

**U.S. GEOLOGICAL SURVEY, DENVER, COLORADO
RADIOCARBON DATES I***

L. J. SCHRODER, W. A. BEETEM, H. C. CLAASSEN,
and R. L. EMERSON

U.S. Geological Survey, Denver Federal Center,
Lakewood, Colorado 80225

The U.S. Geological Survey, at the Denver Federal Center, Lakewood, Colorado assays C^{14} concentration of water samples using liquid scintillation techniques. The laboratory synthesizes benzene from precipitated barium carbonate using techniques described by Noakes, Kim, and Akers (1967). Three ml of the synthesized benzene is pipetted into a tared, low potassium-40 glass vial. The sample is weighed and 1ml of a scintillation solution is added to the vial. The scintillation solution used is a mixture of 10g PPO and 0.025g dimethyl-POPOP scintillators in 250ml toluene. Calculations of dates are made with the radiocarbon half-life of 5568 years; plus or minus numbers quoted herein are the standard error for the counting of radioactive disintegrations.

Hydrologic studies are made by the U.S. Geological Survey in support of the nuclear testing program of the U.S. Atomic Energy Commission. Radiocarbon dates from samples of water obtained during these hydrologic studies are used to aid in hydrologic interpretations of the study areas. Data describing the wells and springs sampled were taken from records of the Nevada State Engineer and then field checked. Water samples were collected in a manner to minimize contamination by atmospheric CO_2 . Through the addition of barium chloride and a precipitation procedure, sufficient barium carbonate is obtained to yield at least 3g carbon after synthesization.

All samples were collected by AEC Hydrology Projects, Water Resources Division, U.S. Geological Survey, Lakewood, Colorado, except for water samples from the State of New Mexico which were collected by U.S. Geological Survey, Water Resources Division, New Mexico District office. Alkalinity values were determined at time of sample collection.

The δC^{13} values reported in Tables 1 and 2 are based on Craig PDB limestone standard (Craig, 1957) equal to 0.00‰ and were determined by Teledyne Isotopes, Inc., Westwood Laboratories (Buckley and Willis, 1969). The total alkalinity as bicarbonate values reported in Tables 1 and 2 were determined using techniques described by Rainwater and Thatcher (1960). Conversion factor from gall/min to m^3/min was 0.0037854.

ACKNOWLEDGMENTS

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* Publication authorized by the Director, U.S. Geological Survey.

TABLE 1.
Summary of C¹⁴, δC¹³, and alkalinity for water sources in Nevada

Sample no.	Date	Radiocarbon (‰ NBS)	δC ¹³ (‰ PDB)	Total alkalinity as bicarbonate (mg/l)
DE-670293	11/19/66	5.1 ± 0.8	-5.5	300
DE-670294	11/19/66	2.4 ± 0.8	-6.9	300
DE-670295	11/21/66	11.1 ± 1.4	-8.7	304
DE-670296	11/20/66	11.4 ± 1.8	-11.0	310
DE-670297	11/18/66	8.0 ± 1.6	-6.8	303
DE-670298	10/20/66	10.8 ± 1.3	-4.8	278
DE-670299	11/19/66	2.9 ± 1.4	-5.0	330
DE-670300	11/21/66	7.2 ± 1.0	-7.4	304
DE-670301	11/21/66	3.7 ± 1.6	-5.5	300
DE-670302	11/20/66	12.1 ± 1.7	-7.9	302
DE-670303	11/21/66	3.0 ± 1.3	-5.6	318
DE-670341	12/09/66	3.5 ± 1.5	-6.8	310
DE-670342	12/09/66	14.8 ± 2.1	-8.3	302
DE-670343	12/10/66	18.1 ± 1.5	-9.9	234
DE-670344	12/11/66	17.8 ± 1.6	-10.5	310
DE-670345	12/12/66	82.9 ± 1.0	-11.6	307
DE-670346	12/13/66	20.4 ± 1.3	—	316
DE-670347	12/14/66	18.6 ± 1.7	-11.1	268
DE-670348	12/14/66	80.3 ± 0.9	—	302
DE-680076	07/07/67	29.1 ± 1.1	-8.5	139
DE-680078	07/07/67	9.2 ± 1.0	-8.4	184
DE-680080	07/05/67	14.5 ± 0.9	-5.5	207
DE-680082	07/05/67	26.2 ± 1.0	-6.8	232
DE-680089	07/05/67	30.3 ± 1.3	-5.2	183
DE-680092	07/06/67	27.6 ± 1.2	-6.3	185
DE-680097	07/04/67	25.6 ± 1.0	-6.8	228
DE-680098	07/04/67	37.6 ± 1.4	-6.6	372
DE-680101	07/03/67	36.5 ± 1.1	—	185
DE-680105	07/03/67	34.1 ± 0.8	-7.7	196
DE-680106	07/03/67	35.8 ± 1.2	-7.2	212
DE-680107	07/03/67	65.1 ± 1.4	-8.9	396
DE-680583	11/16/67	4.4 ± 1.6	—	258
DE-680649	08/25/67	51.6 ± 1.5	-12.0	232
DE-680905	02/14/68	27.2 ± 1.2	-7.6	189
DE-680914	02/14/68	7.3 ± 0.9	-7.4	178
DE-680960	03/04/68	5.8 ± 0.8	-5.5	580
DE-680961	03/05/68	5.9 ± 0.7	—	580
DE-680962	03/06/68	7.6 ± 0.8	—	580
DE-680963	03/07/68	8.7 ± 0.8	-6.9	580
DE-680964	03/08/68	11.9 ± 1.3	—	580
DE-681240	06/18/68	12.7 ± 2.0	—	114

