Beta Analytic Inc.
4985 SW 74 Court
Miami, Florida 33155 USA
Tel: 305 667 5167
Fax: 305 663 0964
Beta@radiocarbon.com
www.radiocarbon.com

Consistent Accuracy . . .
. . . Delivered On-time

August 28, 2013

Dr. Dale Vinson
National Park Service
Lake Clark/Katmai National Park
240 West 5th Avenue
Suite 236
Anchorage, AK 99501
USA

RE: Radiocarbon Dating Results For Samples C5-047.1, C5-048.3, C5-050.2, C5-051.3, C5-053.2, C5-056.2, C5-058.3, C5-060.1

Dear Dr. Vinson:

Enclosed are the radiocarbon dating results for eight samples recently sent to us. They each provided plenty of carbon for accurate measurements and all the analyses proceeded normally. As usual, the method of analysis is listed on the report with the results and calibration data is provided where applicable.

The web directory containing the table of results and PDF download also contains pictures including, most importantly the portion actually analyzed. These can be saved by opening them and right clicking. Also a cvs spreadsheet download option is available and a quality assurance report is posted for each set of results. This report contains expected versus measured values for 3-5 working standards analyzed simultaneously with your samples.

All results reported are accredited to ISO-17025 standards and all analyses were performed entirely here in our laboratories. Since Beta is not a teaching laboratory, only graduates trained in accordance with the strict protocols of the ISO-17025 program participated in the analyses. When interpreting the results, please consider any communications you may have had with us regarding the samples. If you have specific questions about the analyses, please contact us. Your inquiries are always welcome.

Our invoice has been sent separately. Thank you for your prior efforts in arranging payment. As always, if you have any questions or would like to discuss the results, don't hesitate to contact me.

Sincerely,

Darden Hood

Digital signature on file

BETA ANALYTIC INC.
DR. M.A. TAMERS and MR. D.G. HOOD
4985 S.W. 74 COURT
MIAMI, FLORIDA, USA 33155
PH: 305-667-5167 FAX:305-663-0964
beta@radiocarbon.com

REPORT OF RADIOCARBON DATING ANALYSES

Dr. Dale Vinson

Report Date: 8/28/2013

National Park Service

Material Received: 8/20/2013

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 357204	240 +/- 30 BP	-24.9 o/oo	240 +/- 30 BP
SAMPLE : C5-047.1			
ANALYSIS : AMS-Standard delivery			
MATERIAL/PRETREATMENT : (charred material): acid/alkali/acid			
2 SIGMA CALIBRATION : Cal AD 1640 to 1670 (Cal BP 310 to 280) AND Cal AD 1780 to 1800 (Cal BP 170 to 150)			
Cal AD 1940 to post 1950 (Cal BP 10 to post 1950)			
Beta - 357205	270 +/- 30 BP	-25.6 o/oo	260 +/- 30 BP
SAMPLE : C5-048.3			
ANALYSIS : AMS-Standard delivery			
MATERIAL/PRETREATMENT : (charred material): acid/alkali/acid			
2 SIGMA CALIBRATION : Cal AD 1520 to 1560 (Cal BP 420 to 390) AND Cal AD 1630 to 1670 (Cal BP 320 to 280)			
Cal AD 1780 to 1800 (Cal BP 170 to 150) AND Cal AD 1950 to 1950 (Cal BP 0 to 0)			
Beta - 357206	330 +/- 30 BP	-24.3 o/oo	340 +/- 30 BP
SAMPLE : C5-050.2			
ANALYSIS : AMS-Standard delivery			
MATERIAL/PRETREATMENT : (charred material): acid/alkali/acid			
2 SIGMA CALIBRATION : Cal AD 1450 to 1640 (Cal BP 500 to 310)			
Beta - 357207	310 +/- 30 BP	-25.0 o/oo	310 +/- 30 BP
SAMPLE : C5-051.3			
ANALYSIS : AMS-Standard delivery			
MATERIAL/PRETREATMENT : (charred material): acid/alkali/acid			
2 SIGMA CALIBRATION : Cal AD 1480 to 1650 (Cal BP 470 to 300)			

Dates are reported as RCYBP (radiocarbon years before present, "present" = AD 1950). By international convention, the modern reference standard was 95% the 14C activity of the National Institute of Standards and Technology (NIST) Oxalic Acid (SRM 4990C) and calculated using the Libby 14C half-life (5568 years). Quoted errors represent 1 relative standard deviation statistics (68% probability) counting errors based on the combined measurements of the sample, background, and modern reference standards. Measured 13C/12C ratios (delta 13C) were calculated relative to the PDB-1 standard.

The Conventional Radiocarbon Age represents the Measured Radiocarbon Age corrected for isotopic fractionation, calculated using the delta 13C. On rare occasion where the Conventional Radiocarbon Age was calculated using an assumed delta 13C, the ratio and the Conventional Radiocarbon Age will be followed by "*". The Conventional Radiocarbon Age is not calendar calibrated. When available, the Calendar Calibrated result is calculated from the Conventional Radiocarbon Age and is listed as the "Two Sigma Calibrated Result" for each sample.

