Shellfish Action Plan

Inner Dundrum Bay

December 2019

Department of
Agriculture, Environment
and Rural Affairs
www.daera-ni.gov.uk

INVESTORS
IN PEOPLE

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1.0 Introduction

Pollution Reduction Programmes (now Shellfish Action Plans) were established under Article 5 of the Shellfish Waters Directive (2006/113/EC) which stated that all Member States should establish programmes in order to reduce pollution in designated shellfish waters. Shellfish Action Plans will next be reviewed in 2021 which is in line with the third River Basin Cycle under the Water Framework Directive.

The Shellfish Waters Directive was subsumed into the Water Framework Directive (2000/60/EC) in December 2013. Since then all shellfish waters are protected under the Water Framework Directive (WFD) and are hereafter referred to as Shellfish Water Protected Areas. Shellfish Water Protected Areas are afforded the same level of protection under WFD as they were under the Shellfish Waters Directive. The Department will continue to work to deliver effective management of Shellfish Water Protected Areas through the UK's post Brexit Marine Strategy.

Inner Dundrum Bay and catchment was designated as a sensitive area under the Urban Wastewater Treatment Directive (UWWTD[1]) in August 2014. This followed a review which demonstrated that the Inner Bay was both:

- Eutrophic or likely to become eutrophic and
- Failing to meet the WFD Guideline shellfish standard

A further review carried out in May 2015, recommended that Inner Dundrum Bay retain its designated status under Annex IIA(c) of the UWWT Directive. The implications of this are that additional treatment than that prescribed in Article 4 of the UWWTD may be necessary to address both the trophic status and the microbiological water quality.

There are ongoing concerns around the deterioration in water quality in Inner Dundrum Bay which continues to be investigated by the Department and other agencies and measures put in place to control potential impacts.

A pilot project was established in 2017 to investigate how water management issues were being addressed across the Environment, Marine and Fisheries Group within DAERA. Inner Dundrum Bay was chosen as the pilot priority catchment area with

[1] Urban Wastewater Treatment Directive http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:31991L0271

liaison between Water Management Unit, Water Regulation, Marine & Fisheries Division, Northern Ireland Water and their consultants, AFBI, and FSA in NI. The following objectives of the project were established:
To assist in the delivery of environmental outcomes i.e. the water quality objectives in the river basin management plans:

- provide at least good status for all water bodies;
- prevent deterioration in status;
- promote sustainable development;
- achieve specific standards for protected areas.
- By 2021 and beyond.

To be delivered by:

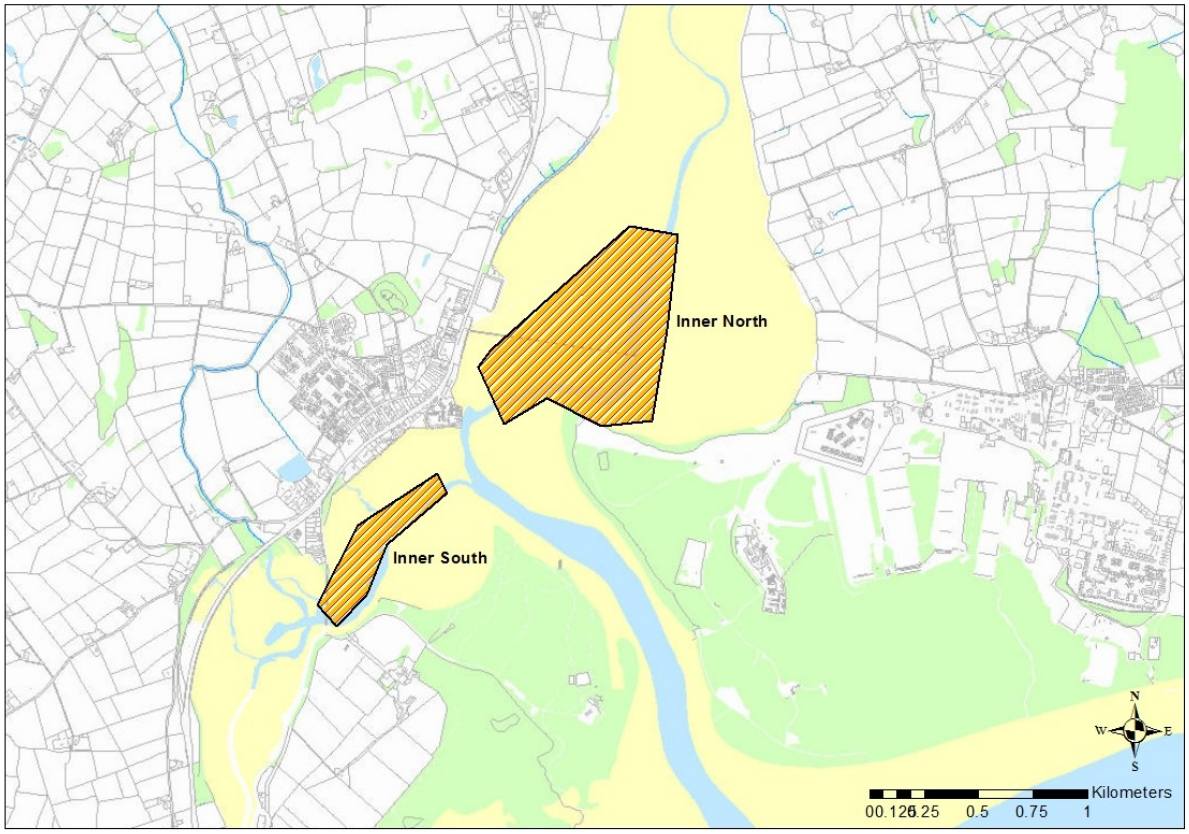
- improving the catchment approach across EMFG and wider
- empowering staff at all levels across EMFG in managing water in the catchment context.

