Capturing the Record of Neogene Climate Change from Strata of the High Plains Aquifer in Kansas: Research Activities and Findings

Greg A. Ludvigson, Rolfe Mandel, Allen MacFarlane, Jon J. Smith

Purpose

The purpose of this research was to investigate Neogene stratigraphy and aquifer architecture by analyzing the $\delta^{13}C$ and $\delta^{18}O$ values of organic carbon and pedogenic carbonate sources from materials recovered during scientific drilling in the High Plains of western Kansas. Fox and Koch (2003) isotopically analyzed Neogene paleosols from throughout the High Plains with well-established biostratigraphic or tephrochronologic dates, and showed a long-term increase in $\delta^{13}C$ values starting at ~10 Ma (Fig. 1). They interpreted these to reflect the expansion of C_4 grassland biomes 1–4 Ma. Their Pliocene-Pleistocene samples show an intricate structure of successive **carbon isotope excursions** (CIEs). Martin et al. (2008) showed that Pliocene-Pleistocene CIEs from southern Kansas are associated with $\delta^{18}O$ shifts of up to 10 per mil, suggesting changes in paleotemperatures and/or evaporation effects. These works demonstrate the potential for adding further constraints on the ages of units of the Neogene High Plains succession using stable isotope chemostratigraphy.

To evaluate the regional expression of long-term chemostratigraphic trends in High Plains deposits, we analyzed the isotopic compositions of bulk sediments and carbonate nodules from three research wells drilled in southwestern Kansas by the U.S. Geological Survey (USGS) Water Resources Division in 2000 as part of a High Plains Regional Ground-Water Study (Fig. 2). Drill cuttings from these boreholes (CNG, CAL-121, and CAL-122) represent the best subsurface samples of the Ogallala Formation in stratigraphic context that are currently available for scientific evaluation

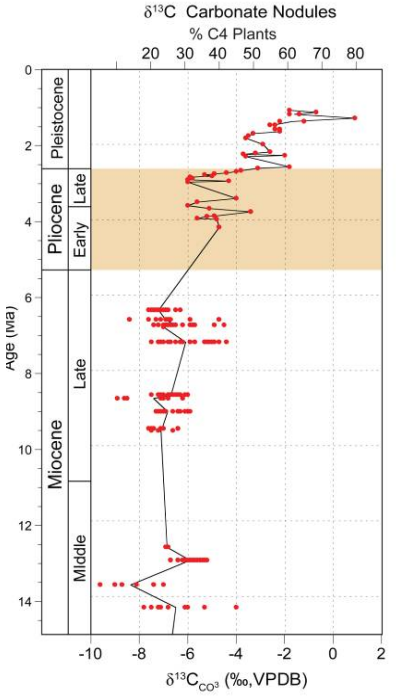

Figure 1. Carbonate $\delta^{13}C$ record of Neogene sediments in the Great Plains with 5-pt. moving average. Estimated % of C_4 paleofloras shown in upper scale. Modified from data in Fox and Koch (2003).

Activities and Results

Isotopic Analyses

PI Ludvigson and postdoctoral researchers Haj and Smith visited USGS facilities at the Denver Federal Center to retrieve 454 bulk sediment samples and 222 carbonate nodules from bagged drill cuttings of the USGS boreholes. Carbonate nodules were crushed with mortar and pestle, and sampled for $\delta^{13}C$ and $\delta^{18}O$ analysis by Stable Isotope Ratio Mass Spectrometer (SIRMS) on the Kiel Device in the W.M. Keck Paleoenvironmental and Environmental Stable Isotope Laboratory (KPESIL). Carbonate nodules and bulk sediment samples were decarbonated in KGS laboratory facilities and their organic $\delta^{13}C$ values were generated by Elemental Analyzer (EA-SIRMS) at the KPESIL (tabular data are presented in Appendix A).

Carbonate nodules from the CNG borehole present

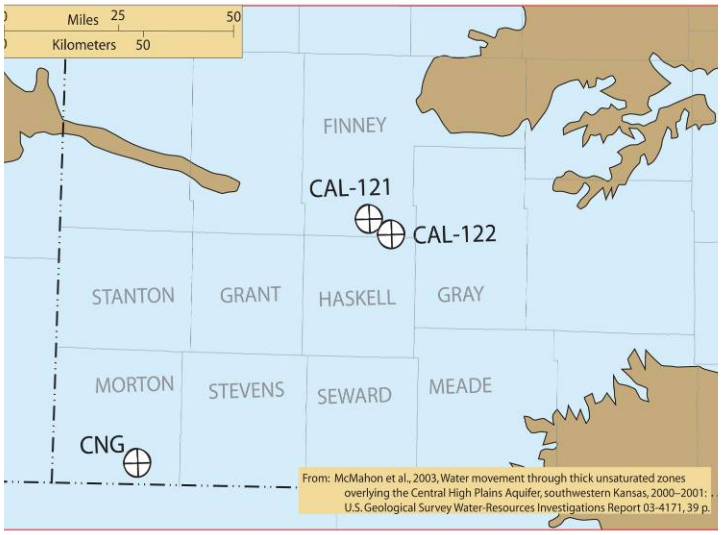

Figure 2. Locations of USGS research wells in southwestern Kansas. Modified from McMahon et al. (2003).

some similarities to Fox and Koch (2003) in that they show a long-term upward increase in $\delta^{13}C$ values, with about the same starting baseline value of -6‰ VPDB (Fig. 3a). The CAL-121 and CAL-122 profiles also show long-term upward increases in $\delta^{13}C$ values, but with higher starting baseline values of -4‰ VPDB (Fig. 3b and 3c). The SOM profiles for the CNG and CAL boreholes all show long-term upward increases in $\delta^{13}C$ values, and all with the same starting baseline values of -27‰ VPDB. These relationships suggest that there were long-term differences in paleohydrologic or soil gas processes (kinetic $\delta^{13}C$ effects of soil CO_2 degassing? evaporation rates? etc.) between the CNG and CAL sites.

Of special note are the more short-term CIEs in the profiles. In the CNG profile, pedogenic carbonates show three well-developed positive CIEs (labeled A, B, and C in Fig. 3). Some of these features might be identifiable in the carbonate chemostratigraphy of the CAL boreholes, but tentative chemostratigraphic correlations cannot be tested by other independent chronostratigraphic data with these borehole samples. The existence and structure of these carbonate CIEs is even more tenuous in the bulk sediment SOM profiles. It is apparent that these features did not originate simply from changes in paleovegetation; other paleoclimatic, paleohydrologic, or diagenetic processes were involved. Although they could not be sampled at the same stratigraphic frequencies, the $\delta^{13}C$ values of SOM extracted from pedogenic carbonates differ from those in bulk sediments. In CIEs A and C, the $\delta^{13}C$ of SOM extracted from carbonates was about 2 per mil higher than that of the bulk sediment, while in CIE B, the $\delta^{13}C$ of SOM extracted from carbonates was about 2 per mil lower than that from the bulk sediment. Wynn (2007) has presented evidence that the $\delta^{13}C$ of SOM in buried soils is fractionated by diagenetic processes, suggesting that the SOM extracted from carbonates preserves a more accurate record of paleovegetation than SOM from bulk sediments.

The carbonate CIEs in the CNG and CAL boreholes are variably expressed in corresponding oxygen isotope profiles (Fig. 3a–c). Positive CIEs A, B, and C have only a muted expression with a positive $\delta^{18}O$ shift of less than a per mil in the CNG borehole, but display larger positive $\delta^{18}O$ shifts of up to 2 per mil in the CAL boreholes. Conversely, negative CIE B' in the CAL boreholes is associated with positive $\delta^{18}O$ shifts in the CAL boreholes, obviously recording a different set of processes than the positive CIEs A, B, and C. Do these chemostratigraphic/paleoclimatologic events open an avenue for more refined stratigraphic correlations of the High Plains succession? We will not know until such events are documented in long continuous drillcores in the context of a chronostratigraphic record calibrated by volcanic ash bed tephrochronology and the magnetic polarity time scale.

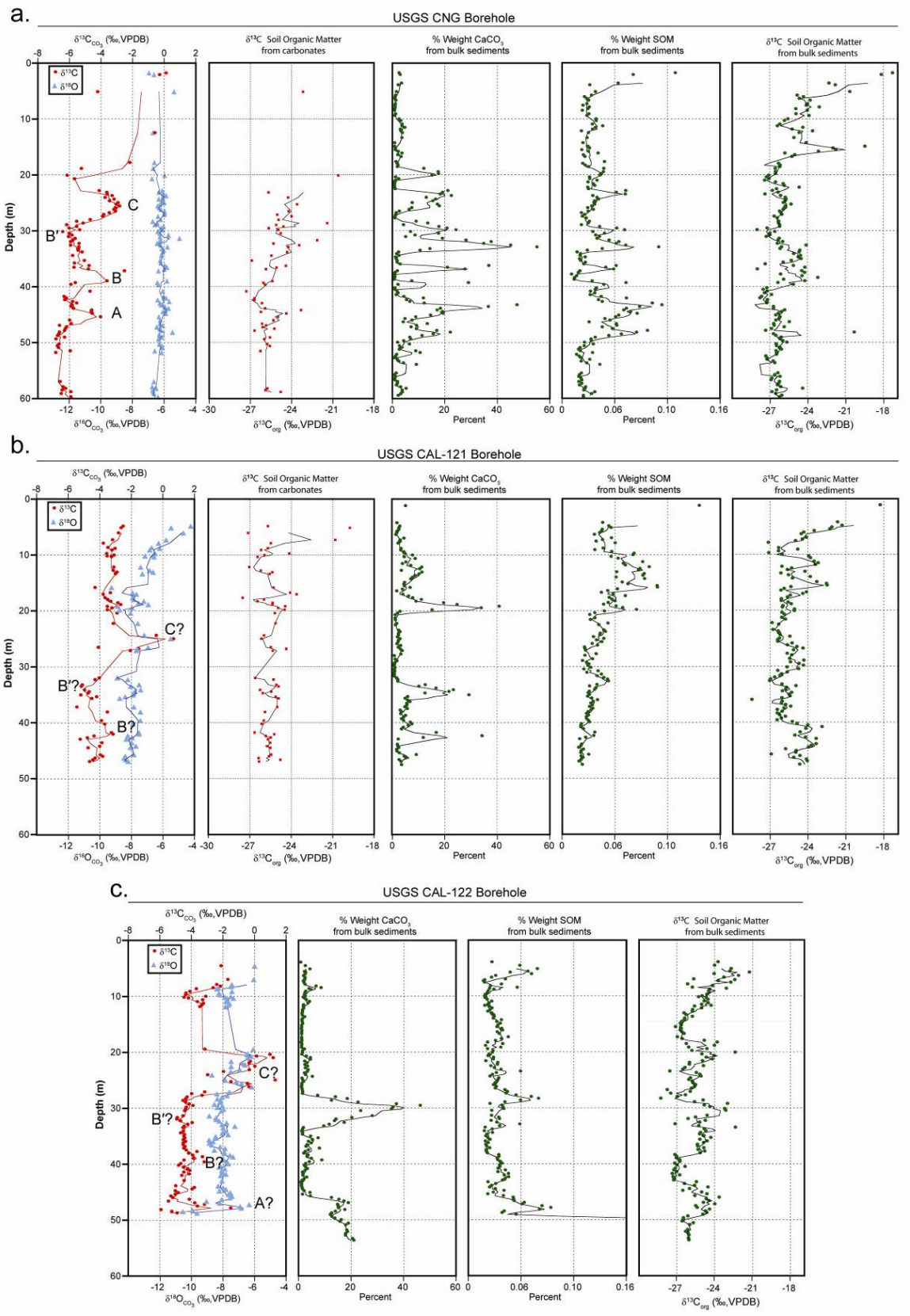

Figure 3. Carbonate $\delta^{13}C$ and $\delta^{18}O$, and organic $\delta^{13}C$ records of Neogene sediments in USGS boreholes with 5-pt. moving averages. $\delta^{13}C$ of soil organic matter from CAL-122 carbonate nodules is still being analyzed.

The different magnitudes of these $\delta^{18}O$ shifts, and their lack of local or regional coherence, suggests that they were not simply changes in paleotemperatures, but involved paleohydrologic and/or diagenetic changes. This poses such questions as whether the $\delta^{18}O$ of infiltrating precipitation changed, or the magnitudes of ^{18}O enrichments through evaporation of soil groundwater changed through time. Digital cathodoluminescence imaging facilities at KGS, and microsampling equipment at KPESIL would enable the PIs to carry out diagenetic deconvolutions of cored carbonates to elucidate these paleohydrologic questions, as done recently by Suarez et al. (2009).

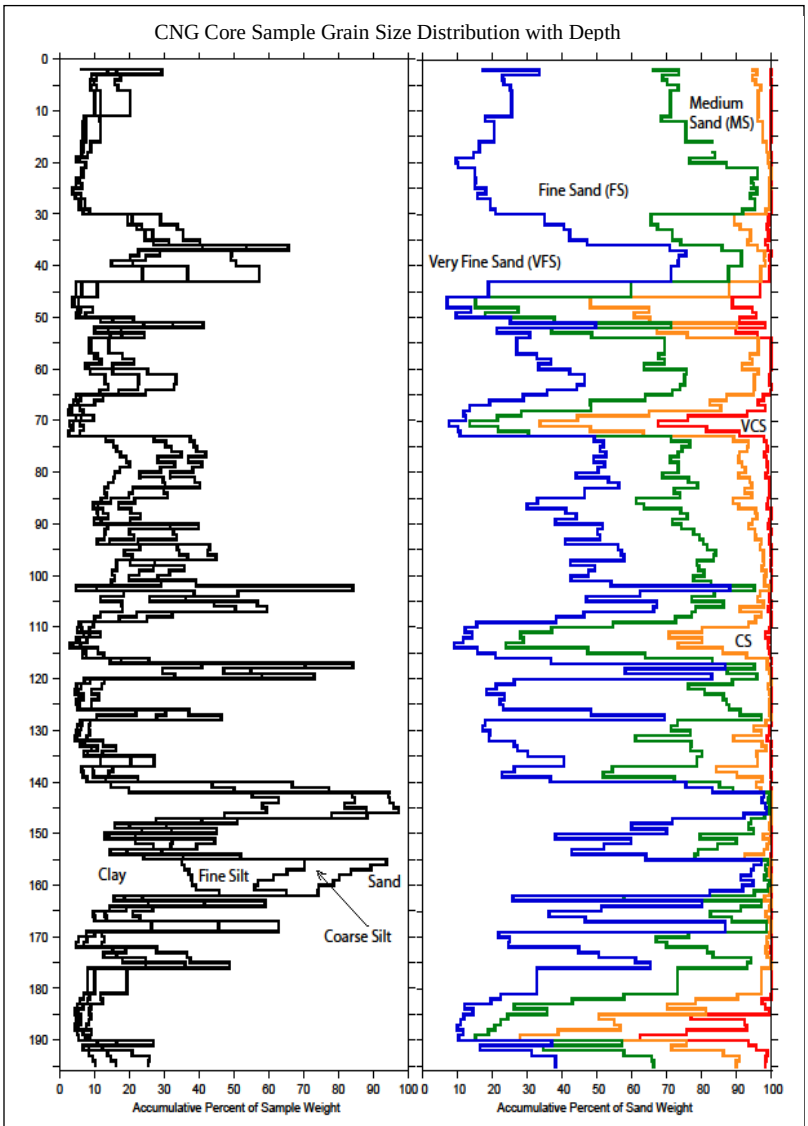

Figure 4. Grain size distribution of CNG research well bulk sediments.

Particle Size Analyses

Particle size analyses of the 169 stratigraphically superposed CNG bulk sediment samples were conducted by Dr. Adel Haj with the Department of Biology and Earth Science at the University of Central Missouri, Warrensburg, MO. A graphical representation of this data is presented in Fig. 4; tabular data presented in Appendix B.

Optically Stimulated Luminescence (OSL) Dating

Optically Stimulated Luminescence (OSL) dating of two sealed CNG core samples was conducted by Dr. Paul Hanson of the University of Nebraska-Lincoln (tabular data presented in Appendix C). Dr. Hanson is in the process of conducting additional OSL analyses on two CAL-121 and two CAL-122 core samples at the time of this reporting.

Detrital Zircon Analyses

Detrital zircon analyses of three bagged cuttings samples were conducted by Dr. George Gehrels and lab personnel of the University of Arizona LaserChron Center (tabular data presented in Appendix D). These samples were selected on the basis of documented modes in the medium sand-size fractions (Fig. 4). While acknowledging concerns of possible biases introduced by the drilling method (ODEX air-hammering in 30 cm increments), the youngest single grain dated to 26.3 ± 1.9 Ma.

