THE ENVIRONMENT OF THE WEST COAST OF THE APPLECROSS PENINSULA

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- 11.1 Introduction
- 11.1.1 This preliminary report details evidence gathered as a result of fieldwork in the area between 28 April and 1 May 2000. As such, the level of detail is limited and the conclusions need validation by further fieldwork.
- 11.1.2 The method used was to search printed sources for information on the geology and soils of the area and to confirm these by field observation. The fieldwork comprised observations along a selected number of transects, mostly perpendicular to the coast, for changes in the soil vegetation and topography. The transects were selected to be representative of the major areas of less steeply sloping land, and where possible they included sandy beaches. All of the main geological facies along the coast were examined between Toscaig and Fearnbeg. The area between Fearnmore and Shieldaig was examined visually but no field walking or sampling was undertaken. The detailed observations from this fieldwork are included in Appendix X.

11.2 Geology

11.2.1 The Applecross peninsula consists of a massive exposure of Torridonian Sandstone, which extends both to North and South towards Gairloch and Skye respectively but is cut off from them by Loch Torridon and Loch Carron. The sandstones were laid down about 770 Ma ago as erosion occurred from a large landmass in the position of modern north Skye and Lewis and Harris (Johnstone & Mykura, 1989). The rock is an arkose and was laid down under fluvial conditions. It contains strong current bedding and a great deal of local variation. From Applecross southwards the rock is Altbea formation, while to the North it is Applecross formation. Both are described as fine to medium grained pale red sandstones. The cementing agents and mineral composition of these particular rocks is not as yet known, though examination of caves suggested that calcium carbonate may be present in some of the deposits as it was present on cave walls as flowstone. Phemister (1960) does recognise the presence of calcareous material in the Altbea and Diabaig formations. Around Applecross village and in the Applecross valley there are small outcrops of Triassic and Jurassic rocks. These include limestones and further reddened sandstones. None of these rocks have been subject to major earthmoving forces and consequently they retain their original near-level stratification. The whole area has been exposed to glacial processes, which have deposited a thin and patchy till; this outcrops mostly to the North of Applecross (Geological Survey, 1954). Over much of the rest of the area there is either sandstone exposed at the surface or a covering of moraine. The moraine fields vary greatly in stoniness and have a very uneven surface of small rounded knolls. Much of the area is covered in postglacial peat, though this is thin outside depressions and mostly would class as a humose layer at lower elevations. The massif to the east prevented movement of ice from other regions across the peninsula so that most of the till and moraines are of local origin from the Torridonian series. One glacier did

come down the Applecross valley and may have spread some of the carbonate-rich sediments across the land between Applecross and Sand. The main glacial flow was from south west to north east (Anderson & Denham, 1966).

11.3 Soils

11.3.1 The typical soil to be expected on sandstone is a podsol, though in such a wet climate (2 m annual rainfall) then peat would be expected in depressions (Glentworth & Dion, 1950). However, it has already been noted that many of the sandstones appear to be fine textured and there is thin boulder clay over part of the area, hence a wider range of soils typical of upland conditions (Askew et al., 1985) might be found. On flat areas, blanket peat would form and in depressions, a basin peat. On other less well drained areas a humic stagnogley and in areas of pan formation, humic stagnopodsols would also be found. Thus a varied suite of soils is to be expected. The soils of the area have been mapped at 1:250 000 scale (xxxxx) but this only shows a low resolution and the published maps are of soil associations rather than series.

11.4 Interpretation

- 11.4.1 The most striking feature of this whole area is the lack of peat and the presence both of rock and soil close to or at the surface and of a flora which is typical of soils which are drier and less acid than might otherwise be expected. This is not to say that there are not areas of peat; most of the hollows and flat areas are filled with peat to 1m or more depth, but elsewhere mineral material is found usually within about .5m. This indicates that, in the past, the environment, which can have been no worse than today as there has been little to ameliorate the conditions (*delete?*) (*doubtful in meso and better to rely on pollen???*), would have been able to support a wide flora and fauna, and would have been relatively productive, given the long growing season at low elevations. In what follows, the acidity, wetness, soil development, flora and the environment for human occupants and for the preservation of artefacts are considered.
- 11.4.2 **Soil Acidity**. As it is near to the coast the area already receives two main inputs of baserich material, sea spray and shell fragments. In an area as windy as this there is a considerable carry of sodium, potassium, magnesium and calcium inland on the spray. These conditions commonly maintain the flora associated with a eutrophic environment, as is found around coasts, but here the extent of this aeolian effect may be more pronounced. There is also considerable exposure in bays of shell sand. This sand is less mobile than the spray but certainly will have an impact on low-lying areas around inlets for perhaps as much as 50-100m. In addition to these sources, it does seem that the sandstone contains an unusually large amount of bases, and the three factors taken together may have been responsible for maintaining the pHs noted in Appendix 1 below. Such an environment may also be maintained if the vegetation is active and transpires large amounts of water to take up base nutrients from depth. The factors discussed below certainly suggest that until relatively recently the vegetation may have maintained a rather better suite of soils than is now visible, which even today are relatively good for the location.