GROUNDWATER SAMPLES

	23,900 ± 1200
DE-670293. Fairbanks Spring	21,950 B.C.
Sample coll. Nov. 19, 1966 from SW spring orifice, Fairbanks Spring, Amargosa Desert, Nye Co., Nevada (36° 29' 30" N Lat, 116° 20' 30" W Long) 17.7km SSE of Lathrop Wells, Nevada. The total spring discharge was 6.5 m ³ /min. at 27.0°C at alt. 694.9m above msl from valley fill.	
	30,000 ± 2300
DE-670294. Fairbanks Spring	28,050 B.C.
Sample coll. Nov. 19, 1966 from NE spring orifice, Fairbanks Spring, Amargosa Desert, Nye Co., Nevada (36° 29' 30" N Lat, 116° 20' 30" W Long) 17.7km SSE of Lathrop Wells, Nevada. The total spring discharge was 6.5 m ³ /min. at 27.0°C at alt. 694.9m above msl from valley fill.	
	17,700 ± 1000
DE-670295. Point of Rocks Spring (King)	15,750 B.C.
Sample coll. Nov. 21, 1966 from Point of Rocks Spring (King), Amargosa Desert, Nye Co., Nevada (36° 24' 02" N Lat, 116° 16' 25" W Long) 29.0km SSE of Lathrop Wells, Nevada. The spring discharged 4.1 m ³ /min. at 33.0°C from Paleozoic limestones at alt. 701.0m above msl.	
	17,400 ± 1300
DE-670296. Spring 17S/50-23bbc	15,450 B.C.
Sample coll. Nov. 20, 1966 from Spring 17S/50-23bbc, Amargosa Desert, Nye Co., Nevada (36° 27' 36" N Lat, 116° 21' 14" W Long) 20.9km SSE of Lathrop Wells, Nevada. Water issues from Paleozoic limestone at alt. 713m above msl.	
	20,300 ± 1200
DE-670297. Longstreet Spring	18,350 B.C.
Sample coll. Nov. 18, 1966 from Longstreet Spring, Amargosa Desert, Nye Co., Nevada (36° 28' 04" N Lat, 116° 19' 31" W Long) 20.1km SSE	

TABLE 2.
Summary of C¹⁴, δC¹³, and alkalinity for water sources in New Mexico

Sample no.	Date	Radiocarbon (% NBS)	δC ¹³ (‰ PDB)	Total alkalinity as bicarbonate (mg/l)
DE-680458	09/04/67	17.9 ± 3.0	-12.5	—
DE-680650	11/14/67	47.9 ± 1.6	-23.4	—
DE-680651	11/20/67	8.0 ± 1.5	-10.3	—
DE-680759	12/11/67	22.5 ± 1.6	-7.8	—
DE-680782	10/10/67	6.5 ± 1.6	—	—
DE-680788	10/03/67	29.1 ± 2.4	—	—

of Lathrop Wells, Nevada. The spring discharged 3.9 m³/min. at 27.0°C at alt. 701.0m above msl from valley fill.

