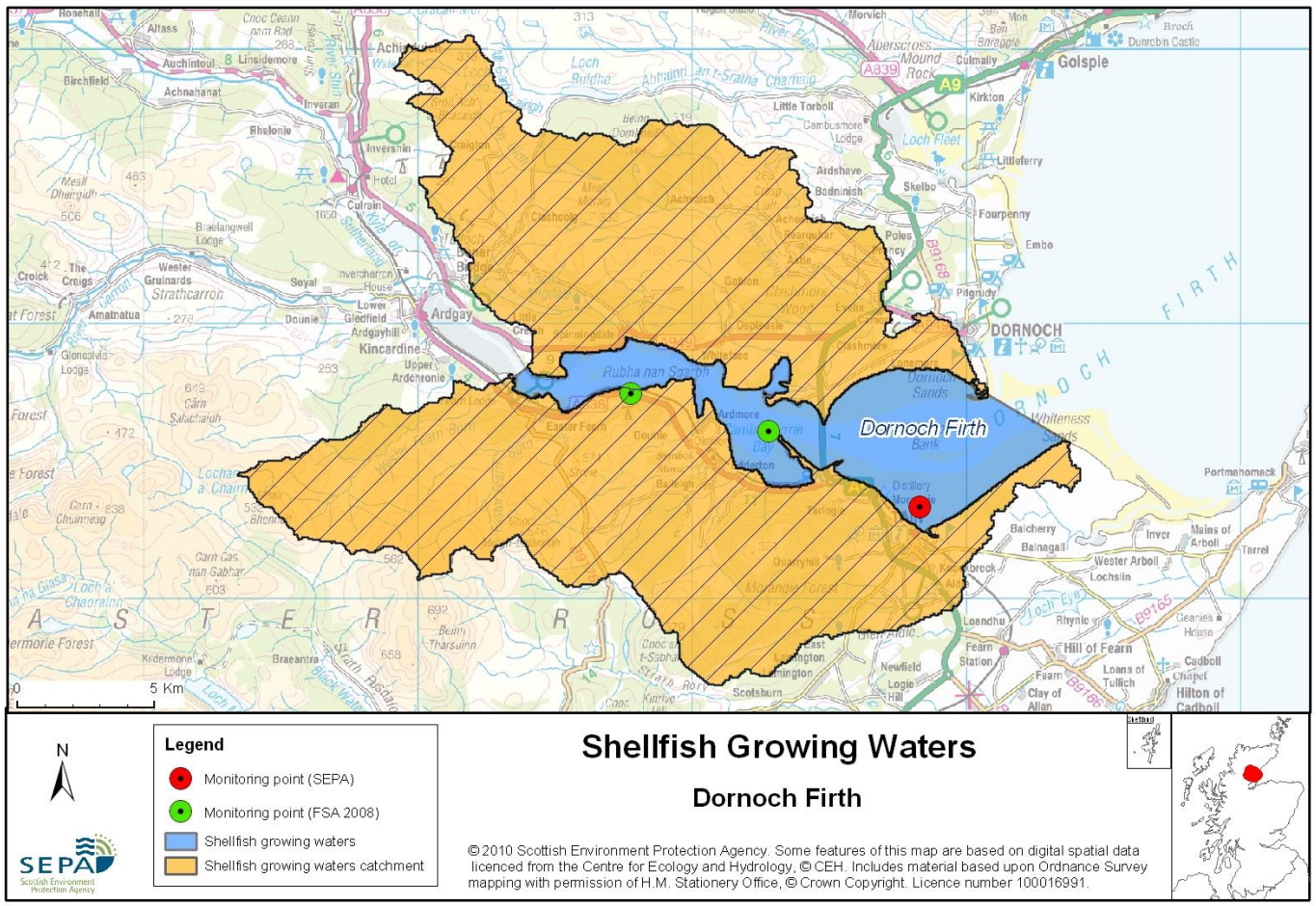
113 Dornoch Firth



Name	Dornoch Firth
Report Reference Number	113
WFD Code	UKS79923113
Local Information	Area bounded by a line drawn between NH6362188131 (Wester Fearn Point) to NH6397788408 and a line drawn between NH8080987394 (Domoch Point) and NH8366985717 (Rub na Innse Moire) and extending to MHWS.
Designated Area (km²)	51.77
Year of Designation	1981
Sampling Points	Dornoch Firth Mussel Site (From Feb 2004) - NH 78320 83330
Commencement of Monitoring	1981