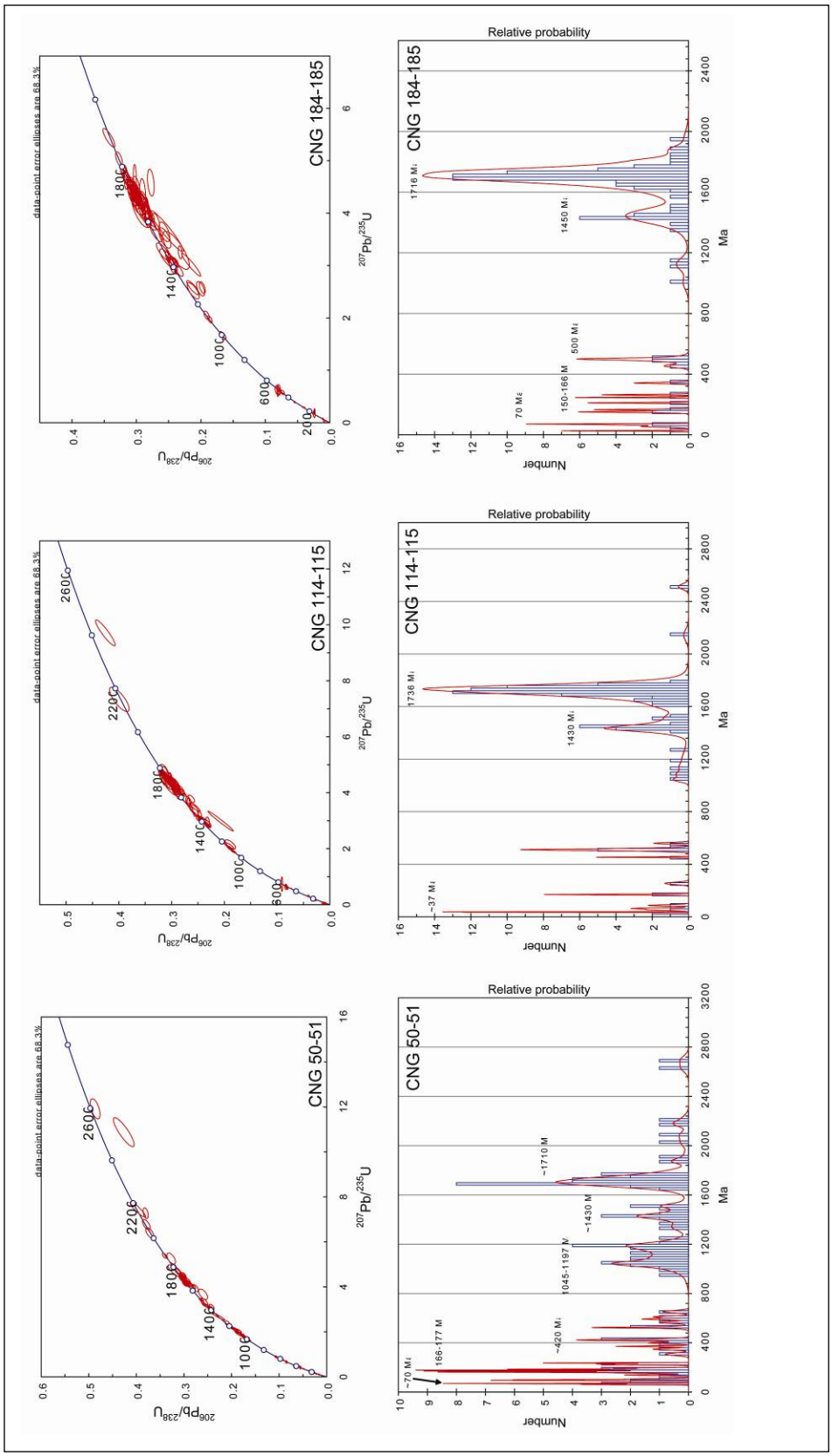

Figure 5. Concordia and age distribution diagrams derived from detrital zircon analyses of CNG borehole samples.

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Wynn, J.G., 2007, Carbon isotope fractionation during decomposition of organic matter in soils and paleosols: Implications for paleoecological interpretations of paleosols: Palaeogeography Palaeoclimatology Palaeoecology, v. 251, no. 3-4, p. 437-448.

Resulting Publications and Broader Impacts

Six abstracts of presentations at professional meetings have been published. One NSF proposal stemming from this work has been submitted (January 2010), two scientific papers have been published, and another manuscript is in preparation. Recent results from this work include:

Grant Proposal

Smith, J.J., Petronis, M., Ludvigson, G.A., and Doveton, J.H., Collaborative Research: Investigating Lithologic and Stratigraphic Controls on Hydrogeology in Neogene Strata of the Central High Plains Aquifer. National Science Foundation (submitted January 2010, $476,582 requested)

Publications

Xia, J., Ludvigson, G., Miller, R., Mayer, L., and Haj, A., 2010, Delineation of a volcanic ash body using electrical resistivity profiling: Journal of Geophysics and Engineering, v. 7, p. 1-10 (accepted 4/28/2010).

Ludvigson, G.A., Sawin, R.S., Franseen, E.K., Watney, W.L., West, R.R., and Smith, J.J., 2009, A review of the stratigraphy of the Ogallala Formation and revision of Neogene ("Tertiary") nomenclature in Kansas: Kansas Geological Survey: Current Research in Earth Sciences, Kansas Geological Survey Bulletin 256, part 2, 9 p. (http://www.kgs.ku.edu/Current/2009/Ludvigson/Bull256part2.pdf).

Abstracts

Smith, J.J., Ludvigson, G.A., Mandel, R., Macfarlane, P.A., Haj, A., Murphy, L., and McKee, A., 2009. A record of carbon- and oxygen-isotope excursions from pedogenic carbonates of the Neogene High Plains succession in western Kansas. Geological Society of America, Abstracts with program, 41(7): 125-126.

Smith, J.J., Ludvigson, G.A., Macfarlane, P.A., Mandel, R., Haj, A., Murphy, L., and McKee,

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Ludvigson, G.A., Haj, A., Fox, D.L., Mandel, R. and Macfarlane, P.A., 2007, A new approach to understanding Neogene stratigraphic architecture of the High Plains succession in western Kansas using carbon isotope chemostratigraphy: 2007 Mid-Continent Section Meeting, American Association of Petroleum Geologists, Meeting Program, p. 40.

Ludvigson, G.A., Haj, A., Macfarlane, P.A., Mandel, R., and Murphy, L., 2007, Testing a carbon isotopic age model for the Neogene High Plains succession in western Kansas: Geological Society of America, Abstracts with Programs, 39(6): 336.

Development and Training of Junior Scientists

During the period of this project, two post-doctoral research associates at the Kansas Geological Survey were involved in the daily conduct of the research. Post-doctoral Research Associate Dr. Adel Haj (Ph.D. University of Iowa 2007) worked at KGS from the inception of the project in October 2006 until August 2007, at which time he left to accept a tenure-track appointment as an Assistant Professor at the University of Central Missouri. Post-doctoral Research Associate Dr. Jon J. Smith (Ph.D. University of Kansas 2007) began working at the Kansas Geological Survey in September 2007 and continued in that position until May 2009, at which time he accepted appointment as an Assistant Scientist at the Kansas Geological Survey.

During the period of this project, two graduate research assistants were involved in carrying out laboratory analyses in facilities of the Kansas Geological Survey and the KU Keck Paleoenvironmental and Environmental Stable Isotope Laboratory (KPESIL). Ph.D student Laura Murphy has been involved in the renovation of lab facilities in rooms 101 and 105 Moore Hall (April 2007), and room 18 in Parker Hall (2009-2010). She has carried out lab procedures, and trained and supervised other student laboratory assistants in those facilities and at KPESIL. Arlo McKee (M.A. University of Kansas 2009) carried out a large number of laboratory analyses in the facilities at KGS and at KPESIL.

Development of KGS Laboratory Facilities

At the inception of the project, it was determined that the limited equipment and lab space available for routine sediment decarbonation procedures for organic ^{13}C analyses at KPESIL would pose a major bottleneck that would slow the routine conduct of decarbonation procedures on large volumes of samples. A workaround solution was found by reclaiming and repurposing inactive lab spaces in Moore Hall 101 and 105. These labs now house facilities for large numbers of decarbonation procedures, a Digital Catholodoluminescence Imaging

Laboratory, and a geologic sample degassing system for vacuum impregnation of hand samples with epoxide resins. The acquisition of equipment in these facilities was supported by other funding sources in addition to initial startup funds in this Small Grant for Research. Research and equipment funds held by Drs. Mandel and Ludvigson were devoted to the development of these facilities, and KGS Stratigraphic Research Section funds held by Dr. Evan Franseen were also devoted to the development of these facilities, and supported other laboratory expenses involved in producing the data presented in this report.

The most recent development from the High Plains Initiative is the opening of laboratory facilities for routine analysis of sedimentary particle sizes using the pipette method. This laboratory is opening in Parker Hall 18 in late spring 2010. Research funds contributed by Murphy, Mandel, Smith, and Ludvigson are being devoted to the opening of this facility.

Contributions to KGS Geologic Sample Archive

In February 2009, during a transfer of office facilities at the Denver Federal Center, USGS hydrogeologist Dr. Peter McMahon offered the custody of the USGS borehole samples from the CNG (Morton County) and CAL-121 and CAL-122 (Finney County) boreholes to KGS. These samples were transferred to archival facilities of the KGS, and have been inventoried by Dr. Smith.

Appendix A

Isotopic Data from CNG Borehole										
Carbonate Nodules							Organic C from Bulk Sediments			
Depth (m)	$\delta^{13}C$ VPDB carbonate	$\delta^{18}O$ VPDB carbonate	Wt % Loss on Decarb	C% from EA	Total Organic Carbon Wt %	$\delta^{13}C$ VPDB organic	Wt % Loss on Decarb	C% from EA	Total Organic Carbon Wt %	$\delta^{13}C$ VPDB
1.8							2.66	0.11	0.11	-17.26
2.1							3.11	0.07	0.07	-18.14
3.7							3.57	0.06	0.05	-22.29
4.0							2.32	0.03	0.03	-21.79
5.2	-4.20	-5.37	21.45	0.13	0.10	-23.17	1.66	0.03	0.03	-20.64
5.8							1.34	0.03	0.03	-24.81
6.1							1.19	0.02	0.02	-24.29
6.4							1.08	0.03	0.02	-24.63
6.7							1.43	0.03	0.03	-23.78
7.3							1.27	0.03	0.03	-23.99
7.6							1.12	0.02	0.02	-24.08
7.9							1.18	0.03	0.03	-23.05
8.2							0.98	0.03	0.03	-24.90
8.5							0.94	0.02	0.02	-24.01
9.1							1.39	0.03	0.03	-24.90
9.4							1.06	0.03	0.03	-23.87
10.1							2.67	0.03	0.03	-25.53
10.4							3.39	0.03	0.03	-25.81
11.0							3.87	0.03	0.03	-26.18
11.3							3.76	0.04	0.04	-26.37
11.6							4.82	0.03	0.03	-24.35
11.9							3.18	0.03	0.03	-25.20
12.2							3.30	0.02	0.02	-23.59
12.5							3.89	0.03	0.03	-24.66
13.4							3.76	0.03	0.02	-25.07
14.3							1.03	0.02	0.02	-24.09
14.9							1.04	0.03	0.03	-19.45
15.2							1.22	0.03	0.03	-21.98
15.5							1.25	0.02	0.02	-21.75
15.8							2.34	0.03	0.03	-23.12
16.2							3.75	0.04	0.04	-25.78
16.5							2.16	0.02	0.02	-25.00
16.8							3.48	0.02	0.02	-25.22
17.7							1.52	0.04	0.04	-29.78
18.0							1.89	0.02	0.02	-26.28
18.3							2.26	0.02	0.02	-26.16
18.6							2.03	0.03	0.03	-26.17
18.9							12.12	0.04	0.04	-26.55
19.5							17.56	0.04	0.03	-26.52
19.8							17.67	0.04	0.03	-26.52

Isotopic Data from CNG Borehole										
Carbonate Nodules							Organic C from Bulk Sediments			
Depth (m)	$\delta^{13}C$ VPDB carbonate	$\delta^{18}O$ VPDB carbonate	Wt % Loss on Decarb	C% from EA	Total Organic Carbon Wt %	$\delta^{13}C$ VPDB organic	Wt % Loss on Decarb	C% from EA	Total Organic Carbon Wt %	$\delta^{13}C$ VPDB
20.1	-6.12	-5.97	62.58	0.14	0.05	-20.60	15.16	0.04	0.03	-27.06
20.4							1.35	0.03	0.03	-27.23
20.7							2.54	0.03	0.03	-27.03
21.0							1.34	0.04	0.04	-27.37
21.3							0.60	0.03	0.03	-26.52
21.6							0.96	0.03	0.03	-25.92
21.9							0.95	0.03	0.03	-25.83
22.3							0.97	0.03	0.03	-24.65
22.6							1.19	0.03	0.03	-26.45
22.9							21.25	0.06	0.05	-26.77
23.2	-3.61	-6.33	73.12	0.12	0.03	-25.68	19.24	0.06	0.04	-26.32
23.5							18.36	0.06	0.05	-27.35
23.8							22.55	0.03	0.02	-26.12
24.1	-3.72	-6.10	20.03	0.03	0.03	-24.26	12.98	0.04	0.03	-25.74
24.4							16.58	0.04	0.03	-25.69
24.7							15.49	0.03	0.03	-25.74
25.0							7.73	0.03	0.03	-25.90
25.3	-3.01	-6.26	62.03	0.07	0.03	-23.60	17.24	0.03	0.03	-25.29
25.6							18.06	0.03	0.02	-25.73
25.9							7.52	0.03	0.02	-25.82
26.2							6.51	0.03	0.03	-25.91
26.5	-3.06	-5.96	74.88	0.09	0.02	-24.20	2.81	0.03	0.03	-26.19
26.8							1.55	0.02	0.02	-26.11
27.1	-3.81	-5.98	69.29	0.07	0.02	-25.04	1.40	0.02	0.02	-26.03
27.4	-3.87	-6.38	69.42	0.13	0.04	-24.00	1.21	0.02	0.02	-26.63
27.7							1.12	0.02	0.02	-26.38
28.0	-4.66	-6.22	69.80	0.04	0.01	-24.95				
28.3							9.18	0.03	0.03	-26.26
28.7	-5.11	-6.43	57.93	0.03	0.01	-21.40	13.60	0.03	0.02	-26.28
29.0	-6.14	-6.60	57.10	0.06	0.02	-25.12	4.33	0.02	0.02	-26.19
29.3	-5.53	-6.03	46.44	0.04	0.02	-24.58	17.87	0.04	0.04	-26.19
29.6	-6.00	-6.19	41.42	0.05	0.03	-25.67	20.96	0.06	0.05	-27.18
29.9	-5.32	-6.09	32.93	0.04	0.03	-24.97	24.30	0.06	0.05	-27.98
30.2							7.03	0.03	0.02	-26.58
30.5	-6.01	-6.27	72.96	0.06	0.02	-24.79	17.72	0.04	0.04	-26.96
30.8							8.76	0.03	0.03	-27.03
31.1							5.20	0.04	0.03	-27.26
31.4							19.20	0.04	0.03	-26.23
31.7	-5.76	-6.20	63.10	0.07	0.02	-22.13	28.20	0.05	0.04	-26.32
32.0	-5.91	-6.30	56.25	0.18	0.08	-11.87	37.73	0.06	0.04	-25.95
32.3	-5.37	-6.44	51.67	0.05	0.03	-25.32	34.92	0.06	0.03	-26.36
32.6	-5.91	-6.22	50.70	0.16	0.08	-23.45	45.21	0.06	0.04	-24.10

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Carbonate Nodules							Organic C from Bulk Sediments			
Depth (m)	$\delta^{13}C$ VPDB carbonate	$\delta^{18}O$ VPDB carbonate	Wt % Loss on Decarb	C% from EA	Total Organic Carbon Wt %	$\delta^{13}C$ VPDB organic	Wt % Loss on Decarb	C% from EA	Total Organic Carbon Wt %	$\delta^{13}C$ VPDB
32.9	-5.38	-5.79	81.67	0.15	0.03	-24.23	55.18	0.10	0.05	-26.05
33.2							14.43	0.04	0.02	-26.17
33.5							10.69	0.03	0.02	-24.60
33.8	-5.17	-6.09	21.84	0.05	0.04	-24.31	2.53	0.02	0.01	-24.64
34.1							1.78	0.02	0.02	-25.08
34.4	-5.78	-6.17	68.38	0.07	0.02	-25.46	2.64	0.02	0.02	-24.55
34.7							1.38	0.02	0.02	-24.72
35.1							1.57	0.02	0.02	-24.48
35.4	-5.04	-6.25	44.12	0.10	0.06	-26.89	1.97	0.02	0.02	-25.28
35.7							1.93	0.02	0.02	-25.93
36.0							3.08	0.02	0.02	-27.34
36.3	-4.73	-5.95	34.25	0.08	0.05	-24.41	36.86	0.05	0.05	-25.11
36.6	-5.69	-5.82	44.81	0.07	0.04	-25.09	21.08	0.04	0.03	-24.19
36.9	-4.78	-5.99	32.72	0.08	0.05	-25.87	27.76	0.05	0.04	-27.96
37.2							2.06	0.02	0.01	-24.44
37.5							1.16	0.02	0.02	-24.21
37.8							0.83	0.01	0.01	-26.12
38.1							1.10	0.02	0.01	-24.43
38.4							0.99	0.01	0.01	-23.18
38.7							0.79	0.01	0.01	-25.89
39.0	-3.60	-5.82	19.05	0.06	0.05	-25.39	7.51	0.03	0.03	-24.20
39.3	-5.61	-6.43	47.67	0.08	0.04	-26.05	29.14	0.07	0.06	-26.34
39.6	-5.89	-6.36	37.70	0.08	0.05	-25.94	2.23	0.04	0.03	-25.10
40.2							1.14	0.03	0.03	-27.21
40.5							1.14	0.03	0.03	-27.50
40.8	-4.67	-6.09	23.46	0.08	0.06	-27.30	1.88	0.03	0.03	-27.18
41.1							2.26	0.03	0.03	-27.39
41.5							1.55	0.03	0.03	-26.83
41.8							4.51	0.04	0.04	-27.61
42.1	-6.18	-5.88	39.85	0.08	0.05	-26.70	11.88	0.07	0.06	-27.75
42.4	-6.27	-6.41	66.28	0.13	0.04	-26.71	5.50	0.04	0.03	-27.18
42.7							6.76	0.04	0.04	-27.19
43.0	-5.53	-6.26	51.09	0.10	0.05	-26.15	12.25	0.09	0.09	-27.20
43.3							47.60	0.10	0.09	-30.08
43.6							36.71	0.08	0.04	-26.69
43.9	-5.72	-5.73	30.23	0.06	0.04	-25.92	18.47	0.07	0.04	-26.68
44.2	-4.57	-5.91	20.07	0.05	0.04	-23.31	17.16	0.06	0.05	-25.79
44.5	-4.60	-6.08	20.70	0.06	0.04	-26.23	19.27	0.07	0.06	-26.01
44.8	-4.54	-5.88	21.36	0.08	0.06	-24.38	19.48	0.08	0.06	-26.30
45.1							14.65	0.06	0.05	-26.51
45.4	-4.01	-6.33	16.28	0.03	0.02	-24.98	9.04	0.05	0.05	-26.15
45.7							4.91	0.04	0.04	-26.23