17,900 ± 1100

DE-670298. Crystal Spring

15,950 B.C.

Sample coll. Nov. 20, 1966 from Crystal Spring, Amargosa Desert, Nye Co., Nevada (36° 25' 15" N Lat, 116° 19' 19" W Long) 25.7km SSE of Lathrop Wells, Nevada. The spring discharged 10.7 m³/min. at 33.0°C at alt. 670.6m above msl from valley fill.

28,400 ± 4200

DE-670299. Soda Ash Spring

26,450 B.C.

Sample coll. Nov. 19, 1966 from Soda Ash Spring, Amargosa Desert, Nye Co., Nevada (36° 29' 22" N Lat, 116° 20' 10" W Long) 17.7km SSE of Lathrop Wells, Nevada. The spring discharged 0.3 m³/min. at 23.0°C at alt. 694.9m above msl from valley fill.

21,100 ± 1200

DE-670300. Point of Rocks Spring (small)

19,150 B.C.

Sample coll. Nov. 21, 1966 from Point of Rocks Spring (small), Amargosa Desert, Nye Co., Nevada (36° 24' 05" N Lat, 116° 16' 15" W Long) 29.0km SSE of Lathrop Wells, Nevada. The spring discharged 0.1 m³/min. at 34.0°C at alt. 829.1m above msl from Paleozoic limestone.

DE-670301. Jack Rabbit Spring

>26,500 ± 1400

Sample coll. Nov. 21, 1966 from Jack Rabbit Spring, Amargosa Desert, Nye Co., Nevada (36° 23' 23" N Lat, 116° 16' 41" W Long) 29.8km SSE of Lathrop Wells, Nevada. The spring discharged 2.2 m³/min. at 28.0°C at alt. 691.9m above msl from valley fill.

17,000 ± 1200

DE-670302. Rogers Spring

15,050 B.C.

Sample coll. Nov. 20, 1966 from Rogers Spring, Amargosa Desert, Nye Co., Nevada (36° 28' 48" N Lat, 116° 19' 32" W Long) 19.3km SSE of Lathrop Wells, Nevada. The spring discharged 2.8 m³/min. at 28.0°C at alt. 694.9m above msl from valley fill.

**DE-670303. Big Spring (Deep Spring,
Ash Meadows Spring)**

28,200 ± 3000

26,250 B.C.

Sample coll. Nov. 21, 1966 from Big Spring (Deep Spring, Ash Meadows Spring), Amargosa Desert, Nye Co., Nevada (36° 22' 29" N Lat, 116° 16' 26" W Long) 31.4km SSE of Lathrop Wells, Nevada. The spring discharged 3.9 m³/min. at 28.5°C at alt. 682.8m above msl from valley fill.

27,000 ± 2800

DE-670341. Devils Hole

25,050 B.C.

Sample coll. 5m below water surface Dec. 9, 1966 from Devils Hole, Death Valley National Monument, Nye Co., Nevada (36° 25' 32" N Lat, 116° 17' 27" W Long) 22.4km SSE of Lathrop Wells, Nevada. Water temperature was 32.0°C and alt. of water surface was 719.6m above msl.

DE-670342. Spring 17S/50-35cal **15,300 ± 1200**
13,350 ± B.C.

Sample coll. Dec. 9, 1966 from Spring 17S/50-35cal, Amargosa Desert, Nye Co., Nevada (36° 25' 41" N Lat, 116° 18' 35" W Long) 1.6km W of Devils Hole, Death Valley National Monument. Spring discharges at 31.0°C at alt. 743.7m above msl from valley fill.

DE-670343. Cactus Spring **13,700 ± 600**
11,750 B.C.

Sample coll. Dec. 10, 1966 from Cactus Spring at Cactus Springs, Clark Co., Nevada (36° 33' 55" N Lat, 115° 45' 39" W Long). The spring when pumped yields 0.02 m³/min. at 20.5°C at alt. 975.4m above msl from lake beds and valley fill.

