

6. ENVIRONMENTAL ANALYSES

6.1 Macroplant and charcoal

by Genoveva Dimova & Jackaline Robertson

Forty bulk samples were submitted to the authors for environmental analysis in December 2023 from Beaully Substation. Following processing, the charred macroplant and charcoal assemblages were identified in the laboratory. The full report on the analysis of macroplant and charcoal including a methodology is contained within the site archive to be deposited at the National Record of the Historic Environment of Scotland (NRHE).

6.1.1 Macroplant assemblage

One poorly preserved bud was recovered from Deposit (011), which was part of the wall base of Roundhouse [053].

6.1.2 Charcoal assemblage: introduction

A total of 165 fragments (41.4g) were identified to species from 26 contexts (Table 2). The species were alder (*Alnus glutinosa* L.), hazel (*Corylus avellana* L.), ivy (*Hedera helix* L.), pine (*Pinus* sp.), cherry (*Prunus* sp.), and oak (*Quercus* sp.). The charcoal was scattered throughout the site with no evidence of selective or deliberate disposal within any specific feature. Preservation of the charcoal ranged from poor to good.

6.1.3 Summary of charcoal assemblage

Neolithic

Pit [078] was Neolithic in date, but its function is unknown. The charcoal assemblage in its fill, composed of pine (80%) and oak (20%), is fuel debris backfilled into this feature.

Bronze Age

The charcoal from podzol Deposit (006) consisted of 60% pine roundwood and 40% oak fragments. It was fuel debris that had been reworked into the deposit.

Pit [009] contained charcoal made up of 50% oak, 25% alder, and 25% hazel. This charcoal was likely fuel debris associated with the roundhouse.

Contexts associated with Bank (005) contained 58% oak, 19% hazel, 13% pine, 6% ivy, and

4% alder charcoal. The charcoal was in small quantities with no signs of deliberate disposal, suggesting it was fuel debris from the roundhouse that was incorporated into the bank material as the roundhouse collapsed.

A single fragment of oak charcoal (0.1g) came from occupation Deposit (032). The charcoal was likely trampled into this deposit during the roundhouse's use.

The fills of Postholes [024], [028], [033], [035], [039], [062], [068], [070], [072], and [080] contained 51% oak, 39% pine, 8% hazel, and 2% alder charcoal. This likely represents domestic fuel debris, rather than remnants from structural burning, possibly reworked during cleaning of occupation floors.

Deposits (011), (047), (048), and (049) associated with the roundhouse wall base contained randomly dispersed charcoal, comprising 42% oak, 26% hazel, 26% pine, 3% ivy, and 3% cherry. This charcoal may have been already present in the turf material used to construct the roundhouse walls, originating from earlier human activity within the area.

Charcoal was recovered from Posthole [057] of the roundhouse entrance. This included 70% oak, 20% alder, and 10% ivy roundwood, likely trampled into the area during the roundhouse's use and naturally redeposited in the posthole, filling the void left by the decayed post.

6.1.4 Discussion

The macroplant bud was probably an accidental inclusion of the wood brought to site as a fuel resource.

The charcoal species from Beaully Substation are native and would have grown in the surrounding landscape. Alder favours damp habitats, hazel and cherry grow in hedgerows, scrub or more open woods, pine prefers acidic landscapes, and oak is adaptable to a variety of growing conditions (Linford 2009; Stace 2010; Martynoga 2012). Ivy is a climbing plant that grows on trees, banks, rocks, structures, or along the ground (Stace 2010: 800). The alder, hazel, cherry, pine, and oak were likely deliberately collected for fuel. The ivy may have been introduced accidentally if it was growing on other wood species or was already present in the location in which the roundhouse was constructed.

