

# East Grampian Drift Group, Quaternary lithostratigraphy, Cainozoic of north-east Scotland

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## East Grampian Drift Group

[File:P915251.png](#)

Generalised flow-lines of ice during the Main Late Devensian glaciation.  
P915251.

This group is broadly equivalent to the sediments that were previously referred informally to the 'Inland Series' (Hall, 1984a; Sutherland and Gordon, 1993). The deposits contain clasts that have been carried by ice flowing from the eastern Grampian Highlands during several glaciations ([P915251](#)). Although erratics from farther afield do occur ([P915294](#)), the colour and clast composition of the tills closely reflect the nature of underlying bedrock (commonly deeply weathered), or of rocks cropping out within a few kilometres to the west. The tills are generally sandy, thin (less than 2 m) and patchy, especially across central Buchan, where they are normally pale yellowish brown in colour. Thicker and more widespread tills occur in the valleys of the Dee and Don, where colour ranges from brown to grey. Glaciofluvial and glaciolacustrine deposits are relatively uncommon across large tracts of countryside, especially in central Buchan. The uppermost metre or so of all materials is commonly severely disturbed by periglacial activity (Connell and Hall, 1987).



Transport paths of some indicator erratics in north-east Scotland. P915294.

The sandy nature and pale colour of the tills occurring in central Buchan have led some authors to conclude that they have been weathered since their deposition. These attributes, together with inferred relationships to incorrectly dated organic sediments ([Crossbrae](#)), led some to conclude that they were laid down either during an early Devensian glaciation (Hall, 1984; Sutherland, 1984a; Hall and Connell, 1991) or during a pre-Devensian one (Charlesworth, 1956; Syngé, 1956, Fitzpatrick, 1958, 1972; Galloway, 1961a, b, c). The sandiness and colour are equally likely, however, to result from the incorporation of significant proportions of deeply weathered bedrock or previously weathered deposits, in which case the tills need be no older than Late Devensian in age (Clapperton and Sugden, 1977; Hall and Bent, 1990). For example, pedological studies of a till (possibly Hythie Till Formation) near Mintlaw suggest that the soil-forming processes occurred during the Holocene (Van Amerongen, 1976).

Glacigenic deposits of inland provenance are known to occur at several stratigraphical levels ([P915347](#)) and there are possibly representatives of glaciations going back to OIS 8, if not the Anglian ([Kirkhill](#)). The older deposits have been identified through the discovery of intervening units of peat, soil and gelifluctate, but in the absence of firm dating control, their chronostratigraphical context is not known for certain.

Most deposits of inland provenance that have been named in the literature occur at widely dispersed sites where relatively long sequences have been described, for example at the [Teindland](#) and [Kirkhill](#) localities. Although formal lithostratigraphical units have been established locally at [Boyne Bay](#) and [Gardenstown](#), only on Sheet 66E Banchory and Sheet 67 Stonehaven have units of this group been mapped out systematically. On these sheets, the glaciofluvial, glaciolacustrine and glacial deposits associated with the former East Grampian ice sheet are placed in the Lochton Sand and Gravel, the Glen Dye Silts and the Banchory Till formations, respectively. These Late Devensian deposits extend northwards onto Sheets 76E and 77, if not farther north, and they form part of the important sequence established at [Nigg Bay](#) ([P915347](#)).

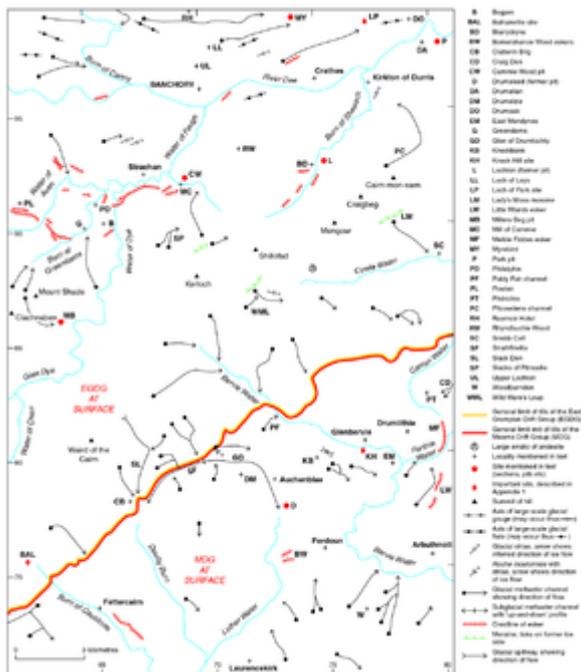
Oxygen Isotope Stage	Teindland/Elgin	Boyne Limestone Quarry/Keith	Gardenstown/Banff	Byth/Crossbrae	Kirkhill/Lays	Peterhead/Cruden	Ellon/Fyvie	Aberdeen	Banchory	Stonehaven
Flandrian (Holocene)										
Loch Lomond Stadial										
Windermere Interstadial										
Dimlington Stadial										
2a										
2b										
2c										
3										
4										
5a-c										
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References	Hall et al. (1995)	Sheet 96W Godwin and Willis (1959) Peacock and Merritt (2000a)	Sheet 96E Peacock and Merritt (1997)	Hall et al. (1995) Whittington et al. (1998)	Connell and Hall (1987)	Sheet 87E Connell and Hall (1987) Whittington et al. (1993)	Sheet 87W Connell and Hall (1987) Hall and Jarvis (1995)	Bremner (1931, 1943) McLean (1977) Munro (1986) Munro (1977)	Sheet 66E Vasari (1977)	Sheet 67 Auton et al. (2000)