DE-670344. Corn Creek Springs **13,900 ± 800**
11,950 B.C.

Sample coll. Dec. 11, 1966 from SW area of major discharge in pond 1m below bottom of pond, Corn Creek Springs, Clark Co., Nevada (36° 26' 17" N Lat, 115° 21' 16" W Long) 31.4km NW of Las Vegas, Nevada. Spring discharges at 21.5°C along fault scarp assoc. with Las Vegas shear zone at alt. 890.0m above msl from valley fill.

DE-670345. Cold Creek Spring **1500 ± 1000**
A.D. 450

Sample coll. Dec. 12, 1966 from Cold Creek Spring, Spring Mountains, Clark Co., Nevada (36° 24' 41" N Lat, 115° 44' 20" W Long) 20.9km SSE of Indian Springs, Nevada. The spring discharges 2.6 m³/min. at 10.0°C at alt. 1900m above msl from Paleozoic limestone.

DE-670346. Grapevine Spring **12,800 ± 700**
10,850 B.C.

Sample coll. Dec. 13, 1966 from Grapevine Spring near Pahrump, Nye Co., Nevada (36° 27' 26" N Lat, 116° 01' 14" W Long) 14.5km SE of junction of U.S. Hwy. 95 and Nevada 16. The spring discharges 0.04 m³/min. at 19.0°C at alt. 1450m above msl from Paleozoic clastic rocks.

DE-670347. Indian Spring **13,500 ± 800**
11,550 B.C.

Sample coll. Dec. 14, 1966 from Indian Spring at Indian Springs, Clark Co., Nevada (36° 34' 22" N Lat, 115° 39' 31" W Long). The spring discharges 1.5 m³/min. at 25.0°C at alt. 975.4m above msl from Paleozoic limestone.

DE-670348. Willow Spring **1800 ± 100**
A.D. 150

Sample coll. Dec. 14, 1966 from Willow Spring, Clark Co., Nevada (36° 25' 01" N Lat, 115° 45' 51" W Long) 17.7km SSW of Indian Springs, Nevada. Spring discharges at 10.5°C at alt. 1829m above msl from valley fill over Paleozoic limestone.

DE-680076. Well 9A **9900 ± 300**
7950 B.C.

Sample coll. July 7, 1967 from Well 9A, Tonopah Test Range, Nye Co., Nevada (37° 50' 40" N Lat, 116° 42' 40" W Long). Well drilled and cased to depth 83.5m in 1962. Well yields <0.02 m³/min. at 17.5°C from valley fill. Alt. of lsd is 1630.7m above msl and static water level was 44.2m below lsd.

DE-680078. Well No. 7 **19,200 ± 900**
17,250 B.C.

Sample coll. July 7, 1967 from Well No. 7, Tonopah Test Range, Nye Co., Nevada (37° 57' 20" N Lat, 116° 45' 00" W Long). Well drilled and cased to depth 226.5m in 1963. Well yields 0.3 m³/min. at 25.0°C from valley fill. Alt. of lsd is 1682.5m above msl and static water level was 110.0m below lsd.

DE-680080. Spring 10S/47-14bab **15,500 ± 500**
13,550 B.C.

Sample coll. July 5, 1967 from Spring 10S/47-14bab, Oasis Valley, Nye Co., Nevada (37° 04' 40" N Lat, 116° 41' 10" W Long) 24.1km NNW of Beatty, Nevada. The spring discharges 1.3 m³/min. at 29.0°C at alt. 1213.7m above msl from valley fill.

DE-680082. Well 10S/47-30dcc2 **10,800 ± 300**
8850 B.C.

Sample coll. July 5, 1967 from Well 10S/47-30dcc2, Oasis Valley, Nye Co., Nevada (37° 02' 10" N Lat, 116° 45' 20" W Long) 14.5km NNW of Beatty, Nevada. Well drilled to 36.9m and cased to 19.8m in 1939. Well yields 0.2 m³/min at 22.5°C from valley fill. Alt. of lsd 1182m above msl and static water level was 8.6m below lsd.

DE-680089. Spring 11S/47-3cdbl **9600 ± 400**
7650 B.C.