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REPORT OF RADIOCARBON DATING ANALYSES

Dr. Dale Vinson

Report Date: 8/28/2013

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 357208	280 +/- 30 BP	-23.4 o/oo	310 +/- 30 BP
SAMPLE : C5-053.2			
ANALYSIS : AMS-Standard delivery			
MATERIAL/PRETREATMENT : (charred material): acid/alkali/acid			
2 SIGMA CALIBRATION : Cal AD 1480 to 1650 (Cal BP 470 to 300)			
Beta - 357209	1180 +/- 30 BP	-24.1 o/oo	1190 +/- 30 BP
SAMPLE : C5-056.2			
ANALYSIS : AMS-Standard delivery			
MATERIAL/PRETREATMENT : (charred material): acid/alkali/acid			
2 SIGMA CALIBRATION : Cal AD 730 to 740 (Cal BP 1220 to 1210) AND Cal AD 770 to 900 (Cal BP 1180 to 1060) Cal AD 920 to 940 (Cal BP 1030 to 1010)			
Beta - 357210	270 +/- 30 BP	-25.1 o/oo	270 +/- 30 BP
SAMPLE : C5-058.3			
ANALYSIS : AMS-Standard delivery			
MATERIAL/PRETREATMENT : (charred material): acid/alkali/acid			
2 SIGMA CALIBRATION : Cal AD 1520 to 1570 (Cal BP 430 to 380) AND Cal AD 1590 to 1590 (Cal BP 360 to 360) Cal AD 1630 to 1670 (Cal BP 320 to 280) AND Cal AD 1780 to 1800 (Cal BP 170 to 160) AND Cal AD 1950 to 1950 (Cal BP 0 to 0)			
Beta - 357211	240 +/- 30 BP	-24.5 o/oo	250 +/- 30 BP
SAMPLE : C5-060.1			
ANALYSIS : AMS-Standard delivery			
MATERIAL/PRETREATMENT : (charred material): acid/alkali/acid			
2 SIGMA CALIBRATION : Cal AD 1530 to 1540 (Cal BP 420 to 410) AND Cal AD 1550 to 1550 (Cal BP 400 to 400) Cal AD 1630 to 1670 (Cal BP 320 to 280) AND Cal AD 1780 to 1800 (Cal BP 170 to 150) AND Cal AD 1940 to 1950 (Cal BP 0 to 0)			

Dates are reported as RCYBP (radiocarbon years before present, "present" = AD 1950). By international convention, the modern reference standard was 95% the 14C activity of the National Institute of Standards and Technology (NIST) Oxalic Acid (SRM 4990C) and calculated using the Libby 14C half-life (5568 years). Quoted errors represent 1 relative standard deviation statistics (68% probability) counting errors based on the combined measurements of the sample, background, and modern reference standards. Measured 13C/12C ratios (delta 13C) were calculated relative to the PDB-1 standard.

The Conventional Radiocarbon Age represents the Measured Radiocarbon Age corrected for isotopic fractionation, calculated using the delta 13C. On rare occasion where the Conventional Radiocarbon Age was calculated using an assumed delta 13C, the ratio and the Conventional Radiocarbon Age will be followed by "*". The Conventional Radiocarbon Age is not calendar calibrated. When available, the Calendar Calibrated result is calculated from the Conventional Radiocarbon Age and is listed as the "Two Sigma Calibrated Result" for each sample.

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The Conventional Radiocarbon Age represents the Measured Radiocarbon Age corrected for isotopic fractionation, calculated using the delta 13C. On rare occasion where the Conventional Radiocarbon Age was calculated using an assumed delta 13C, the ratio and the Conventional Radiocarbon Age will be followed by "*". The Conventional Radiocarbon Age is not calendar calibrated. When available, the Calendar Calibrated result is calculated from the Conventional Radiocarbon Age and is listed as the "Two Sigma Calibrated Result" for each sample.

CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-24.9:lab. mult=1)

Laboratory number: **Beta-357204**

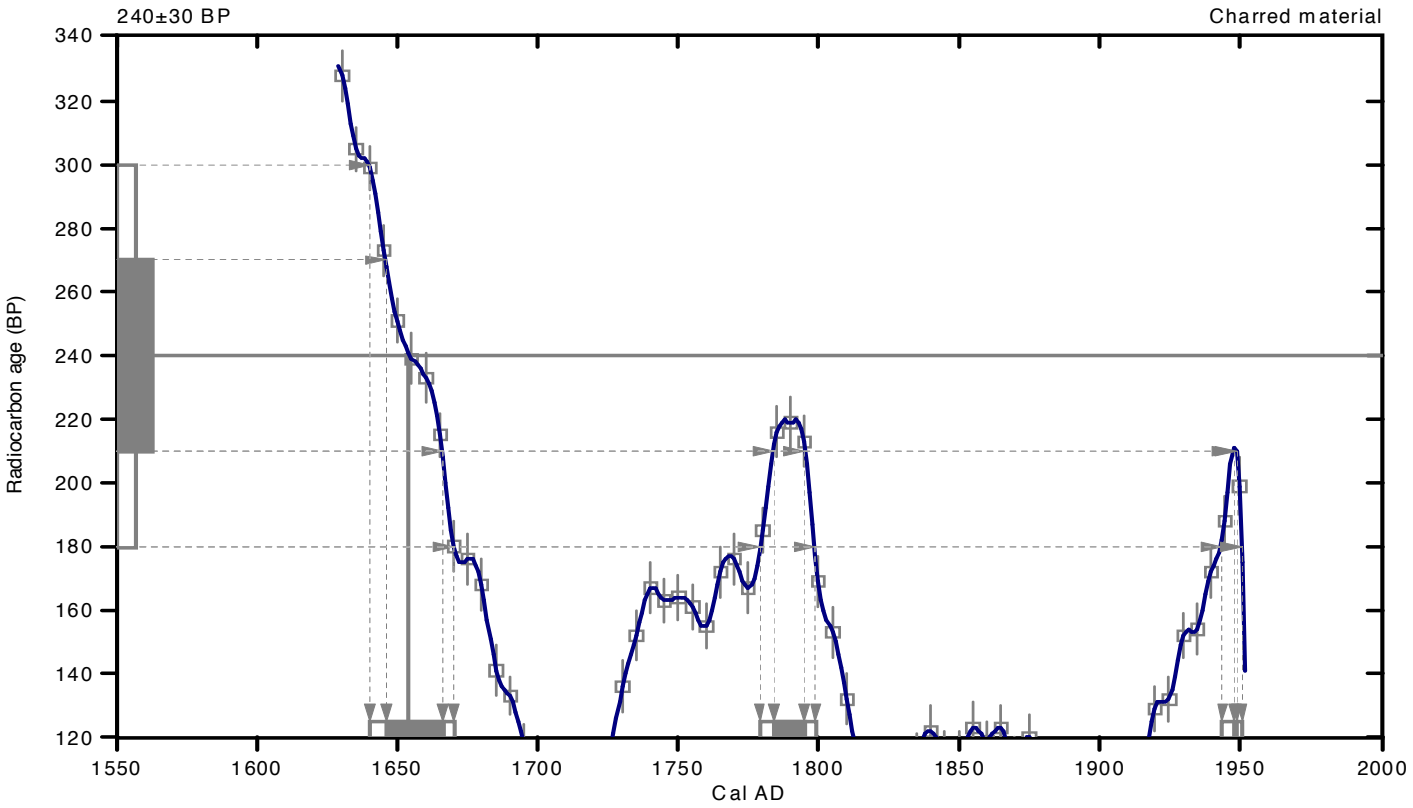
Conventional radiocarbon age: **240±30 BP**

