6
119	PB3720	593623	4001903	100.6	97.3
120	PB37635	594473	3999509	91.4	91.4
121	PB37975	593269	3999897	91.4	91.4
122	PB38493	598496	3997489	91.4	91.4
123	PB3855	588315	4012756	155.4	79.2
124	PB40165	592454	4020164	353.6	353.6
125	PB4020	598078	3999087	139.0	131.4

Table 1. Location and depth of Pahrump Valley boreholes – Continued.

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Index	Well name	Easting (UTM m)	Northing (UTM m)	Total depth (m)	Corrected depth (m)
126	PB4023	588166	3997810	140.2	120.4
127	PB41083	591185	4012817	99.1	99.1
128	PB41147	598473	3999492	124.4	124.4
129	PB41224	587518	4022517	143.3	137.8
130	PB41936	594174	4006378	97.5	97.5
131	PB41957	598473	3999492	216.4	92.0
132	PB44192	601652	3999097	109.7	109.7
133	PB44193	601652	3999097	109.7	109.7
134	PB44640	591185	4012817	99.1	99.1
135	PB44689	592051	4008758	105.2	105.2
136	PB4469	593767	3995465	121.9	68.6
137	PB4508	599225	4001534	219.5	214
138	PB45153	587530	4021315	114.3	114.3
139	PB45214	600077	3999109	91.4	91.4
140	PB4533	594625	4003948	249.9	243.8
141	PB46904	587858	4025817	292.6	292.6
142	PB47289	592462	4009995	120.7	120.7
143	PB47448	592475	4008763	106.7	106.7
144	PB47843	587090	4022944	151.5	151.5
145	PB47846	591600	4013622	116.4	116.4
146	PB4789	587488	4015583	106.7	103.7
147	PB4792	586682	4018841	140.2	138.4
148	PB4793	587102	4019246	234.1	227.1
149	PB4926	587504	4016415	106.7	82.9
150	PB50907	593400	3994660	91.4	88.4
151	PB5092	596873	3999505	152.4	141.7
152	PB51228	586662	4023340	157.0	157.0
153	PB51521	590924	3999471	121.9	120.7
154	PB52055	593308	4007971	111.3	111.3
155	PB52056	593342	4007170	103.6	103.6
156	PB53304	590370	4011976	91.4	84.7
157	PB5393	585859	4018833	143.3	140.3
158	PB5590	592964	4005132	238.7	238.7
159	PB58064	588756	4020927	152.4	152.4
160	PB5846	588327	4013989	155.4	155.4
161	PB5848	587496	4014782	152.4	152.4
162	PB58960	592471	4009194	103.6	103.6
163	PB60808	593342	4007170	96.0	96.0
164	PB61022	587094	4022512	131.1	120.4
165	PB6175	588311	4013157	157.0	157.0
166	PB61843	593266	4016506	233.2	233.2

Table 1. Location and depth of Pahrump Valley boreholes – Continued.

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Index	Well name	Easting (UTM m)	Northing (UTM m)	Total depth (m)	Corrected depth (m)
167	PB61844	593246	4016105	306.3	306.3
168	PB62094	599032	4000915	104.2	103.0
169	PB62096	599225	4001534	100.6	99.3
170	PB62097	599634	4000737	91.4	91.4
171	PB62099	599634	4000737	91.4	87.7
172	PB62130	600034	4000742	91.4	67.0
173	PB62208	601652	3999097	115.2	115.2
174	PB62211	601652	3999097	115.8	115.8
175	PB62214	600482	3998682	115.2	115.2
176	PB6261	593665	4000302	97.5	96.3
177	PB62653	597668	3999914	122.5	121.3
178	PB62932	590374	4011576	121.9	110.9
179	PB63198	590819	4009547	153.9	153.9
180	PB63205	590844	4007143	182.9	175.9
181	PB63280	589184	4008328	91.4	91.4
182	PB63291	590012	4007936	91.4	91.4
183	PB6475	591332	3998675	121.9	121.9
184	PB64821	593750	4006373	91.4	91.4
185	PB6510	590012	4007936	201.8	182.0
186	PB65583	589982	4018074	248.4	248.4
187	PB68452	589612	4007932	91.4	91.4
188	PB68455	593750	4006373	91.4	91.4
189	PB69403	591616	4016889	306.3	306.3
190	PB6942	594473	3999509	144.8	144.8
191	PB69514	583839	4005810	310.9	310.9
192	PB69572	589184	4008328	121.9	121.9
193	PB69742	591185	4012817	99.4	99.4
194	PB69743	591185	4012817	108.2	108.2
195	PB70982	592043	4018927	210.3	210.3
196	PB7132	593801	4003939	201.8	201.8
197	PB7138	589205	4006294	182.9	182.9
198	PB72598	587098	4022112	121.9	121.9
199	PB72977	593342	4007170	91.4	91.4
200	PB73033	592467	4009595	100.6	100.6
201	PB73078	592903	3999092	91.4	91.4
202	PB73120	591605	4013222	114.3	114.3
203	PB73124	590805	4018113	114.3	114.3
204	PB73669	592047	4009159	96.6	96.6
205	PB73694	593750	4006373	109.7	109.7
206	PB73695	592051	4008758	100.6	100.6
207	PB73698	591282	4005915	129.5	129.5

Table 1. Location and depth of Pahrump Valley boreholes – Continued.

[Data are compiled from the State of Nevada, Division of Water Resources, Well Driller's Reports; Easting and northing are in UTM meters, using UTM zone 11, NAD 27 coordinates; corrected thickness is computed by subtracting from the total depth of the hole any intervals that lacked lithologic descriptions and intervals described as soil]