The group has met a number of times throughout 2017 and has established a network to discuss and plan multi-faceted investigations and to prioritise action to deliver outcomes for Inner Dundrum Bay. Progress continues to be made towards stated objectives.

There is one shellfish farm with two sites licensed by Department of Agriculture Environment and Rural Affairs (DAERA) Marine and Fisheries Division in Inner Dundrum Bay; one to the south of the outer channel (Inner Dundrum South) and one to the north of the outer channel (Inner Dundrum North), see Figure 1. The Inner North production area was classified as either A or B consistently since coming into production, until 2015 when the oysters were reclassified as Class C. In 2016 it was reclassified again as a Seasonal Class C and in 2017 was reclassified as Class B. Mussels in the Inner North production area have been Class B since coming into production in 2013.

The Inner South bed was reclassified twice during 2012. In August 2012 it was reclassified from Class B to Class C and in December 2012 from Class C to Seasonal Class B and finally to Class B again in June 2013. In December 2014 it was reclassified to a Seasonal Class C. The Inner South bed has remained at Class C since 2015.

Figure1. Shellfish production areas in Inner Dundrum Bay



2.0 Description of catchment

Inner Dundrum Bay lies within the South Down catchment area which in turn lies within the North Eastern River Basin District and covers an area of approximately 500km^2. As a shallow sheltered bay area, it is almost entirely intertidal with the exception of the entrance channel. As a result there is a complete exchange of water twice per day. The Carrigs, Moneycarragh and Blackstaff Rivers all drain into Inner Dundrum Bay (see Figure 2 – catchment map). A DAERA investigation assessed the salinity changes over a number of full tidal cycles within the Inner South area of the bay. This showed that part of the shellfish production area is submerged by fresh water for more than 50% of the tidal cycle.

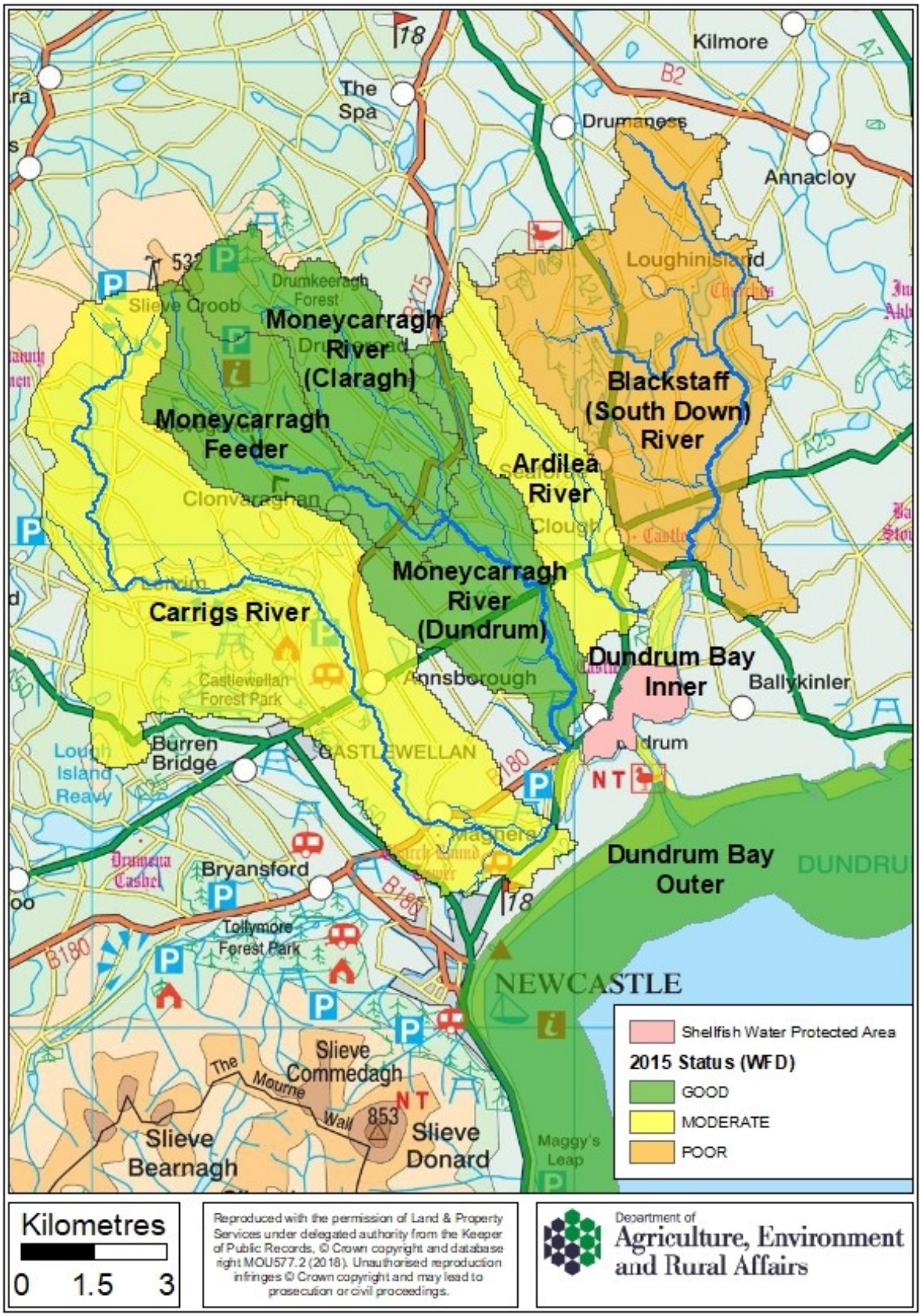
Pollution sources within the Inner Bay can therefore be directly attributed to both the agricultural catchment and wastewater sources. The Food Standards Agency in

Northern Ireland (FSA in NI) carried out a Sanitary Survey in 2012[2] and a review in 2013[3].