Formally site 1, designation modified 2005

113.1 Commercial Shellfish Interests

Part of the Dornoch Firth are Designated by the Food Standards Agency (FSA) as Shellfish Harvesting Areas. There are five sites within the firth that are classified by FSA for the Production of Common mussels (*Mytilus edulis*).

Dornoch Firth: Dornoch Firth, Mussel Scalps, Tain Scalps (Common mussels)
2011 = A - April to July
B - August to December
2012 = B - January
A - February & March

Dornoch Firth: Meikle Ferry (Common mussels)
2011 = A - April & May
B - June to December
2012 = B - January to March

Category A sites are of the highest standard and means that shellfish can go directly for human consumption however category B requires that shellfish must be depurated, heat-treated or re-laid prior to human consumption.

FSA have completed a sanitary survey for Dornoch Firth.

For more information on Food Standards Agency Classification please visit:
http://www.food.gov.uk/scotland/safetyhygienescot/shellmonitorscot/shellclassesscot/

113.2 Bathymetric Information

This shellfish water encompasses almost the entire area of the Dornoch Firth. The area is some 22 km long by a maximum of 5.5 km wide. The maximum charted depth (at LAT) is <10 m. Approximately half of the area is <0 m chart depth, i.e. intertidal area exposed at low tide. The slope from the min to max depth has a very shallow gradient (spread over 3 km, south to north). The substrate consists mainly of fine sand and mud material. The Firth is sheltered from prevailing winds but is very exposed from north and north-easterly winds, especially in the widest part of the Firth to the east of the road bridge, which a produces a fetch that suspends a lot of fine material into the water column. There are no morphological pressures on the Firth.

113.3 Conservation Designations

RAMSAR – Dornoch Firth and Loch Fleet
Designated 24/03/1997 for internationally important bird species - Bar-tailed godwit (*Limosa lapponica*), Greylag goose (*Anser anser*), Wigeon (*Anas penelope*), Waterfowl assemblage. Also designated internationally important habitats – mudflat, reefs, saltmarsh, Sand dune, sandflats and wet woodland.

RAMSAR – Loch Eye
Designated 01/10/1986 for internationally important bird species - Greylag goose (*Anser anser*) and Whooper swan (*Cygnus cygnus*),

Special Protected Area (SPA) – Strath Carnaig and Strath Fleet Moors
Designated 07/07/2008 for internationally important aggregations of breeding birds - Hen harrier (*Circus cyaneus*)
This is also a **Water Dependent SPA**

Special Protected Area (SPA) – Morangie Forest
Designated 03/10/2001 for internationally important aggregations of breeding birds - Capercaillie (*Tetrao urogallus*)
This is also a **Water Dependent SPA** and a **Groundwater Dependent** SPA

Special Protected Area (SPA) – Dornoch Firth and Loch Fleet
Designated 24/03/1997 for internationally important aggregations of non-breeding birds (Bar-tailed godwit (*Limosa lapponica*), Curlew (*Numenius arquata*), Dunlin (*Calidris alpina alpina*), Greylag goose (*Anser anser*), Oystercatcher (*Haematopus ostralegus*), Teal (*Anas crecca*), Wigeon (*Anas penelope*) – non breeding Waterfowl assemblage and aggregations of breeding Osprey (*Pandion haliaetus*)
This is also a **Water Dependent SPA**

Special Protected Area (SPA) – Loch Eye
Designated 01/10/1986 for internationally important non-breeding bird species - Greylag goose (*Anser anser*), Whooper swan (*Cygnus cygnus*)
This is also a **Water Dependent SPA** and a **Groundwater Dependent** SPA