Index	Well name	Easting (UTM m)	Northing (UTM m)	Total depth (m)	Corrected depth (m)
208	PB738	589126	4011563	135.6	135.6
209	PB7398	592865	4000293	139.0	139.0
210	PB7436	587526	4019250	137.2	137.2
211	PB7477	592907	3998691	236.2	236.2
212	PB7490	592941	3997890	152.4	152.4
213	PB75057	593342	4007170	106.7	106.7
214	PB7515	590403	4008741	114.3	114.3
215	PB7516	591282	4001078	120.4	120.4
216	PB7695	591737	3998278	121.9	121.9
217	PB7740	590474	4001870	182.9	182.9
218	PB7750	587936	4008315	121.9	121.9
219	PB7833	596069	3999896	167.6	167.6
220	PB7933	592141	3997882	138.7	138.7
221	PB7934	592082	4001086	105.2	105.2
222	PB8263	593707	3998700	149.4	149.4
223	PB829	594192	4004745	242.3	242.3
224	PB8339	588328	4016424	246.3	246.3
225	PB8356	590516	4000268	128.0	128.0
226	PB8438	587098	4022112	128.3	128.3
227	PB8579	586708	4008673	121.9	121.9
228	PB8587	593809	3993863	128.0	128.0
229	PB8705	592950	3997058	97.5	97.5
230	PB8750	592090	4000285	167.6	167.6
231	PB884	598496	3997489	259.4	259.4
232	PB8949	587965	4007884	121.9	121.9
233	PB8976	592145	3997450	121.9	121.9
234	PB9004	593042	3993053	121.9	121.9
235	PB9067	592132	3998683	134.1	134.1
236	PB9180	592903	3999092	121.9	121.9
237	PB9214	598491	3997889	290.2	290.2
238	PB9231	590933	3998670	121.9	121.9
239	PB9238	591274	4001879	105.2	105.2
240	PB9273	592238	3993446	152.4	152.4
241	PB9274	588360	4008320	128.6	128.6
242	PB9278	592600	3994651	121.9	121.9
243	PB9284	593843	3993062	121.9	121.9
244	PB9324	593042	3993053	152.4	152.4
245	PB9366	590479	4001470	92.4	92.4
246	PB9472	592106	4005924	147.8	147.8
247	PB9474	588377	4006687	160.0	160.0
248	PB9679	592541	3997886	98.1	98.1
249	PB9697	591291	4000276	93.0	93.0

Table 1. Location and depth of Pahrump Valley boreholes – Continued.

[Data are compiled from the State of Nevada, Division of Water Resources, Well Driller's Reports; Easting and northing are in UTM meters, using UTM zone 11, NAD 27 coordinates; corrected thickness is computed by subtracting from the total depth of the hole any intervals that lacked lithologic descriptions and intervals described as soil]

Index	Well name	Easting (UTM m)	Northing (UTM m)	Total depth (m)	Corrected depth (m)
250	PB9795	593299	3999496	121.9	121.9
251	PB9968	589953	4013605	152.4	152.4
252	PB9969	592907	3998691	104.2	104.2
253	PB8424	603334	3992182	121.9	120.7
254	PB8749	603369	3991351	99.1	97.2
255	PB29095	596925	3997070	97.5	97.5
256	PB9475	595325	3997083	147.8	74.0
257	PB10806	594662	3995967	121.9	121.9
258	PB10850	594158	3996270	137.2	137.2
259	PB62403	595358	3996283	60.9	60.7
260	PB48671	594563	3995873	54.9	53.6
261	PB52765	594925	3997079	57.9	57.9
262	PB4213	595307	3998686	160.0	146.3
263	PB50732	605692	3997880	204.2	204.2
264	PB62542	610332	3992761	152.4	152.4
265	PB61021	592468	4030549	272.5	261.8
266	PB46904	587858	4025817	289.6	289.6
267	02DS04 (outcrop)	599432	4010025	12.3	12.3
268	02DS05 (outcrop)	602098	4013373	24.0	24.0
269	02DS06 (outcrop)	601851	4013146	39.0	39.0
270	02DS07 (outcrop)	604958	4015705	35.0	35.0

Data acquired from drilling records require tedious filtering to provide descriptions that are consistent and geologically meaningful. Lithologic descriptions were simplified into one of 14 categories (table 2). This process is by necessity interpretive; each field description is interpreted with the knowledge of the geologic units mapped at the surface and the characteristics of the surrounding data. For many of the records, described intervals could easily be assigned to one of the 14 lithologic descriptors, but in certain cases, lithologic descriptions may have been inadequate to make a proper assignment. In other instances, it is possible that more than one lithologic descriptor may have been appropriate. In the absence of cuttings, grain size information is subjective and does not necessarily correspond to standard grain size definitions. Lithologic descriptors were kept as generic as possible; stratigraphic names or names with genetic significance were avoided. One aspect of the lithologic description that was ignored because of the inconsistency of the driller's descriptions was the degree of induration of the sediment. Thus, "gravel" was not distinguished from "conglomerate"; "shale" was not distinguished from "clay". The resulting set of 266 holes contained about 3900 intervals where a geologist was required to make decisions regarding the lithologic identity of the interval. Stratigraphic sections created from multiple borehole logs (fig. 3) show a general consistency in lithologic trends.

Table 2. Lithologic descriptors derived from borehole logs

[Driller's logs were obtained from State of Nevada: State of Nevada, Division of Water Resources, Well Driller's Report]

Lithologic descriptor	Corresponding descriptions from driller's logs
Conglomerate	boulders; boulders & gravel; cement gravel; rock & cement gravel; cemented boulders; cemented gravel; gravel; conglomerate; cemented conglomerate rock; cemented gravel & boulders; cemented rocks & gravel; cemented sand & gravel; cobbles; lime cement gravel; loose gravel
Conglomerate and mudstone	clay & gravel; brown clay mixed with some gravel; clay & boulders; clay & rock; cobbles clay; gravel with clay streaks
Sand and gravel	sand & gravel; cemented rock & sand; coarse sand fine gravel; gravel boulders sand water; loose cobble & sand; sand gravel & cobbles
Sandstone	sand water; cemented sand; coarse sand; fine dark sand; hard sand; hard sand & rock; quartz; quick sand; sand; sand stone
Siltstone	Silt; silty clay
Mudstone	bentonite clay; brown clay; clay; hard clay formation; red shale; soft clay; sticky brown clay; lime shale; red shale & limestone; sandy clay 40% caliche
Sand Mudstone	brown sandy clay; clay & sand; hard shale & sand water; sand & clay; sandstone with shale; sandy clay with gravel
Mudstone and limestone	brown clay & caliche; clay with streaks of caliche; lime & clay
Silty limestone	sandy formation with white rock; sandy lime; sandy loose clay & caliche
Gypsum	gypsum formation
Limestone	caliche; caliche & limestone; cemented limestone; fractured limestone; hard brown caliche; hard calcite; hard gray lime; hard lime shell; hard white layer; lime; limestone; soft white rock formation
Basalt	black rock; black volcanic rock; fractured black rock;
nd	no data; formation unknown; hard formation; ???; cemented gray small trace clay; rock; [blank entry]
Soil	sandy loam; sandy surface; soil; surface; surface soil; top soil; top soil & rock

Outcrop data

Alluvial material of the Pahrump fan is exposed in outcrop in the deeply incised Wheeler Wash, to the east of the Pahrump Valley (fig. 2; see also Malmberg, 1967, fig. 3); outcrops were observed in four localities (fig. 2). These outcrops consist of cliff faces 10-30 m high that expose rocks that have been mapped as older fanglomerate and alluvial fan material (Malberg, 1967; dePolo and others, 1999, Workman and others, 2002). The four observed outcrops all consisted of poorly stratified matrix to clast-supported conglomerate with subordinate thin stringers of finer-grained material.