Dundrum Bay Outer includes the sea area that extends one nautical mile from the coastline between St. John's Point and Glassdrumman. It is neighboured by EU identified Bathing Waters (Murlough, Tyrella and Newcastle), of which in 2017 Murlough and Tyrella had Excellent Bathing Water Quality, and Newcastle had Sufficient Bathing Water Quality under the EU Bathing Water Directive.

[2] www.food.gov.uk/enforcement/monitoring/shellfish/ssurveys/sanitarysurveyni
[3] www.food.gov.uk/sites/default/files/multimedia/pdfs/pdf-ni/dundrum-survey-review.pdf

Figure 2. River Catchment Areas Draining into Inner Dundrum Bay



3.0 Objectives for Shellfish Water Protected Areas

Under WFD all Shellfish Water Protected Areas (SWPAs) must be managed to ensure that they meet their ecological and chemical objectives under WFD **AND** meet at least Class B status under the EU Hygiene Regulations. SWPAs must also make progress towards the WFD microbiological guideline standard of ≥75% of samples contain ≤230 *E.coli* in the shellfish flesh and intervalvular liquid[4]. The Food Standards Agency in NI is responsible for the implementation of Classification and monitoring programmes for shellfish for the protection of public health.

3.1 Water Framework Directive status and shellfish classification

Comprehensive monitoring programmes are in place to assess the status of Shellfish Water Protected Areas under the WFD and classification under the EU Hygiene Regulations. A suite of determinands are assessed to determine ecological status and the overall objective under WFD. Table 1 shows the future WFD ecological objective for Inner Dundrum Bay water body. Inner Dundrum Bay has recently shown some improvement[5] and is making progress towards Moderate Ecological Status under WFD.

Table 1. WFD Ecological Status and Objectives for Inner Dundrum Bay

2021 Objective	2027 Objective
Moderate Ecological Status & Class B under EU Hygiene Regulations	Good Ecological Status & Class B under EU Hygiene Regulations

Table 2 shows the Classification status at Inner Dundrum Bay under WFD (colour) and the licensed shellfish beds under the EU Hygiene Regulations (text).

[4] http://www.legislation.gov.uk/nisr/2015/351/contents/made
[5] https://www.daera-ni.gov.uk/sites/default/files/publications/doe/Lough%20Foyle%20Coastal%202nd%20Cycle%202015.PDF

Table 2. Classification status of shellfish production areas in Inner Dundrum Bay

	2018	2017	2016	2015	2014	2013	2012	2004-2011
Inner North (Oysters) (AFFNI 95)	B	B	(Dec-Aug) B (Aug-Nov) C	C	B	B	B	B
Inner North (Mussels) (AFFNI 95)	B	B	B	B	B Provisional	B Provisional	N/A	N/A
Inner South (Mussels) (AFFNI 95)	C	C	C	C	(Jan) B (Dec) C	(Jan) B (Jun) B	(Jan) B (Aug) C (Dec) Seasonal B	B

A provisional classification is given when a new bed is classified based on a limited number of samples or when a bed is borderline compliant with criteria of a classification.

Key to WFD Status

	High		
	Good		Good Ecological Potential
	Moderate		Moderate Ecological Potential
	Poor		Poor Ecological Potential
	Bad		Bad Ecological Potential

4.0 Monitoring programmes for Shellfish Water Protected areas and shellfish flesh

4.1 Monitoring of *E. coli* in shellfish flesh

FSA conducts monthly analysis of *E. coli* in shellfish flesh as part of its Official Control monitoring. This analysis is used to classify the quality of shellfish production areas. The classification determines the level of post-harvest treatment required before placing shellfish product from that area on the market. The FSA in NI's Official Control monitoring programme is solely for the purpose of classification of shellfish production areas. It is not intended as an indication of the end product standard of shellfish.

Responsibility for ensuring the safety of shellfish which are placed on the market for human consumption rests solely with the food business operator (FBO)[6].

Table 3. Shellfish classification and post-harvest treatment

Classification of harvesting areas		
Category	**E.coli per 100g flesh and intravalvular liquid**	**Post-harvest treatment required**
A	<230	May go directly for human consumption if end product standard met.
B	90% results <4600 Remaining 10% results <46000 100% results <46000	Must be subject to purification or cooked by an approved method.
C	<46,000	Must be subject to relaying for a period of at least 2 months or cooked by an approved method.
	>46,000 E.coli/100g of flesh	Prohibited. Harvesting not permitted.

4.2 Producer responsibility

Shellfish producers and harvesters have obligations under the EU Hygiene Regulations to ensure the quality of the product which they place on the market for human consumption. Producers should have an understanding and awareness of the environment in which product is being produced. Producers should use where possible, their own testing regimes to inform business management decisions. It is acknowledged that in order to make sounds decisions, producers need access to appropriate and timely information relating to the quality of the shellfish water and anything which has the potential to impact upon it.