Site of Special Scientific Interest (SSSI) – Loch Fleet
Designated 13/07/1984 for assemblages of breeding birds (including Eider (*Somateria mollissima*), Long-tailed duck (*Clangula hyemalis*), Wigeon (*Anas penelope*)), habitats (Eelgrass beds, Native pinewood, saltmarsh, sand dunes, sandflats) and Vascular plant assemblage

Site of Special Scientific Interest (SSSI) – Ledmore Wood
Designated 29/02/1984 for Upland oak woodland

Site of Special Scientific Interest (SSSI) – Spinningdale Bog
Designated 01/06/1984 for Valley fen

Site of Special Scientific Interest (SSSI) – Migdale Rock
Designated 23/08/1985 for native pinewood and Vascular plant assemblage

Site of Special Scientific Interest (SSSI) – Strath Carnaig and Strath Fleet Moors
Designated 10/05/2006 for aggregations of breeding birds - Hen harrier (*Circus cyaneus*),

Site of Special Scientific Interest (SSSI) – Easter Fearn
Designated 10/07/1984 for Upland birch woodland

Site of Special Scientific Interest (SSSI) – Struie Channels
Designated 24/12/1986 for Quaternary geology and geomorphology of Scotland

Site of Special Scientific Interest (SSSI) – Craigroy Burn
Designated 26/02/1985 for Upland birch woodland

Site of Special Scientific Interest (SSSI) – Black Park, Edderton
Designated 11/02/1987 for Palaeontology (Silurian - Devonian Chordata)

Site of Special Scientific Interest (SSSI) – Dornoch Firth
Designated 23/08/1985 for aggregations of non-breeding birds (Bar-tailed godwit (*Limosa lapponica*), Whooper swan (Cygnus cygnus), Wigeon (*Anas penelope*)), habitats (eelgrass beds, saltmarsh, sand dunes) and vascular plant assemblage

Site of Special Scientific Interest (SSSI) – Pitmaduthy Moss
Designated 19/12/1986 for invertebrate species (flies) and raised (wetland) bogs.

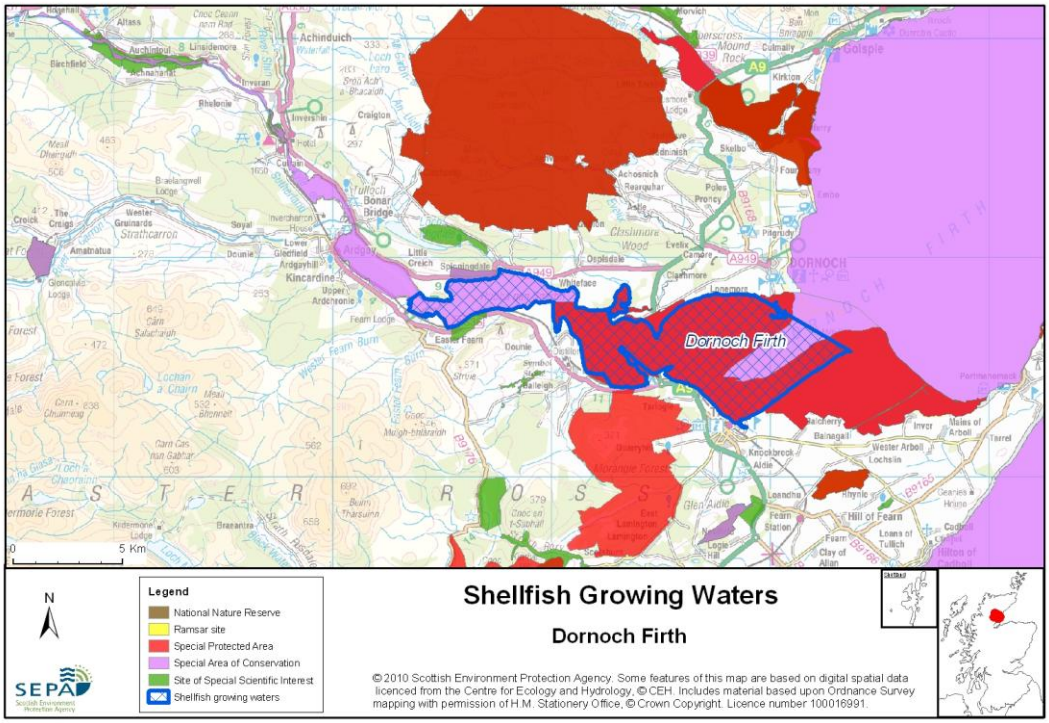
Site of Special Scientific Interest (SSSI) – Calrossie
Designated 29/01/1988 for lowland dry heath, lowland wet heath and native pinewood

