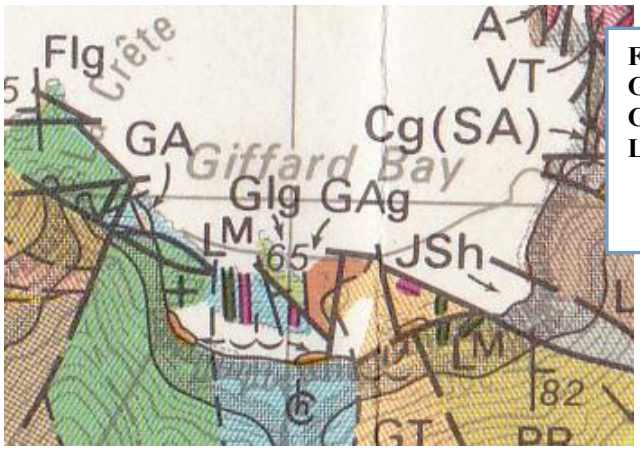
Giffard Bay Trail.

Volcanic rocks, lamprophyre dykes, raised beach.



Flg	**(Green).**	Frémont Ignimbrite **(St. John's Rhyolite. Fm)**
GA	**(Biege)**	Giffard Andesite (**Bouley Rhyolite. Fm**)
GR	**(Blue)**	Giffard Rhyolite **(Bouley Rhyolite Fm**)
LM	**(Green)**	Mica lamprophyre dykes (in Giffard Rhyolite).
	(Red)	Dolerite dykes.

Fig. 1.

Giffard Bay is situated due east of Bonne Nuit Bay on the north coast of Jersey in St. John. It is best approached via the road from Bonne Nuit Bay eastwards and at about half way along, by branching off left via the narrow drive down and behind the Cheval Roc Apartments (Hotel on map) to La Crête Fort **(Fig. 1).** Park near the Fort and follow the cliff path east round the bay and c. 75m along, descend to the beach via a narrow path and steps.
The trail starts on the beach rocks at the foot of this path which are the start of a variety of volcanic rocks ranging from ignimbrites to agglomerates and rhyolites with minor spherulites **(Fig. 2).**

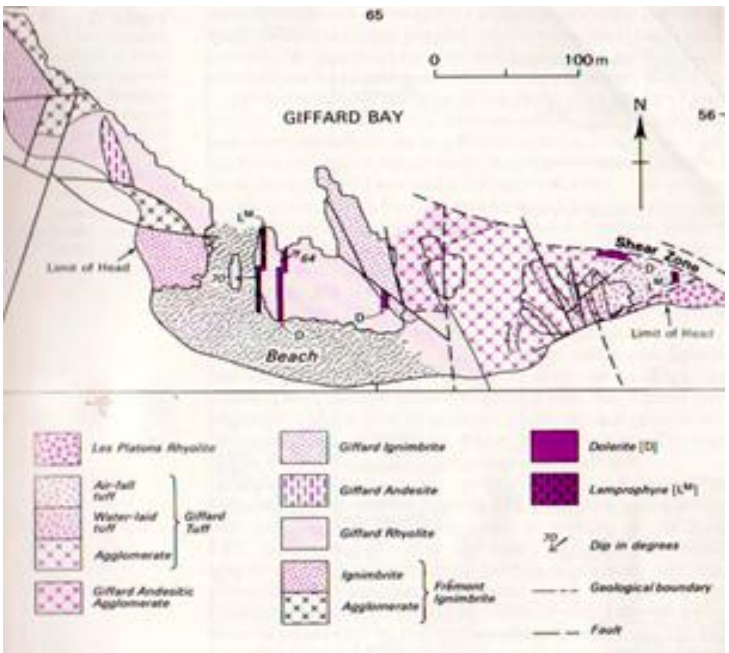


Fig. 2.

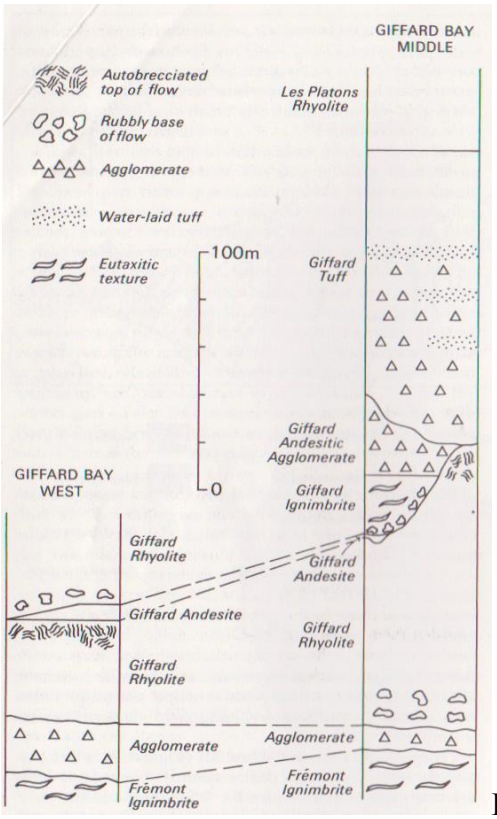


Fig. 3.