4.3 Guideline microbiological standard (DAERA)

The shellfish flesh monitoring programme is operated by FSA in NI. The analyses in shellfish flesh are carried out by Northern Ireland Public Health Laboratories and results are reported back to both DAERA and FSA in NI.

In addition to being used for the Official Control monitoring for the microbiological shellfish classification carried out by the FSA in NI, this information is also used by

[6] www.food.gov.uk/enforcement/monitoring/shellfish/nibiotoxin#toc-3

DAERA to determine the status of Shellfish Water Protected Areas against a guideline microbiological standard for shellfish flesh which is set in the Water Framework Directive (Priority Substances and Classification) (Amendment) Regulations (Northern Ireland) 2015. This guideline standard requires that 75% of samples contain ≤ 230 *E. coli* per 100ml of shellfish flesh and intervalvular liquid.

Table 4 shows the status of Inner Dundrum Bay against the WFD Guideline standard.

Inner Dundrum Bay - guideline microbiological standard

Shellfish Water Protected Area	2018	2017	2016	2015	2014	2013	2012	2011	2010	2009
Inner Dundrum Bay										
Total Number of Samples	36	36	38	42	50	37	57	24	25	24
% Samples Meeting Guideline	14	17	18	12	16	49	30	63	58	71

	Met Guideline
	Did Not Meet Guideline

4.4 Monitoring of contaminants in shellfish flesh

Annual analysis of a suite of contaminants in shellfish flesh is carried out in all seven of the sea loughs/areas in Northern Ireland in which shellfish are cultivated and harvested. This is a joint programme of monitoring currently in place with FSA in NI and DAERA to meet both organisations' requirements under EU legislative requirements and OSPAR (Oslo/Paris convention *(for the Protection of the Marine Environment of the North-East Atlantic*)) and to enable DAERA to determine compliance with a range of environmental obligations relating to Shellfish Water Protected Areas.

The suite of contaminants tested for includes trace metals, lipids, dioxins, polyaromatic hydrocarbons (PAHs) and polychlorinated biphenyls (PCBs). See Annex B.

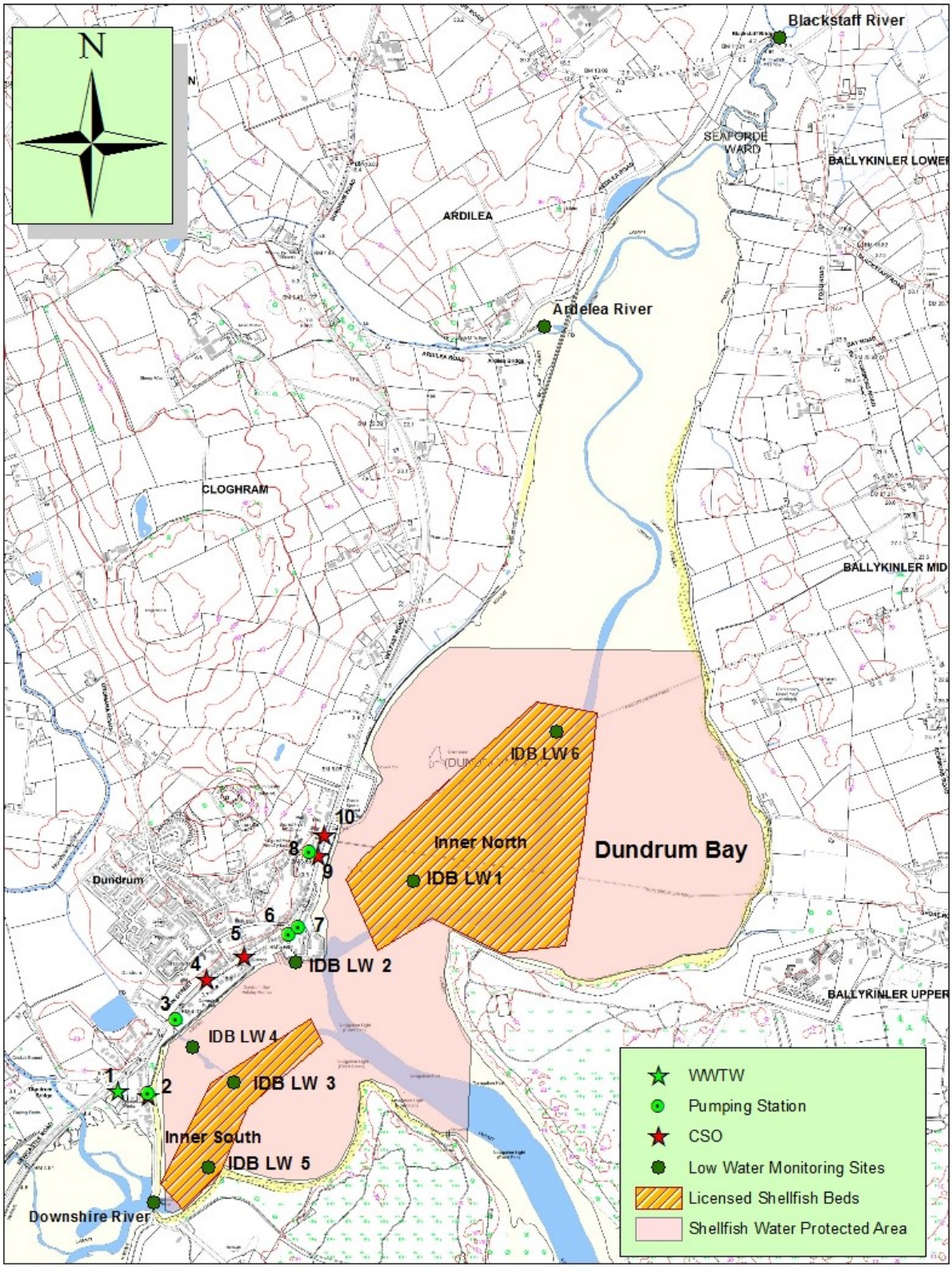
4.5 Investigative monitoring (DAERA)