Site of Special Scientific Interest (SSSI) – Morrich More
Designated 11/03/1987 for aggregations of non-breeding birds (Bar-tailed godwit (*Limosa lapponica*), Curlew (*Numenius arquata*), Teal (*Anas crecca*),), assemblages of breeding birds, Coastal Geomorphology of Scotland, Vascular plant assemblage, Invertebrate assemblage (including flies), habitats (saltmarsh, sand dunes)

Site of Special Scientific Interest (SSSI) – Loch Eye
Designated 26/03/1985 for Eutrophic loch and aggregations of non-breeding birds (Greylag goose (*Anser anser*), (*Cygnus cygnus*))

Site of Special Scientific Interest (SSSI) – Talich
Designated 05/03/1984 for Wet woodland

Site of Special Scientific Interest (SSSI) – Tarbat Ness
Designated 22/08/1985 for Coastal Geomorphology of Scotland, Stratigraphy (Non-marine Devonian), coastal Supralittoral rock (maritime cliff)



113.4 Topography and Land Use – Potential Diffuse Pollution Sources

The Dornoch Firth shellfish water, being over 20 km long, is bordered by a wide range of land uses. The most common of these are heather moorland and improved pasture, but there are significant areas of coniferous forestry, and small areas of arable land, semi-natural woodland and coastal wetlands.

Major roads run close to both the north and south shores of the Firth between Bonar Bridge and Tain, and the main A9 trunk road crosses the Firth by means of two causeways connected by a 1 km bridge.

There are numerous towns and villages along the shores of the Firth, the most significant being Bonar Bridge, Ardgay, Edderton, Tain and Dornoch.
Four rivers flow into the western, upper end of the Firth, these being the Shin, Cassley, Oykel, and Carron. In total, these rivers drain almost 1500 km2 of moorland and mountain terrain that contains several hundred square kilometres of coniferous forestry. All of these rivers are monitored by SEPA at the point where they flow into the Firth, and all are consistently classified as being of at least good quality. There are numerous other minor freshwater inputs to the Firth. One of these, the Black Burn, receives treated effluent from Dornoch STW, but the impact of this discharge on the Firth is minimal.

Pressures on this water body come mainly from diffuse sources; there are a number of public and private sewage treatment works and livestock farming in this catchment; there is one point source of pollution at Tain sewage treatment works into the Dornoch Firth