- 11.4.3 Wetness. The immediate post-glacial rainfall is usually considered to be somewhat lower than that today, though from the beginning of the Atlantic period about 5300 BC rainfall increased to at least as much as present. The lower rainfall coupled with the suggested deciduous woodland vegetation discussed below would have provided a much drier environment; even today the planting of coniferous vegetation is leading to substantial drying of the soil. For as long as the deciduous woodland persisted, the soils and environment would therefore have been drier, and there would also have been collateral benefits from better shelter and fuel supply.
- 11.4.4 **Soil development**. The lack of widespread podsolisation on a sandstone under high rainfall was initially surprising, but in view of the higher pH and presence of deciduous trees even today on areas where grazing animals are restricted it is suggested that the soil would have probably been an acid brown earth on slopes for much of the postglacial period. In flat areas and hollows gley and peats would have developed from an early date, though much of the gleying could post-date woodland clearance. As acid brown earths, probably with some gleying, the soils would have had a thick humus mat under woodland conditions, on clearing this would rapidly transform into an incipient humose horizon or thin peat as seen today.
- 11.4.5 **Flora**. The presence of many understory plants usually associated with deciduous woodland, and the presence of a wide range of natural scrub of deciduous species indicates that at low level the flora in the past would seem to have consisted of oak woodland with a rich understory. Such an environment is a rich source of foodstuffs for a human population; it also provides a habitat for a range of mammals and birds that can be hunted. Without pollen evidence it is difficult to define the extent and date of such woodland.
- 11.4.6 **Human environment**. It has already been suggested that the original woodland along the coast would have been a resource-rich habitat with fuel, seasonal plant products and a range of animals. Shelter would also be available and the extra evaporation from the trees would render the whole environment drier than today.
- 11.4.7 **Artefact preservation**. Although some artefacts are well preserved under wet and acid conditions, materials such as bone and shell require a relatively high pH before they can survive. In effect, the survival of various shell middens in the area indicates the generally eutrophic nature of the surroundings. From this we can deduce that outside the depressions, organics are unlikely to have survived. The survival of so much shell does suggest that if bone were originally present it too should have survived. However this assumes that animals were processed near to the shell deposits.
- 11.4.8 **Further work**. As indicated earlier his report is preliminary. Much more measurement on pH and on the petrology of the local rocks is needed. Pollen analysis and examination of peat in depressions may also be valuable to throw more light on the vegetation and on the use of other resources. (Remove??)

(this latter sentence is a little bit facile - it sounds as if he has not done much work on archaeol projects like this - omit?)

Appendix 19: Soil Sample Descriptions

Soil descriptions follow standard procedures (Hodgson 1976) and the following abbreviations have been used to aid soil description. The ends of the transects were plotted by EDM to record their relative positions.

DV= Dominant vegetation MD= Maximum depth Mun= Munsel colour code Txt= Texture Con= Consistency Rts= Root content St= Stone content