Since January 2014 monthly water quality sampling for microbiology has been carried out at low water, directly adjacent to the shellfish production areas and other specific points throughout Inner Dundrum Bay and as close in time as possible to when shellfish flesh samples are collected for the FSA in NI shellfish flesh classification. This enables better assessments to be made of the microbiological pressures associated within the more sensitive shellfish production area in the south of the Inner Bay. Where Shellfish Water Protected Areas are at risk of failing to meet objectives, specific investigative monitoring is undertaken of the protected areas, rivers and any other potential sources of pollution identified.

In addition to the measures set out in this Pollution Reduction Programme, DAERA will investigate any pollution incident and/or deterioration in water quality. Formal arrangements are in place between DAERA, NI Water and the FSA in NI to investigate and respond to incidents relating to water quality at Shellfish Water Protected Areas. This includes responding to requests for investigation of FSA in NI microbiological official control sample results which are outwith the classification of the shellfish production area and any pollution incident in the proximity of a Shellfish Water Protected Area.

It is an offence under the terms of the Water (Northern Ireland) Order 1999 to cause pollution to a waterway. Pollution incidents will be investigated in accordance with the DAERA Enforcement and Prosecution Policy, which can be found at; https://www.daera-ni.gov.uk/sites/default/files/publications/daera/emfg-enforcement-policy.pdf

Figure 3. Licensed shellfish production areas in Inner Dundrum Bay, showing sampling points for microbiological analysis, the Shellfish Water Protected Area and potential point pollution sources.



0 0.25 0.5 0.75 1
Kilometers

Key: Inner Dundrum Bay

1: Dundrum Wastewater Treatment Works

2: Keel Point Combined Sewer Overflow & Wastewater Pumping Station

3: Flynns Wastewater Pumping Station

4: Main Street Dundrum (Three) Combined Sewer Overflow

5: Murlough Inn Combined Sewer Overflow

6: Downshire Wastewater Pumping Station

7: The Quay Wastewater Pumping Station

8: Kielty's School Wastewater Pumping Station

9: Main Street Dundrum (Two) Combined Sewer Overflow

10: Main Street Dundrum (One) Combined Sewer Overflow

5.0 Programme of Measures to Protect Shellfish Water Protected Areas

A North Eastern River Basin Management Plan was published in December 2009, identifying where the water environment needed to be protected or improved, the timeframe to make these improvements and how this could be achieved through a Programme of Measures.

Since this first Plan was published in 2009, the Department has been working with others to make improvements detailed within the Plan. Progress has been made and there are signs of improvement throughout the North Eastern River Basin District water environment. NIEA has updated the Programme of Measures taking into consideration existing measures and identifying new measures which are required to meet the objectives for 2021 and 2027

A second North Eastern River Basin Management Plan was published in 2015 which builds on the positive work already being carried out. It details changes and new measures for the second river basin planning cycle 2015-2021. The Programme of Measures aims to address the key pressures through concentrated efforts targeted at greatest threats to the water environment. From assessments conducted, two significant sources of pressure have been identified that are preventing water bodies from achieving good status in the North Eastern River Basin District. These are diffuse pressures and point source pressures from both agricultural, urban wastewater and development.

A summary of some of the existing and planned measures is below. More detail can be found at https://www.daera-ni.gov.uk/sites/default/files/publications/doe/water-report-north-eastern-river-basin-plan-2015.pdf

Key Sector – Agriculture – General

Specific actions for Dundrum are highlighted in the report card below.

Pressure Type – Diffuse and Point Source Pollution

Improvements required – Reduction in nutrient inputs and reduction in organic waste, reduction in pollution from sediment, education and awareness.

A **Memorandum of Understanding** has been signed between NIEA and the Ulster Farmers' Union. It is hoped that the MOU will assist in improving environmental outcomes, including improving water quality through addressing diffuse pollution.

One new incentive the Department has introduced is the **Environment Farming Scheme** (EFS) Launched in February 2017, this is a voluntary scheme that will support farmers and land managers to carry out environmentally beneficial farming practices on agricultural land. Agricultural pollution can have potentially damaging effects on rivers and shellfish growing waters. Many of our shellfish waters are in rural catchments and can therefore be susceptible to agricultural pollution. The scheme includes elements to improve and enhance water quality through both individual and group catchment improvement actions. Measures to improve water quality include buffer strips around rivers and riverine fencing.

The **Catchment Care Project,** which will be funded under INTERREG VA, will look at a range of agricultural issues across three catchments which have the potential to cause water pollution. The project will also examine measures to mitigate against water pollution impacts. The catchments are the Arney, Finn and Blackwater.

A **Strategic Agricultural Land Management Strategy** was launched by Minister McIlveen on 21st October 2016. Some of the recommendations within the Strategy are now being progressed by a pilot scheme in the Upper Bann catchment. A report on the effectiveness of the pilot, which will influence future management of agricultural land use incorporating better protection of waterways.

