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The dalradian of central Donegal: An example of polyphase mid-crustal thrusting

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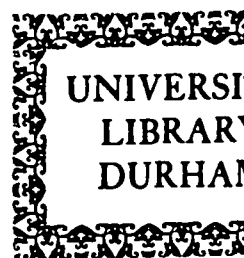
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I would sincerely like to thank Prof. W. S. Pitcher of the University of Liverpool for the loan of his original field sheets for the area of detailed mapping.

Theris
1987/ALS



GEOLOGICAL MAP OF CENTRAL DONEGAL, IRELAND.

MAP 1 DALRADIAN STRATIGRAPHY AND BEDDING

DALRADIAN SUPERGROUP

- Killileer Quartzite
- Termon Pelite / Lough Eske Psammite
- Boutypatrick Grit
- Croaghbruid Pelite
- Tectonic slide
- Reelian Formation
- Gauguin Quartzite
- Port Askaig Tillite
- Croveenananta Formation

STRUCTURAL SYMBOLS

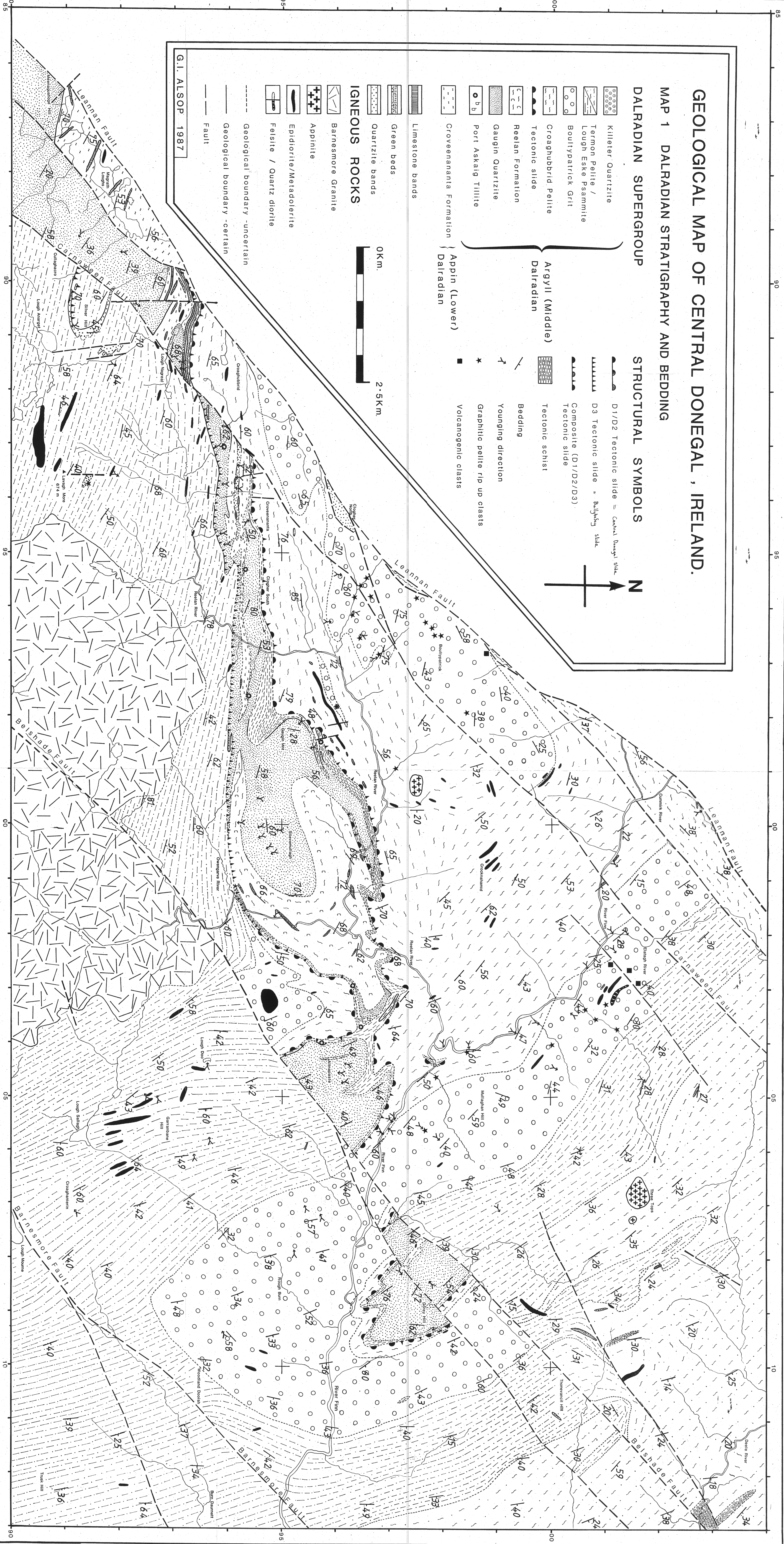
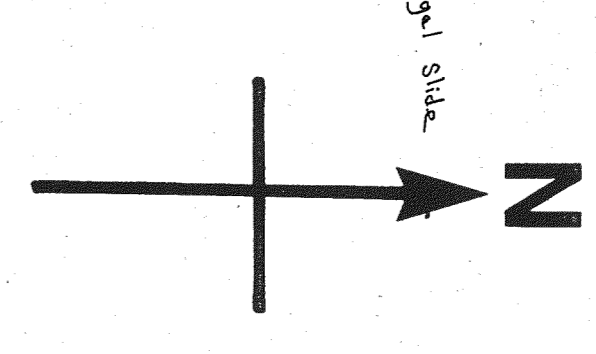
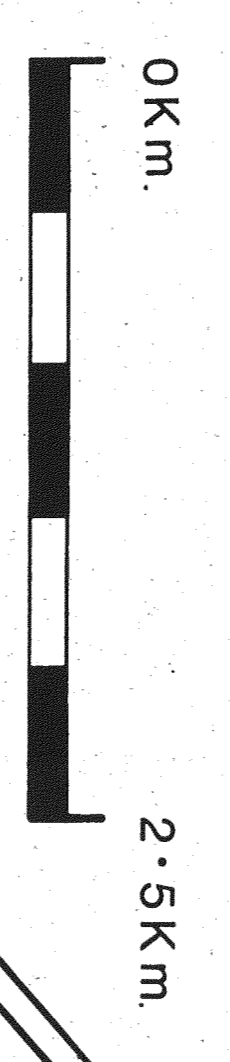
- D1/D2 Tectonic slide = Central Donegal Slide
- D3 Tectonic slide = Ballyshay Slide
- Composite (D1/D2/D3) Tectonic slide
- Tectonic schist
- Bedding
- Younging direction
- Graphitic pelite rip up clasts
- Volcanogenic clasts

IGNEOUS ROCKS

- Limestone bands
- Green beds
- Quartzite bands
- Barnesmore Granite
- Apatite
- Epidiorite/Metadiorite
- Felsite / Quartz diorite

- Geological boundary - uncertain
- Geological boundary - certain
- Fault

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GEOLOGICAL MAP OF CENTRAL DONEGAL, IRELAND.

MAP 2 SYNOPSIS OF D2 STRUCTURES

DALRADIAN SUPERGROUP

- Killteer Quartzite
- Termon Pelite / Lough Eske Psammite
- Boultypatrick Grit
- Croaghbruid Pelite
- Tectonic slide
- Reelan Formation
- Gaugin Quartzite
- Port Askaig Tuffite
- Croveenananta Formation

- Argyll (Middle) Dalradian
- Appin (Lower) Dalradian

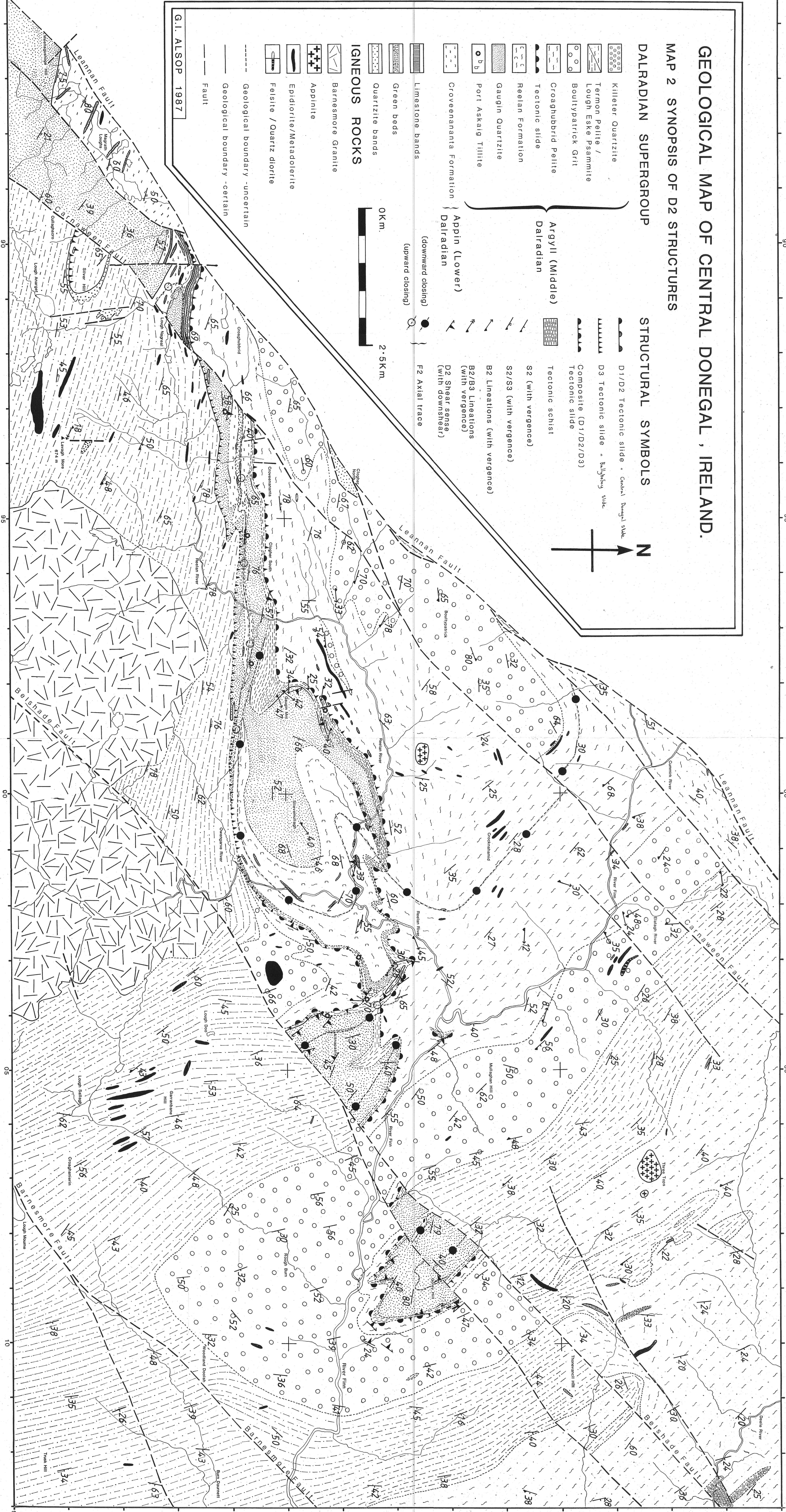
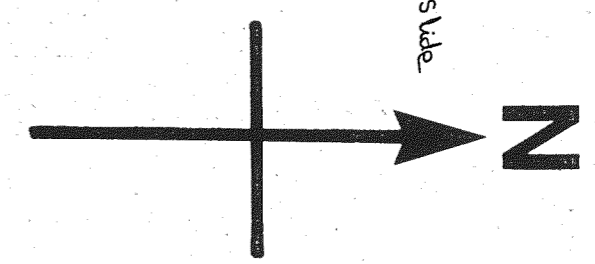
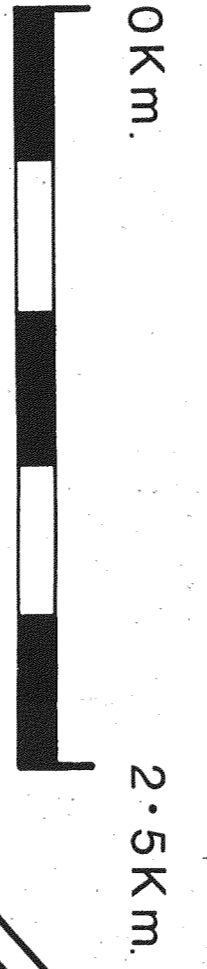
STRUCTURAL SYMBOLS

- D1/D2 Tectonic slide - Central Donegal slide
- D3 Tectonic slide - Ballybeg slide
- Composite (D1/D2/D3) Tectonic slide
- Tectonic schist
- S2 (with vergence)
- S2/S3 (with vergence)
- B2 Lineations (with vergence)
- B2/B3 Lineations (with vergence)
- D2 Shear sense (with downshear)
- F2 Axial trace

- ### IGNEOUS ROCKS
- Limestone bands
 - Green beds
 - Quartzite bands
 - Barnesmore Granite
 - Appinite
 - Epidiorite/Metadiorite
 - Felsite / Quartz diorite

- Geological boundary - uncertain
- Geological boundary - certain
- Fault

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GEOLOGICAL MAP OF CENTRAL DONEGAL, IRELAND.