2 Sigma calibrated results: **Cal AD 1640 to 1670 (Cal BP 310 to 280) and**
(95% probability) **Cal AD 1780 to 1800 (Cal BP 170 to 150) and**
Cal AD 1940 to post 1950 (Cal BP 10 to post 1950)

Intercept data

Intercept of radiocarbon age with calibration curve: Cal AD 1650 (Cal BP 300)

1 Sigma calibrated results: Cal AD 1650 to 1670 (Cal BP 300 to 280) and
(68% probability) Cal AD 1780 to 1800 (Cal BP 170 to 160) and
Cal AD 1950 to 1950 (Cal BP 0 to 0)



References:

Database used

INTCAL09

References to INTCAL09 database

Heaton,et.al.,2009, Radiocarbon 51(4):1151-1164, Reimer,et.al, 2009, Radiocarbon 51(4):1111-1150, Stuiver,et.al,1993, Radiocarbon 35(1):137-189, Oeschger,et.al.,1975,Tellus 27:168-192

Mathematics used for calibration scenario

A Simplified Approach to Calibrating C14 Dates
Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2):317-322

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CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-25.6:lab. mult=1)

Laboratory number: **Beta-357205**

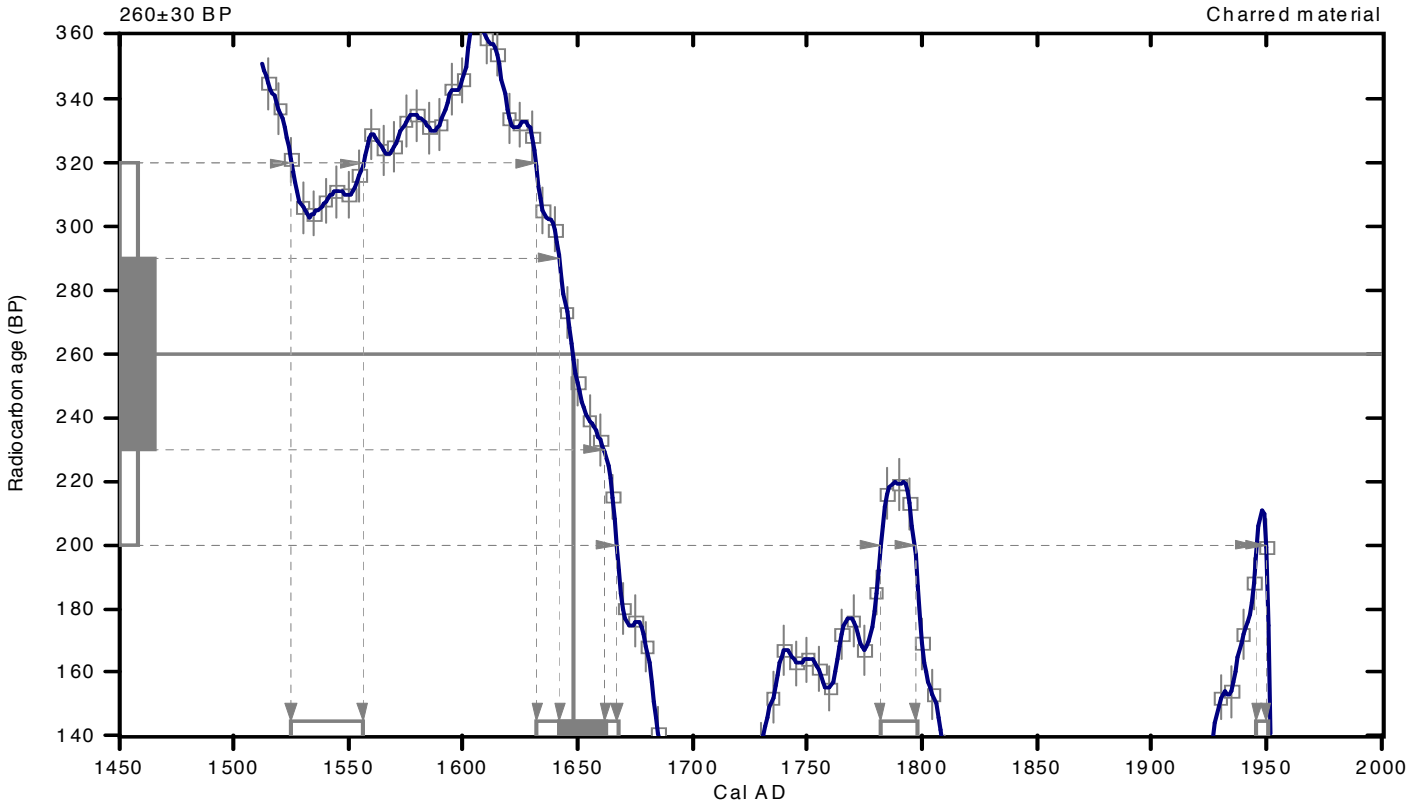
Conventional radiocarbon age: **260±30 BP**