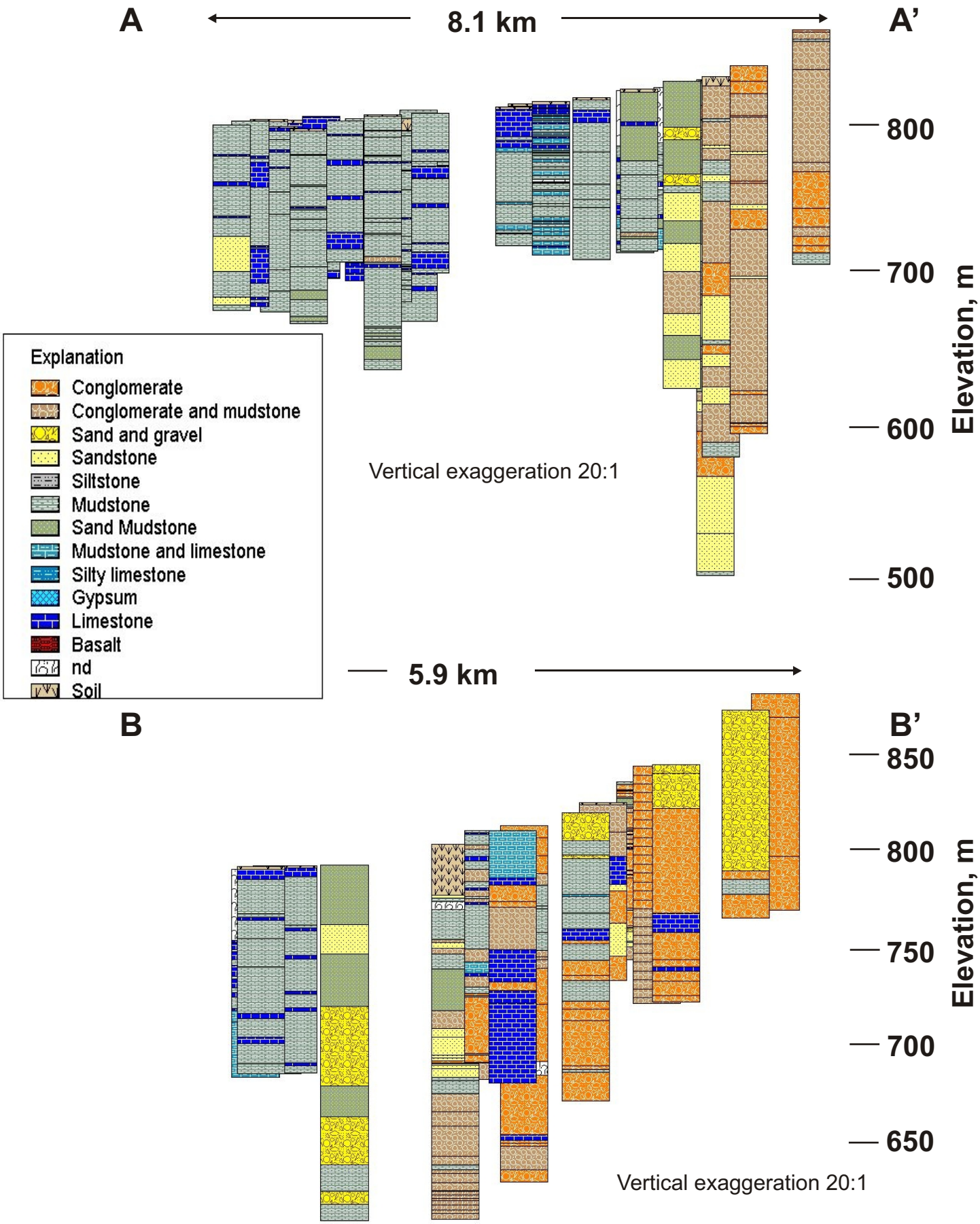

Figure 3. Example stratigraphic sections from the Pahrump Valley. Locations of sections are shown in figure 2. All wells within 1 km of the section are projected onto the line of section.

Lithologic data collected at each outcrop were collected so as to be as comparable as possible to the driller's logs from boreholes. Table 3 presents the outcrop data, including a lithologic descriptor that most closely represents what this material would have been called in a driller's log, plus generalized grain-sized information for both the conglomeratic material and the finer-grained interbeds.

Table 3. Lithologic descriptors derived from outcrops in Wheeler Wash

Name	Lithologic description	Clast size in coarse fan material	Clast size in fine grained interbeds	Distance from toe of fan (km)
02DS04	Conglomerate	2-8 cm, average 5 cm	0.5-2 cm, average 1 cm	7.4
02DS05	Conglomerate	1-10 cm, average 4 cm	0.5-2 cm, average 1 cm	11.3
02DS06	Conglomerate	2-4 cm, average 3 cm	0.2-1 cm clasts in sand-sized matrix	11.6
02DS07	Sand and gravel	1-5 cm, average 2 cm	0.5 cm to sand	15.3

Calculations

From the above data, the following aggregate thicknesses were computed for all of the lithologic intervals in each borehole and outcrop locality (table 4):

Corrected Thickness: This value was computed by subtracting from the total depth of the hole any intervals that lacked lithologic descriptions and intervals described as soil in the uppermost portions of the hole. The resulting corrected thickness represents those intervals of the hole that penetrated bedrock units for which lithologic descriptions were available.