MAP 3 SYNOPSIS OF D3 STRUCTURES

DALRADIAN SUPERGROUP

- Killeter Quartzite
- Termon Pelite / Lough Eske Psemmite
- Boultypatrick Grit
- Croaghubbriid Pelite
- Tectonic slide
- Reelan Formation
- Gauguin Quartzite
- Port Askaig Tillite
- Crovenananta Formation

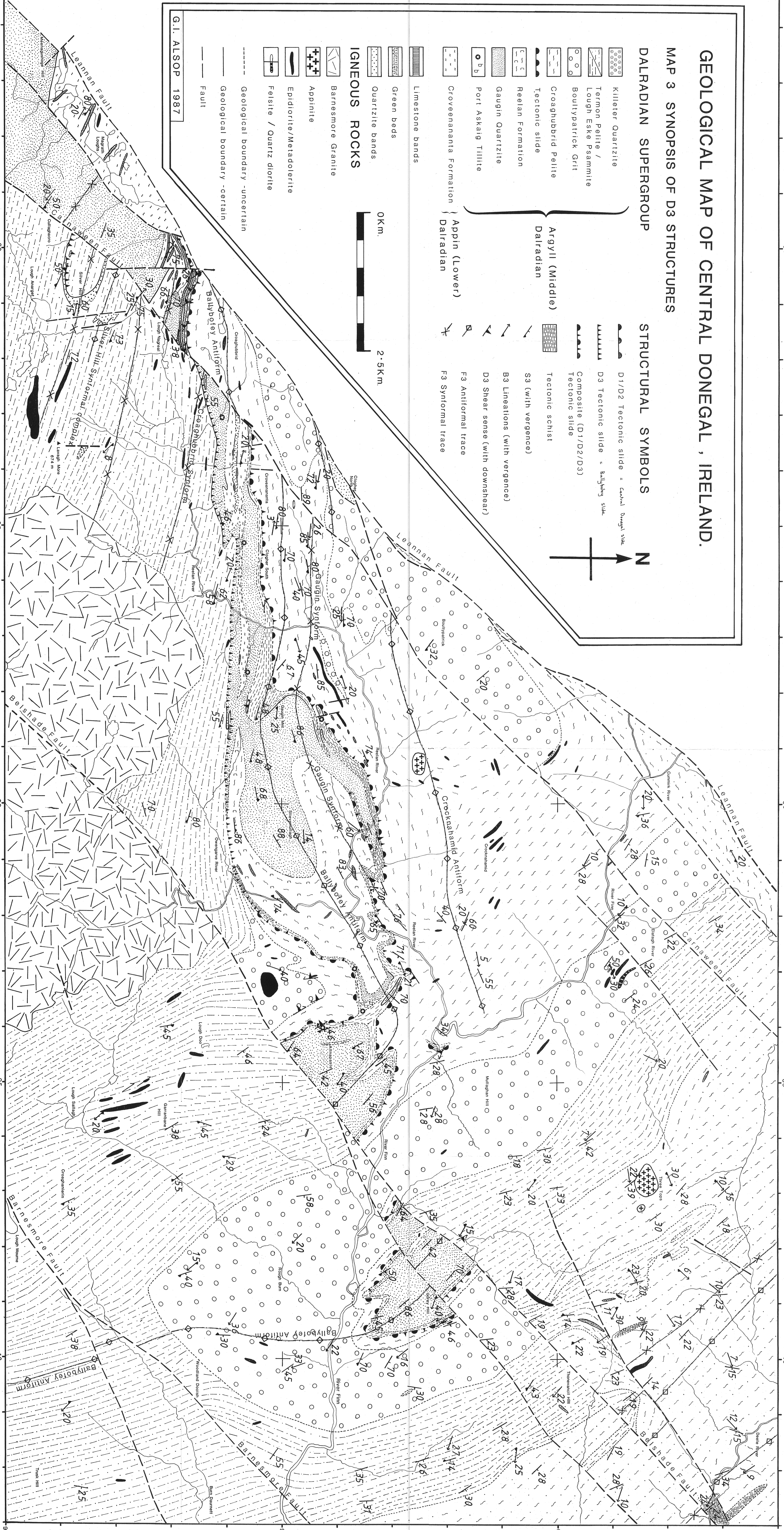
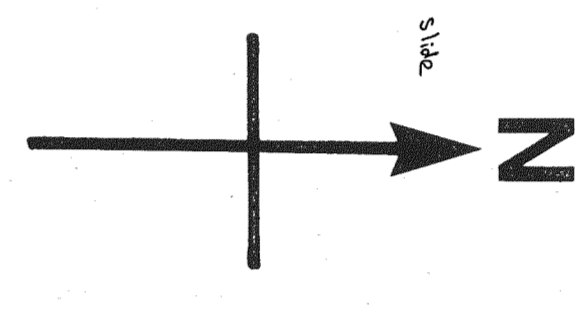
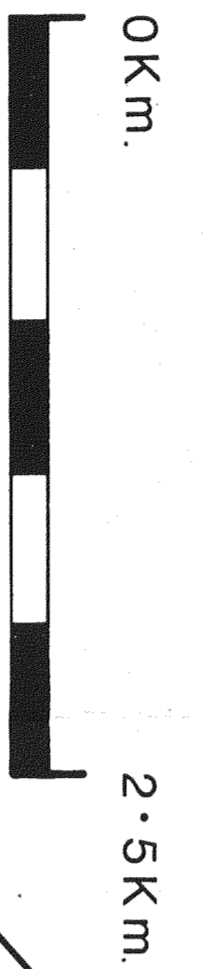
- ### STRUCTURAL SYMBOLS
- D1/D2 Tectonic slide = Central Donegal slide
 - D3 Tectonic slide = Ballybeggy slide
 - Composite (D1/D2/D3) Tectonic slide
 - Tectonic schist
 - S3 (with vergence)
 - B3 Lineations (with vergence)
 - D3 Shear sense (with downshear)
 - F9 Antiformal trace
 - F3 Synformal trace

IGNEOUS ROCKS

- Limestone bands
- Green beds
- Quartzite bands
- Barnesmore Granite
- Appinitic
- Epidiorite/Metadiorite
- Felsite / Quartz diorite

- Geological boundary - uncertain
- Geological boundary - certain
- Fault

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GEOLOGICAL MAP OF CENTRAL DONEGAL, IRELAND.

MAP 4 SYNOPSIS OF D4 STRUCTURES

DALRADIAN SUPERGROUP

- Kilteer Quartzite
 - Termon Pelite / Lough Eske Psammite
 - Boulypatrick Grit
 - Croaghshrubrid Pelite
 - Tectonic slide
 - Reelan Formation
 - Gauguin Quartzite
 - Port Askaig Tiltite
 - Croveenanania Formation
- } Appin (Lower)
} Dalradian

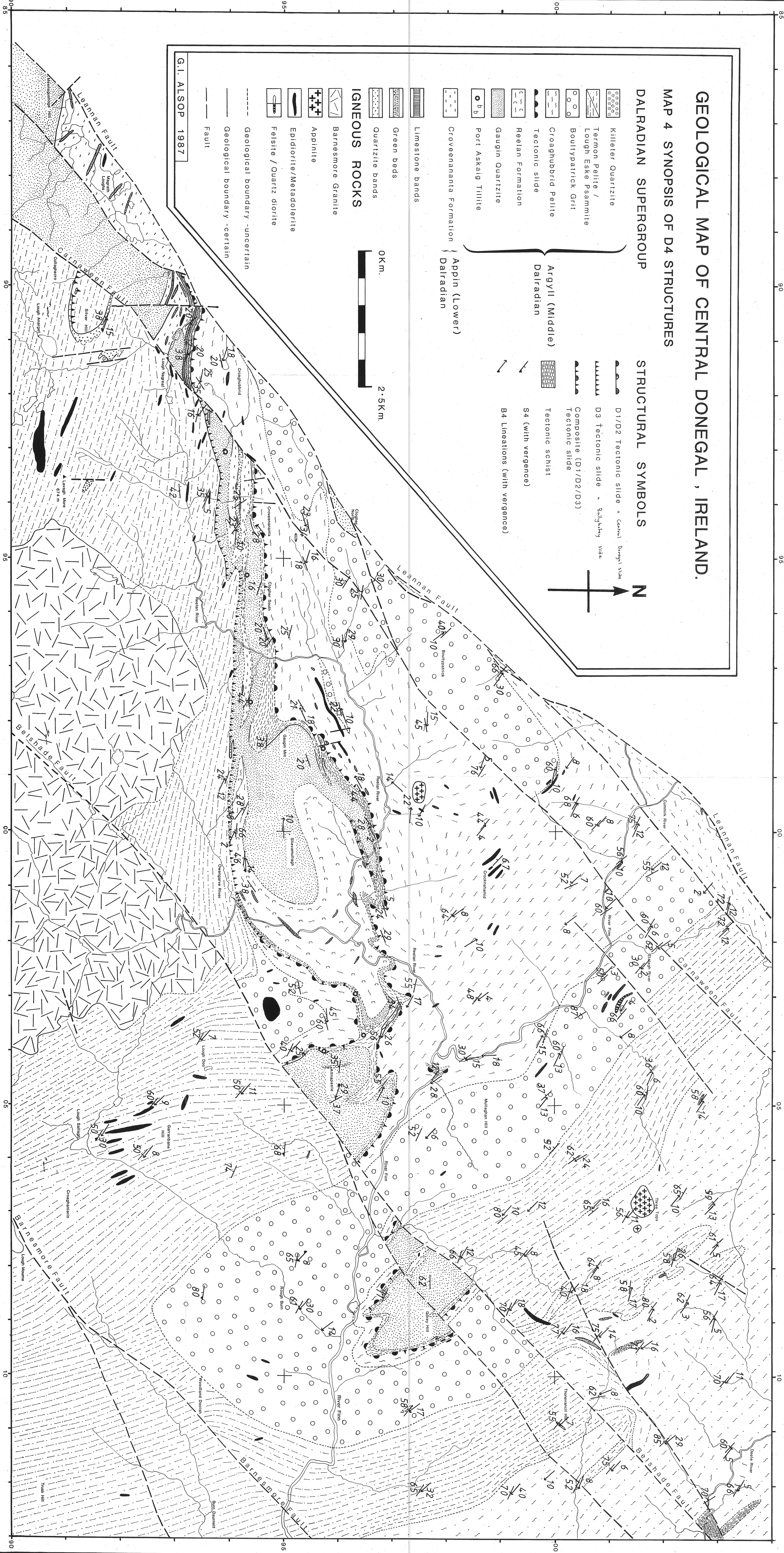
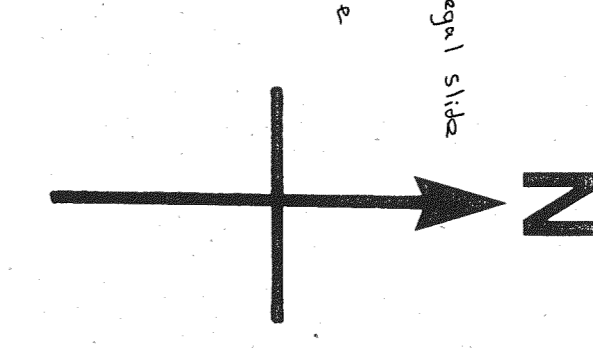
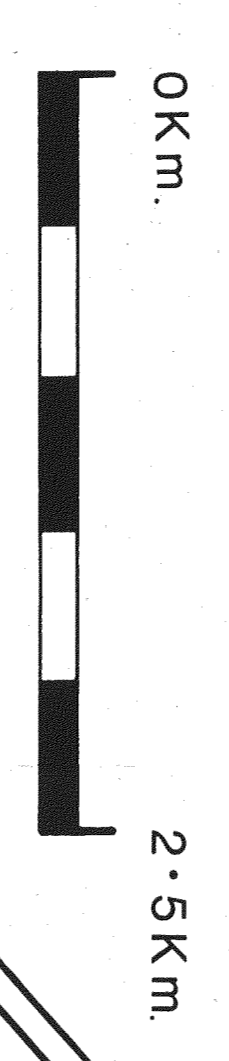
STRUCTURAL SYMBOLS

- D1/D2 Tectonic slide - Central Donegal slide
- D3 Tectonic slide - Boulypatrick slide
- Composite (D1/D2/D3) Tectonic slide
- Tectonic schist
- S4 (with vergence)
- B4 Lineations (with vergence)

- ### IGNEOUS ROCKS
- Limestone bands
 - Green beds
 - Quartzite bands
 - Barnesmore Granite
 - Appinite
 - Epidiorite/Metadolerite
 - Felsite / Quartz diorite

- Geological boundary - uncertain
- Geological boundary - certain
- Fault

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GEOLOGICAL MAP OF CENTRAL DONEGAL, IRELAND.

