

**Abandoned Uranium Mines Project
Navajo Lands**

Chinle Area

Water Sample Information

Map ID	Sample ID	Field Type	Sample Name	Longitude DMS (W)	Latitude DMS (N)	Elevation (ft)	Sample Date	Sample Time	pH su	Cond uS/cm	Temp C	ORP millivolt	Metals	Radio	Filtration	Preserved	Bacterial Sampling	Ludlum 19 mR/hr	Notes
1	CH981117NZW003	Well	Fluted Rock Well	109 14 55.45	35 52 35.464	7777	17-Nov-1998	4:33 pm	7.79	585	10.1	232	Yes	Yes	No	Yes	No	12-16	Handpump
2	CH981118NZS004	Spring	White Rock Spring	109 16 33.74	35 54 14.885	7771	18-Nov-1998	4:07 pm	7.30	599	9.3	232	Yes	Yes	No	Yes	No	10	Used Pump
3	CH981118NZS003	Spring	Honeymoon Spring	109 19 2.158	35 58 55.002	7212	18-Nov-1998	9:45 am	7.78	812	11.3	73	Yes	Yes	No	Yes	No	12-14	Used Bailer; Sample ID changed from CH981118NZS002 to CH981118NZS003
4	CH981117NZS001	Spring	Tsegito Spring	109 23 30.52	35 55 15.509	6507	17-Nov-1998	11:37 am	7.63	490	15.7	244	Yes	Yes	No	Yes	No	10-12	
5	CH981117NZW001	Well	Nazlini Chapter House	109 26 41.17	35 53 56.584	6177	17-Nov-1998	8:57 am	7.81	504	12.2	643	Yes	Yes	No	Yes	No	10-14	Taken from Sink; Nazlini Chapter Sample
6	CH981117NZS002	Spring	WSL Spring	109 27 57.90	35 56 4.7514	5979	17-Nov-1998	2:12 pm	7.80	526	15.8	256	Yes	Yes	No	Yes	No	10-12	Used Bailer
7	CH981117NZW002	Well	Tank 10R-24	109 27 8.664	35 59 29.548	6309	17-Nov-1998	3:14 pm	7.76	486	16.1	172	Yes	Yes	No	Yes	No	8-10	Taken from Discharge
8	CH981123CHS001	Spring	Cottonwood Spring	109 27 45.92	36 10 58.860	6133	23-Nov-1998	9:50 am	7.99	445	16.4	273	Yes	Yes	No	Yes	No	12-15	Handpump
9	CH981123CHW002	Wind Mill	Tank 10K-236	109 29 6.398	36 11 53.026	6154	23-Nov-1998	1:15 pm	8.50	320	12.4	296	Yes	Yes	No	Yes	No	10-12	Taken from Trough
10	CH981123CHW001	Well	Chinle Chapter House	109 33 32.30	36 9 10.6224	5443	23-Nov-1998	8:39 am	7.42	463	11.8	267	Yes	Yes	No	Yes	No	8-10	Taken from Kitchen; Chinle Chapter Sample

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Water Sample Analysis for Stable Metals

