

Strontíum mælingar og aldursgreiningar á byggfræjum úr skála og mannvirki 2 í Lækjargötu, Reykjavík

Skýrsludrög



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2020

FS787-18191



Forsíðumynd: Nærmynd af byggfræjum úr Lækjargötu . (Myndataka: Dawn Mooney)

Fornleifastofnun Íslands 2019 Bárugata 3
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Inngangur	4
Niðurstöður	4
Strontíum samsætur	4
Aldursgreiningar	5
Umræður	6
Heimildaskrá	8
Viðauki I – Strontíum mælingar og aldursgreiningar	9

Inngangur

Síðastliðin ár hafa orðið miklar framfarir í mælingum á stöðugum samsætum frumefna í mönnum, dýrum og plöntum með það að markmiði að kanna uppruna og mataræði. (E. N. T. Douglas Price, 2015; T. Douglas Price, 2006; K. M. F. T. Douglas Price, Elise Naumann, 2015). Hér á landi hafa greiningar á strontíumsamsætum í mannabeinum verið gerðar til þess að rannsaka fólksflutninga á 10. öld og gefist vel. (Hildur Gestsdóttir, 2020; H. G. T. Douglas Price, 2015). Árið 2015 hófst fornleifauppgröftur á lóð Lækjargötu 12 í miðbæ Reykjavíkur vegna framkvæmda. Fornleifarannsókn leiddi í ljós skála sem var í notkun frá 9. öld til þeirrar 12. Auk samtíða byggingum sem höfðu margþætt hlutverk. Í gólfum og eldstæðum skálans og hinna marvirkjanna fannst töluvert magn af koluðu byggi. Bygg var notað í bakstur, matar- og ölgerð. Ekki er hægt að greina út frá fræjunum einum saman hvort þau hafi verið ræktuð á Íslandi eða innflutt. Greining á strontíum samsætum í byggi gæti þó svarað slíkri spurningu og varpað frekara ljósi á landnámi Reykjavíkur og hvernig fyrstu íbúar Reykjavíkur höfðu í sig og á. Rannsóknin hlaut styrk úr Fornminjasjóði árið 2018 og er unnin í samstarfi við Háskólasafnið í Stavanger (Dawn Mooney) og Jarðvísindadeild Háskólans í Árósum (Rasmus Andreasen) og Háskólasafnið í Bergen (Morten Ramstad).

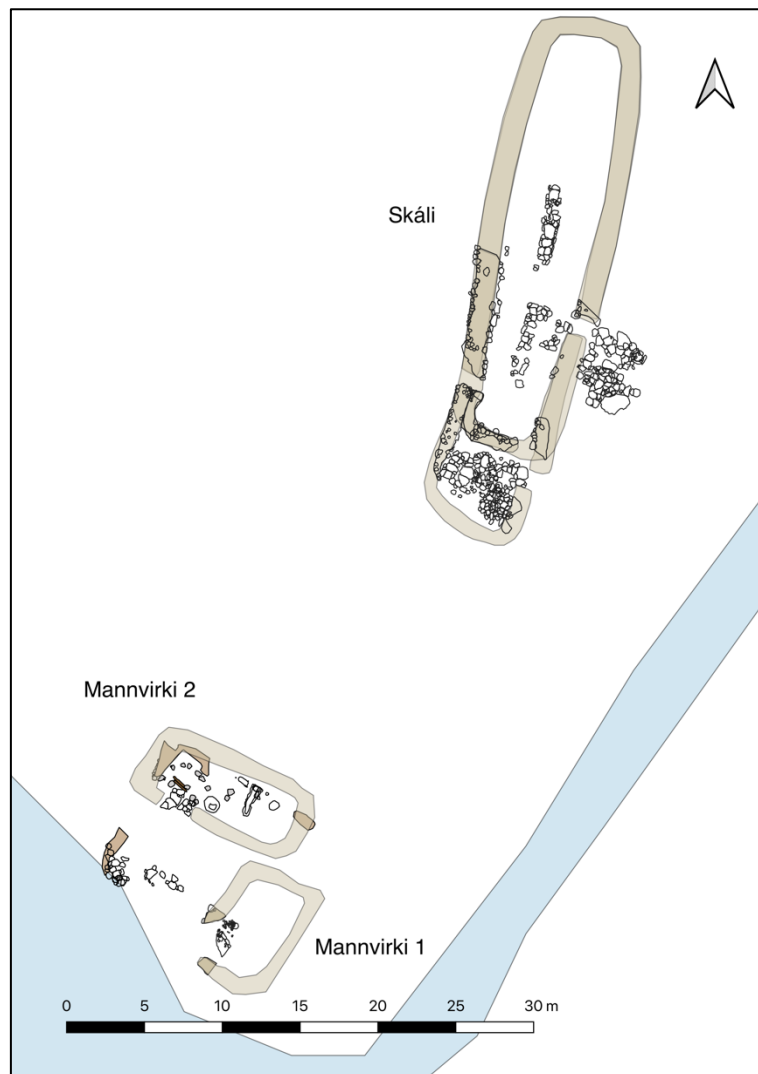
Niðurstöður

Strontíum samsætur

Strontíum samsætur eru í misháu hlutfalli eftir svæðum og fer það að jafnaði eftir aldri bergsins. Þegar bergið brotnar niður berast samsæturnar jarðveg og þaðan í plöntur og dýr. Þar sem hlutfall strontíum samsæta breytist ekki í þessari keðju er hlutfall þess það sama í lífverunni og því jarðfræðilega svæði sem það á uppruna sinn að rekja. Þar með er hægt að greina hvaðan lífveran kom. Ísland er mjög ungt land jarðfræðilega séð og þar með er íslenskt berg með lág strontíumhlutföll nánar tiltekið gildi frá 0.703-0.704 og lífverur með gildi frá 0.704-0.706¹. (K. M. F. T. Douglas Price, Elise Naumann, 2015). Lífverur sem eiga uppruna sinn að rekja til Íslands eru þar með með lægra hlutfall af strontíum samsætum en lífverur frá nágrannalöndunum sem eru jarðfræðilega séð mjög gömul og þar með, með há strontíumhlutföll, gildi frá 0.709-0.725. Bygg sem ræktað er á Íslandi myndi þar af leiðandi sýna lág strontíumhlutföll en innflutt bygg há gildi. Í allt voru 21 sýni valin úr Lækjargötu og þrjú frá Noregi til samanburðar. Valin voru sýni úr elstu lögum skálans til þeirrar yngstu ásamt byggi úr mannvirki 2 sem er talið hafa verið

¹ Lífverur á Íslandi sýndu iðulega hærra hlutfall af strontíum samsætum en bergið og það talið vera vegna áhrifs sjávar en gildi strontíum samsæta í sjó er 0.709. (Price et al. 2015)

notað til þess að verka byggið. Aldursgreiningar hafa leitt í ljós að skálinn ásamt samtíða byggingum voru í notkun frá upphafi landnáms, jafnvel fyrir þann tíma, fram á 12. öld. Þar með er hægt að greina hvort bygg hafi verið ræktað hér á landi frá landnámi og fram á 12. öld. Til þessa hafa sjö sýni verið greind, sex frá Íslandi og eitt frá Noregi. Gildi strontíum samsæta í íslensku sýnunum er frá 0.706 – 0.709 en sýnið frá Noregi 0.712. Það bendir til þess að byggið sem fannst í Lækjargötu hafi verið ræktað á Íslandi.



Mynd 1. Skálinn í Lækjargötu ásamt samtíða mannvirkjum. Byggið sem rannsakað var í þessari rannsókn kom úr skálanum og mannvirki 2 en er sunnan við skálann.

