

Point Table				
Point #	Northing	Easting	SOIL CPM	SOIL pCi/g
274	1684867.0330	2517558.0710	2371	1.4
275	1684859.9110	2517555.3820	2363	1.4
276	1684850.4720	2517553.1400	2479	1.5
277	1684840.8460	2517550.7770	2424	1.5
278	1684831.2200	2517548.1960	2290	1.4
279	1684821.6100	2517545.7750	2248	1.4
280	1684875.0620	2517551.0160	2424	1.5
281	1684876.5100	2517543.3000	2404	1.5
282	1684878.2440	2517533.4560	2361	1.4
283	1684879.6180	2517523.7330	2496	1.5
284	1684881.1410	2517513.7200	2166	1.3
285	1684882.8030	2517504.0430	1980	1.2
286	1684879.0630	2517560.7780	2417	1.5
287	1684886.4530	2517561.7440	2430	1.5
288	1684896.2460	2517563.5430	2396	1.5
289	1684906.1180	2517565.4220	2397	1.5
290	1684915.7220	2517567.0890	2270	1.4
291	1684925.6460	2517568.8620	1877	1.1
292	1684872.4130	2517566.9510	2529	1.5
293	1684871.5780	2517574.3880	2290	1.4
294	1684868.4530	2517583.6740	2364	1.4
295	1684866.3340	2517593.5010	2282	1.4
296	1684864.4720	2517603.2320	2239	1.3
297	1684862.3230	2517612.9370	2213	1.3

CPM = Counts Per Minute
pCi/g = Picocuries Per Gram

Northing = Feet

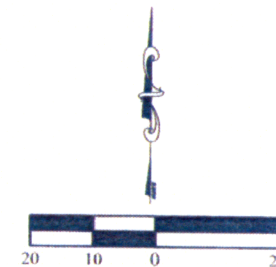
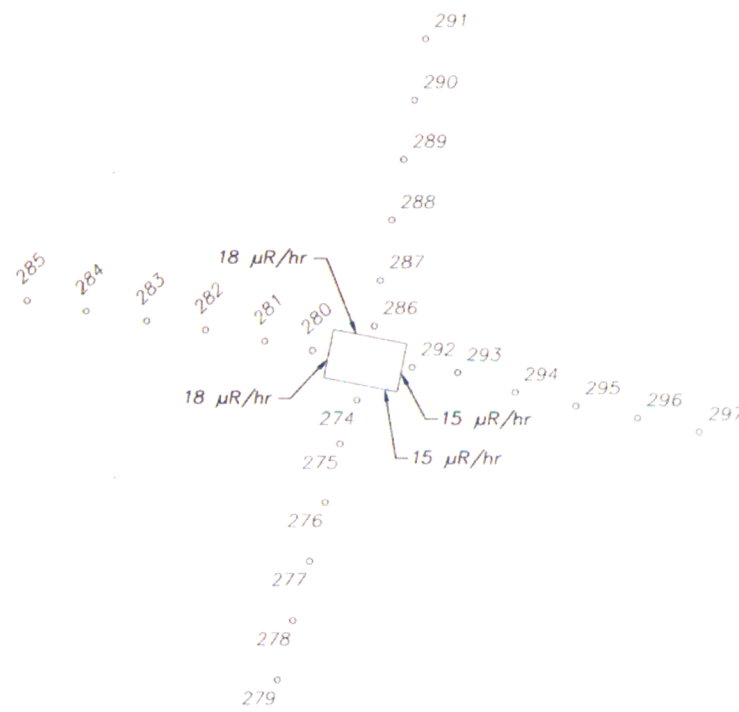
Easting = Feet

μ R/hr = Microrentgens per hour

Building Materials Radiation Readings

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4601 N. BUTLER AVE., SUITE 1101
PASADENA, NEW MEXICO 87401
TEL. (505) 327-1072 FAX (505) 327-1517

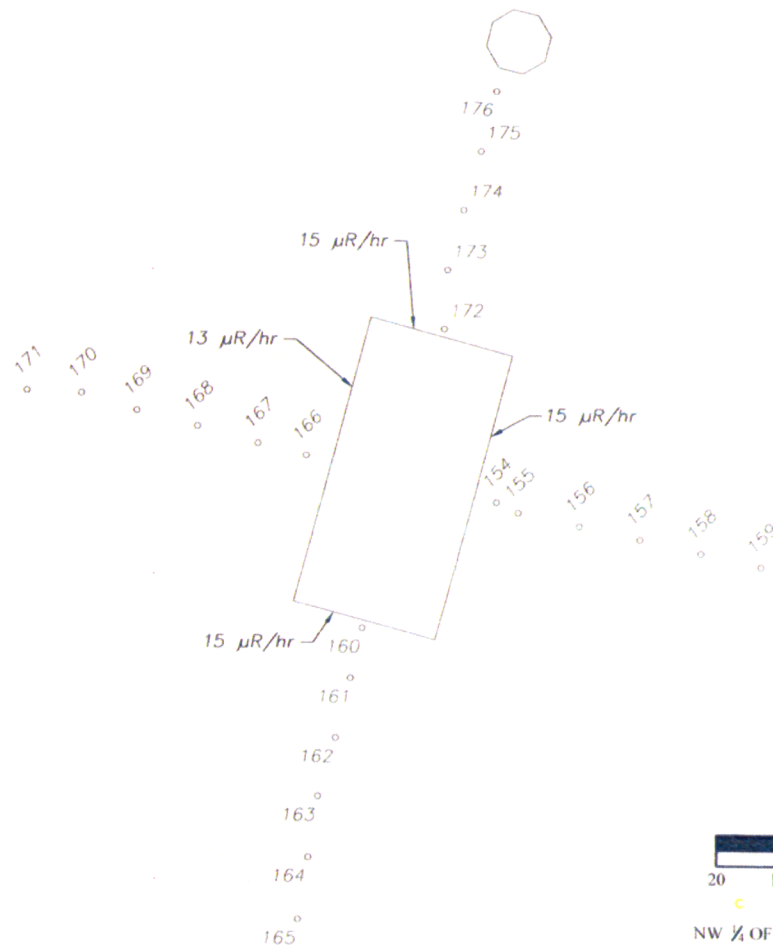


Scale: 1" = 20'
SW ¼ OF SECTION 10, T16N, R16W
NMPM

STRUCTURE: WOODEN SHED		NNEPA LOCATION: 724126 E. 3945563 N		SOIL RADIATION SURVEY PD-027B PINEDALE, NEW MEXICO
PERSONNEL: J. MOORE, A. PICCIRILLO & S. CHAVEZ		WEATHER: SUNNY, BREEZY SURVEY EQUIPMENT: iino [®] iio [®] LEICA		
DATE/TIME: 5/26/09 9:00 AM		DRAWN BY: AAL	DATE: 10/09/09	

Point Table				
Point #	Northing	Easting	CPM	pCi/g
154	1686529.8650	2517847.7970	2110	1.3
155	1686528.1460	2517851.3880	1788	1.0
156	1686525.9960	2517861.0380	1685	1.0
157	1686523.8560	2517870.8020	1825	1.1
158	1686521.6280	2517880.5890	1922	1.1
159	1686519.4790	2517890.3140	2045	1.2
160	1686509.2690	2517825.9400	2461	1.5
161	1686501.1400	2517824.0600	1985	1.2
162	1686491.5000	2517821.6360	1950	1.2
163	1686481.9930	2517818.7780	2082	1.2
164	1686472.1440	2517817.2130	2063	1.2
165	1686462.1120	2517815.6050	1995	1.2
166	1686537.4950	2517816.6530	2475	1.5
167	1686539.4360	2517808.8590	2080	1.2
168	1686542.2010	2517799.2160	1955	1.2
169	1686544.7370	2517789.3540	2078	1.2
170	1686547.5260	2517780.2590	2124	1.3
171	1686547.9030	2517771.2300	2091	1.2
172	1686558.0750	2517839.1640	2107	1.3
173	1686567.6380	2517839.6670	2000	1.2
174	1686577.3480	2517842.2900	2113	1.3
175	1686586.8340	2517845.1090	2039	1.2
176	1686596.4700	2517847.6500	2096	1.3
Obstruction: Missing Data Point-Hogan				