Although both the Catchment Care Project and the Strategic Land Management Strategy pilot are not within shellfish water catchments, the methodology and findings will be transferable to other sites.

Knowledge Advisory Service
A knowledge focussed service, managed by CAFRE which will deliver proactive programmes and drive innovation to improve the economic and environmental performance and resilience of the land based and food processing industries. Early indications are that interactions with the Knowledge Advisory Service and NIEA will help to provide advice to farmers on the linkages between their agricultural practices and impacts on water quality.

Compliance and Enforcement Visits *Actions* – DAERA to enforce closed spreading period for slurries and application on land restrictions. Encourage and advise on good land management practices such as; riverbank fencing and riparian buffers.

Key Sector – Sewage and Industry – General.

Specific actions for Dundrum are highlighted in the report card below.

Pressure Type – Diffuse and Point source pollution

Improvements required – Reduction in pollution from sewage, reduction in nutrient and dangerous substances, reduction in pollution from un-sewered properties, reduction in pollution from industry.

Actions – Northern Ireland Water Price Control (PC) process ensures investment in infrastructure. DAERA continue work on microbial source tracking to identify sources of bacterial contamination. Reviews of discharge consents on a catchment basis and comply with discharge standards in quality and quantity. Also improvements to existing controls on septic tanks, develop models and catchment based approaches to protect areas.

Because of the downgrading in shellfish class in 2012 at the Inner Dundrum Bay South bed, a protocol was developed to ensure communication between interested parties in the event of NI Water staff identifying any problems affecting the normal operation of the WWTW, pumping stations or other NI Water asset likely to impact on Inner Dundrum Bay Shellfish Water Protected Area. Under the protocol NI Water will inform NIEA who in turn will contact: DAERA Marine and Fisheries Division, Newry Mourne and Down District Council, FSA in NI and the Food Business Operator, if deemed likely to impact on water quality. The protocol has been actioned on a number of occasions since November 2013.

Key Sector – Urban Catchment

Pressure Type – Diffuse and point source pollution

Improvements required – Control of diffuse and point source pollution, reduction in pollution and flood risk,

Actions – Promote and adopt good practice with respect to storage, use and disposal of hazardous chemicals. Promote wider use of Sustainable Urban Drainage Systems (SuDs) and buffer strips.

The water environment in the North Eastern River Basin District is being managed at a local level through Local Management Area action plans, including the South Down Local Management Area action plan. In 2017 and 2018, activities have focussed on targeted catchments to best utilise resources.

Catchment Stakeholder groups provide forums for stakeholders to discuss water management issues in their local area and to work in partnership to address them.

Local Management Area Plan and 2013 update for South Down[7] :

[7] https://www.daera-ni.gov.uk/sites/default/files/publications/doe/water-report-significant-water-management-issues-south-down-local-management-area-action-plan-and-update-2013.pdf

6.0 Summary of Outputs (Expanded at Annex A)

Actions in Improving Sewerage Network and Waste Water Treatment Works
Monitoring and Investigations
Actions in Reducing Agricultural Inputs
Overall Management Actions

How much did we do #	How well did we do it %
Actions in improving Sewerage Network and Waste Water Treatment Works	
Sewerage network improvements in the Dundrum Area	Installation of Combined Sewer Overflow (CSO) monitors within 2km of identified Bathing Waters and Shellfish Water Protected Areas. Sewer network rehabilitation works. Drainage Area model updates, ground conditions, site selection reporting and landowner negotiations have been carried out.
Upgrades to Dundrum Wastewater Treatment Works (WWTW)	Work began in January 2018 on a £2.5m programme to improve the existing treatment process and deal with increased flows at Dundrum Wastewater Treatment Works.
Monitoring and Investigations	
Investigative monitoring E Coli in water matching Food Standards Agency in NI flesh programme annually from 2009	UKAS accreditation maintained since 2008, all samples analysed to UKAS standards.
High water nutrients sampling annually from 2009	Samples collected and analysed following UKAS standards. Standards are set by WFD and based on a 6 year rolling programme.
Plants (Chlorophyll, Angiosperms (seagrass) and opportunistic macroalgae) sampling from 2012	Analysts maintain quality assurance (QA) accreditation through QUASIMEME scheme (twice a year).
WFD classification (2015/21)	Overall status for the water body is Moderate (which is the 2021 classification objective).

Food Standards Agency *E. coli* in flesh programme (Annual Classification)	Full statistical analysis of the raw data is presented in Annex A
NIEA Pollution Investigations	Since 2012 the overall number of reported pollution investigations appears to be decreasing
Actions in Reducing Agricultural Inputs	
Farm advisory visits in Dundrum catchment	A significant number of visits have been made to farms in the Dundrum catchment.
Cross compliance visits in Dundrum Catchment	71 cross compliance visits since 2012
Environmental Farming Scheme (2 rounds)	Limited uptake in round one and two, round three is currently open for applications.
Inspection and enforcement of the NAP Regulations carried out by NIEA	Around 300 farm businesses annually assessed for compliance with the Nitrates Directive. Levels of non-compliance decreased in 2014-16, but increased in 2017 and 2018.
Overall Management Actions	
Dundrum Priority Catchment working Group	4 Meetings since inception in 2017 with 23 participants representing 10 groups (both Departmental and non-Departmental)
NIW/McAdam Design investigative project – An investigation into sources of pollution in Inner Dundrum Bay utilising MST, statistical and mathematical techniques to identify relative risk of pollution from both human and agricultural sources.	Investigation outcomes highlighted where the greatest significant microbial risk was from in both the north and south areas of the Inner Bay.
Urban Waste Water Treatment Directive Sensitive Area Reviews (2001, 2005, 2009 and Interim 2012. The latter recommended Inner Dundrum Bay be designated as a sensitive area)	Inner Dundrum Bay designated as a sensitive area 1 August 2014.
Statistical calculations using Seasonal Kendall test (SK test) were investigated for all data available from FSA E-coli monitoring programme.	This process is quality assured to the ISO9001:2008 standard.