The Frémont Ignimbrite is the top unit of the St. John's Rhyolite Formation (base of left section, **Fig. 3)** and is exposed from La Crête Point below the path and at the bottom of the steps onto the beach rocks where it is described as overturned based on the disposition of the flattened pumice and shards (eutaxitic texture) in the former tuff (Bishop & Bisson, 1989, p. 26) **(Fig. 4).**

Continuing across the rocks, the change to the Giffard Rhyolite occurs, it is brown to purple, finely crystalline and with areas of spherulites **(Fig. 5)** aligned along apparent flow-banding **(Figs. 6, 7).**

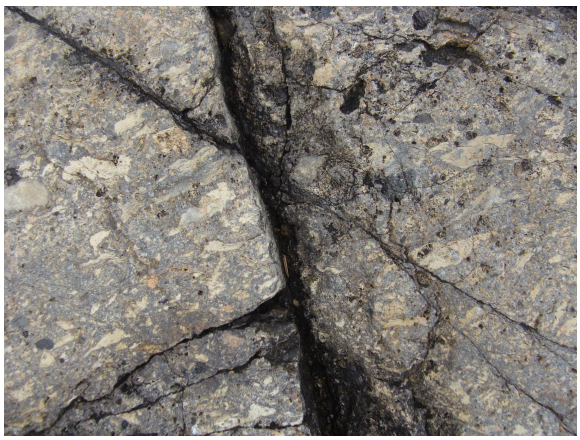


Fig. 4.

Fig. 5.

Fig. 6.

Fig. 7.

Patches of quartz crystals also occur, described as corroded and devitrified (op. cit. p. 31) **(Fig. 8).**

Fig. 8.

Fig. 9.

The beds exposed among the shingle, half way across the beach to the more central rock mass in the mid-low tide zone, show laminations similar to the flattened tuff layers **(Figs. 9, 10).** This seems to be in the position equivalent to the Giffard Andesite on the map but the structure seems more like that of an ignimbrite.

Fig. 10. **Fig. 11.**

Towards the back of the beach there are outcrops of grey agglomerate, with angular clasts ranging from fine to coarse (>10cm) in unsorted exposures **(Figs. 11, 12)** to more uniformly size - sorted **(Fig. 13).** Many clasts are clast supported while others are matrix-supported by a dark grey felsic groundmass. These outcrops may be equal to the Agglomerate between the Frémont Ignimbrite and the Giffard Rhyolite in the section (op. cit. p. 30), or to the Giffard Andesitic Agglomerate (not shown on the map), or to the western section, between the Giffard Rhyolite and Ignimbrite. However, the key on the map seems to indicate it is part of the Frémont Ignimbrite/Agglomerate, with the Giffard Andesitic Agglomerate cropping out further east.

Fig. 12.

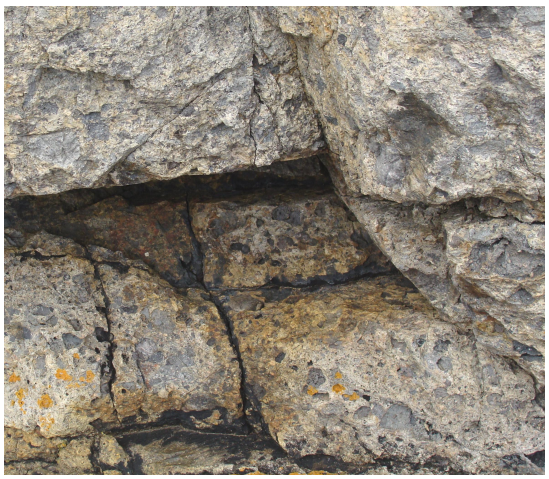


Fig. 13.