CPM = Counts Per Minute
pCi/g = Picocuries Per Gram
Northing = Feet
Easting = Feet
μR/hr = Microrentgens per hour
Building Materials Radiation Readings



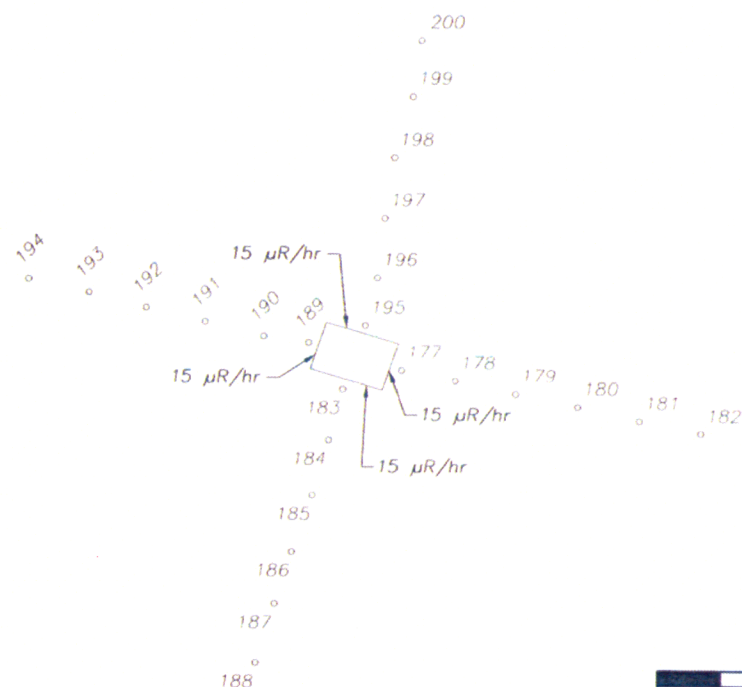
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4801 N. BUTLER AVE., SUITE 1101
FARMINGTON, NEW MEXICO 87401
PH. (505) 327-1072 FAX (505) 327-1517

STRUCTURE: WOODEN FRAMED HOUSE	NNEPA LOCATION: 724214 E, 3946088 N		SOIL RADIATION SURVEY PD-028A PINEDALE, NEW MEXICO
PERSONNEL: J. MOORE, J. JOHNSON, E. ESPLAIN, J. CHARLES, & R. TOWNE	WEATHER: SUNNY, WARM BREEZE SURVEY EQUIPMENT: Ima® Ima® LEICA		
DATE/TIME: 5/28/09 10:25 AM	DRAWN BY: AAL	DATE: 10/09/09	

Point Table				
Point #	Northing	Easting	SOIL CPM	SOIL pCi/g
177	1686493.9670	2517814.9470	2023	1.2
178	1686492.2770	2517823.7300	2063	1.2
179	1686490.1690	2517833.4620	2067	1.2
180	1686488.1150	2517843.2120	1920	1.1
181	1686485.8760	2517852.9880	2119	1.3
182	1686483.8750	2517862.8320	2044	1.2
183	1686490.8640	2517805.5230	1929	1.1
184	1686482.5460	2517803.3010	1989	1.2
185	1686473.5890	2517800.7040	1963	1.2
186	1686464.4090	2517797.4120	1986	1.2
187	1686455.9410	2517794.6970	2024	1.2
188	1686446.4030	2517791.6550	2118	1.3
189	1686498.4580	2517800.0290	1948	1.2
190	1686499.4970	2517792.7590	2115	1.3
191	1686501.8370	2517783.2530	2047	1.2
192	1686504.0830	2517773.5040	2059	1.2
193	1686506.5200	2517763.8830	2128	1.3
194	1686508.7010	2517754.0380	2053	1.2
195	1686501.2790	2517809.0570	1890	1.1
196	1686509.0830	2517810.9800	1951	1.2
197	1686518.7720	2517812.1330	2134	1.3
198	1686528.6180	2517813.6210	2180	1.3
199	1686538.5600	2517816.6410	2079	1.2
200	1686547.5850	2517817.9900	2120	1.3

CPM = Counts Per Minute
pCi/g = Picocuries Per Gram
Northing = Feet
Easting = Feet
μR/hr = Microrentgens per hour
Building Materials Radiation Readings

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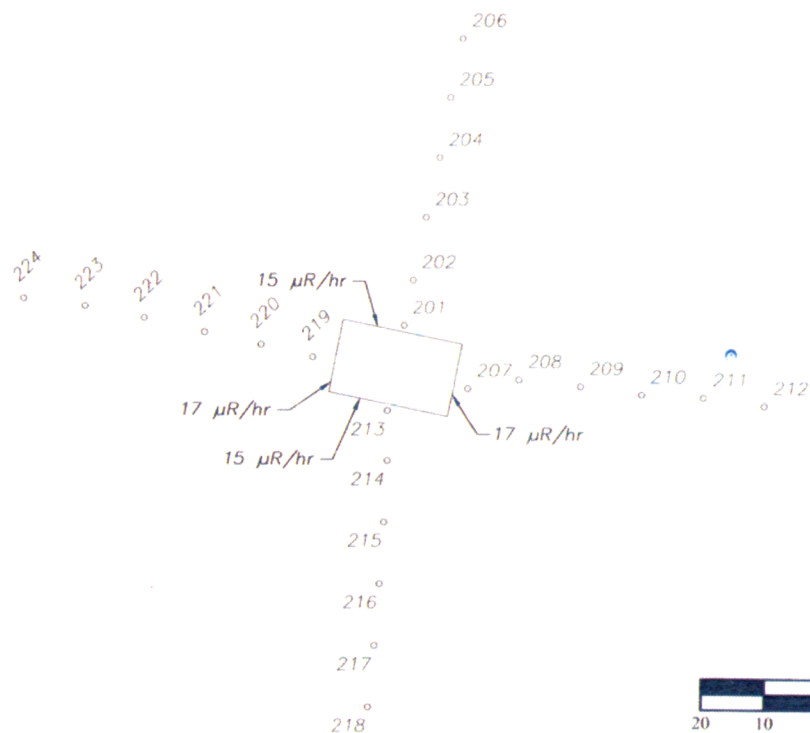
Scale: 1" = 20'

NW ¼ OF SECTION 10, T16N, R16W
NMPM

STRUCTURE: WOODEN BARN SHED	NNEPA LOCATION: 724214 E, 3940088 N		SOIL RADIATION SURVEY	
PERSONNEL: J. MOORE, J. JOHNSON, E. ESPLAIN, J. CHARLES, S. CHAVEZ & R. TOWNE	WEATHER: SUNNY, WARM, LIGHT BREEZE		PD-028B	
DATE/TIME: 5/28/09 11:00 AM	DRAWN BY: AAL	DATE: 10/09/09	PINEDALE, NEW MEXICO	

Point Table				
Point #	Northing	Easting	SOIL CPM	SOIL pCi/g
201	1686479.5950	2517840.5320	1986	1.2
202	1686487.0280	2517842.0330	2002	1.2
203	1686497.1840	2517844.1380	1969	1.2
204	1686506.8990	2517846.3070	1820	1.1
205	1686516.6840	2517848.0180	1885	1.1
206	1686526.2490	2517849.9860	1712	1.0
207	1686469.3620	2517851.0620	2257	1.4
208	1686470.8550	2517859.2390	2121	1.3
209	1686469.8380	2517869.2370	2152	1.3
210	1686468.5710	2517879.0960	2092	1.2
211	1686468.1600	2517888.8330	2070	1.2
212	1686466.8810	2517898.4400	2016	1.2
213	1686465.7200	2517837.7860	2112	1.3
214	1686457.6080	2517837.8160	2014	1.2
215	1686447.6540	2517837.3130	2065	1.2
216	1686437.6690	2517836.6830	1998	1.2
217	1686427.6920	2517835.9260	2002	1.2
218	1686417.7760	2517834.9480	2026	1.2
219	1686474.3250	2517825.5190	2546	1.6
220	1686476.3200	2517817.1960	2037	1.2
221	1686478.2920	2517808.0750	2008	1.2
222	1686480.5510	2517798.2970	1991	1.2
223	1686482.4210	2517788.6190	1899	1.1
224	1686483.6080	2517778.6350	2046	1.2