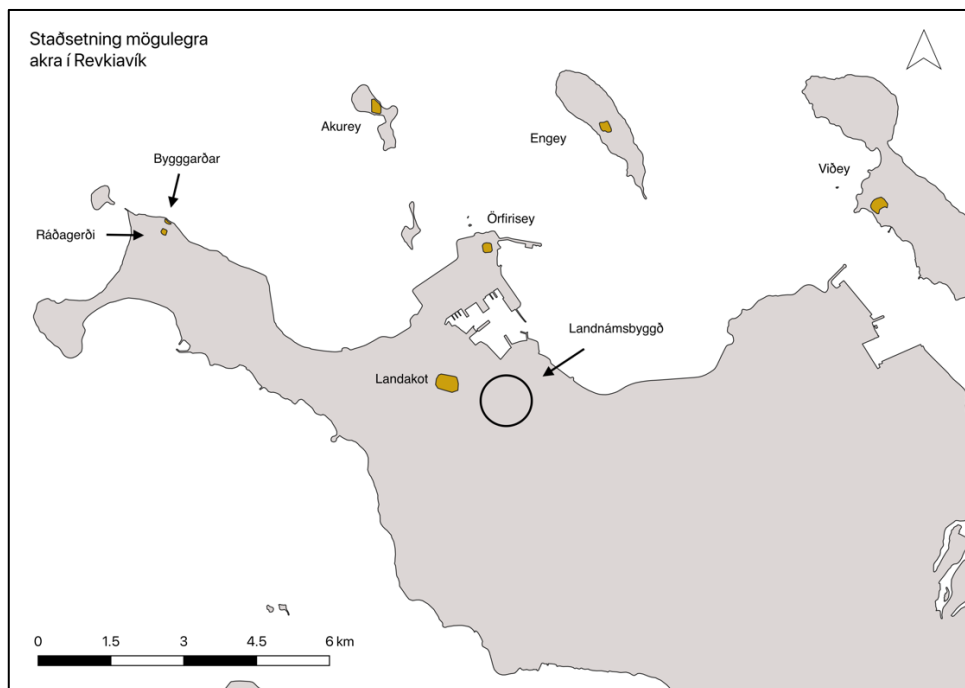
Aldursgreiningar

Auk þess að mæla hlutfall strontíums í bygginu úr Lækjargötu voru níu sýni send til aldursgreiningar, úr skálanum og mannvirki tvö. Niðurstöður leiddu í ljós að skálinn var reistur á seinni hluta 9. aldar og var í notkun fram yfir 1000 líklegast fram á fyrri hluta 12, hins vegar eru ekki til sýni úr yngstu byggingarstigum skálans. Aldursgreining á byggi úr

mannvirki tvö sem var notað til kornvinnslu, sýnir fram á að mannvirkið var í notkun frá 9. eða 10. öld til þeirrar 12.

Umræður

Fyrstu niðurstöður greininga á strontíumgildum úr byggfræjum frá Lækjargötu benda til þess að byggið hafi verið ræktað á Íslandi. Rannsókn er þó ekki lokið og standa mælingar enn yfir þegar þetta er skrifað. Fyrstu mælingar sýna fram á að þegar fyrstu landnemarnir settust að í Reykjavík hófust þeir strax handa við að finna hentug svæði fyrir akra. Hvar þessir akrar voru er ekki vitað en í upphafi hafa þeir að öllum líkindum verið stutt frá byggð. Björn M. Olsen tók saman heimildir og örnefni um kornrækt í Reykjavík. Samkvæmt Birni eru heimildi rum kornrækt í Viðey, Engey, Örfirisey og Akurey en bendir hann einnig á staði eins og Landakot, Bygggarða og Ráðagerði (Olsen, 1910). Landkotstúnið snýr í suður og er skammt frá landnámsbyggðinni í Reykjavík það væri því álitlegur kostur í upphafi byggðar.



Mynd 2. Á kortinu hafa staði verið merktir inn sem annaðhvort örnefni eða heimildir eru til um, l er varða kornræktun í Reykjavík. (Kort: Lísabet Guðmundsdóttir)

Í umræðum um landnám og líf fyrstu íbúa landsins hefur kornrækt ekki hlotið mikla athygli. Enda er landið á jaðri þess svæðis sem hægt er að rækta korn eins og bygg. Hins vegar benda niðurstöður rannsóknarinnar til þess að við upphaf landnáms í Reykjavík hófst ræktun á bygg. Auk þess er talið að bygg hafi leikið stærra hlutverk í mataræði Reykvíkingar á fyrstu árum byggðar þegar enn var ekki búið að koma upp stofni húsdýra. Bygg var ekki eingöngu

notað til matargerðar, það var og er megin hráefnið í framleiðslu á munngát og annað öl. Til þessa hefur eingöngu eitt spírað byggfræ fundist á landinu og var það í Lækjargötu, þrátt fyrir að eingöngu sé um eitt fræ að ræða þá er sá möguleiki fyrir hendi að Reykvíkingar hafi framleitt öl mjög skömmu eftir landnám þar sem áfengir drykkir líkt og munngát og öl lék stórt hlutverk í veisluhaldi forfeðra vorra (Guðmundsdóttir, 2020).

Heimildaskrá

- Guðmundsdóttir, L. (2020). Munngátslepjandi víkingar í 101 Reykjavík. In H. G. Guðrún Alda Gísladóttir, Orri Vésteinsson (Ed.), *Minjaping* (pp. 53-70). Reykjavík: Fornleifastofnun Íslands.
- Hildur Gestsdóttir, K. S., Howell Roberts. (2020). Þú ert það sem þú borðar? Samsæturannsóknir á Ingiríðarstöðum.
- Olsen, B. M. (1910). Um kornirkju á Íslandi að fornu. *Búnaðarrit*, 24, 81-166.
- T. Douglas Price, E. N. (2015). The Peopling of the North Atlantic: Isotopic Results from Norway. *Journal of the North Atlantic*, 7, 88-107.
- T. Douglas Price, H. G. (2006). The first settlers of Iceland: an isotopic approach to colonisation. *Antiquity*, 80, 130-144.
- T. Douglas Price, H. G. (2015). The Peopling of the North Atlantic: Isotopic Results from Iceland. *Journal of the North Atlantic*, 7, 146-163.
- T. Douglas Price, K. M. F., Elise Naumann. (2015). Isotopic Baselines in the North Atlantic Region. *Journal of the North Atlantic*, 7, 103-136.

Viðauki I – Strontíum mælingar og aldursgreiningar

						Strontium				Sr/ ⁸⁶ Sr Leach	Sr/ ⁸⁶ Sr Residu	
Site	Country	Context	Sample	Sample details	Period	Nr grains	ID	Weight (g)	Photo?			
Lækjargata	Iceland	46570	372	Sq 009A	Viking Age	6	Hordeum vulgare	0,0233	Y	0,70853	0,70789 0,70925	
Lækjargata	Iceland	46537	376	Sq 111A	Viking Age	4	Hordeum vulgare	0,0344	Y			
Lækjargata	Iceland	46461	382	-	Viking Age	3	Hordeum vulgare	0,0217	Y			
Lækjargata	Iceland	38933	125	Sq 010V	Viking Age	4	Hordeum vulgare	0,0277	Y			
Lækjargata	Iceland	38351	138	Sq 005V	Viking Age	3	Hordeum vulgare var. vulgare	0,0235	Y			
Lækjargata	Iceland	26394	12	-	Viking Age	3	Hordeum vulgare var. vulgare	0,0288	Y			
Lækjargata	Iceland	40994	302	Sq 016A	Viking Age	3	Hordeum vulgare var. vulgare	0,0287	Y			
Lækjargata	Iceland	31831	69	-	Viking Age	3	Hordeum vulgare	0,0238	Y			
Lækjargata	Iceland	39834	173	Sq 017V	Viking Age	3	Hordeum vulgare	0,0255	Y			
Lækjargata	Iceland	40120	242	Sq 012A	Viking Age	4	Hordeum vulgare	0,022	Y			
Lækjargata	Iceland	263	429	-	Viking Age	3	Hordeum vulgare var. vulgare	0,0207	Y	0,70850	0,70755 0,70688	
Lækjargata	Iceland	180	393	-	Viking Age	3	Hordeum vulgare var. vulgare	0,0236	Y			
Lækjargata	Iceland	156	389	-	Viking Age	3	Hordeum vulgare	0,021	Y	0,70884	0,70760	
Lækjargata	Iceland	213	411	-	Viking Age	3	Hordeum vulgare var. vulgare	0,0222	Y			
Lækjargata	Iceland	221	414	-	Viking Age	3	Hordeum vulgare var. vulgare	0,0273	Y			
Lækjargata	Iceland	243	420	-	Viking Age	3	Hordeum vulgare	0,0137	Y			
Lækjargata	Iceland	245	423	-	Viking Age	3	Hordeum vulgare var. vulgare	0,0151	Y	0,70619	0,71200	
Lækjargata	Iceland	217	408	-	Viking Age	3	Hordeum vulgare var. vulgare	0,0246	Y			
Bjørkum	Norway	575	526	120x127y Lag B	Viking Age	5	Hordeum vulgare	0,0393	Y			
Håland	Norway	AG3408	2018/94-07	1P3557	Viking Age	3	Hordeum vulgare var. vulgare	0,024	Y	0,71006 0,707145		
Sandeid	Norway	AG8351	2018/51-55	1P14814	Roman Iron Age/Migration Period	3	Hordeum vulgare	0,0256	Y			
China		Present day				Soybean						
Aarhus Sr						In house standard						