2 Sigma calibrated results: **Cal AD 1520 to 1560 (Cal BP 420 to 390) and**
(95% probability) **Cal AD 1630 to 1670 (Cal BP 320 to 280) and**
Cal AD 1780 to 1800 (Cal BP 170 to 150) and
Cal AD 1950 to 1950 (Cal BP 0 to 0)

Intercept data

Intercept of radiocarbon age with calibration curve: Cal AD 1650 (Cal BP 300)

1 Sigma calibrated result: Cal AD 1640 to 1660 (Cal BP 310 to 290)
(68% probability)



References:

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Heaton,et.al.,2009, Radiocarbon 51(4):1151-1164, Reimer,et.al, 2009, Radiocarbon 51(4):1111-1150, Stuiver,et.al,1993, Radiocarbon 35(1):1-244, Oeschger,et.al.,1975,Tellus 27:168-192

Mathematics used for calibration scenario

A Simplified Approach to Calibrating C14 Dates
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CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-24.3:lab. mult=1)

Laboratory number: **Beta-357206**

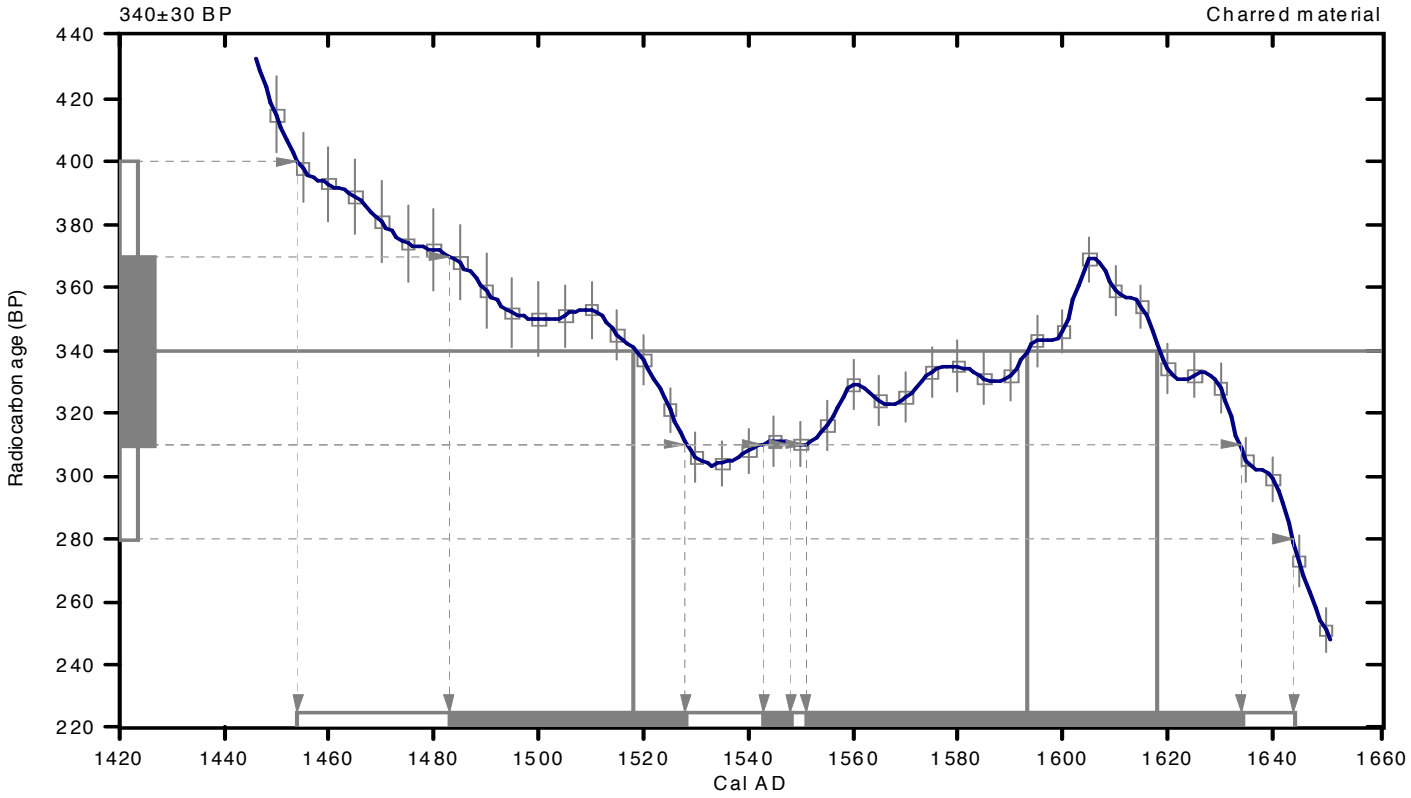
Conventional radiocarbon age: **340±30 BP**

2 Sigma calibrated result: (95% probability) **Cal AD 1450 to 1640 (Cal BP 500 to 310)**

Intercept data

Intercepts of radiocarbon age with calibration curve: Cal AD 1520 (Cal BP 430) and
Cal AD 1590 (Cal BP 360) and
Cal AD 1620 (Cal BP 330)

