
Scottish Sanitary Survey Project



Restricted Sanitary Survey Report North Ford UB 493 March 2010



Report Distribution – North Ford

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1. Area Overview

The harvesting area at North Ford lies between the islands of North Uist and Benbecula in the Outer Hebrides (see Figure 1.1). It is an area of intertidal sands bordered by North Uist, Benbecula, Grimsay and Baleshare. The area is approximately 5.5.km by 2.7 km at its widest points. A restricted sanitary survey at North Ford was conducted in response to receipt of an application to classify the area for commercial harvest of common cockles (*Cerostoderma edule*).

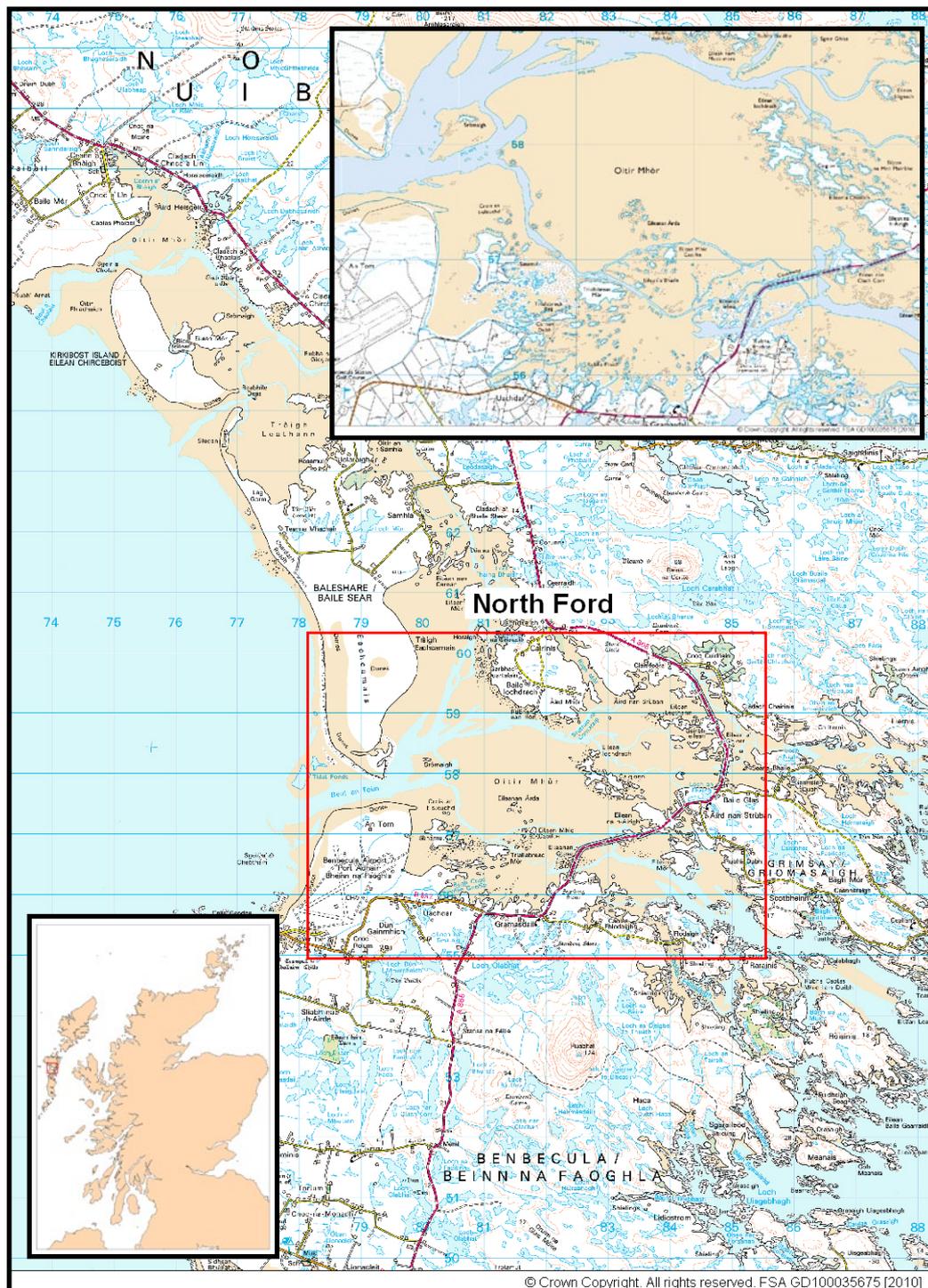


Figure 1.1 Location of North Ford

1.1 Land Use

No Land Cover 2000 data was available for the Western Isles at the time of writing this report. Observations made during the shoreline survey indicated that the land surrounding North Ford was mainly croft land used for grazing sheep and some cattle.

1.2 Human Population

Population data relating to the 2001 census was obtained from the General Records Office for Scotland for the North Ford area. Figure 1.2 shows the human population figures by census output area. The populations within each output area are not evenly distributed, so care must be exercised in interpreting the numbers presented. The largest centre of population in the area is the village of Baile a' Mhanaich (Balivanich), which lies adjacent to Benbecula airport, to the south and west of the fishery. The airport is small, with 2009 passenger traffic of 32,692 (UK Civil Aviation Authority, 2009). In addition to the airport, there is a range of tourist accommodation in the area, suggesting there is likely to be a seasonal increase in human population during the summer months. Much of the remaining population in the area is associated with crofts and small farms. Concentrations of these are found around Cairinis (Cairinish) and Aird 'nan Struban, both of which are directly adjacent to the fishery and are noted in Figure 1.2. The impact of human settlement on water quality at the fishery is likely to be greatest along the northern side of the cockle sands nearest Cairinis and also along the shore north and east of Balivanich.

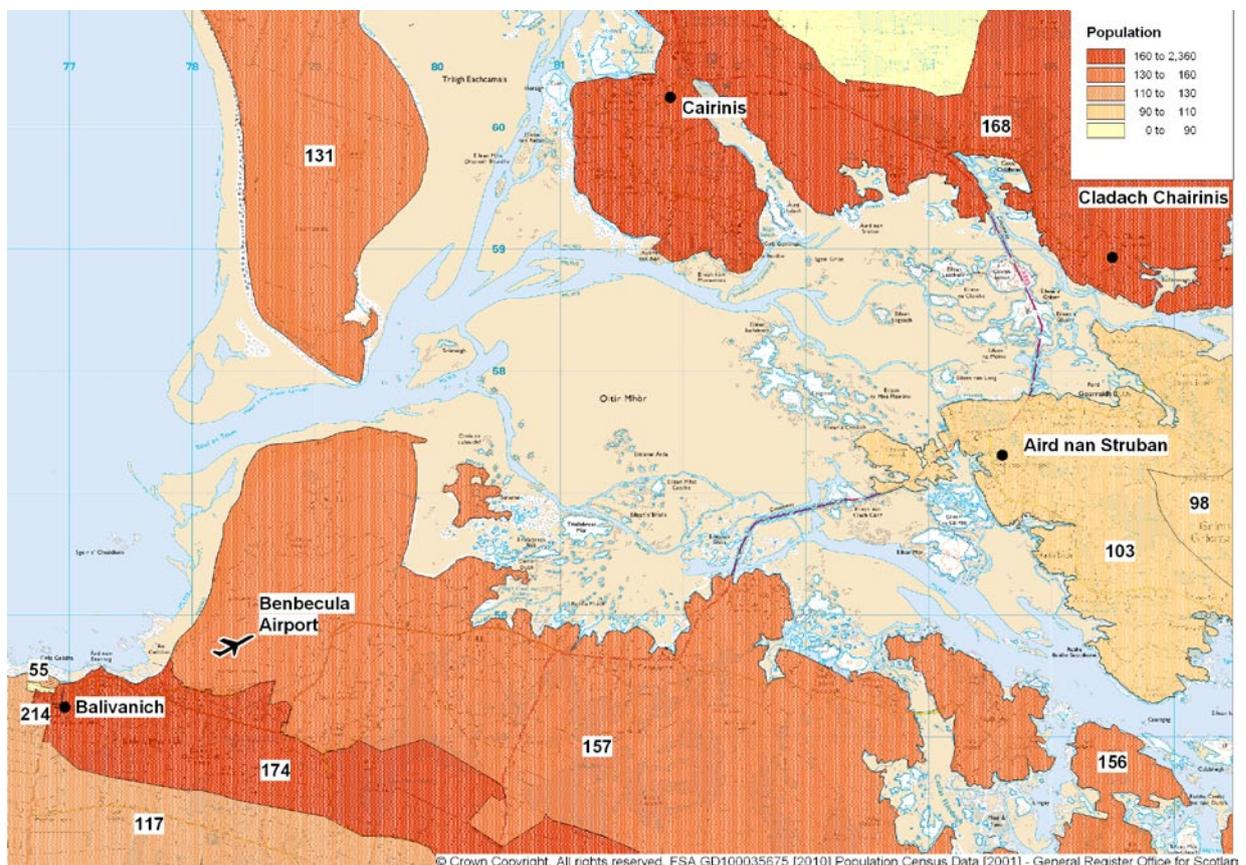


Figure 1.2 Human population surrounding North Ford

2. Fishery

The fishery at North Ford (UB 493 852 04) is comprised of a wild common cockle (*Cerastoderma edule*) bed on an area of intertidal sands. The cockles will be hand raked and harvesting is planned to take place throughout the year.

The cockle bed was identified by the harvester on the classification application form as the sands at Oitir Mhor, south of the inlet Beul an Toim, east of NF80 to the causeway road A865 and south of NF 800 590.

There is currently no representative monitoring point (RMP) assigned to this area. The cockle bed at North Ford does not lie within a designated shellfish growing water.

The boundaries of the common cockle bed are mapped in Figure 2.1.