he same batch measured to 0.70994 & 0.71012, Thomsen & Andreassen 2019)

In house quality control - reference value 0.707143

All results normalized to NIST NBS 987 Sr = 0.71025



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RADIOCARBON DATING CERTIFICATE

17 May 2019

Laboratory Code GU50908

Submitter Lísabet Guðmundsdóttir
Fornleifastofnun Íslands
Bárugata 3
101 Reykjavík
Iceland

Site Reference Lækjargata

Context Reference 46570

Sample Reference 372

Material Charred grain : *Hordeum vulgare*

Result Failed on AMS.

N.B. Any questions directed to the laboratory should quote the GU coding given above.

Detailed descriptions of the methods employed by the SUERC Radiocarbon Laboratory can be found in Dunbar et al. (2016) *Radiocarbon* 58(1) pp.9-23.

For any queries relating to this certificate, the laboratory can be contacted at suerc-c14lab@glasgow.ac.uk.

Checked and signed off by :

P. Naysmith



The University of Glasgow, charity number SC004401



The University of Edinburgh is a charitable body,
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RADIOCARBON DATING CERTIFICATE

17 May 2019

Laboratory Code SUERC-86219 (GU50909)

Submitter Lísabet Guðmundsdóttir
Fornleifastofnun Íslands
Bárugata 3
101 Reykjavík
Iceland

Site Reference Lækjargata

Context Reference 46537

Sample Reference 376

Material Charred grain : *Hordeum vulgare*

$\delta^{13}\text{C}$ relative to VPDB -24.2 ‰

Radiocarbon Age BP 1157 ± 26

N.B. The above ^{14}C age is quoted in conventional years BP (before 1950 AD) and requires calibration to the calendar timescale. The error, expressed at the one sigma level of confidence, includes components from the counting statistics on the sample, modern reference standard and blank and the random machine error.

Samples with a SUERC coding are measured at the Scottish Universities Environmental Research Centre AMS Laboratory and should be quoted as such in any reports within the scientific literature. The laboratory GU coding should also be given in parentheses after the SUERC code.

Detailed descriptions of the methods employed by the SUERC Radiocarbon Laboratory can be found in Dunbar et al. (2016) *Radiocarbon* 58(1) pp.9-23.

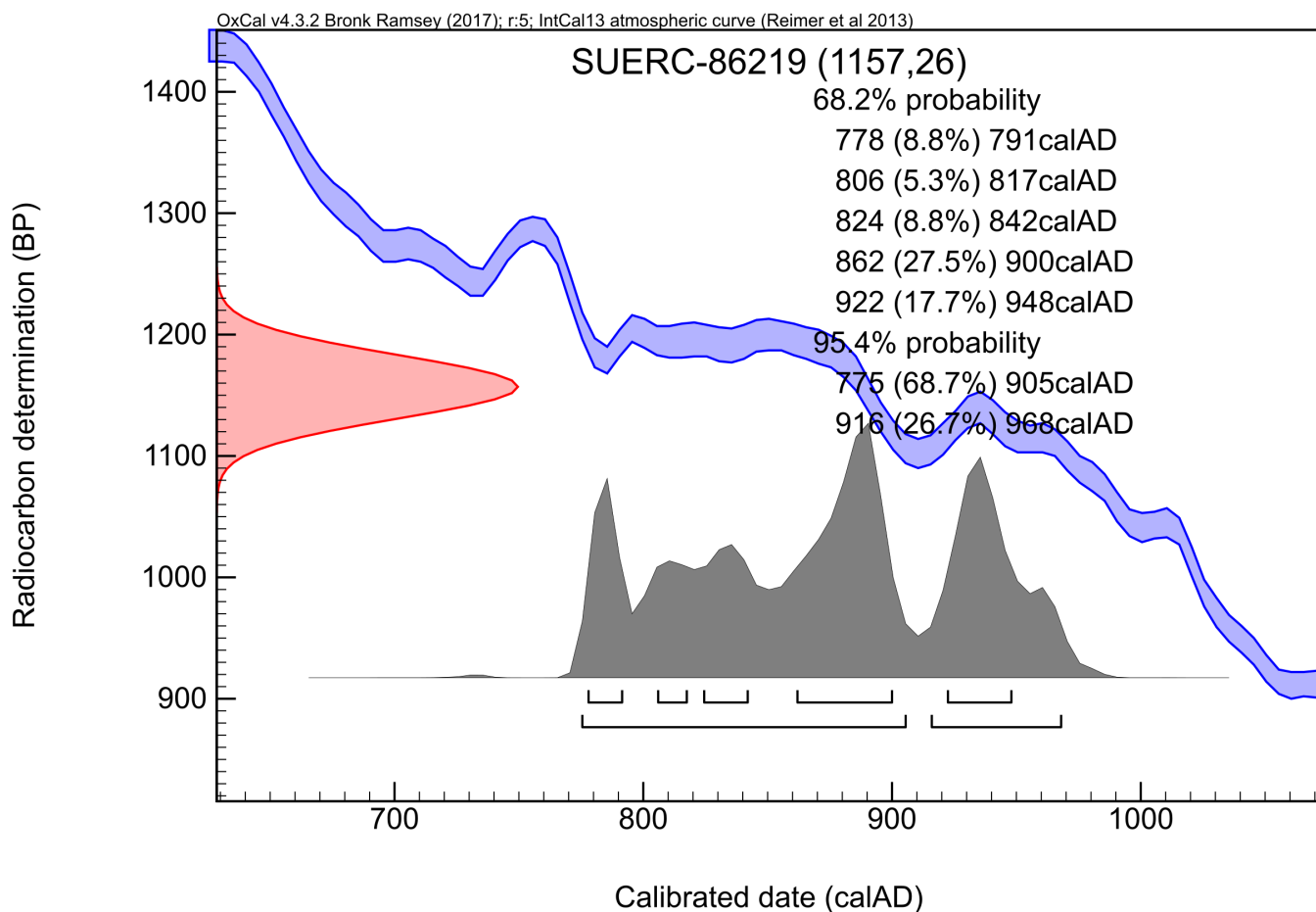
For any queries relating to this certificate, the laboratory can be contacted at suerc-c14lab@glasgow.ac.uk.

Conventional age and calibration age ranges calculated by :



Checked and signed off by :





The radiocarbon age given overleaf is calibrated to the calendar timescale using the Oxford Radiocarbon Accelerator Unit calibration program OxCal 4.*

The above date ranges have been calibrated using the IntCal13 atmospheric calibration curve†

Please contact the laboratory if you wish to discuss this further.