10.1.1.3 TRANSECT A-B Soil Sample Descriptions

Sample No. 1/50m	DV/Calluna vulgaris, MD/0.16m, Mun/10YR 3/1 v.d. grey, Txt/Gritty, Con/Plastic. Rts/Frequent. St/Rare				
Sample No. 2/48m	DV/ <i>Calluna vulgaris</i> , MD/0.24m, Mun/10YR 3/1 v.d.grey, Txt/Gritty, Con/ Plastic, St/Rare Surface wet with <i>Sphagnum rubricum</i> .				
Sample No. 3/46m	DV/ <i>Calluna vulgaris</i> , MD/0.30m Mun/10YR 3/1 v.d. grey Txt/Gritty, Con/Plastic, St/Rare, Rts Frequent. Surface spongy.				
Sample No. 4/44m	DV/ <i>Calluna vulgaris</i> , MD/0.60m, Mun/10YR 3/1 v.d.grey (top) 7.5YR 4/2 brown (basal), Txt/Gritty, Con/Plastic, Dt/Rare. Peat giving way to peaty loam.				
Sample No. 5/42m	DV/ <i>Calluna vulgaris</i> , MD/0.44m, Mun/10YR 3/1 v.d. grey, (top) 7.5YR 4/2 brown (basal), Txt/gritty, Con/Plastic, St/Rare. Sand content increases with depth becoming granular towards the base.				
Sample No. 6/40m	DV/ <i>Calluna vulgaris</i> , MD/0.35m, Mun 10YR 3/1 black (top) 7.5YR 4/2 brown (basal) Txt/Gritty, Con/Plastic becoming firm with depth.				
Sample No. 7/38m	DV/ <i>Calluna vulgaris</i> , MD/0.30m, Mun/10YR 3/1 black 7.5 YR 4/2 brown (basal) Txt/Gritty, Const/Plastic becoming firm with depth, St/Rare. Rt/Frequent.				
Sample No. 8/36m	DV/ <i>Calluna vulgaris</i> , MD/0.26m, Mun/10YR 4/3 Brown, Txt/Gritty, Const/Friable, Rt/Frequent. Very sandy in contrast to previous-shallow profile close to weathered base.				

Sample No. 9/34m	DV/ <i>Calluna vulgaris</i> , MD/0.30m, Mun/10YR 3/1 v. d. grey (top) 10YR 6/8 Yellowish brown (basal) Text/Grittty, Const/Loose, Rt/ Frequent. Weathered sandstone at base.				
Sample No 10/32m	DV/ <i>Calluna Vulgaris</i> , MD/0.15m, Mun/10YR 3/1 Black, Txt/Gritty/Const/Firm, Rt/Rare. Weathered sandstone at the base.				
Sample No 11/30m	DV/ <i>Calluna Vulgaris</i> , MD/0.18m, Mun/10YR 3/1 Black, Text/Sandy, Const/Friable, Rt/Abundant fine, St/Rare. Brown weathered sandstone at base.				
Sample No 12/28m	DV/ <i>Calluna vulgaris</i> , MD/0.20m, Mun/10YR 3/1 Black, Text/Sandy, Const/Friable, St/Rare, Rt/Abundant fine.				
Sample No 13/26m	DV/Calluna vulgaris, MD/0.23, Mun/10YR Black, Text/Sandy/silt, Const/Firm, Rts Abundant large.				
Sample No 14/24m	DV/formerly <i>Pteridium aquilinum</i> , MD/0.20m, Mun/10YR 3/1 Black with white quarts grains, Text/Gritty, Const/Firm, Rts/Abundant, mixed from top to base.				
Sample No 15/22m	DV/ formerly <i>Pteridium aquilinum</i> , MD/0.20m, Mun/10YR 3/1 black, Text/Sandy, Const/Firm.				
Sample No 16/20m	DV/ formerly <i>Pteridium aquilinum</i> , MD/0.20m, Mun/10YR black, Text/Gritty, Const/Firm, Rts/Abundant, fine with thicker <i>Pteridium</i> root present.				
Sample No 17/18m	DV/ formerly <i>Pteridium aquilinum</i> , MD/0.32, Mun/10YR 3/1 black, Text/Gritty, Const/Friable, Rts/Occasional fine, St/Rare. Centre of cultivation strip.				
Sample No 18/16m	DV/ formerly <i>Pteridium aquilinum</i> , MD/0.44m, Mun/10YR 3/1 black, Text/Gritty sand, Const/Friable, St/Rare Rts/Abundant fine below turf.				
Sample No 19/14m	DV/ formerly <i>Pteridium aquilinum</i> , MD/0.45m, Mun/10YR 3/1 black, Text/Gritty, Const/Firm, St/Rare Rts/Abundant fine with thicker <i>Pteridium</i> root present.				
Sample No 20/12m	DV/ formerly <i>Pteridium aquilinum</i> , MD/0.46m, Mun/10YR black, (lower 10YR 6/4 yellowish brown), Text/Gritty, Const/Firm, Rts/Abundant large at 0.12m becoming fine with depth. Weathered sandstone at 0.38m.				
Sample No 21/10m	DV/ formerly <i>Pteridium aquilinum</i> , MD/0.50m, Mun/7.5 YR 3/1 very dark grey, Text/Gritty, Const/Firm, St/ Abundant angular, Rts/Abundant fine with thicker <i>Pteridium</i> root present.				