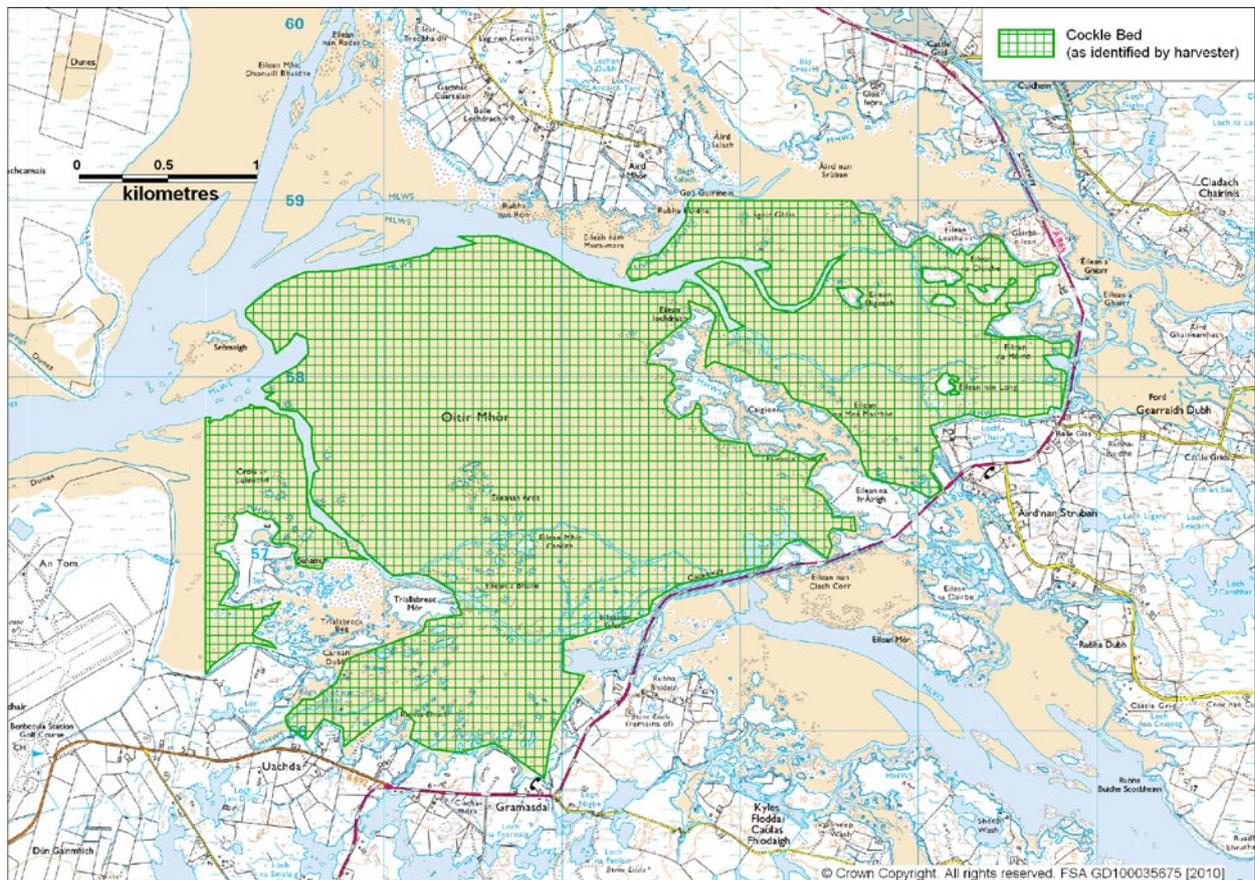


Figure 2.1 North Ford fishery

3. Sewage Discharges

A large number of discharge consent numbers were identified by SEPA for the area surrounding North Ford. Details provided for those consents relating to discharges to watercourses or the sea are listed in Table 3.1. At the time of writing this report, SEPA had not yet provided data concerning the size or flow of any of the discharges.

Table 3.1 SEPA consents for discharges to water

No.	Consent No.	NGR of discharge	Treatment Level/ Discharge Type	Discharges to
1	CAR/L/1003883	NF 7760 5605	Primary (Continuous)	Sound of Monach (NF 7762 5559)
2	CAR/R/1040104	NF 8573 5892	Primary (Continuous)	Bolltravagh, Claddish Carinish
3	CAR/R/1042439	NF 8485 5780	Primary (Continuous)	Coastal waters
4	CAR/R/1042770	NF 8421 5715	Primary (Continuous)	Coastal waters, Grimsay
5	CAR/R/1043420	NF 8195 5560	Primary (Continuous)	Unnamed tributary, Loch na Cuithe
6	CAR/R/1045267	NF 8214 6027	Primary (Continuous)	Bagh Mor, Carinish
7	CAR/R/1049529	NF 8472 5953	Primary (Continuous)	Coastal waters
8	CAR/R/1049974	NF 8481 5947	Primary (Continuous)	Sound Of Monach
9	CAR/R/1055767	NF 8519 5679	Primary (Continuous)	Unknown watercourse, Grimsay
10	CAR/R/1055774	NF 8539 5773	Primary (Continuous)	The Little Minch, Gearradubh
11	CAR/R/1056376	NF 8525 5765	Primary (Continuous)	Loch na Glas Ruaidh
12	CAR/R/1056498	NF 7977 5594	Primary (Continuous)	Unknown river, Isle of Benbecula
13	CAR/R/1056521	NF 8432 5730	Primary (Continuous)	Unnamed watercourse, Grimsay
14	CAR/R/1056525	NF 8469 5762	Primary (Continuous)	Unnamed tributary of Beul an Toim, Grimsay
15	CAR/R/1056592	NF 8454 5733	Primary (Continuous)	Unnamed tributary of Oitir Mhor
16	CAR/R/1056694	NF 8176 5569	Primary (Continuous)	Oitir Mhor
17	CAR/R/1059563	NF 8545 5626	Primary (Continuous)	Unnamed tributary to Loch a Bhradain
18	CAR/R/1059698	NF 7997 5542	Primary (Continuous)	Unknown watercourse, Isle of Benbecula
19	CAR/R/1060005	NF 8166 5951	Primary (Continuous)	Beul an Toim
20	CAR/R/1061611	NF 8490 5782	Primary (Continuous)	Sound of Monach
21	CAR/R/1062182	NF 8429 5977	Primary (Continuous)	Cnoc Cuidheir
22	CAR/R/1063320	NF 8451 5976	Primary (Continuous)	Oitir Mhor
23	CAR/R/1063344	NF 8586 5868	Primary (Continuous)	Bolltravagh
24	CAR/R/1065313	NF 8415 5517	Primary (Continuous)	Caolas Fhlodaigh, Isle of Benbecula
25	CAR/R/1066613	NF 8500 5780	Primary (Continuous)	Eilean ant Seagail, Grimsay
26	CAR/R/1066742	NF 8536 5760	Primary (Continuous)	Unknown watercourse, Grimsay
27	CAR/R/1069489	NF 8173 5569	Primary (Continuous)	Oitir Mhor
28	CAR/R/1075839	NF 8501 5779	Primary (Continuous)	The Minch coast
29	CAR/R/1077645	NF 8477 5974	Primary (Continuous)	Cnon Cuidhein
30	CAR/R/1078123	NF 8462 5973	Primary (Continuous)	Beul an Toim
31	WPC/N/61876	NF 7690 5540	Screened (Other)	Not provided
32	WPC/N/62259	NF 7960 5540	Not provided (Other)	Not provided
33	WPC/N/61874	NF 7760 5520	Screened (Other)	Not provided
34	WPC/N/61877	NF 7880 5540	Screened (Other)	Not provided
35	CAR/L/1080277	NF 8181 6075	Septic tank (Other)	Not provided
36	CAR/L/1080262	NF 8176 6068	Septic tank (Other)	Not provided
37	CAR/L/1080275	NF 8196 6054	Septic tank (Other)	Not provided

Most of the consents in the area (100) relate to discharges to soakaway, of which 60 are within 400 m of the shoreline and therefore have the potential to impact the fishery if they malfunction. Further information on these can be found in Appendix 4.

Of those discharges to water listed in Table 3.1, CAR/L/1003883 (No.1) relates to a sewage treatment works with primary treatment at Balivanich. The works serves at least 250 homes and businesses (Scottish Water, 2006.) SEPA has informed that CAR/L/1003883 has a licensed dry weather flow of 225,000 litres per day for a population equivalent (PE) of 970 to an outfall located around NF 7762 559 (exact location is unknown as the pipe has recently been re-laid and the licence has not been updated). A discharge from the MoD West Camp Site (ref No. WPC/N/61911, PE 50) is also linked to this outfall.

There is a fish processing plant located at NF 8230 5638 (see Figure 3.1). SEPA have identified that as there is no public sewer in the area it is likely that the effluent from the plant will include sewage effluent. However, there is no official record of this.

In Figure 3.1 the discharge consents have been thematically mapped to identify soakaways within 400 m of MHWS, soakaways <400 m from MHWS, sewage (private) primary discharges (septic tanks), a sewage (public) primary discharge, other discharges and the fish processing plant.

Three community septic tanks and sewage discharges were identified by Scottish Water for Cairinish, to the north of the bay at North Ford. These are detailed in Table 3.2 and mapped in Figure 3.1. The corresponding SEPA consent number is included in the table.

Table 3.2 Discharges identified by Scottish Water

Consent No.	Discharge Name	NGR of discharge	Discharge Type	Level of Treatment	Consented/design PE	Consented flow m ³ /day
CAR/L/1080277	Cairinish A Primary School Thoraigdh	NF 8184 6077	Continuous	Septic tank	180	13.5
CAR/L/1080262	Cairinish B Trianiadh Bruach Gor	NF 8180 6070	Continuous	Septic tank	100	7.5
CAR/L/1080275	Cairinish C Carabhat	NF 8180 6070	Continuous	Septic tank	88	6.6

No sanitary or microbiological data were available for these discharges. Two of the septic tanks, Cairinish B and Cairinish C relate to the same grid reference, however SEPA has identified that they do not share an outfall pipe. No further information was available at the time of writing that would confirm the locations of these outfalls. Their location at the north end of Cairinis is 3.2 km from the northern boundary of the cockle bed and on the opposite side of the Beul an Toim inlet.

Several outfall pipes were also observed during the shoreline survey. Of these, two were flowing sufficiently to sample on the date of the shoreline survey. Both samples returned results of <100 *E. coli* cfu/100 ml indicating that they were unlikely to be septic discharges. The Scottish Water discharges at Cairinish were not directly observed during the shoreline surveys conducted at North Ford and at Baleshare immediately to the north. The sewage treatment works at Balavanich lies outside the area covered by the shoreline survey and so it was also not observed directly. Further details relating to these can be found in the shoreline survey report in the appendix.

The Scottish Water discharges at Cairinish are less likely to impact the fishery as they discharge north of the island and also north of the inlet channel.

Although potential sources of sewage are present around most of the bay, the bulk of direct discharges from septic tanks are located at the eastern end of the bay and so will most acutely affect the eastern side of the cockle bed.

