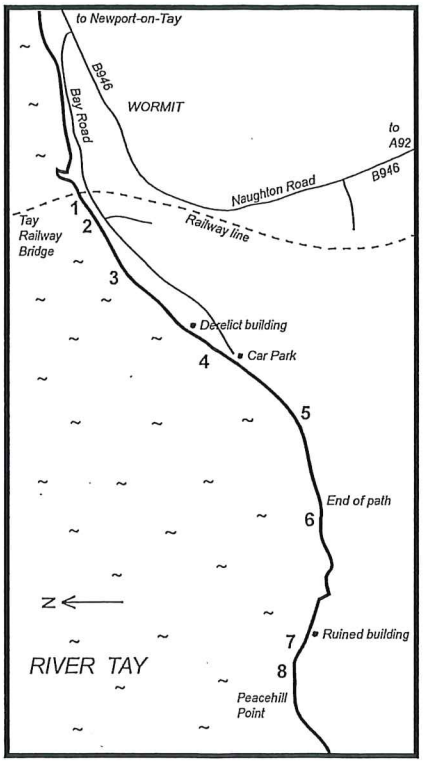
Locality Map



SAFETY INFORMATION
This trail, about 3 km long, is entirely on a tidal foreshore. **A low tide is essential for this walk.** You must wear stout footware and clothing appropriate for the current weather conditons. A walking pole could be useful. Parts of the beach can be slippery.
DO NOT HAMMER THE ROCKS.

geoHeritage Fife
was set up in 2000 to:

* publicise Fife's geological heritage
* provide educational resources in geology
* promote geotourism

If you would like to assist with these aims, consider joining the group by contacting geoHeritage Fife
01334 828623

Scottish Charity No. SC 032509

Fife RIGS/LGS
RIGS were Regionally Important Geological (and Geomorphological) Sites, but are now known as Local Geodiversity Sites (LGS). Fife LGS is concerned with identifying and assessing important sites and notifying the statutory planning authority of these sites. Fife LGS was incorporated into **geoHeritage Fife** in 2005.

TRAVEL INFORMATION
Traveline Scotland: http://www.travelinescotland.com
Bus: Moffat & Williamson service 92, St.Andrews to Tayport (via Leuchars Railway Station). Strathtay service 77 from Dundee

Rail: Nearest stations are Dundee and Leuchars.

Car: From the North turn off the A92 onto the B946 road to Wormit at the south end of the Tay Road Bridge. From the South, the B946 road junction off the A92 lies 1km SW of Links Wood roundabout, or 2km NE of Kilmany village. In Wormit, turn into Bay Road and park at the end of this road by the shore.
Grid Ref: NO 3915 2600

Wormit shore Geological Trail

See evidence of volcanic activity 400 million years ago which poured out vast quantities of lava. In between eruptions, rivers deposited conglomerates, and temporary lakes filled with sand and mud. After the lava eruptions ceased, new molten rock pushed its way through and formed an intrusion of a reddish-coloured rhyolite. During the last Ice Age, glaciers scoured the landscape and rocks from the Highlands were carried down the Tay valley to Fife.

geoHeritage Fife
Scottish GEODIVERSITY Forum
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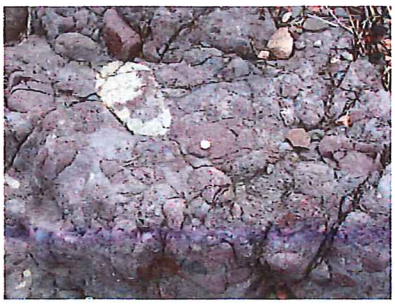
Locality 1
Volcanic conglomerate

<From the car park at the foot of Bay Road walk east towards the railway bridge along a grassy bank. At a derelict building, step down to the shingle beach and proceed over it and potentially slippery rocks (care needed) towards the base of the railway bridge arches.>

As you walk along the foreshore, note that much of the rock is dark-coloured. This is a volcanic lava called andesite.



Scale = £1 coin (2cm)

Conglomerate with rounded pebbles of lava and sandstone

At the base of the bridge is a cliff of conglomerate, a sedimentary rock containing rounded pebbles of andesite and sandstone like those seen at other localities on this walk. These are held together and supported by a "cement" which includes weathered lava fragments.

Conglomerate represents a rock formed by the rapid erosion of local rocks, followed by subsequent compaction, to produce the rock on which the Tay Bridge arches are built.
The surrounding lavas have been dated as 410 million years old, and belong to the beginning of the Devonian Period.

Locality 2
Lava flow with alteration

<Return westwards for approximately 30m to a low outcrop of rocks in the shingle beach just below a large holly tree growing out of the cliff. [NO 3945.2628] >

Scale = Hammerhead (17cm)

The area below the hammer marks a zone of alteration caused when hot lava flowed over wet sediment. The heat from the lava caused water in the sediment to boil and this broke up the lava and altered it. This feature is called a PEPERITE. Above the hammer is a lava flow with an irregular contact with the lower horizon.

Scale = Pen (14cm)

3m to the left of the previous outcrop you will see some pieces of brownish-coloured layered sandstone trapped in the lava, suggesting it was plucked by a lava flow from a pre-existing sandstone exposure.