Map ID	Sample ID	Sample Name	Field Type	Aluminum	Antimony ²	Arsenic ^{2,4}	Barium	Beryllium ^{2,4}	Cadmium ^{2,4}	Calcium	Chromium ^{2,5}	Cobalt ²	Copper ²	Iron ²	Lead ²	Magnesium	Manganese ²	Mercury ²	Nickel ²	Potassium ²	Selenium ²	Silver ²	Sodium	Thallium ^{2,5}	Vanadium ²	Zinc ²	ILCR ^{1,6}	HI ^{3,6}
				Primary MCLs in Micrograms per Liter (ug/L) ⁷	6	50	1000	4	5	NONE	100	NONE	1300	300	15	NONE	50	2	NONE	NONE	50	100	NONE	2	NONE	5000		
				PRG Limits in Micrograms per Liter (ug/L) ⁸	15	0.045	2600	73	18	NONE	180	2200	1400	1100	4	NONE	1700	11	730	NONE	189	180	NONE	2.6	260	11000		
1	CH981117NZW003	Fluted Rock Well	Well	60.4	0	0	79.2	0	0	101,000	0	0	15.9	182.0	0	31,200	5.4	0.072	0	2,750	2.7	0	26,900	0	0	113.0	0.00E+00	0.09
2	CH981118NZS004	White Rock Spring	Spring	66.2	0	0	374.0	0	0	100,000	0	0	0	62.9	0	23,700	128.0	0.250	0	2,150	0	0.7	42,100	0	0	10.6	0.00E+00	0.25
3	CH981118NZS003	Honeymoon Spring	Spring	81.8	0	0	246.0	0	0	110,000	0	0.7	0	591.0	2.5	30,900	863.0	0.067	0	4,720	0	0	73,000	4.1	1.1	126.0	0.00E+00	2.26
4	CH981117NZS001	Tsegito Spring	Spring	79.0	0	0	271.0	0	0	75,200	0	0	0	16.5	0	10,400	8.2	0.063	0	2,150	0	0	30,400	0	3.6	2.2	0.00E+00	0.13
5	CH981117NZW001	Nazlini Chapter House	Well	75.0	0	2.7	115.0	0	0	64,400	0	0	17.2	40.4	0	11,300	1.0	0.059	0	4,200	0	0	54,100	4.0	5.1	231.0	6.00E-005	1.89
6	CH981117NZS002	WSL Spring	Spring	222.0	0	0	147.0	0	0	64,800	0	0.9	0	119.0	0	13,700	18.0	0.070	0	3,350	0	0	50,600	0	1.1	6.2	0.00E+00	0.10
7	CH981117NZW002	Tank 10R-24	Well	45.2	0	0	65.1	0	0	55,300	0	0.6	9.0	3,340.0	3.6	18,500	20.5	0.059	2.0	5,500	4.2	0	41,700	0	3.0	1,270.0	0.00E+00	0.51
8	CH981123CHS001	Cottonwood Spring	Spring	429.0	0	282.0	763.0	0.2	0	77,300	0	15.3	217.0	47,300.	17.4	9,180	2,550.0	0.120	9.4	3,090	6.5	0.7	15,200	0	18.7	1,540.0	6.27E-003	32.18
9	CH981123CHW002	Tank 10K-236	Wind Mill	131.0	0	5.2	137.0	0.2	0	55,600	6.0	0.8	128.0	7,900.0	75.1	19,000	20.6	0.140	1.0	5,600	0	0.7	10,600	4.7	1.7	2,470.0	1.16E-004	3.44
10	CH981123CHW001	Chinle Chapter House	Well	73.1	0	0	954.0	0	0	57,500	0	0.6	14.3	242.0	0	16,700	307.0	0.180	0	2,210	0	0.7	27,300	0	0	28.7	0.00E+00	0.60

1. ILCR = Incremental Lifetime Cancer Risk with Respect to Stable Metals.
2. The values of "0" represent a result of either "not detected" at the detection limit of the laboratory method or a negative count. In both cases, the result can be considered "0".
3. The evaluation of Beta is in two steps. The initial screening level is 50 pCi/L. If the measured level of Beta exceeds the 50 pCi/L, a further evaluation is merited. Beta-emitting radionuclides would be screened.
4. The values of "0" in the Pb210 column represent analytical results that measured less than the Minimum Detectable Activity (MDA).
5. Definition of final calculations and ranking will be fully described and published in a final report.
6. When comparing these PRG's with the U.S. EPA's PRG list, the calculated PRG used for U238 is less than the EPA's PRG for U238 (D meaning that its decay daughters are included in the risk calculations).
7. MCL- Maximum Contaminant Levels are the maximum permissible level of a contaminant in water delivered to users of a public water system. This level is not always based on health or risk criteria.
8. PRG- Preliminary Remediation Goals are tools for evaluating and cleaning up contaminated sites. They are risk-based concentrations derived from standardized equations, combining exposure information assumptions and EPA toxicity data.