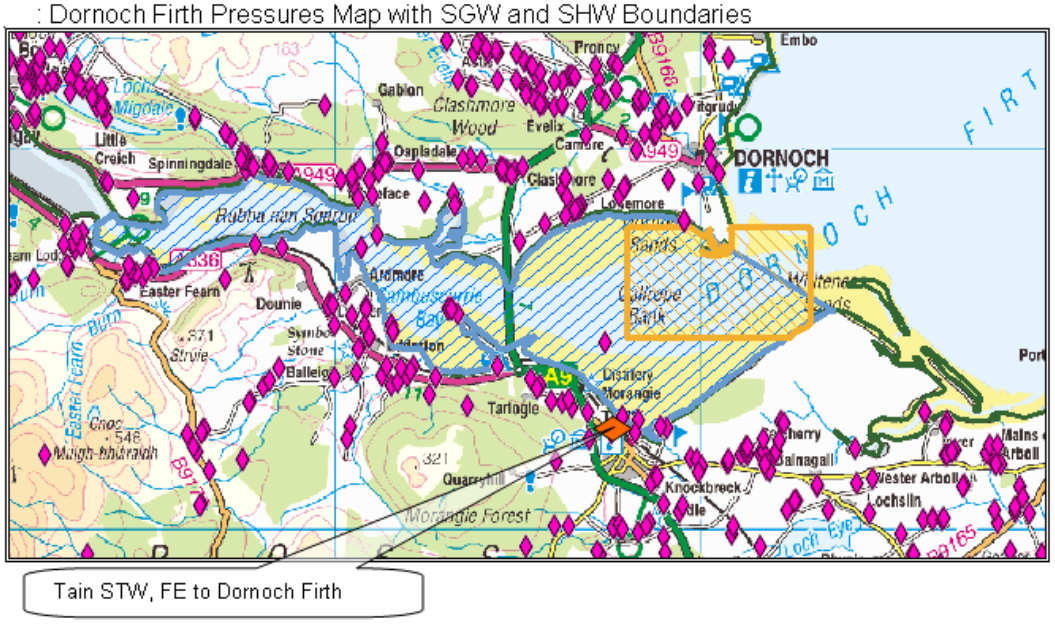
113.5 Point Source Discharge

Type	Name	Treatment	Consent No.	NGR	PE	Additional Information
Scottish Water Asset	Tain STW and CSO/EO	Secondary	CAR/L/1001672	NH 7787 8282	5000	-
	Dornoch STW and storm tank discharges	Secondary	CAR/L/1008717	NH 7957 8821	4000	-
	Edderton Septic Tank and CSO	Septic Tank	CAR/L/1001646	NH 7144 8510	200	-
Other	Spinningdale Septic Tank	-	-	-	500	-
	Skibo Castle private STW	Secondary	CAR/L/1002006	NH 733 886	130	-
	Private household ST	-	Various around Firth	-	100	-
Industrial	Balblair distillery	-	CAR/L/1003976	NH 807 870	-	-

	Glenmorangie distillery	-	CAR/L/1002032	NH 7730 8502	-	-
Fish Farm	Wester Fearn Fish Farm	Primary	CAR/L/1001932	NH 6269 8812	-	-
	Easter Fearn Fish Farm	-	CAR/L/1002170	NH 644 866	-	-
	Easter Fearn Fish Farm	-	CAR/L/1002189	NH 645 869	-	-

There are no marine cage fish farms located within the designated water.

: Dornoch Firth Pressures Map with SGW and SHW Boundaries



Key:

Private and public sewage treatment works and other licensed activities
The orange hatched area denotes the SHW boundary
The blue hatched area denotes the SGW boundary

113.6 Compliance Monitoring Regime

The following monitoring regime of the designated area was not fully implemented until the second half of 2005.

Year	Monitoring Regime
2005 -	• Quarterly for Sal, DO, pH, temperature, visible oil
	• Twice yearly for metals in water
	• Annually for metals and organohalogens in mussels
	• Quarterly for faecal coliforms in mussels

113.7 Compliance History

UKS79923113 - Dornoch Firth				
	Compliance history for Waters and Biota, excluding faecal coliforms data			Compliance history for faecal coliforms
Year	Overall Result	Imperative	Guideline	Guideline
1998	Pass	Pass	Pass	Not monitored
1999	Fail	Fail	Fail	Pass
2000	Pass	Pass	Pass	Pass
2001	Pass	Pass	Fail	Pass
2002	Pass	Pass	Pass	Pass
2003	Pass	Pass	Pass	Fail
2004	Pass	Pass	Pass	Fail
2005	Pass	Pass	Pass	Fail
2006	Pass	Pass	Pass	Fail
2007	Pass	Pass	Pass	Pass
2008	Pass	Pass	Pass	Fail
2009	Pass	Pass	Pass	Fail
2010	Pass	Pass	Pass	Fail

In 1999, there was a failure to meet the Imperative standard for pH. This was due to one result out of six being slightly above the upper limit of 9. This single measurement was not consistent with other results for these waters. None of the discharges to the area have an alkaline component.