* Bronk Ramsey (2009) *Radiocarbon* 51(1) pp.337-60

† Reimer et al. (2013) *Radiocarbon* 55(4) pp.1869-87

RADIOCARBON DATING CERTIFICATE

17 May 2019

Laboratory Code SUERC-86220 (GU50910)

Submitter Lísabet Guðmundsdóttir
Fornleifastofnun Íslands
Bárugata 3
101 Reykjavík
Iceland

Site Reference Lækjargata

Context Reference 46461

Sample Reference 382

Material Charred grain : *Hordeum vulgare*

$\delta^{13}\text{C}$ relative to VPDB -25.0 ‰ assumed

Radiocarbon Age BP 1075 ± 24

N.B. The above ^{14}C age is quoted in conventional years BP (before 1950 AD) and requires calibration to the calendar timescale. The error, expressed at the one sigma level of confidence, includes components from the counting statistics on the sample, modern reference standard and blank and the random machine error.

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Detailed descriptions of the methods employed by the SUERC Radiocarbon Laboratory can be found in Dunbar et al. (2016) *Radiocarbon* 58(1) pp.9-23.

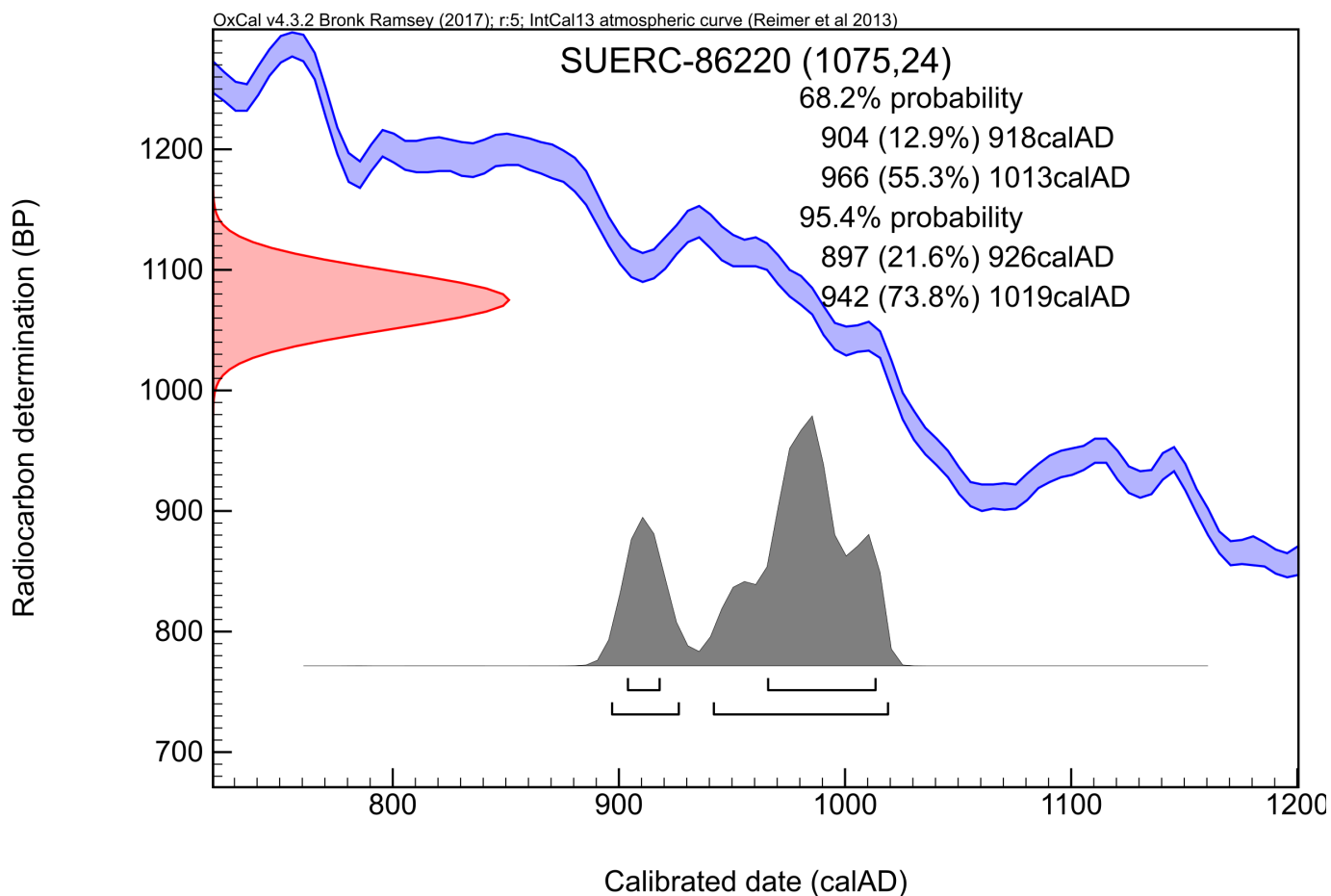
For any queries relating to this certificate, the laboratory can be contacted at suerc-c14lab@glasgow.ac.uk.

Conventional age and calibration age ranges calculated by :



Checked and signed off by :





The radiocarbon age given overleaf is calibrated to the calendar timescale using the Oxford Radiocarbon Accelerator Unit calibration program OxCal 4.*

The above date ranges have been calibrated using the IntCal13 atmospheric calibration curve†

Please contact the laboratory if you wish to discuss this further.

* Bronk Ramsey (2009) *Radiocarbon* 51(1) pp.337-60

† Reimer et al. (2013) *Radiocarbon* 55(4) pp.1869-87

RADIOCARBON DATING CERTIFICATE

17 May 2019

Laboratory Code SUERC-86221 (GU50911)
Submitter Lísabet Guðmundsdóttir
Fornleifastofnun Íslands
Bárugata 3
101 Reykjavík
Iceland
Site Reference Lækjargata
Context Reference 38933
Sample Reference 125
Material Charred grain : *Hordeum vulgare*
 $\delta^{13}\text{C}$ relative to VPDB -23.5 ‰

Radiocarbon Age BP 1136 ± 26

N.B. The above ^{14}C age is quoted in conventional years BP (before 1950 AD) and requires calibration to the calendar timescale. The error, expressed at the one sigma level of confidence, includes components from the counting statistics on the sample, modern reference standard and blank and the random machine error.

Samples with a SUERC coding are measured at the Scottish Universities Environmental Research Centre AMS Laboratory and should be quoted as such in any reports within the scientific literature. The laboratory GU coding should also be given in parentheses after the SUERC code.

Detailed descriptions of the methods employed by the SUERC Radiocarbon Laboratory can be found in Dunbar et al. (2016) *Radiocarbon* 58(1) pp.9-23.