Sample No 22/8m	DV/ formerly <i>Pteridium aquilinum</i> , MD/0.50mm, Mun/7.5YR 3/1 very dark grey(lower 7.5YR 5/4 brown, Text/Gritty, Const/Firm at top, friable with depth, Rts/Rare, St/ Large angular stones at base intermixed with weathered sandstone.
Sample No 23/6m	DV/ formerly <i>Pteridium aquilinum</i> , MD/0.67m, Mun/7.5YR very dark grey, Text/Silty sand, Const/Plastic, Rts/Rare, St/Present and impeding. Shell present encroaching on midden material.
Sample No 24/4m	Not recorded due to the presence of large rock
Sample No 25/2m	DV/ formerly <i>Pteridium aquilinum</i> , MD/0.42m, Mun/7.5YR 3/1 very dark grey, Text/Gritty, Const/Firm, Rts/Abundant fine with thicker <i>Pteridium</i> root present, St/Large angular blocks with medium smaller stones. Midden material present.
Sample No 26/0m	Recorded from within east facing section due to the presence of boulders near the surface. DV/ formerly <i>Pteridium aquilinum</i> , MD/Not etablished,Text/Gritty, Const/Friable due to exposure thicker <i>Pteridium</i> root present.

TRANSECT C-D Soil Sample Descriptions

Sample 21/1	DV/ formerly <i>Pteridium aquilinum</i> , MD/0.30m, Mun/10YR 4/1 very dark grey, Text/Grittty, Const/Loose and friable, Rt/ Frequent small, St/Rare. Homogenous due to ploughing.				
Sample 18/2	DV/ formerly <i>Pteridium aquilinum</i> , MD/0.30m, Mun/10YR 4/1 very dark grey, Text/Sandy, Const/Friable, Rt/ Frequent, St/Occasional. Homogenous due to ploughing.				
Sample 16/3	DV/ formerly <i>Pteridium aquilinum</i> , MD/0.25m, Mun/10YR 4/1 very dark grey, Text/Grittty, Const/Loose and friable, Rt/Frequent <i>Pteridium</i> down through the profile. Homogenous due to ploughing at surface. Base consists of archaeological layer.				
Sample 14/4	DV/ formerly <i>Pteridium aquilinum</i> , MD/0.40m, Mun/10YR 4/1 very dark grey, Text/Grittty, Const/Loose and friable, Rt/ Frequent small, ST/Occasional angular fragments Homogenous due to ploughing. Weathered sandstone at the base, root impact at base.				
Sample 12/5	DV/ formerly <i>Pteridium aquilinum</i> , MD/0.45m, Mun/10YR 2/2 very dark brown, Text/Sandy, Const/Loose and friable down to 0.33m, Rt/ Abundant <i>Pteridium</i> roots in upper section, St/Absent				
Sample 10/6	DV/ formerly <i>Pteridium aquilinum</i> , MD/0.30m, Mun/10YR 4/1 very dark grey, Text/Grittty, Const/Loose and friable, Rt/ Frequent small. Homogenous due to ploughing.				
Sample 8/7	DV/ formerly <i>Pteridium aquilinum</i> , MD/0.30m, Mun/10YR 4/1 very dark grey, Text/Grittty, Const/Loose and friable, Rt/ Frequent small. Homogenous due to ploughing.				
Sample 6/8	DV/ formerly <i>Pteridium aquilinum</i> , MD/0.30m, Mun/10YR 4/1 very dark grey, Text/Grittty, Const/Loose and friable, Rt/ Frequent small. Homogenous due to ploughing.				
Sample 4/9	DV/ formerly <i>Pteridium aquilinum</i> , MD/0.30m, Mun/10YR 4/1 very dark grey, Text/Grittty, Const/Loose and friable, Rt/ Frequent small. Homogenous due to ploughing.				
Sample 2/10	DV/ formerly <i>Pteridium aquilinum</i> , MD/0.30m, Mun/10YR 4/1 very dark grey, Text/Grittty, Const/Loose and friable, Rt/ Frequent small. Homogenous due to ploughing.				

Appendix 20Soil pollen and micromorphology samples

All taken at Sand, trench A, north facing section

Sample 1	Soil pollen: Taken in the middle of the section at the interface of lower midden and upper sandy silt.
Sample 2	Soil micromorphology: taken at interface between natural orange sand and black sandy silty layer
Sample 3	Soil pollen: Taken at interface between sandy orange layer and humified layer above.

Appendix 21Detailed records of the transects examined for soils and environmental
information
R.Shiel and A. Stewart

- 1. Transect examination
- 1.1 On the first day, transects were completed for the area to the north of Applecross. Access was restricted to some areas by deer fencing. On the second day transects of the area south from Applecross to Toscaig were completed.
- 2. DAY ONE. Cuaig to Sand

Between these two locations the rock is all Applecross formation of the Torridonian sandstone and it has been patchily covered by various glacial and postglacial deposits including raised beach, till, moraine, alluvium, blown sand and peat.