MAP 5 SYNOPSIS OF D5 STRUCTURES

DALRADIAN SUPERGROUP

- Killiteer Quartzite
- Termon Pelite / Lough Eske Psammite
- Boulypatrick Grit
- Croaghbruid Pelite
- Tectonic slide
- Reelan Formation
- Gauguin Quartzite
- Port Askaig Tuffite
- Croveenananta Formation

Argyll (Middle) Dalradian

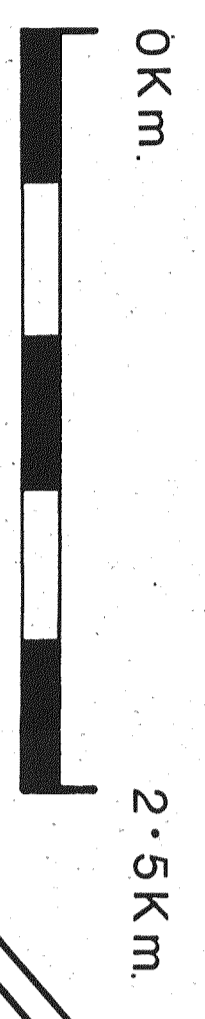
- Appin (Lower) Dalradian
- Green beds
- Quartzite bands

IGNEOUS ROCKS

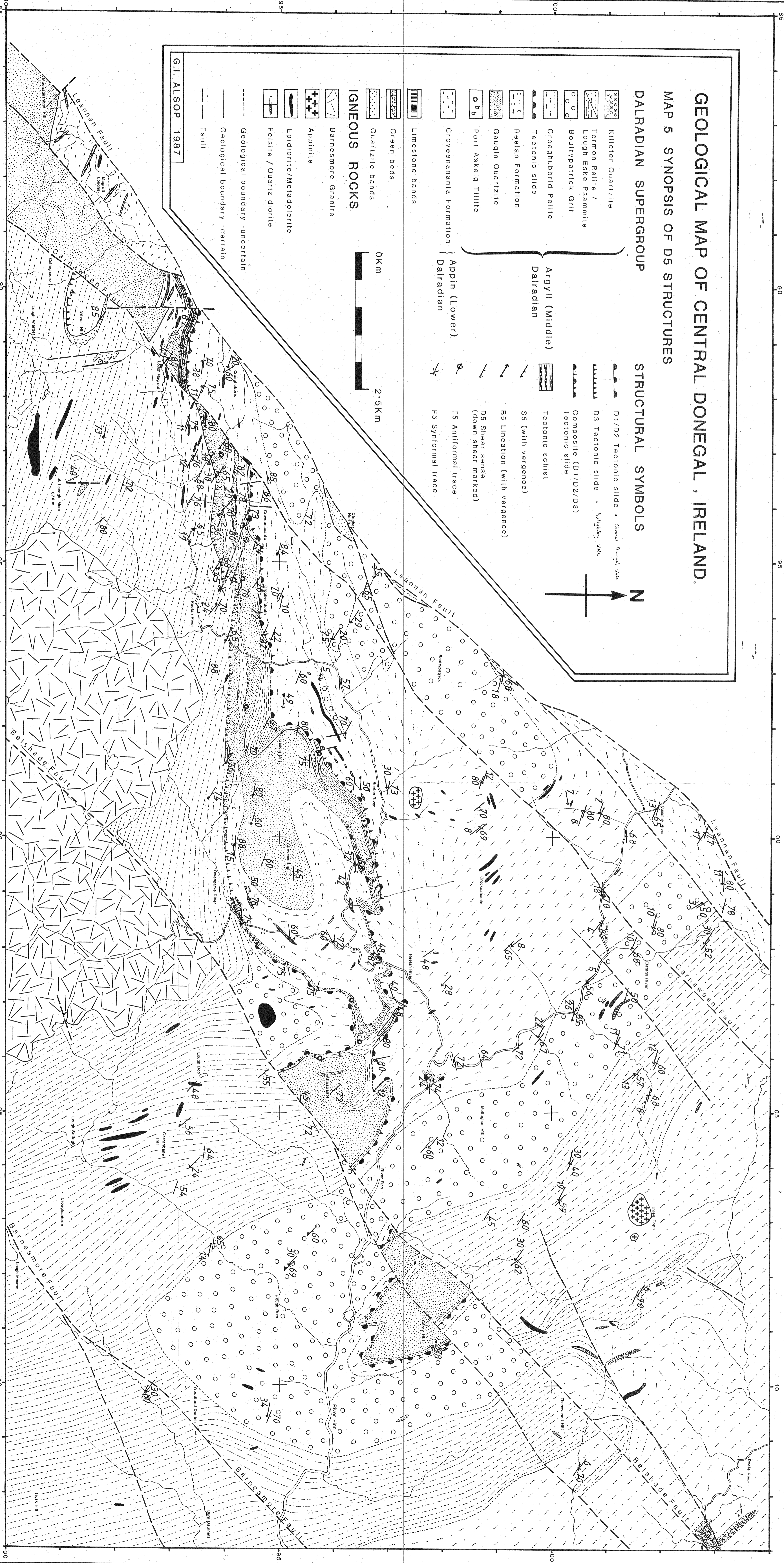
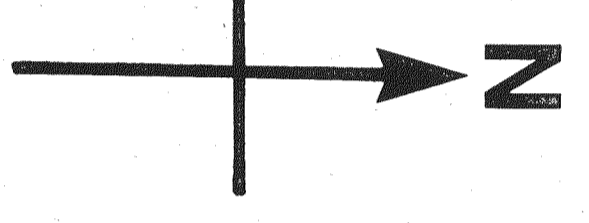
- Barnesmore Granite
- Apatite
- Epidiorite/Metadolerite
- Felsite / Quartz diorite

- Geological boundary - uncertain
- Geological boundary - certain
- Fault

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- ### STRUCTURAL SYMBOLS
- D1/D2 Tectonic slide - Central Donegal Slide
 - D3 Tectonic slide - Boulypatrick slide
 - Composite (D1/D2/D3) Tectonic slide
 - Tectonic schist
 - S5 (with vergence)
 - B5 Lineation (with vergence)
 - D5 Shear sense (down shear marked)
 - F5 Antiformal trace
 - F5 Synformal trace



GEOLOGICAL MAP OF CENTRAL DONEGAL, IRELAND.

MAP 6 SYNOPSIS OF D6 AND D7 STRUCTURES

DALRADIAN SUPERGROUP

- Killiter Quartzite
- Termon Pelite / Lough Eske Psammite
- Boulypatrick Grit
- Croaghbruid Pelite
- Tectonic slide
- Reelan Formation
- Gaugin Quartzite
- Port Askaig Tillite
- Croveenananta Formation
- Limestone bands
- Green beds
- Quartzite bands

IGNEOUS ROCKS

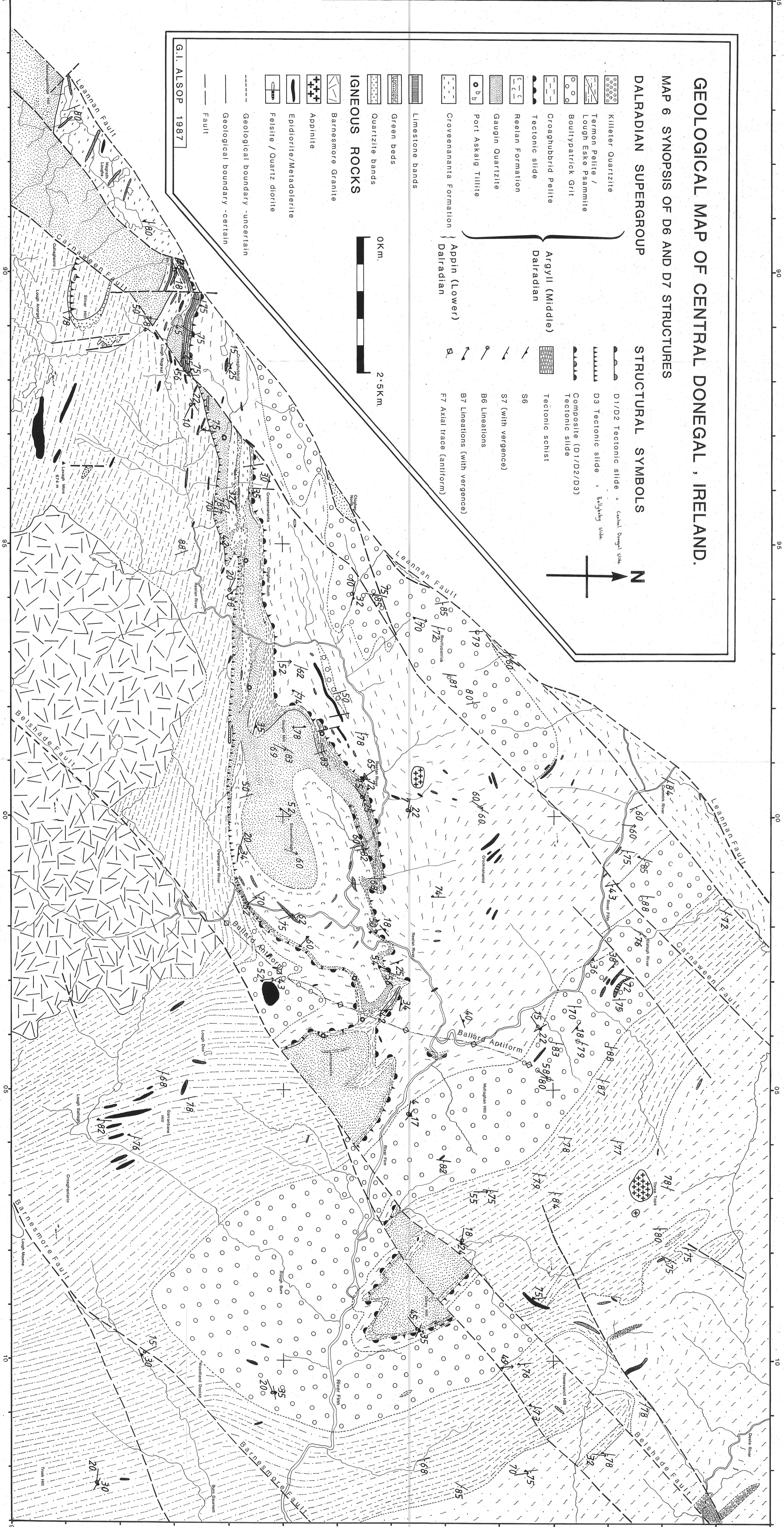
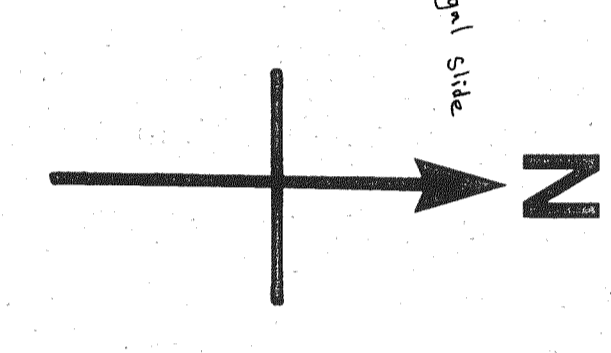
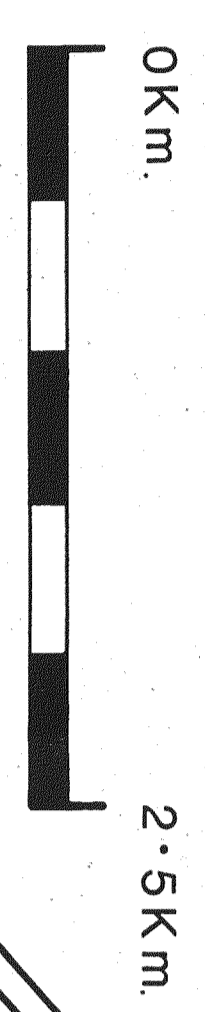
- Barnesmore Granite
- Appinite
- Epidiorite/Metadolerite
- Felsite / Quartz diorite

- Geological boundary - uncertain
- Geological boundary - certain
- Fault

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STRUCTURAL SYMBOLS

- D1/D2 Tectonic slide = Central Donegal Slide
- D3 Tectonic slide = Galway Slide
- Composite (D1/D2/D3) Tectonic slide
- Tectonic schist
- S6
- S7 (with vergence)
- S8 Lineations
- S7 Lineations (with vergence)
- F7 Axial trace (antiform)



GEOLOGICAL MAP OF CENTRAL DONEGAL, IRELAND.