Thickness of coarse grained material: The total thickness of coarse grained material in each hole was calculated as the aggregate thickness of all lithologic intervals described as conglomerate, sand and gravel, sandstone, or tuffaceous sandstone.

Thickness of fine grained material: The total thickness of fine grained material in each hole was calculated as the aggregate thickness of all lithologic intervals described as conglomerate and mudstone, siltstone, mudstone, sand mudstone, or mudstone and limestone.

Thickness of limestone: The total thickness of carbonate material in each hole was calculated as the aggregate thickness of all lithologic intervals described as limestone or silty limestone.

Thickness of volcanic material: The total thickness of volcanic material was calculated as the aggregate thickness of all lithologic intervals described as tuff, welded tuff, or basalt. In the Pahrump Valley, these descriptors only applied to less than ten wells.

From these thickness data, the following percentages were computed for each borehole and outcrop locality (table 4):

Percent sedimentary rock component is calculated as (Thickness of coarse grained material+ Thickness of fine grained material+ Thickness of limestone)/Corrected thickness (fig. 4);

Percent coarse grained material in the sedimentary component is calculated as

$$\frac{\text{(Thickness of coarse grained material)}}{\text{(Thickness of coarse grained material+ Thickness of fine grained material+ Thickness of limestone)}}$$

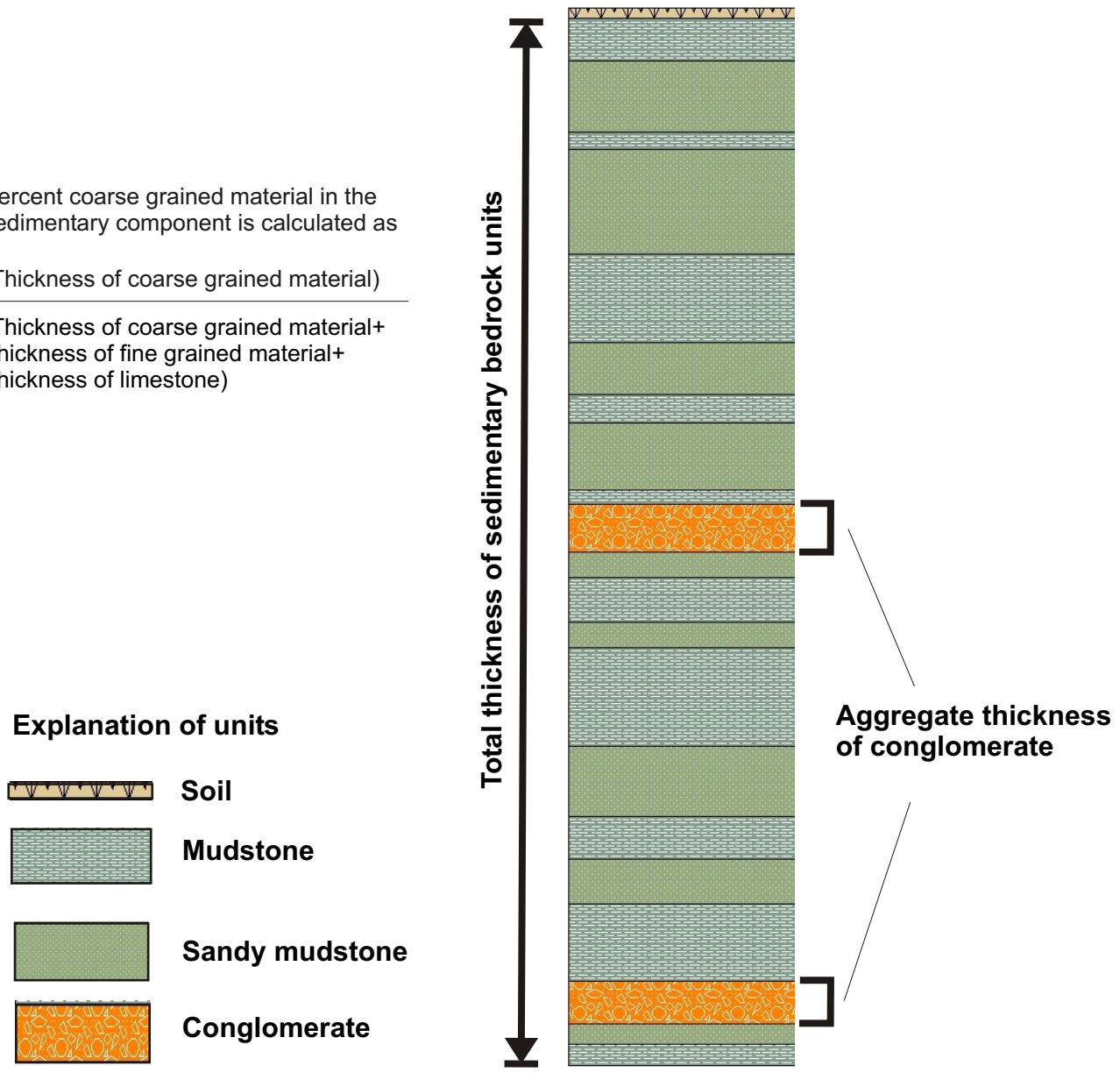

Figure 4. Sample borehole showing methodology for calculation of coarse grained sedimentary component.

Percent volcanic rock component is calculated as Thickness of volcanic material/corrected thickness;

Percent limestone is calculated as (limestone thickness/corrected thickness);

Percent coarse grained material in the sedimentary component is calculated as (Thickness of coarse grained material /(Thickness of coarse grained material+ Thickness of fine grained material+ Thickness of limestone).