The secondary sewage discharge at Balavanich lies just outside the entrance to the bay, and could potentially impact the southwestern edge of the cockle bed, particularly if it were to malfunction.

No information was available regarding seasonal variation in any of these discharges.

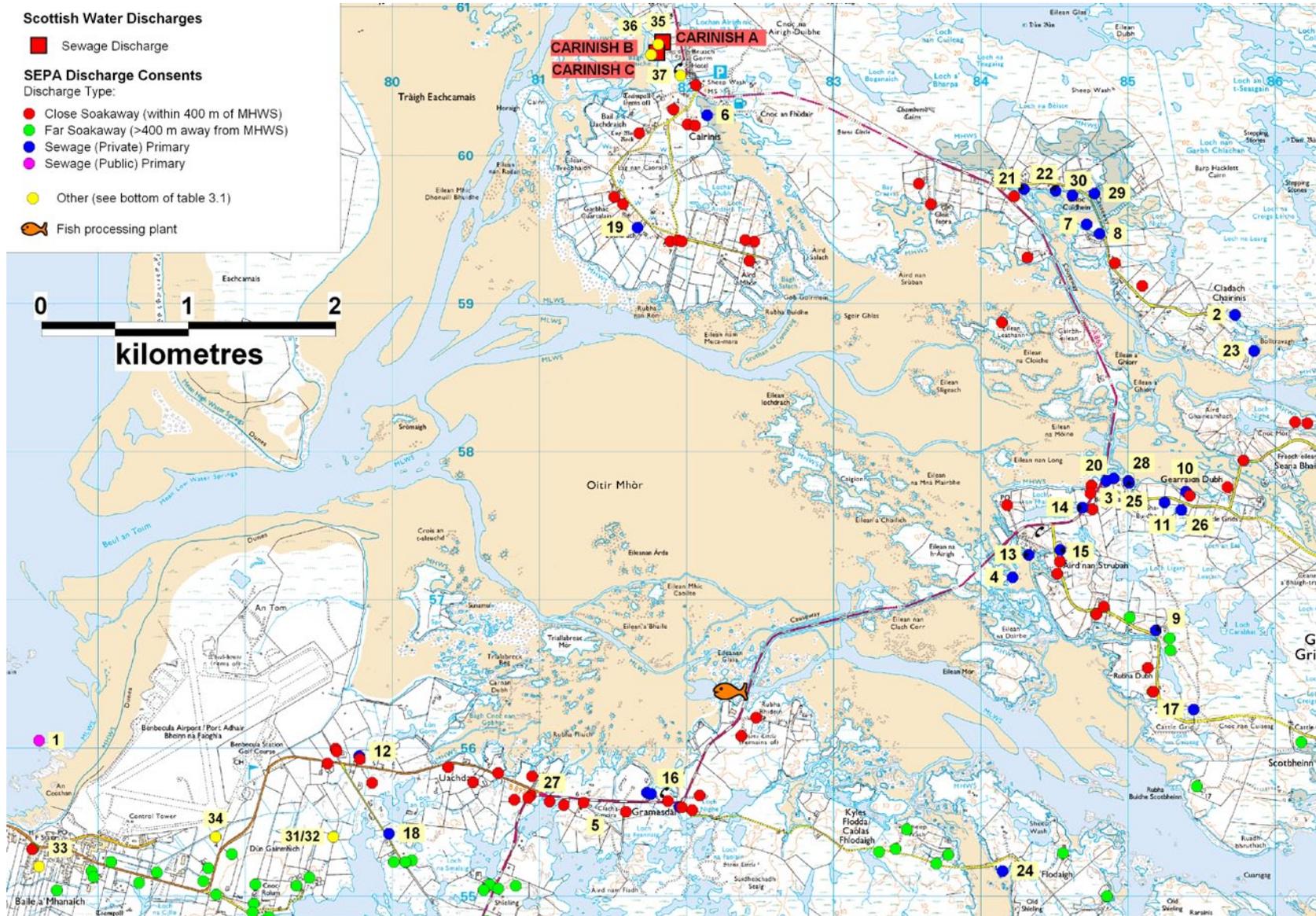


Figure 3.1 Sewage discharges at North Ford

4. Animals

4.1 Livestock

The only significant source of information concerning livestock numbers in the area surrounding North Ford was available from the shoreline survey. The shoreline survey relates to the time of the site visits on the 15th March 2010.

On the southern shoreline of North Ford 50 sheep and 14 cattle were seen grazing on crofts close to the shoreline. On the eastern shoreline of North Ford an additional 38 sheep were scattered around crofts either side of the causeway. The northern shoreline had the most livestock with 100 sheep and 6 cattle grazing in crofts next to the shoreline.

Livestock numbers in the area as a whole are likely to be at their highest during the summer months when calves and lambs are present. During the warmer months livestock may access streams to drink and cool off more frequently, leading to higher levels of faecal contamination in freshwater streams and the shellfish bed itself.

4.2 Wildlife

Seabirds such as gulls will always be present on and around the production area but their distribution is likely to be relatively random over time and as such would not materially affect the overall assessment. During the shoreline survey approximately 63 gulls, 20 oyster catchers, 31 geese, 2 swans and 2 ducks were observed in North Ford area (see Figure 4.1). An otter was also observed in the south west corner of the bay. Wildlife was therefore scattered around the shores of the area and no particular spatial aspect to contamination from this source would be expected.

No other wildlife was observed at the time of the shoreline survey. However, it is likely that other seabirds may be present in the area. The seasonal variation in wildlife species present in the area was not investigated.



Figure 4.1 Livestock and wildlife present at North Ford during the shoreline survey

5. Rainfall

The nearest weather station is located at North Uist: Cllachan na Luib which is approximately 5.7 km north of North Ford. Daily rainfall values for this station were purchased from the Meteorological Office for the period 01/01/2003 to 30/09/2007 inclusive for the North Uist: Clachan na Luib weather station. For this period of 1664 days, total daily rainfall was not recorded for 260 days, including the entire months of July 2003, June 2004, October and December 2005, March and April 2006, and February 2007. Due to the close proximity of the weather station to North Ford, rainfall recorded here is likely to be very similar to that experienced in the bay and the surrounding land.

Rainfall data were supplied to Cefas/FSAS under license by the Meteorological Office. Unless otherwise identified, the content of this section (e.g. graphs) is based on further analysis of this data undertaken by Cefas.

High rainfall and storm events are commonly associated with increased faecal contamination of coastal waters through surface water run-off from land where livestock or other animals are present, and through sewer and wastewater treatment plant overflows (Mallin et al. 2001, Lee and Morgan 2003).

The influence of rainfall on microbiological quality will depend on factors such as local geology, topography, land use and sewerage infrastructure.

5.1 Rainfall at North Uist

Due to the missing data it is not appropriate to present total rainfall at North Uist by year or month. Instead, Figures 5.1 and 5.2 summarise the pattern of rainfall recorded at North Uist. The box and whisker plots present the distribution of individual daily rainfall values (observations) by year (Figure 5.1) or by month (Figure 5.2). The grey box represents the middle 50% of the observations, with the median noted by a line within the box. The whiskers extend to the largest or smallest observations up to 1.5 times the box height above or below the box. Individual observations falling outside the box and whiskers are represented by the symbol ‘*’.

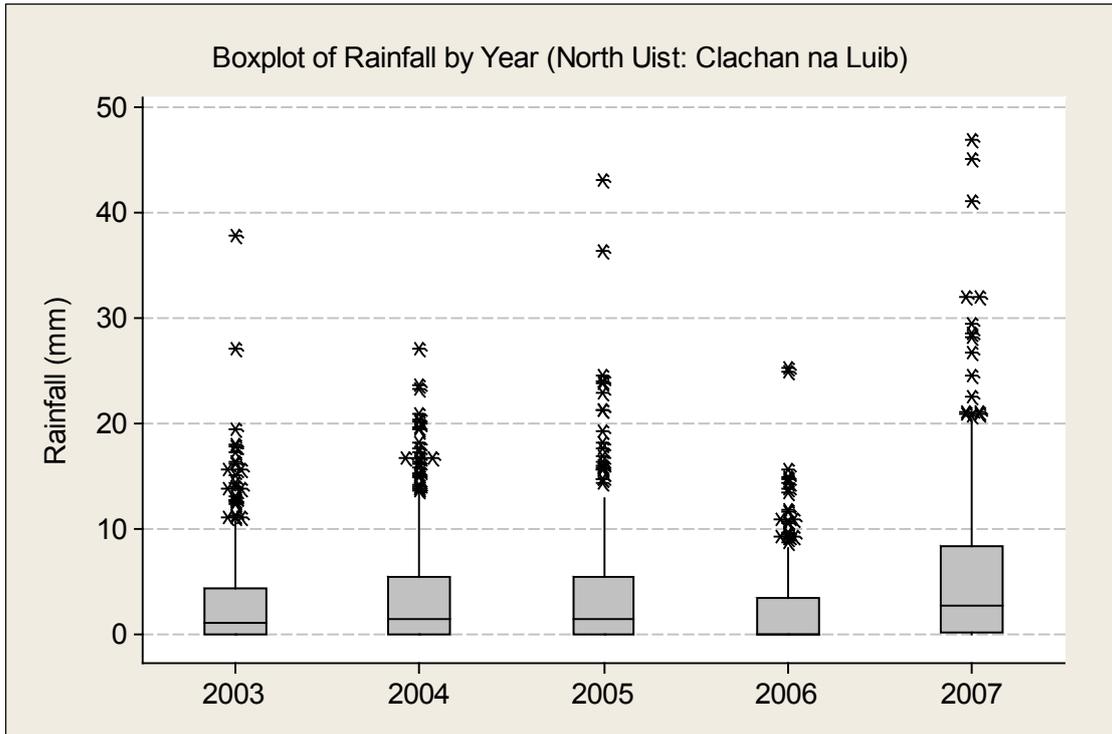


Figure 5.1 Boxplot of daily rainfall at North Uist by year

Figure 5.1 shows that there was considerable variation in the median daily rainfall from year to year. Overall, 2006 saw the lowest median rainfall, of 0mm. The highest individual rainfall events occurred in 2005 and 2007, with 2007 being wetter overall.