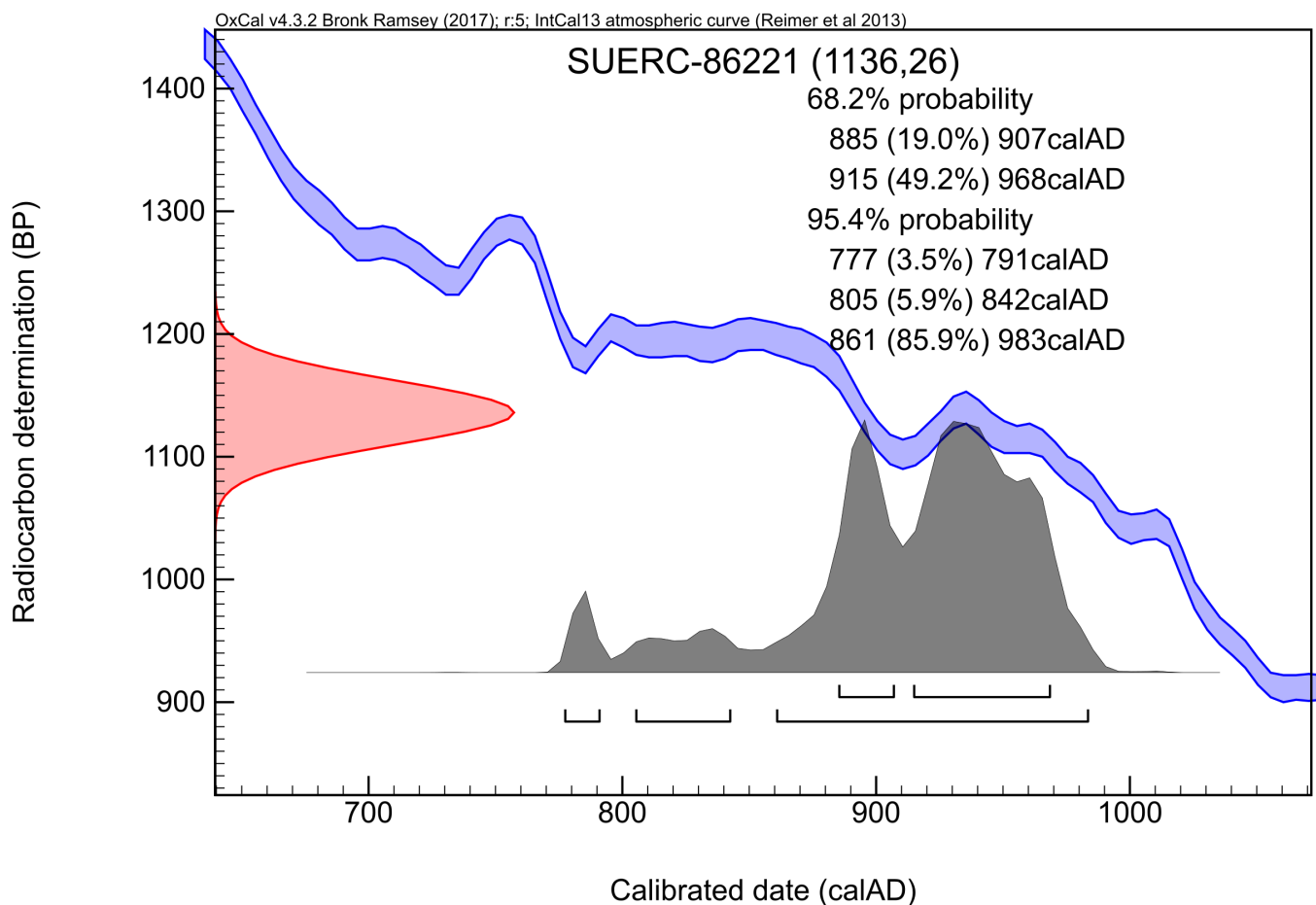
For any queries relating to this certificate, the laboratory can be contacted at suerc-c14lab@glasgow.ac.uk.

Conventional age and calibration age ranges calculated by :



Checked and signed off by :





The radiocarbon age given overleaf is calibrated to the calendar timescale using the Oxford Radiocarbon Accelerator Unit calibration program OxCal 4.*

The above date ranges have been calibrated using the IntCal13 atmospheric calibration curve†

Please contact the laboratory if you wish to discuss this further.

* Bronk Ramsey (2009) *Radiocarbon* 51(1) pp.337-60

† Reimer et al. (2013) *Radiocarbon* 55(4) pp.1869-87

RADIOCARBON DATING CERTIFICATE

17 May 2019

Laboratory Code SUERC-86222 (GU50912)

Submitter Lísabet Guðmundsdóttir
Fornleifastofnun Íslands
Bárugata 3
101 Reykjavík
Iceland

Site Reference Lækjargata
Context Reference 39834
Sample Reference 173

Material Charred grain : *Hordeum vulgare*

$\delta^{13}\text{C}$ relative to VPDB -22.5 ‰

Radiocarbon Age BP 1112 ± 26

N.B. The above ^{14}C age is quoted in conventional years BP (before 1950 AD) and requires calibration to the calendar timescale. The error, expressed at the one sigma level of confidence, includes components from the counting statistics on the sample, modern reference standard and blank and the random machine error.

Samples with a SUERC coding are measured at the Scottish Universities Environmental Research Centre AMS Laboratory and should be quoted as such in any reports within the scientific literature. The laboratory GU coding should also be given in parentheses after the SUERC code.

Detailed descriptions of the methods employed by the SUERC Radiocarbon Laboratory can be found in Dunbar et al. (2016) *Radiocarbon* 58(1) pp.9-23.

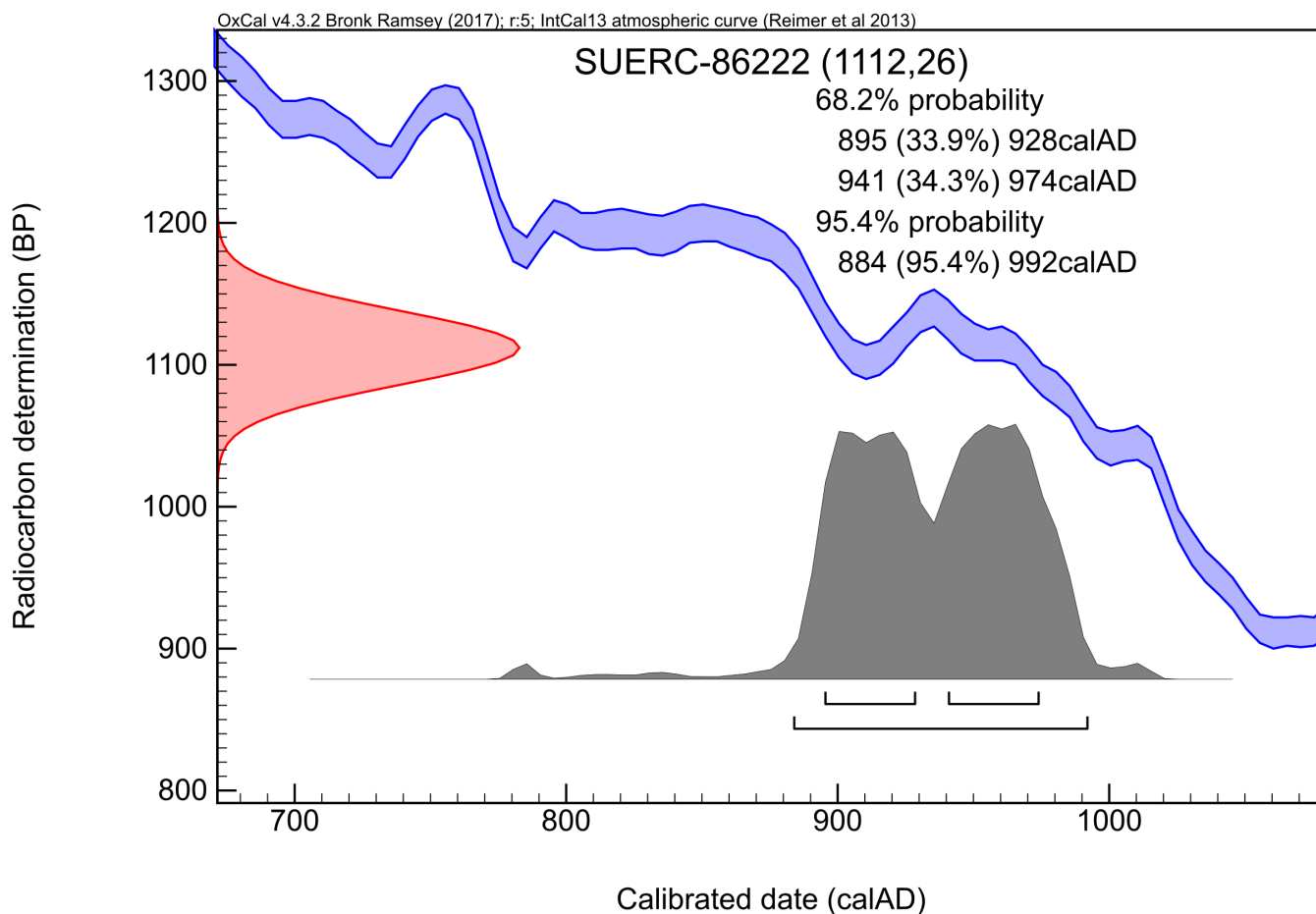
For any queries relating to this certificate, the laboratory can be contacted at suerc-c14lab@glasgow.ac.uk.