Isotopic Data from CNG Borehole										
Carbonate Nodules							Organic C from Bulk Sediments			
Depth (m)	$\delta^{13}C$ VPDB carbonate	$\delta^{18}O$ VPDB carbonate	Wt % Loss on Decarb	C% from EA	Total Organic Carbon Wt %	$\delta^{13}C$ VPDB organic	Wt % Loss on Decarb	C% from EA	Total Organic Carbon Wt %	$\delta^{13}C$ VPDB
46.0	-5.97	-6.25	21.49	0.03	0.02	-25.32	7.60	0.05	0.05	-26.49
46.3							4.23	0.03	0.03	-25.43
46.6	-5.88	-6.25	32.12	0.04	0.02	-26.15	13.41	0.06	0.05	-26.67
46.9	-6.62	-6.09	39.26	0.05	0.03	-25.85	9.37	0.06	0.05	-26.63
47.2	-6.17	-6.47	32.61	0.03	0.02	-26.10	7.30	0.04	0.04	-25.83
47.5	-6.23	-6.28	23.47	0.03	0.03	-25.25	9.25	0.05	0.05	-26.84
47.9	-6.29	-6.19	30.21	0.06	0.04	-26.69	17.03	0.09	0.08	-27.31
48.2							22.20	0.08	0.06	-20.30
48.5							15.65	0.06	0.05	-26.67
48.8							11.40	0.05	0.04	-26.48
49.1	-6.29	-6.15	17.14	0.04	0.03	-25.57	6.74	0.03	0.03	-26.08
49.4	-6.83	-6.36	36.30	0.05	0.03	-25.96	7.10	0.03	0.03	-26.17
49.7							4.41	0.03	0.03	-25.94
50.0							2.15	0.02	0.02	-25.63
50.3	-6.64	-6.30	43.91	0.05	0.03	-25.78	6.62	0.03	0.03	-26.47
50.6	-6.74	-6.13	25.20	0.04	0.03	-25.57	2.85	0.02	0.02	-26.44
50.9							3.23	0.02	0.02	-26.16
51.2							2.75	0.02	0.02	-26.06
51.5	-5.92	-6.59	37.74	0.05	0.03	-26.27	9.03	0.02	0.02	-26.48
51.8							10.70	0.03	0.03	-26.42
52.1							1.76	0.01	0.01	-26.44
52.4							1.37	0.02	0.02	-27.29
52.7							0.96	0.02	0.02	-27.19
53.0							1.97	0.03	0.03	-27.18
53.3							2.56	0.02	0.02	-26.72
53.6							4.38	0.03	0.02	-26.57
53.9							9.30	0.04	0.04	-30.05
55.5							1.59	0.02	0.02	-26.34
55.8							0.96	0.02	0.02	-26.57
56.1							1.28	0.02	0.02	-26.15
56.4							1.04	0.02	0.02	-26.81
56.7							1.10	0.02	0.02	-26.87
57.0							2.11	0.02	0.02	-26.21
57.3							2.05	0.02	0.02	-26.26
57.6							1.73	0.02	0.02	-26.36
57.9							3.22	0.02	0.02	-26.11
58.2	-6.22	-6.50	67.32	0.08	0.03	-25.76	5.33	0.02	0.02	-24.37
58.5	-6.44	-6.71	51.76	0.07	0.04	-25.89	3.82	0.02	0.02	-26.43
58.8	-5.88	-6.69	62.46	0.09	0.03	-24.80	3.92	0.03	0.03	-26.79
59.1	-6.50	-6.64	59.79	0.14	0.06	-16.44	3.31	0.03	0.03	-26.50
59.4							2.38	0.02	0.02	-26.01
59.7	-5.88	-6.38	64.15	0.26	0.09	-12.64		0.02	0.02	-26.20

Isotopic Data from CAL-121 Borehole										
Carbonate Nodules							Organic C from Bulk Sediments			
Depth (m)	$\delta^{13}C$ VPDB carbonate	$\delta^{18}O$ VPDB carbonate	Wt % Loss on Decarb	C% from EA	Total Organic Carbon Wt %	$\delta^{13}C$ VPDB organic	Wt % Loss on Decarb	C% from EA	Total Organic Carbon Wt %	$\delta^{13}C$ VPDB
1.2							5.27	0.15	0.14	-18.26
4.3							2.05	0.04	0.04	-21.63
4.9	-2.50	-4.24	61.40	0.19	0.07	-25.69	3.14	0.05	0.05	-21.28
5.2	-2.62	-5.48	30.57	0.47	0.32	-19.75	2.80	0.05	0.05	-22.09
5.5							2.72	0.04	0.04	-22.23
5.8							2.00	0.04	0.04	-23.48
6.1	-2.79	-4.71	48.37	0.21	0.11	-27.12	1.96	0.04	0.04	-24.31
6.4							1.56	0.03	0.03	-24.51
7.0							4.67	0.05	0.05	-24.12
7.3	-3.17	-5.81	71.36	0.18	0.05	-20.81	3.25	0.04	0.04	-24.43
7.6							3.05	0.04	0.03	-24.97
7.9	-3.75	-6.28	60.44	0.08	0.03	-25.47	2.48	0.06	0.05	-27.12
8.7	-3.47	-6.71			0.00					
8.8	-3.01	-6.21	79.28	0.08	0.02	-25.70	3.58	0.04	0.04	-26.30
9.1	-3.20	-6.84	54.17	0.12	0.05	-26.19	3.43	0.03	0.03	-24.78
9.4							4.65	0.05	0.05	-26.32
9.8	-3.53	-6.50	62.35	0.23	0.09	-24.15	5.10	0.08	0.07	-27.09
10.1	-3.07	-6.61	83.41	0.13	0.02	-25.94	7.89	0.08	0.07	-26.03
10.2	-3.51	-7.14			0.00					
10.4	-3.24	-6.58	81.69	0.14	0.03	-26.43	4.74	0.05	0.05	-23.92
10.7							8.88	0.06	0.06	-23.78
11.3							5.46	0.09	0.08	-23.49
11.6							4.11	0.06	0.06	-23.18
11.9							7.23	0.07	0.06	-23.40
12.2	-3.08	-7.41	64.31	0.21	0.07	-27.03	11.41	0.10	0.09	-26.04
12.5							10.64	0.09	0.08	-25.28
12.8	-3.13	-6.85	54.21	0.12	0.05	-26.20	3.67	0.08	0.08	-25.60
13.1	-2.88	-6.62	55.82	0.07	0.03	-25.36	11.53	0.06	0.06	-24.21
13.4	-2.99	-7.30	58.64	0.09	0.04	-25.57	10.46	0.09	0.08	-26.13
13.7							8.85	0.09	0.08	-25.52
14.0							7.95	0.06	0.05	-23.81
14.3							7.30	0.09	0.08	-25.21
14.9							4.93	0.06	0.06	-23.27
15.2				0.14		-24.50	4.72	0.07	0.07	-22.52
15.5							4.84	0.10	0.10	-22.46
15.8	-4.28	-9.26	57.72	0.12	0.05	-25.28	7.05	0.10	0.10	-25.32
16.2							4.07	0.06	0.06	-25.86
16.5							1.94	0.05	0.05	-26.12
16.8								0.04	0.04	-24.09
16.8	-3.31	-7.92	45.78	0.08	0.04	-24.08				
17.1	-3.77	-7.68	52.18	0.04	0.02	-23.61	4.24	0.05	0.05	-24.39
17.4				0.18		-26.04	6.45	0.07	0.06	-25.38
17.7	-3.64	-7.93	65.51	0.09	0.03	-27.52	8.01	0.05	0.05	-25.61
18.0	-3.47	-7.85	64.27	0.07	0.02	-25.97	11.27	0.06	0.05	-26.08

Isotopic Data from CAL-121 Borehole										
Carbonate Nodules							Organic C from Bulk Sediments			
Depth (m)	$\delta^{13}C$ VPDB carbonate	$\delta^{18}O$ VPDB carbonate	Wt % Loss on Decarb	C% from EA	Total Organic Carbon Wt %	$\delta^{13}C$ VPDB organic	Wt % Loss on Decarb	C% from EA	Total Organic Carbon Wt %	$\delta^{13}C$ VPDB
18.3	-3.28	-7.21	75.47	0.08	0.02	-26.44	9.22	0.06	0.05	-26.10
18.6	-2.84	-7.55	65.80	0.08	0.03	-25.35	19.79	0.06	0.05	-25.54
18.9	-2.65	-6.93	75.47	0.06	0.02	-25.36	24.83	0.06	0.04	-25.31
19.2	-3.50	-8.86	60.31	0.07	0.03	-24.44	40.84	0.09	0.05	-25.94
19.5	-3.20	-7.97	69.75	0.07	0.02	-24.95	34.05	0.09	0.06	-26.00
19.8	-3.49	-8.75	61.98	0.05	0.02	-24.49	15.33	0.09	0.08	-25.05
20.1				0.10		-27.54	3.17	0.04	0.04	-25.06
20.4	-2.88	-8.06	65.80	0.05	0.02	-25.18	2.25	0.03	0.03	-26.04
20.7							1.38	0.03	0.03	-25.86
21.3							1.32	0.03	0.03	-26.05
21.6							1.45	0.03	0.03	-25.75
22.3	-3.13	-7.60	34.33	0.07	0.05	-25.14	1.93	0.05	0.05	-26.82
22.6							1.46	0.04	0.04	-26.30
23.5							2.65	0.04	0.04	-26.75
23.8							3.16	0.05	0.04	-26.34
24.1							2.61	0.04	0.04	-26.24
24.4	-0.40	-7.19	93.89	0.50	0.03	-25.97	2.56	0.04	0.04	-26.18
24.7				0.30		-22.10	2.17	0.03	0.03	-25.42
25.0	0.70	-5.51	78.44	0.26	0.06	-26.17	3.20	0.04	0.04	-26.23
25.3							2.62	0.04	0.03	-26.37
25.6							2.39	0.04	0.04	-26.36
25.9							2.02	0.03	0.03	-25.24
26.2							3.41	0.04	0.04	-25.60
26.5	-4.07	-6.95	45.98	0.06	0.03	-25.48	2.52	0.02	0.02	-24.87
26.8							3.30	0.02	0.02	-24.37
27.1	-2.04	-7.67	65.02	0.11	0.04	-25.33	3.99	0.02	0.02	-25.12
27.7							3.53	0.04	0.03	-25.63
28.0							1.04	0.02	0.02	-25.25
28.7							1.38	0.03	0.03	-25.43
29.0							2.04	0.02	0.02	-24.30
29.3							1.26	0.02	0.02	-25.36
29.6				0.05		-26.00	0.96	0.03	0.03	-24.68
29.9							1.03	0.03	0.03	-24.33
30.2							1.22	0.03	0.03	-25.63
30.5							1.02	0.02	0.02	-24.72
30.8				0.03		-24.22	1.21	0.04	0.04	-26.37
31.1				0.05		-25.05	0.92	0.03	0.03	-25.62
31.4							1.03	0.04	0.04	-26.07
31.7							0.95	0.04	0.04	-26.19
32.0	-4.01	-8.91	49.74	0.09	0.04	-26.61	1.84	0.04	0.04	-26.61
32.3	-4.27	-8.24	47.05	0.06	0.03	-25.29	2.33	0.05	0.05	-26.94
32.6							2.38	0.05	0.05	-27.01
33.2	-5.08	-7.52	45.15	0.05	0.03	-25.08	12.74	0.04	0.04	-26.05
33.5	-5.15	-8.06	28.09	0.04	0.03	-24.93	10.30	0.03	0.03	-24.92
33.8							16.82	0.04	0.03	-25.67

Isotopic Data from CAL-121 Borehole										
Carbonate Nodules							Organic C from Bulk Sediments			
Depth (m)	$\delta^{13}C$ VPDB carbonate	$\delta^{18}O$ VPDB carbonate	Wt % Loss on Decarb	C% from EA	Total Organic Carbon Wt %	$\delta^{13}C$ VPDB organic	Wt % Loss on Decarb	C% from EA	Total Organic Carbon Wt %	$\delta^{13}C$ VPDB
34.1	-4.94	-7.42	64.37	0.10	0.04	-26.25	23.40	0.04	0.03	-25.74
34.4	-4.64	-7.78	55.67	0.05	0.02	-25.45	21.79	0.04	0.03	-26.00
34.7	-4.72	-7.87	41.52	0.06	0.04	-26.06	12.66	0.03	0.03	-25.27
35.1	-5.18	-7.88	73.64	0.30	0.08	-10.33	29.31	0.04	0.03	-25.46
35.4	-4.18	-8.41	47.04	0.05	0.03	-25.13	6.13	0.03	0.03	-25.40
35.7	-4.49	-8.74	23.10	0.04	0.03	-24.92	5.06	0.03	0.03	-26.03
36.0							6.08	0.04	0.04	-28.41
36.3							6.93	0.03	0.03	-26.03
36.6							5.78	0.03	0.03	-26.07
36.9							5.79	0.03	0.03	-25.74
37.2	-5.43	-7.85	41.03	0.06	0.04	-25.02	5.06	0.03	0.03	-25.34
37.5							5.91	0.03	0.03	-25.89
37.8							3.27	0.03	0.03	-26.40
38.1	-3.50	-7.43	53.16	0.09	0.04	-25.90	3.79	0.03	0.03	-26.03
38.4							3.46	0.03	0.02	-26.41
38.7							5.23	0.03	0.03	-26.22
39.0							4.56	0.03	0.02	-25.77
39.3							3.78	0.03	0.02	-26.09
39.6	-3.87	-7.43	22.35	0.06	0.05	-25.99	4.53	0.03	0.03	-26.42
39.9							7.07	0.03	0.03	-25.23
40.2	-3.66	-7.92	24.96	0.06	0.05	-26.14	7.68	0.02	0.02	-24.84
40.5							6.25	0.02	0.02	-23.99
40.8							4.40	0.02	0.02	-22.86
41.1							3.73	0.02	0.02	-24.15
41.8	-3.24	-7.52	34.40	0.10	0.06	-26.65	16.93	0.04	0.03	-24.60
42.1	-3.13	-7.52	34.40	0.08	0.05	-25.23				
42.4	-4.35	-8.24	54.16	0.07	0.03	-25.84	34.39	0.05	0.03	-25.01
42.7	-4.76	-7.96	58.97	0.07	0.03	-25.48	12.06	0.03	0.02	-24.16
43.0	-5.22	-8.34	66.31	0.06	0.02	-25.69	2.50	0.02	0.02	-23.34
43.6	-3.84	-7.98	48.77	0.07	0.04	-25.53	2.20	0.02	0.02	-23.34
43.9										
44.2	-3.99	-7.73	20.82	0.08	0.06	-25.76	2.36	0.02	0.02	-23.72
44.5	-4.72	-8.07	48.77	0.07	0.04	-25.51	2.65	0.02	0.02	-23.94
44.8							1.94	0.02	0.02	-25.74
45.1							1.99	0.02	0.02	-24.91
45.4							2.95	0.02	0.02	-24.95
45.7	-3.94	-7.85	47.85	0.06	0.03	-25.44	9.30	0.03	0.03	-26.89
46.0	-3.79	-8.38	24.26	0.04	0.03	-25.61	4.78	0.02	0.02	-24.61
46.3	-4.28	-8.47	19.71	0.05	0.04	-26.36	5.33	0.02	0.02	-25.11
46.6	-4.42	-8.36	45.18	0.04	0.02	-24.78	2.88	0.02	0.02	-24.10
46.9	-4.63	-8.20	37.00	0.07	0.04	-26.33	3.51	0.02	0.02	-24.05
47.5							3.76	0.02	0.02	-24.63

Isotopic Data from CAL-122 Borehole						
Carbonate Nodules			Organic C from Bulk Sediments			
Depth (m)	$\delta^{13}C$ VPDB carbonate	$\delta^{18}O$ VPDB carbonate	Wt % Loss on Decarb	C% from EA	Total Organic Carbon Wt %	$\delta^{13}C$ VPDB
4.0			0.96	0.02	0.02	-23.72
4.6	-2.09	-6.00	2.66	0.05	0.05	-23.99
5.2			4.43	0.07	0.07	-22.66
5.6			2.34	0.06	0.06	-22.78
5.8			2.75	0.04	0.04	-21.23
6.1			2.62	0.07	0.06	-24.03
6.4			1.99	0.03	0.03	-22.10
6.7			2.59	0.02	0.02	-23.25
7.0	-1.66	-6.06	2.44	0.04	0.04	-25.64
7.2			2.37	0.02	0.02	-22.39
7.3			1.91	0.02	0.02	-23.70
7.6			2.15	0.02	0.02	-22.71
7.9	-2.37	-7.44	2.58	0.03	0.03	-26.12
8.2	-2.16	-7.47	6.81	0.02	0.02	-24.14
8.5	-2.59	-8.30	8.64	0.05	0.05	-25.75
8.7	-3.66	-8.40	4.08	0.02	0.02	-23.06
8.8			4.85	0.03	0.03	-24.36
9.1	-4.07	-7.43	2.82	0.02	0.02	-24.46
9.4	-4.32	-8.26	2.53	0.02	0.02	-24.41
9.8	-4.35	-8.17	2.32	0.02	0.02	-24.59
10.1	-3.07	-7.51	2.65	0.02	0.02	-24.97
10.2	-4.45	-7.89	1.85	0.02	0.02	-25.25
10.4	-4.16	-7.35	2.24	0.02	0.02	-24.64
10.7	-3.26	-7.76	2.98	0.02	0.02	-24.50
11.0	-3.59	-7.79	4.27	0.03	0.02	-24.81
11.3	-3.23	-7.59	3.67	0.02	0.02	-24.48
11.6	-3.30	-7.66	2.00	0.02	0.02	-25.01
11.7			1.94	0.02	0.02	-24.27
11.9	-3.44	-7.86	2.01	0.02	0.02	-25.58
12.2			2.03	0.02	0.02	-25.02
12.5			1.56	0.02	0.02	-25.73
12.8			1.57	0.02	0.02	-25.74
13.1			1.44	0.02	0.02	-26.40
13.4			1.52	0.03	0.03	-26.24
13.7			2.45	0.03	0.03	-25.73
14.0			1.55	0.03	0.03	-26.35
14.3			1.38	0.03	0.03	-26.39
14.6			1.53	0.03	0.03	-26.59
14.9			1.69	0.03	0.03	-26.70
15.2			1.21	0.03	0.03	-26.63
15.5			1.22	0.03	0.03	-27.08
15.8			1.19	0.03	0.03	-26.63
16.2			1.38	0.04	0.03	-26.70
16.5			1.27	0.03	0.03	-26.57