NOTE: In general, minimal ages are shown. For example, Crossbrae Gelifluctate Bed may be OIS 2c to 4, Anderson Drive Diamiction may be OIS 6, Kirkhill Palaeosol Bed may be OIS 9 or 11. All Peat and Palaeosol beds are assigned to the group of the underlying or enclosing deposit. Italicized units are informal; they have not been entered into the BGS Lexicon.

Central Grampian Drift Group    East Grampian Drift Group    Banffshire Coast Drift Group    Logie-Buchan Drift Group    Meams Drift Group    Dated unit

# Tills

## Banchory Till Formation



Glacial and glaciofluvial features and the distribution of glacial deposits on Sheet

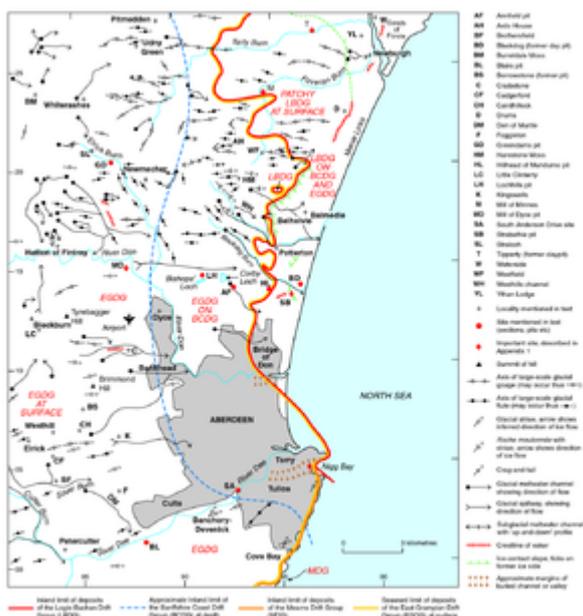
66E Banchory. P915380.



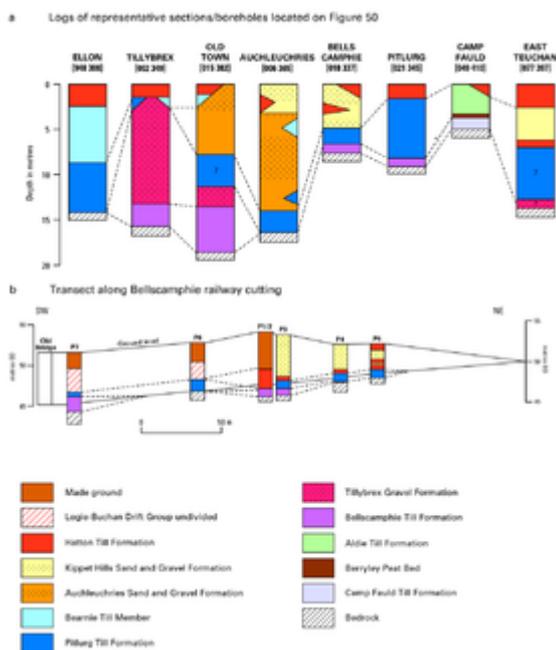
Subglacial till of the Banchory Till Formation. P266691.

Glacial sediments assigned to the Late Devensian Banchory Till Formation are typically sandy, gravelly or bouldery diamictos containing clasts of Dalradian psammite, pelite and semipelite, and Caledonian granitic rocks (P266691). Like most tills related to ice emanating from the East Grampian sheet, their composition closely reflects the nature of the underlying bedrock. For example, a lime-rich fertile soil has developed on the till on the flanks of Rhinbuckie Wood (NO 716 933), where calcareous strata crop out (P915380). The Banchory Till is generally less than 5 m thick, free-draining and notably overconsolidated. Typically it is pale to yellowish brown, although darker colours occur beneath the water table, ranging from greyish brown to olive-grey. Red and brown colours occur where the tills are developed on decomposed (reddened) granite bedrock.