CPM = Counts Per Minute
pCi/g = Picocuries Per Gram
Northing = Feet
Easting = Feet
μR/hr = Microrentgens per hour
Building Materials Radiation Readings



Scale: 1" = 20'
NW ¼ OF SECTION 10, T16N, R16W
NMPM

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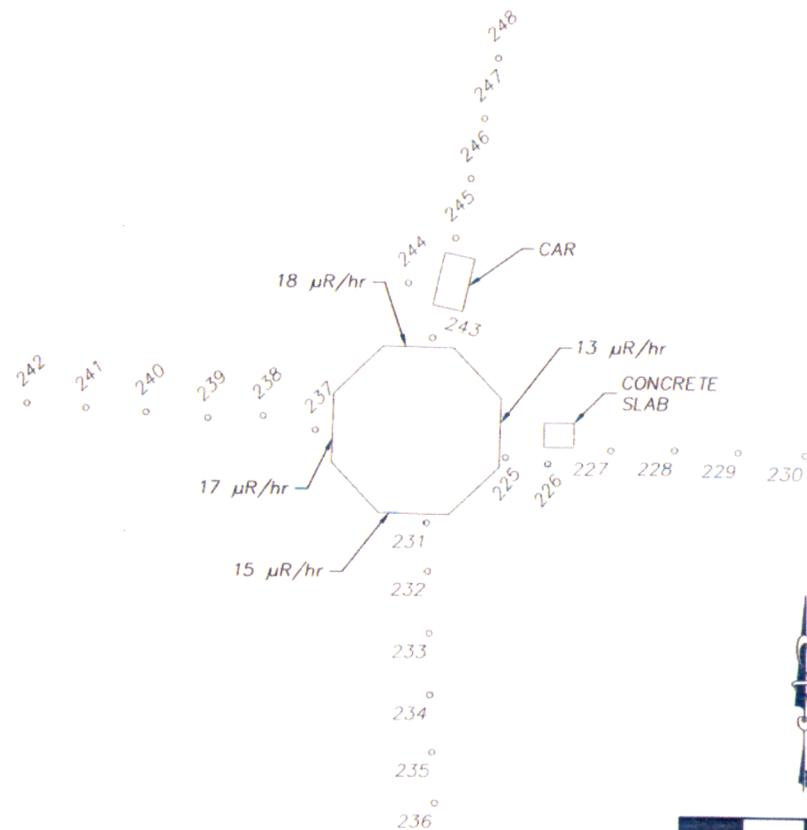
4801 N. BUTLER AVE., SUITE 1101
FARMINGTON, NEW MEXICO 87401
PH. (505) 327-1072 FAX (505) 327-1817

STRUCTURE: WOODEN SHED	NNEPA LOCATION: 724214 E, 3946088 N		SOIL RADIATION SURVEY PD-028C PINEDALE, NEW MEXICO
PERSONNEL: J. MOORE, J. JOHNSON, L. ESPLAIN, J. CHARLES, & R. TOWNE	WEATHER: SUNNY, WARM LIGHT BREEZE SURVEY EQUIPMENT: 1100' ba' LEICA		
DATE/TIME: 5/26/09 11:40 AM	DRAWN BY: AAL	DATE: 10/09/09	

Point Table				
Point #	Northing	Easting	SOIL CPM	SOIL pCi/g
225	1686611.7610	2517870.2470	1810	1.1
226	1686610.7780	2517877.1640	2102	1.3
227	1686613.0250	2517887.2870	2065	1.2
228	1686613.1640	2517897.5140	2025	1.2
229	1686612.9140	2517907.6430	2144	1.3
230	1686612.5710	2517918.1810	2028	1.2
231	1686601.0730	2517857.7460	1977	1.2
232	1686593.2670	2517857.9920	2056	1.2
233	1686583.1530	2517858.3340	1986	1.2
234	1686573.1600	2517858.5420	2041	1.2
235	1686563.8450	2517858.9840	2003	1.2
236	1686555.6030	2517859.4770	2069	1.2
237	1686615.9830	2517839.5950	2058	1.2
238	1686618.2300	2517831.1630	2077	1.2
239	1686617.7810	2517822.1410	2250	1.4
240	1686618.6240	2517812.2110	2114	1.3
241	1686619.1740	2517802.2110	2064	1.2
242	1686619.8420	2517792.4320	2117	1.3
243	1686631.0000	2517858.4330	2048	1.2
244	1686639.7920	2517854.5140	2144	1.3
245	1686647.1560	2517861.8990	2159	1.3
246	1686656.7810	2517864.2470	2029	1.2
247	1686666.5270	2517866.3730	2035	1.2
248	1686676.2270	2517868.5210	2108	1.3

CPM = Counts Per Minute
pCi/g = Picocuries Per Gram
Northing = Feet
Easting = Feet
μR/hr = Microrentgens per hour
Building Materials Radiation Readings

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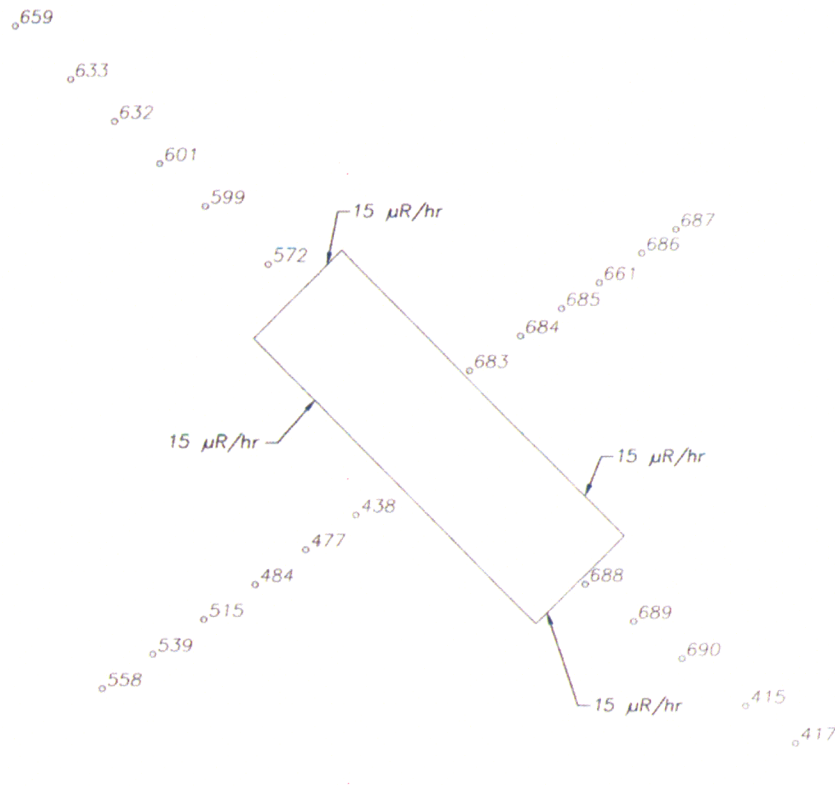


NW ¼ OF SECTION 10, T16N, R16W
NMMP

STRUCTURE: BROWN STUCCO HOGAN	NNEPA LOCATION: 724214 E, 3946088 N		SOIL RADIATION SURVEY PD-029A PINEDALE, NEW MEXICO
PERSONNEL: J. MOORE, J. JOHNSON, E. ESPLAIN, S. CHAVEZ, J. CHARLES, & R. TOWNE	WEATHER: PARTLY CLOUDY, WARM BREEZE SURVEY EQUIPMENT: iina' ba' LEXA		
DATE/TIME: 5/26/09 12:15 PM	DRAWN BY: AAL	DATE: 10/09/09	