Table 2 The charcoal species

Date	Quadrant	Structure	Feature	Context	Species	Name	Fragments	Roundwood	Weight
Neo	4	Backfill	Pit 078	079	<i>Pinus</i> sp.	Pine	3	5	
Neo	4	Backfill	Pit 078	079	<i>Quercus</i> sp.	Oak	2		3.7
BA	2	Podzol	Deposit	006	<i>Pinus</i> sp.	Pine		4	0.8
BA	4	Podzol	Deposit	006	<i>Quercus</i> sp.	Oak	1		
BA	4		Pit 009	008	<i>Alnus glutinosa</i> L.	Alder	2		
BA	4		Pit 009	008	<i>Corylus avellana</i> L.	Hazel	2		
BA	4		Pit 009	008	<i>Quercus</i> sp.	Oak	4		0.8
BA	2	Bank 005	Deposit	010	<i>Pinus</i> sp.	Pine		1	2.5
BA	2	Bank 005	Deposit	010	<i>Quercus</i> sp.	Oak	9		
BA	4	Bank 005	Wall 013	014	<i>Quercus</i> sp.	Oak	1		0.1
BA	2	Bank 005	Wall 013	015	<i>Quercus</i> sp.	Oak	2		0.3
BA	2	Bank 005	Deposit	019	<i>Corylus avellana</i> L.	Hazel		2	
BA	2	Bank 005	Deposit	019	<i>Hedera helix</i> L.	Ivy		1	0.8
BA	2	Bank 005	Deposit	019	<i>Quercus</i> sp.	Oak	1		
BA	2	Bank 005	Deposit	023	<i>Corylus avellana</i> L.	Hazel	3		1.1
BA	2	Bank 005	Deposit	023	<i>Quercus</i> sp.	Oak	7		
BA	2	Bank 005	Deposit	026	<i>Alnus glutinosa</i> L.	Alder		2	
BA	2	Bank 005	Deposit	026	<i>Corylus avellana</i> L.	Hazel		4	
BA	2	Bank 005	Deposit	026	<i>Hedera helix</i> L.	Ivy		1	
BA	2	Bank 005	Deposit	026	<i>Quercus</i> sp.	Oak	3		2.2
BA	1	Bank 005	Wall 051	052	<i>Hedera helix</i> L.	Ivy		1	
BA	1	Bank 005	Wall 051	052	<i>Pinus</i> sp.	Pine	2	3	
BA	1	Bank 005	Wall 051	052	<i>Quercus</i> sp.	Oak	4		3.3
BA	2	Cobble	Deposit	032	<i>Quercus</i> sp.	Oak	1		0.1
BA	4	RH 053	PH 024	025	<i>Quercus</i> sp.	Oak	1		0.5

Table 2 cont

BA	4	RH 053	PH 028	029	<i>Quercus</i> sp.	Oak	1	0.3
BA	4	RH 053	PH 033	034	<i>Quercus</i> sp.	Oak	2	0.2
BA	2	RH 053	PH 035	036	<i>Corylus avellana</i> L.	Hazel	1	
BA	2	RH 053	PH 035	036	<i>Quercus</i> sp.	Oak	9	1
BA	2	RH 053	PH 039	040	<i>Corylus avellana</i> L.	Hazel	2	
BA	2	RH 053	PH 039	040	<i>Quercus</i> sp.	Oak	8	2.2
BA	1	RH 053	PH 062	063	<i>Alnus glutinosa</i> L.	Alder	1	
BA	1	RH 053	PH 062	063	<i>Pinus</i> sp.	Pine	7	2.7
BA	4	RH 053	PH 068	069	<i>Pinus</i> sp.	Pine	10	1.6
BA	1	RH 053	PH 070	071	<i>Corylus avellana</i> L.	Hazel	1	
BA	1	RH 053	PH 070	071	<i>Quercus</i> sp.	Oak	1	0.1
BA	3	RH 053	PH 072	073	<i>Quercus</i> sp.	Oak	2	0.4
BA	3	RH 053	PH 080	081	<i>Quercus</i> sp.	Oak	1	0.1
BA	2	RH 053	Wall	011	<i>Corylus avellana</i> L.	Hazel		5
BA	2	RH 053	Wall	011	<i>Hedera helix</i> L.	Ivy		1
BA	2	RH 053	Wall	011	<i>Quercus</i> sp.	Oak	4	
BA	2	RH 053	Wall	047	<i>Corylus avellana</i> L.	Hazel	4	3.6
BA	2	RH 053	Wall	047	<i>Quercus</i> sp.	Oak	6	
BA	4	RH 053	Wall	048	<i>Pinus</i> sp.	Pine	1	3
BA	4	RH 053	Wall	048	<i>Prunus</i> sp.	Cherry	1	2.4
BA	4	RH 053	Wall	048	<i>Quercus</i> sp.	Oak	5	
BA	4	RH 053	Wall	049	<i>Pinus</i> sp.	Pine	5	0.9
BA	2	RH 053	PH 057	056	<i>Alnus glutinosa</i> L.	Alder	2	
BA	2	RH 053	PH 057	056	<i>Hedera helix</i> L.	Ivy		1
BA	2	RH 053	PH 057	056	<i>Quercus</i> sp.	Oak	7	3.8