MAP 7 SYNOPSIS OF D8 STRUCTURES

DALRADIAN SUPERGROUP

- Killalee Quartzite
- Ternon Pelite / Lough Eske Psammite
- Boultypatrick Grit
- Croaghbruid Pelite
- Tectonic slide
- Reelian Formation
- Gaugin Quartzite
- Port Askaig Tillite
- Croveenananta Formation

STRUCTURAL SYMBOLS

- D1/D2 Tectonic slide - Central Donegal Slide
- D3 Tectonic slide - Ballybegg Slide
- Composite (D1/D2/D3) Tectonic slide
- Tectonic schist
- S8 (with vergence)
- B8 Lineations (with vergence)
- F8 Axial trace (Synform)

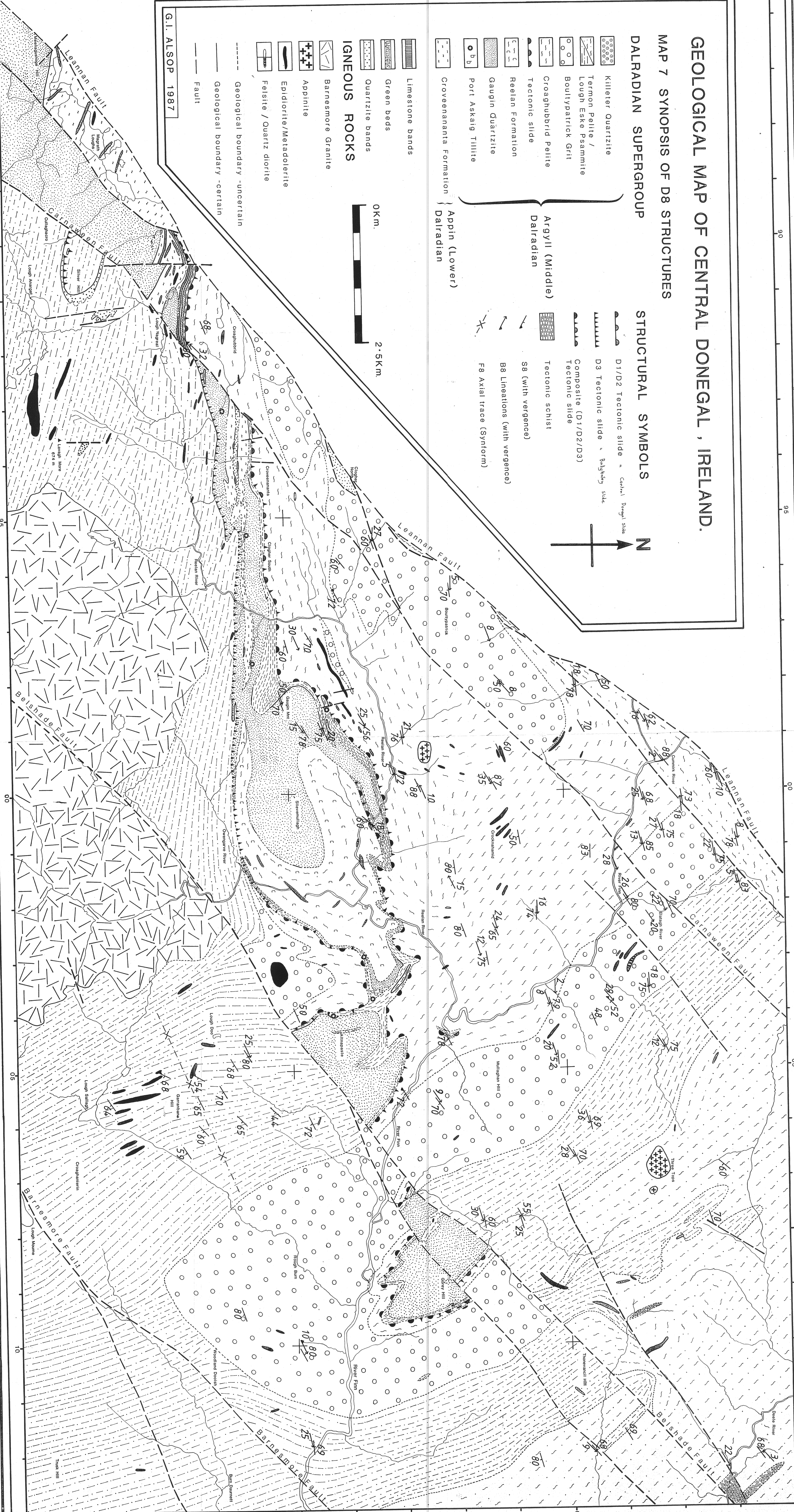
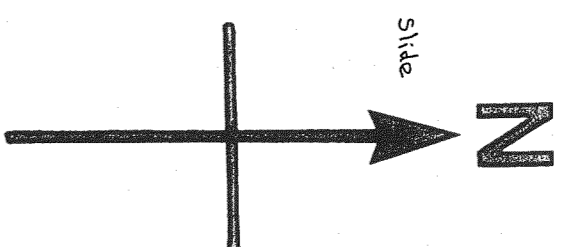
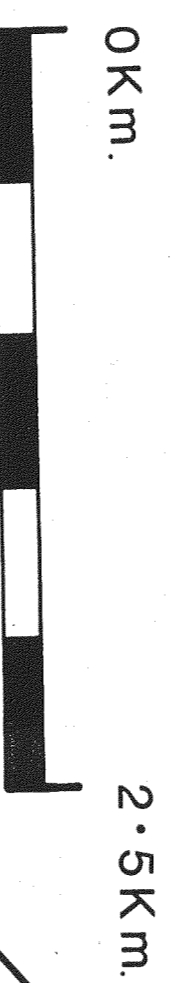
Appin (Lower)
Dalradian

IGNEOUS ROCKS

- Limestone bands
- Green beds
- Quartzite bands
- Barnesmore Granite
- Appinite
- Epidiorite/Metadolerite
- Felsite / Quartz diorite

- Geological boundary -uncertain
- Geological boundary -certain
- Fault

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GEOLOGICAL MAP OF CENTRAL DONEGAL, IRELAND.

MAP 8 SYNOPSIS OF D9 STRUCTURES

DALRADIAN SUPERGROUP

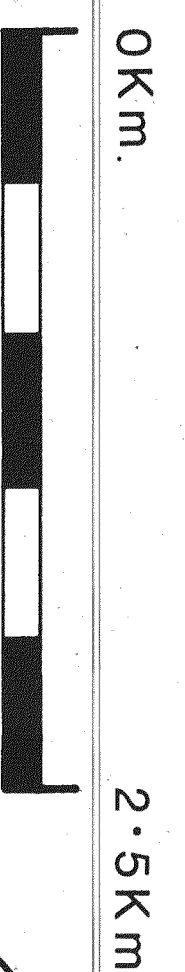
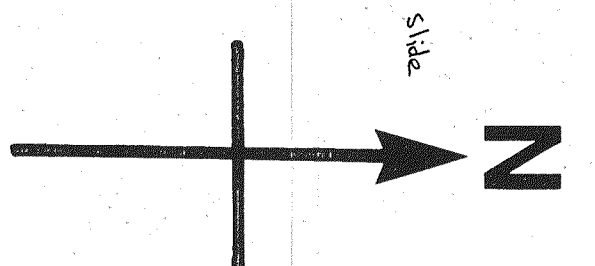
- Killeter Quartzite
- Termon Pelite / Lough Eske Psammite
- Boultypatrick Grit
- Croaghbruid Pelite
- Tectonic slide
- Reelan Formation
- Gaugin Quartzite
- Port Askaig Tillite
- Croveenanania Formation

Argyll (Middle)
Dalradian

Appin (Lower)
Dalradian

STRUCTURAL SYMBOLS

- D1/D2 Tectonic slide - Central Donegal slide
- D3 Tectonic slide - Ballybeggy slide
- Composite (D1/D2/D3) Tectonic slide
- Tectonic schist
- S9 (with vergence)
- B9 Lineations (with vergence)
- F9 Axial trace (antiform)

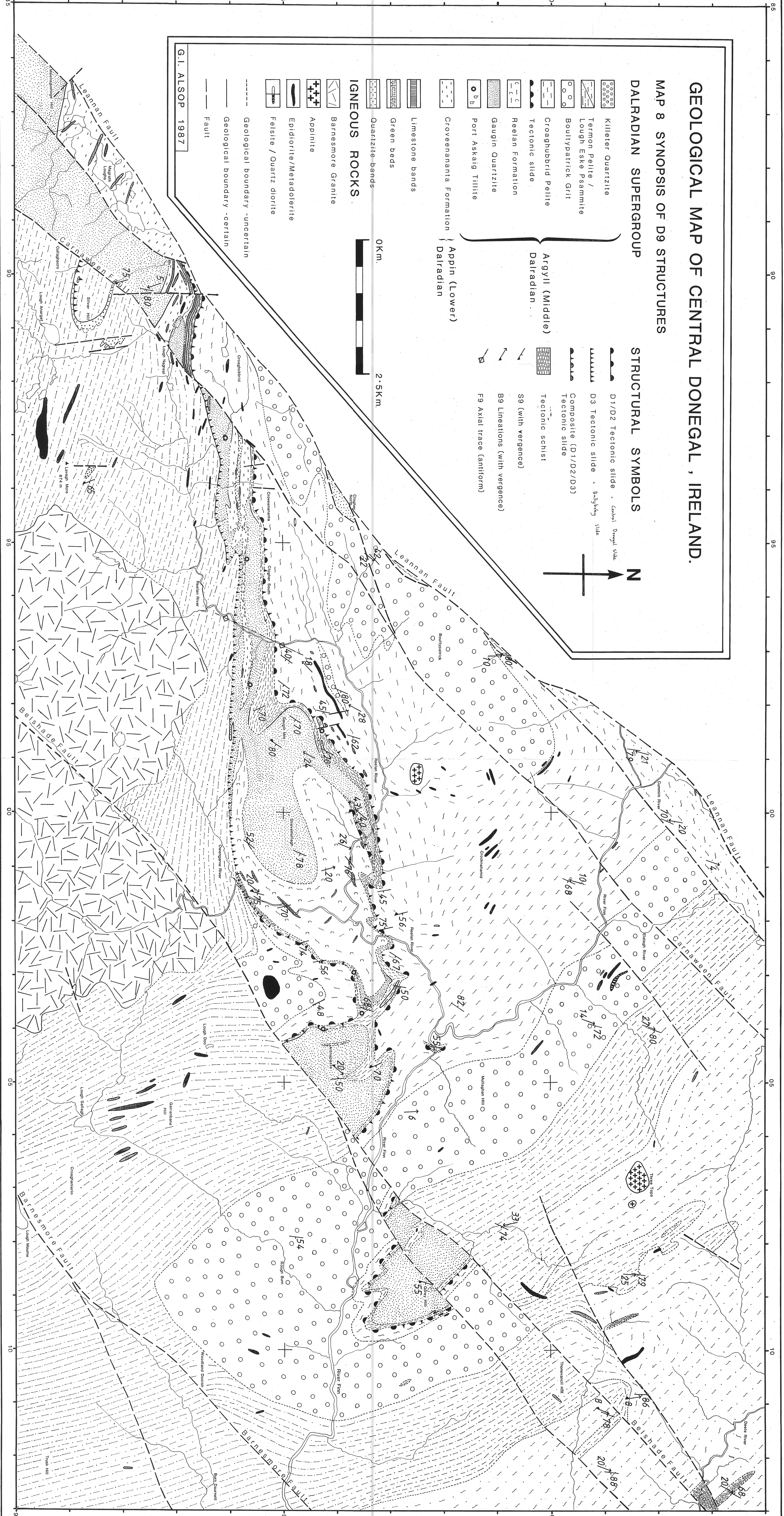


IGNEOUS ROCKS

- Barrenmore Granite
- Appinite
- Epidiorite/Metadolerite
- Felsite / Quartz diorite

----- Geological boundary - uncertain
 - - - - Geological boundary - certain
 - - - - Fault

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GEOLOGICAL MAP OF CENTRAL DONEGAL, IRELAND.