Table 4. Lithologic data from Pahrump Valley boreholes

[Data are compiled from the State of Nevada, Division of Water Resources, Well Driller's Reports]

Index	Thickness of volcanic rock (m)	Thickness of coarse grained sedimentary rocks (m)	Thickness of fine grained sedimentary rocks (m)	Limestone thickness (m)	Percent Volcanic rocks	Percent Sedimentary rocks	Percent limestone	Percent coarse grained sedimentary rocks
1	0	0	85.6	3.7	0	100	4.1	0
2	0	0.6	105.9	4.8	0	100	4.3	0.5
3	0	0	84.7	8.9	0	100	9.5	0
4	0	199.6	0	0	0	100	0	100
5	0	24.3	128.7	1.5	0	100	1	15.7
6	0	7.7	73.7	9.2	0	100	10.2	8.5
7	0	28.1	75.7	21.2	0	100	17	22.5
8	0	33	78.2	35.5	0	100	24.2	22.5
9	0	3.3	98.2	27.4	0	100	21.3	2.6
10	0	0	86.7	22.4	0	100	20.5	0
11	0	0	85.7	35.6	0	100	29.3	0
12	0	1.2	86.5	3.1	0	100	3.4	1.3
13	0	0	121.7	8.5	0	100	6.5	0
14	0	1.9	87.8	7.9	0	100	8.1	1.9
15	0	0	90.9	26.4	0	100	22.5	0
16	0	0	113.3	7.4	0	100	6.1	0
17	0	0	82.1	40.8	0	100	33.2	0
18	0	0	69.1	36.7	0	100	34.7	0
19	0	0	51.7	54.7	0	100	51.4	0
20	0	142	79.6	0	0	100	0	64.1
21	0	0	48.2	21.9	0	100	31.2	0
22	0	6.1	29.3	34.7	0	100	49.5	8.7
23	0	0	54	16.1	0	100	23	0
24	0	0	62.7	5.5	0	100	8.1	0
25	0	0	56.5	13.6	0	100	19.4	0
26	0	51.8	85.4	0	0	100	0	37.8
27	0	2.5	76.1	11.6	0	100	12.9	2.8
28	0	0	96.6	8.9	0	100	8.4	0
29	0	2.1	90.9	0	0	100	0	2.3
30	32.2	22.3	0.9	0	58.1	41.9	0	96.1
31	0	9.5	111.6	5.7	0	100	4.5	7.5

Table 4. Lithologic data from Pahrump Valley boreholes – Continued.

[Data are compiled from the State of Nevada, Division of Water Resources, Well Driller's Reports]

Index	Thickness of volcanic rock (m)	Thickness of coarse grained sedimentary rocks (m)	Thickness of fine grained sedimentary rocks (m)	Limestone thickness (m)	Percent Volcanic rocks	Percent Sedimentary rocks	Percent limestone	Percent coarse grained sedimentary rocks
32	0	2.7	138	42.2	0	100	23.1	1.5
33	0	171.4	45.6	0	0	100	0	79
34	2.7	0	126.3	23.4	1.8	98.2	15.4	0
35	0	1.2	87.2	35.6	0	100	28.7	1
36	0	82.8	8.6	0	0	100	0	90.6
37	0	0	91.6	13.9	0	100	13.2	0
38	0	24.4	74.4	0	0	100	0	24.7
39	0	0	93	12.5	0	100	11.8	0
40	0	0	92.8	12.4	0	100	11.8	0
41	0	69	21.8	0.6	0	100	0.7	75.5
42	0	0	41.4	49.7	0	100	54.6	0
43	0	49.6	26.8	14.1	0	100	15.6	54.8
44	0	0	167.6	0	0	100	0	0
45	0	68.2	21.4	0	0	100	0	76.1
46	0	0	88.1	2.7	0	100	3	0
47	0	0	152.4	0	0	100	0	0
48	0	0	86.5	3.1	0	100	3.5	0
49	0	0	97.2	8	0	100	7.6	0
50	0	0	101.8	2.5	0	100	2.4	0
51	0	0.6	148.6	0.7	0	100	0.5	0.4
52	0	7.9	82.9	0	0	100	0	8.7
53	0	39.1	165.1	0	0	100	0	19.1
54	0	0	89.9	0.6	0	100	0.7	0
55	0	0	146.3	6.1	0	100	4	0
56	0	9.4	85.4	0	0	100	0	9.9
57	0	5.2	116.4	0	0	100	0	4.3
58	0	2.1	78.7	7.6	0	100	8.6	2.4
59	0	54.7	162	0	0	100	0	25.2
60	0	51.5	152.7	0	0	100	0	25.2
61	0	121.6	112.8	0	0	100	0	51.9
62	0	52.7	191.1	0	0	100	0	21.6
63	0	29.5	132.7	0	0	100	0	18.2
64	0	26.5	216.2	10.3	0	100	4.1	10.5
65	0	2.4	103.1	0	0	100	0	2.3
66	0	178.7	145.3	0	0	100	0	55.2
67	0	54.2	154.3	20.1	0	100	8.8	23.7
68	0	3.6	90.8	12	0	100	11.3	3.4
69	0	212.9	123	0	0	100	0	63.4

Table 4. Lithologic data from Pahrump Valley boreholes – Continued.

[Data are compiled from the State of Nevada, Division of Water Resources, Well Driller's Reports]

Index	Thickness of volcanic rock (m)	Thickness of coarse grained sedimentary rocks (m)	Thickness of fine grained sedimentary rocks (m)	Limestone thickness (m)	Percent Volcanic rocks	Percent Sedimentary rocks	Percent limestone	Percent coarse grained sedimentary rocks
70	0	61.9	112.8	2.4	0	100	1.4	35
71	0	0	153.9	0	0	100	0	0
72	0	77.7	44.2	0	0	100	0	63.7
73	0	0	81.6	8.6	0	100	9.5	0
74	0	22.2	99.7	0	0	100	0	18.2
75	0	0	121.6	0	0	100	0	0
76	0	39.6	114.6	0	0	100	0	25.7
77	0	31.5	59.3	0	0	100	0	34.7
78	0	15	102.7	2.4	0	100	2	12.5
79	0	92	152.1	5.5	0	100	2.2	36.9
80	0	22.1	224.2	0	0	100	0	9
81	0	213.4	14	0	0	100	0	93.8
82	0	0	90.5	59.8	0	100	39.8	0
83	0	12.2	76.2	3	0	100	3.3	13.3
84	0	0	135	17.1	0	100	11.2	0
85	0	105.5	0	0	0	100	0	100
86	0	3	168.9	0.9	0	100	0.5	1.7
87	0	0	82.1	21.9	0	100	21.1	0
88	0	16.8	71.9	7.3	0	100	7.6	17.5
89	0	48.7	105.2	0	0	100	0	31.6
90	0	48.7	105.2	0	0	100	0	31.6
91	0	0	40.6	59.4	0	100	59.4	0
92	0	33.3	79.3	6.9	0	100	5.8	27.9
93	0	0	42.8	17.2	0	100	28.7	0
94	0	109.6	0	12.3	0	100	10.1	89.9
95	0	50.3	141.1	34.8	0	100	15.4	22.2
96	0	281.9	0	0	0	100	0	100
97	0	0	96.2	5.6	0	100	5.5	0
98	0	100.6	0	0	0	100	0	100
99	0	0	76.2	14	0	100	15.5	0
100	0	62.8	98.6	21.5	0	100	11.8	34.3
101	0	0	54.4	6.5	0	100	10.7	0
102	0	9.7	87.3	3.6	0	100	3.6	9.6
103	0	12.2	67.1	12.1	0	100	13.2	13.3
104	0	18.1	58	15.3	0	100	16.7	19.8

Table 4. Lithologic data from Pahrump Valley boreholes – Continued.