- 2.1 Cuaig (NG 705 577)
- 2.1.1 The village lies within the moraine deposit area but the large stream, Abhainn Chuaig, that drains from Croic Bheinn to the south east has deposited large amounts of terrace alluvium. North east of Cuaig in the stream zone, ref. point c1 (NG 706 578), a peat bog is present, thicker than 1m in places with humic sands on the slopes rising away from the flatter stream area. In the area north of Cuaig, west of a chapel ruin, a basin holds humic sands and on the terrace immediately rising to the north west, a soil at ref. point c2 (NG 706 577) shows properties of being buried. This is possibly a buried podsol consisting of a layer of bleached sand underneath .7m of humus. The soil above the humus is a modern cover sand. Much of the vegetation is heather or rough grazing.
- 2.1.2 Soil samples were taken at ref. point c3 (NG 702 576) south west of Cuaig, still within the moraine landscape, where some evidence of stone clearance exists in the form of a low stone wall. This site is almost level, approximately 30m wide with a stream running through the centre. The upper horizon, .2m deep, was a humic sandy loam overlying a sandy silt loam.
- 2.2 Between Cuaig and Callakile
- 2.2.1 Ref. point k1 (NG 695 566) This site is located west of the main road. The landform has a steep slope that drops to a walled, moderately to gently sloping area, finally meeting a steeper sloped shoreline. This plateau is probably a raised beach and is shown as such on the geological map. Inland the boulder clay is largely covered by peat. Some stone clearance is evident here. Much of the walled area is covered by: Depth(m)
 - 0-.4 Fine Peat
 - .4+ Coarse sand, slightly reddened.
- 2.2.2 Shallower peat exists on gentle slopes, but in localised depressions coarser peat was found to a depth of 1m. A small area of grassland with Juncus, approximately 10m wide, was found 30m inland from the sea on a gentle slope. The soil was: Depth (m)

- 0-.4 Humose coarse sand
- .4+ Coarse sand, slightly reddened.
- 2.2.3 Similar soil was also found on the edge of the 3rd raised beach, but with coarser vegetation growing.
- 2.3 Lonbain (NG 688 531)

This site is adjacent to a previously crofted area. The area consists of sandstone outcrops on the steeper slopes and boulder clay over much of the level areas but with alluvium along the stream that flows parallel to the coast. Along the coast the raised beach seen earlier continues. 150m inland east of the 'Black House' on steep sloping ground ref. point L1 (NG 688 532) the soil was:

Depth (m)

- 0-.3 very slightly sandy amorphous peat
- .3-.55 sandy loam sandy clay loam
- .55-.6 very pale sand.
- 2.3.1 Areas which are level to slightly sloping range from humose sands to peat up to .3m deep, with an underlying thin layer of sand on sandstone. Peat bog areas can be found in slight depressions. The adjacent old crofted area (NG 688 531) is of a similar geography with locally variable soils ranging from peat or humose sands over sand or sandy loam. Strip cultivation scars are evident and it is possible that some of the variability in soils is due to past cultivation effects on drainage patterns.
- 2.4 Salacher (NG 687 511)
- 2.4.1 This area is situated where the parent material changes from a thin cover of boulder clay to the north and east to sandstone running along the coastline to the west and south. Depressions are filled with peat. At Ref. point sr1 (NG 686 511) the site is a depression adjacent to the main road. It holds a peat bog with:
 - Depth (m)
 - 0-.9 peat
 - .9+ sandy loam.
- 2.4.2 The surrounding area to the west and south was found to be solid sandstone, with boulder clay to the east. Indication of land management exists in the form of a wooden fence that cuts through this site, joining with the wall that surrounds the woodland at ref. point sr3.
- 2.4.3 Ref. Point sr2 (NG 684 511) This point is on a steep slope of the first ridge to the west, running parallel to the road, facing east. Small pockets of gleyed soil can be found, with gleying at approximately .1m deep.
- 2.4.4 Ref. point sr3 (NG 663 508) Coniferous trees are growing on this site, which is 50m south on the same ridge as sr2. The soil here was found to be: Depth (m)
 - 0-.2 sandy loam
 - .2+ sandstone