MAP 9 SYNOPSIS OF MINERAL LINEATIONS

DALRADIAN SUPERGROUP

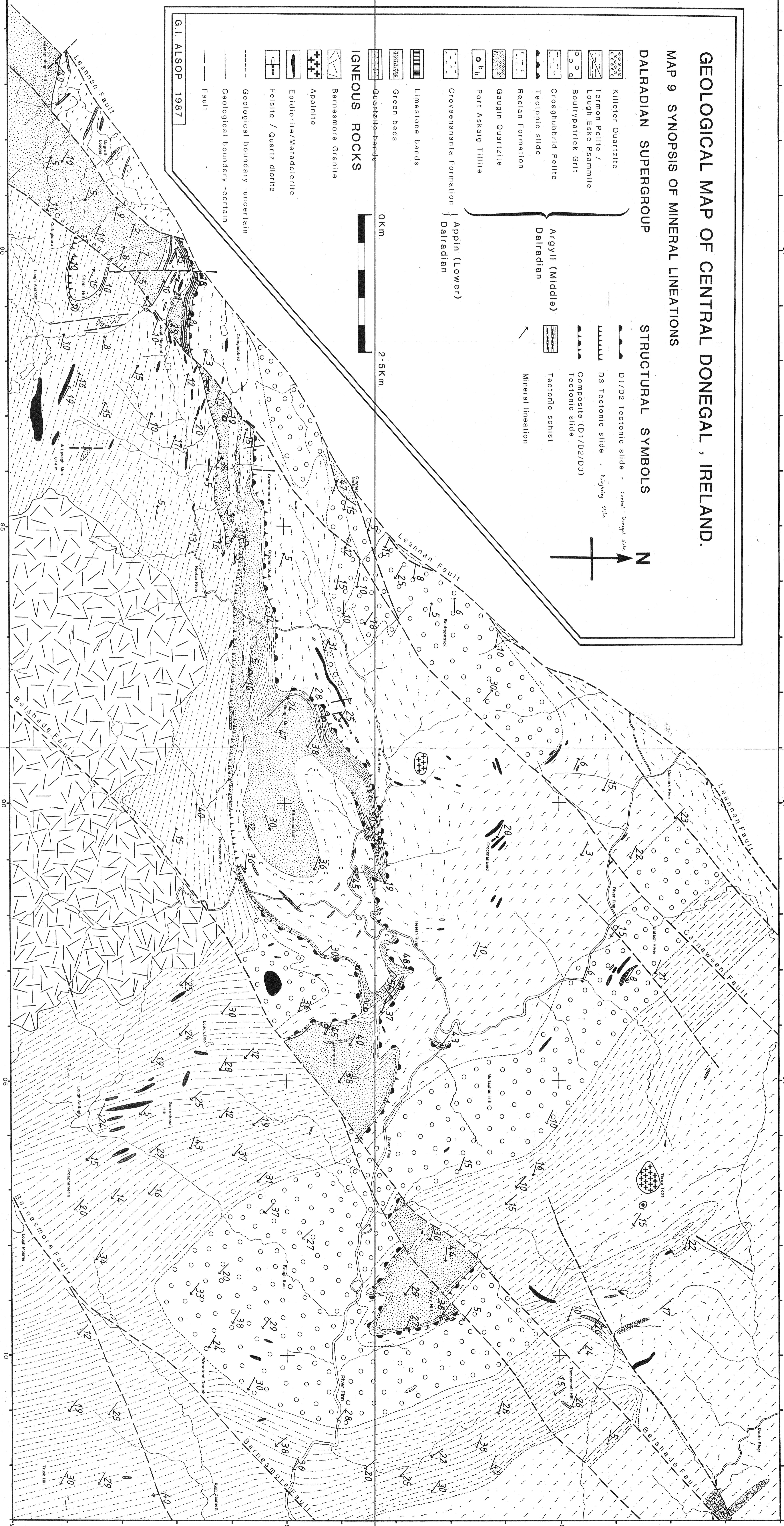
- Killteer Quartzite
- Termon Pelite / Lough Eske Psammite
- Boultypatrick Grit
- Craighubbrid Pelite
- Tectonic slide
- Reelan Formation
- Gaugin Quartzite
- Port Askaig Tiltite
- Croveenanania Formation

- D1/D2 Tectonic slide = Central Donegal Slide
- D3 Tectonic slide = Ballyvaughan Slide
- Composite (D1/D2/D3) Tectonic slide
- Tectonic schist
- Mineral lineation

IGNEOUS ROCKS

- Barnesmore Granite
- Appinite
- Epidiorite/Metadolerite
- Felsite / Quartz diorite

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GEOLOGICAL MAP OF CENTRAL DONEGAL, IRELAND.

MAP 10 SYNOPSIS OF FOLD AXIAL TRACES

DALRADIAN SUPERGROUP

- Killeter Quartzite
- Termon Pelite / Lough Eske Psammite
- Bouliypatrick Grit
- Croaghbridd Pelite
- Tectonic slide
- Reelan Formation
- Gauguin Quartzite
- Port Askaig Tillite
- Croveenananta Formation

Argyll (Middle) Dalradian

- F2 Sheath Axial trace (downward closing)
- F2 Sheath Axial trace (upward closing) with facing direction
- F3 Antiformal trace with facing direction
- F3 Synformal trace with facing direction
- F5 Antiformal trace
- F5 Synformal trace
- F7 Antiformal trace
- F8 Synformal trace
- F9 Antiformal trace

STRUCTURAL SYMBOLS

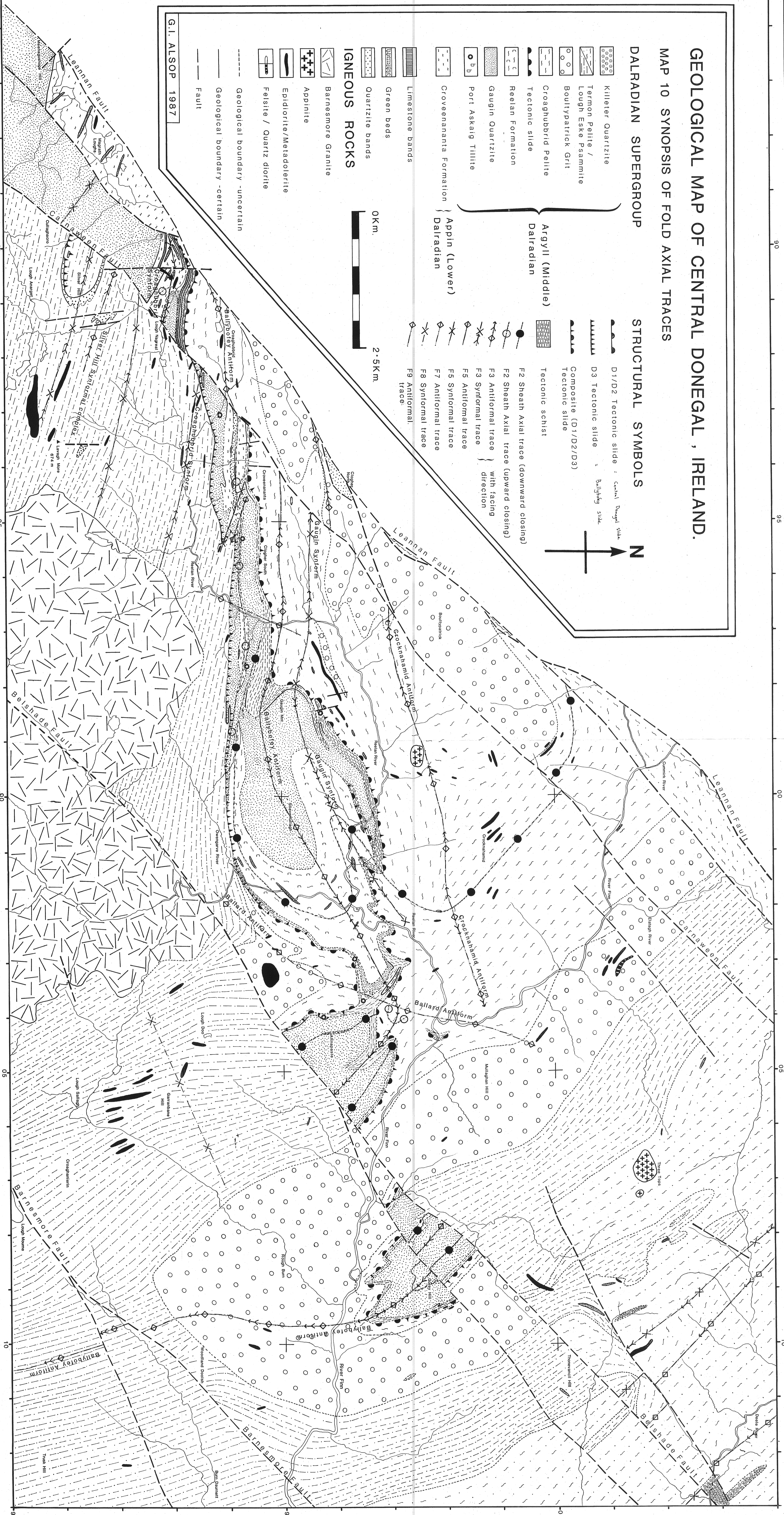
- D1/D2 Tectonic slide
- D3 Tectonic slide
- Composite (D1/D2/D3) Tectonic slide
- Tectonic schist

IGNEOUS ROCKS

- Barnesmore Granite
- Apatite
- Epidiorite/Metadolerite
- Felsite / Quartz diorite

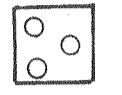

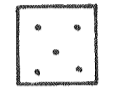
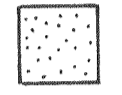
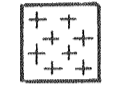



- Geological boundary - uncertain
- Geological boundary - certain
- Fault

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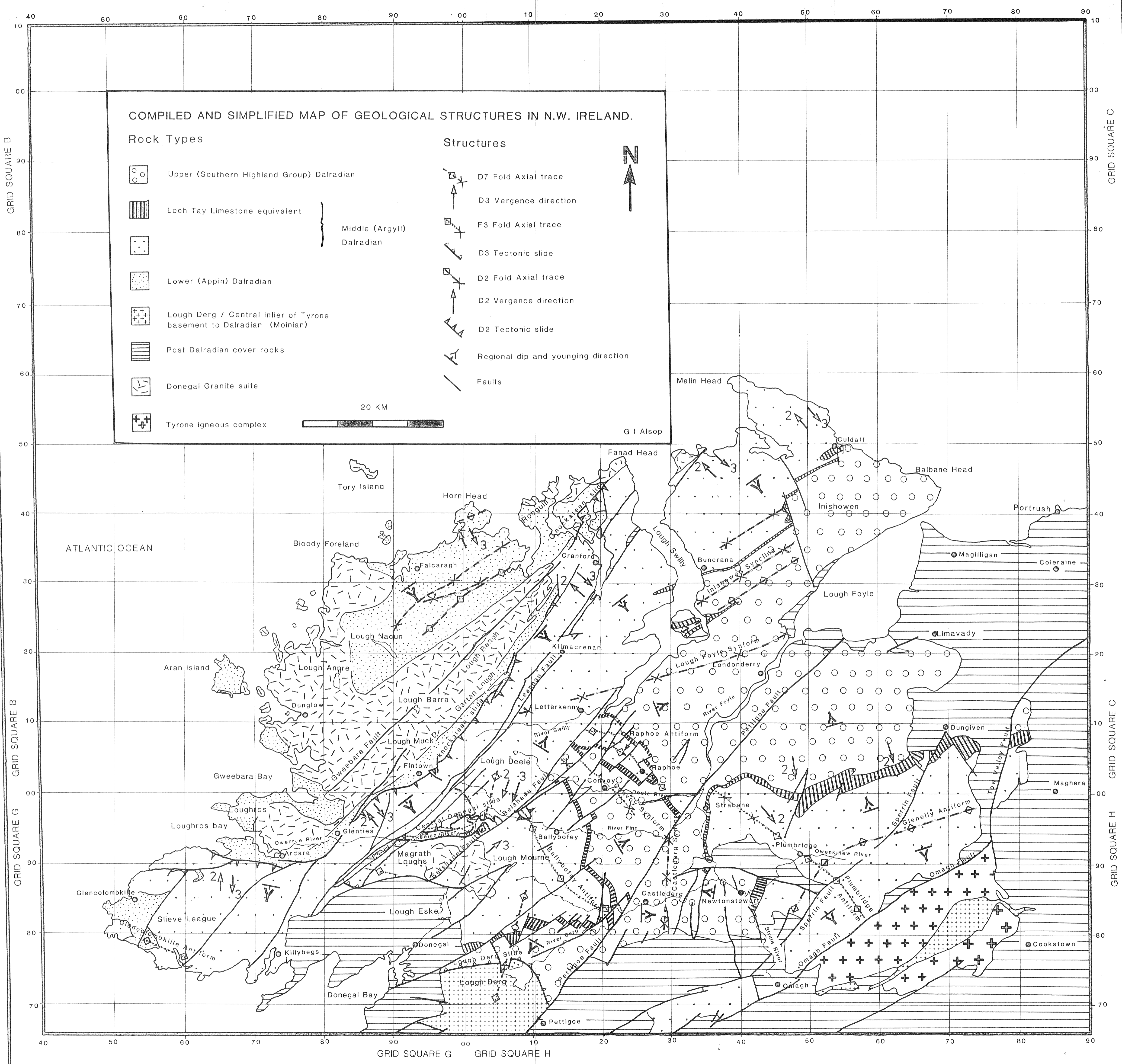
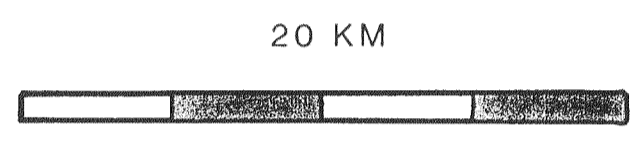
COMPILED AND SIMPLIFIED MAP OF GEOLOGICAL STRUCTURES IN N.W. IRELAND.