Sample coll. July 5, 1967 from Spring 11S/47-3cdbl, Oasis Valley, Nye Co., Nevada (37° 00' 20" N Lat, 116° 42' 20" W Long) 11.3km NNE of Beatty, Nevada. The spring discharges 0.2 m³/min. at 23.0°C at alt. 1170.4m above msl from Tertiary volcanic rocks.

DE-680092. Spring 11S/47-10ccb **10,300 ± 400**
8350 B.C.

Sample coll. July 6, 1967 from Spring 11S/47-10ccb, Oasis Valley, Nye Co., Nevada (36° 59' 30" N Lat, 116° 42' 50" W Long) 9.7km NNE of Beatty, Nevada. The spring discharges 1.8 m³/min. at 21.0°C at alt. 1112.5m above msl from valley fill.

DE-680097. Spring 11S/47-21aba2 **10,900 ± 300**
8950 B.C.

Sample coll. July 4, 1967 from Spring 11S/47-21aba2, Oasis Valley, Nye Co., Nevada (36° 58' 20" N Lat, 116° 42' 50" W Long) 7.2km NNE of Beatty, Nevada. The spring discharges <0.04 m³/min. at 41.0°C at alt. 1097.3m above msl from valley fill.

DE-680098. Well 11S/47-21accl **7900 ± 300**
5950 B.C.

Sample coll. July 4, 1967 from Well 11S/47-21accl, Oasis Valley, Nye Co., Nevada (36° 58' 00" N Lat, 116° 43' 20" W Long) 6.4km NNE of Beatty, Nevada. Well yields 0.1 m³/min. at 31.5°C from valley fill. Alt. of lsd is 1085m above msl and static water level was 3.0m below lsd.

DE-680101. Well 11S/47-27cba **8100 ± 200**
6150 B.C.

Sample coll. July 3, 1967 from Well 11S/47-27cba, Oasis Valley, Nye Co., Nevada (36° 57' 00" N Lat, 116° 42' 50" W Long) 6.4km NE of Beatty, Nevada. Well drilled and cased to 16.8m in 1963 and yields 0.08 m³/min. at 21.5°C from valley fill. Alt. of lsd is 1060.7m above msl and static water level was 9.1m below lsd.

DE-680105. Beatty Spring (Municipal spring) **8600 ± 200**
6650 B.C.

Sample coll. July 3, 1967 from Beatty Spring (Municipal spring), Oasis Valley, Nye Co., Nevada (36° 56' 40" N Lat, 116° 44' 40" W Long) 1.6km NE of Beatty, Nevada. Spring discharges 1.8 m³/min. at 24.0°C at alt. 1027.2m above msl from valley fill.

DE-680106. Well 11S/47-6cdd **8300 ± 300**
6350 B.C.

Sample coll. July 3, 1967 from Well 11S/47-6cdd, Oasis Valley, Nye Co., Nevada (36° 55' 00" N Lat, 116° 55' 50" W Long) 0.8km NNW of Beatty, Nevada. Well drilled to 54.9m and cased to 29.0m in 1962 and yields 0.3 m³/min. at 21.5°C from valley fill. Alt. of lsd is 1030.2m above msl and static water level was 333.8m below lsd.

DE-680107. Well 12S/47-7bdb **3500 ± 200**
1550 B.C.

Sample coll. July 3, 1967 from Well 12S/47-7bdb, Oasis Valley, Nye Co., Nevada (36° 54' 20" N Lat, 116° 45' 30" W Long) at Beatty, Nevada. Well drilled to 91.4m and cased to 54.9m in 1965 and yields 0.9 m³/min. at 20.0°C from valley fill. Alt. of lsd is 999.7m above msl and static water level was 6.7m below lsd.

DE-680458. Well 22S/5-15daa **13,800 ± 1500**
11,850 B.C.

Sample coll. Sept. 4, 1967 from Well 22S/5-15daa, White Sands Missile Range, Dona Anna Co., New Mexico (32° 24' 06" N Lat, 106° 24' 54" W Long) 2.4km N and 6.4km E of White Sands, New Mexico. Well drilled to 1833.4m and cased to 121.9m in 1967. The interval sampled was between 1792.2m and 1795.3m below lsd. The interval yielded ≈ 0.01 m³/min. at 54.5°C. Alt. of lsd is 1204.0m above msl and the static water level was 59.4m below lsd.