- 2.4.5 This is possibly a peaty ranker, and since gleying was found adjacent at sr2, it is possible that the trees have influenced the formation of the ranker through processes such as increasing transpiration and improved ground drainage. This suggests that there could also be similar soils in situations where trees have been growing until relatively recent times.
- 2.4.6 Ref. point sr4 (NG 684 507) The depression south and west of the trees at sr3 holds a peat bog greater than 1m deep. The surrounding area running parallel to the coastline consists mainly of blanket peat with small pockets of peat bogs in hollows.
- 2.4.7 Ref. point sr5 (NG 685 507) On this slope, approximately 40, rising to the main road 30m south east of the trees, the soil found was: Depth (m)
 - 0-.3 humose slightly bleached sand
 - .3+ sand-coarse sandy loam.
- 2.4.8 This small area has a low wall and stone clearance piles are present. The vegetation is moss, tussock grass with some Juncus and occasional heather. A few large stones are present on the ground surface. This slope also slopes north towards the depression at ref. point sr1 with similar vegetation and soils.
- 2.5 2.10 Sand (NG 682 506).
- 2.5.1 This substantial depression is sheltered behind a low sandstone ridge to the West that is broken at this point. The depression is partly in-filled with blown sand but there are also raised beach deposits, sandstone outcrops and peat in the wetter areas.
- 2.5.2 Ref. point s1 (NG 683 493) 30m south of the archaeological investigation site, in a slight depression, this site is a peat bog greater than .35m depth.
- 2.5.3 Ref. point s2 (NG 682 492) To the west and south, extending to a military base, much of the ground in depressions consists of peat bogs of .55m depth with blanket bog covering the raised areas. Evidence of past peat cutting was found 50m from the base.
- 2.5.4 Ref. point s3 (NG 682 490) 20m south of the road linked to the military base, on the edge of a sandstone-sand ridge, humose sand over sand can be found to a depth of 1m or greater. The vegetation here is bracken and grass; Oxalis is also present.
- 2.5.5 Ref. point s4 (NG 682 489) South of the ridge, 150m north west of an old settlement, Juncus and grass persist on: Depth (m)
 - 0-.3 humose peaty sand
 - .3 + sand.
- 2.5.6 This site is gently sloping southeast and is on a noticeably wetter site that could be caused by a spring line.

2.5.7 Ref. point s5 (NG 683 489) East of s4, this site is gently sloping, approximately 20, facing southeast. This soil consists of:

Depth (m)

0-.05 humose

.05 + humose sand - sand

and has a poor quality grassland vegetation. This area may be affected by increasing salt levels from the sea's influence.

- 2.5.8 Ref. point s6 (NG 682 488) An old settlement is 50m south; here the vegetation is bracken with some grass and sporadic Juncus. This site is on a slight ridge and the soil is: Depth (m)
 - 0-.2 humose sand
 - .2 + sand.
- 2.5.9 Summary of Sand Bay

Blown sand underlies a significant area of this site. Visually the physical boundaries of this sand can be plotted approximately in line with the change in vegetation from heather to bracken and grassland. Oxalis was noted particularly to the east side of the blown sand area. Blanket peat and peat bogs cover the adjacent areas located on sandstone.

- 2.5.10 Blown sand is now being deposited on the south side of Sand bay, indicating a change in factors influencing deposition patterns during soil formation at this site.
- 3 DAY 2 Applecross to Toscaig.
- 3.1 This area is more complex geologically than that to the north. Around Applecross itself there are Mesozoic outcrops including limestones and along the coast to the South is Altbea formation of the Torridonian while inland the Applecross formation continues. This area is variously covered by a range of superficial deposits similar to those to the north seen in day one. Applecross bay contains a substantial undifferentiated terrace with large areas of alluvium overlying the Liassic limestone. There is boulder clay fringing the valley edge above the terrace.
- 3.2 Applecross (NG 713 442)
- 3.2.1 There was no sampling on the complex alluvium and raised beaches of the River Applecross or on the Mesozoic red clays, sandstones and conglomerates. The area examined was on the Lias limestone.
- 3.2.2 Ref.point Ap1 (NG 713 443) This site is on limestone with a variable cover of moraine. The location is gently sloping and the soil is:

Depth (m) 0-.5 sandy loam

.5-.8 sandy clay loam.

3.2.3 The vegetation is clover grassland, grazed by sheep and cattle. The surrounding landscape

has varying slopes from gentle to steeply sloping to the east and south east. It was noted in conversation with the farmer that there are locations on the farm where during heavy rainfall water disappears from the surface in to natural drainage voids in and below the surface. The farmer also said that the soils on the limestone did not suffer from trafficability problems even with seasonal wetness.