Point Table				
Point #	Northing	Easting	SOIL CPM	SOIL pCi/g
683	1687728.3200	2517178.5996	2121	1.3
684	1687733.9513	2517186.8632	2055	1.2
685	1687738.4084	2517193.4037	2009	1.2
661	1687742.5801	2517199.5255	2026	1.2
686	1687747.3552	2517206.5327	2112	1.3
687	1687751.2089	2517212.1877	2217	1.3
688	1687693.6626	2517197.3158	2622	1.6
689	1687687.6569	2517205.3115	2511	1.5
690	1687681.6512	2517213.3072	2207	1.3
415	1687673.9108	2517223.6125	2508	1.5
417	1687667.9051	2517231.6082	2470	1.5
422	1687661.8994	2517239.6040	2162	1.3
438	1687704.8648	2517160.0887	2498	1.5
477	1687699.1540	2517151.8798	2483	1.5
484	1687693.4433	2517143.6708	2497	1.5
515	1687687.7325	2517135.4619	2697	1.7
539	1687682.0217	2517127.2529	2520	1.5
558	1687676.3109	2517119.0440	2480	1.5
572	1687745.3658	2517145.6806	2329	1.4
599	1687754.7185	2517135.5447	2191	1.3
601	1687761.4999	2517128.1954	2160	1.3
632	1687768.2812	2517120.8460	2086	1.2
633	1687775.0626	2517113.4967	1922	1.1
659	1687783.6311	2517104.2106	2067	1.2

CPM = Counts Per Minute
pCi/g = Picocuries Per Gram
Northing = Feet
Easting = Feet
μR/hr = Microrentgens per hour
Building Materials Radiation Readings



Scale: 1" = 20'

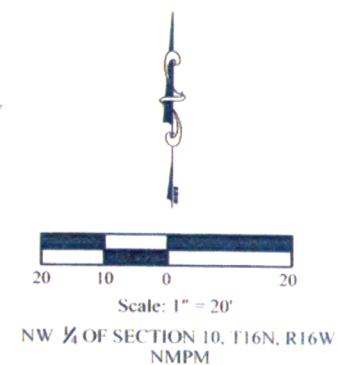
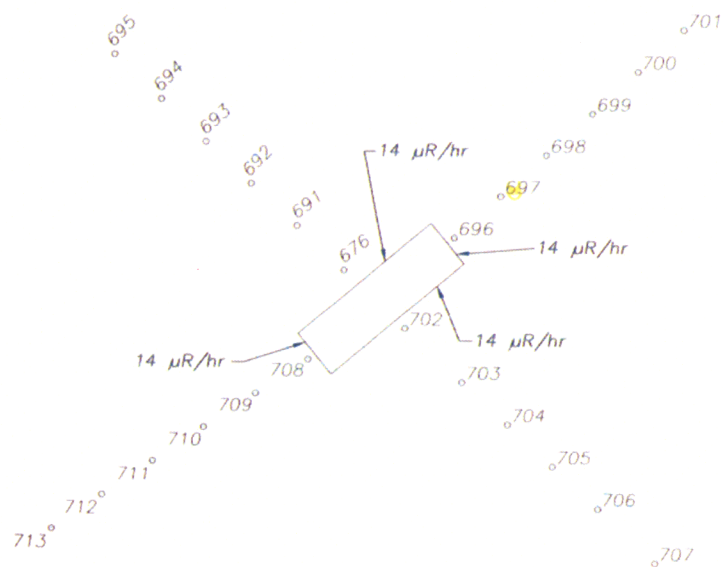
NW ¼ OF SECTION 10, T16N, R16W
NMPM

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STRUCTURE: BEIGE MOBILE HOME	NNEPA LOCATION: 723985 E. 3946463 N		SOIL RADIATION SURVEY PD-030A PINEDALE, NEW MEXICO
PERSONNEL: J. MOORE, A. PICCOLLO, J. JOHNSON, E. ESPLAIN, J. CHARLES, & R. TOWNE	WEATHER: PARTLY, CLOUDY, WARM HUMID, BREEZE SURVEY EQUIPMENT: iino' ba' LEICA		
DATE/TIME: 5/26/09 3:05 PM	DRAWN BY: AAL	DATE: 10/08/09	

Point Table				
Point #	Northing	Easting	SOIL CPM	SOIL pCi/g
676	1688055.3655	2517156.8874	1888	1.1
691	1688062.5569	2517149.2159	2058	1.2
692	1688069.3960	2517141.9202	1966	1.2
693	1688076.2351	2517134.6246	1859	1.1
694	1688083.0742	2517127.3289	1855	1.1
695	1688090.2655	2517119.6574	1904	1.1
696	1688060.6073	2517175.1030	1995	1.2
697	1688067.3556	2517182.4828	1879	1.1
698	1688074.1038	2517189.8626	1956	1.2
699	1688080.8521	2517197.2423	2052	1.2
700	1688087.6003	2517204.6221	1983	1.2
701	1688094.3486	2517212.0019	1957	1.2
702	1688045.8455	2517167.0374	1864	1.1
703	1688037.0707	2517176.3953	1837	1.1
704	1688030.2306	2517183.6900	1899	1.1
705	1688023.3905	2517190.9847	1921	1.1
706	1688016.5503	2517198.2794	1959	1.2
707	1688007.7755	2517207.6374	1945	1.1
708	1688040.8238	2517151.0803	2005	1.2
709	1688035.3034	2517142.7256	2342	1.4
710	1688029.7830	2517134.3710	2480	1.5
711	1688024.2626	2517126.0164	2071	1.2
712	1688018.7421	2517117.6618	2007	1.2
713	1688013.2238	2517109.3103	2039	1.2

CPM = Counts Per Minute
pCi/g = Picocuries Per Gram
Northing = Feet
Easting = Feet
μR/hr = Microrentgens per hour
Building Materials Radiation Readings

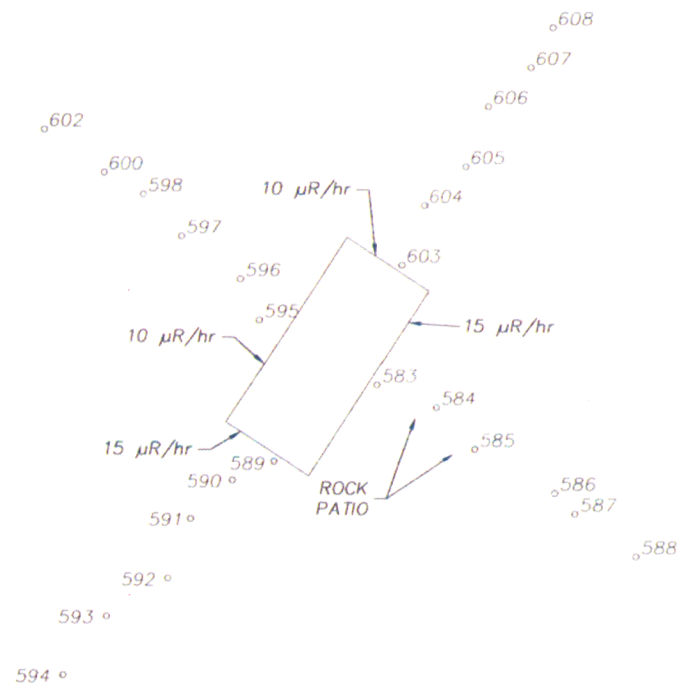


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STRUCTURE: SILVER MOBILE HOME	NNEPA LOCATION: 723979 E, 3946554 N		SOIL RADIATION SURVEY PD-030B PINEDALE, NEW MEXICO
PERSONNEL: J. MOORE, A. PICCIRILLO, J. JOHNSON, E. ESPINOSA, S. CHAVEZ, J. CHARLES, & R. TOWNE	WEATHER: PARTLY, CLOUDY, WINDY SURVEY EQUIPMENT: line' ba' LEICA		
DATE/TIME: 5/26/09 3:45 PM	DRAWN BY: AAL	DATE: 10/08/09	