Key: Neo=Neolithic, BA=Bronze Age, RH=Roundhouse, PH=Posthole, weight recorded in grams

The charcoal is representative of re-deposited fuel debris and there is no evidence that any structural elements or wooden artefacts were burnt or disposed of on-site. There is limited evidence of Neolithic activity when pine (80%) and oak (20%) charcoal were exploited for fuel. During the Bronze Age, when the roundhouse was constructed and occupied, the wood species used were more varied, comprising oak (52%), pine (25%), hazel (15%), alder (4%), ivy (3%), and cherry (1%).

6.2 Micromorphological analysis

by Lynne Roy

Two kubiena tin samples were taken from the turf bank of the roundhouse wall. The objective of the analysis was to shed light on the formation and construction of the roundhouse. Examination of the microstructure of the turf wall sequence was undertaken with the aim of defining the processes of sediment deposition and nature of activity. The full report on the micromorphological analysis, including methodology, is contained within the site archive to be deposited at the NRHE.

6.2.1 Context (011)

Context (011), was identified in Sample 1 as two basal units, initially hypothesised to be wall core material. In thin section, these were identifiable as anthropogenically altered thick organo-mineral A horizons (topsoil). Unit 1 resembles topsoil or turf material, indicating the wall core's basal part may have been constructed from turf. There was an observed increase in anthropic indicators in Unit 2, along with a decrease in porosity, suggesting that the upper part of the wall core material was sourced from an area more heavily influenced by anthropogenic activity.

6.2.2 Context (016)

Context (016), the remains of a collapsed turf wall foundation, is represented in Unit 3 of Sample 1 and Units 1 to 4 of Sample 2. Thin section analysis revealed at least four stratigraphic units in Sample 2, with Unit 3 of Sample 1 likely corresponding to Unit 1 of Sample 2. The sedimentary characteristics suggest reworked anthropogenic soil deposits, indicating that, similar to (011), (016) was likely

constructed using turf material. Humic and biological components were observed, with organic-rich mineral soil generally becoming finer farther up the profile.

Post-depositional faunal activity was evidenced by well-preserved vughs, bio-channels, and partially welded organo-mineral excrements, with finer components like silts and clay likely translocated by soil invertebrates and rainwater. Evidence of reworking increased upwards, indicating that many sedimentary features formed after deposition. In contrast, anthropic indicators decreased upwards, suggesting reduced human influence in the upper deposit. However, it remains unclear if this reflects the original soil character or results from the wall's use and collapse.

The similarities between the sedimentary units and their distinctive arrangement suggest that the earthen material for the roundhouse construction originated nearby, and it is hypothesised that turfs from various soil profile sections were stacked to form the wall.

6.2.3 Conclusion

Taphonomic and post-depositional processes are especially intense in afforested parts of the Highlands, such as Beauly, preventing a complete understanding of roundhouse remains located in these areas due to the degradation of scarce evidence. Very intense and constant pedo- and bioturbation was observed in the pedosedimentary sequences analysed micromorphologically from the Beauly Substation roundhouse. This pedoturbation led to a partial blurring of the stratigraphy of the sequence, causing a certain homogenisation in terms of colour, texture, and structure inside each of the main units that were already difficult to distinguish due to the homogeneity of the source material across time. However, stratigraphic units were preserved as coherent layers at microscopic levels, as shown by the litho-stratigraphic descriptions and the vertical distribution of key micromorphological features (grain size, organic matter, charcoal, etc.). The identification of these features confirmed the use of turf in the wall core Deposit (011) and also indicated multiple sediment sources and depositional/construction activities within the wall collapse Deposit (016).

The investigations at Beaully Substation have offered further insight into the construction of turf roundhouses in the Highlands, and associated soil formation dynamics. Despite the strong post-depositional processes affecting the taphonomy of the archaeological stratigraphy, the micromorphological analysis has allowed characterisation of the deposits

from within the structure and has added to an increasing bank of micromorphological evidence for prehistoric roundhouses from across the region, such as that at Dalchork, Sutherland (Glew & Peteranna 2020; Roy 2023), which is allowing better recognition and characterisation of the use of turf as a construction material.