[Data are compiled from the State of Nevada, Division of Water Resources, Well Driller's Reports]

Index	Thickness of volcanic rock (m)	Thickness of coarse grained sedimentary rocks (m)	Thickness of fine grained sedimentary rocks (m)	Limestone thickness (m)	Percent Volcanic rocks	Percent Sedimentary rocks	Percent limestone	Percent coarse grained sedimentary rocks
105	0	64	90.3	7.6	0	100	4.7	39.5
106	0	1.5	268.9	3.9	0	100	1.4	0.5
107	0	3	83.5	3.7	0	100	4.1	3.3
108	0	0	53.3	0	0	100	0	0
109	0	52.1	100.9	0	0	100	0	34.1
110	0	100.6	7.9	0	0	100	0	92.7
111	0	50.6	39.6	0	0	100	0	56.1
112	0	0	67	22.9	0	100	25.5	0
113	0	67.6	36	0	0	100	0	65.3
114	0	91.4	0	0	0	100	0	100
115	0	18.3	153.4	4.8	0	100	2.7	10.4
116	0	0	35.8	13.3	0	100	27.1	0
117	0	70.7	77.5	0	0	100	0	47.7
118	0	0	31.2	11.4	0	100	26.8	0
119	0	0	85.1	12.2	0	100	12.5	0
120	0	0	60.6	30.8	0	100	33.7	0
121	0	0	60.8	30.6	0	100	33.5	0
122	0	41.5	47.1	2.8	0	100	3.1	45.4
123	0	5.5	71.3	2.4	0	100	3	6.9
124	1.6	120.4	231.6	0	0.5	99.5	0	34.2
125	0	0.9	130.5	0	0	100	0	0.7
126	0	0	116.1	4.3	0	100	3.6	0
127	0	76.2	21.7	1.2	0	100	1.2	76.9
128	0	18.6	98.9	6.9	0	100	5.5	15
129	9.1	25	103.7	0	6.6	93.4	0	19.4
130	0	97.5	0	0	0	100	0	100
131	0	35.6	16.8	39.6	0	100	43	38.7
132	0	18.3	91.4	0	0	100	0	16.7
133	0	12.2	97.5	0	0	100	0	11.1
134	0	76.3	22.8	0	0	100	0	77
135	0	34.5	70.7	0	0	100	0	32.8
136	0	0	40.9	27.7	0	100	40.4	0
137	0	171.4	42.6	0	0	100	0	80.1
138	0	114.3	0	0	0	100	0	100
139	0	19.7	70.2	1.5	0	100	1.6	21.6
140	0	82.9	160.9	0	0	100	0	34
141	10.7	259.1	22.8	0	3.7	96.3	0	91.9
142	0	27.5	93.2	0	0	100	0	22.8
143	7.3	61.9	37.5	0	6.8	93.2	0	62.3

Table 4. Lithologic data from Pahrump Valley boreholes – Continued.

[Data are compiled from the State of Nevada, Division of Water Resources, Well Driller's Reports]

Index	Thickness of volcanic rock (m)	Thickness of coarse grained sedimentary rocks (m)	Thickness of fine grained sedimentary rocks (m)	Limestone thickness (m)	Percent Volcanic rocks	Percent Sedimentary rocks	Percent limestone	Percent coarse grained sedimentary rocks
144	0	151.5	0	0	0	100	0	100
145	4.3	88.6	23.5	0	3.7	96.3	0	79
146	0	14.1	89.6	0	0	100	0	13.6
147	0	45.8	92.6	0	0	100	0	33.1
148	0	39.4	185.3	2.4	0	100	1.1	17.3
149	0	3.9	77.8	1.2	0	100	1.4	4.7
150	0	0	73.7	14.7	0	100	16.6	0
151	0	0	140.1	1.6	0	100	1.1	0
152	0	157	0	0	0	100	0	100
153	0	0	116	4.7	0	100	3.9	0
154	0	111.3	0	0	0	100	0	100
155	0	103.6	0	0	0	100	0	100
156	0	15.9	68.8	0	0	100	0	18.8
157	0	74.7	13.7	51.9	0	100	37	53.2
158	0	131.2	107.5	0	0	100	0	55
159	0	152.4	0	0	0	100	0	100
160	0	22.3	121.2	11.9	0	100	7.7	14.4
161	0	4.6	129.3	18.5	0	100	12.1	3
162	0	54.8	48.8	0	0	100	0	52.9
163	0	54.2	41.8	0	0	100	0	56.5
164	45.7	6	51.9	16.8	38	62	14	8
165	0	0	157	0	0	100	0	0
166	0	76.2	157	0	0	100	0	32.7
167	0	146.3	160	0	0	100	0	47.8
168	0	26.8	76.2	0	0	100	0	26
169	0	18.6	80.1	0.6	0	100	0.6	18.7
170	0	0	91.4	0	0	100	0	0
171	0	5.4	82.3	0	0	100	0	6.2
172	0	32.3	34.7	0	0	100	0	48.2
173	0	11.6	103.6	0	0	100	0	10.1
174	0	115.8	0	0	0	100	0	100
175	0	115.2	0	0	0	100	0	100
176	0	0	93.9	2.4	0	100	2.5	0
177	0	3.5	112.4	5.4	0	100	4.5	2.9
178	0	62.2	48.7	0	0	100	0	56.1
179	0	109.7	44.2	0	0	100	0	71.3
180	0	111.9	61	3	0	100	1.7	63.6
181	0	0	80.2	11.2	0	100	12.3	0
182	0	3.9	82	5.5	0	100	6	4.3

Table 4. Lithologic data from Pahrump Valley boreholes – Continued.