Point Table				
Point #	Northing	Easting	SOIL CPM	SOIL pCi/g
583	1680643.5710	2512905.9630	1605	0.9
584	1680639.9760	2512915.6920	1630	0.9
585	1680633.2080	2512922.0380	1696	1.0
586	1680626.2290	2512934.9400	1891	1.1
587	1680622.8450	2512938.1120	1928	1.1
588	1680615.9710	2512947.7360	1865	1.1
589	1680630.9850	2512889.1490	1771	1.0
590	1680627.9180	2512882.4860	1846	1.1
591	1680621.5730	2512875.7190	1828	1.1
592	1680611.8430	2512872.1230	1834	1.1
593	1680605.6030	2512862.0770	1681	1.0
594	1680595.9800	2512855.2040	1732	1.0
595	1680654.0390	2512886.6090	1828	1.1
596	1680660.7020	2512883.5420	1852	1.1
597	1680667.5750	2512873.9190	1802	1.1
598	1680674.3430	2512867.5730	1751	1.0
600	1680677.8320	2512861.1220	1877	1.1
602	1680684.7060	2512851.4980	2071	1.2
603	1680663.1350	2512909.8750	1824	1.1
604	1680672.8650	2512913.4700	1970	1.2
605	1680679.2100	2512920.2380	1835	1.1
606	1680688.9390	2512923.8330	1816	1.1
607	1680695.2850	2512930.6000	1765	1.0
608	1680701.7360	2512934.0900	1755	1.0

CPM = Counts Per Minute
pCi/g = Picocuries Per Gram
Northing = Feet
Easting = Feet
μR/hr = Microentgens per hour
Building Materials Radiation Readings



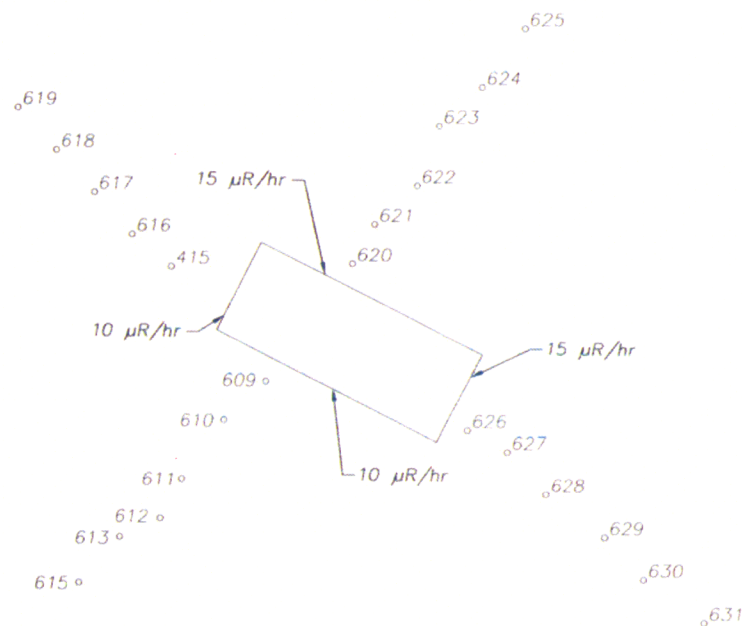
Scale: 1" = 20'
NW ¼ OF SECTION 16, T16N, R16W
NMPM

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STRUCTURE: ROCK HOUSE		NNEPA LOCATION: 722742 E, 3943284 N		SOIL RADIATION SURVEY CR-001A CHURCH ROCK, NEW MEXICO	
PERSONNEL: J. MOORE, A. PICCIRILLO, J. BEGAY, E. ESPLA, L. KING, B. LEDDY, & S. CHAVEZ		WEATHER: PARTLY CLOUDY BREEZY SURVEY EQUIPMENT: iina' ba' LEICA			
DATE/TIME: 5/20/09 1:10 PM		DRAWN BY: AAL DATE: 10/12/09			

Point Table				
Point #	Northing	Easting	SOIL CPM	SOIL pCi/g
620	1680737.1640	2512954.9210	1932	1.1
621	1680743.6150	2512958.4110	1892	1.1
622	1680749.9610	2512965.1790	1778	1.0
623	1680759.6900	2512968.7740	1812	1.1
624	1680766.0360	2512975.5420	1909	1.1
625	1680775.6590	2512982.4150	1838	1.1
626	1680710.3040	2512973.7470	1896	1.1
627	1680706.8140	2512980.1980	1956	1.2
628	1680700.0470	2512986.5430	1828	1.1
629	1680693.1730	2512996.1670	2042	1.2
630	1680686.4050	2513002.5130	1904	1.1
631	1680679.5320	2513012.1360	1968	1.2
609	1680717.9160	2512941.1750	1669	1.0
610	1680711.5710	2512934.4070	1867	1.1
611	1680701.9470	2512927.5330	1926	1.1
612	1680695.4960	2512924.0440	2039	1.2
613	1680692.4290	2512917.3820	1962	1.2
615	1680684.9568	2512910.7362	1799	1.0
Obstruction: Missing Data point				
415	1680736.4306	2512925.4195	1764	1.0
616	1680741.6040	2512918.9650	1815	1.1
617	1680748.3720	2512912.6200	1737	1.0
618	1680755.1400	2512906.2740	1960	1.2
619	1680761.9070	2512899.9290	1833	1.1

CPM = Counts Per Minute
pCi/g = Picocuries Per Gram
Northing = Feet
Easting = Feet
 $\mu\text{R/hr}$ = Microrentgens per hour
Building Materials Radiation Readings



Scale: 1" = 20'
NW ¼ OF SECTION 16, T16N, R16W
NMPM

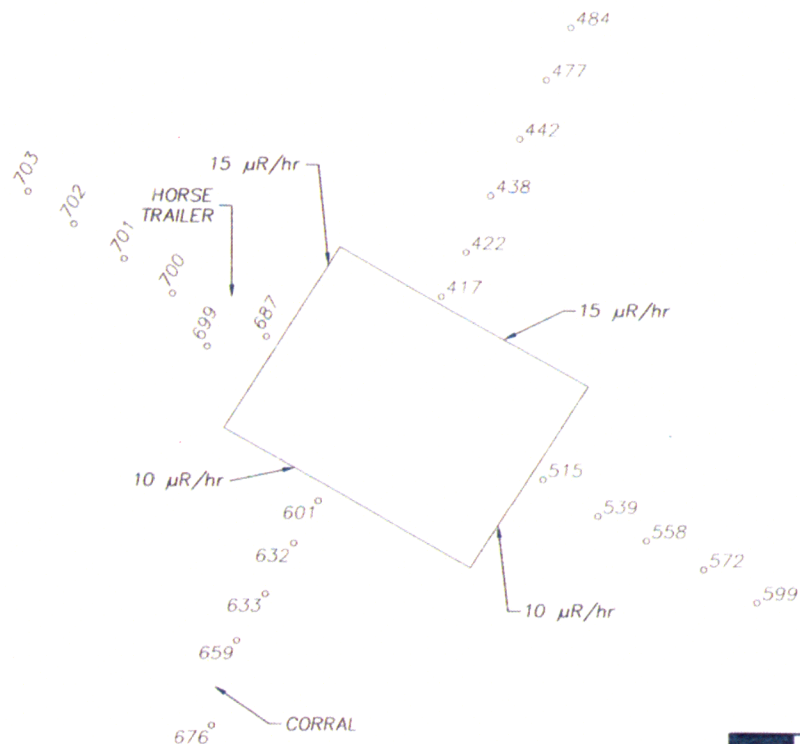
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4001 N. BUTLER AVE., SUITE 1101
FARMINGTON, NEW MEXICO 87401
PH. (505) 327-1072 FAX (505) 327-1517

STRUCTURE: WOODEN GARAGE AND WORKSHOP	NNEPA LOCATION: 722742 E, 3944247 N		SOIL RADIATION SURVEY CR-001B CHURCH ROCK, NEW MEXICO
PERSONNEL: J.MOORE, R.TOWNE, T.CHARLES, J.JOHNSON, E.ESPLAIN, & S.CHAVEZ, L.KING	WEATHER: THUNDERSTORM, PARTLY CLOUDY, SURVEY EQUIPMENT: TREMBLE BACKPACK		
DATE/TIME: 5/20/09 2:00 PM	DRAWN BY: AAL	DATE: 10/12/09	