Conventional age and calibration age ranges calculated by :



Checked and signed off by :





The radiocarbon age given overleaf is calibrated to the calendar timescale using the Oxford Radiocarbon Accelerator Unit calibration program OxCal 4.*

The above date ranges have been calibrated using the IntCal13 atmospheric calibration curve†

Please contact the laboratory if you wish to discuss this further.

* Bronk Ramsey (2009) *Radiocarbon* 51(1) pp.337-60

† Reimer et al. (2013) *Radiocarbon* 55(4) pp.1869-87

RADIOCARBON DATING CERTIFICATE

17 May 2019

Laboratory Code SUERC-86223 (GU50913)

Submitter Lísabet Guðmundsdóttir
Fornleifastofnun Íslands
Bárugata 3
101 Reykjavík
Iceland

Site Reference Lækjargata

Context Reference 180

Sample Reference 393

Material Charred grain : *Hordeum vulgare* var. *vulgare*

$\delta^{13}\text{C}$ relative to VPDB -25.5 ‰

Radiocarbon Age BP 937 ± 22

N.B. The above ^{14}C age is quoted in conventional years BP (before 1950 AD) and requires calibration to the calendar timescale. The error, expressed at the one sigma level of confidence, includes components from the counting statistics on the sample, modern reference standard and blank and the random machine error.

Samples with a SUERC coding are measured at the Scottish Universities Environmental Research Centre AMS Laboratory and should be quoted as such in any reports within the scientific literature. The laboratory GU coding should also be given in parentheses after the SUERC code.

Detailed descriptions of the methods employed by the SUERC Radiocarbon Laboratory can be found in Dunbar et al. (2016) *Radiocarbon* 58(1) pp.9-23.

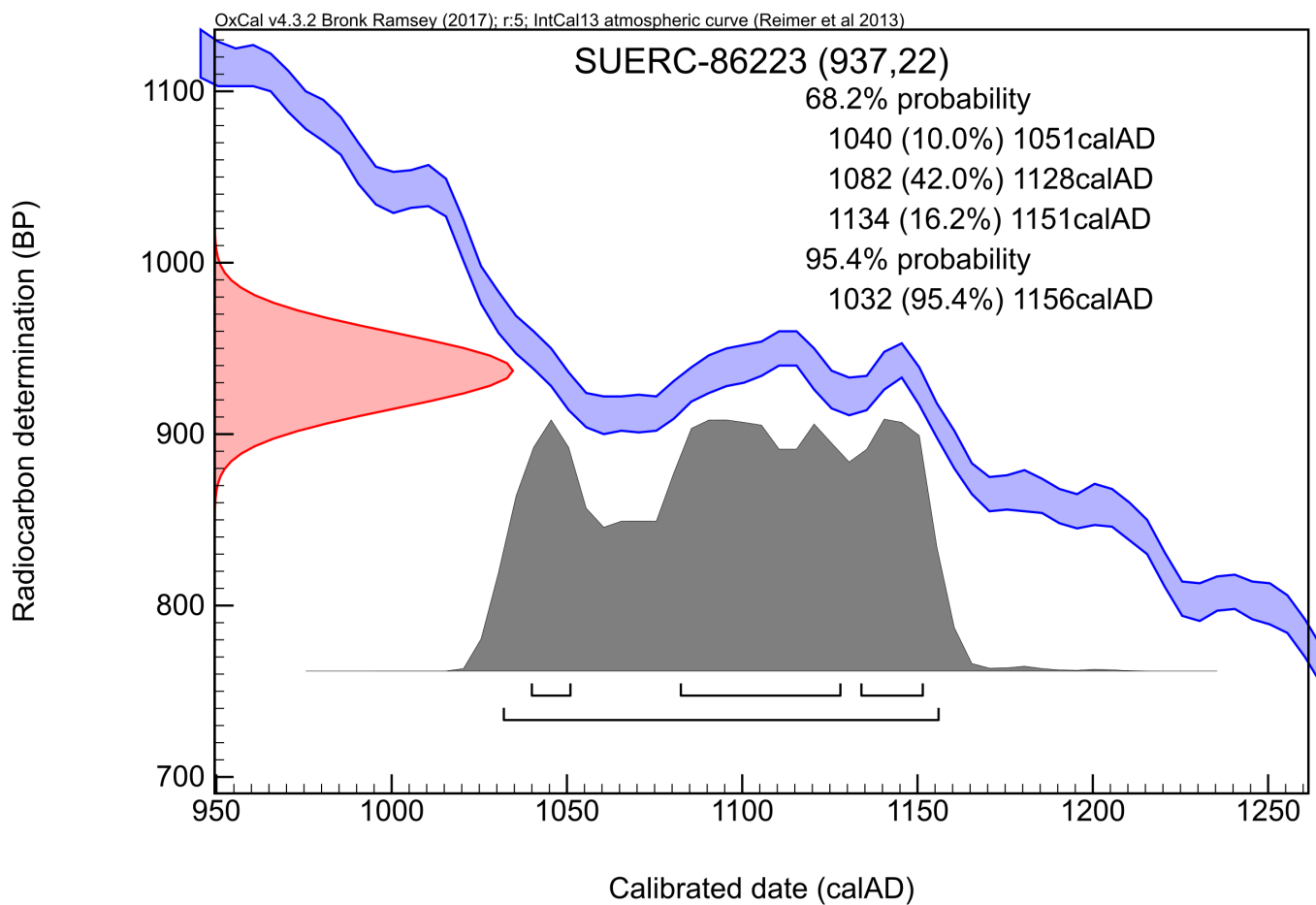
For any queries relating to this certificate, the laboratory can be contacted at suerc-c14lab@glasgow.ac.uk.

Conventional age and calibration age ranges calculated by :



Checked and signed off by :





The radiocarbon age given overleaf is calibrated to the calendar timescale using the Oxford Radiocarbon Accelerator Unit calibration program OxCal 4.*

The above date ranges have been calibrated using the IntCal13 atmospheric calibration curve†

Please contact the laboratory if you wish to discuss this further.

* Bronk Ramsey (2009) *Radiocarbon* 51(1) pp.337-60

† Reimer et al. (2013) *Radiocarbon* 55(4) pp.1869-87

RADIOCARBON DATING CERTIFICATE

17 May 2019

Laboratory Code SUERC-86224 (GU50914)

Submitter Lísabet Guðmundsdóttir
Fornleifastofnun Íslands
Bárugata 3
101 Reykjavík
Iceland

Site Reference Lækjargata

Context Reference 156

Sample Reference 389

Material Charred grain : *Hordeum vulgare*

$\delta^{13}\text{C}$ relative to VPDB -22.5 ‰

Radiocarbon Age BP 984 ± 26

N.B. The above ^{14}C age is quoted in conventional years BP (before 1950 AD) and requires calibration to the calendar timescale. The error, expressed at the one sigma level of confidence, includes components from the counting statistics on the sample, modern reference standard and blank and the random machine error.

Samples with a SUERC coding are measured at the Scottish Universities Environmental Research Centre AMS Laboratory and should be quoted as such in any reports within the scientific literature. The laboratory GU coding should also be given in parentheses after the SUERC code.

Detailed descriptions of the methods employed by the SUERC Radiocarbon Laboratory can be found in Dunbar et al. (2016) *Radiocarbon* 58(1) pp.9-23.