- 3.2.4 Ref point Ap2 (NG 713 442) This site is adjacent to a dried up stream bed. The soil is sandy loam to .3m or greater, and there is evidence of iron movement with oxidised red iron mottles visible. This indicates that water movement has occurred down the profile causing iron movement with subsequent oxidation after water dispersal. Large trees run along field boundaries, maple, silver birch and possibly hazel, with a plantation of coniferous woodland to the north east.
- 3.2.5 This was the only substantial farming business seen with good quality well-managed cultivated land.
- 3.3 Camusteel.
- 3.3.1 On Applecross formation sandstone but with a large area between the coastal ridge and An Glas-tulach covered with moraine.
- 3.3.2 Ref. point c1 (NG 705 426) On sandstone. Blanket bog covers the area along the coastline to the west of the road. To the east of the road the landscape changes to moraine with: Depth (m)
 - 0-.3 coarse sandy peat
 - .3 + coarse sandy loam

on the slope, about 30, facing east.

3.3.3 On the opposing steeper slope, about 60, facing west, the soil was:

Depth (m)

0-.2 sandy loam

with humose sandy loams on even steeper slopes. The ground was very stony, large to medium size stones, but there were also mole hills present indicating the presence of earthworms and lighter soils which are not particularly acid. This area is densely populated with much of the land in use for crofting and with stone clearance piles common.

- 3.4 Ard-dubh (NG 706 408)
- 3.4.1 This location is on Aultbea formation sandstone which gives a rougher landscape. It is adjacent to a stone pebble beach, the surrounding land is covered by blanket peat .3-.7m deep.
- 3.5 Culduie (NG 715 403)
- 3.5.1 The fields in front of this row of croft houses are gentle to moderately sloping on moraine and undifferentiated deposit landscape. The vegetation is essentially grassland which is heavily grazed by sheep. The soils are: Depth (m)

0-.7 humose sands and in depressions
Depth (m)
0-.3 humose sands
.3 + sandy loams

- 3.6 Ardban (NG 700 397)
- 3.6.1 An area of blown sand surrounded by Aultbea formation sandstone but with peat in the hollows.
- 3.6.2 Ref. point A1 (NG 703 392) En route to Ardban, the inlet on the east side of the Ardban peninsula forms a depression through the landscape. This depression is only about 15m wide but holds a soil with the properties:

Depth (m)

0-.01 humose

.01-.2 humose sandy loam.

The vegetation is moss, Juncus with celandine nearby, and pockets of woodland grow along the coastline with silver birch, oak and possibly rowan.

3.6.3 Ref. point Ab1 (NG 701 396) The majority of soils on this site have formed on blown white sand formed from CaCO3-rich shells. This has resulted in the formation of an alkaline soil, as indicated by the pH results in table 1,with: Depth (m)

0-.2 humic sand

- .2 + white sand.
- 3.6.4 The vegetation is grassland and it is heavily grazed by sheep. White sand and shells are present in the small bay to the south of the Ardban settlement from which the soils extend. This area of sandy soil is surrounded on all sides away from the coastline by blanket bog and occasional peat bogs. Peat cutting was being carried out during the site visit with the peat used to fuel the 2 holiday cottages at Ardban.
- 3.7 Toscaig (NG 713 385)
- 3.7.1 Much of this area is located on Aultbea formation sandstone with Toscaig itself located on the edge of a low (first) raised beach. There is also an area of alluvium brought down by the River Toscaig from Coire Dubh. The land rises steeply to west and east of Toscaig.
- 3.7.2 Ref. point T1 (NG 709 381) 50m north west of the harbour, in a north west to south east trending valley, the vegetation is moss, tussock grass and deciduous woodland, mainly mature silver birch. A peat bog of .5-.7m depth is located here overlying .1-.2m of humose sand on sandstone. Lonicera and bilberry were found growing on the ground rising north west, as was Oxalis, grading in to heather and bracken on the steeper ground rising north out of the valley.
- 3.7.3 Ref. point T2 (NG 709 383) North east of T1, this site is in a flat L-shaped basin and has a peat bog to a depth of greater than 1m and a small lake to the north west.