Point Table				
Point #	Northing	Easting	SOIL CPM	SOIL pCi/g
417	1680505.5791	2512926.5028	2082	1.2
422	1680512.7969	2512930.4398	2251	1.4
438	1680521.9833	2512934.3768	2235	1.3
442	1680531.1697	2512938.9700	2215	1.3
477	1680540.6842	2512943.2351	2198	1.3
484	1680549.2144	2512947.1721	2114	1.3
OBSTRUCTION: WOODEN PORCH				
515	1680476.0514	2512942.9070	2143	1.3
539	1680470.1459	2512951.7653	2117	1.3
558	1680466.2089	2512959.6394	2244	1.3
572	1680461.6157	2512968.8257	2239	1.3
599	1680456.3664	2512977.3559	2298	1.4
601	1680472.4425	2512906.1615	1698	1.0
632	1680465.5527	2512902.2245	2206	1.3
633	1680457.3506	2512897.6313	2136	1.3
659	1680449.8047	2512893.0381	2153	1.3
OBSTRUCTION: Missing Data Point-Corral				
676	1680436.0251	2512889.1011	2014	1.2
687	1680499.0174	2512897.6313	2169	1.3
699	1680497.3770	2512888.1169	2101	1.3
700	1680505.9072	2512882.5394	2183	1.3
701	1680511.4846	2512874.6654	2086	1.2
702	1680517.0620	2512866.4633	2031	1.2
703	1680522.3114	2512858.9173	2171	1.3

CPM = Counts Per Minute
pCi/g = Picocuries Per Gram
Northing = Feet
Easting = Feet
μR/hr = Microrentgens per hour
Building Materials Radiation Readings



Scale: 1" = 20'
NW ¼ OF SECTION 16, T16N, R16W
NMPM

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STRUCTURE: WOODEN HOUSE ON NATIVE STONE	NNEPA LOCATION: 722742 E, 3944247 N		SOIL RADIATION SURVEY CR-001C CHURCH ROCK, NEW MEXICO
PERSONNEL: J. MOORE, R. TOWNE, T. CHARLES, J. JOHNSON, E. ESPLAIN, & S. CHAVEZ, L. KING	WEATHER: RAINY SURVEY EQUIPMENT: TREMBLE BACKPACK		
DATE/TIME: 5/20/09 2:35 PM	DRAWN BY: AAL	DATE: 10/12/09	

Point Table				
Point #	Northing	Easting	SOIL CPM	SOIL pCi/g
58	1684545.9540	2511119.6680	2461	1.5
59	1684544.0960	2511128.3720	2508	1.5
60	1684542.9000	2511138.6330	2408	1.5
61	1684541.8680	2511148.2350	2470	1.5
62	1684540.9800	2511157.8720	2350	1.4
63	1684540.1290	2511167.7220	2444	1.5
64	1684534.1280	2511105.7920	2598	1.6
65	1684525.4670	2511104.5260	2397	1.5
66	1684515.6540	2511102.6140	2681	1.6
67	1684505.9230	2511100.5540	2753	1.7
68	1684496.7850	2511098.3750	2673	1.6
69	1684486.9290	2511095.7060	2363	1.4
70	1684547.4200	2511095.9000	2313	1.4
71	1684550.1610	2511088.1130	2293	1.4
72	1684548.3880	2511078.7880	2159	1.3
73	1684556.6660	2511068.5260	2502	1.5
74	1684561.3530	2511060.9180	2281	1.4
75	1684561.8330	2511051.4630	2569	1.6
76	1684562.2640	2511110.4260	2394	1.5
77	1684568.6600	2511112.7750	2262	1.4
78	1684579.0100	2511114.8440	2335	1.4
79	1684589.0300	2511115.2260	2411	1.5
80	1684598.8520	2511116.1090	2473	1.5
81	1684608.4340	2511118.4890	2229	1.3

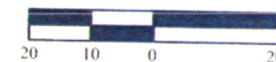
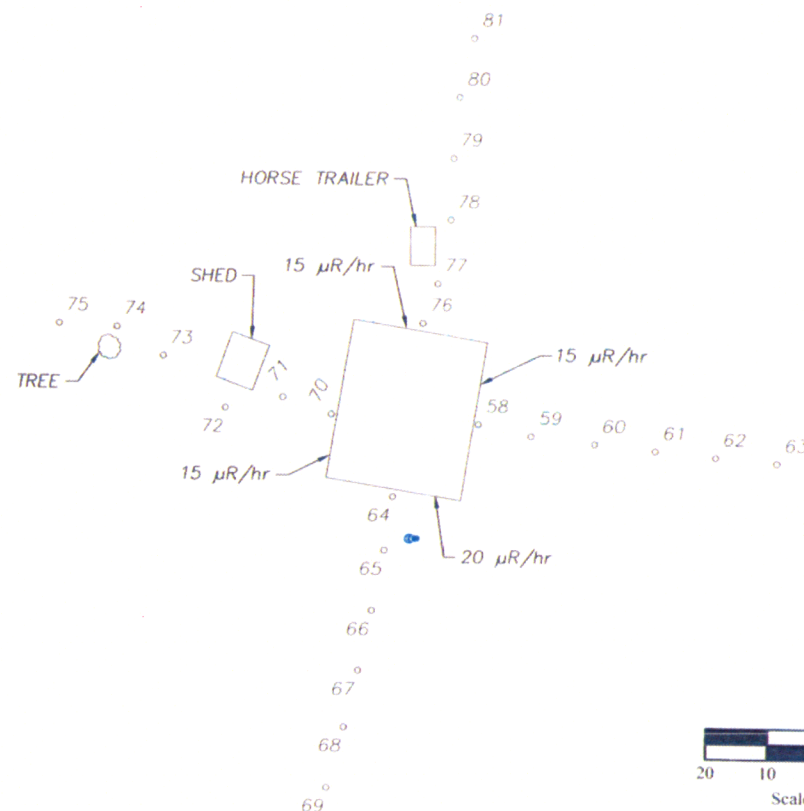
CPM = Counts Per Minute
pCi/g = PicoCuries Per Gram

Northing = Feet

Easting = Feet

$\mu\text{R/hr}$ = Microrentgens per hour

Building Materials Radiation Readings



Scale: 1" = 20'

SW 1/4 OF SECTION 9, T16N, R16W
NMPM

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STRUCTURE: BROWN STUCCO HOUSE	NNEPA LOCATION: 722174 E, 3945424 N		SOIL RADIATION SURVEY CR-002A CHURCH ROCK, NEW MEXICO
PERSONNEL: J. MOORE, A. PICCIRILLO, R. TOWNE T. CHARLES, J. JOHNSON, E. ESPLAIN, & S. CHAVEZ	WEATHER: THUNDERSTORM, BREEZY SURVEY EQUIPMENT: Iino' ba' LEICA		
DATE/TIME: 5/28/09 1:00 PM	DRAWN BY: AAL	DATE: 10/12/09	