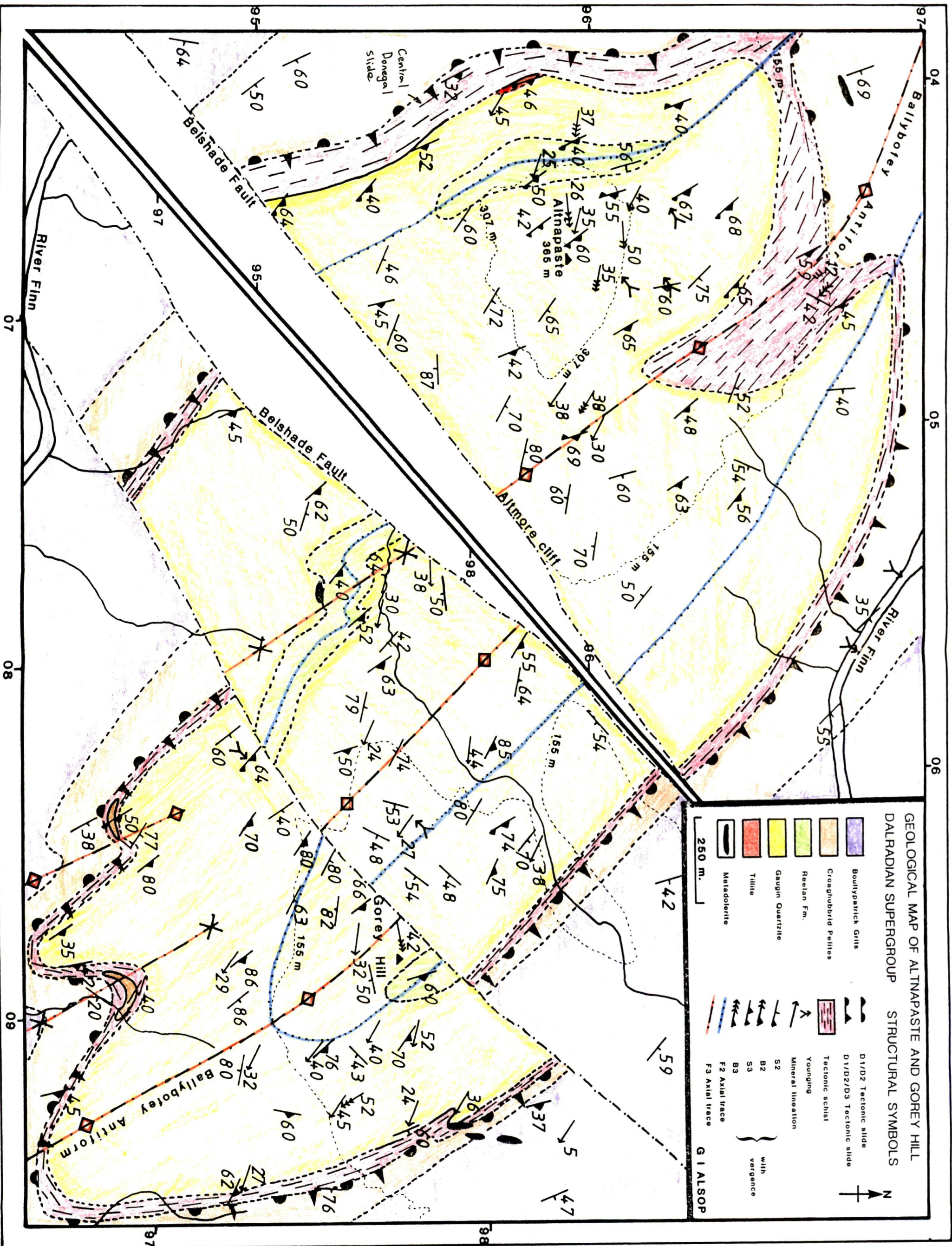
Rock Types

-  Upper (Southern Highland Group) Dalradian
-  Loch Tay Limestone equivalent
-  Middle (Argyll) Dalradian
-  Lower (Appin) Dalradian
-  Lough Derg / Central inlier of Tyrone basement to Dalradian (Moinian)
-  Post Dalradian cover rocks
-  Donegal Granite suite
-  Tyrone igneous complex

Structures

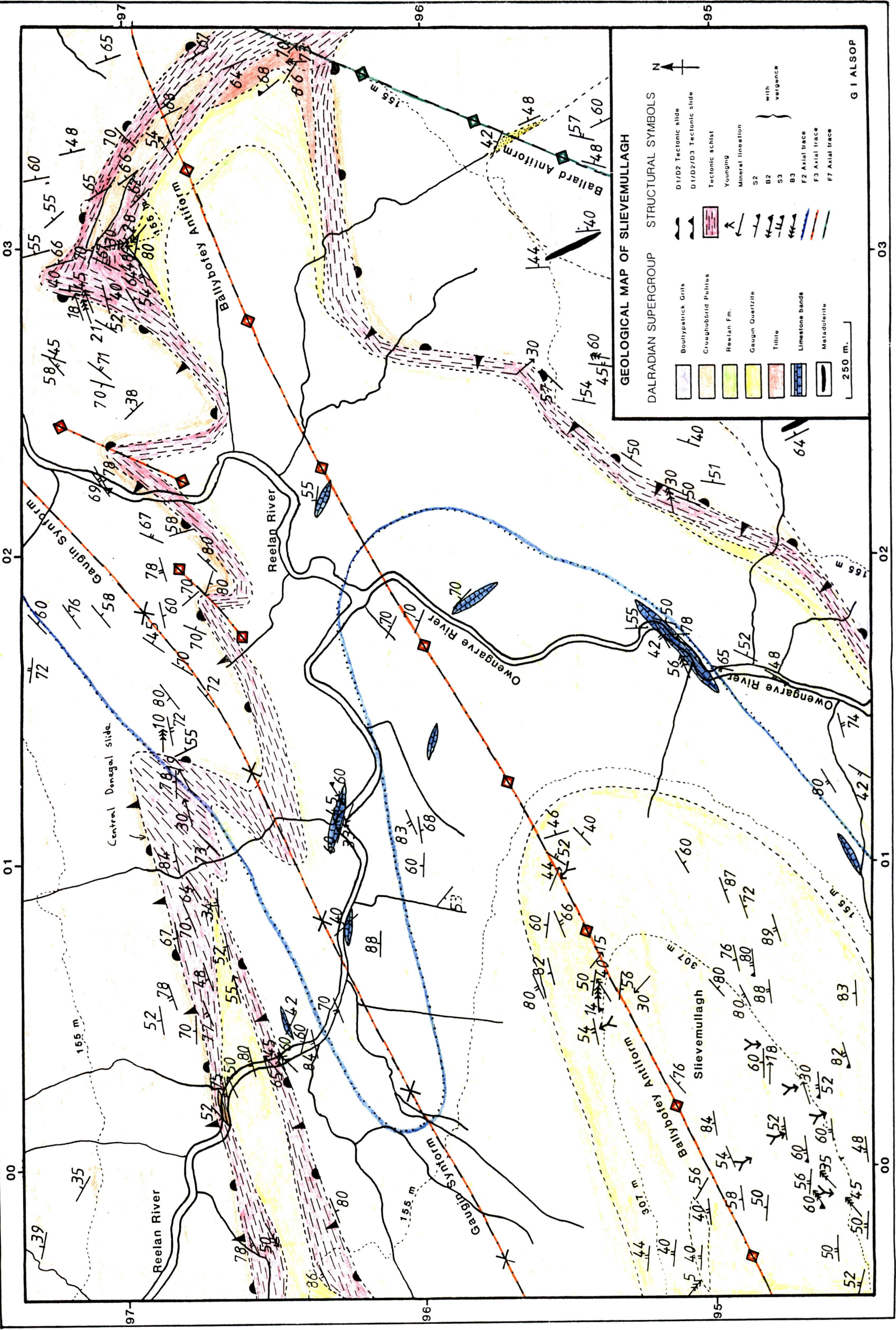
-  D7 Fold Axial trace
-  D3 Vergence direction
-  F3 Fold Axial trace
-  D3 Tectonic slide
-  D2 Fold Axial trace
-  D2 Vergence direction
-  D2 Tectonic slide
-  Regional dip and younging direction
-  Faults





MAP I 6





GEOLOGICAL MAP OF SLIEVEMULLAGH










DALRADIAN SUPERGROUP		STRUCTURAL SYMBOLS	
	Bouthpatrick Grits		D1/D2 Tectonic slide
	Croughbrid Pelites		D1/D2/D3 Tectonic slide
	Reelan Fm.		Tectonic schist
	Gaugin Quartzite		Younging
	Tillite		Mineral lineation
	Limestone bands		S2
	Metadolomite		B2
			S3
			B3
			F2 Axial trace
			F3 Axial trace
			F7 Axial trace

250 m. G I ALSOP





GEOLOGICAL MAP OF GAUGIN MOUNTAIN

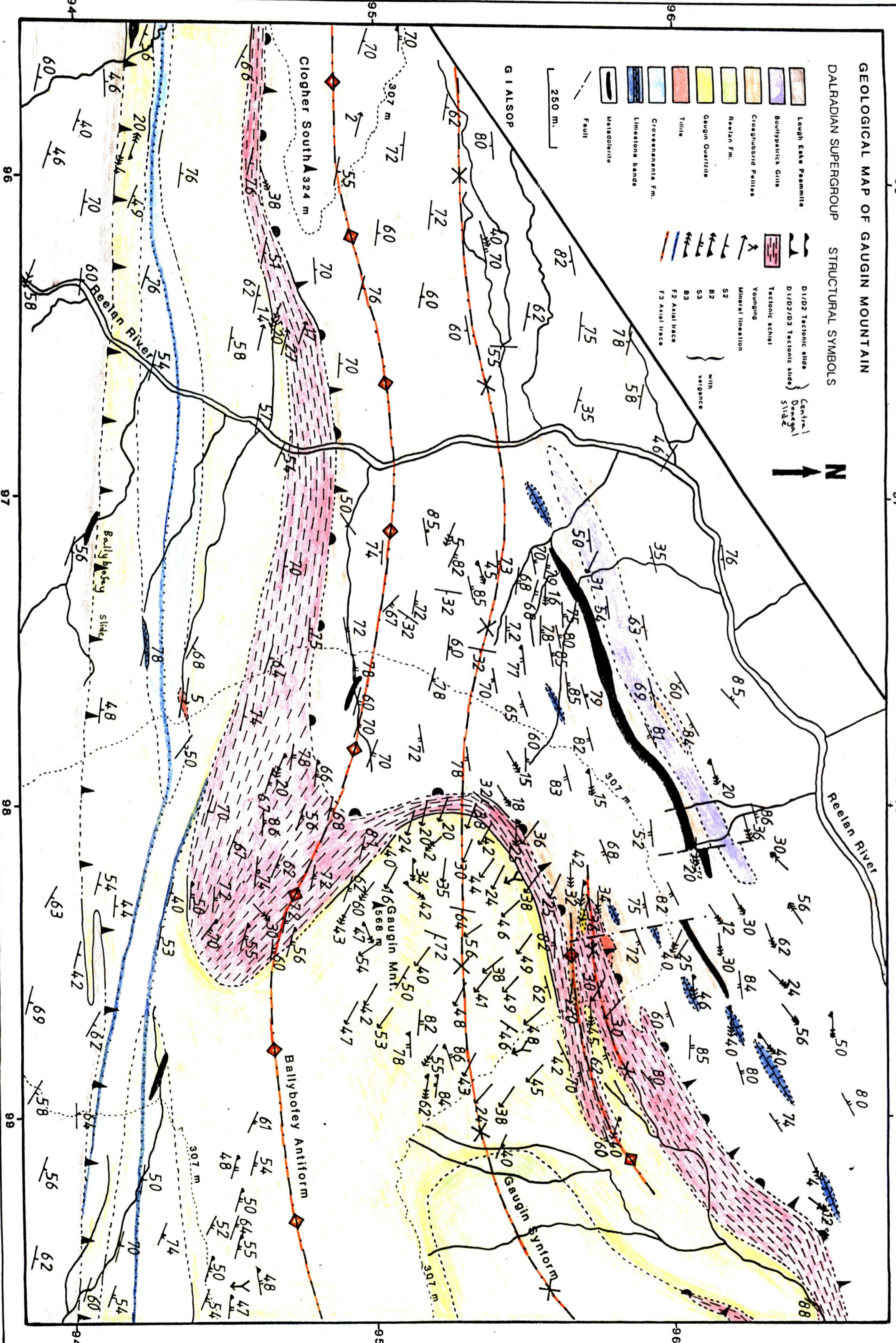
DALRADIAN SUPERGROUP

-  Lough Eke Psammite
-  Boulypatrick Gills
-  Croaghuddid Pelites
-  Reelan Fm.
-  Gaugin Quartzite
-  Trillite
-  Crovannanra Fm.
-  Limestone bands
-  Metadolomite

250 m.