Locality 3
Inter-lava sediments

< Walk 35m west from Locality 2 and you will see a distinctive reddish rock lying within darker lavas. [NO 3943.2627] >

Scale = £1 coin (2cm)

Here can be seen exposures of sheets of volcanic rock that once covered the area. At this outcrop, a 3 metre long band of reddish-mauve coloured sandstone lies in between the darker lavas. This represents a period when sediment was deposited between episodes of eruptions of lava.
Note the disrupted texture at the top of the sandstone. This is another example of a PEPERITE.

The contact below the sandstone suggests that the lower andesite rock may have been intruded later as a sheet of molten material, ie. it could be a sill (an injection of molten rock), rather than an earlier lava flow.

Locality 4
Glacial erratic

<Continue along the beach towards the car park. When you reach the derelict building, cross the beach to a large block of stone. [NO 3925.2611]>

Scale = OS map (23cm)

Here a 3 metre-wide block lies on the beach.
On closer examination, one can see textures and sharp folds in the rock unlike anything seen so far. This boulder has no relationship with the rocks seen on this trail. It is called schist and originated from Precambrian Dalradian metamorphic rocks (about 600 million years old) in the Highlands. The development of sharp, crinkly folded structures is a feature created when the rock was heated and under great pressure deep in the Earth.
This block was plucked from the Highland mountains, carried and deposited here by a glacier during the last glacial period (about 20,000 years ago).
Such a boulder is known as an ERRATIC.

Scale = £1 coin (2cm)

A close-up view of the crinkly folding in the rock.

Locality 7
Sands, muds and fossils

<Continue along the beach past the stumps of an old jetty, then past a ruined building for 12m>.

At the cliff base are pale brown sandstones with darker, crumbly mudstone above them. This section is typical of sediments deposited in lakes. Rare fossil fish scales have been reported here, as well as wrinkle structures made by algal mats. Cross-bedded sandstone results when sand ripples form on a beach or lake bed. The lines marked below indicate the direction of water flow (right to left), although other examples of cross-bedding in the area show the opposite sense, ie. left to right.

S.C.Johnson

Scale = Hammerhead (17cm)

Cross-bedded sandstones.

<Continue towards the West side of the sandy bay by rejoining the path on the embankment.>

Locality 5
Glacial meltwater channel

Along this stretch there is a lack of rock outcrop on the beach and inland the ground forms a shallow valley. This valley was formed by melting glacier ice which deposited sand and gravel when the glaciers began to retreat about 16,000 years ago. This action created a deep, gravel-filled valley which today has no stream in it.

G. Burgess

Arable fields occupy the glacial valley.

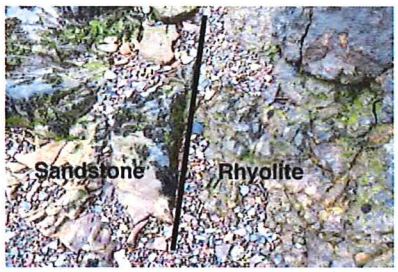
<Continue along the path from the car park towards the south-west past a memorial to the Tay Rail Bridge disaster (photo below). At the point where the path enters woodland, there is a wood carving of a seal. Leave the path here and descend, with care, to the beach and walk south-west along the beach for 5 metres.>

Tay Rail Bridge Disaster memorial.

The memorial stones are made of granite containing large crystals of the white mineral feldspar.

Locality 8
Rhyolite lava

<Continue along the beach for another 10 metres towards a small headland and you will approach an outcrop of an pink coloured rock.>



In a gully is a contact between sandstone (on the left) and a knobbly pinkish rock (on the right), 5m east of the vertical cliff face (photo below).

The fine-grained pink-coloured rock is rhyolite which is less dense than andesite. This rhyolite represents a later stage of volcanic activity during the early Devonian Period.

Scale = Hammerhead (17cm)

The stripey texture in the rhyolite is called flow banding and forms when "sticky" magma (molten rock) moves slowly through the Earth's crust. This texture shows that this rhyolite rock was once molten.

Locality 6
Lava with gas bubbles

Scale = £1 coin (2cm)

Chalcedony fills voids in lava

For 100m along this section of the shore, andesite lavas are exposed. Small rounded cavities in the rock show that it was a lava rich in gas bubbles. Some of these bubbles have been filled with a reddish mineral called chalcedony (a form of quartz), which locally may form banded agates. Some agate fragments may be found in the shingle beach.

As you walk across the beach look out for pebbles of red Jasper (examples shown below).

< Walk west over a short rocky bluff into a small bay.>

When rhyolite is affected by hot fluids, it alters to a fine-grained rock called felsite.

Scale = £1 coin (2cm)

Felsite breccia at the top of the beach.

Around the margins of this locality there is an accumulation of fragments of this rock. This is called a BRECCIA, most likely formed by explosive eruptions from a volcanic vent which shattered the rock.

Scale = Hammerhead (17cm)

Felsite outcrop.

<Return along the beach to re-join the path and follow it back to the car park.>