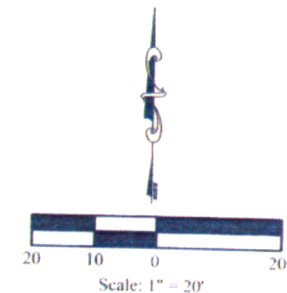
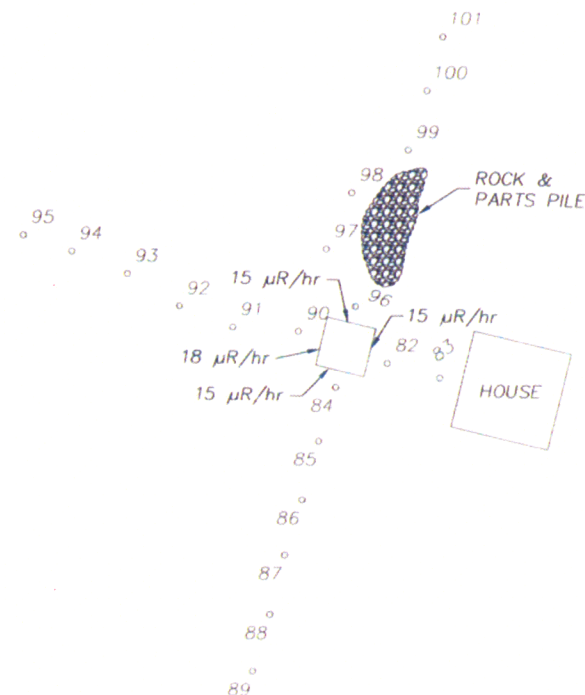
Point Table				
Point #	Northing	Easting	SOIL CPM	SOIL pCi/g
82	1684553.5970	2511086.7950	2131	1.3
83	1684551.3810	2511095.3680	2324	1.4
84	1684549.5840	2511078.6240	2149	1.3
85	1684540.7300	2511075.9670	2235	1.3
86	1684531.0820	2511073.4300	2468	1.5
87	1684522.0400	2511070.7970	2524	1.5
88	1684512.3860	2511068.5360	2553	1.6
89	1684503.1390	2511065.8140	2660	1.6
90	1684558.5550	2511072.4360	2516	1.5
91	1684559.0520	2511061.7300	2514	1.5
92	1684562.3790	2511052.8480	2552	1.6
93	1684567.4880	2511044.3150	2453	1.5
94	1684571.0020	2511035.1370	2486	1.5
95	1684573.5060	2511027.2150	2658	1.6
96	1684562.6940	2511081.5870	2274	1.4
97	1684572.0080	2511076.7620	2432	1.5
98	1684581.1170	2511080.7040	2470	1.5
99	1684588.1910	2511089.6850	2525	1.5
100	1684597.8050	2511092.5840	2585	1.6
101	1684606.5020	2511094.9540	2409	1.5

CPM = Counts Per Minute
pCi/g = Picocuries Per Gram

Northing = Feet
Easting = Feet

μ R/hr = Microentgens per hour

Building Materials Radiation Readings



SW 1/4 OF SECTION 9, T16N, R16W
NMMP

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PH. (505) 327-1072 FAX (505) 327-1517

STRUCTURE: BROWN/WHITE WOODEN SHED	NNEPA LOCATION: 722174 E, 3945424 N	
PERSONNEL: J. MOORE, J. JOHNSON, T. CHARLES, R. TOWNE, & S. CHAVEZ	WEATHER: OVERCAST, COOL BREEZY SURVEY EQUIPMENT: iina' ba' LEICA	
DATE/TIME: 5/26/09 1:39 PM	DRAWN BY: AAL	DATE: 10/12/09

SOIL RADIATION SURVEY
CR-002B
CHURCH ROCK, NEW MEXICO

Appendix C

Title: Results of the Gamma-Ray Radiation Survey Performed Around Dwelling Units Located in the Pinedale and Churchrock Chapters of the Navajo Nation

Date: June 9, 2009

To: Mr. David Esparza
inaa' ba', Inc.
612 E. Murray Drive
Farmington, NM 87401

Authors: Dr. Jeffrey Johnson, Ph.D.; Mr. Anthony Piccirillo

Introduction:

In May of 2009, Radiation Physics & Engineering, Inc. was contracted by inaa' ba', Inc. to perform a direct gamma-ray radiation survey of surface soil around numerous dwelling units located in the Pinedale and Churchrock Chapters of the Navajo Nation. These types of surveys are often performed to determine if: 1) radon gas could be an issue in dwelling units or buildings located in the surveyed area, or 2) to detect possible surface contamination from uranium mining activity in the area.

The difficulty in detecting uranium directly through gamma-ray radiation measurements is well known. However, since the natural decay series of uranium is well understood (see Figure 1) the presence of uranium can be determined from the uranium daughters, some of which decay with observable gamma-ray emission. It is typical to relate observed gamma-ray count rates to the concentration of Ra-226 (radium-226, one of the uranium daughters) in the soil. Radium-226 is also the direct decay precursor to Rn-222 (radon-222; a radioactive gas.)

Survey Procedure:

Direct radiation surveys were performed on May 18 – 22 and May 26, 2009 by Anthony Piccirillo and Jeff Johnson of Radiation Physics & Engineering, Inc. at sites specified by inaa' ba', Inc. The surveys were performed using a Ludlum Model 2350 single channel analyzer with a sodium iodide scintillation probe. The analyzer and probe have been set to preferentially detect the 609 keV gamma-ray from the decay of Bi-214, and measured gamma-ray counts correlated to known concentrations of Ra-226 in soil. All measurements were made with the probe in contact with the soil surface.

During a meeting with inaa' ba', Inc. and the Navajo Nation EPA (NNEPA) on 5/18/09, it was decided by the NNEPA that the survey around each dwelling unit (DU) would consist of four linear tracks, each beginning in the center of each wall of the DU and extending out for 50 feet, with measurements taken every 10 feet (six individual measurements per track: 0, 10, 20, 30, 40 and 50 feet from the DU.) GPS

coordinates were determined for each surveyed structure using a hand-held GPS unit and are also reported here.

In addition, "background" measurements were conducted at two sites specified by the NNEPA. These sites were undeveloped and undisturbed locations within a few miles of the dwelling units and are assumed to be measurements of naturally occurring radioactivity in representative soil of the area, with no contamination from uranium mining activity.

Survey Results:

Measurements conducted at the two background locations showed a mean Ra-226 concentration of 1.2 pCi/g (picocuries per gram), with a total range of 0.3 pCi/g. The measurements consisted of two straight lines, each 50 feet long, with measurements taken every 10 feet (a total of 12 measurements.) This concentration of Ra-226 is not unusual and is well below the typical level where problems with radon gas are encountered.

Surveys were conducted around 57 separate dwelling units and other structures. The results are summarized in Table 1, and shown graphically in Figure 2. All of the raw data, listed by site, is also included in this report.

It was noted while conducting the surveys that during periods of rain measured radiation levels at the soil surface increased. It has been reported in the literature that rain during a ground-based gamma-ray survey will increase observed gamma-ray levels (1). From Reference 1: "Rain deposits radioactive daughter products of atmospheric radon onto the ground, resulting in a significant increase in apparent U concentrations. These short-lived daughter products decay to insignificant concentrations within about 3 hours." Two dwelling unit locations, PD-021-A and PD-021-B, were surveyed during periods of heavy rain and exhibited elevated gamma-ray levels. We returned to those two sites the next day when conditions were clear and repeated the measurements. It was found that when it was not raining, both sites measured at the background gamma-ray level. Therefore, all dwelling unit surveys conducted during periods of rain are noted in both Table 1 and Figure 2. We believe that the slightly elevated measurements observed at locations during periods of rain are not indicative of actual surface soil radiation levels and/or the presence of uranium contamination.

It can be seen in Figure 2 that when measurements taken during the rain are discounted, none of the dwelling units surveyed exceeded the observed background level by more than 0.2 pCi/g. All of these dwelling units exhibited a mean Ra-226 between 0.9 and 1.4 pCi/g. In fact, of the 41 dwelling units surveyed during periods of no rain, only 6 exceeded the mean background level and all of those at insignificant levels (a difference in the means of less than or equal to 0.2 pCi/g) If the raw data is examined, it can be seen that under conditions of no rain, no individual measurement exceeded 1.7 pCi/g. For comparative purposes, results of radon testing performed by this firm indicate that structures built on soils with radium concentrations higher than 2 pCi/g have a moderate chance of exceeding the EPA recommended action level of 4 picocuries of radon per liter of indoor air. For a building to have elevated concentrations of radon, the soils underlying the structure must have abnormally high concentrations of Ra-226, the basement or slab of the structure must be cracked, and the structure must be sealed reasonably well (energy efficient) to allow the radon to build up. The radium concentrations in the soils on these sites, being below 2.0 pCi/g, make it unlikely for structures built on the sites to have elevated radon levels.

Since no sites exhibited Ra-226 concentrations above the background level, maps showing the individual sites and Ra-226 concentrations were not generated. However, since extensive GPS coordinates were taken at each measurement site by other firms/agencies, maps of these data could be generated using those coordinates at a later date if desired.

Conclusions:

Gamma-ray radiation surveys of surface soil at 32 different sites in the Pinedale and Churchrock Chapters containing a total of 57 individual structures were conducted. No locations were found where the Ra-226 concentration in the soil was statistically higher than that observed in the background locations.