STRUCTURAL SYMBOLS

-  D1/D2 Tectonic slide
-  D1/D2/D3 Tectonic slide
-  Tectonic schist
-  Younging
-  Mineral lineation
-  S2
-  B2
-  S3
-  B3
-  F2 Axial trace
-  F3 Axial trace
-  with vergence
-  Central Donegal slide



MAP I 4



GEOLOGICAL MAP OF GROVEENANANTA

DALRADIAN SUPERGROUP

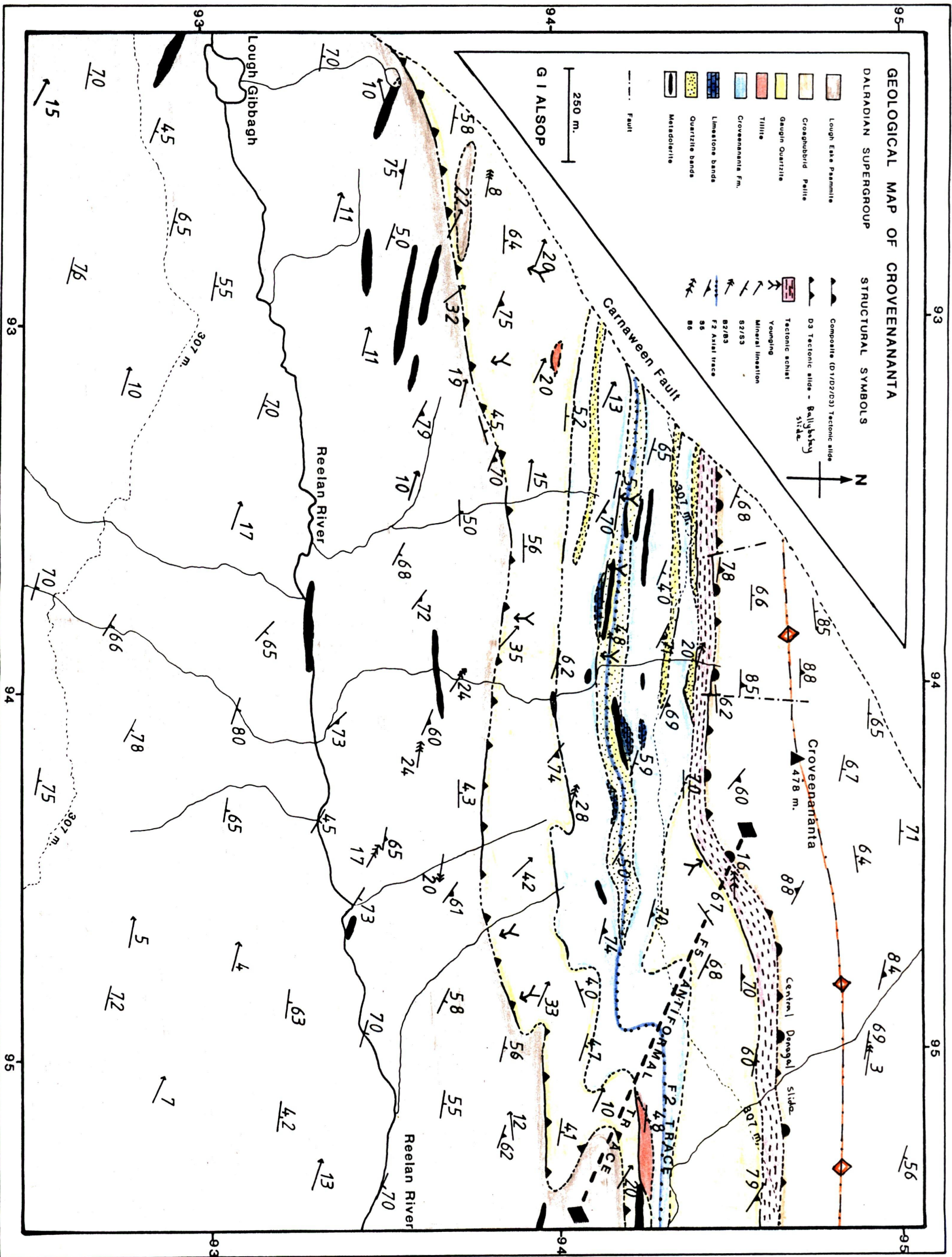
- Lough Eske Psammite
- Crosshubbrid Pelite
- Gaughin Quartzite
- Tiltite
- Groveenanta Fm.
- Limestone bands
- Quartzite bands
- Metadolomite

STRUCTURAL SYMBOLS

- Composite (D1/D2/D3) Tectonic slide
- D3 Tectonic slide - Ballyshesky slide
- Tectonic schist
- Younging
- Mineral lineation
- 82/83
- 82/83
- F2 Axial trace
- 95
- 86

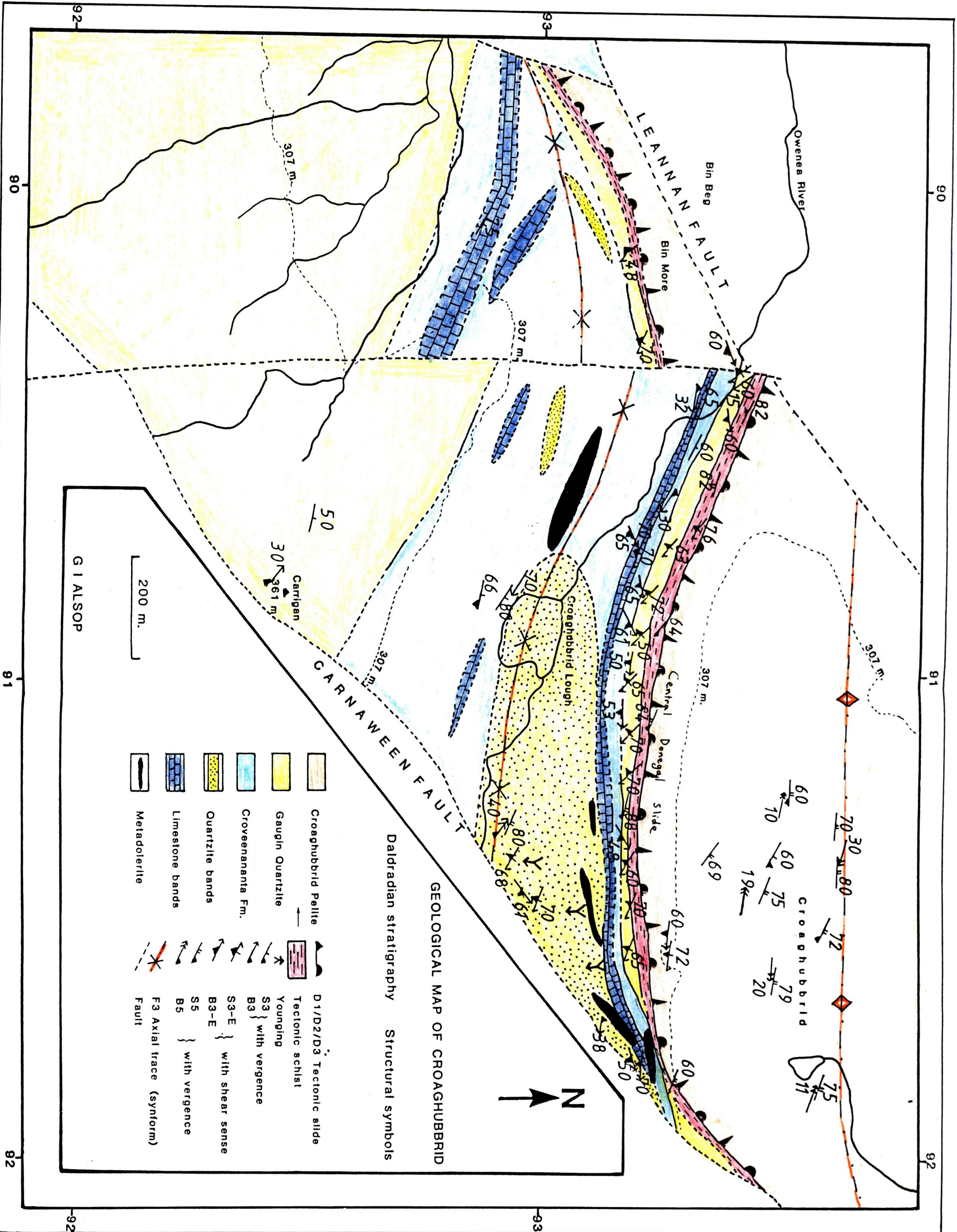
250 m.

G I ALSOP



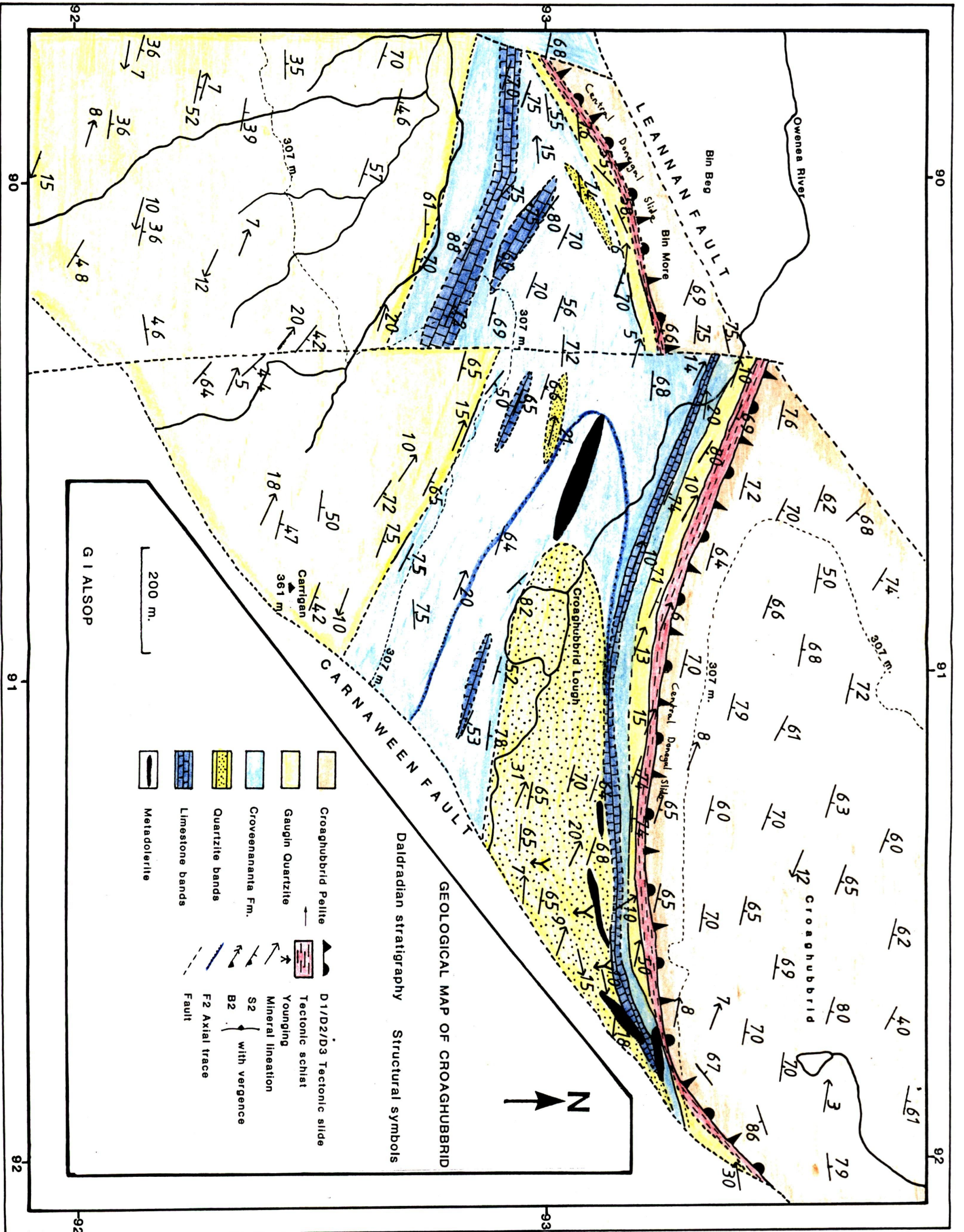
MAP I 3





MAP I 2





MAP II



ROCKSHEET 1

Specimen a.

Locality - Gorey Hill (H 090977), within the zone of tectonic schists.

This specimen is representative of tectonic schists throughout the mapped area. It displays a mylonitic S2 cleavage (associated with D2 sheath folding), developed in a fine grained quartz rich 'groundmass'. Large porphyroblasts of biotite are both parallel to, and also overprint this S2 fabric.

Specimen b.

Locality - Gaugin Mountain (G 983957), approximately 10m from the Croaghubbrid Pelite / tectonic schist junction (within Croaghubbrid Pelites).

This specimen is representative of the Croaghubbrid Pelites adjacent to the tectonic schists of the Central Donegal slide (Specimen a. above). An intense, mylonitic S2 fabric (with a probable S3 component in this case) is clearly developed, and defined by an alignment of quartz, biotite and graphite. The proportion of quartz within the graphitic pelites (Croaghubbrid Pelite) increases towards the tectonic schists.

Specimen c.