Isotopic Data from CAL-122 Borehole						
Carbonate Nodules			Organic C from Bulk Sediments			
Depth (m)	$\delta^{13}C$ VPDB carbonate	$\delta^{18}O$ VPDB carbonate	Wt % Loss on Decarb	C% from EA	Total Organic Carbon Wt %	$\delta^{13}C$ VPDB
16.8			1.28	0.03	0.03	-26.40
17.4			1.30	0.04	0.04	-26.94
17.7			1.21	0.03	0.03	-26.56
18.0			1.33	0.03	0.03	-24.80
18.3			1.14	0.02	0.02	-23.78
18.6			1.36	0.04	0.04	-26.23
18.9			1.23	0.02	0.02	-24.01
19.2			1.29	0.03	0.03	-26.04
19.5	-3.13	-6.08	2.30	0.02	0.02	-24.60
19.8			1.60	0.03	0.03	-25.79
20.1			1.56	0.03	0.02	-22.36
20.4	1.00	-6.48	1.39	0.02	0.02	-25.00
20.7	0.16	-6.21	3.05	0.02	0.02	-24.02
21.0	1.22	-6.44	4.62	0.03	0.03	-24.64
21.3			4.63	0.03	0.03	-24.17
21.6	-0.25	-7.49	2.40	0.02	0.02	-24.94
21.9	-0.31	-6.80	3.32	0.03	0.03	-25.96
22.3	-0.70	-6.60	2.50	0.03	0.03	-25.99
22.6	0.04	-7.48	3.53	0.02	0.02	-24.87
22.9			2.71	0.03	0.03	-26.34
23.2	-0.30	-6.93	3.81	0.03	0.03	-26.51
23.5	-1.95	-7.51	3.42	0.06	0.05	-27.54
23.8			2.39	0.03	0.03	-25.43
24.1	-2.95	-8.70	2.76	0.03	0.02	-25.15
24.4			5.38	0.02	0.02	-25.06
24.7			1.47	0.03	0.03	-25.89
25.0	1.33	-7.86	1.66	0.03	0.03	-26.03
25.3	-1.47	-7.17	1.97	0.03	0.03	-25.74
25.6	-0.43	-6.84	1.35	0.03	0.03	-25.69
25.9			1.36	0.03	0.03	-25.49
26.2	-0.31	-6.18	1.19	0.03	0.03	-25.58
26.5			1.48	0.03	0.03	-25.80
26.8			1.54	0.04	0.04	-27.74
27.1	-3.14	-7.59	1.68	0.04	0.04	-25.93
27.4	-3.96	-8.39	1.55	0.04	0.04	-27.47
27.7	-3.30	-7.75	7.39	0.05	0.05	-26.29
28.0	-4.25	-8.07	14.14	0.07	0.06	-26.93
28.3	-4.33	-8.36	18.57	0.09	0.07	-28.24
28.7	-4.51	-8.14	12.60	0.06	0.05	-24.89
29.0	-4.35	-8.22	22.69	0.05	0.04	-25.58
29.3	-4.13	-8.55	37.24	0.04	0.02	-22.97
29.6	-3.88	-8.04	46.36	0.06	0.03	-24.80
29.9	-4.30	-8.37	35.91	0.06	0.04	-24.36
30.2	-4.35	-7.97	35.46	0.06	0.04	-23.20

Isotopic Data from CAL-122 Borehole						
Carbonate Nodules			Organic C from Bulk Sediments			
Depth (m)	$\delta^{13}C$ VPDB carbonate	$\delta^{18}O$ VPDB carbonate	Wt % Loss on Decarb	C% from EA	Total Organic Carbon Wt %	$\delta^{13}C$ VPDB
30.5	-4.39	-8.10	23.66	0.03	0.02	-23.10
31.4	-4.51	-8.87	28.10	0.03	0.02	-24.58
31.7	-4.87	-8.44	20.31	0.04	0.03	-25.49
32.0	-4.91	-8.45	14.31	0.04	0.03	-26.09
32.3	-4.67	-8.25	13.75	0.03	0.02	-24.71
32.6	-3.92	-7.77	17.47	0.04	0.03	-25.17
32.9	-4.21	-8.07	11.79	0.06	0.05	-27.11
33.2	-4.42	-7.24	9.71	0.04	0.03	-25.24
33.5	-4.52	-7.99	1.95	0.02	0.02	-22.34
33.8			1.58	0.02	0.02	-24.80
34.1	-4.48	-7.88	1.28	0.02	0.02	-24.68
34.4	-4.67	-8.05	1.64	0.03	0.02	-25.11
34.7	-4.41	-7.68	1.61	0.02	0.02	-25.17
35.1	-4.44	-8.47	4.68	0.02	0.02	-24.84
35.4	-4.40	-8.45	7.52	0.02	0.02	-24.28
35.7	-4.50	-8.88	5.35	0.02	0.02	-25.16
36.0	-4.35	-8.62	3.83	0.02	0.02	-24.59
36.3	-4.51	-8.87	4.90	0.02	0.02	-24.86
36.6	-4.50	-8.72	3.39	0.02	0.02	-25.35
36.9	-4.38	-8.18	2.89	0.02	0.02	-25.32
37.2	-4.46	-7.87	7.99	0.02	0.02	-24.83
37.5	-4.30	-8.55	3.82	0.02	0.02	-25.30
37.8	-3.62	-7.92	2.67	0.02	0.02	-24.78
38.1	-4.14	-7.92	2.14	0.02	0.02	-25.13
38.4	-3.90	-7.57	3.65	0.03	0.03	-27.14
38.7	-3.28	-7.37	3.34	0.03	0.03	-27.00
39.0	-3.86	-8.00	4.95	0.03	0.03	-27.01
39.3	-4.44	-7.94	8.95	0.03	0.03	-26.75
39.6	-3.16	-7.74	4.19	0.03	0.03	-26.74
39.9	-4.66	-7.66	2.83	0.04	0.03	-27.15
40.2	-4.79	-8.18	2.21	0.03	0.03	-26.97
40.5	-4.44	-8.25	2.68	0.03	0.03	-26.33
40.8	-4.23	-7.88	3.47	0.03	0.03	-27.10
41.1	-4.08	-8.08	2.59	0.04	0.04	-27.19
41.5	-4.46	-8.05	1.58	0.03	0.03	-26.99
41.8	-4.12	-7.81	1.78	0.04	0.04	-27.35
42.1	-4.58	-8.15	1.81	0.04	0.04	-26.76
42.4			3.20	0.04	0.04	-27.28
42.7			2.20	0.04	0.04	-27.19
43.0	-4.44	-8.07	1.47	0.04	0.03	-27.21
43.3			0.99	0.02	0.02	-25.44
43.6			1.26	0.03	0.03	-26.37
43.9	-4.97	-8.30	1.16	0.02	0.02	-25.56
44.2	-3.78	-8.00	1.47	0.02	0.02	-24.51

Isotopic Data from CAL-122 Borehole						
Carbonate Nodules			Organic C from Bulk Sediments			
Depth (m)	$\delta^{13}C$ VPDB carbonate	$\delta^{18}O$ VPDB carbonate	Wt % Loss on Decarb	C% from EA	Total Organic Carbon Wt %	$\delta^{13}C$ VPDB
44.5	-3.93	-7.82	1.59	0.03	0.03	-25.97
44.8	-5.00	-8.23	2.15	0.04	0.04	-26.51
45.1	-4.82	-7.54	4.44	0.03	0.03	-25.01
45.4	-5.00	-7.65	1.59	0.02	0.02	-24.59
45.7	-5.28	-7.43	4.63	0.04	0.04	-25.56
46.0	-5.17	-7.56	12.63	0.05	0.05	-23.63
46.3	-4.11	-8.10	15.40	0.05	0.05	-24.66
46.6	-5.42	-9.06	17.33	0.06	0.05	-24.44
46.9	-3.77	-8.22	18.99	0.07	0.06	-24.87
47.2	-3.15	-6.35	14.91	0.06	0.05	-23.97
47.5	-3.60	-6.92	15.20	0.09	0.07	-25.48
47.9	-1.49	-6.85	15.22	0.10	0.08	-25.36
48.2	-5.90	-9.94	17.67	0.09	0.07	-24.38
48.5	-5.22	-10.56	14.13	0.04	0.04	-24.69
48.8	-4.89	-9.65	12.64	0.04	0.03	-24.62
49.1			12.20	0.06	0.05	-24.92
49.4			12.73	0.22	0.19	-26.10
49.7			13.96	0.30	0.26	-26.45
50.0			16.36	0.39	0.32	-26.47
50.3			15.85	0.39	0.33	-26.56
50.6			18.99	0.43	0.35	-25.68
50.9			17.98	0.45	0.37	-25.95
51.8			18.44	0.47	0.39	-26.13
52.1			18.66	0.48	0.39	-26.28
52.4			18.01	0.42	0.35	-26.08
52.7			17.92	0.49	0.40	-26.01
53.3			20.58	0.50	0.40	-26.06
53.6			21.15	0.54	0.43	-26.02

Appendix B

Particle Size Analyses Data from CNG Borehole

Depth (ft.)	%Clay	%Fine Silt	%Coarse Silt	%Very Fine Sand	%Fine Sand	%Medium Sand	%Coarse Sand	%Very Coarse Sand
2	6.3	0.4	4.0	6.5	48.8	28.6	5.1	0.2
3	13.8	2.5	13.1	4.2	39.9	22.4	4.0	0.2
4	9.1	1.4	7.0	5.4	45.8	25.9	5.1	0.3
5	8.7	1.2	6.0	7.4	46.8	25.3	4.6	0.1
6	9.0	1.6	6.0	8.6	48.1	23.7	3.0	0.0
11	10.0	1.8	8.5	5.1	45.6	25.1	3.7	0.1
12	6.9	0.8	3.8	6.3	50.7	27.5	3.9	0.1
16	6.6	0.8	4.2	8.8	55.0	22.1	2.4	0.1
18	6.3	0.5	2.2	7.2	66.8	15.6	1.1	0.0
19	6.4	0.0	1.7	6.6	69.1	15.5	0.7	0.1
20	4.9	0.0	0.6	3.9	67.1	22.4	1.0	0.0
21	7.3	0.1	0.2	2.3	77.1	12.5	0.4	0.0
23	6.1	0.0	0.8	7.8	81.2	3.8	0.2	0.0
24	4.8	0.0	0.9	9.5	79.2	5.3	0.4	0.0
25	4.6	0.1	1.6	8.6	79.9	4.7	0.4	0.0
25	4.2	0.0	2.2	9.7	78.1	5.6	0.2	0.0
26	3.7	0.2	-0.4	14.6	77.7	3.8	0.4	0.0
27	4.4	0.0	1.7	9.6	78.2	5.4	0.7	0.0
29	5.5	0.5	1.2	12.1	76.1	4.2	0.4	0.0
30	6.5	0.2	1.9	12.3	70.9	6.7	1.6	0.0
32	19.5	1.4	8.0	5.9	30.7	23.8	9.9	0.8
33	22.1	1.5	10.1	6.8	26.9	23.7	7.7	1.2
35	24.5	2.3	8.6	6.8	29.4	22.3	5.2	0.9
36	27.0	4.3	8.9	7.0	26.8	19.3	5.1	1.7
37	41.0	12.5	12.2	5.3	14.9	10.2	2.9	1.0
38	22.7	6.1	20.6	26.1	15.9	6.6	1.8	0.2
39	20.2	4.4	24.4	24.4	18.0	6.4	1.6	0.6
40	14.9	6.1	29.6	22.6	18.2	6.8	1.5	0.3
43	23.7	13.0	20.5	14.0	16.5	9.2	2.3	0.7
46	4.6	1.7	4.4	8.1	40.9	28.2	8.9	3.2
48	3.8	0.4	1.2	1.7	7.9	33.1	40.7	11.2
49	5.1	0.8	3.5	4.3	13.5	37.7	29.7	5.4
50	4.9	0.6	2.1	2.0	8.3	42.7	35.1	4.4
51	11.8	3.5	5.9	4.0	12.4	27.6	25.7	9.1
52	24.2	8.4	8.6	8.3	21.8	18.9	8.0	1.7
53	10.0	3.9	3.7	3.5	15.8	30.2	22.4	10.3
54	14.5	3.4	6.5	6.3	17.7	27.3	20.3	3.9
57	8.6	0.3	5.3	12.8	42.5	26.8	3.7	0.1
58	10.1	0.9	7.0	14.5	35.2	26.0	6.1	0.2
59	11.3	0.8	9.2	15.4	32.6	25.3	5.3	0.1
60	7.3	0.9	7.0	18.0	30.3	28.0	8.4	0.1
61	8.8	6.6	9.9	16.8	33.7	20.6	3.4	0.3
63	13.0	9.7	10.7	12.9	28.7	20.1	4.4	0.5
64	13.9	8.5	10.4	11.3	29.6	21.5	4.8	0.1
65	11.5	5.4	7.7	11.0	36.1	23.2	4.8	0.3

Particle Size Analyses Data from CNG Borehole

Depth (ft.)	%Clay	%Fine Silt	%Coarse Silt	%Very Fine Sand	%Fine Sand	%Medium Sand	%Coarse Sand	%Very Coarse Sand
66	4.7	1.2	6.5	16.3	35.0	23.3	10.6	2.3
67	3.9	1.3	4.8	9.2	28.9	34.3	13.9	3.7
68	3.0	0.4	2.4	7.6	34.8	37.2	12.9	1.7
69	2.7	0.6	3.4	5.0	16.5	36.5	28.3	6.8
70	4.7	1.3	3.5	2.8	9.0	22.9	31.8	23.9
71	2.9	1.0	2.0	1.7	6.0	20.1	34.0	32.4
72	3.2	0.9	2.8	3.3	11.5	26.4	33.4	18.6
73	2.6	0.3	3.0	4.8	19.6	32.9	27.6	9.2
74	13.2	13.8	10.4	11.7	22.0	18.1	8.6	2.1
75	15.4	15.1	8.0	13.2	24.9	16.8	5.2	1.4
76	16.3	15.9	7.1	11.4	23.6	18.7	5.7	1.2
77	17.4	17.5	7.1	10.4	20.8	17.7	7.1	2.0
78	19.2	9.0	8.8	12.0	22.1	19.5	8.0	1.4
79	20.0	13.0	7.9	11.3	21.1	18.2	7.1	1.3
80	17.3	11.7	9.2	12.0	23.2	19.2	6.4	1.1
81	15.9	7.2	8.6	12.3	24.9	21.8	7.9	1.3
82	15.4	14.3	9.1	14.5	23.0	17.4	5.6	0.6
83	13.9	16.4	9.9	15.9	22.5	15.6	5.0	0.7
84	12.9	8.2	8.8	16.4	25.9	20.1	6.9	0.7
85	13.3	6.6	11.1	15.4	27.4	20.6	5.1	0.5
86	11.9	2.8	7.0	11.3	28.4	27.5	10.0	1.1
87	9.7	1.3	5.9	13.0	33.5	27.1	8.1	1.3
88	10.7	1.8	8.0	20.6	32.8	21.5	4.4	0.2
89	11.0	2.9	9.3	20.7	31.9	20.1	4.0	0.1
90	9.8	2.1	8.4	17.8	33.6	22.9	5.1	0.4
91	13.8	18.0	8.0	11.7	22.7	19.2	5.8	0.8
92	13.0	7.1	12.6	17.4	27.5	17.7	4.5	0.2
93	12.8	8.5	12.2	17.2	28.6	16.0	4.0	0.6
94	10.8	3.5	8.1	18.3	39.8	16.5	2.6	0.4
95	23.0	10.8	9.2	13.1	25.4	15.2	3.0	0.2
96	18.6	15.8	8.1	14.5	27.0	13.7	2.2	0.1
97	20.7	16.1	8.2	12.8	25.8	14.2	2.3	0.0
98	16.3	4.1	6.9	15.0	36.3	19.2	2.2	0.1
99	16.4	10.6	8.8	13.5	29.8	18.1	2.5	0.3
100	15.0	7.8	8.7	15.9	33.1	17.8	1.5	0.0
101	15.9	3.9	8.4	14.3	35.2	20.3	2.0	0.0
102	14.9	14.2	10.2	14.6	28.7	15.5	1.8	0.1
103	4.7	5.9	73.5	4.1	7.1	4.1	0.6	0.1
104	18.3	20.2	12.6	11.1	21.3	13.2	2.5	0.1
105	11.8	13.9	10.5	10.7	30.3	18.9	3.4	0.5
106	17.8	26.6	12.4	10.3	19.1	11.4	2.3	0.1
107	18.1	32.3	9.1	6.6	12.2	12.7	8.1	0.8
108	11.7	10.4	10.2	13.9	30.9	20.1	2.7	0.1
109	10.1	7.0	7.9	13.4	34.2	23.0	4.4	0.1
110	5.4	0.7	3.6	5.8	39.0	39.0	6.4	0.1
111	5.1	1.1	2.2	3.7	24.8	43.2	19.0	0.7
112	7.0	1.5	3.3	2.4	13.9	42.6	27.6	1.7