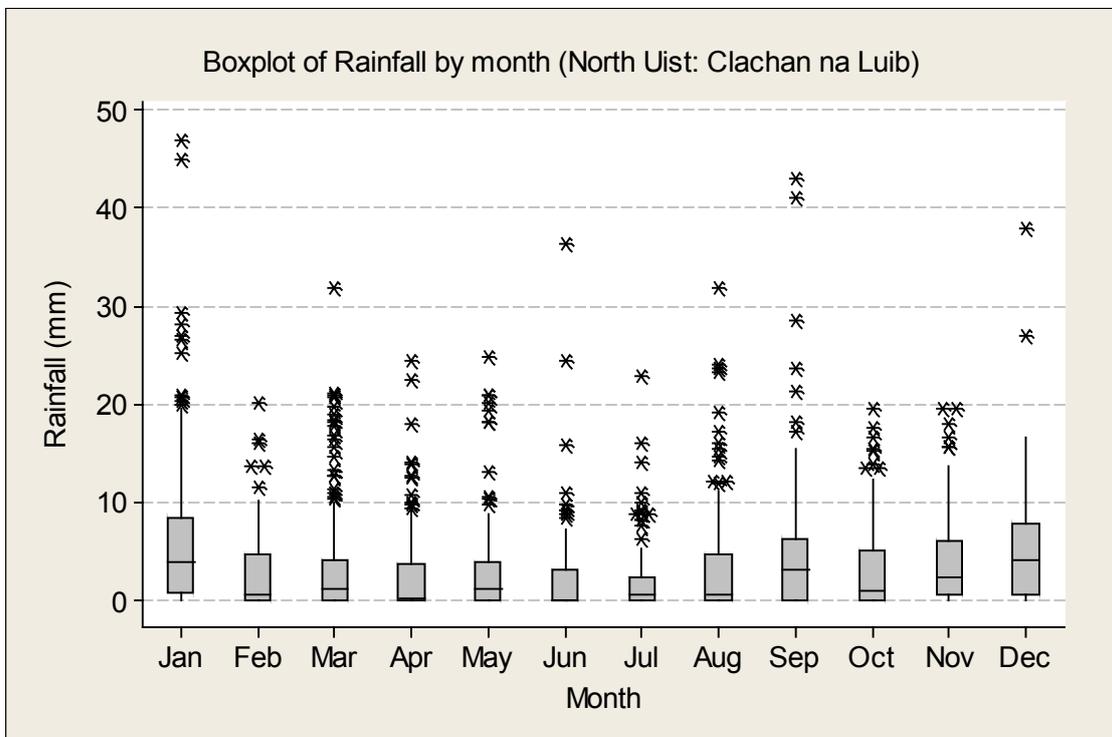


Figure 5.2 Boxplot of daily rainfall values at North Uist by month

The wettest months were December and January, but high individual rainfall events generally occurred throughout the year although the most extreme events (>40 mm/day) were only seen in January and September in this dataset. For the period considered here (2003 – 2007), 36% of days for which records were available experienced no rainfall while 47% of days experienced rainfall of 1mm or less. Although the mean rainfall was 4 mm per day, there were 8 occasions where daily rainfall exceeded 30mm. The highest daily rainfall recorded (47mm) fell in January 2007.

Periods of increased rainfall are generally associated with higher levels of contaminated surface water runoff. Marked changes in the level of rainfall may also cause significant wash off of faecal material accumulated during dry periods.

6. River Flow

There are no river gauging stations in the vicinity of North Ford. A total of five fresh water inputs were observed discharging into the area. However, of these only four were of sufficient size to sample. These streams represented the largest freshwater inputs to the area and are listed in Table 6.1 and mapped in Figure 6.1.

Table 6.1 Stream flow and loadings – North Ford

No	Grid Ref	Description	<i>E. coli</i> (cfu/ 100 ml)
1	NF 80278 55974	Stream	100
2	NF 81053 55684	Stream	<100
3	NF 84518 57123	Stream	<100
4	NF 81868 59053	Stream	<100

^ Freshwater input dimensions and flow were not measured

All but one sample result fell below the level of detection of the test used. Results indicated that levels of bacterial contamination from *E. coli* were low in all sampled streams on the day of survey. It is expected, however, that bacterial concentrations in these streams may be higher after rainfall.



Figure 6.1. Location of streams and fresh water sample results at North Ford

7. Historical *E. coli* Monitoring Data

There is no historical *E. coli* monitoring data available for North Ford.

8. Bathymetry and Hydrodynamics

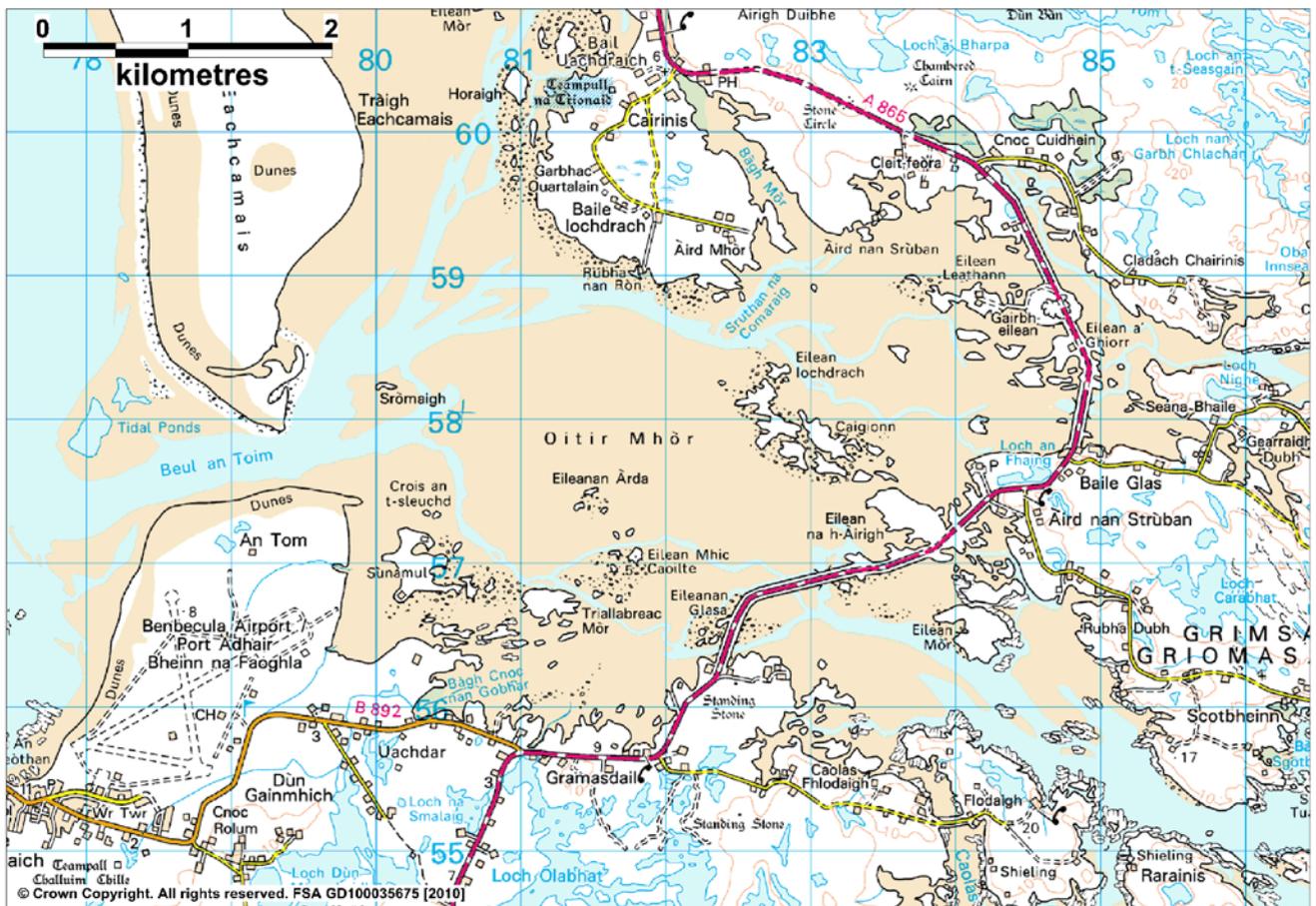


Figure 8.1 North Ford bathymetry chart and OS map

Electronic hydrographic data was not available for the North Ford area. The Ordnance Survey map shows that the majority of the area is intertidal (see Figure 8.1), which appears as drying area on UKHO Admiralty charts.

The charts show that with distance from the coastline of the Baleshare and Benbecula islands, the depth increases from a shallow drying area to depths of up to 50 m. The area is open to water flow from both the west side of the bay via the Beul an Toim and from the southeast side of the bay via a channel between Grimsay and Benbecula islands. Water is able to flow between the two areas via culverts beneath the causeway to both the north and south of Grimsay.

8.1 Tidal curve and description

The two tidal curves below are for the port of the Balivanich, the nearest secondary port– they have been output from UKHO TotalTide. The first is for seven days beginning 00.00 GMT on 9th March 2010. The second is for seven days beginning 00.00 GMT on 16th March 2010. Together they show the predicted tidal heights over high/low water for a full neap/spring tidal cycle.

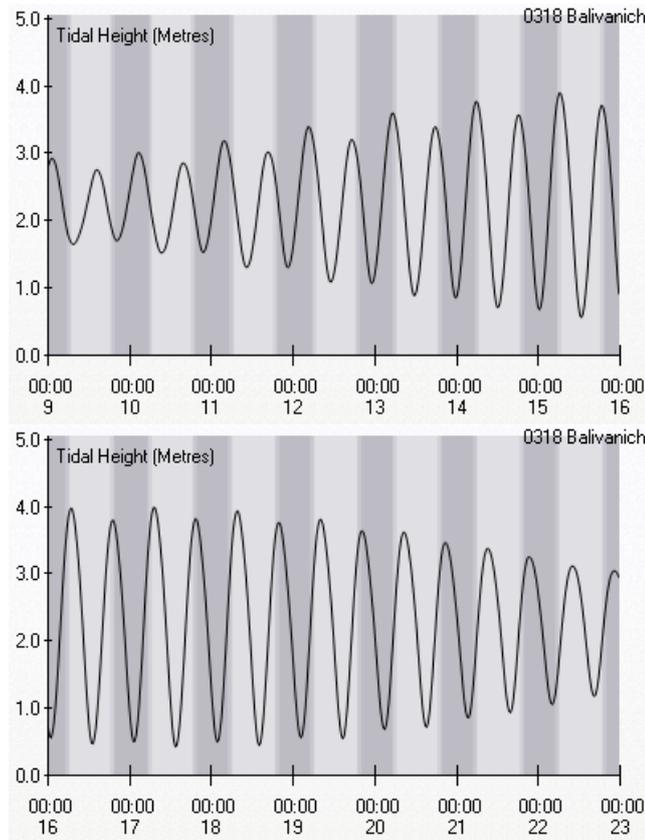


Figure 8.2 Tidal curves for Balivanich

The following is the UKHO summary description for Balivanich:

The tide type is Semi-Diurnal.