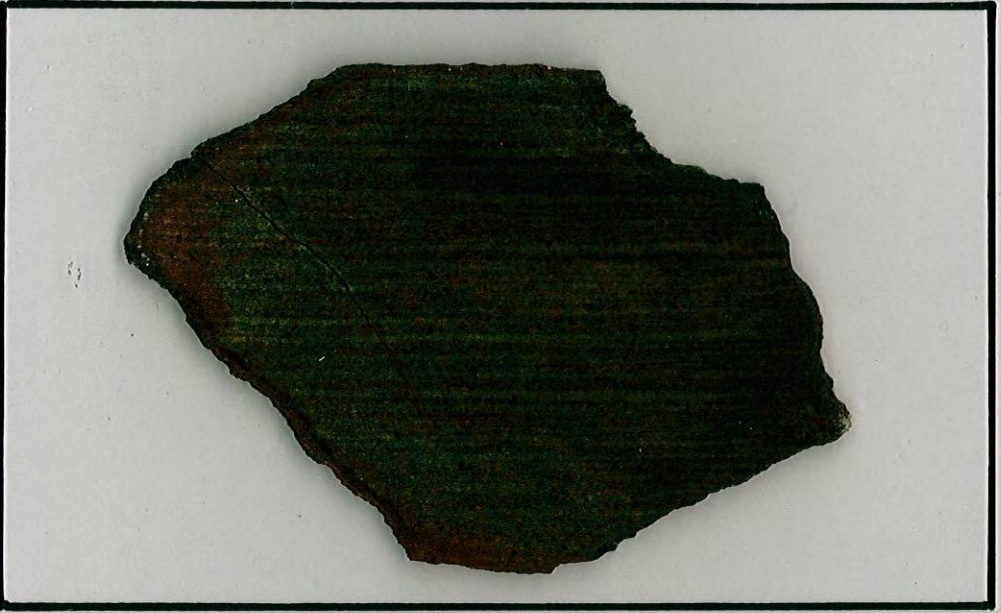
Locality - Croaghubbrid (G 913932), approximately 10m from the Gaugin Quartzite / tectonic schist junction (within Gaugin Quartzite).

This specimen is representative of the Gaugin Quartzite adjacent to the tectonic schists of the Central Donegal slide. A mylonitic fabric (S2-S3 in this case) is defined by an alignment of quartz, feldspar and biotite. This fabric is clearly crenulated by extensional crenulations (dipping moderately to the right on the specimen) associated with the oblique, dextral overthrusting towards the south of the D3 Ballybofey Antiformal complex.

a.



b.



c.



ROCKSHEET 2

Specimen a. - corresponds to Plate 23a. (photomicrograph)

Locality - Clogher South (G 964946), 20m south of the Gaugin Quartzite / tectonic schist contact (within the Gaugin Quartzite).

Specimen of Gaugin Quartzite, with a well developed S2 fabric (now positioned horizontally) defined largely by an alignment of quartz grains, biotite and some muscovite.

Specimen b. - corresponds to Plate 23b. (photomicrograph)

Locality - Clogher South (G 964947), at the Gaugin Quartzite / tectonic schist junction.

Specimen of tectonic schist, with an intense S2 fabric (with a probable D3 component) defined by an alignment of quartz and biotite. This tectonic schist specimen is relatively quartz rich and contains numerous biotite porphyroblasts.

Specimen c. - corresponds to Plate 23c. (photomicrograph)

Locality - Clogher South (G 963947), 25m North of the Gaugin Quartzite / tectonic schist junction (within tectonic schists).

Specimen of tectonic schist with an intense mylonitic S2 fabric, defined by extremely well aligned biotite porphyroblasts and quartz ribbons. This tectonic schist is still comparatively quartz rich.

Specimen d. - corresponds to Plate 23d. (photomicrograph)

Locality - Clogher South (G 964948), 25m North of the tectonic schist / Croaghubbrid Pelite junction (within Croaghubbrid Pelite)

Specimen of the quartz rich variety of Croaghubbrid Pelite (normally graphitic) which is found adjacent to the Central Donegal slide along its length. The S2 fabric is defined by an alignment of quartz and biotite, the biotite porphyroblasts being more numerous than is typical for the Croaghubbrid Pelites.



a .



b .



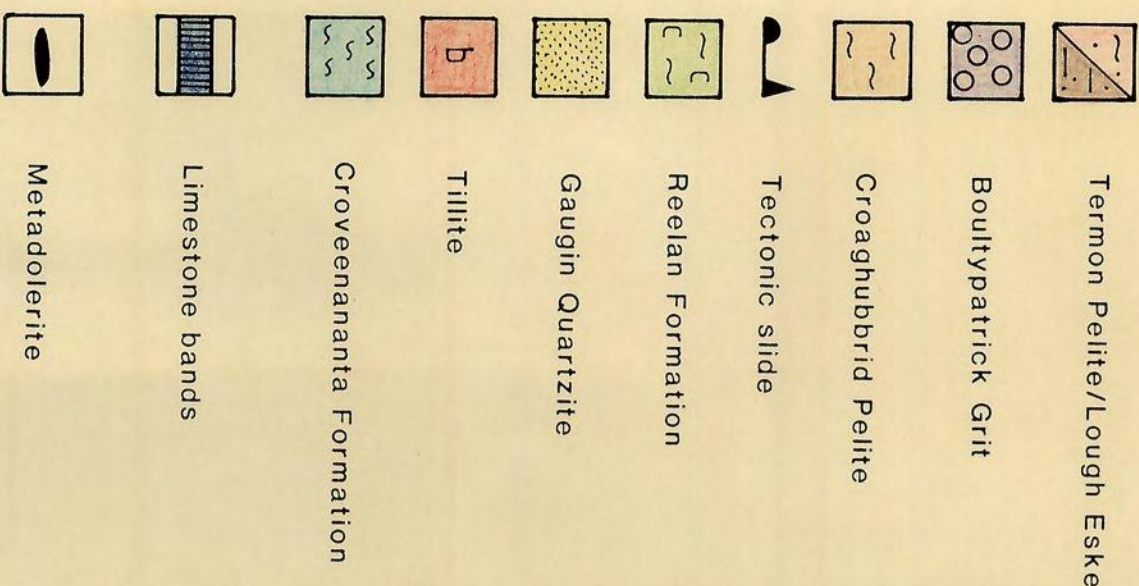
c .



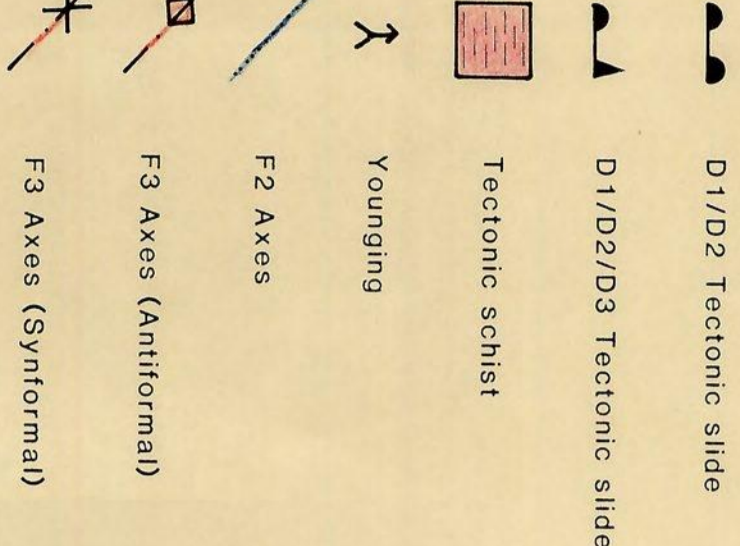
d .

NE SW GEOLOGICAL CROSS SECTION THROUGH GAUGIN MOUNTAIN AND LAVAGH MORE

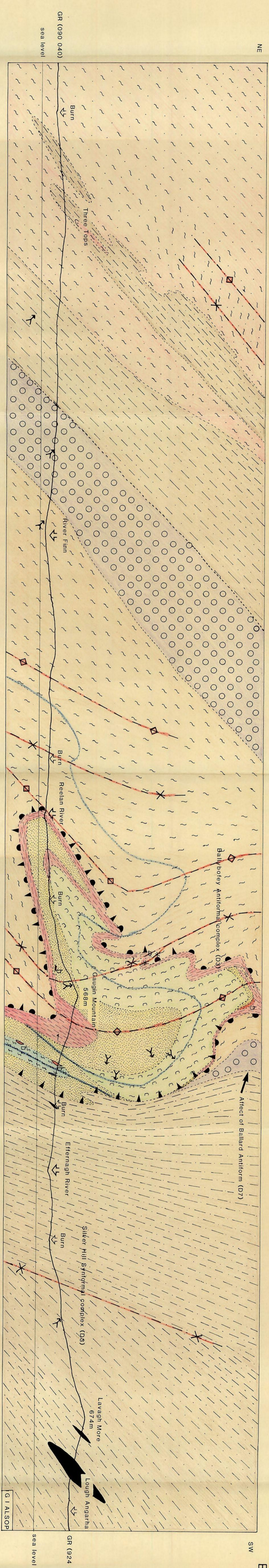
DALRADIAN STRATIGRAPHY



STRUCTURAL SYMBOLS



2 Km (no vertical exaggeration)

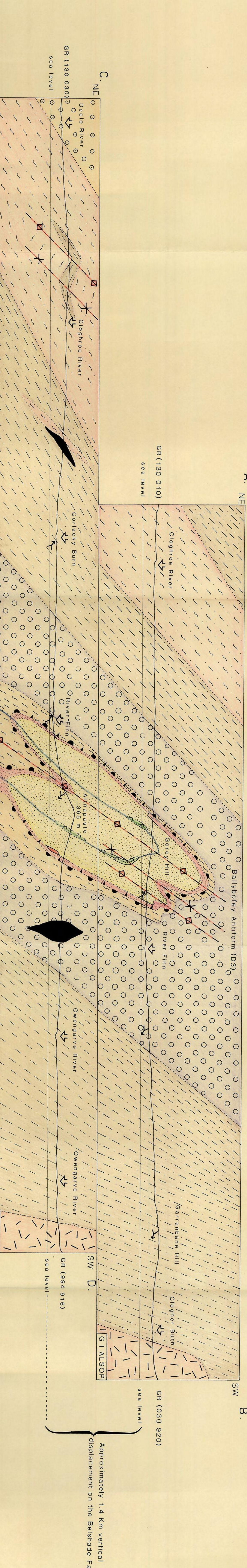


GEOLOGICAL CROSS SECTIONS PARALLEL THE BELSHADE FAULT

DALDRADIAN STRATIGRAPHY

STRUCTURAL SYMBOLS

- | | | | |
|--|-----------------------------------|--|-------------------------|
| | Killeter Quartzite | | D1/D2 Tectonic slide |
| | Termon Pelite/Lough Eske Psammite | | D1/D2/D3 Tectonic slide |
| | Boultypatrick Grit | | Tectonic schist |
| | Croaghbruid Pelite | | Younging |
| | Tectonic slide | | F2 Axes |
| | Reelian Formation | | F3 Axes (Antiformal) |
| | Gauguin Quartzite | | F3 Axes (Synformal) |
| | Tillite | | |
-
- IGNEOUS ROCKS
- | | |
|--|--------------------|
| | Barnesmore Granite |
| | Metadolerite |



Approximately 1.4 Km vertical displacement on the Belshade Fault

GEOLOGICAL CROSS SECTIONS PARALLEL THE CARNAAWEEN FAULT

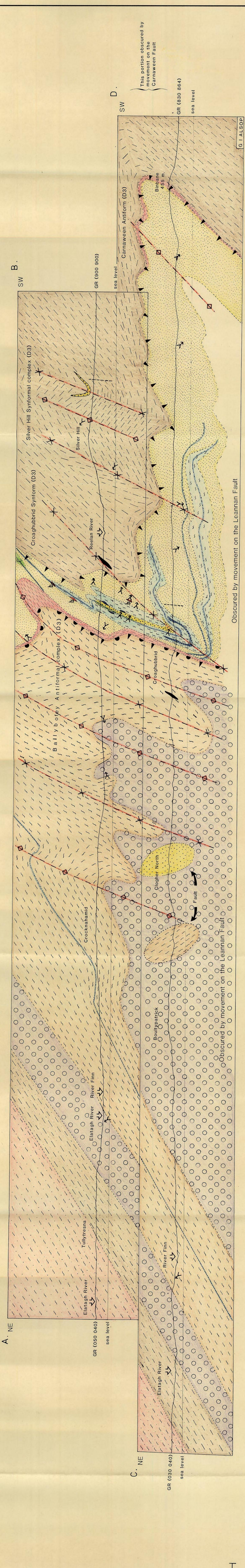
DALRADIAN STRATIGRAPHY

- Termion Pelite/Lough Eske Psammite
- Boulypatrick Grit
- Croaghbruid Pelite
- Tectonic slide
- Reelan Formation
- Gaugin Quartzite
- Tillite
- Croveenananta Formation
- Quartzite bands
- Limestone bands
- Metadolomite

STRUCTURAL SYMBOLS

- D1/D2 Tectonic slide
- D1/D2/D3 Tectonic slide
- Tectonic schist
- Younging
- F2 Axes
- F3 Axes (Antiformal)
- F3 Axes (Synformal)
- Fault

2 Km (no vertical exaggeration)



Obscured by movement on the Leannan Fault

G I ALSOP