The type area of the Banchory Till Formation is the upland on the southern flank of the Dee valley, between Banchory and Strachan, on Sheet 66E. A reference section occurs (NO 607 920) at a 5 m-high river cliff of the Burn of Granney (a tributary of the Water of Feugh), just to the west of Sheet 66E. The till is sandy, moderate brown in colour and contains abundant angular clasts of the underlying granite, together with psammite and microgranite. A further reference section (NO 6073 9199) occurs in a small working 400 m west-south-west of Finzean, also just to the west of the Sheet 66E. Bouldery subglacial diamictos of the Banchory Till Formation commonly occur at the base of the East Grampian Drift Group. More sandy and gravelly diamictos are locally interstratified with the overlying Lochton Sand and Gravel Formation and, in places, along the contact between the East Grampian and Mearns drift groups, they overlie the latter deposits (see above).



Glacial and glaciofluvial features and the distribution of glacial deposits on Sheet 77 Aberdeen. P915379.



Schematic logs and correlations in the Ellon area (after Hall and Jarvis, 1995). P915319.

Three probably Late Devensian members of the Banchory Till Formation have been established in the Aberdeen area (P915379), but only one is visible at the [Nigg Bay](#) site (P915347). The Nigg Till Member is dark greyish brown, contains clasts derived locally from the west to west-south-west and is typical of surficial tills in the lower Dee valley and to the south. The brown Kingswells Till Member is probably a local variant, having a west-south-west to east-north-east fabric and containing much 'Hill of Fare' granite. It is equivalent to Till B of Murdoch (1977) and its type area is the Kingswells-Culter-Aberdeen city area. A third unit, the dark grey Den Burn Member with locally derived clasts underlies the above-mentioned till in the vicinity of the Kingswells Roundabout (NJ 878 061). It has a north-west to south-east fabric and is equivalent to Till A of Murdoch (1977). It is possibly equivalent to the 'grey boulder clay' with clasts derived from the north-west, which Bremner (1934a, 1943) recorded as overlying 'dark shelly boulder clay' in excavations for the Anderson Drive Ring Road. The shelly unit is assigned here to the Banffshire Coast Drift Group (see above).

A fourth member of the Banchory Till Formation occurs in the Ellon-Bells Camphie area. This till, named here as the Bearnie Till Member, contains clasts of local provenance but is typically dark grey and contains a rich Jurassic palynoflora (Site 15 [Ellon](#)). The last two attributes are probably the result of glacial reworking of the older Pitlurg Till Formation (Banffshire Coast Drift Group). The Bearnie Till is overlain by the red, Hatton Till Formation (P915347; P915319).

## Other units

Most surficial tills of the Late Devensian East Grampian ice sheet occurring to the north and west of Sheet 76E Inverurie and Sheet 77 Aberdeen have not yet been assigned to lithostratigraphical formations. However, the Hythie Till Formation (Kirkhill Upper Till) has been identified at several sites in central Buchan, including [Oldmill](#) (Site 8). The Hythie Till probably correlates with the Byth Till Formation at the [Howe of Byth](#) site and the Crovie Till Formation at [Gardenstown](#) (P915347). The relationship of the Hythie Till Formation to the Aldie Till Formation at the Camp Fauld site is

uncertain, but the latter unit may be of an earlier Devensian age ([P915347](#); Site 14 [Moss of Cruden](#)). The granite-rich till at the base of the Sandford Bay sequence is named here as the [Sandford Bay Till Member](#) of the Hythie Till Formation.

Pre-Devensian tills derived from the west, north-west and possibly also north have been identified at several localities. They include the Rottenhill Till Formation (Kirkhill Lower Till) at Kirkhill assigned to OIS 6, together with two other units of possibly similar age, the Crossbrae Till Formation at Crossbrae and the Bellscamphie Till Formation in the Ellon area ([P915347](#); Site 15 [Ellon](#)). The group also includes the oldest known till in the district, the Leys Till Formation of the Kirkhill sequence, which is probably at least as old as OIS 8 ([P915347](#)). The Leys Till is also the oldest Pleistocene glacial deposit known onshore in Scotland.