MHWS	4.1 m
MHWN	3.1 m
MLWN	1.5 m
MLWS	0.5 m

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Predicted heights are in metres above chart datum. The tidal range at spring tide is therefore approximately 2.6 m and at neap tide 2.6 m.

8.2 Currents

No tidal flow information was available from the UKHO for points close to North Ford. Scottish Sea Kayaking (Cooper and Reid, 2005) indicates that the average spring flow to the west of Baleshare island are in the order of 2 knots, approximately 1 m/s) with the northerly flood occurring approximately 4 hours 30 minutes before HW Ullapool and the southerly ebb tide occurring approximately 1 hour 55 minutes after HW Ullapool. Average neap flows will be approximately half of this.

The flooding tide will be expected to enter the bay primarily from the west through the channel Beul an Thoim. Tidal flows moving in from the southeast toward the

Benbecula - Grimsay and Grimsay - North Uist causeways will meet the incoming tide from the other direction near the causeway, however where this meeting point occurs will depend upon tidal state and prevailing weather conditions at the time. In general, the flood tide will flow up the channels, spreading across the intertidal sands and cockle bed as the water rises with the opposite happening on the ebb.

8.3 Conclusions

The area at North Ford is generally very shallow and water movement is likely to be restricted at the causeways, in part due to the constriction at three culverts and in part due to the meeting of the two incoming tides. Water depth over the cockle bed is shallow and opportunity for dilution of contaminants is low. Sources of faecal contamination were predominantly associated with areas around Cairinis and along the eastern and southern shores of the bay. Faecal contamination from the sewage discharge at Balivanich, which lies just south of the entrance to the bay, could potentially be carried toward the fishery on the flood tide where it would be most likely to impact the northwestern extent of the cockle bed. However, as this is secondary-treated sewage discharge, it may contribute less to faecal contamination levels in the shellfish at North Ford than those sources within the bay that receive a lower level of treatment.

9. Shoreline Survey Overview

A restricted shoreline survey of the North Ford shoreline was undertaken by staff from Comhairle nan Eilean Siar Council on the 15th March 2010.

Sub-surface sea water samples were taken from three points within the shellfish bed area. Two samples taken from the north end of the site had results of 0 *E. coli* cfu/100 ml and the other sample taken from the eastern side of North Ford had a result of 10 *E. coli* cfu/100 ml.

Fresh water samples were taken all along the coastline of North Ford at any streams flowing at the time of the shoreline survey. From the four fresh water samples taken from streams, three had results of <100 *E. coli* cfu/100 ml and one sample, taken from the southwest corner of North Ford had a result of 100 *E. coli* cfu/100 ml.

Common cockle samples were collected from three points within the bay North Ford. All of these were taken from the eastern side of the bay and one of them from outside the area identified by the harvester. One of the samples had a result of 80 *E. coli* MPN/100 g. A second sample taken from the far north eastern corner of North Ford had a result of <20 *E. coli* MPN/100 g. The final sample, taken towards the northern end of North Ford, had the highest result of 230 *E. coli* MPN/100 g.

A total of three possible sewage outfall pipes were observed on the northern shoreline of North Ford during the shoreline survey. Two of these possible outfall pipes had enough flow to take a water sample. Both samples returned results of 0 *E. coli* cfu/100 ml.

Approximately 50 sheep and 14 cattle were seen grazing on crofts close to the southern shoreline of North Ford. On the eastern shoreline of North Ford an additional 38 sheep were scattered around crofts either side of the causeway. The northern shoreline had more concentrated livestock numbers with 100 sheep and 6 cattle grazing close to the shoreline.

A map is provided in Figure 9.1 that shows the relative locations of the most significant findings of the shoreline survey.

10. Overall Assessment

Fishery

The location of the common cockle bed at North Ford, as identified by the harvester on the classification application form, comprises the sands at Oitir Mhor, south of the inlet Beul an Toim, east of NF80 to the causeway road A865 and south of NF 800 590. The cockles are hand raked when the sands are exposed at low tide and harvesting is expected to take place throughout the year.

Human sewage impacts

There are a large number of consented discharges in the area surrounding the North Ford cockle bed. Of these, 29 private septic tanks discharge either to the sea or to watercourses that in turn discharge to the sea, and the majority of these are located along the eastern shore of the bay. Few of these were identified during the shoreline surveys in this and adjacent areas.

Any potential impact from the three Scottish Water septic tank discharges at Cairinis would be most likely to occur at the northwestern extremity of the fishery. However, due to the distance (> 3 km away) and location north of the inlet separating the cockle bed from the island, these discharges are less likely to impact the cockle bed than those on shoreline directly adjacent the fishery.

The secondary sewage discharge at Balavanich lies just outside the entrance to the bay, and could potentially impact the southwestern edge of the cockle bed, particularly if it were to malfunction.

Although potential sources of sewage are present around most of the bay, the bulk of direct discharges from septic tanks are located at the eastern end of the bay and so will most acutely affect the eastern side of the cockle bed.

A seasonal increase in human sewage discharge is anticipated during the months of April to September.

Agricultural impacts

During the shoreline survey sheep and some cattle were seen grazing on much of the shoreline surrounding the cockle bed. Due to the close proximity of the livestock to the shoreline and freshwater inputs, livestock are expected to be a significant source of faecal contamination to the area. The impact on faecal indicator concentrations at the fishery is likely to be highest near to the shore and where streams draining grazed areas enter the bay. The largest concentration of livestock observed during the shoreline survey was at south of Cairinish, along the northern shore of the bay.

Wildlife impacts

A variety of birds and one otter were observed in the area during the shoreline survey, though no large aggregations of animals were seen.

It is likely that there will be seasonal variation in the numbers of birds present in the area as migrating birds move through and breeding birds nest and raise young. However, this variation was not investigated. The impact of birds to the fishery is

assumed, therefore, to be relatively evenly distributed throughout the bay with no evidence to suggest any one part of the fishery is more affected than another.

Rivers and streams

Five watercourses were found to be discharging into North Ford at the time of the shoreline survey, although only four of them were sampled. All were relatively lightly contaminated, with *E. coli* concentrations of ≤ 100 cfu/100 ml, suggesting that at the time of survey those watercourses tested were not receiving significant amounts of faecal contamination and thus not contributing them to the bay.

Rainfall

Rainfall patterns at the nearest rainfall station show that seasonal variation in rainfall levels occurs, with the wettest months being December and January. An increase in rainfall may be expected to wash a flush of bacteria from the surrounding land into the production area. The impact of rainfall events is likely to be most acute nearest where the streams enter the shellfish bed and particularly after dry periods, when runoff of faecal contaminants is more likely to occur.

Analysis of results

There are no historical *E. coli* monitoring results for North Ford. During the shoreline survey, common cockle samples were collected from three points within the bay at North Ford. Sample results ranged from <20 to 230 *E. coli* MPN/100 g. The highest result was obtained from a cockle sample taken to the north of the identified cockle bed, very near to the shoreline on the south side of Cairinis.

Of the three seawater samples taken during the shoreline survey, the only sample to test positive for *E. coli* had a result of 10 cfu 100 ml. This sample was taken from a channel the southeastern shore.

No sampling was undertaken at the western side of the fishery, therefore it is difficult to assess levels of contamination present there.

Movement of contaminants

Limited dilution of contaminants is expected due to the shallow depths in the area. Septic tank discharges and livestock near to the eastern shore will have the highest impact on the shellfish bed in this area. Contaminants from the sewage discharge at Balivanich may impact the western side of the bed, while contaminants arising from the discharges at Cairinis are expected to impact mostly to the north of the Beul an Toim.

Overall conclusions

Livestock and human sources of faecal contamination are likely to be the main sources of contamination to the fishery at North Ford. Both of these sources are likely to be subject to seasonal variation, with potential for higher impacts during the summer months. Spatial variation across the identified cockle bed is expected, with higher levels of contamination likely nearest the north shore (and to a lesser extent along the rest of the shoreline where livestock have access) and along channels carrying freshwater discharges from streams.

11. Recommendations

Production Area

The recommended production area boundaries are described as the area bounded by lines drawn between NF 8254 5890 to NF 8383 5945 and between NF 8440 5831 to NF 8433 5776 and between NF 8200 5600 to NF 8075 5600 to NF 8073 5633 and between FN 8026 5647 to NF 8017 5672 and between NF 8015 5722 to NF 8015 5823 to NF 8178 5900 extending to MHWS. This area encompasses the bed as identified by the harvester, while excluding areas that are likely to experience higher levels of contamination due to the proximity of livestock or septic tank discharges.

RMP

It is recommended that the RMP be set at NF 8405 5786. This is near to the shore and to the largest cluster of consented discharges at the shoreline.

Tolerance

As there is likely to be substantial variation in cockle density across the North Ford area, it is recommended that a 100 m tolerance be allowed for sampling. This will allow for some variability in density while still ensuring that monitoring is undertaken reasonably close to the assigned RMP.

Frequency

As there is no historical monitoring data for the area and some seasonal variation in sources of contamination is expected, it is recommended that monthly monitoring be undertaken until sufficient data has been accumulated to permit a review.

The locations of the recommended production area boundaries, RMP and tolerance zone are illustrated in Figure 11.1.