Particle Size Analyses Data from CNG Borehole

Depth (ft.)	%Clay	%Fine Silt	%Coarse Silt	%Very Fine Sand	%Fine Sand	%Medium Sand	%Coarse Sand	%Very Coarse Sand
113	4.6	0.8	2.4	3.7	17.2	51.4	19.0	0.8
114	3.0	1.0	2.1	2.9	14.8	49.4	25.7	1.1
115	6.8	0.9	3.3	4.7	31.6	38.7	13.4	0.6
116	6.5	1.0	5.1	8.2	42.9	29.1	6.8	0.3
117	14.4	3.2	7.9	11.1	46.4	15.7	1.2	0.0
118	40.9	29.5	13.8	2.7	8.2	3.8	0.9	0.3
119	29.5	17.7	7.6	3.2	29.2	12.1	0.5	0.1
120	33.0	25.1	14.9	9.7	13.0	3.9	0.2	0.0
121	7.1	1.5	4.2	13.3	62.5	11.0	0.2	0.0
122	4.8	1.3	5.9	8.9	55.3	22.5	1.2	0.0
123	4.3	0.9	3.9	9.1	62.6	18.8	0.4	0.0
124	5.5	1.2	4.4	12.4	62.8	13.3	0.3	0.0
125	4.8	0.7	3.5	13.0	65.0	12.5	0.4	0.0
126	5.1	0.7	3.2	13.9	64.8	11.7	0.4	0.0
127	22.0	8.4	6.7	11.1	42.8	8.5	0.4	0.1
128	10.5	17.3	18.4	23.1	27.8	2.6	0.2	0.0
129	5.8	0.7	2.3	9.0	55.3	25.3	1.6	0.0
130	5.0	1.1	2.1	8.9	54.1	23.5	4.9	0.4
131	4.7	0.9	3.1	10.5	57.6	20.3	2.5	0.4
132	4.4	0.5	3.0	11.0	42.0	28.1	9.8	1.2
133	6.0	1.1	5.4	13.8	50.7	20.3	2.5	0.2
134	9.2	1.6	5.3	11.0	49.7	21.7	1.2	0.1
135	6.9	1.1	4.2	17.9	49.9	15.8	3.9	0.2
137	11.8	8.5	6.8	13.3	38.1	17.6	3.7	0.2
138	6.4	3.2	5.7	11.0	28.2	29.7	15.6	0.3
139	6.8	2.8	4.4	8.7	29.0	38.2	9.8	0.2
140	7.8	5.4	9.2	14.1	35.5	25.3	2.6	0.0
141	14.6	29.2	23.0	8.7	9.8	10.4	4.1	0.3
142	19.9	30.2	27.2	5.7	6.0	7.9	3.0	0.1
143	55.2	28.8	10.4	3.4	1.6	0.4	0.1	0.0
144	62.9	21.7	10.0	2.7	1.9	0.8	0.1	0.0
145	58.2	23.4	14.2	2.5	1.1	0.5	0.1	0.0
146	59.4	28.6	9.3	1.3	1.0	0.3	0.1	0.1
147	47.3	30.8	10.2	3.9	6.0	1.8	0.1	0.0
148	27.6	13.2	10.3	20.4	22.7	5.6	0.2	0.0
149	15.9	4.2	10.5	29.3	33.5	6.2	0.4	0.0
150	23.5	8.7	12.9	24.7	25.1	4.8	0.3	0.0
151	13.1	1.2	7.4	16.3	41.6	18.0	2.4	0.1
152	21.7	10.6	12.1	15.3	30.2	9.5	0.6	0.0
153	26.9	5.0	7.5	12.4	32.7	14.3	1.2	0.0
154	14.4	4.9	10.1	13.3	36.3	18.9	2.1	0.0
155	24.2	11.3	16.5	11.8	14.1	14.4	7.4	0.2
156	35.0	35.2	23.4	3.5	1.8	0.8	0.2	0.0
157	35.9	34.4	19.0	5.5	3.5	1.3	0.4	0.0
158	37.2	28.1	18.2	10.6	4.5	0.9	0.4	0.1
159	37.8	23.5	19.0	11.0	6.8	1.7	0.2	0.0
160	38.0	18.9	21.6	16.1	4.8	0.4	0.0	0.1

Particle Size Analyses Data from CNG Borehole

Depth (ft.)	%Clay	%Fine Silt	%Coarse Silt	%Very Fine Sand	%Fine Sand	%Medium Sand	%Coarse Sand	%Very Coarse Sand
161	39.1	17.1	18.2	17.5	7.2	1.0	0.1	0.0
162	45.8	19.1	9.2	8.1	12.9	4.4	0.4	0.0
163	15.5	3.1	5.1	2.2	31.7	40.4	2.0	0.0
164	25.5	16.0	17.4	21.1	17.1	2.8	0.1	0.0
165	14.3	4.9	7.6	24.5	40.1	8.3	0.4	0.0
166	9.7	3.3	8.1	15.1	46.4	15.9	1.5	0.0
167	10.0	3.3	9.8	23.5	42.0	10.5	0.9	0.0
169	26.3	19.2	17.2	24.0	11.8	1.2	0.2	0.0
170	7.6	2.4	2.2	9.6	54.5	23.2	0.5	0.0
171	5.4	2.4	5.0	12.1	42.1	31.6	1.4	0.0
172	4.7	2.4	5.1	12.3	45.4	28.9	1.2	0.0
173	15.3	3.6	8.8	16.9	36.8	17.1	1.4	0.1
174	12.6	3.8	20.1	14.0	32.9	15.5	1.2	0.0
175	18.0	6.8	12.7	23.5	33.2	5.6	0.2	0.0
176	24.7	11.2	12.8	16.6	27.7	6.8	0.2	0.0
181	8.0	2.2	9.3	13.2	40.5	24.1	2.8	0.0
182	6.9	1.6	3.0	10.8	35.3	32.7	9.5	0.1
183	5.8	2.3	4.2	7.2	23.4	35.3	19.1	2.7
184	5.0	1.6	2.4	2.9	14.3	44.0	27.9	1.8
185	4.5	0.8	3.3	5.8	21.2	45.7	18.0	0.7
186	4.9	1.1	2.9	2.9	12.7	25.9	26.6	23.1
187	4.8	1.2	2.3	2.5	11.5	32.4	37.5	7.7
188	4.4	0.9	2.2	2.2	10.9	35.9	36.3	7.1
189	5.1	1.6	2.6	2.2	7.3	19.9	37.0	24.3
190	5.4	1.9	1.2	1.7	4.9	12.8	34.4	37.7
191	10.8	5.6	10.5	10.1	20.1	18.5	17.9	6.5
192	6.6	1.8	4.0	4.1	18.2	36.8	24.2	4.4
193	8.3	5.4	6.9	10.6	26.3	28.7	12.4	1.2
194	9.4	5.2	11.2	12.3	27.5	25.2	7.6	1.6
195	10.3	5.9	9.3	12.6	28.1	23.6	8.5	1.7

Appendix C

Equivalent dose, dose rate data, and optical age estimates from OSL Dating on sealed CNG core sections

Field Site	UNL Lab #	Depth (m)	U (ppm)	Th (ppm)	K_20 (wt %)	In Situ H_20 (%)[a]	Dose Rate (Gy/ka)	D_e (Gy) ± 1 Std. Err.	Aliquots (n)	Optical Age Estimate (ka)
CNG 27-28	UNL-2085	8.4	0.6	1.7	1.0	1.3	1.16 ± 0.07	52.5 ± 1.7	24/38	45.4 ± 3.7
CNG 36-36.5	UNL-2086	11.0	1.8	7.3	1.8	11.2	2.16 ± 0.19	> 200	--	> 92.6

[a]assumes 100% error in measurement

Appendix D

Detrital zircon analyses results on sealed CNG core sections

						Isotope ratios					Apparent ages (Ma)								
Analysis	U (ppm)	206Pb 204Pb	U/Th	206Pb* 207Pb*	± (%)	207Pb* 235U*	± (%)	206Pb* 238U	± (%)	error corr.	206Pb* 238U*	± (Ma)	207Pb* 235U	± (Ma)	206Pb* 207Pb*	± (Ma)	Best age (Ma)	± (Ma)	Conc (%)
CNG50-51-1	48	10566	1.7	9.5481	2.6	4.3501	2.8	0.3012	1.0	0.35	1697.5	14.5	1702.9	23.2	1709.6	48.5	1709.6	48.5	99.3
CNG50-51-2	132	13255	3.1	13.5370	0.8	1.7644	1.5	0.1732	1.2	0.83	1029.9	11.6	1032.5	9.5	1037.9	16.6	1037.9	16.6	99.2
CNG50-51-3	98	26961	2.4	9.6976	2.1	4.1142	3.0	0.2894	2.2	0.73	1638.4	32.3	1657.1	24.9	1681.0	38.4	1681.0	38.4	97.5
CNG50-51-4	81	8128	2.0	17.6000	6.1	0.6629	6.2	0.0846	0.7	0.11	523.6	3.4	516.4	25.0	484.5	135.5	523.6	3.4	108.1
CNG50-51-5	143	28354	1.1	10.6182	0.8	3.4216	1.5	0.2635	1.2	0.83	1507.7	16.1	1509.4	11.4	1511.7	15.5	1511.7	15.5	99.7
CNG50-51-6	166	15681	4.4	9.5569	0.9	4.3798	1.5	0.3036	1.2	0.82	1709.0	18.3	1708.5	12.3	1707.9	15.8	1707.9	15.8	100.1
CNG50-51-7	130	29856	2.8	11.6644	1.2	2.7137	4.6	0.2296	4.4	0.96	1332.3	53.4	1332.2	34.2	1332.1	24.0	1332.1	24.0	100.0
CNG50-51-8	94	16673	3.0	12.8773	1.6	2.0281	1.7	0.1894	0.6	0.35	1118.2	6.1	1125.0	11.3	1138.1	31.0	1138.1	31.0	98.3
CNG50-51-9	392	55844	4.6	13.6706	1.1	1.7457	1.5	0.1731	1.1	0.71	1029.1	10.5	1025.6	10.0	1018.1	21.9	1018.1	21.9	101.1
CNG50-51-10	135	13542	3.4	16.4566	2.8	0.8933	3.2	0.1066	1.5	0.47	653.1	9.3	648.1	15.2	631.0	60.4	653.1	9.3	103.5
CNG50-51-12	204	49880	3.2	7.2101	2.0	7.2760	2.2	0.3805	0.9	0.42	2078.5	16.2	2145.9	19.5	2210.9	34.5	2210.9	34.5	94.0
CNG50-51-13	138	2247	4.1	20.2105	12.1	0.1124	12.6	0.0165	3.6	0.28	105.3	3.7	108.1	13.0	170.6	284.0	105.3	3.7	61.7
CNG50-51-14	132	1923	1.3	22.3517	11.5	0.1344	11.8	0.0218	2.7	0.23	138.9	3.7	128.0	14.2	NA	NA	138.9	3.7	-199.0
CNG50-51-15	125	20088	2.8	12.5241	1.5	2.1195	1.9	0.1925	1.3	0.65	1135.0	13.0	1155.2	13.3	1193.2	29.0	1193.2	29.0	95.1
CNG50-51-16	85	21914	3.4	9.6223	1.4	4.3479	2.0	0.3034	1.4	0.70	1708.3	20.7	1702.5	16.4	1695.4	26.2	1695.4	26.2	100.8
CNG50-51-17	214	64761	18.8	8.7240	1.0	5.3874	1.4	0.3409	0.9	0.65	1890.9	14.6	1882.9	11.7	1874.0	18.8	1874.0	18.8	100.9
CNG50-51-18	333	2500	1.3	21.5573	7.5	0.0704	7.7	0.0110	1.7	0.22	70.6	1.2	69.1	5.2	17.8	181.1	70.6	1.2	396.1
CNG50-51-19	121	21820	1.9	11.4332	1.6	2.8997	2.0	0.2404	1.1	0.57	1389.0	14.0	1381.8	14.8	1370.7	30.8	1370.7	30.8	101.3
CNG50-51-20	157	21705	1.9	13.4617	1.2	1.7716	2.7	0.1730	2.5	0.91	1028.4	23.5	1035.1	17.7	1049.2	23.2	1049.2	23.2	98.0
CNG50-51-21	357	76222	4.9	11.1186	0.9	3.0454	1.1	0.2456	0.6	0.57	1415.7	8.1	1419.1	8.6	1424.2	17.6	1424.2	17.6	99.4
CNG50-51-22	116	46136	2.6	8.0097	1.9	6.4004	2.4	0.3718	1.5	0.63	2037.9	26.2	2032.3	21.1	2026.6	33.1	2026.6	33.1	100.6
CNG50-51-23	195	3786	1.9	19.3169	13.9	0.2499	13.9	0.0350	1.3	0.09	221.9	2.8	226.5	28.3	275.2	319.5	221.9	2.8	80.6
CNG50-51-24	51	2670	1.2	18.4297	9.0	0.4157	9.2	0.0556	2.0	0.22	348.6	6.8	353.0	27.6	381.8	203.2	348.6	6.8	91.3
CNG50-51-25	50	12349	2.0	9.7170	1.2	4.1295	1.4	0.2910	0.8	0.53	1646.6	11.2	1660.2	11.8	1677.3	22.6	1677.3	22.6	98.2
CNG50-51-26	617	4842	1.1	16.6313	4.0	0.4916	4.1	0.0593	0.9	0.22	371.4	3.3	406.0	13.8	608.2	86.7	371.4	3.3	61.1
CNG50-51-27	460	16128	0.8	18.7933	1.6	0.3580	3.8	0.0488	3.4	0.90	307.1	10.3	310.7	10.1	337.8	36.8	307.1	10.3	90.9
CNG50-51-28	72	18476	7.6	9.6646	1.3	4.2356	1.6	0.2969	0.9	0.58	1675.9	13.6	1681.0	13.1	1687.3	24.0	1687.3	24.0	99.3
CNG50-51-29	231	36795	351.0	12.1087	2.8	2.3758	3.2	0.2086	1.5	0.48	1221.6	16.8	1235.3	22.7	1259.4	54.6	1259.4	54.6	97.0
CNG50-51-30	115	2682	1.2	20.7241	5.5	0.2028	5.8	0.0305	1.7	0.29	193.6	3.2	187.5	9.9	111.7	130.8	193.6	3.2	173.3
CNG50-51-31	176	1569	2.4	23.7311	16.0	0.0616	16.2	0.0106	2.3	0.14	68.0	1.6	60.7	9.5	NA	NA	68.0	1.6	-31.1
CNG50-51-32	209	38530	2.8	12.5476	1.5	2.1818	2.0	0.1986	1.3	0.65	1167.5	14.2	1175.3	14.2	1189.5	30.4	1189.5	30.4	98.2
CNG50-51-33	93	21958	1.1	11.1247	2.5	3.0263	3.0	0.2442	1.6	0.53	1408.3	20.0	1414.3	22.8	1423.2	48.4	1423.2	48.4	99.0

						Isotope ratios					Apparent ages (Ma)								
Analysis	U (ppm)	206Pb 204Pb	U/Th	206Pb* 207Pb*	± (%)	207Pb* 235U*	± (%)	206Pb* 238U	± (%)	error corr.	206Pb* 238U*	± (Ma)	207Pb* 235U	± (Ma)	206Pb* 207Pb*	± (Ma)	Best age (Ma)	± (Ma)	Conc (%)
CNG50-51-34	51	8011	0.7	14.0918	2.9	1.6369	3.2	0.1673	1.3	0.40	997.2	11.8	984.5	20.3	956.3	60.2	956.3	60.2	104.3
CNG50-51-35	466	8896	2.6	19.4931	6.1	0.2638	6.2	0.0373	0.7	0.11	236.1	1.6	237.7	13.0	254.4	140.7	236.1	1.6	92.8
CNG50-51-36	133	34870	2.6	9.6337	1.1	4.0401	1.9	0.2823	1.5	0.82	1602.8	21.6	1642.3	15.1	1693.2	19.6	1693.2	19.6	94.7
CNG50-51-38	368	6596	1.4	20.5527	3.4	0.1790	3.5	0.0267	0.7	0.19	169.8	1.1	167.2	5.4	131.3	80.8	169.8	1.1	129.3
CNG50-51-39	257	6015	3.9	20.8292	3.7	0.1849	3.8	0.0279	1.1	0.28	177.6	1.8	172.3	6.1	99.7	86.8	177.6	1.8	178.1
CNG50-51-40	189	10249	1.6	18.2378	2.3	0.4826	2.8	0.0638	1.6	0.55	398.9	6.0	399.9	9.3	405.3	52.3	398.9	6.0	98.4
CNG50-51-41	129	20482	1.3	13.1479	1.3	1.9832	1.8	0.1891	1.3	0.69	1116.6	12.8	1109.8	12.2	1096.6	26.0	1096.6	26.0	101.8
CNG50-51-42	205	27060	1.5	12.7322	1.5	2.0915	1.7	0.1931	0.7	0.41	1138.3	7.3	1146.0	11.6	1160.6	30.5	1160.6	30.5	98.1
CNG50-51-43	267	13915	1.0	18.0159	1.3	0.5160	2.1	0.0674	1.6	0.78	420.6	6.5	422.5	7.1	432.7	28.8	420.6	6.5	97.2
CNG50-51-44	135	11845	1.3	16.2856	2.0	0.8410	2.3	0.0993	1.2	0.51	610.5	6.8	619.7	10.6	653.4	42.4	610.5	6.8	93.4
CNG50-51-45	365	33734	2.0	9.3333	2.3	4.7154	3.8	0.3192	3.0	0.80	1785.8	46.6	1770.0	31.5	1751.4	41.6	1751.4	41.6	102.0
CNG50-51-46	681	135988	3.7	9.6323	1.7	4.2138	1.8	0.2944	0.8	0.44	1663.4	11.9	1676.7	15.2	1693.4	30.6	1693.4	30.6	98.2
CNG50-51-47	390	56270	3.6	12.9760	2.7	1.9130	2.7	0.1800	0.5	0.18	1067.2	4.9	1085.6	18.1	1122.9	53.3	1122.9	53.3	95.0
CNG50-51-48	273	6705	2.6	20.8609	3.4	0.1677	3.9	0.0254	1.8	0.47	161.5	2.9	157.4	5.6	96.2	80.9	161.5	2.9	167.9
CNG50-51-49	70	7726	0.8	8.5652	2.5	5.2612	3.1	0.3268	1.8	0.59	1823.0	28.9	1862.6	26.3	1907.1	44.8	1907.1	44.8	95.6
CNG50-51-50	180	2318	1.9	23.1371	12.1	0.0931	12.2	0.0156	1.5	0.12	99.9	1.4	90.3	10.5	NA	NA	99.9	1.4	-64.5
CNG50-51-51	79	20183	2.3	9.5515	1.5	4.3217	1.9	0.2994	1.1	0.60	1688.2	16.8	1697.5	15.4	1709.0	27.4	1709.0	27.4	98.8
CNG50-51-52	315	6813	1.5	20.3127	2.4	0.1787	3.4	0.0263	2.3	0.69	167.5	3.8	166.9	5.2	158.8	56.8	167.5	3.8	105.5
CNG50-51-53	303	22540	1.5	16.8118	1.5	0.7514	2.1	0.0916	1.5	0.73	565.1	8.3	569.0	9.2	584.8	31.7	565.1	8.3	96.6
CNG50-51-54	74	28982	1.1	5.6301	2.1	11.9173	2.5	0.4866	1.4	0.56	2556.0	29.3	2597.9	23.2	2630.7	34.1	2630.7	34.1	97.2
CNG50-51-55	162	40496	3.5	9.3959	1.0	4.4466	1.5	0.3030	1.2	0.78	1706.2	18.0	1721.1	12.7	1739.1	17.4	1739.1	17.4	98.1
CNG50-51-56	88	20567	2.0	9.5129	1.4	4.4693	1.5	0.3084	0.5	0.34	1732.6	7.6	1725.3	12.4	1716.4	25.8	1716.4	25.8	100.9
CNG50-51-57	229	57357	1.7	9.1890	1.7	4.6953	2.1	0.3129	1.3	0.60	1755.1	19.7	1766.4	18.0	1779.8	31.4	1779.8	31.4	98.6
CNG50-51-58	87	5396	1.2	18.7430	3.9	0.5040	4.3	0.0685	1.9	0.44	427.2	7.9	414.4	14.8	343.9	88.4	427.2	7.9	124.2
CNG50-51-59	344	61677	5.4	9.3811	1.1	4.2814	1.5	0.2913	1.0	0.68	1648.0	14.4	1689.8	11.9	1742.0	19.4	1742.0	19.4	94.6
CNG50-51-60	108	3611	1.2	18.1946	1.6	0.5141	1.9	0.0678	1.1	0.58	423.1	4.6	421.2	6.7	410.6	35.4	423.1	4.6	103.0
CNG50-51-61	77	20716	4.0	9.7001	2.1	4.2105	2.4	0.2962	1.3	0.52	1672.5	18.7	1676.1	19.9	1680.5	38.2	1680.5	38.2	99.5
CNG50-51-62	122	35047	4.6	9.4468	1.5	4.4760	1.6	0.3067	0.5	0.31	1724.3	7.6	1726.5	13.3	1729.2	27.9	1729.2	27.9	99.7
CNG50-51-63	159	18943	2.0	13.3078	1.6	1.8417	1.8	0.1778	0.8	0.44	1054.7	7.6	1060.5	11.6	1072.4	31.8	1072.4	31.8	98.4
CNG50-51-64	149	1509	1.8	25.6094	18.4	0.0517	18.7	0.0096	3.6	0.19	61.6	2.2	51.2	9.4	NA	NA	61.6	2.2	-14.9
CNG50-51-65	889	13030	2.4	19.3402	4.1	0.2033	4.4	0.0285	1.6	0.36	181.2	2.8	187.9	7.5	272.4	94.0	181.2	2.8	66.5
CNG50-51-66	35	8942	1.9	9.8445	1.8	4.1689	2.2	0.2977	1.3	0.59	1679.7	19.4	1667.9	18.2	1653.2	33.3	1653.2	33.3	101.6
CNG50-51-67	65	21390	2.3	7.3577	1.3	7.4414	3.0	0.3971	2.7	0.91	2155.6	49.3	2166.0	26.6	2175.7	21.8	2175.7	21.8	99.1
CNG50-51-68	63	14966	2.2	7.7228	1.7	6.7663	2.2	0.3790	1.4	0.64	2071.6	25.3	2081.3	19.8	2091.0	30.2	2091.0	30.2	99.1
CNG50-51-69	41	9287	3.1	9.4696	2.2	4.4165	2.5	0.3033	1.3	0.50	1707.8	18.8	1715.4	20.8	1724.8	40.0	1724.8	40.0	99.0