1 Sigma calibrated results: (68% probability) Cal AD 1480 to 1530 (Cal BP 470 to 420) and
Cal AD 1540 to 1550 (Cal BP 410 to 400) and
Cal AD 1550 to 1630 (Cal BP 400 to 320)



References:

Database used

INTCAL09

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Heaton,et.al.,2009, Radiocarbon 51(4):1151-1164, Reimer,et.al, 2009, Radiocarbon 51(4):1111-1150, Stuiver,et.al,1993, Radiocarbon 35(1):1-244, Oeschger,et.al.,1975,Tellus 27:168-192

Mathematics used for calibration scenario

A Simplified Approach to Calibrating C14 Dates
Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2):317-322

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CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-25:lab. mult=1)

Laboratory number: **Beta-357207**

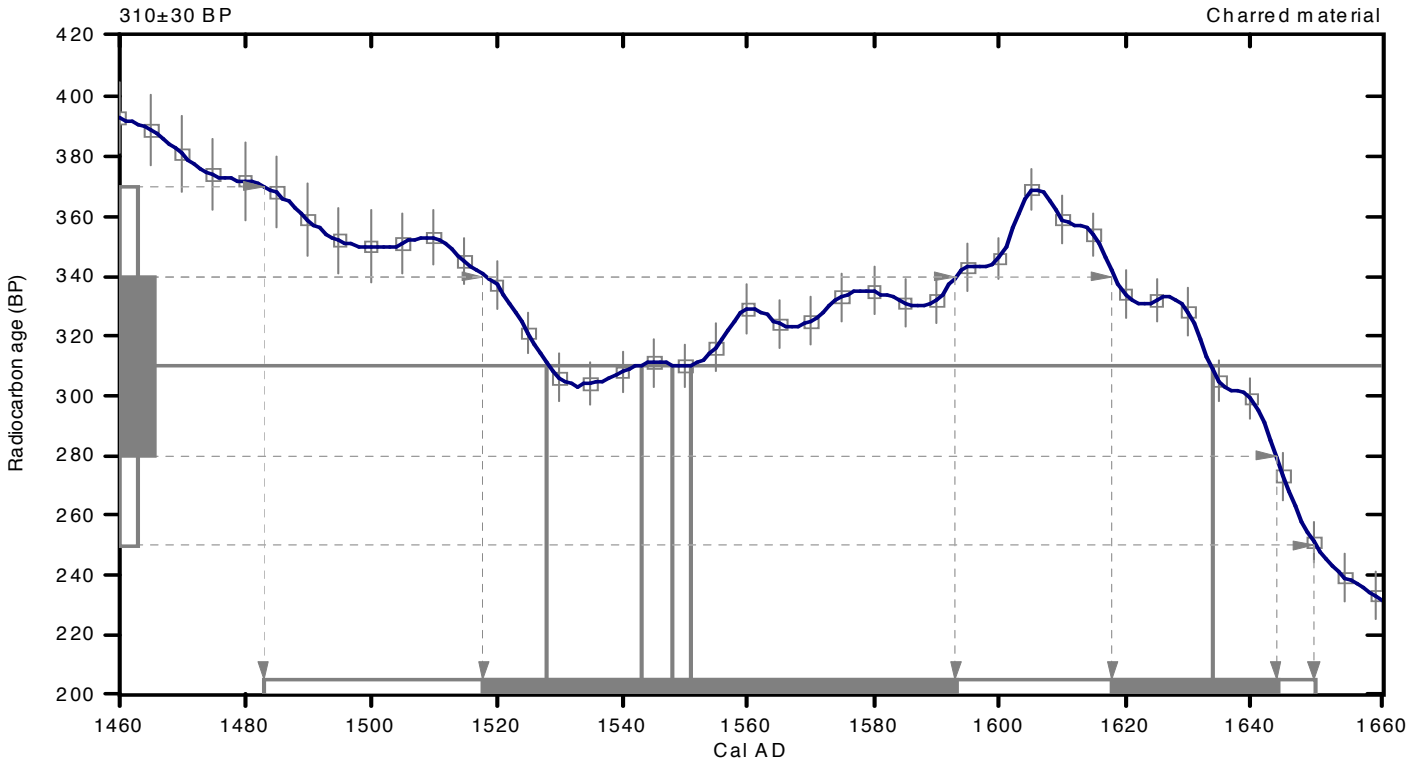
Conventional radiocarbon age: **310±30 BP**

2 Sigma calibrated result: (95% probability) **Cal AD 1480 to 1650 (Cal BP 470 to 300)**

Intercept data

Intercepts of radiocarbon age with calibration curve: Cal AD 1530 (Cal BP 420) and
Cal AD 1540 (Cal BP 410) and
Cal AD 1550 (Cal BP 400) and
Cal AD 1550 (Cal BP 400) and
Cal AD 1630 (Cal BP 320)

1 Sigma calibrated results: (68% probability) Cal AD 1520 to 1590 (Cal BP 430 to 360) and
Cal AD 1620 to 1640 (Cal BP 330 to 310)



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Mathematics used for calibration scenario

A Simplified Approach to Calibrating C14 Dates
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CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-23.4:lab. mult=1)