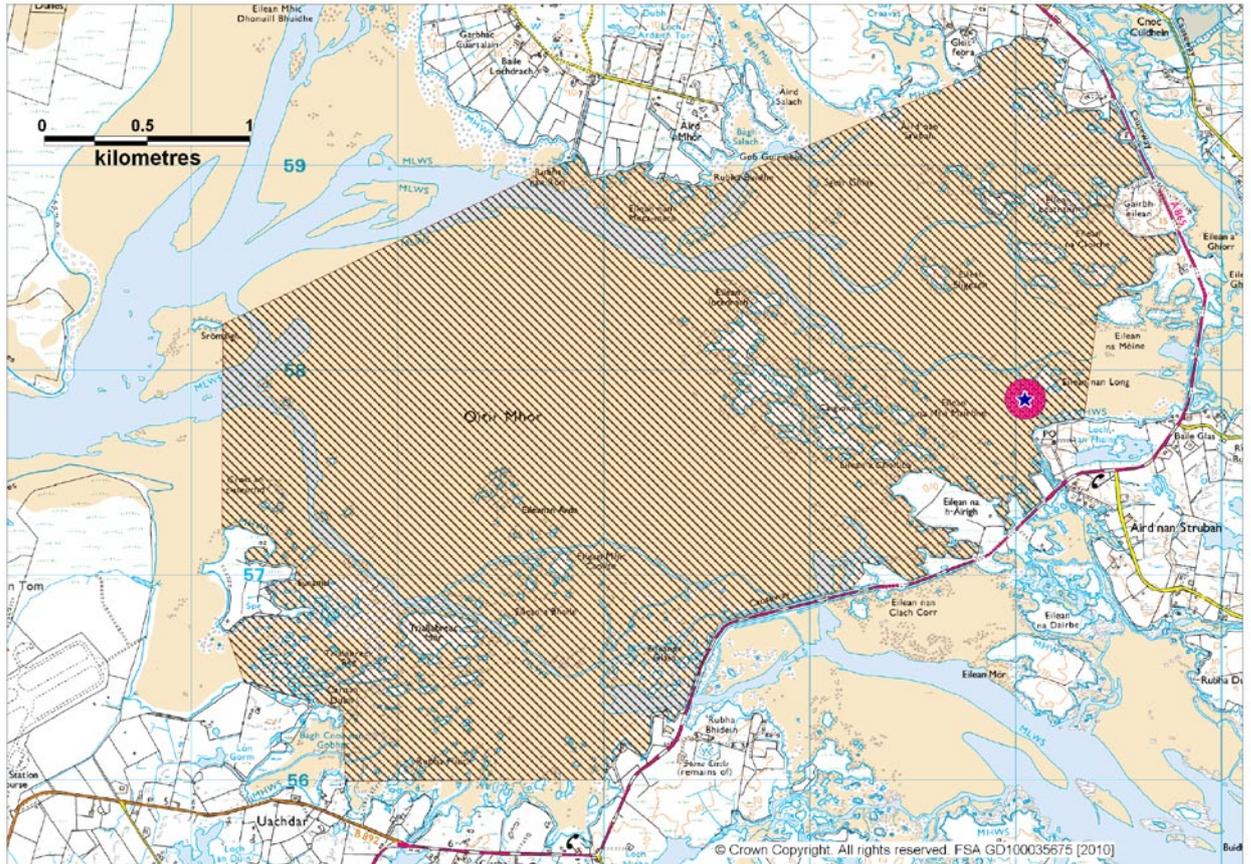


Figure 11.1 Recommendations for North Ford

12. References

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Appendices

1. **Summary Sampling Plan**
2. **Comparative Table of Boundaries and RMPs**
3. **Shoreline Survey Report**
4. **SEPA Discharge consents - Soakaways**

Sampling Plan for North Ford

PRODUCTION AREA	SITE NAME	SIN	SPECIES	TYPE OF FISHERY	NGR OF RMP	EAST	NORTH	TOLE R-ANCE (M)	DEPTH (M)	METHOD OF SAMPLING	FREQ OF SAMPLING	LOCAL AUTHORITY	AUTHORISED SAMPLER(S)	LOCAL AUTHORITY LIAISON OFFICER
North Ford	Oitir Mhor	UB 493 852 04	Common cockles	Wild	NF 8405 5786	84050	857860	100	NA	Hand raked	Monthly	CnES	Samantha Muir	Samantha Muir

Comparative Table of Boundaries and RMPs – North Ford

Production Area	Species	SIN	Existing Boundary	Existing RMP	New Boundary	New RMP	Comments
North Ford	Common cockles	UB 493 852 04	NA	NA	The area bounded by lines drawn between NF 8254 5890 to NF 8383 5945 and between NF 8440 5831 to NF 8433 5776 and between NF 8200 5600 to NF 8075 5600 to NF 8073 5633 and between FN 8026 5647 to NF 8017 5672 and between NF 8015 5722 to NF 8015 5823 to NF 8178 5900 extending to MHWS	NF 8405 5786	New production area and RMP

Shoreline Survey Report



North Ford UB 493

Scottish Sanitary Survey Project



Shoreline Survey Report

Production area: North Ford
 Site name: Oitir Mhor
 Species: Common Cockles (*Cerostoderma edule*).
 Harvester: Duncan MacInnes
 Local Authority: CnES
 Status: New site

Date Surveyed: Monday 15th March 2010
 Surveyed by: Samantha Muir
 Matt McDonald
 Existing RMP: NA
 Area Surveyed: See Figure 1.

Weather observations

Monday 15th March: Overcast but some sunny spells. No rain for the previous week.

Site Observations

Fishery

The North Ford production area is harvested for common cockles (*Cerostoderma edule*). The common cockles are hand raked within the Oitir Mhor site, shown in Figure 1. The harvesters plan to harvest the razors all year round.

Sewage/Faecal Sources

There are no large settlements surrounding North Ford. Human population is spread through scattered dwellings around the production area. Three possible sewage outfall pipes were observed on the northern shoreline of Oitir Mhor. No septic tanks were observed during the shoreline survey.

Seasonal Population

There are no caravan parks or campsites in the area surrounding North Ford. No hotels or B&BS were observed during the shoreline survey.

Boats/Shipping

At the time of the shoreline survey no boats were observed in North Ford.

Land Use

The land surrounding North Ford is mainly croft land primarily used for grazing sheep and some cattle.

Livestock

During the shoreline survey 50 sheep and 14 cattle were seen grazing on crofts close to the southern shoreline of North Ford. On the eastern shoreline of North Ford an additional 38 sheep were scattered around crofts either side of the causeway. The northern shoreline had the most livestock with 100 sheep and 6 cattle grazing in crofts next to the shoreline.

Wildlife/Birds

During the shoreline survey gulls, oyster catchers, swans, ducks, starlings and geese were observed on and around the North Ford area. An otter was also observed in the south west corner of North Ford.

Observations can be found in Table 1.