Is anyone better off as a result #/%

Increased knowledge and better understanding of what's happening in the Dundrum Catchment – an investigative study found the greatest significant microbial risk to the Inner Bay is coming from the Carrigs River with a 80:20 ruminant:human loading.

It is not possible to measure temporal trends using shellfish flesh classifications alone. Full statistical analysis of raw data is required (See Annex A).

Both Inner North oysters and Inner South Mussels have statistically significant upward trends in e-coli in flesh overall. There was not enough data available to analyse Inner North Mussels.
Monthly trends show, significant upward trends in e-coli in flesh in April, May, September, October and December for Inner North Oysters. For Inner South Mussels, there was significant monthly upward trends in e-coli in flesh in; January, February and May. In addition to these seasonal trends, the results show a significant deterioration in shellfish quality at both the North and South beds over the period 2012-2017.

UWWTD Interim Sensitive Area Review - Catchment of Inner Dundrum Bay was designated as a sensitive area on the basis of both trophic status (Annex IIAa) and also under Annex IIAc of the Urban Waste Water Treatment Directive, in order to prevent the further deterioration of water quality within the bay.

No conclusive trends in assessment of angiosperms. WFD status based on a 6 year rolling programme and has fluctuated between poor (2013), moderate (2012, 2016) and good (2017).

Pollution investigations are carried out by Water Management Unit. Since 2012 there has been **an overall decreasing trend in the number of reported pollution incidents**, although 2016 was an exception when 13 reported incidents were investigated, one of which was the only confirmed high severity incident within the time period.

Overall status for the waterbody is Moderate (which is the 2021 classification objective). The status has been Moderate since 2009 (apart from in 2014 when it dropped to Poor due to seagrass decline).

Inspection and enforcement of the NAP Regulations is carried out by NIEA. Around 300 farm businesses are now selected for scheduled inspection each year and all are assessed for compliance with the Nitrates Directive.

The levels of non-compliance were found to be reducing from 2014 to 2016. However in 2017 and 2018 the levels of non-compliance increased. NIEA
have increased the number of identified risk farms to visit in 2019 and will increase the number of inspections in selected priority water bodies this year.

Conclusion – Whilst significant efforts have been devoted to continued work in and around the Inner Dundrum Bay catchment, there have been limited improvements in measured elements and unfortunately a continued decrease in shellfish quality to date. Inner Dundrum Bay has already been identified as a “Priority Catchment” and will continue to be investigated and reviewed on an ongoing basis. It will continue to be highlighted on risk registers to emphasise the importance of the continued work ongoing by many teams within DAERA and other organisations.

Any incident should be reported to the NIEA Water Pollution Hotline on
0800 80 70 60

7.0 Further Information:

Further Information is available at: www.daera-ni.gov.uk

Or by Emailing:

MarineDivision.InfoRequests@daera-ni.gov.uk

Annex A

Action/Output	Group	Completed, Ongoing or Planned
Upgrades to Sewerage Network		
Combined Sewer Overflow (CSO) monitor installation due to be completed by mid-2019. Pilot project completed 2018, to be rolled out to CSOs within 2km of identified bathing waters and Shellfish Water Protected Areas.	NI Water	Ongoing
Drainage Area model updates, ground conditions, site selection reporting and landowner negotiations have been carried out at a total cost of circa £190k	NI Water	Completed 2018
Flynn's Wastewater Pumping Station has had base maintenance delivered which involved pump and screen replacement at a cost of circa £55k.	NI Water	Completed February 2016 – April 2016
The contract for the CCTV surveying on the condition of the foul/combined system resulted in the removal of misconnections to the main sewerage system in addition to pipework and flow monitoring improvements within the WWTW. Tideflex and non-return valves fitted on CSOs to reduce tidal ingress. Work on sewer rehabilitation was undertaken at a cost of circa £260k in 2016	NI Water	Completed January 2014 and May to November 2016
Substantial blockage removed from sewer line at Delinvilla Lane and sewer line de-silted to outfall. A number of cross connections identified and rectified. Increase in frequency of screen cleaning at WWTW beyond the manufacturer's recommendations Calibration and external verification of flow meters within the WWTW.	NI Water	Completed May 2013
Upgrades to Dundrum Wastewater Treatment Works		
Work began in January 2018 on a £2.5m programme to improve the existing treatment process and deal with increased flows at Dundrum Wastewater Treatment Works. Significant NI Water investment will include: upgraded inlet and storm screening, upgraded grease removal, a new flow attenuation chamber, primary settlement tank refurbishment, new back washable MBR panels, new final effluent measurement and upgraded controls and power network for the site.		Ongoing
Upgrade of Dundrum WWTW. MBR panels being cleaned to allow maximum treatment of effluent. New fine screens will be installed prior to the replacement of the MBR panels. New panels will provide a higher level of treatment and reduce the overall bacteriological loading in the effluent.	NI Water	Currently underway due to complete late 2018