Laboratory number: **Beta-357208**

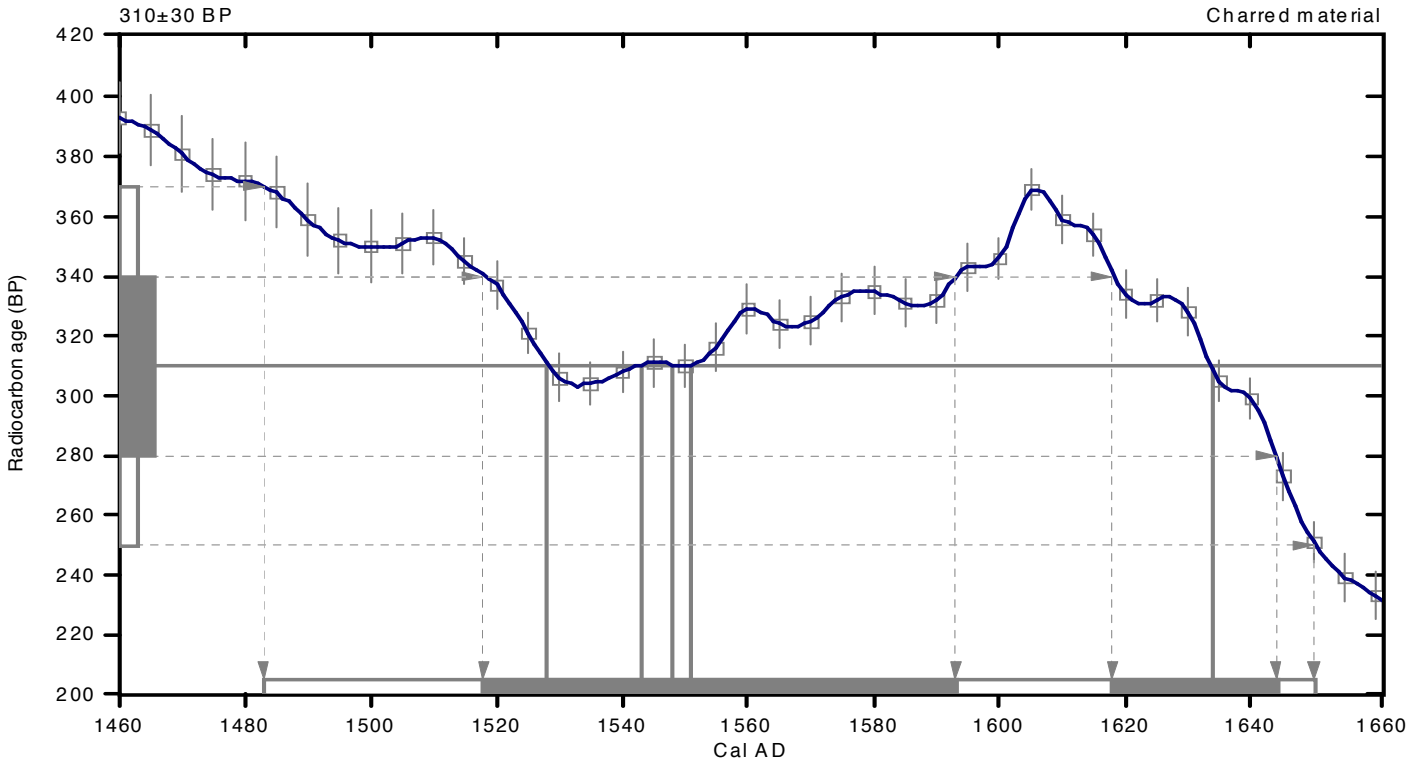
Conventional radiocarbon age: **310±30 BP**

2 Sigma calibrated result: (95% probability) **Cal AD 1480 to 1650 (Cal BP 470 to 300)**

Intercept data

Intercepts of radiocarbon age with calibration curve: Cal AD 1530 (Cal BP 420) and
Cal AD 1540 (Cal BP 410) and
Cal AD 1550 (Cal BP 400) and
Cal AD 1550 (Cal BP 400) and
Cal AD 1630 (Cal BP 320)

1 Sigma calibrated results: (68% probability) Cal AD 1520 to 1590 (Cal BP 430 to 360) and
Cal AD 1620 to 1640 (Cal BP 330 to 310)



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Mathematics used for calibration scenario

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CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-24.1:lab. mult=1)

Laboratory number: **Beta-357209**

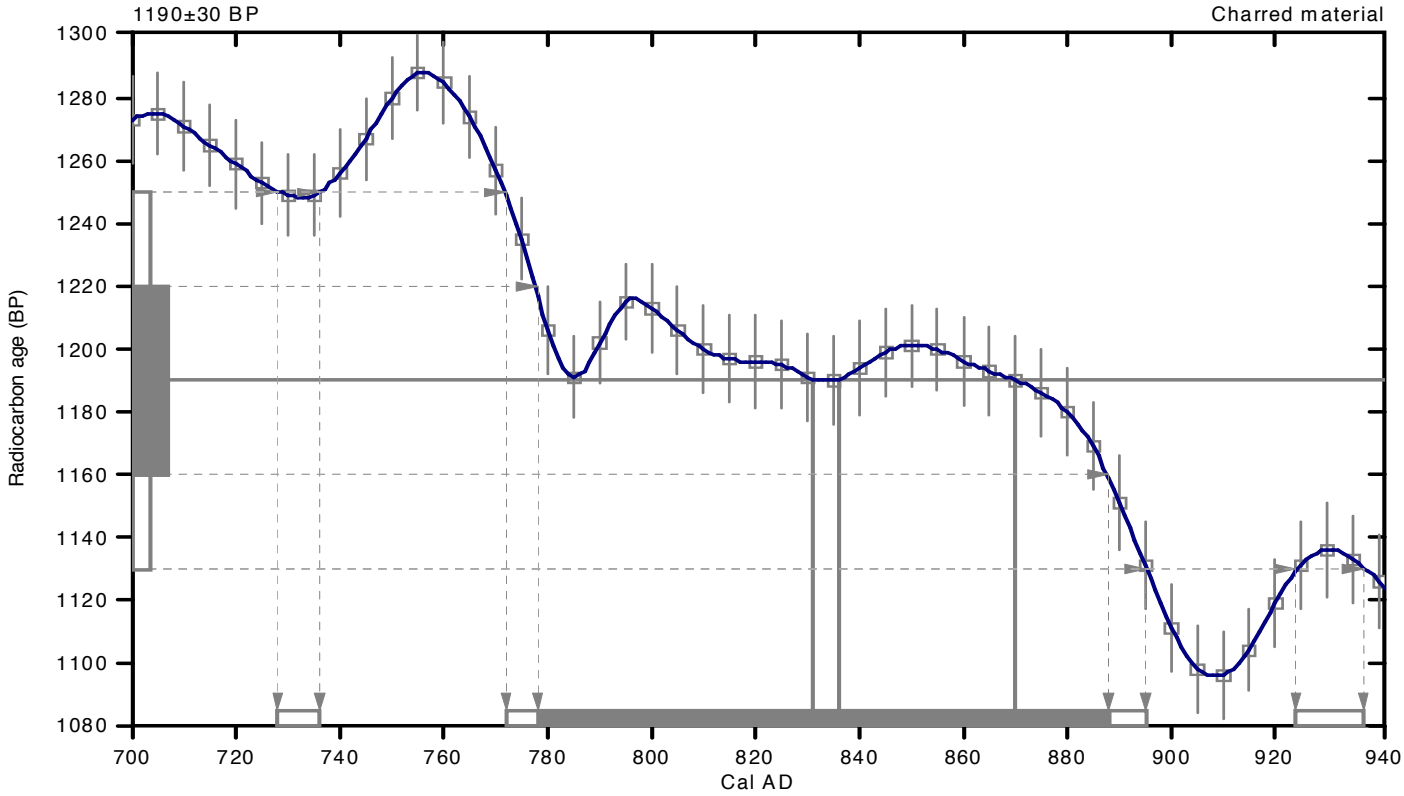
Conventional radiocarbon age: **1190±30 BP**