The sampling site was changed in February 2004 to the mussel scalps at Tain, however, this was not a satisfactory site and was moved in 2005 to the Ferry Point pier. The failures during 2003-2005 are thought to be partially due to diffuse pollution from sewage treatment works around the Firth. The waters failed to comply with the Guideline standards for 2006, 2008, 2009 and 2010 but passed in 2007.

113.8 Future Monitoring

The monitoring regime (113.6 Compliance Monitoring Regime) will be followed. In the event of any chemistry parameter failing to meet any EQS, the site will be revisited and resampled for the failed parameter.

Samplers are asked to identify any evidence of visible harm to the shellfish population at the site.

Faecal coliform data is collected by SEPA from many of the shellfish waters to comply with Guideline Standards (≤ 300/100ml of shellfish flesh and intervalvular fluid). However many shellfish sites are also by FSA, which can often be more frequent. When this occurs FSA data (≤ 230 *E.coli*/100g flesh) can be used to infer pass/fail of Guideline Standards for faecal coliforms.

113.9 Improvement Actions

The sewage from the villages and towns of Dornoch, Tain, Edderton and Bonar Bridge discharge to the Dornoch Firth. Scottish Water's Q&SII programme had a project for each of these settlements to ensure the requirements of the shellfish waters Directive were met. Since the instigation of these projects, the boundaries of the designated shellfish water have been moved and now exclude Bonar Bridge and therefore, there will now be no change to the primary treatment afforded to the discharge.

UV disinfection was installed at Dornoch STW in June/July 2007 to reduce the bacterial load to the Firth from the works. Tain STW has also had UV disinfection installed but it is not fully operational as yet. There are improvements planned for Dornoch's CSOs under Q&SIIIb (2010-2014).

A new STW has been proposed for Edderton with the final effluent being discharged to a point below the distillery's cooling water return point on the Craigroy Burn. The old septic tank would be used as a pumping station under this scheme with a CSO and EO licence. The CSO will have storm spillage capacity to limit the significant spills to below 10 per annum as is required by the Directive.

An improvement plan for the fish hatcheries on the Easter Fearn Burn has been undertaken with a drum filter being installed at the upper hatchery. This has greatly improved the state of the burn downstream from this hatchery, however, there are ongoing issues at the downstream hatchery. The discharge licences governing the effluent quality from the two distilleries have recently been reviewed to ensure compliance with UWWTD and that these effluents do not threaten EC Shellfish Waters environmental quality standards.
These improvements will help to ensure that the designated water continues to meet Imperative standards, and progresses towards consistent compliance with guideline EQS values.

WFD Objectives

Under the Water Framework Directive, the target objectives expect this shellfish water to Pass by 2015 (first River Basin Management Plan Cycle) for Imperative Shellfish Growing Water Standards. The Guideline Shellfish Growing Water Standards are also predicted to pass by 2015 but with low confidence.

Objective	First Cycle 2015	Confidence	Second Cycle 2021	Confidence	Third Cycle 2027	Confidence
Imperative Shellfish Growing Waters Standard	Pass by 2015	High	Pass by 2021	High	Pass by 2027	High
Guideline Shellfish Growing Waters Standard	Pass by 2015	Low	Pass by 2021	Low	Pass by 2027	Low

113.10 Summary of Actions

Action	Deadline
UV disinfection at Tain (not fully operational as yet) and Dornoch, Q&SII.	June/July 2007
Improvements to Dornoch CSOs under Q&SIIIb.	2010 - 2014
Improvements to Edderton's septic tank	Ongoing discussions
Improvement Plans for Easter Fearn Hatcheries	2005