## Sands and gravels

### Lochton Sand and Gravel Formation

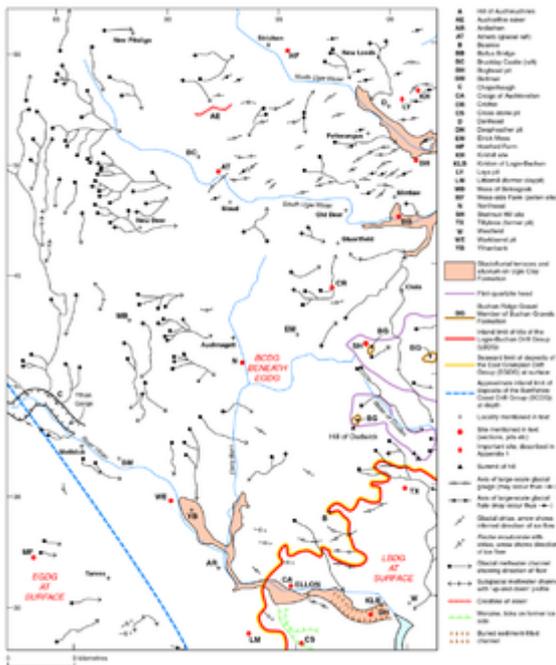
Coarse-grained glaciofluvial deposits of the Lochton Sand and Gravel Formation are characterised by clasts of Dalradian metamorphic rocks and Caledonian granitic rocks, both of relatively local provenance. Sandier units are typically pale yellowish brown in colour. Coarse-, medium- and fine-grained quartzo-feldspathic sands are common, normally forming upward-coarsening units. The formation includes mounded (ice-contact) and terraced (sheet) deposits that both commonly pass downwards into laminated silt and clay of the Glen Dye Silts Formation. Sharp erosional contacts on to the underlying Banchory Till Formation are evident, especially at the base of terraced spreads.

The type locality of the Lochton Sand and Gravel Formation is Lochton Pit (NO 749 926) in the valley of the Burn of Sheeoch, on Sheet 66E (Auton et al., 1988; Brown, 1994) ([P915380](#)). Here, a coarsening-upward deltaic sequence of sand and gravel up to 5.4 m thick overlies interlaminated clay and silt of the Glen Dye Silts Formation. Reference sections occur between 0.4 and

5.2 m depth in BGS Borehole NO69SE15, sited on a kame terrace in the valley of the Water of Feugh, near Heugh Head, and in a trial pit (NO69SW5), dug into an esker ridge south-west of Easter Clune (Auton et al., 1990).

The 'lower sands and gravels' of the [Nigg Bay](#) section contain clasts that are predominantly derived from the Dee valley to the west. Importantly however, they contain very sparse Scandinavian erratics and flint ([Erratics](#); [P915294](#)). The unit is named here as the Ness Sand and Gravel Member of the Lochton Sand and Gravel Formation.

### Other units



Glacial and glaciofluvial features and the distribution of glacial deposits on Sheet 87W Ellon. P915376.

Several other units of sand and gravel have been assigned to the East Grampian Drift Group, most predating the Late Devensian (P915347). The Pishlinn Burn Gravel Bed, which underlies the Whitehills Glacigenic Formation at Gardenstown, is tentatively placed within the group, although its age and origin is problematic (Peacock and Merritt, 1997; Site 3 Gardenstown). At the former Tillybrex gravel pit (NK 001 347), 6 km northeast of Ellon (P915376), over 11 m of weathered gravels with no morphological expression are overlain by brown till of westerly derivation, capped in turn by red diamicton and clay of the Logie-Buchan Drift Group (Merritt, 1981). The gravels at Tillybrex are here named the Tillybrex Gravel Formation. Although no contact has been recorded, the gravels appear to occur stratigraphically below patchy deposits of dark grey till correlated with the Pitlurg Till Formation of the Banffshire Coast Drift Group (Hall and Jarvis, 1995; Ellon). The gravels are underlain by yellowish brown sandy till containing clasts of psammite from the west, together with some well-rounded quartz, quartzite and flint pebbles derived from the Buchan Gravels Formation. This till, correlated with the pre-Devensian Bellscamphie Till by Hall and Jarvis (1995), overlies weathered psammite bedrock. Like the Bellscamphie Till, the Tillybrex Gravel most probably predates the Devensian (P915347).

The westerly palaeocurrent of the Tillybrex Gravel Formation is broadly similar to the gravels at Oldmill (NK 023 440) and the Denend Gravel Formation (Leys Lower Gravel) of the Kirkhill sequence. It suggests that ice advanced into eastern Buchan during a pre-Devensian cold stage(s), perhaps as old as OIS 8 (Oldmill, Kirkhill and Ellon). Other pre-Devensian units at Kirkhill assigned to the East Grampian Drift Group include the Pitscow Sand and Gravel Formation (Kirkhill Lower Sand and Gravel) and the Swineden Sand Bed (P915347). The Birnie Gravel Formation, which underlies the Benholm Clay at the Burn of Benholm site, is also assigned to the East Grampian Drift Group.

## Glaciolacustrine deposits



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