- 3.7.4 Ref. point T3 (NG 709 385) The ground rising to this point is a moderately sloping south south west facing gully approximately 10o and the vegetation consists of a number of flowering plants including Oxalis, dog violet, celandine, primroses and grasses. Bracken was also common. T3 is on the highest point of this rising gully, between two higher areas of land. To the north west the ground rises sharply, and to the south east the rising ground has a moderate slope. T3 is relatively exposed but the vegetation is similar to that mentioned above, but with a higher proportion of grass. The soil is: Depth (m)
 - 0-.2 sandy loam sandy clay loam (dark red)
 - .2 + coarse sandy loam.
- 3.7.5 Deciduous woodland is situated on most of the surrounding slopes and even on some of the more exposed sites. The steeply rising ground to the north and north west has sandy loam soil to approximately .3m depth. On the hill top overlooking T3, the site is very exposed with blanket peat dominating. However, a number of young silver birch are found growing, approximately 0.5m in height. A point worth noting is that this area has some recently erected deer fencing and it may be the control of deer that is aiding the regeneration of woodland over this area.
- 3.7.6 Gully cutting through Shalach peninsula at NG685 377, SE-NW between Loch Toscaig and the west coast. This location holds a raised peat bog which is greater than 1m depth. There is an inlet from the Loch to the SE which is rocky. In the transition zone between the peat bog and the rocky shore line the vegetation includes primrose, bracken, reeds and celandine.
- 3.7.7 Silver birch and oak trees are present on slopes on the north side and on some of the east facing coastline, with young silver birch growing sporadically over most hills. The majority of this very hilly landscape is covered by blanket bog to a depth of .2m or greater, with small peat bogs in depressions. There is evidence of old peat cutting on the top of the hills to the south of this gully.
- 4 DAY THREE: From Fearnmore to Rhuroin on Loch Shieldaig.
- 4.1 This north east part of the Applecross peninsula consists largely of Applecross formation sandstone but there are also substantial outcrops of Lewisian gneiss. In the other areas examined there are substantial amounts of moraine and isolated areas of raised beach, however this part has little if any boulder clay till. No field examination of soil profiles was undertaken.
- 4.2 Fearnmore (NG 724 606)
- 4.2.1 This area is Applecross formation sandstone along the coastline with small areas of moraine adjacent. Peat bogs occur in hollows and on higher ground blanket bog occurs. Rough grassland with Juncus occurs on slopes adjacent to the coast where there is currently fencing. Highland cattle graze some in this area.
- 4.3 Fearnbeg (NG 737 598)

- 4.3.1 The settlement is on the second raised beach, which fills a depression in the Applecross formation. There are also areas of moraine nearby. Here there is cultivation evidence with stone clearance and ridges between plots. The soil is very humose and peat also occurs. Trees have been cleared behind the settlement with stumps remaining. The sandstone is ancient and slightly yellower. The surrounding soils are thin with impeded drainage.
- 4.4 Arinacrinachd (NG 745 584)
- 4.4.1 This settlement is situated next to a raised beach with inland a substantial alluvial terrace. The area is mostly moraine with Applecross formation only outcropping on hilltops. There is a substantial hill of gneiss to the south east. The vegetation is greener - grass and Juncus grading in to bracken and heather up the hill sides to houses on less steep areas.
- 4.5 Kenmore (NG 758 575)
- 4.5.1 En route to Kenmore, passing across sandstone and gneiss there is a 'boulder field' in moraine, with angular rather than rounded rocks. The moraine is also thinner than the moraine in the Cuaig area. This boulder field is in a valley above the terrace alluvium where Kenmore is situated. Along the coast there is a small area of raised beach. Field boundaries are present at Kenmore and the vegetation is once again greener grassland and Juncus. A large area of deciduous woodland is located to the right and left of Kenmore. There are a series of inlets around this coastline with rocky beaches and the land rises sharply from the coast in a number of places.
- 4.6 Rhuroin (NG 798 543)
- 4.6.1 This area is dominated by gneiss geology with only isolated outcrops of Torridonian sandstone. En route to this settlement, paler soils were found on gneiss with an O horizon, an albic horizon and an iron pan, as opposed to the redder soils on sandstone. Grassland was located in lower lying areas and there is a large area of woodland along the coast.

Appendix 22 Laboratory Soil Analysis

R Shiel and A Stewart

- 1. Soils were oven dried at 105oC and ground to less than 2mm particle size. The pH test was carried out using a Barium Sulphate method and combination pH electrode.
- 2. pH of soil samples taken from several of the sites and measured with a range of methods.

Sampling	Horizon	Method		
reference point	depth m		Barium Sulpha	te Combination
		(BDH)	(Phillip Harris)	electrode
Cuaig (c3)	02	5.5	6.0	4.6
Cuaig (c3)	.23	5.0	5.5	4.6
Lonbain (crofted area)	02	6.5	6.5	5.1
Applecross (Ap1)	02	6.5	6.5	6.0
Applecross (Ap2)	02	6.0	6.0	5.7
Ardban (Ab1)	02	8.0	7.5	7.2
Ardban (Ab2)	.23	8.0	7.5	7.4
Toscaig (T3)	01	5.0	5.5	5.0