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Chinle Area

Water Sample Analysis for Radioactive Metals

Map ID	Sample ID	Sample Name	Field Type ⁷	Alpha ²	Beta ³	Lead210 ⁴	Radium226 ²	Radium228 ²	Thorium228 ²	Thorium230 ²	Thorium232 ²	Uranium234 ²	Uranium235 ²	Uranium238 ^{2,6}	ILCRrad ^{1,5}		
				15	50	NONE	5	5	NONE	NONE	NONE	20	20	20			
				Primary MCL's in pico Curies per Liter (pCi/L) ⁸													
				NONE	NONE	0.047	0.16	0.19	0.21	1.3	1.5	1.1	1.1	0.71			
1	CH981117NZW003	Fluted Rock Well	Well	1.62	5.58	0.61	0.101	0.751	0.002	0.012	0	3.13	0.039	2.40	1.09E-005		
2	CH981118NZS004	White Rock Spring	Spring	4.30	5.02	0.76	0.075	0.386	0.009	0	0	8.05	0.121	1.89	2.87E-005		
3	CH981118NZS003	Honeymoon Spring	Spring	10.50	8.41	0.56	0.116	0.534	0.053	0	0	5.50	0.232	3.19	1.35E-005		
4	CH981117NZS001	Tsegito Spring	Spring	7.44	4.22	0.23	0.281	0.263	0	0.004	0	4.56	0.128	2.77	1.13E-005		
5	CH981117NZW001	Nazlini Chapter House	Well	10.40	6.71	0.46	0.208	0.975	0.028	0.022	0	5.44	0.080	2.91	1.57E-005		
6	CH981117NZS002	WSL Spring	Spring	8.54	8.46	1.27	0.079	0.303	0.080	0.036	0.025	5.20	0.161	2.40	3.78E-005		
7	CH981117NZW002	Tank 10R-24	Well	8.74	8.85	0.05	0.121	0.358	0.007	0	0	6.22	0.143	3.47	1.33E-005		
8	CH981123CHS001	Cottonwood Spring	Spring	36.10	23.60	6.57	3.070	1.220	0.401	0.047	0.013	11.40	0.222	10.80	1.93E-004		
9	CH981123CHW002	Tank 10K-236	Wind Mill	6.16	10.20	0.79	0.137	0.234	0.015	0.005	0	4.40	0.306	4.79	3.01E-005		
10	CH981123CHW001	Chinle Chapter House	Well	0.13	2.77	0.39	0.226	0.228	0.038	0	0	0.04	0	0.06	2.92E-006		

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3. The evaluation of Beta is in two steps. The initial screening level is 50 pCi/L. If the measured level of Beta exceeds the 50 pCi/L, a further evaluation is merited. Beta-emitting radionuclides would be screened.

4. The values of "0" in the Pb210 column represent analytical results that measured less than the Minimum Detectable Activity (MDA).

5. Definition of final calculations and ranking will be fully described and published in a final report.

6. When comparing these PRG's with the U.S. EPA's PRG list, the calculated PRG used for U238 is less than the EPA's PRG for U238D (D meaning that its decay daughters are included in the risk calculations).

7. MCL- Maximum Contaminant Levels are the maximum permissible level of a contaminant in water delivered to users of a public water system. This level is not always based on health or risk criteria.