[Data are compiled from the State of Nevada, Division of Water Resources, Well Driller's Reports]

Index	Thickness of volcanic rock (m)	Thickness of coarse grained sedimentary rocks (m)	Thickness of fine grained sedimentary rocks (m)	Limestone thickness (m)	Percent Volcanic rocks	Percent Sedimentary rocks	Percent limestone	Percent coarse grained sedimentary rocks
183	0	0	77.4	44.5	0	100	36.5	0
184	0	19.8	71.6	0	0	100	0	21.7
185	0	66.1	115.9	0	0	100	0	36.3
186	0	121.9	114.3	12.2	0	100	4.9	49.1
187	0	0	91.4	0	0	100	0	0
188	0	0	91.4	0	0	100	0	0
189	0	0	306.3	0	0	100	0	0
190	0	0	144.8	0	0	100	0	0
191	0	0	310.9	0	0	100	0	0
192	0	0	121.9	0	0	100	0	0
193	0	0	99.4	0	0	100	0	0
194	0	0	108.2	0	0	100	0	0
195	0	0	210.3	0	0	100	0	0
196	0	0	201.8	0	0	100	0	0
197	0	0	182.9	0	0	100	0	0
198	0	0	121.9	0	0	100	0	0
199	0	0	91.4	0	0	100	0	0
200	0	0	100.6	0	0	100	0	0
201	0	0	91.4	0	0	100	0	0
202	0	0	114.3	0	0	100	0	0
203	0	0	114.3	0	0	100	0	0
204	0	0	96.6	0	0	100	0	0
205	0	0	109.7	0	0	100	0	0
206	0	0	100.6	0	0	100	0	0
207	0	0	129.5	0	0	100	0	0
208	0	0	135.6	0	0	100	0	0
209	0	0	139	0	0	100	0	0
210	0	0	137.2	0	0	100	0	0
211	0	0	236.2	0	0	100	0	0
212	0	0	152.4	0	0	100	0	0
213	0	0	106.7	0	0	100	0	0
214	0	0	114.3	0	0	100	0	0
215	0	0	120.4	0	0	100	0	0
216	0	0	121.9	0	0	100	0	0
217	0	0	182.9	0	0	100	0	0
218	0	0	121.9	0	0	100	0	0
219	0	0	167.6	0	0	100	0	0
220	0	0	138.7	0	0	100	0	0
221	0	0	105.2	0	0	100	0	0
222	0	0	149.4	0	0	100	0	0

Table 4. Lithologic data from Pahrump Valley boreholes – Continued.

[Data are compiled from the State of Nevada, Division of Water Resources, Well Driller's Reports]

Index	Thickness of volcanic rock (m)	Thickness of coarse grained sedimentary rocks (m)	Thickness of fine grained sedimentary rocks (m)	Limestone thickness (m)	Percent Volcanic rocks	Percent Sedimentary rocks	Percent limestone	Percent coarse grained sedimentary rocks
223	0	0	242.3	0	0	100	0	0
224	0	0	246.3	0	0	100	0	0
225	0	0	128	0	0	100	0	0
226	0	0	128.3	0	0	100	0	0
227	0	0	121.9	0	0	100	0	0
228	0	0	128	0	0	100	0	0
229	0	0	97.5	0	0	100	0	0
230	0	0	167.6	0	0	100	0	0
231	0	0	259.4	0	0	100	0	0
232	0	0	121.9	0	0	100	0	0
233	0	0	121.9	0	0	100	0	0
234	0	0	121.9	0	0	100	0	0
235	0	0	134.1	0	0	100	0	0
236	0	0	121.9	0	0	100	0	0
237	0	0	290.2	0	0	100	0	0
238	0	0	121.9	0	0	100	0	0
239	0	0	105.2	0	0	100	0	0
240	0	0	152.4	0	0	100	0	0
241	0	0	128.6	0	0	100	0	0
242	0	0	121.9	0	0	100	0	0
243	0	0	121.9	0	0	100	0	0
244	0	0	152.4	0	0	100	0	0
245	0	0	92.4	0	0	100	0	0
246	0	0	147.8	0	0	100	0	0
247	0	0	160	0	0	100	0	0
248	0	0	98.1	0	0	100	0	0
249	0	0	93	0	0	100	0	0
250	0	0	121.9	0	0	100	0	0
251	0	0	152.4	0	0	100	0	0
252	0	0	104.2	0	0	100	0	0
253	0	60.7	60	0	0	100	0	50.3
254	0	46.6	47.2	3.4	0	100	3.4	48
255	0	0	86.3	11.3	0	100	11.6	0

Table 4. Lithologic data from Pahrump Valley boreholes – Continued.

[Data are compiled from the State of Nevada, Division of Water Resources, Well Driller's Reports]

Index	Thickness of volcanic rock (m)	Thickness of coarse grained sedimentary rocks (m)	Thickness of fine grained sedimentary rocks (m)	Limestone thickness (m)	Percent Volcanic rocks	Percent Sedimentary rocks	Percent limestone	Percent coarse grained sedimentary rocks
256	0	22.3	50.9	0.9	0	100	1.2	30
257	0	82.3	36.3	3.4	0	100	2.8	67.5
258	0	0	130.5	6.7	0	100	4.9	0
259	0	1.2	55.5	4	0	100	6.5	2
260	0	0	52.1	1.5	0	100	2.8	0
261	0	0	17.7	40.2	0	100	69.5	0
262	0	0	142.9	3.4	0	100	2.3	0
263	0	36.9	167.3	0	0	100	0	18.1
264	0	12.5	139.9	0	0	100	0	8.2
265	0	126.2	118.9	16.8	0	100	6.4	48.2
266	10.7	228.6	50.3	0	3.7	96.3	0	82
267	0	12.25	0	0	0	100	0	100
268	0	24	0	0	0	100	0	100
269	0	39	0	0	0	100	0	100
270	0	35	0	0	0	100	0	100

Compositional Trends

The basin-filling rocks of the Pahrump basin are almost entirely composed of sedimentary rocks. Only two boreholes, out of 266, were initially interpreted as containing more than a few percent volcanic rocks, based on driller's descriptions: well PB11478 and well PB61022 (table 2). Well PB11478 reportedly intercepted about 16 m of "fractured, black rock" between 172 and 188 m depth; this was interpreted to correspond to basalt. This well is located along the southern edge of the Pahrump fan, 3 km from outcrops of Paleozoic limestone. Based on proximity to bedrock outcrops and an absence of any detectable aeromagnetic anomaly (Blakely and others, 2000), it is likely that this borehole intercepted dark-colored Paleozoic limestone bedrock at depth. Well PB61022 reportedly intercepted 46 m of "hard granite" between 10 and 56 m depth. This well is located at the north end of the Pahrump Valley; no tuffs are known to crop out in the vicinity. A possible interpretation is that the "hard granite" represents coarse colluvial material derived from the Late Proterozoic Johnnie Formation and Stirling Quartzite that crop out on the northwestern flank of the Spring Mountains.