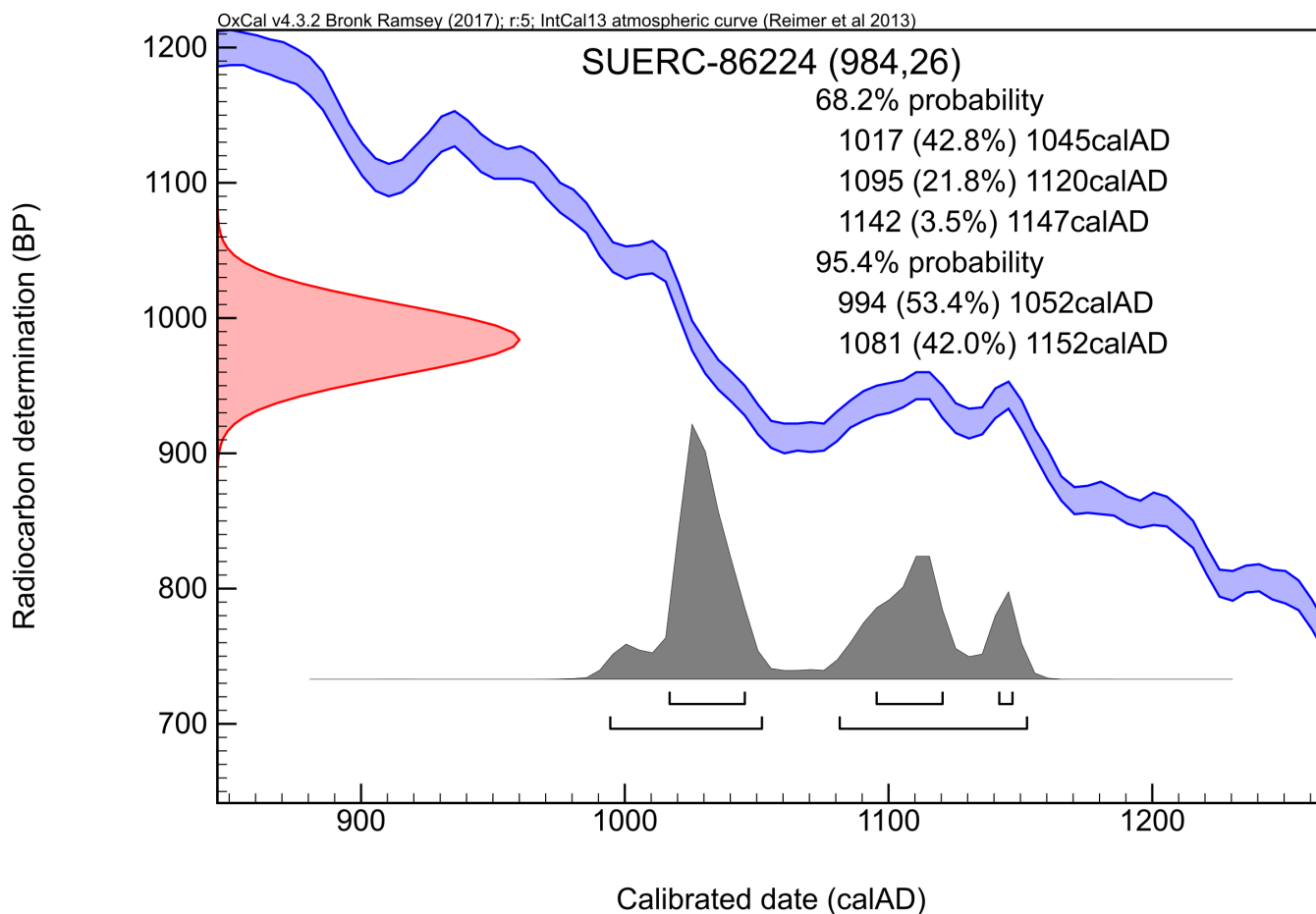
For any queries relating to this certificate, the laboratory can be contacted at suerc-c14lab@glasgow.ac.uk.

Conventional age and calibration age ranges calculated by :



Checked and signed off by :





The radiocarbon age given overleaf is calibrated to the calendar timescale using the Oxford Radiocarbon Accelerator Unit calibration program OxCal 4.*

The above date ranges have been calibrated using the IntCal13 atmospheric calibration curve†

Please contact the laboratory if you wish to discuss this further.

* Bronk Ramsey (2009) *Radiocarbon* 51(1) pp.337-60

† Reimer et al. (2013) *Radiocarbon* 55(4) pp.1869-87

RADIOCARBON DATING CERTIFICATE

17 May 2019

Laboratory Code SUERC-86225 (GU50915)

Submitter Lísabet Guðmundsdóttir
Fornleifastofnun Íslands
Bárugata 3
101 Reykjavík
Iceland

Site Reference Lækjargata

Context Reference 243

Sample Reference 420

Material Charred grain : *Hordeum vulgare*

$\delta^{13}\text{C}$ relative to VPDB -24.6 ‰

Radiocarbon Age BP 1095 ± 26

N.B. The above ^{14}C age is quoted in conventional years BP (before 1950 AD) and requires calibration to the calendar timescale. The error, expressed at the one sigma level of confidence, includes components from the counting statistics on the sample, modern reference standard and blank and the random machine error.

Samples with a SUERC coding are measured at the Scottish Universities Environmental Research Centre AMS Laboratory and should be quoted as such in any reports within the scientific literature. The laboratory GU coding should also be given in parentheses after the SUERC code.

Detailed descriptions of the methods employed by the SUERC Radiocarbon Laboratory can be found in Dunbar et al. (2016) *Radiocarbon* 58(1) pp.9-23.

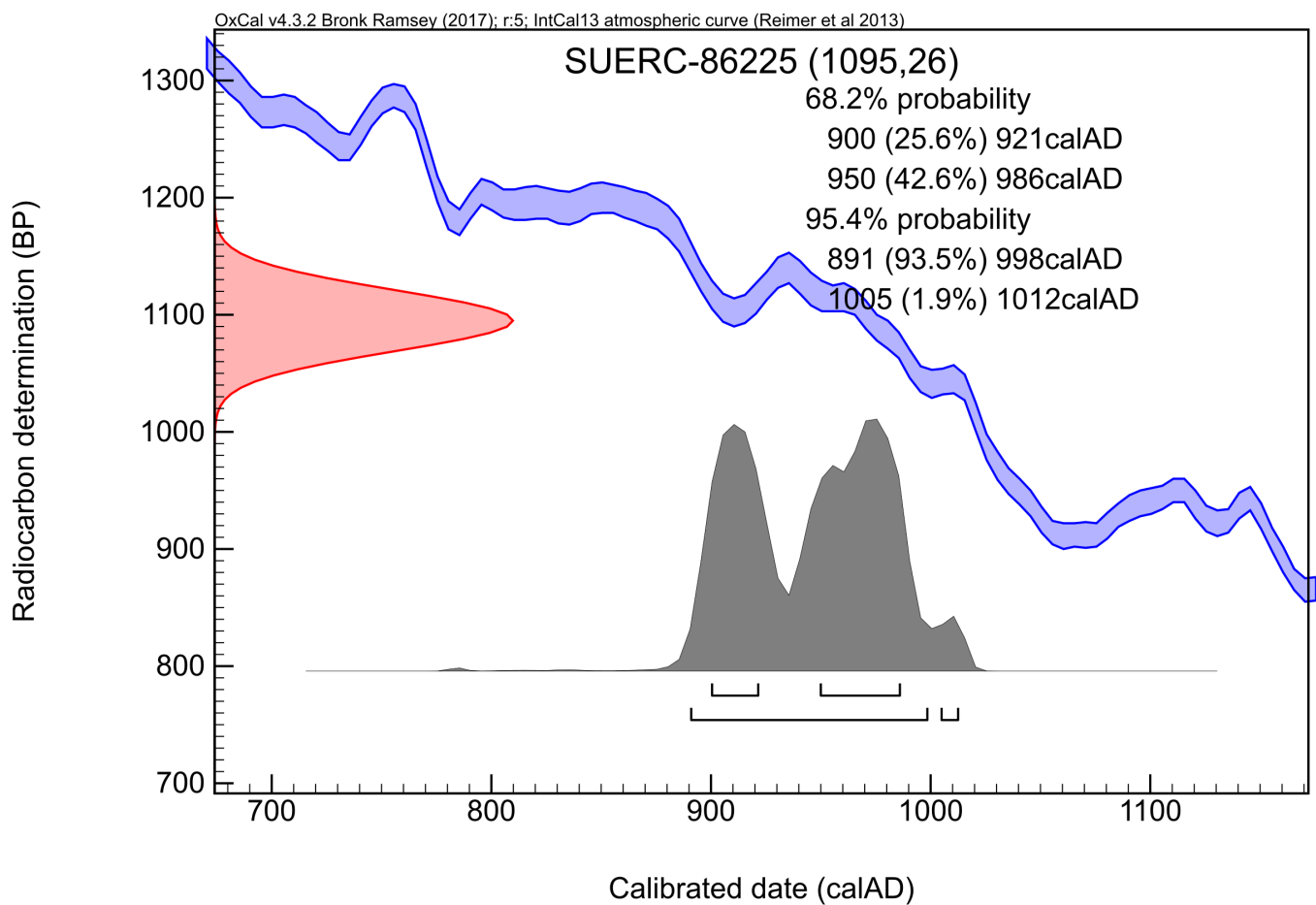
For any queries relating to this certificate, the laboratory can be contacted at suerc-c14lab@glasgow.ac.uk.