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**Water Quality Analysis: Stable and Radioactive Metals
In Order of Map ID**

Map ID	Sample ID	Field Type	2		ILCR for Stable Metals	ILCR for Rad Metals	Total Cancer Risk	Hazard Index (HI)	3			Total U	4			Risk Category	Risk Ranking	Map ID	Bacteria Present	Total Coliform Detected/ Fecal Coliform Not Detected	Total Coliform & Fecal Coliform Detected
			Alpha	Beta					Arsenic	Lead	Total U		Less Risk	Some Risk	More Risk						
			MCL: 15 PRG: NONE	50 NONE				50 0.045	15 4	30 NONE											
1	CH981117NZW003	Well	1.62	5.58	0.00E+000	1.09E-005	1.09E-005	0.09	0	0	5.53		ILCR	SOME	2	1					
2	CH981118NZS004	Spring	4.30	5.02	0.00E+000	2.87E-005	2.87E-005	0.25	0	0	9.94		ILCR	SOME	5	2					
3	CH981118NZS003	Spring	10.50	8.41	0.00E+000	1.35E-005	1.35E-005	2.26	0	2.5	8.92		ILCR, HI	SOME	7	3					
4	CH981117NZS001	Spring	7.44	4.22	0.00E+000	1.13E-005	1.13E-005	0.13	0	0	7.33		ILCR	SOME	3	4					
5	CH981117NZW001	Well	10.40	6.71	6.00E-005	1.57E-005	7.57E-005	1.89	2.7	0	8.35		ILCR, HI	SOME	6	5					
6	CH981117NZS002	Spring	8.54	8.46	0.00E+000	3.78E-005	3.78E-005	0.10	0	0	7.60		ILCR	SOME	4	6					
7	CH981117NZW002	Well	8.74	8.85	0.00E+000	1.33E-005	1.33E-005	0.51	0	3.6	9.69		ILCR	SOME	8	7					
8	CH981123CHS001	Spring	36.10	23.60	6.27E-003	1.93E-004	6.46E-003	32.18	282.0	17.4	22.20		ILCR, HI, Lead	MORE	10	8					
9	CH981123CHW002	Wind Mill	6.16	10.20	1.16E-004	3.01E-005	1.46E-004	3.44	5.2	75.1	9.50		Lead	MORE	9	9					
10	CH981123CHW001	Well	0.13	2.77	0.00E+000	2.92E-006	2.92E-006	0.60	0	0	0.00	X		LESS	1	10					

1. ILCR = Incremental Lifetime Cancer Risk with Respect to Stable Metals and Radioactive Metals.

2. The PRG's and MCL's for Alpha, Beta, and Uranium are in Pico-Curies per Liter (pCi/L).

3. The PRG's and MCL's for Lead and Arsenic are in Micrograms per Liter (ug/L).

4. Water Quality Levels:

- Less Risk Total Cancer Risk is less than or equal to 1E-05 and Hazard Index is less than or equal to 1 and Lead is less than 4 and total U less than 30.
 - Some Risk Total Cancer Risk is less than or equal to 6E-04 but greater than 1E-05 or Hazard Index is less than 10 but greater than 1 or Lead is less than 15 but greater than 4 and total U less than 30.
 - More Risk Total Cancer Risk is greater than 6E-04 or Hazard Index is greater than 10 or Lead is greater than 15 or total U equal to or greater than 30.
- The three categories will be color coded on the associated map to be published with the final document.

5. Proposed EPA MCL is 30 pCi/L for the sum of three U isotopes.

6. The definitions of the risk categories and the ranking will be fully described and published in the final report.

7. No change in water quality assessment with respect to stable and radioactive metals results.

8. In accordance with USEPA emergency response procedures for purifying bacteria - impacted water, please use the following methods of emergency disinfection. These methods will not remove stable metals or radionuclides from water.

Boiling: Vigorous boiling for one minute will kill any disease-causing microorganisms present in water. The flat taste of boiled water can be improved by pouring it back and forth from one container to another (called aeration), by allowing it to stand for a few hours, or by adding a small pinch of salt for each quart of water boiled.

Chemical Treatment: When boiling is not practical, chemical disinfection should be used. The two chemicals commonly used are chlorine and iodine. Chlorine and iodine are somewhat effective in protecting against exposure to Giardia, but may not be effective in controlling Cryptosporidium.