2 Sigma calibrated results: **Cal AD 730 to 740 (Cal BP 1220 to 1210) and**
(95% probability) **Cal AD 770 to 900 (Cal BP 1180 to 1060) and**
Cal AD 920 to 940 (Cal BP 1030 to 1010)

Intercept data

Intercepts of radiocarbon age with calibration curve: Cal AD 830 (Cal BP 1120) and
Cal AD 840 (Cal BP 1110) and
Cal AD 870 (Cal BP 1080)

1 Sigma calibrated result: (68% probability) Cal AD 780 to 890 (Cal BP 1170 to 1060)



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Mathematics used for calibration scenario

A Simplified Approach to Calibrating C14 Dates
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CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-25.1:lab. mult=1)

Laboratory number: **Beta-357210**

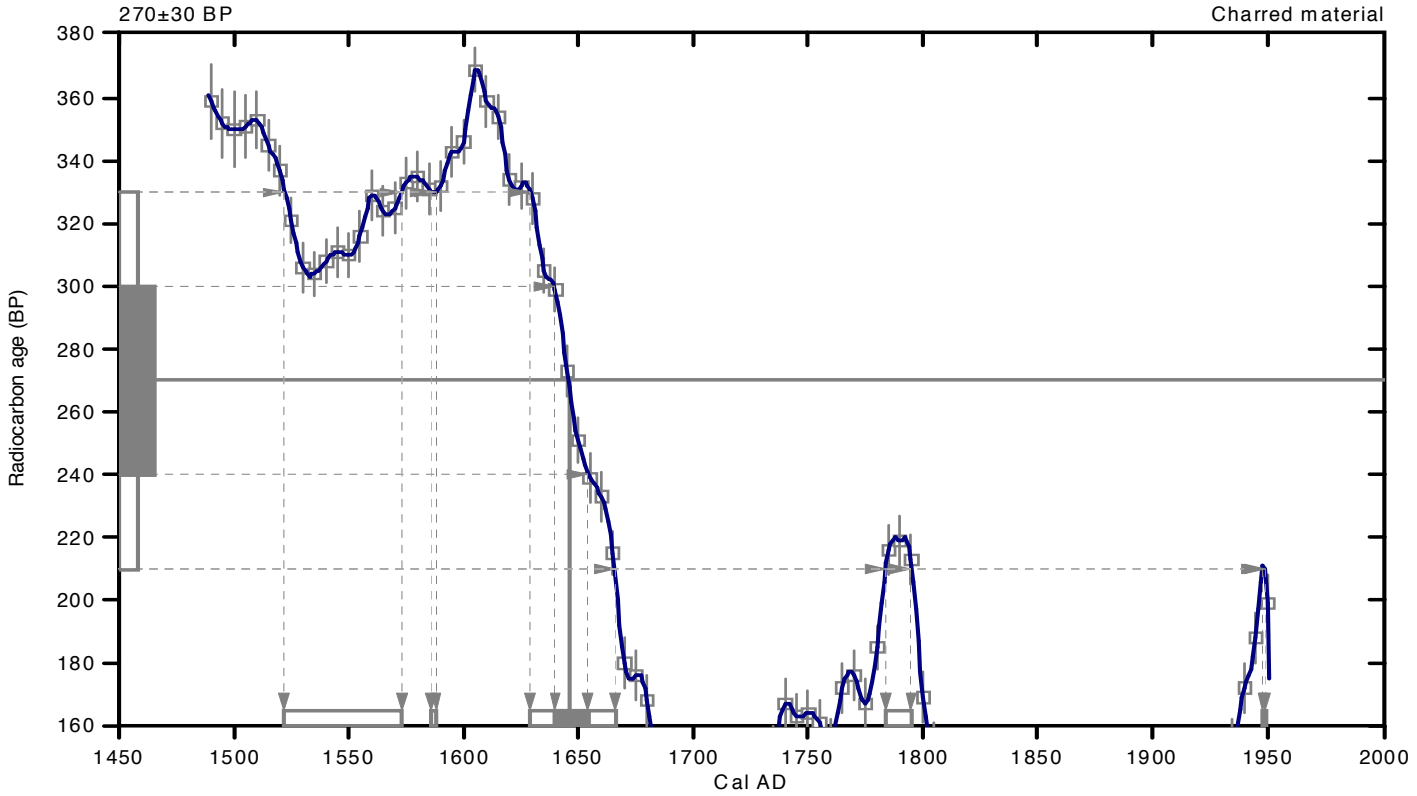
Conventional radiocarbon age: **270±30 BP**