DE-680583. Well Army-1 **25,100 ± 2600**
23,150 B.C.

Sample coll. Aug. 1967 from Well Army-1, Nevada Test Site, Nye Co., Nevada (36° 35' 30" N Lat, 116° 02' 14" W Long) 4.0km W of junc. of Mercury Hwy. and U.S. 95. Well drilled to 593.1m and cased to 414.5m and yields 1.7 m³/min. at 30.5°C from Paleozoic limestone. Alt. of lsd is 961.3m above msl and static water level was 239.3m below lsd.

DE-680649. Well HTH-1 **5300 ± 200**
3350 B.C.

Sample coll. Aug. 25, 1967 from Well HTH-1, Hot Creek Valley, Nye Co., Nevada (38° 27' 34.80" N Lat, 116° 12' 45.30" W Long) 16.1km NE of Hot Creek Ranch, Nevada. Well drilled and cased to 1129.0m in 1967 in valley fill. Alt. of lsd is 1832m above msl and static water level was 170m below lsd.

DE-680650. Well SMR-4 **5900 ± 300**
3950 B.C.

Sample coll. Nov. 14, 1967 from Well SMR-4, White Sands Missile Range, Dona Anna Co., New Mexico (32° 27' 38" N Lat, 106° 27' 15" W Long) 9.7km N and 2.4km E of White Sands, New Mexico. Well drilled to 137.2m in 1967 and yields ca. 0.05 m³/min. at 24.0°C from valley fill. Alt. of lsd is 1283.2m above msl and static water level was 83.2m below lsd.

DE-680651. Well SMR-4 **20,300 ± 1800**
18,350 B.C.

Sample coll. Nov. 20, 1967 from Well SMR-4, White Sands Missile Range, Dona Anna Co., New Mexico (32° 27' 38" N Lat, 106° 27' 15" W Long) 9.7km N and 2.4km E of White Sands, New Mexico. Well drilled to 137.2m in 1967 and yields ca. 0.05 m³/min. from valley fill. Alt. of lsd is 1283.2m above msl and static water level was 83.2m below lsd.

DE-680759. Well SMR-5 **12,000 ± 600**
10,050 B.C.

Sample coll. Dec. 11, 1967 from Well SMR-5, White Sands Missile Range, Dona Anna Co., New Mexico (32° 28' 32" N Lat, 106° 23' 50" W Long) 11.3km N and 8.0km E of White Sands, New Mexico. Well drilled and cased to 75.9m in 1967 and yields 0.08 m³/min. at 21.0°C from valley fill. Alt. of lsd is 1204.0m above msl and static water level was 33.1m below lsd.

DE-680773. Constantine Spring **3300 ± 300**
1350 B.C.

Sample coll. Sept. 27, 1967 from Constantine Spring, Amchitka I., Alaska (51° 22' 43" N Lat, 179° 14' 59" E Long) 0.8km N of Base Camp, Amchitka I., Alaska. The spring discharges 0.73 m³/min. at 30.0°C at alt. 27.7m above msl from Pleistocene gravel.

DE-680782. Well Skelly Jal WSW-1 **22,000 ± 1800**
20,050 B.C.

Sample coll. Oct. 3, 1967 from Well Skelly Jal WSW-1, Lea Co., New Mexico (32° 12' 30" N Lat, 103° 16' 25" W Long) 9.7km N and 8.0km W of Jal. Well drilled to 1371.6m and cased to 1204.3m in 1967. Alt. is 1030.2m above msl and static water level is 1205.5m below lsd.

DE-680788. Well **9900 ± 700**
7950 B.C.

Sample coll. Oct. 3, 1967 from well, White Sands Missile Range, Dona Anna Co., New Mexico 2.4km N and 6.4km E of White Sands, New Mexico. Well drilled to 1833.4m and cased to 121.9m in 1967 and yields 0.002 m³/min. at 53.5°C from lakebed sediments. Alt. is 1204.0m above msl and static water level was 119m below lsd.

DE-680905. Base Camp Well **10,500 ± 400**
8550 B.C.