The Trail then moves down beach to the central outcrop where three mica lamprophyre dykes can be seen. Two are shown on the map, but a third narrow one can seen at the eastern end. The dolerite one hasn't been found yet.
The dykes strike N -S and vary from c.45cm wide **(Figs. 14, 15)** the western one having a sinuous outcrop, to c. 30cm wide with straighter outcrops for the eastern two **(Figs. 16, 17)**. All are a faulted by dextral tear faults.

Fig. 14.

Fig. 15.

Fig. 16.

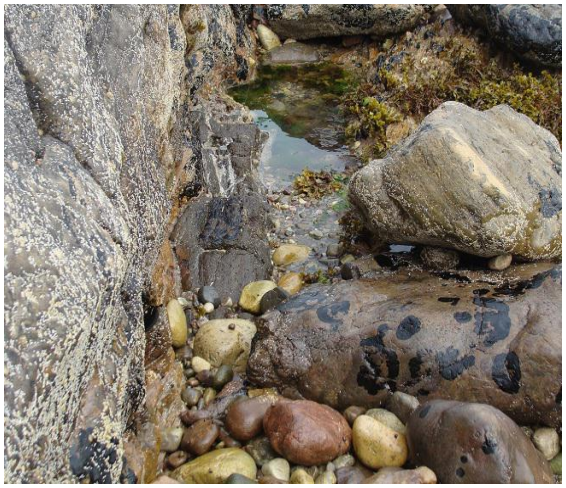


Fig. 17.

The mica lamprophyre dykes intrude the Giffard Rhyolite which is purple to brown and flow-banded, showing beautiful flow folds and laminar flow **(Figs. 18, 19)** individually.

Fig. 18.

Fig. 19.

Other units are brown to light brown and also show contorted flow-banding (Bishop & Bisson, 1989, p. 30). Laminar flow can still be seen picked out by more yellow bands and scattered spherulites also occur **(Figs. 20, 21).** No fully developed spherulitic layers were found here.

Fig. 20.

Fig. 21.

To the east on the cliff path, there are varieties of ignimbrite, recently described as rheomorphic or flow varieties (pers. comm. J. Sonnex, 2008, UCL unpubl. dissertation and G. Mason, UCL, unpubl. 2014). At present there is some discussion about the origin of the ignimbrite banding whether it is due to original flow or later compression **(Figs. 22, 23)**.

Fig. 22

Fig. 23.

In time sequence in this limited area, the Trail turns back to the cliffs at the top of the beach. Here, there is a short section of the 8m raised beach cropping out at the foot of the cliffs westward. The pebbles are well-rounded and range in colour from light grey to brown, red, and purple with white bands set in a yellow-brown matrix **(Figs. 24, 25)**. These are varieties of the local volcanic rocks, and rhyolite, jasper and flow-banded rhyolite can be seen **(Fig. 26).** Above, lies glacial head, a mixture of angular fragments in a partly loess-looking matrix.

Fig. 24.

Fig. 25.

Fig. 26.

Brief Geological History.

After the deposition, uplift and folding of the Jersey Shale Formation, the St. Saviour's Andesite volcanic rocks were deposited disconformably on the eroded surface. These were followed by rhyolite and ignimbrite volcanic rocks of the St. John's Rhyolite Formation seen at the start of this trail and where the overlying rhyolites of the Bouley Rhyolite formation can also be seen. Here though, the rhyolites are interbedded with porphyritic and pyroclastic deposits. Further east in the bay, there are tuffs, and more agglomerates with pyroclasts of mudstone, andesite and rhyolite.
The environments of deposition in the bay area are discussed by Bishop & Bisson (op. cit. p. 31) who cite the work of Casimir & Henson (1955) and Thomas (1977) who identified a variety of terrestrial, fluviatile and lacustrine situations.
This is in contrast to the environments elsewhere, and recently the ignimbrites have been considered rheomorphic or flow types and there is much discussion about the, origin of the banding in them, whether it is a result of flow or compression.
Subsequently, the volcanic rocks were uplifted and eroded to produce the Rozel Conglomerate to the east and the lamprophyre dykes were intruded. These occur with two different strikes, N-S here but NW-SE further west of Plémont where there is a minor swarm. This intrusive phase is later than the main dolerite phase of the Jersey Main Dyke Swarm (Lees, 1990) to the south.
There followed a period of faulting and then a very long period of weathering and erosion until the changes in sea level during the Ice Age produced a sequence of raised beaches during interglacials separated by Head and loess intervals deposited during glacial times. The 8m raised beach at Giffard Bay is part of the last transgression (interglacial) followed by the head and loess of the last regression (glacial). The present Holocene sea level rise has caused some of the present day erosional and depositional landforms.

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Ralph Nichols. 2014.