2 Sigma calibrated results: **Cal AD 1520 to 1570 (Cal BP 430 to 380) and**
(95% probability) **Cal AD 1590 to 1590 (Cal BP 360 to 360) and**
Cal AD 1630 to 1670 (Cal BP 320 to 280) and
Cal AD 1780 to 1800 (Cal BP 170 to 160) and
Cal AD 1950 to 1950 (Cal BP 0 to 0)

Intercept data

Intercept of radiocarbon age with calibration curve: Cal AD 1650 (Cal BP 300)

1 Sigma calibrated result: Cal AD 1640 to 1650 (Cal BP 310 to 300)
(68% probability)



References:

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Mathematics used for calibration scenario

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CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-24.5:lab. mult=1)

Laboratory number: **Beta-357211**

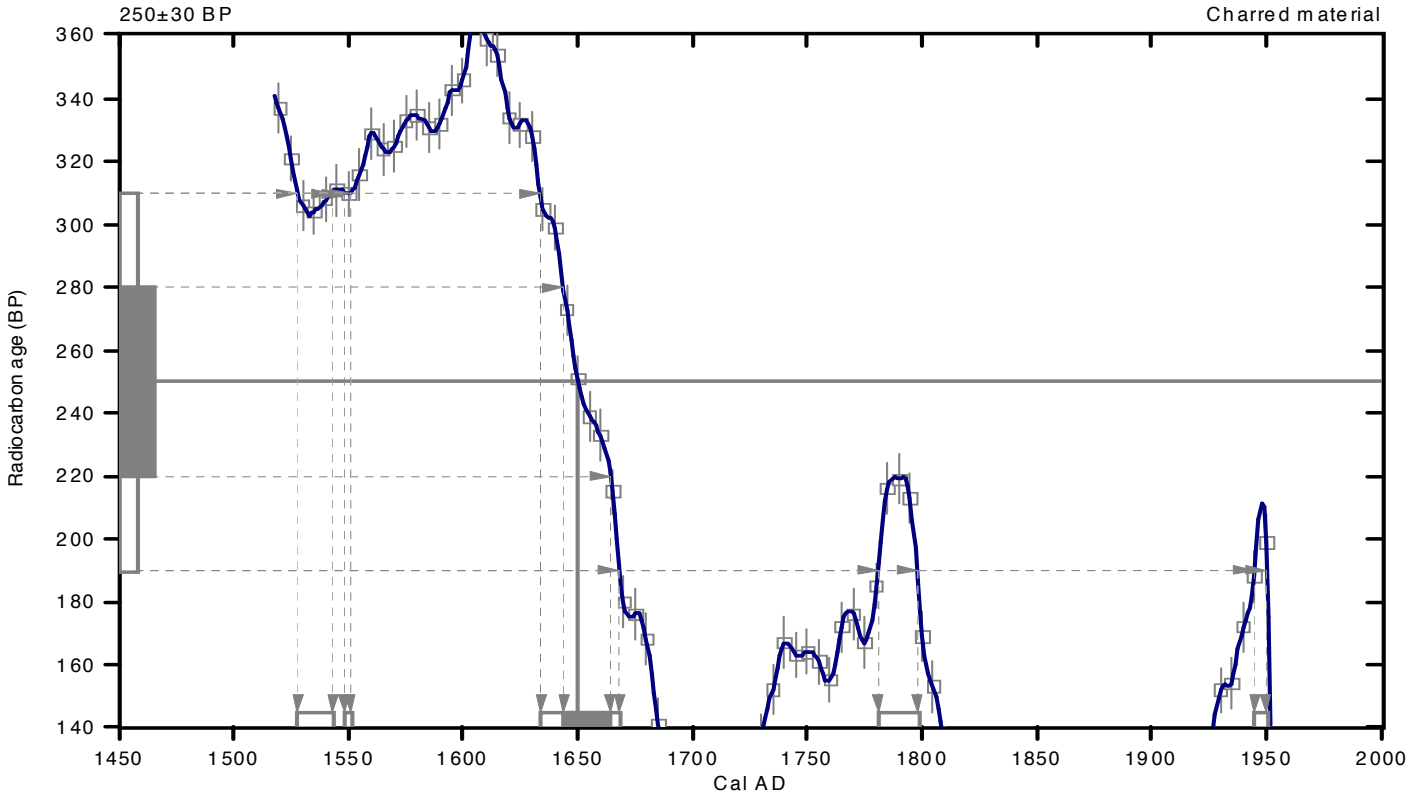
Conventional radiocarbon age: **250±30 BP**

2 Sigma calibrated results: **Cal AD 1530 to 1540 (Cal BP 420 to 410) and**
(95% probability) **Cal AD 1550 to 1550 (Cal BP 400 to 400) and**
Cal AD 1630 to 1670 (Cal BP 320 to 280) and
Cal AD 1780 to 1800 (Cal BP 170 to 150) and
Cal AD 1940 to 1950 (Cal BP 0 to 0)

Intercept data

Intercept of radiocarbon age with calibration curve: Cal AD 1650 (Cal BP 300)

1 Sigma calibrated result: Cal AD 1640 to 1660 (Cal BP 310 to 290)
(68% probability)



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