Sample coll. Feb. 14, 1968 from Base camp Well, Hot Creek Valley, Nye Co., Nevada (38° 18' 20" N Lat, 116° 16' 55" W Long) 16.1km E of Warm Springs, Nevada at USAEC CNTA Base Camp. Well drilled and cased to 90.5m below lsd in 1967 and yielded >0.2 m³/min. at 17.0°C from valley fill. Alt. of lsd is 585m above msl and static water level was 24.4m below lsd.

DE-680914. Amargosa Tracer Well No. 2 **21,000 ± 1100**
19,050 B.C.

Sample coll. Feb. 1968 from Amargosa Tracer Well No. 2, Amargosa Valley, Nye Co., Nevada (36° 32' 11" N Lat, 116° 13' 39" W Long) 27.4km SW of Mercury, Nevada. Well drilled to 252.4m and cased to 200.9m below lsd in 1966 and yields 3.4 m³/min. at 31.0°C. Alt. of lsd is 731.6m above msl and static water level was 11.9m below lsd.

DE-680960. Well C **22,900 ± 1200**
20,950 B.C.

Sample coll. Mar. 4, 1968 from Well C, Yucca Flat, Nevada Test Site, Nye Co., Nevada (36° 55' 08" N Lat, 116° 00' 35" W Long) 30km N of Mercury, Nevada. Well drilled and cased to 518.5m below lsd in 1961 and yields 0.8 to 1.7 m³/min. at 36.5°C from Paleozoic limestone. Alt. of lsd is 1195.1m above msl and static water level was 469.4m below lsd.

TABLE 3.
Summary of C¹⁴, δC¹³, and alkalinity for water sources in Alaska

Sample no.	Date	Radiocarbon (% NBS)	δC ¹³ (‰ PDB)	Total alkalinity as bicarbonate (mg/l)
DE-680773	09/27/67	66.6 ± 2.5	-16.6	92

DE-680961. Well C **22,700 ± 1000**
20,750 B.C.

Sample coll. Mar. 5, 1968 from Well C, Yucca Flat, Nevada Test Site, Nye Co., Nevada (36° 55' 08" N Lat, 116° 00' 35" W Long) 30km N of Mercury, Nevada.

DE-680962. Well C **20,700 ± 900**
18,750 B.C.

Sample coll. Mar. 6, 1968 from Well C, Yucca Flat, Nevada Test Site, Nye Co., Nevada (36° 55' 08" N Lat, 116° 00' 35" W Long) 30km N of Mercury, Nevada.

DE-680963. Well C **17,100 ± 800**
15,150 B.C.

Sample coll. Mar. 7, 1968 from Well C, Yucca Flat, Nevada Test Site, Nye Co., Nevada (36° 55' 08" N Lat, 116° 00' 35" W Long) 30km N of Mercury, Nevada.

DE-680964. Well C **17,100 ± 900**
15,150 B.C.

Sample coll. Mar. 8, 1968 from Well C, Yucca Flat, Nevada Test Site, Nye Co., Nevada (36° 55' 08" N Lat, 116° 00' 35" W Long) 30km N of Mercury, Nevada.

DE-681240. Clover Creek **127 ± 2.0% modern**

Sample coll. June 18, 1968 from Clover Creek, Little Fish Lake Valley, Nye Co., Nevada (38° 40' 40" N Lat, 116° 29' 30" W Long) 8.0km SW of Fish Lake Ranch, Nevada at alt. of 1975m above msl.

REFERENCES

- Buckley, J. D. and Willis, E. H., 1969, Isotopes' radiocarbon measurements VII: Radiocarbon, v. 11, p. 53-105.
- Craig, Harmon, 1957, Isotopic standards for carbon and oxygen and correction factors for mass-spectrometric analysis of carbon dioxide: *Geochim. et Cosmochim. Acta*, v. 12, p. 133-149.
- Noakes, J. E., Kim, S. M., and Akers, L. K., 1967, Recent improvements in benzene chemistry for radiocarbon counting: *Geochim. et Cosmochim. Acta*, v. 31, p. 1094-1096.
- Rainwater, F. H. and Thatcher, L. L., 1960, Methods for collection and analysis of water samples: U.S. Geol. Survey Water-Supply Paper 1454, p. 94-95.