Figure 1. Shoreline Observations

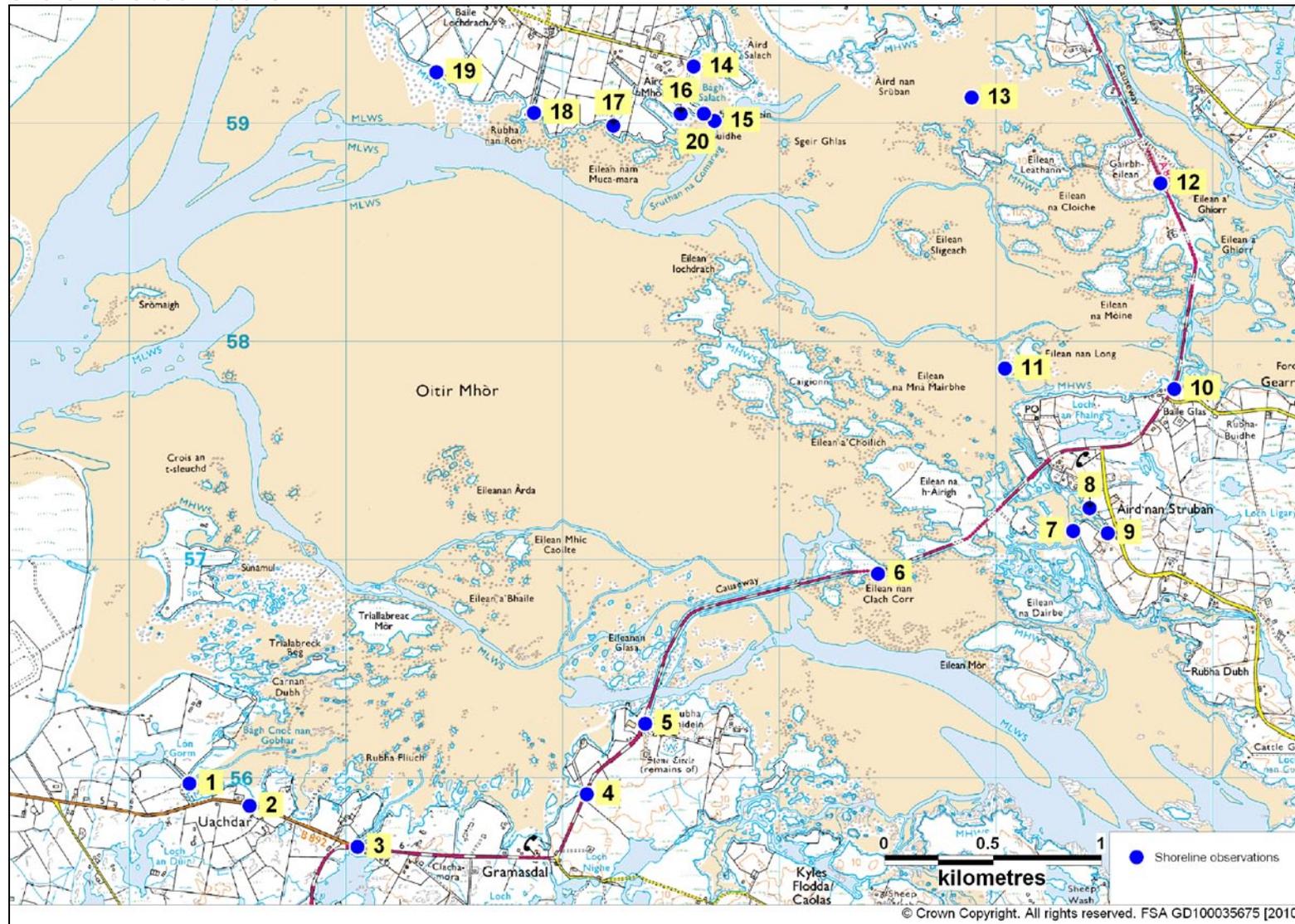


Table 1. Shoreline Observations

No.	Date	Time	NGR	East	North	Associated photograph	Description
1	15/03/2010	08:55	NF 80278 55974	80278	855974	Figure 4.	Fresh water discharge onto shore. NFFW1 (North Ford Fresh Water Sample 1) Width: 1.3m Depth: 67cm. Flow: +0.011 +0.003 m/sec SD 0.018. 3 houses visible, 1 otter, 11 geese, 2 gulls, evidence of sheep but none visible at shore, up in fields other side of road.
2	15/03/2010	09:08	NF 80556 55873	80556	855873	-	MacLeans Bakery. Cow shed opposite, 6 cows visible. 15 sheep on shore machair.
3	15/03/2010	09:20	NF 81053 55684	81053	855684	Figure 5.	Freshwater run off onto shore, NFFW2 (North Ford Fresh Water Sample 2). Width: 1m Depth: 18cm. Flow: -0.355 -0.376 m/sec SD 0.024. Opposite side of road, small holding with 17 sheep, 8 cattle, 7 hens, 11 seagulls.
4	15/03/2010	09:40	NF 82111 55926	82111	855926	-	6 sheep at shore, 12 sheep land side of road. Kyles of Flodda junction 9 sheep.
5	15/03/2010	09:40	NF 82381 56250	82381	856250	-	Fish processing plant. 40 starlings.
6	15/03/2010		NF 83456 56937	83456	856937	-	Causeway, 30 gulls, 12 sheep.
7	15/03/2010	10:00	NF 84357 57134	84357	857134	-	6 small holdings, croft land, 6 sheep, 2 gulls, evidence of cockles and mussels.
8	15/03/2010	10:10	NF 84434 57239	84434	857239	Figure 6.	Aird nan Strubh minor FW input, 20 sheep.
9	15/03/2010	10:20	NF 84518 57123	84518	857123	Figure 7.	FW input NFFW3 (North Ford Fresh Water Sample 2). Width: 65cm, Depth: 1-2cm. Flow: pooh sticks, travel 1m in 8 secs.
10	15/03/2010	11:00	NF 84824 57784	84824	857784	-	Start of second causeway at Baile Glas. 2 nesting swans, 7 sheep, 6 gulls, 2 ducks.
11	15/03/2010	11:15	NF 84042 57878	84042	857878	-	Beach exposed. Evidence of mussels and juveniles cockles close in, some adult cockles further out. Sand fine and compacted. Cockle sample NFC1. NFSW1 (North Ford Sea Water Sample 1). 40 houses overlook this area, 18 oyster catchers, 6 gulls.
12	15/03/2010	11:45	NF 84761 58728	84761	858728	-	Stone quarry. 3 sheep
13	15/03/2010	12:20	NF 83889 59121	83889	859121	Figure 8.	Cockle sample NFC2. NFSW2 (North Ford Sea Water Sample 2). 13 buildings overlook this area.
14	15/03/2010	12:45	NF 82606 59266	82606	859266	Figure 9.	Start of walk. 70 sheep, 6 cows, 6 gulls.
15	15/03/2010	13:00	NF 82701 59015	82701	859015	-	2 oyster-catchers, 6 small shore birds. Some mussels on rocks,
16	15/03/2010	13:10	NF 82546 59049	82546	859049	Figure 10.	Fresh water input, NFFW4 (North Ford Fresh Water Sample 4). Almost Zero flow from 4" pipe. 20 geese, 30 sheep.
17	15/03/2010	13:15	NF 82234 58992	82234	858992	-	Minor fresh water input, barely moving. Ditch cut at end of pipe, 20cm wide, <1cm deep.
18	15/03/2010	13:30	NF 81868 59053	81868	859053	Figure 11.	Fresh water input, NFFW5 (North Ford Fresh Water Sample 5).

No.	Date	Time	NGR	East	North	Associated photograph	Description
19	15/03/2010	13:40	NF 81417 59238	81417	859238	Figure 12.	Fresh water input, NFFW6 (North Ford Fresh Water Sample 6). Width of pipe 30cm, depth 2cm, little flow.
20	15/03/2010	13:55	NF 82653 59048	82653	859048	-	NFSW3 (North Ford Sea Water Sample 3). Cockle sample, hardly any here, only managed to get x10.

Photographs referenced in the table can be found attached as Figures 4 – 12.

Sampling

Water and shellfish samples were collected at sites marked on the map. Bacteriology results follow in Tables 2 and 3.

Seawater samples were tested for salinity using a hand held refractometer. These readings are recorded in Table 1 as salinity in parts per thousand (ppt).

Samples were also tested for salinity by the laboratory using a salinity meter under more controlled conditions. These results are shown in Table 2, given in units of grams salt per litre of water. This is the same as ppt.

Table 2. Water Sample Results

No.	Date	Sample	Grid Ref	Type	<i>E. coli</i> (cfu/100ml)	Salinity (g/L)
1	15/03/2010	NFFW1	NF 80278 55974	Fresh water	100	-
2	15/03/2010	NFFW2	NF 81053 55684	Fresh water	<100	-
3	15/03/2010	NFFW3	NF 84518 57123	Fresh water	<100	-
4	15/03/2010	NFFW4	NF 82546 59049	Fresh water	<100	-
5	15/03/2010	NFFW5	NF 81868 59053	Fresh water	<100	-
6	15/03/2010	NFFW6	NF 81417 59238	Fresh water	<100	-
7	15/03/2010	NFSW1	NF 84042 57878	Seawater	10	36.7
8	15/03/2010	NFSW2	NF 83889 59121	Seawater	0	36.5
9	15/03/2010	NFSW3	NF 82653 59048	Seawater	0	37.8

Table 3. Shellfish Sample Results

No.	Date	Sample	Grid Ref	Type	<i>E. coli</i> (cfu/100g)
1	15/03/2010	NFC1	NF 84042 57878	Common cockles	80
2	15/03/2010	NFC2	NF 83889 59121	Common cockles	<20
3	15/03/2010	NFC3	NF 82653 59048	Common cockles	230