						Isotope ratios					Apparent ages (Ma)								
Analysis	U (ppm)	206Pb 204Pb	U/Th	206Pb* 207Pb*	± (%)	207Pb* 235U*	± (%)	206Pb* 238U	± (%)	error corr.	206Pb* 238U*	± (Ma)	207Pb* 235U	± (Ma)	206Pb* 207Pb*	± (Ma)	Best age (Ma)	± (Ma)	Conc (%)
CNG50-51-70	319	66406	7.3	11.1842	1.1	3.0313	1.2	0.2459	0.5	0.42	1417.2	6.6	1415.5	9.5	1413.0	21.6	1413.0	21.6	100.3
CNG50-51-71	165	36400	2.9	9.6735	1.3	4.1774	2.4	0.2931	2.0	0.85	1656.9	29.5	1669.6	19.5	1685.6	23.1	1685.6	23.1	98.3
CNG50-51-72	524	80385	4.0	12.7007	1.0	2.1536	1.2	0.1984	0.7	0.53	1166.6	6.9	1166.2	8.5	1165.5	20.6	1165.5	20.6	100.1
CNG50-51-73	84	22184	11.1	9.2693	2.1	4.4673	2.4	0.3003	1.2	0.50	1692.9	18.2	1724.9	20.2	1763.9	38.4	1763.9	38.4	96.0
CNG50-51-74	167	37899	4.5	9.6544	2.2	3.9445	2.6	0.2762	1.5	0.57	1572.2	20.9	1622.9	21.4	1689.2	40.2	1689.2	40.2	93.1
CNG50-51-75	288	6944	0.9	20.1904	6.8	0.1743	6.9	0.0255	1.1	0.16	162.5	1.8	163.2	10.3	172.9	158.2	162.5	1.8	94.0
CNG50-51-76	238	22259	1.8	16.4650	2.9	0.8065	3.0	0.0963	0.9	0.31	592.8	5.3	600.5	13.7	629.8	61.8	592.8	5.3	94.1
CNG50-51-77	264	22048	1.2	5.4044	2.0	10.8801	3.9	0.4265	3.4	0.86	2289.8	65.0	2512.9	36.4	2698.5	32.7	2698.5	32.7	84.9
CNG50-51-78	83	14377	1.6	13.2642	2.0	1.8999	3.8	0.1828	3.3	0.85	1082.1	32.4	1081.0	25.5	1078.9	40.7	1078.9	40.7	100.3
CNG50-51-79	192	16339	2.0	17.5604	2.4	0.6648	2.9	0.0847	1.8	0.60	523.9	9.0	517.6	12.0	489.4	51.9	523.9	9.0	107.0
CNG50-51-80	274	52176	18.7	9.7500	3.4	3.6732	4.1	0.2597	2.4	0.58	1488.5	31.9	1565.6	32.9	1671.0	62.0	1671.0	62.0	89.1
CNG50-51-81	232	34502	3.1	13.8544	1.5	1.6179	1.9	0.1626	1.2	0.62	971.0	10.8	977.2	12.1	991.0	30.5	991.0	30.5	98.0
CNG50-51-82	288	12487	2.2	19.9747	5.7	0.2497	5.8	0.0362	1.2	0.20	229.0	2.7	226.3	11.7	197.9	131.8	229.0	2.7	115.7
CNG50-51-83	257	38065	2.7	13.4840	0.8	1.7842	1.1	0.1745	0.8	0.71	1036.8	7.4	1039.7	7.1	1045.9	15.5	1045.9	15.5	99.1
CNG50-51-84	537	7730	2.8	21.4249	3.0	0.0961	3.2	0.0149	1.3	0.39	95.6	1.2	93.2	2.9	32.6	71.1	95.6	1.2	293.2
CNG50-51-85	1030	108107	4.4	13.5281	1.1	1.6839	1.5	0.1652	1.0	0.66	985.7	8.9	1002.5	9.3	1039.3	22.0	1039.3	22.0	94.8
CNG50-51-86	485	93502	4.2	11.0647	1.0	3.1220	2.1	0.2505	1.9	0.89	1441.3	24.8	1438.1	16.5	1433.5	18.3	1433.5	18.3	100.5
CNG50-51-87	131	29550	3.6	9.4839	1.2	4.4105	1.5	0.3034	1.0	0.64	1708.0	14.7	1714.3	12.6	1722.0	21.3	1722.0	21.3	99.2
CNG50-51-88	1059	42479	20.3	10.7156	2.0	3.1142	2.4	0.2420	1.4	0.58	1397.2	17.8	1436.2	18.7	1494.4	37.5	1494.4	37.5	93.5
CNG50-51-89	342	7335	2.9	20.9037	4.6	0.1937	4.6	0.0294	0.8	0.17	186.6	1.5	179.8	7.7	91.3	108.6	186.6	1.5	204.4
CNG50-51-90	93	18000	1.0	10.6438	2.3	3.3403	3.1	0.2579	2.0	0.65	1478.9	26.6	1490.5	24.0	1507.1	43.9	1507.1	43.9	98.1
CNG50-51-91	209	4296	0.8	19.9158	6.3	0.1694	6.7	0.0245	2.5	0.37	155.8	3.8	158.9	9.9	204.8	145.5	155.8	3.8	76.1
CNG50-51-92	58	7903	1.5	13.1662	2.4	1.8354	2.4	0.1753	0.5	0.21	1041.0	4.8	1058.2	15.9	1093.8	47.4	1093.8	47.4	95.2
CNG50-51-93	138	22931	4.1	12.5950	1.8	2.0479	1.9	0.1871	0.7	0.34	1105.5	6.7	1131.6	13.2	1182.1	35.8	1182.1	35.8	93.5
CNG50-51-94	461	70398	4.1	9.2333	1.4	4.5229	2.0	0.3029	1.3	0.69	1705.6	20.1	1735.2	16.2	1771.1	25.9	1771.1	25.9	96.3
CNG50-51-96	316	4000	1.5	19.1498	7.2	0.1999	7.3	0.0278	1.1	0.15	176.5	1.9	185.1	12.3	295.1	163.8	176.5	1.9	59.8
CNG50-51-97	390	44155	1.1	12.5193	0.8	2.2103	1.3	0.2007	1.1	0.82	1179.0	11.6	1184.3	9.2	1193.9	15.0	1193.9	15.0	98.8
CNG50-51-98	65	6937	1.3	13.4884	2.8	1.7734	3.2	0.1735	1.5	0.49	1031.3	14.7	1035.8	20.6	1045.2	55.9	1045.2	55.9	98.7
CNG50-51-99	344	23396	1.7	12.4192	1.3	2.0587	2.5	0.1854	2.1	0.85	1096.6	21.6	1135.2	17.1	1209.7	25.7	1209.7	25.7	90.6
CNG50-51-100	171	35284	0.9	11.0256	1.3	3.1858	2.3	0.2548	1.9	0.83	1462.9	25.3	1453.7	18.0	1440.3	25.0	1440.3	25.0	101.6
CNG114-115-1	144	4917	2.4	17.5005	3.6	0.6477	3.7	0.0822	1.0	0.27	509.3	4.9	507.1	14.8	497.0	78.8	509.3	4.9	102.5
CNG114-115-2	940	77545	9.8	11.1197	0.8	2.9069	1.7	0.2344	1.5	0.88	1357.7	18.5	1383.7	12.9	1424.0	15.5	1424.0	15.5	95.3
CNG114-115-3	236	7261	4.3	17.0527	1.7	0.6793	1.9	0.0840	0.9	0.44	520.0	4.2	526.3	8.0	553.8	38.2	520.0	4.2	93.9
CNG114-115-4	24	3066	2.3	9.7045	2.7	4.3554	3.7	0.3066	2.6	0.68	1723.7	38.6	1703.9	30.9	1679.7	50.7	1679.7	50.7	102.6
CNG114-115-5	273	35984	3.6	9.2997	1.0	4.7002	1.5	0.3170	1.1	0.74	1775.1	16.9	1767.3	12.3	1758.0	17.9	1758.0	17.9	101.0

						Isotope ratios					Apparent ages (Ma)								
Analysis	U (ppm)	206Pb 204Pb	U/Th	206Pb* 207Pb*	± (%)	207Pb* 235U*	± (%)	206Pb* 238U	± (%)	error corr.	206Pb* 238U*	± (Ma)	207Pb* 235U	± (Ma)	206Pb* 207Pb*	± (Ma)	Best age (Ma)	± (Ma)	Conc (%)
CNG114-115-6	182	24260	3.3	9.6084	1.7	4.1745	2.1	0.2909	1.3	0.60	1646.1	18.4	1669.0	17.2	1698.0	30.8	1698.0	30.8	96.9
CNG114-115-7	157	20539	3.2	9.4020	0.9	4.4522	2.5	0.3036	2.3	0.93	1709.1	35.0	1722.1	20.7	1737.9	16.7	1737.9	16.7	98.3
CNG114-115-8	254	34721	3.4	9.6482	1.9	4.2259	2.8	0.2957	2.0	0.73	1670.0	29.9	1679.1	22.9	1690.4	35.2	1690.4	35.2	98.8
CNG114-115-9	612	5904	1.4	18.1985	6.3	0.3051	7.2	0.0403	3.4	0.48	254.5	8.6	270.3	17.1	410.2	142.0	254.5	8.6	62.0
CNG114-115-10	231	30194	2.7	9.1840	1.7	4.5776	2.2	0.3049	1.3	0.61	1715.6	20.0	1745.2	18.2	1780.8	31.6	1780.8	31.6	96.3
CNG114-115-11	260	24079	2.8	11.0028	1.4	3.0847	1.6	0.2462	0.7	0.45	1418.6	9.0	1428.9	12.2	1444.2	27.1	1444.2	27.1	98.2
CNG114-115-12	340	44300	7.2	9.3812	1.2	4.4415	2.0	0.3022	1.5	0.79	1702.2	23.0	1720.1	16.2	1742.0	22.0	1742.0	22.0	97.7
CNG114-115-13	127	16891	2.1	9.6024	2.0	4.2259	2.1	0.2943	0.8	0.40	1663.0	12.3	1679.1	17.4	1699.2	35.9	1699.2	35.9	97.9
CNG114-115-14	539	62215	39.8	10.6243	2.8	3.2093	3.0	0.2473	1.1	0.36	1424.5	13.8	1459.4	23.1	1510.6	52.5	1510.6	52.5	94.3
CNG114-115-15	285	25525	3.8	9.3887	2.5	4.3391	3.5	0.2955	2.4	0.69	1668.8	35.9	1700.8	29.1	1740.5	46.6	1740.5	46.6	95.9
CNG114-115-16	88	12524	2.5	9.4445	1.3	4.4768	1.7	0.3067	1.0	0.62	1724.2	15.6	1726.7	13.8	1729.7	24.1	1729.7	24.1	99.7
CNG114-115-17	158	12767	2.7	12.9236	1.5	2.0231	2.2	0.1896	1.7	0.76	1119.4	17.6	1123.3	15.3	1130.9	28.9	1130.9	28.9	99.0
CNG114-115-18	109	13634	2.6	9.2086	1.0	4.7093	1.7	0.3145	1.4	0.82	1762.9	22.1	1768.9	14.6	1775.9	18.1	1775.9	18.1	99.3
CNG114-115-19	276	28939	4.8	9.4051	1.6	4.3969	2.8	0.2999	2.3	0.81	1690.9	33.5	1711.8	22.9	1737.3	29.6	1737.3	29.6	97.3
CNG114-115-20	109	12836	2.4	9.6331	1.4	4.2916	2.4	0.2998	1.9	0.80	1690.5	28.3	1691.7	19.6	1693.3	26.2	1693.3	26.2	99.8
CNG114-115-21	119	11104	4.0	10.9251	1.7	2.9861	3.5	0.2366	3.1	0.87	1369.0	37.6	1404.1	26.6	1457.7	32.5	1457.7	32.5	93.9
CNG114-115-22	64	7997	10.9	10.4654	2.9	3.3807	3.6	0.2566	2.1	0.58	1472.5	27.8	1499.9	28.3	1539.0	55.2	1539.0	55.2	95.7
CNG114-115-23	148	14462	6.0	9.3319	1.4	4.3155	2.1	0.2921	1.5	0.74	1651.9	22.4	1696.3	17.1	1751.6	25.3	1751.6	25.3	94.3
CNG114-115-24	350	8991	1.5	12.0635	3.5	2.1556	4.9	0.1886	3.5	0.71	1113.8	35.8	1166.9	34.2	1266.8	67.6	1266.8	67.6	87.9
CNG114-115-25	328	27453	31.1	11.0195	1.5	3.0377	1.8	0.2428	0.9	0.54	1401.1	11.8	1417.2	13.4	1441.3	28.2	1441.3	28.2	97.2
CNG114-115-26	146	5548	4.4	17.3905	3.9	0.6493	4.0	0.0819	0.7	0.18	507.4	3.5	508.1	15.8	510.9	85.6	507.4	3.5	99.3
CNG114-115-27	49	6691	2.1	9.5649	1.3	4.1512	3.4	0.2880	3.1	0.92	1631.4	45.3	1664.4	27.8	1706.4	23.9	1706.4	23.9	95.6
CNG114-115-28	82	3724	3.0	18.4128	6.4	0.6047	6.6	0.0807	1.2	0.19	500.6	5.9	480.2	25.1	383.9	145.1	500.6	5.9	130.4
CNG114-115-29	247	2452	1.4	22.0155	9.8	0.1657	10.0	0.0265	1.8	0.18	168.3	3.0	155.7	14.4	NA	NA	168.3	3.0	-511.5
CNG114-115-30	130	3740	3.6	17.9592	9.7	0.6380	9.9	0.0831	1.8	0.18	514.6	8.9	501.1	39.1	439.7	216.5	514.6	8.9	117.0
CNG114-115-31	228	15603	1.3	11.2515	1.2	2.8564	2.4	0.2331	2.1	0.86	1350.7	25.0	1370.5	18.0	1401.5	23.7	1401.5	23.7	96.4
CNG114-115-32	66	6077	3.0	9.4094	2.3	4.5853	2.4	0.3129	0.7	0.28	1755.0	10.0	1746.6	19.6	1736.5	41.5	1736.5	41.5	101.1
CNG114-115-33	161	19870	4.2	9.5479	2.1	4.3610	2.2	0.3020	0.7	0.34	1701.2	10.9	1705.0	18.0	1709.7	37.7	1709.7	37.7	99.5
CNG114-115-34	104	13982	1.1	9.2915	4.4	4.6694	4.9	0.3147	2.2	0.45	1763.6	33.5	1761.8	40.7	1759.6	79.6	1759.6	79.6	100.2
CNG114-115-35	221	25801	6.0	9.4463	1.7	4.4214	2.4	0.3029	1.7	0.70	1705.8	25.6	1716.4	20.2	1729.3	31.8	1729.3	31.8	98.6
CNG114-115-36	91	11880	7.7	10.1191	2.6	3.6552	2.6	0.2683	0.6	0.22	1532.0	7.9	1561.7	21.1	1602.0	48.2	1602.0	48.2	95.6
CNG114-115-37	1012	106975	3.5	11.0416	0.9	3.0342	1.8	0.2430	1.6	0.88	1402.2	19.9	1416.3	13.7	1437.5	16.4	1437.5	16.4	97.5
CNG114-115-38	362	39381	2.1	11.0627	0.9	3.0351	1.3	0.2435	0.9	0.73	1405.0	11.7	1416.5	9.7	1433.8	16.6	1433.8	16.6	98.0
CNG114-115-39	83	10605	4.6	9.6336	4.0	4.2061	4.3	0.2939	1.7	0.40	1660.9	25.2	1675.2	35.7	1693.2	73.6	1693.2	73.6	98.1
CNG114-115-40	400	41625	6.6	9.8220	2.0	4.0970	2.6	0.2919	1.7	0.64	1650.8	24.0	1653.7	21.0	1657.4	36.7	1657.4	36.7	99.6