The basin filling sediments are divided between coarse-grained sedimentary rocks of the Manse and Pahrump fans on the eastern and northeastern flank of the basin, and fine-grained siliciclastic rocks and limestone along the basin axis to the southwest (fig. 5). Borehole lithologic data from the coarse-grained fan are nearly lacking; only the fan toe is well represented by borehole data. Lithologic data were contoured (fig. 5) using a hybrid routine that combines triangulation and inverse distance methods, giving equal weight to both routines. The boundary between coarse-grained and fine-grained rocks mimics the shape and location of the currently mapped toe of the fan (Malmberg, 1967; Lundstrom and others, in press; Page and others, in press). In detail, the transition from alluvial fan to basin-axis deposits is characterized by complex interfingering of coarse-grained and fine-grained rocks (fig. 3). Within the fine-grained sediments along the basin axis, individual beds of limestone are not readily correlated, even over short distances (fig. 3).

Summary

Driller's logs from water wells in the Pahrump Valley, NV-CA provide a readily available source of subsurface information. Driller's descriptions, when converted to a uniform suite of lithologic descriptors, form a reasonably self-consistent set of data that depict the spatial variaibility of rock types within the upper basin fill. Compilation and interpretation of these data represent the initial step in developing a three-dimensional understanding of the geometry and properties of the subsurface materials within this basin.

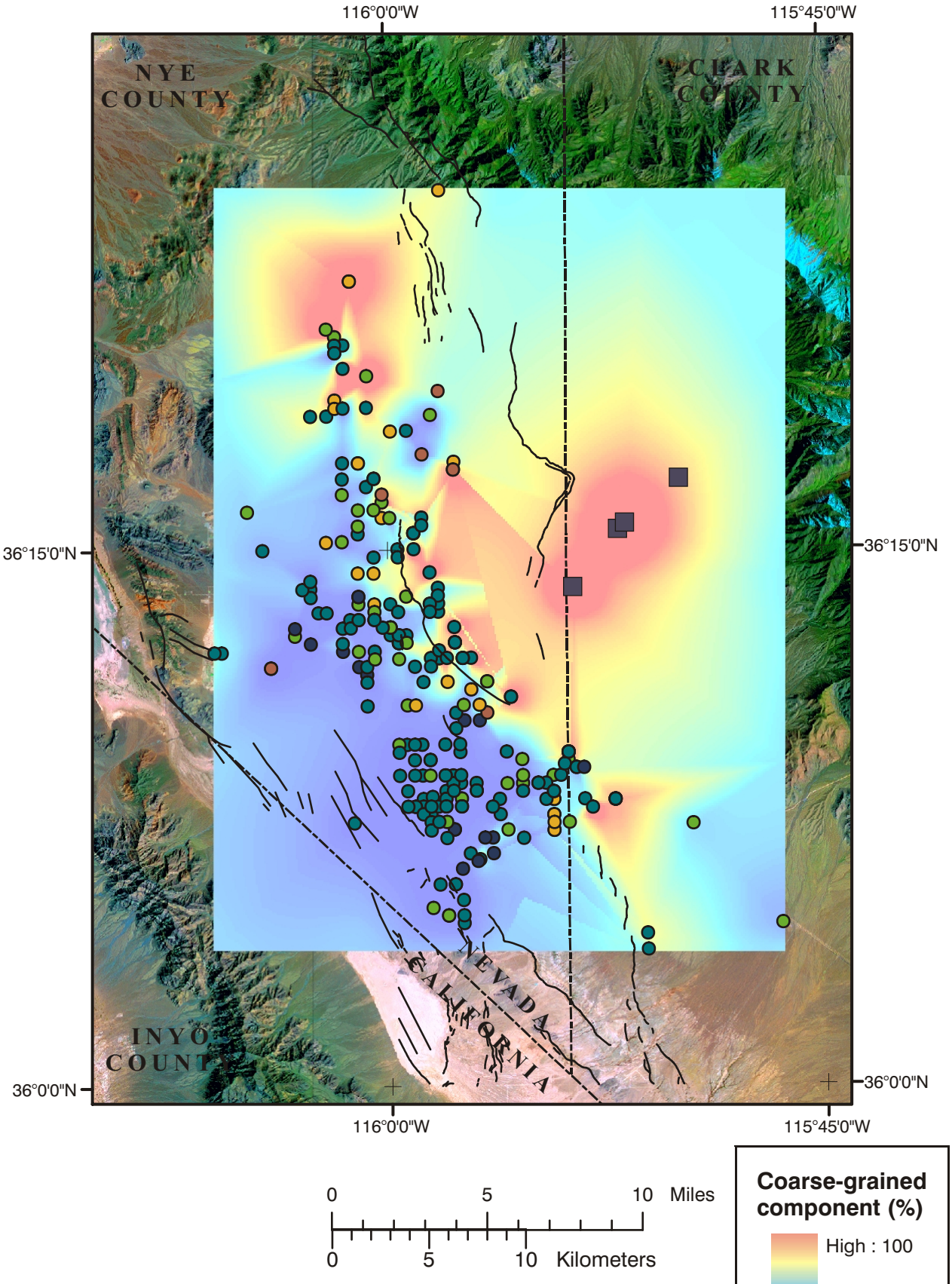

Figure 5. Contoured map showing proportion of coarse-grained rocks (in %) in sedimentary rocks penetrated by boreholes (circles) and outcrop stations (blue squares) in Pahrump Valley. Symbols as in figure 2.

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