Conventional age and calibration age ranges calculated by :



Checked and signed off by :





The radiocarbon age given overleaf is calibrated to the calendar timescale using the Oxford Radiocarbon Accelerator Unit calibration program OxCal 4.*

The above date ranges have been calibrated using the IntCal13 atmospheric calibration curve†

Please contact the laboratory if you wish to discuss this further.

* Bronk Ramsey (2009) *Radiocarbon* 51(1) pp.337-60

† Reimer et al. (2013) *Radiocarbon* 55(4) pp.1869-87

RADIOCARBON DATING CERTIFICATE

17 May 2019

Laboratory Code SUERC-86229 (GU50916)

Submitter Lísabet Guðmundsdóttir
Fornleifastofnun Íslands
Bárugata 3
101 Reykjavík
Iceland

Site Reference Lækjargata

Context Reference 245

Sample Reference 423

Material Charred grain : *Hordeum vulgare* var. *vulgare*

$\delta^{13}\text{C}$ relative to VPDB -24.3 ‰

Radiocarbon Age BP 1098 ± 24

N.B. The above ^{14}C age is quoted in conventional years BP (before 1950 AD) and requires calibration to the calendar timescale. The error, expressed at the one sigma level of confidence, includes components from the counting statistics on the sample, modern reference standard and blank and the random machine error.

Samples with a SUERC coding are measured at the Scottish Universities Environmental Research Centre AMS Laboratory and should be quoted as such in any reports within the scientific literature. The laboratory GU coding should also be given in parentheses after the SUERC code.

Detailed descriptions of the methods employed by the SUERC Radiocarbon Laboratory can be found in Dunbar et al. (2016) *Radiocarbon* 58(1) pp.9-23.

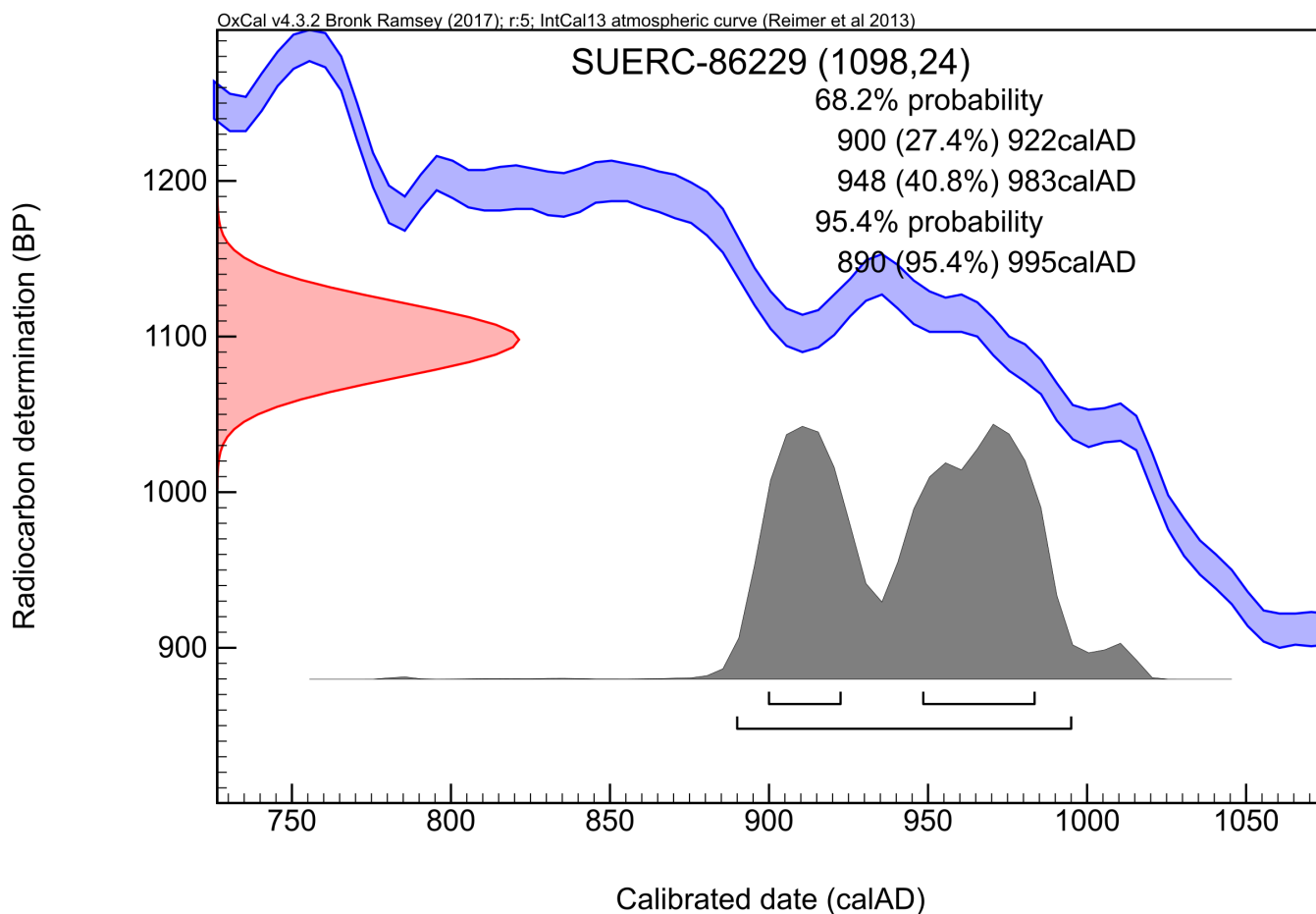
For any queries relating to this certificate, the laboratory can be contacted at suerc-c14lab@glasgow.ac.uk.

Conventional age and calibration age ranges calculated by :



Checked and signed off by :





The radiocarbon age given overleaf is calibrated to the calendar timescale using the Oxford Radiocarbon Accelerator Unit calibration program OxCal 4.*

The above date ranges have been calibrated using the IntCal13 atmospheric calibration curve†

Please contact the laboratory if you wish to discuss this further.

* Bronk Ramsey (2009) *Radiocarbon* 51(1) pp.337-60

† Reimer et al. (2013) *Radiocarbon* 55(4) pp.1869-87