						Isotope ratios					Apparent ages (Ma)								
Analysis	U (ppm)	206Pb 204Pb	U/Th	206Pb* 207Pb*	± (%)	207Pb* 235U*	± (%)	206Pb* 238U	± (%)	error corr.	206Pb* 238U*	± (Ma)	207Pb* 235U	± (Ma)	206Pb* 207Pb*	± (Ma)	Best age (Ma)	± (Ma)	Conc (%)
CNG114-115-41	74	7585	4.0	9.4988	1.8	4.4608	2.5	0.3073	1.7	0.68	1727.4	25.3	1723.7	20.3	1719.1	33.0	1719.1	33.0	100.5
CNG114-115-43	597	46232	8.7	10.5811	1.2	3.4257	1.4	0.2629	0.8	0.57	1504.6	11.0	1510.3	11.2	1518.3	22.1	1518.3	22.1	99.1
CNG114-115-44	57	7496	2.8	9.6279	3.1	4.3997	3.3	0.3072	1.0	0.30	1727.0	14.7	1712.3	26.9	1694.3	57.3	1694.3	57.3	101.9
CNG114-115-45	190	17726	5.7	9.6295	1.4	4.0842	3.3	0.2852	3.0	0.91	1617.7	42.6	1651.2	26.7	1694.0	24.9	1694.0	24.9	95.5
CNG114-115-46	206	31489	2.9	9.2560	1.4	4.4994	1.5	0.3020	0.7	0.46	1701.5	10.6	1730.9	12.8	1766.6	25.1	1766.6	25.1	96.3
CNG114-115-47	197	20258	3.8	9.5817	2.1	4.2192	2.7	0.2932	1.7	0.62	1657.5	24.4	1677.8	22.3	1703.1	39.4	1703.1	39.4	97.3
CNG114-115-48	78	12850	4.4	9.8237	3.4	4.1820	4.9	0.2980	3.5	0.72	1681.2	52.4	1670.5	40.2	1657.1	62.8	1657.1	62.8	101.5
CNG114-115-49	124	18283	3.7	9.4037	0.7	4.5041	2.0	0.3072	1.9	0.94	1726.9	28.3	1731.7	16.6	1737.6	12.9	1737.6	12.9	99.4
CNG114-115-50	260	21719	5.8	9.9419	2.4	3.9082	4.9	0.2818	4.4	0.88	1600.4	61.7	1615.4	40.0	1634.9	43.9	1634.9	43.9	97.9
CNG114-115-51	79	16164	5.0	9.5846	1.3	4.3517	1.6	0.3025	1.1	0.64	1703.7	15.7	1703.2	13.5	1702.6	23.1	1702.6	23.1	100.1
CNG114-115-52	307	39049	6.1	9.7611	1.5	4.1265	2.8	0.2921	2.4	0.84	1652.2	34.3	1659.6	22.9	1668.9	28.1	1668.9	28.1	99.0
CNG114-115-53	490	25645	5.3	17.0279	22.8	0.7346	22.8	0.0907	1.1	0.05	559.8	5.8	559.3	98.3	557.0	502.3	559.8	5.8	100.5
CNG114-115-54	123	465	3.0	21.1630	28.6	0.0544	30.1	0.0083	9.4	0.31	53.6	5.0	53.8	15.8	62.0	694.6	53.6	5.0	86.5
CNG114-115-55	423	5764	2.1	20.7365	3.2	0.1776	3.6	0.0267	1.4	0.41	169.9	2.4	166.0	5.4	110.3	76.7	169.9	2.4	154.0
CNG114-115-56	230	25284	19.2	11.1358	1.8	3.0905	2.1	0.2496	1.1	0.51	1436.4	13.6	1430.3	15.8	1421.3	33.8	1421.3	33.8	101.1
CNG114-115-57	115	14055	4.4	11.0145	2.0	2.9157	2.9	0.2329	2.2	0.74	1349.8	26.4	1386.0	22.2	1442.2	37.7	1442.2	37.7	93.6
CNG114-115-58	122	777	3.7	22.5499	30.6	0.0610	31.2	0.0100	6.1	0.20	64.0	3.9	60.2	18.2	NA	NA	64.0	3.9	-70.1
CNG114-115-59	23	5260	2.1	7.5009	2.4	7.3355	3.9	0.3991	3.1	0.78	2164.7	56.3	2153.1	35.0	2142.1	42.7	2142.1	42.7	101.1
CNG114-115-60	215	38486	3.0	9.5243	1.3	4.2690	2.0	0.2949	1.5	0.74	1665.9	21.3	1687.4	16.1	1714.2	24.1	1714.2	24.1	97.2
CNG114-115-61	235	39459	2.6	9.5032	1.5	4.5082	2.2	0.3107	1.7	0.75	1744.3	25.4	1732.5	18.5	1718.3	27.2	1718.3	27.2	101.5
CNG114-115-62	515	64333	5.9	9.4690	1.0	4.4160	2.3	0.3033	2.1	0.90	1707.5	31.8	1715.3	19.4	1724.9	18.6	1724.9	18.6	99.0
CNG114-115-63	348	41713	1.6	9.5788	2.4	4.2126	2.5	0.2927	0.7	0.26	1654.8	9.5	1676.5	20.3	1703.7	44.0	1703.7	44.0	97.1
CNG114-115-64	462	47964	5.5	9.3104	1.4	4.5838	3.2	0.3095	2.9	0.91	1738.4	44.8	1746.3	27.0	1755.9	24.7	1755.9	24.7	99.0
CNG114-115-65	390	58829	3.7	9.3613	0.9	4.5780	2.2	0.3108	2.0	0.92	1744.7	31.2	1745.3	18.4	1745.9	15.6	1745.9	15.6	99.9
CNG114-115-66	439	24079	2.3	12.5400	2.2	2.0989	3.8	0.1909	3.1	0.81	1126.2	31.6	1148.4	25.9	1190.7	43.5	1190.7	43.5	94.6
CNG114-115-67	441	15327	2.9	9.5584	1.3	2.9859	7.8	0.2070	7.7	0.99	1212.8	84.8	1404.0	59.3	1707.6	24.5	1707.6	24.5	71.0
CNG114-115-68	293	49213	3.1	9.4633	1.2	4.3357	1.4	0.2976	0.8	0.58	1679.3	12.3	1700.2	11.9	1726.0	21.7	1726.0	21.7	97.3
CNG114-115-69	52	6875	2.5	9.8731	3.9	4.0100	4.0	0.2871	1.1	0.28	1627.2	16.0	1636.2	32.6	1647.8	71.5	1647.8	71.5	98.8
CNG114-115-70	202	33950	3.3	9.3349	3.3	4.7177	3.3	0.3194	0.6	0.17	1786.8	8.6	1770.4	27.9	1751.1	60.1	1751.1	60.1	102.0
CNG114-115-72	505	50892	3.5	9.4909	1.9	4.2854	2.2	0.2950	1.3	0.56	1666.4	18.4	1690.6	18.5	1720.7	34.2	1720.7	34.2	96.8
CNG114-115-73	370	17324	4.3	9.5683	1.8	3.7842	2.4	0.2626	1.6	0.66	1503.1	20.8	1589.4	18.9	1705.7	32.7	1705.7	32.7	88.1
CNG114-115-74	460	18600	4.4	16.8201	1.2	0.6785	1.3	0.0828	0.6	0.42	512.7	2.8	525.9	5.5	583.7	26.4	512.7	2.8	87.8
CNG114-115-75	812	65573	8.5	11.0235	1.9	3.0789	2.2	0.2462	1.1	0.52	1418.6	14.3	1427.5	16.6	1440.6	35.5	1440.6	35.5	98.5
CNG114-115-76	108	17602	3.8	9.4820	1.1	4.5001	1.3	0.3095	0.7	0.54	1738.1	10.8	1731.0	10.9	1722.4	20.3	1722.4	20.3	100.9
CNG114-115-77	428	31377	1.0	9.2520	1.2	4.4829	2.0	0.3008	1.6	0.81	1695.3	23.6	1727.8	16.2	1767.4	21.0	1767.4	21.0	95.9

						Isotope ratios					Apparent ages (Ma)								
Analysis	U (ppm)	206Pb 204Pb	U/Th	206Pb* 207Pb*	± (%)	207Pb* 235U*	± (%)	206Pb* 238U	± (%)	error corr.	206Pb* 238U*	± (Ma)	207Pb* 235U	± (Ma)	206Pb* 207Pb*	± (Ma)	Best age (Ma)	± (Ma)	Conc (%)
CNG114-115-79	201	26390	3.0	9.4128	4.6	4.5909	4.9	0.3134	1.8	0.36	1757.5	27.2	1747.6	40.9	1735.8	83.9	1735.8	83.9	101.2
CNG114-115-80	243	30167	1.2	6.0423	1.2	9.7118	3.1	0.4256	2.9	0.92	2285.8	55.6	2407.8	28.9	2512.6	20.3	2512.6	20.3	91.0
CNG114-115-81	48	5180	3.6	9.9836	2.4	3.7021	2.7	0.2681	1.2	0.44	1531.0	16.1	1571.8	21.5	1627.1	44.9	1627.1	44.9	94.1
CNG114-115-83	757	86045	11.8	10.9470	1.3	3.2311	1.4	0.2565	0.5	0.36	1472.1	6.6	1464.7	10.7	1453.9	24.4	1453.9	24.4	101.3
CNG114-115-84	120	20026	2.6	9.5002	1.7	4.2797	2.7	0.2949	2.0	0.77	1665.9	29.9	1689.5	21.9	1718.9	31.5	1718.9	31.5	96.9
CNG114-115-85	108	18826	4.2	9.1985	2.5	4.5376	2.6	0.3027	0.8	0.30	1704.8	11.7	1737.9	21.4	1778.0	44.7	1778.0	44.7	95.9
CNG114-115-86	107	16169	3.7	9.3367	1.0	4.6440	2.2	0.3145	2.0	0.90	1762.7	31.3	1757.2	18.7	1750.7	17.5	1750.7	17.5	100.7
CNG114-115-87	278	14435	2.6	13.2541	1.0	1.9020	2.0	0.1828	1.7	0.87	1082.4	17.1	1081.8	13.2	1080.5	19.9	1080.5	19.9	100.2
CNG114-115-88	96	11751	2.0	9.4972	1.1	4.4145	2.5	0.3041	2.2	0.90	1711.5	33.1	1715.1	20.3	1719.4	20.0	1719.4	20.0	99.5
CNG114-115-89	262	36499	4.9	9.3705	1.6	4.6233	2.3	0.3142	1.6	0.70	1761.4	25.1	1753.5	19.3	1744.1	30.1	1744.1	30.1	101.0
CNG114-115-91	111	856	4.1	28.5175	36.9	0.0657	37.4	0.0136	5.9	0.16	87.0	5.1	64.6	23.4	NA	NA	87.0	5.1	-12.4
CNG114-115-92	204	23058	7.8	10.1110	1.4	3.4863	2.8	0.2557	2.4	0.86	1467.6	31.6	1524.1	22.2	1603.5	26.9	1603.5	26.9	91.5
CNG114-115-93	469	35694	16.8	13.5149	0.7	1.7479	1.0	0.1713	0.7	0.71	1019.4	7.0	1026.4	6.8	1041.2	15.0	1041.2	15.0	97.9
CNG114-115-94	1120	17160	7.0	17.4461	1.5	0.5759	1.6	0.0729	0.5	0.32	453.4	2.2	461.8	5.8	503.8	32.8	453.4	2.2	90.0
CNG114-115-95	97	14922	5.2	9.2494	1.5	4.7171	1.6	0.3164	0.6	0.38	1772.3	9.5	1770.3	13.5	1767.9	27.3	1767.9	27.3	100.3
CNG114-115-96	632	1603	1.6	23.9086	12.4	0.0343	12.5	0.0059	1.6	0.13	38.2	0.6	34.2	4.2	NA	NA	38.2	0.6	-16.1
CNG114-115-97	660	1371	1.5	23.6938	10.4	0.0314	10.6	0.0054	2.2	0.21	34.7	0.8	31.4	3.3	NA	NA	34.7	0.8	-16.2
CNG114-115-98	376	30250	10.4	9.5234	2.1	4.1260	2.9	0.2850	2.1	0.71	1616.4	29.7	1659.5	24.1	1714.4	38.5	1714.4	38.5	94.3
CNG114-115-99	160	8342	2.9	10.8024	3.7	2.9575	3.9	0.2317	1.0	0.26	1343.5	12.4	1396.8	29.5	1479.1	71.0	1479.1	71.0	90.8
CNG114-115-100	152	22457	3.2	9.4021	0.9	4.4577	1.3	0.3040	1.0	0.76	1711.0	15.2	1723.1	11.0	1737.9	15.8	1737.9	15.8	98.5
CNG184-185-1	281	46497	3.3	9.6804	2.5	4.3428	3.1	0.3049	1.8	0.59	1715.6	27.4	1701.5	25.7	1684.3	46.5	1684.3	46.5	101.9
CNG184-185-2	11	2153	1.2	10.0255	1.9	3.9222	4.1	0.2852	3.7	0.89	1617.5	52.2	1618.3	33.4	1619.3	35.6	1619.3	35.6	99.9
CNG184-185-3	124	803	1.9	20.2386	7.4	0.0707	8.8	0.0104	4.8	0.54	66.6	3.1	69.4	5.9	167.3	172.7	66.6	3.1	39.8
CNG184-185-4	163	25355	4.5	9.7816	2.1	3.9924	2.6	0.2832	1.5	0.59	1607.6	21.9	1632.7	21.1	1665.0	38.7	1665.0	38.7	96.6
CNG184-185-5	201	30799	3.6	9.6406	1.5	4.3400	1.7	0.3035	0.8	0.47	1708.4	12.0	1701.0	14.0	1691.9	27.7	1691.9	27.7	101.0
CNG184-185-6	311	51589	3.8	9.3263	1.1	4.5590	1.7	0.3084	1.3	0.74	1732.7	19.1	1741.8	14.1	1752.7	20.7	1752.7	20.7	98.9
CNG184-185-7	322	19442	4.8	9.5380	2.2	3.6596	7.1	0.2532	6.7	0.95	1454.7	87.6	1562.6	56.5	1711.6	40.3	1711.6	40.3	85.0
CNG184-185-8	415	62302	4.3	9.3998	2.5	4.6387	2.6	0.3162	0.6	0.21	1771.3	8.5	1756.3	21.6	1738.4	46.4	1738.4	46.4	101.9
CNG184-185-9	337	48052	2.5	9.2546	1.8	4.7241	2.1	0.3171	1.1	0.52	1775.5	17.1	1771.5	17.8	1766.8	33.3	1766.8	33.3	100.5
CNG184-185-10	173	26795	16.4	8.6888	1.2	5.4374	2.2	0.3426	1.8	0.83	1899.4	29.4	1890.8	18.6	1881.3	22.0	1881.3	22.0	101.0
CNG184-185-11	497	65226	7.3	11.0826	2.3	3.1384	3.8	0.2523	3.0	0.80	1450.1	39.2	1442.2	29.0	1430.4	43.0	1430.4	43.0	101.4
CNG184-185-12	206	27855	6.1	9.6218	1.9	4.3596	2.8	0.3042	2.0	0.72	1712.2	29.9	1704.7	23.0	1695.5	35.8	1695.5	35.8	101.0
CNG184-185-13	378	48870	3.9	9.4704	1.4	4.4404	1.5	0.3050	0.5	0.33	1716.0	7.5	1719.9	12.6	1724.6	26.3	1724.6	26.3	99.5
CNG184-185-14	184	19088	16.9	10.9259	1.7	3.1685	2.0	0.2511	1.0	0.51	1444.0	13.1	1449.5	15.3	1457.5	32.4	1457.5	32.4	99.1
CNG184-185-15	138	6585	3.4	9.0419	0.8	4.8466	1.0	0.3178	0.6	0.60	1779.1	9.6	1793.0	8.6	1809.2	14.8	1809.2	14.8	98.3