Therefore, use iodine or chlorine only to disinfect well water (as opposed to surface water sources such as rivers, lakes, and springs), because well water is unlikely to contain these disease causing organisms. Chlorine is generally more effective than iodine in controlling Giardia, and both disinfectants work much better in warmer water.

Chlorine Bleach: Common household bleach contains a chlorine compound that will disinfect water. The procedure to be followed is usually written on the label. When the necessary procedure is not given, find the percentage of available chlorine on the label and use the information in the following tabulation as a guide.

Available Chlorine	1%	4-6%	7-10%
Drops per Quart of Clear Water	10	2	1

(If strength is unknown, add ten drops per quart of water. Double amount of chlorine for cloudy or colored water.) The treated water should be mixed thoroughly and allowed to stand for 30 minutes. The water should have a slight chlorine odor, if not, repeat the dosage and allow the water to stand for an additional 15 minutes.

If the treated water has too strong a chlorine taste, it can be made more pleasing by allowing the water to stand exposed to the air for a few hours or by pouring it from one clean container to another several times.

9. MCL- Maximum Contaminant Levels are the maximum permissible level of a contaminant in water delivered to users of a public water system. This level is not always based on health or risk criteria.

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**Water Quality Analysis: Stable and Radioactive Metals
In Order of Risk Ranking**

Map ID	Sample ID	Field Type	Alpha ²	Beta ²	ILCR for Stable Metals ¹	ILCR for Rad Metals ¹	Total Cancer Risk	Hazard Index (HI)	Arsenic ³	Lead ³	Total U ²	Water Quality with Respect to Stable and Radioactive Metals ⁴			Risk Category	Risk Ranking ⁶	Map ID	Bacteria Present ⁷	Total Coliform Detected/ Fecal Coliform Not Detected ⁷	Total Coliform & Fecal Coliform Detected ⁸
												Less Risk	Some Risk	More Risk						
10	CH981123CHW001	Well	0.13	2.77	0.00E+000	2.92E-006	2.92E-006	0.60	0	0	0.00	X			LESS	1	10			
1	CH981117NZW003	Well	1.62	5.58	0.00E+000	1.09E-005	1.09E-005	0.09	0	0	5.53		ILCR		SOME	2	1			
4	CH981117NZS001	Spring	7.44	4.22	0.00E+000	1.13E-005	1.13E-005	0.13	0	0	7.33		ILCR		SOME	3	4			
6	CH981117NZS002	Spring	8.54	8.46	0.00E+000	3.78E-005	3.78E-005	0.10	0	0	7.60		ILCR		SOME	4	6			
2	CH981118NZS004	Spring	4.30	5.02	0.00E+000	2.87E-005	2.87E-005	0.25	0	0	9.94		ILCR		SOME	5	2			
5	CH981117NZW001	Well	10.40	6.71	6.00E-005	1.57E-005	7.57E-005	1.89	2.7	0	8.35		ILCR, HI		SOME	6	5			
3	CH981118NZS003	Spring	10.50	8.41	0.00E+000	1.35E-005	1.35E-005	2.26	0	2.5	8.92		ILCR, HI		SOME	7	3			
7	CH981117NZW002	Well	8.74	8.85	0.00E+000	1.33E-005	1.33E-005	0.51	0	3.6	9.69		ILCR		SOME	8	7			
9	CH981123CHW002	Wind Mill	6.16	10.20	1.16E-004	3.01E-005	1.46E-004	3.44	5.2	75.1	9.50			Lead	MORE	9	9			
8	CH981123CHS001	Spring	36.10	23.60	6.27E-003	1.93E-004	6.46E-003	32.18	282.0	17.4	22.20			ILCR, HI, Lead	MORE	10	8			

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Therefore, use iodine or chlorine only to disinfect well water (as opposed to surface water sources such as rivers, lakes, and springs), because well water is unlikely to contain these disease causing organisms. Chlorine is generally more effective than iodine in controlling Giardia, and both disinfectants work much better in warmer water.

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