Figure 2. Water sample results

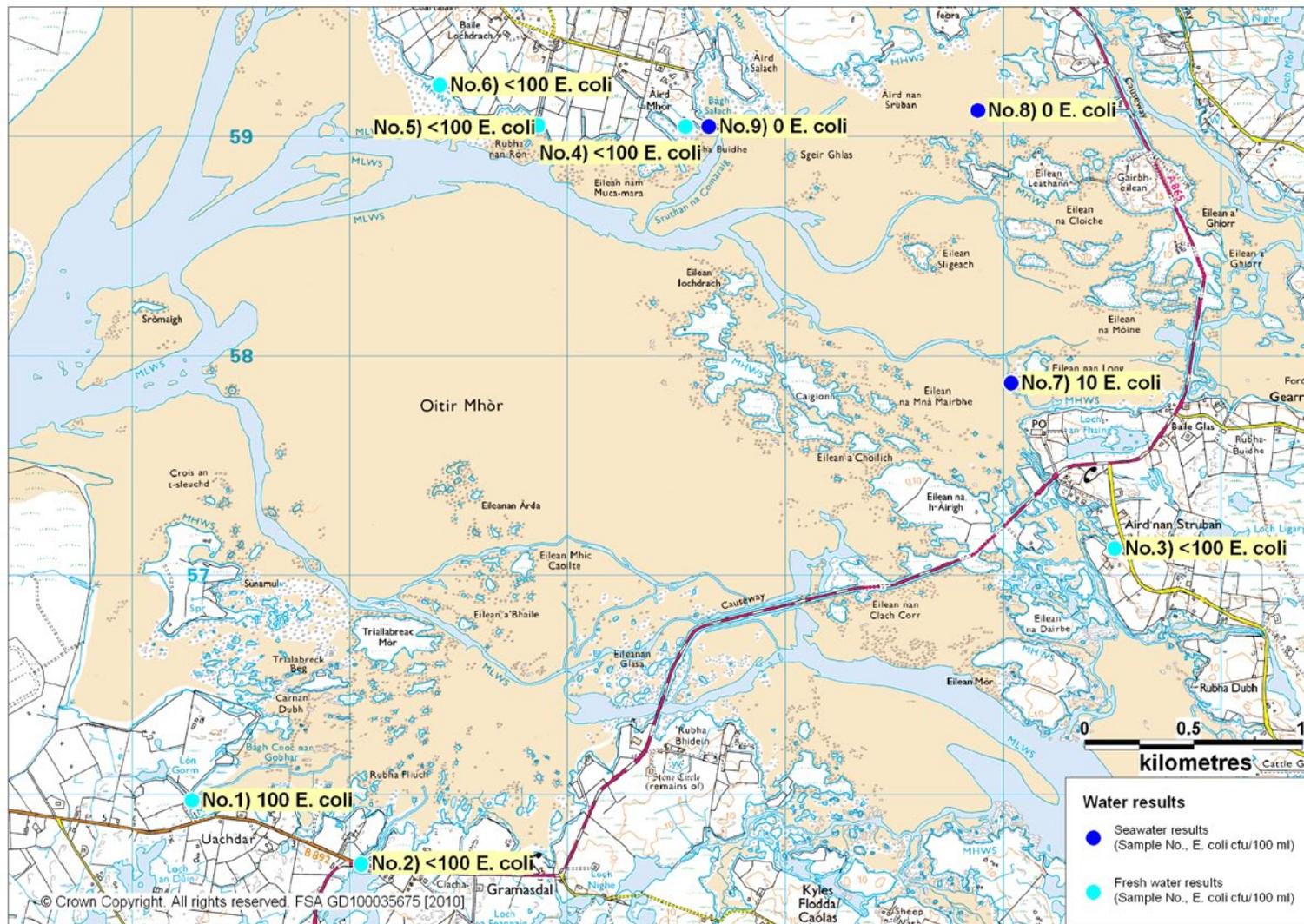


Figure 3. Shellfish sample results



Photographs



Figure 4. Location of NFFW1 sample



Figure 5. Location of NFFW2 sample



Figure 6. Sheep close to shoreline



Figure 7. Location of NFFW3 sample



Figure 8. Location of NFC2 sample



Figure 9. Sheep on shoreline



Figure 10. Location of NFFW4 sample



Figure 11. Location of NFFW 5 sample



Figure 12. Location of NFFW 6 sample

SEPA Discharge Consents – Soakaways

	Consent No.	NGR of discharge	Discharge Type	Discharges to
1	CAR/R/1045897	NF 81680 60150	Continuous	STE to soakaway, Isle of North Uist
2	CAR/R/1047485	NF 81510 59720	Continuous	STE to soakaway, Isle Of North Uist
3	CAR/R/1055988	NF 81912 60310	Continuous	STE to soakaway, Isle Of North Uist
4	CAR/R/1059693	NF 81570 59670	Continuous	STE to land, Isle of North Uist
5	CAR/R/1015248	NF 82065 60476	Continuous	STE to land
6	CAR/R/1060008	NF 82010 60210	Continuous	STE to soakaway, Carnish, Isle of North Uist
7	CAR/R/1060002	NF 82060 60200	Continuous	STE to soakaway, Carnish, Isle of North Uist
8	CAR/R/1057224	NF 81890 59420	Continuous	STE to Land, Isle of North Uist
9	CAR/R/1055618	NF 81944 59426	Continuous	STE to soakaway, Isle of North Uist
10	CAR/R/1021834	NF 81970 59420	Continuous	STE to land, North Uist
11	CAR/R/1050065	NF 82400 59430	Continuous	STE to soakaway, Carinish, Isle of North Uist
12	CAR/R/1066522	NF 82462 59419	Continuous	STE to soakaway, Isle of North Uist
13	CAR/R/1061473	NF 82429 59289	Continuous	STE to soakaway, 15 Carinish, Isle of North Uist
14	CAR/R/1070621	NF 83580 59810	Continuous	STE to Soakaway, Isle of North Uist
15	CAR/R/1070646	NF 83662 59670	Continuous	STE to Soakaway, Isle of North Uist
16	CAR/R/1044141	NF 84229 59724	Continuous	STE to Land, Isle of North Uist
17	CAR/R/1076153	NF 79615 55996	Continuous	STE to soakaway, Benbecula
18	CAR/R/1042735	NF 79621 55978	Continuous	STE to Soakaway, Uachdar
19	CAR/R/1047645	NF 79781 55925	Continuous	STE to soakaway, 2 Uachdar, Isle Of Benbecula
20	CAR/R/1055860	NF 79561 55895	Continuous	STE to soakaway, Isle of Benbecula
21	CAR/R/1047715	NF 84320 59310	Continuous	STE to soakaway, Carinish, Isle of North Uist
22	CAR/R/1078182	NF 79864 55766	Continuous	STE to Soakaway, Isle of Benbecula
23	CAR/R/1062216	NF 84145 58872	Continuous	STE to soakaway, Isle of North Uist
24	CAR/R/1061857	NF 80380 55870	Continuous	STE to soakaway, Isle of Benbecula
25	CAR/R/1078587	NF 80720 55830	Continuous	STE to soakaway, Isle of Benbecula
26	CAR/R/1065525	NF 80550 55770	Continuous	STE to soakaway, 9 Uachdar, Isle of Benbecula
27	CAR/R/1055212	NF 80951 55808	Continuous	STE to soakaway, Isle of Benbecula
28	CAR/R/1072396	NF 80830 55650	Continuous	STE to Soakaway, Uacubad, Isle Of Bendecum
29	CAR/R/1059921	NF 80940 55680	Continuous	STE to soakaway, Gramsdale, Benbecula
30	CAR/R/1057219	NF 80925 55663	Continuous	STE to Land, Isle of Benbecula
31	CAR/R/1042209	NF 81070 55640	Continuous	STE to Soakaway, Isle of Benbecula
32	CAR/R/1042892	NF 81168 55615	Continuous	STE to soakaway, Isle Of Benbecula
33	CAR/R/1048306	NF 84913 59273	Continuous	STE to Soakaway, Isle of North Uist
34	CAR/R/1055210	NF 81302 55630	Continuous	STE to soakaway, Isle of Benbecula
35	CAR/R/1043369	NF 82475 56205	Continuous	STE to soakaway, Isle Of Benbecula
36	CAR/R/1077262	NF 82373 56082	Continuous	STE to soakaway, Isle of Benbecula
37	CAR/R/1061758	NF 84180 57640	Continuous	STE to Soakaway, Grimsay, Isle of North Uist
38	CAR/R/1051949	NF 81590 55570	Continuous	STE to soakaway, Isle of Benbecula
39	CAR/R/1043402	NF 85100 59120	Continuous	STE to soakaway, Isle Of North Uist
40	CAR/R/1047164	NF 81876 55642	Continuous	STE to soakaway, Isle Of Benbecula
41	CAR/R/1019673	NF 82090 55680	Continuous	STE to land, Isle of Benbecula
42	CAR/R/1057218	NF 81970 55600	Continuous	STE to Land, Isle of Benbecula
43	CAR/R/1041038	NF 82040 55580	Continuous	STE to soakaway, Isle Of Benbecula
44	CAR/R/1078617	NF 84755 57772	Continuous	STE to Soakaway, Grimsay, Isle of North Uist

	Consent No.	NGR of discharge	Discharge Type	Discharges to
45	CAR/R/1077752	NF 84747 57719	Continuous	STE to soakaway, Isle of North Uist
46	CAR/R/1067120	NF 84760 57612	Continuous	STE to soakaway, Isle of North Uist
47	CAR/R/1049554	NF 84538 57258	Continuous	STE to soakaway, Grimsay, North Uist,
48	CAR/R/1051291	NF 84538 57258	Continuous	STE to Soakaway, Grimsay
49	CAR/R/1060965	NF 84522 57176	Continuous	STE to soakaway, Grimsay, Isle of North Uist
50	CAR/R/1052402	NF 85422 57703	Continuous	STE to soakaway, North Uist
51	CAR/R/1060619	NF 85680 57760	Continuous	STE to Land, Grimsay, Isle of North Uist
52	CAR/R/1070121	NF 85787 57941	Continuous	STE to soakaway, Isle of North Uist
53	CAR/R/1066161	NF 86140 58200	Continuous	STE to Soakaway, Grimsay
54	CAR/R/1078751	NF 86223 58192	Continuous	STE to Soakaway, North Uist
55	CAR/R/1079403	NF 78910 55283	Continuous	StE to Soakaway, Benbecula
56	CAR/R/1075837	NF 77560 55320	Continuous	STE to soakaway, Benbecula
57	CAR/R/1062068	NF 78090 55230	Continuous	STE to Land, Isle of Benbecula
58	CAR/R/1056460	NF 78750 55190	Continuous	STE to Land, Benbecula
59	CAR/R/1059100	NF 78400 55160	Continuous	STE to Soakaway, Isle of Benbecula
60	CAR/R/1047864	NF 80010 55230	Continuous	STE to soakaway, Isle of Benebecula
61	CAR/R/1059809	NF 77956 55170	Continuous	STE to Soakaway, Isle of Benbecula
62	CAR/R/1064833	NF 80135 55241	Continuous	STE to soakaway, Isle Of Benbecula
63	CAR/R/1057191	NF 80090 55230	Continuous	STE to Land, Isle of Benbecula
64	CAR/R/1060097	NF 80093 55229	Continuous	STE to Land, Isle of Benbecula
65	CAR/R/1056337	NF 78716 55102	Continuous	STE to soakaway, Dunganichy, Isle of Benbecula
66	CAR/R/1057717	NF 79437 55126	Continuous	STE to soakaway, Isle of Benbecula
67	CAR/R/1053592	NF 79070 55080	Continuous	STE to soakaway, Isle of Benbecula
68	CAR/R/1059804	NF 77970 55130	Continuous	STE to Soakaway, Isle of Benebula
69	CAR/R/1059795	NF 78280 55090	Continuous	STE to Soakaway, Isle of Benbecula
70	CAR/R/1053389	NF 79350 55070	Continuous	STE to soakaway, Isle of Benbecula
71	CAR/R/1065538	NF 78805 55010	Continuous	STE to soakaway, Balivanich, Isle of Benbecula
72	CAR/R/1047571	NF 79060 54950	Continuous	STE to soakaway, Isle of Benbecula
73	CAR/R/1051193	NF 77720 55040	Continuous	STE to Soakaway, Isle of Benbecula
74	CAR/R/1060151	NF 79050 54890	Continuous	STE to land, Dunganichy, Isle of Benbecula
75	CAR/R/1060161	NF 79160 54860	Continuous	STE to Soakaway, Isle of Benbecula
76	CAR/R/1057779	NF 80664 55080	Continuous	STE to soakaway, Isle Of Benbecula
77	CAR/R/1060156	NF 79130 54830	Continuous	STE to Soakaway, Isle of Benbecula
78	CAR/R/1057773	NF 80622 55041	Continuous	STE to soakaway, Isle of Benbecula
79	CAR/R/1060599	NF 79110 54810	Continuous	STE to Land, Balivanich, Benbecula
80	CAR/R/1049112	NF 80720 55050	Continuous	STE to soakaway, Isle of Benbecula
81	CAR/R/1056427	NF 80840 55070	Continuous	STE to Soakaway, Isle of Benbecula
82	CAR/R/1047162	NF 80640 54830	Continuous	STE to soakaway, Isle Of Benebecula
83	CAR/R/1056588	NF 80570 54737	Continuous	STE to soakaway, Isle of Benbecula
84	CAR/R/1076094	NF 84782 56908	Continuous	STE to soakaway, Grimsay
85	CAR/R/1055622	NF 84840 56950	Continuous	STE to Land, Isle of North Uist
86	CAR/R/1050557	NF 83500 55450	Continuous	STE to land, Gramsdale, Benebecula
87	CAR/R/1042037	NF 83310 55300	Continuous	STE to Land, Kyles, Isle of Benbecula
88	CAR/R/1071031	NF 85013 56882	Continuous	STE to soakaway, Grimsay
89	CAR/R/1056456	NF 83423 55319	Continuous	STE to soakaway, Baliuanich
90	CAR/R/1039366	NF 83700 55220	Continuous	STE to soakaway, Kyles Flodda, Isle of Benbecula
91	CAR/R/1044727	NF 83780 55280	Continuous	STE to soakaway, Isle Of Benbecula
92	CAR/R/1043317	NF 85287 56740	Continuous	STE to soakaway, Grimsay, Isle Of North Uist
93	CAR/R/1056626	NF 85137 56542	Continuous	STE to soakaway, Isle of North Uist
94	CAR/R/1077736	NF 85290 56660	Continuous	STE to soakaway, Isle of North Uist

	Consent No.	NGR of discharge	Discharge Type	Discharges to
95	CAR/R/1057683	NF 85169 56380	Continuous	STE to soakaway, Grimsay, Isle of North Uist
96	CAR/R/1065554	NF 84560 55290	Continuous	STE to soakaway, Isle Of Benbecula
97	CAR/R/1068333	NF 85470 55740	Continuous	STE to Land, Grimsay, Isle of North Uist
98	CAR/R/1058837	NF 84860 55000	Continuous	STE to Caolas Fhlodaigh, 4 Island Flodda, Benbecula
99	CAR/R/1059526	NF 86180 56040	Continuous	STE to Soakaway, Isle of North Uist
100	CAR/R/1047144	NF 86380 56080	Continuous	STE to soakaway, Isle Of North Uist