						Isotope ratios					Apparent ages (Ma)								
Analysis	U (ppm)	206Pb 204Pb	U/Th	206Pb* 207Pb*	± (%)	207Pb* 235U*	± (%)	206Pb* 238U	± (%)	error corr.	206Pb* 238U*	± (Ma)	207Pb* 235U	± (Ma)	206Pb* 207Pb*	± (Ma)	Best age (Ma)	± (Ma)	Conc (%)
CNG184-185-16	87	15277	3.9	9.5796	1.6	4.2900	1.8	0.2981	0.8	0.45	1681.7	12.1	1691.4	14.9	1703.6	29.7	1703.6	29.7	98.7
CNG184-185-17	1059	11256	10.9	10.0017	2.7	3.5264	3.6	0.2558	2.4	0.66	1468.3	31.5	1533.1	28.8	1623.8	51.0	1623.8	51.0	90.4
CNG184-185-18	117	11272	2.9	11.6128	2.8	2.5164	4.0	0.2119	2.9	0.72	1239.1	32.9	1276.8	29.4	1340.7	54.0	1340.7	54.0	92.4
CNG184-185-19	592	15123	4.7	9.8445	2.4	3.2508	2.5	0.2321	0.9	0.35	1345.5	10.6	1469.4	19.5	1653.2	43.6	1653.2	43.6	81.4
CNG184-185-20	320	1477	1.7	20.5582	11.6	0.0746	11.8	0.0111	2.4	0.20	71.3	1.7	73.0	8.3	130.6	273.5	71.3	1.7	54.6
CNG184-185-21	44	3399	2.9	18.0656	8.7	0.6191	9.3	0.0811	3.2	0.34	502.8	15.2	489.3	36.1	426.5	195.1	502.8	15.2	117.9
CNG184-185-23	180	15707	3.6	9.6933	2.0	4.0546	2.6	0.2850	1.6	0.62	1616.7	23.0	1645.2	21.2	1681.8	37.7	1681.8	37.7	96.1
CNG184-185-22	96	15541	12.6	9.5760	2.7	4.4183	2.8	0.3069	0.7	0.27	1725.2	11.2	1715.8	22.8	1704.2	48.9	1704.2	48.9	101.2
CNG184-185-24	782	18437	2.4	19.3261	1.9	0.2982	2.2	0.0418	1.1	0.49	263.9	2.8	265.0	5.2	274.1	44.4	263.9	2.8	96.3
CNG184-185-25	346	37787	4.1	10.9337	1.7	3.1440	1.8	0.2493	0.5	0.28	1435.0	6.4	1443.5	13.7	1456.2	32.5	1456.2	32.5	98.5
CNG184-185-26	101	13950	3.0	9.2253	1.0	4.6938	1.5	0.3141	1.1	0.73	1760.6	17.3	1766.1	12.8	1772.6	19.0	1772.6	19.0	99.3
CNG184-185-27	90	3521	5.4	18.4940	11.1	0.6018	11.2	0.0807	1.0	0.09	500.5	4.8	478.4	42.7	374.0	251.6	500.5	4.8	133.8
CNG184-185-28	335	42907	6.4	9.6286	2.0	4.2724	2.1	0.2984	0.7	0.33	1683.2	10.2	1688.1	17.3	1694.2	36.5	1694.2	36.5	99.4
CNG184-185-29	53	2199	2.0	17.4257	10.1	0.6273	10.5	0.0793	2.6	0.25	491.8	12.4	494.4	40.9	506.4	223.1	491.8	12.4	97.1
CNG184-185-30	294	38219	5.3	9.5806	1.4	4.2702	1.5	0.2967	0.6	0.40	1675.0	9.0	1687.6	12.6	1703.4	26.0	1703.4	26.0	98.3
CNG184-185-31	144	21160	3.5	9.4474	1.6	4.4281	3.3	0.3034	2.9	0.88	1708.2	43.1	1717.6	27.1	1729.1	28.6	1729.1	28.6	98.8
CNG184-185-32	410	29707	3.3	11.3643	1.8	2.5753	3.5	0.2123	3.0	0.86	1240.9	33.6	1293.7	25.4	1382.3	34.0	1382.3	34.0	89.8
CNG184-185-33	548	17457	4.2	9.3488	2.0	4.5059	2.7	0.3055	1.8	0.67	1718.6	27.5	1732.1	22.5	1748.3	36.7	1748.3	36.7	98.3
CNG184-185-34	359	37136	5.2	10.0000	4.5	3.2902	7.3	0.2386	5.7	0.79	1379.6	70.9	1478.7	56.7	1624.1	83.8	1624.1	83.8	84.9
CNG184-185-35	247	39337	2.3	9.1626	4.2	4.3700	4.4	0.2904	1.1	0.24	1643.5	15.2	1706.7	36.0	1785.1	77.1	1785.1	77.1	92.1
CNG184-185-37	472	42624	18.5	11.1107	1.8	2.8992	2.4	0.2336	1.7	0.69	1353.5	20.4	1381.7	18.3	1425.6	33.4	1425.6	33.4	94.9
CNG184-185-38	103	19628	2.1	8.8707	3.1	4.7031	3.1	0.3026	0.5	0.16	1704.1	7.5	1767.8	26.2	1843.9	56.0	1843.9	56.0	92.4
CNG184-185-39	897	10414	2.6	18.9419	2.9	0.2830	3.0	0.0389	0.9	0.29	245.9	2.1	253.0	6.7	319.9	64.9	245.9	2.1	76.9
CNG184-185-40	103	5046	3.4	17.4076	4.6	0.6350	4.9	0.0802	1.6	0.32	497.1	7.5	499.2	19.3	508.7	101.8	497.1	7.5	97.7
CNG184-185-41	103	11387	3.5	9.6094	1.4	4.0988	1.5	0.2857	0.5	0.34	1619.8	7.3	1654.1	12.4	1697.8	26.4	1697.8	26.4	95.4
CNG184-185-42	676	28598	8.4	9.7083	2.7	3.6431	3.4	0.2565	2.1	0.62	1472.0	27.8	1559.0	27.2	1678.9	49.5	1678.9	49.5	87.7
CNG184-185-43	550	59655	4.2	9.5144	1.8	4.3686	2.1	0.3015	1.2	0.57	1698.5	18.1	1706.4	17.6	1716.1	32.2	1716.1	32.2	99.0
CNG184-185-44	213	26383	3.7	9.8336	2.1	4.0201	2.5	0.2867	1.4	0.55	1625.1	19.7	1638.3	20.3	1655.2	38.6	1655.2	38.6	98.2
CNG184-185-45	599	28736	5.5	9.5832	3.2	4.0823	3.3	0.2837	0.7	0.21	1610.2	9.5	1650.8	26.6	1702.9	58.8	1702.9	58.8	94.6
CNG184-185-46	348	30153	4.7	9.5038	3.0	4.3492	3.1	0.2998	0.9	0.28	1690.2	12.8	1702.7	25.6	1718.2	54.8	1718.2	54.8	98.4
CNG184-185-47	492	59000	4.5	11.0871	1.9	3.0509	2.4	0.2453	1.5	0.61	1414.3	18.4	1420.5	18.0	1429.6	35.5	1429.6	35.5	98.9
CNG184-185-48	345	50149	3.4	9.3832	1.1	4.5116	1.3	0.3070	0.7	0.52	1726.1	10.1	1733.1	10.8	1741.6	20.3	1741.6	20.3	99.1
CNG184-185-49	610	66799	6.2	9.6052	1.8	4.3235	2.2	0.3012	1.3	0.57	1697.2	18.7	1697.8	18.2	1698.6	33.5	1698.6	33.5	99.9
CNG184-185-50	89	12029	3.9	9.5521	1.2	4.3631	2.1	0.3023	1.7	0.83	1702.5	25.4	1705.4	17.0	1708.8	21.3	1708.8	21.3	99.6
CNG184-185-51	1015	106897	25.2	9.6254	0.8	4.1348	2.6	0.2887	2.4	0.95	1634.8	35.1	1661.2	21.0	1694.8	15.3	1694.8	15.3	96.5

						Isotope ratios					Apparent ages (Ma)								
Analysis	U (ppm)	206Pb 204Pb	U/Th	206Pb* 207Pb*	± (%)	207Pb* 235U*	± (%)	206Pb* 238U	± (%)	error corr.	206Pb* 238U*	± (Ma)	207Pb* 235U	± (Ma)	206Pb* 207Pb*	± (Ma)	Best age (Ma)	± (Ma)	Conc (%)
CNG184-185-52	111	1047	0.8	20.2772	25.2	0.1644	25.6	0.0242	4.4	0.17	154.0	6.7	154.5	36.7	162.9	597.0	154.0	6.7	94.5
CNG184-185-53	196	22772	2.7	9.5861	1.2	4.2577	2.1	0.2960	1.8	0.83	1671.5	26.1	1685.2	17.5	1702.3	21.8	1702.3	21.8	98.2
CNG184-185-54	73	2841	3.3	17.4873	4.1	0.5751	4.7	0.0729	2.3	0.49	453.9	10.0	461.3	17.4	498.6	90.0	453.9	10.0	91.0
CNG184-185-55	197	25613	4.8	9.4223	1.5	4.4092	1.7	0.3013	0.8	0.49	1697.8	12.2	1714.1	13.9	1734.0	27.0	1734.0	27.0	97.9
CNG184-185-56	258	19723	3.4	13.0218	1.7	1.9704	2.2	0.1861	1.3	0.59	1100.1	12.9	1105.4	14.6	1115.9	34.8	1115.9	34.8	98.6
CNG184-185-57	268	32851	6.2	9.6608	3.8	4.2547	4.6	0.2981	2.6	0.57	1681.9	38.8	1684.6	37.6	1688.0	69.2	1688.0	69.2	99.6
CNG184-185-58	264	30222	4.4	9.7048	1.5	3.9372	1.9	0.2771	1.2	0.62	1576.8	16.2	1621.4	15.0	1679.6	26.8	1679.6	26.8	93.9
CNG184-185-60	100	738	1.2	36.4796	44.5	0.0326	45.4	0.0086	9.2	0.20	55.3	5.1	32.6	14.6	NA	NA	55.3	5.1	-3.8
CNG184-185-61	424	57456	3.8	11.1072	1.5	3.0709	2.1	0.2474	1.4	0.68	1425.0	17.8	1425.5	15.7	1426.2	28.8	1426.2	28.8	99.9
CNG184-185-62	42	5874	2.1	11.1322	3.2	3.0111	3.6	0.2431	1.7	0.46	1402.8	20.8	1410.4	27.5	1421.9	61.4	1421.9	61.4	98.7
CNG184-185-63	685	95298	3.9	9.3390	1.5	4.4778	2.0	0.3033	1.3	0.64	1707.6	19.2	1726.9	16.6	1750.3	28.0	1750.3	28.0	97.6
CNG184-185-64	322	44910	5.6	9.4765	2.2	4.3718	2.3	0.3005	0.6	0.27	1693.6	9.2	1707.0	18.8	1723.5	40.2	1723.5	40.2	98.3
CNG184-185-65	279	36777	2.8	9.4365	0.9	4.2890	1.0	0.2935	0.5	0.49	1659.2	7.3	1691.2	8.5	1731.2	16.5	1731.2	16.5	95.8
CNG184-185-66	27	4731	3.3	9.8439	4.7	4.0899	5.9	0.2920	3.6	0.61	1651.5	52.7	1652.3	48.3	1653.3	86.8	1653.3	86.8	99.9
CNG184-185-68	545	8112	3.9	19.9767	3.1	0.2294	3.3	0.0332	1.1	0.35	210.8	2.4	209.7	6.2	197.7	71.8	210.8	2.4	106.6
CNG184-185-69	251	15801	1.9	10.7852	1.4	3.0583	1.9	0.2392	1.3	0.67	1382.6	16.1	1422.3	14.7	1482.2	27.1	1482.2	27.1	93.3
CNG184-185-70	484	31887	3.7	9.6742	2.1	3.8455	2.6	0.2698	1.4	0.55	1539.9	19.5	1602.3	20.6	1685.4	39.3	1685.4	39.3	91.4
CNG184-185-71	305	47086	5.7	9.4941	2.1	4.4097	2.3	0.3036	1.1	0.45	1709.4	15.8	1714.2	19.4	1720.0	38.6	1720.0	38.6	99.4
CNG184-185-72	84	5219	2.5	13.7691	2.2	1.6632	3.0	0.1661	2.0	0.67	990.5	18.5	994.6	19.1	1003.5	45.5	1003.5	45.5	98.7
CNG184-185-73	166	23090	6.1	9.4503	1.3	4.4048	1.4	0.3019	0.5	0.35	1700.8	7.5	1713.3	11.7	1728.5	24.3	1728.5	24.3	98.4
CNG184-185-75	508	41757	4.9	9.5116	2.0	4.4823	2.3	0.3092	1.2	0.52	1736.8	18.4	1727.7	19.3	1716.7	36.6	1716.7	36.6	101.2
CNG184-185-76	147	21638	1.9	9.5358	2.8	4.4455	2.9	0.3075	0.5	0.17	1728.2	7.6	1720.9	23.9	1712.0	52.3	1712.0	52.3	100.9
CNG184-185-77	56	2500	1.9	10.5813	2.4	2.5770	2.9	0.1978	1.6	0.55	1163.3	16.8	1294.1	20.9	1518.2	44.9	1518.2	44.9	76.6
CNG184-185-78	251	24638	6.1	10.2911	1.7	3.6087	2.8	0.2693	2.2	0.79	1537.5	30.6	1551.4	22.5	1570.5	32.2	1570.5	32.2	97.9
CNG184-185-79	300	22607	2.2	12.8476	2.1	2.0518	2.6	0.1912	1.4	0.56	1127.8	14.9	1132.9	17.6	1142.7	42.4	1142.7	42.4	98.7
CNG184-185-80	2006	38468	7.8	9.8376	1.5	3.0126	4.7	0.2149	4.5	0.95	1255.1	51.3	1410.8	36.2	1654.5	28.0	1654.5	28.0	75.9
CNG184-185-81	220	27869	8.0	10.0186	2.6	3.8914	2.8	0.2828	1.1	0.40	1605.2	15.6	1611.9	22.4	1620.6	47.5	1620.6	47.5	99.1
CNG184-185-82	226	16965	2.5	11.0815	2.9	2.9677	3.0	0.2385	0.5	0.17	1379.0	6.2	1399.4	22.6	1430.6	55.9	1430.6	55.9	96.4
CNG184-185-83	375	51695	8.9	8.9577	1.5	5.0331	1.8	0.3270	1.1	0.58	1823.7	16.7	1824.9	15.2	1826.2	26.5	1826.2	26.5	99.9
CNG184-185-84	343	41209	3.6	9.6766	1.7	4.2151	2.0	0.2958	1.0	0.51	1670.6	14.7	1677.0	16.0	1685.0	31.0	1685.0	31.0	99.1
CNG184-185-85	631	16647	3.7	19.1334	2.0	0.3925	2.4	0.0545	1.3	0.56	341.9	4.4	336.2	6.8	297.0	45.4	341.9	4.4	115.1
CNG184-185-86	736	36384	5.4	9.5852	2.4	4.1965	3.4	0.2917	2.4	0.71	1650.2	35.1	1673.3	28.0	1702.5	44.6	1702.5	44.6	96.9
CNG184-185-87	446	14863	3.1	9.6197	1.9	4.2247	2.1	0.2948	1.0	0.45	1665.2	13.9	1678.8	17.2	1695.9	34.3	1695.9	34.3	98.2
CNG184-185-88	50	8673	2.8	9.4388	4.4	4.3911	4.6	0.3006	1.5	0.32	1694.3	22.2	1710.7	38.2	1730.8	80.3	1730.8	80.3	97.9
CNG184-185-89	372	51676	4.0	9.3917	0.7	4.4535	1.4	0.3034	1.3	0.88	1707.9	18.8	1722.4	11.8	1739.9	12.5	1739.9	12.5	98.2

						Isotope ratios					Apparent ages (Ma)								
Analysis	U (ppm)	206Pb 204Pb	U/Th	206Pb* 207Pb*	± (%)	207Pb* 235U*	± (%)	206Pb* 238U	± (%)	error corr.	206Pb* 238U*	± (Ma)	207Pb* 235U	± (Ma)	206Pb* 207Pb*	± (Ma)	Best age (Ma)	± (Ma)	Conc (%)
CNG184-185-90	61	10713	5.5	9.8041	2.8	4.1927	3.5	0.2981	2.1	0.60	1682.0	31.2	1672.6	28.9	1660.8	52.2	1660.8	52.2	101.3
CNG184-185-91	448	642	2.0	29.3778	36.0	0.0192	36.8	0.0041	7.3	0.20	26.3	1.9	19.3	7.0	NA	NA	26.3	1.9	-3.3
CNG184-185-92	60	1281	9.3	10.8145	2.9	2.5566	3.5	0.2005	2.1	0.58	1178.1	22.3	1288.3	25.9	1477.0	54.6	1477.0	54.6	79.8
CNG184-185-93	332	43100	3.9	9.2228	1.6	4.7753	2.0	0.3194	1.2	0.58	1786.9	18.3	1780.6	16.8	1773.1	29.8	1773.1	29.8	100.8
CNG184-185-94	572	5952	1.4	20.4166	4.1	0.1763	4.5	0.0261	1.7	0.38	166.1	2.8	164.8	6.8	146.9	97.3	166.1	2.8	113.1
CNG184-185-95	40	2353	1.5	8.3587	3.5	4.5823	3.7	0.2778	1.2	0.34	1580.2	17.4	1746.0	30.8	1950.8	62.2	1950.8	62.2	81.0
CNG184-185-96	85	11569	2.7	9.5498	2.0	4.4162	2.1	0.3059	0.6	0.28	1720.4	8.8	1715.4	17.3	1709.3	36.9	1709.3	36.9	100.6
CNG184-185-97	300	34691	2.5	9.3070	1.8	4.6679	2.1	0.3151	1.1	0.50	1765.7	16.5	1761.5	17.8	1756.5	33.7	1756.5	33.7	100.5
CNG184-185-98	120	21484	10.3	10.9163	2.1	3.2576	3.5	0.2579	2.8	0.81	1479.2	37.3	1471.0	27.2	1459.2	39.4	1459.2	39.4	101.4
CNG184-185-99	204	1120	2.6	15.5345	17.2	0.2096	17.4	0.0236	2.1	0.12	150.4	3.1	193.2	30.6	753.9	366.5	150.4	3.1	20.0
CNG184-185-100	624	34739	2.2	9.6250	3.9	4.1401	4.4	0.2890	2.1	0.48	1636.6	30.6	1662.2	36.2	1694.8	71.6	1694.8	71.6	96.6