References:

- (1) Minty B., Wilford J. (2004) Radon effects in ground gamma-ray spectrometric surveys. Exploration Geophysics 35, 312–318.

Figure 1: Natural radioactive decay series of uranium-238 with half-lives.

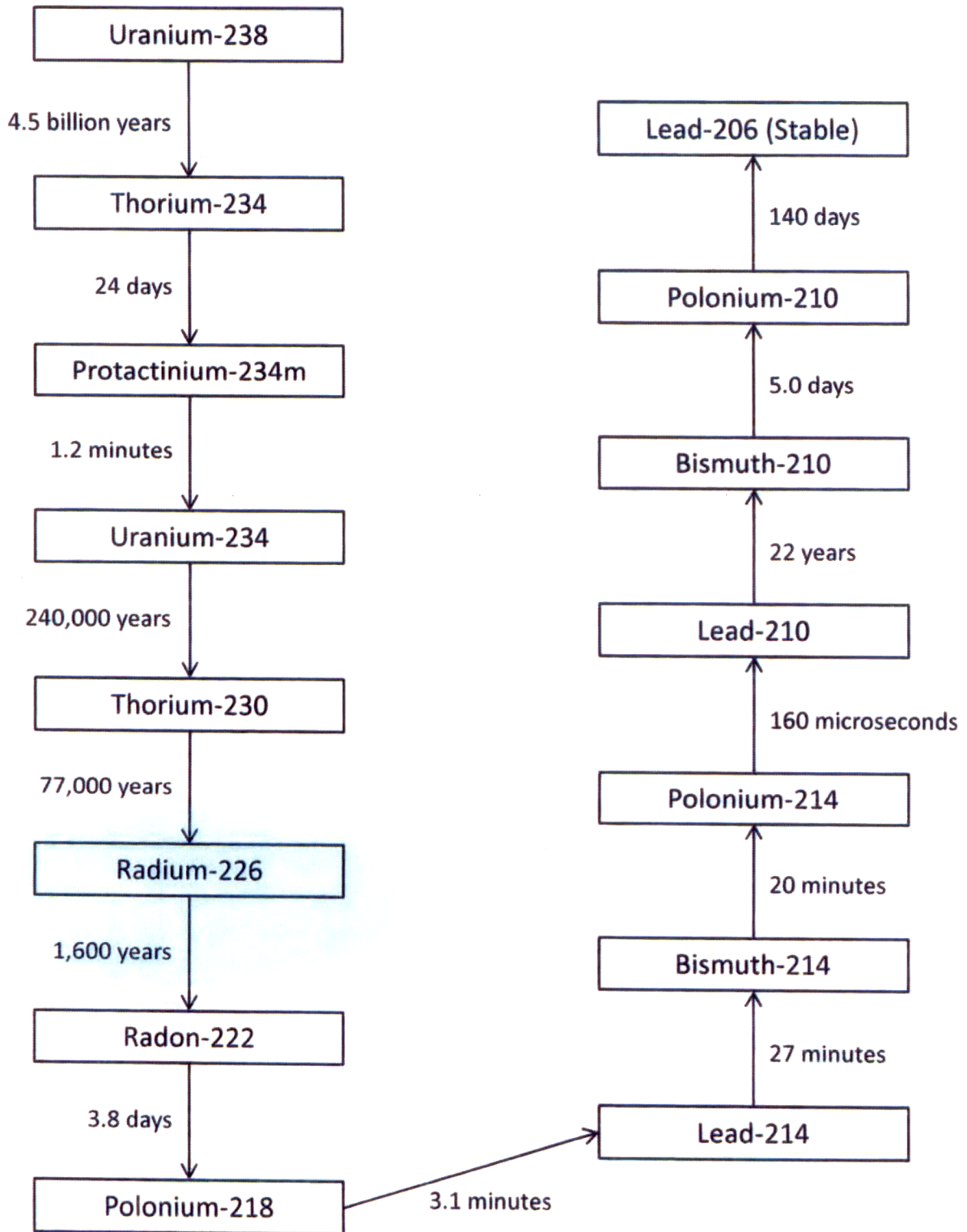


Table 1: Results of Dwelling Unit Surveys

Location	gamma-ray counts		Ra-226 Concentration		Conditions
	Mean (CPM)	Range (CPM)	Mean (pCi/g)	Range (pCi/g)	
Background	2033	454	1.2	0.3	
PD-001-A	1666	467	1.0	0.3	
PD-002-A	1722	341	1.0	0.2	
PD-002-B	1611	369	0.9	0.2	
PD-003-A	1663	547	1.0	0.4	
PD-003-B	1676	300	1.0	0.2	
PD-004-A	1677	306	1.0	0.2	
PD-004-B	1704	363	1.0	0.2	
PD-005-A	1657	407	1.0	0.3	
PD-005-B	1724	712	1.0	0.5	
PD-005-C	1691	412	1.0	0.3	
PD-006-A	1670	456	1.0	0.3	
PD-006-B	1569	262	0.9	0.2	
PD-007-A	1862	462	1.1	0.3	
PD-007-B	1811	290	1.1	0.2	
PD-008-A	1860	510	1.1	0.3	
PD-008-B	1734	301	1.0	0.2	
PD-008-C	1755	244	1.0	0.2	
PD-009-A	1721	384	1.0	0.3	
PD-010-A	1698	334	1.0	0.2	
PD-010-B	1712	299	1.0	0.2	
PD-010-C	1743	273	1.0	0.2	
PD-010-D	1646	255	0.9	0.2	
PD-011-A	2314	1147	1.4	0.8	Light Rain
PD-012-A	2626	529	1.6	0.4	Rain
PD-013-A	3364	589	2.1	0.4	Heavy Rain
PD-014-A	2922	959	1.8	0.6	Rain
PD-015-A	2664	1511	1.6	1	Rain
PD-015-B	2668	1080	1.6	0.7	Rain
PD-016-A	2552	557	1.6	0.4	Rain / Wet
PD-017-A	2418	1009	1.5	0.7	Rain / Wet

Table 1: Results of Dwelling Unit Surveys (continued)

Location	gamma-ray counts		Ra-226 Concentration		Conditions
	Mean (CPM)	Range (CPM)	Mean (pCi/g)	Range (pCi/g)	
Background	2033	454	1.2	0.3	
PD-018-A	2641	1777	1.6	1.2	Rain
PD-019-A	2681	440	1.6	0.3	Rain / Wet
PD-020-A	3291	792	2.1	0.5	Heavy Rain
PD-021-A	3533	780	2.2	0.5	Heavy Rain
PD-021-A	1993	478	1.2	0.3	Next Day / No Rain
PD-021-B	3306	301	2.1	0.2	Heavy Rain
PD-021-B	1905	297	1.1	0.2	Next Day / No Rain
PD-021-C	1947	351	1.1	0.2	
PD-022-A	2283	960	1.4	0.7	Light Rain
PD-022-B	2244	465	1.4	0.3	Light Rain
PD-022-C	2437	297	1.5	0.2	Light Rain
PD-023-A	2217	670	1.3	0.5	
PD-024-A	2210	422	1.3	0.3	
PD-025-A	2041	233	1.2	0.2	
PD-026-A	1932	221	1.1	0.2	
PD-026-B	1920	472	1.1	0.3	
PD-027-A	2346	665	1.4	0.5	No Rain / First site of the day. Possible diurnal effect.
PD-027-B	2321	652	1.4	0.4	
PD-028-A	2046	790	1.2	0.5	
PD-028-B	2040	290	1.2	0.2	
PD-028-C	2034	834	1.2	0.6	
PD-029-A	2063	440	1.2	0.3	
PD-030-A	2290	775	1.4	0.5	
PD-030-B	1988	643	1.2	0.4	
CR-001-A	1811	466	1.1	0.3	
CR-001-B	1875	373	1.1	0.3	
CR-001-C	2140	600	1.3	0.4	
CR-002-A	2430	594	1.5	0.4	Light Rain
CR-002-B	2446	529	1.5	0.4	Light Rain

Figure 2: Surface soil concentrations of Ra-226 versus the background measurement, dwelling unit, and the presence of rain during the measurement.