Upgrade of Dundrum WWTW Conversion of the existing primary settlement tank to a blind storm tank in order to provide additional storage prior to overflow. Also alterations to the pipe work to improve the return of process liquors at the works in order to improve sewage treatment.	NI Water	Completed October 2014
Upgrade of Dundrum WWTW to a Membrane Bioreactor (MBR)	NI Water	Completed 2007
Ministerial moratorium on approval of planning applications in the Dundrum area, which would otherwise further increase the pressure on the WWTW.	DOE	Ongoing from 2013
Monitoring and Investigations		
Investigative monitoring *E. Coli* in water matching Food Standards Agency (FSA)in NI flesh programme - From 2009 to 2018 a total of 1272 tests for faecal indicator organisms (faecal coliforms, E.coli, faecal streptococci and intestinal enterococci) have been carried out. From 2012 sampling was carried out in conjunction with the FSA in NI shellfish flesh sampling programme calendar; prior to this samples were collected as part of in-house investigations.	DAERA	Ongoing since 2008
High water nutrients sampling - A total of 58 samples were lifted during the winter period (November to February) between 2009 and 2015 and analysed for nutrients and dissolved oxygen. Samples were not lifted during 2016 but resumed in 2017 (results not available yet). Low water nutrients sampling from 2012 – collected quarterly (alongside samples collected for Microbiology following Food Standards Agency shellfish flesh sampling programme). Monthly sampling of nutrients began in the third quarter of 2017. Samples collected following UKAS standards (though method is not audited) and analysed by WCG to UKAS standards. The standards used to determine classification are set by WFD and based on a 6 year rolling programme. It should be noted that sampling at high water of IDB is not an accurate reflection of nutrient/DO levels – this actually reflects the condition of Outer Dundrum Bay. This data cannot be included in WFD classifications as samples do not fit the salinity requirements set by WFD hence the classification tool is not applicable. However, samples useful in overall investigative monitoring.	DAERA	Ongoing since 2009
Plants (Chlorophyll, Angiosperms (seagrass) and opportunistic macroalgae) sampling A total of 122 samples were collected between 2009 and 2017 to determine Chlorophyll biomass.	DAERA	Ongoing

Assessment of angiosperms (seagrass) has been carried out in 2012, 2013, 2016 and 2017. The assessment tool uses three metrics thus individual sample numbers are not relevant. Assessment of opportunistic macroalgae has been carried out in 2009, 2013, 2016 and 2017. The assessment tool uses five metrics thus individual sample numbers are not relevant. Analysts maintain quality assurance (QA) accreditation through QUASIMEME scheme (twice a year). WFD status for chlorophyll since 2012 has been high. However, similarly to the nutrients above, samples for Chlorophyll are collected at high water thus reflecting Outer Dundrum Bay conditions rather than that of the inner bay. Analysts maintain QA standards through *Zostera* biomass and quadrat ring test (UKTAG method). WFD status is based on a 6 year rolling programme and has fluctuated between poor (2013), moderate (2012, 2016) and good (2017). Analysts maintain QA standards through NMBAQC OGA ring test (UKTAG method). WFD status is based on a 6 year rolling programme and has fluctuated between moderate (2009, 2016) and good (2013, 2017).		
Water Framework Directive ecological objectives Overall status for the waterbody is Moderate (2021 classification objective). Status has been Moderate since 2009 (apart from in 2014 when this dropped to Poor due to seagrass decline).	DAERA	Ongoing
E. coli in shellfish flesh monthly Official Control monitoring and classification programme Increased knowledge and better understanding of what's happening in the Dundrum Catchment – investigative study found the greatest significant microbial risk to the Inner Bay is coming from the Carrigs River with a 80:20 ruminant:human loading. It is not possible to measure temporal trends using shellfish flesh classifications alone. Full statistical analysis of raw data is required.	FSA in NI	Ongoing

Statistical calculations using Seasonal Mann-Kendall test (SM-K test).

SM-K is a nonparametric test that analyses data for monotonic trends in seasonal data. It is the most popular trend test in environmental studies. “Monotonic” means a consistent upwards or downwards trend. “Seasonal” means that data is collected for periods where trends can are upwards or downwards. While it can refer to Spring, Summer etc., “seasonal” can also refer to other time periods, such as months. This will allow analysis of monthly trends over all the years’ data alongside an overall annual trend.

Using SM-K tests, it was found;

- There is a number of statistically significant monthly trends in both the inner north oysters and inner south mussel beds. This indicates an increase in faecal coliforms when comparing months on a yearly basis. I.e. comparing January 2012, January 2013, January 2014 etc.
- There are statistically significant trends in overall annual data for both inner north oysters and inner south mussel beds. I.e. comparing 2012, 2013, 2014 etc. data, faecal coliforms are increasing overall.

See table below.

	Inner North (Oysters)	**Inner South (Mussels)**
January	NS	*
February	NS	*
March	NS	NS
April	*	NS
May	**	*
June	NS	NS
July	NS	NS
August	NS	NS
September	*	NS
October	*	NS
November	NS	NS
December	*	NS
Overall Significant Trend	***	***

Seasonal Mann Kendall Monotonic trends were investigated for all data available from FSA E-coli monitoring programme and found as above.
Key:
NS – not a significant probability of a trend
* - significant probability of trend <5%
** - high significant probability of trend <1%
*** - very high significant probability of trend <0.1%

Pollution Investigations in the Dundrum catchment Breakdown by category

Pollution investigations continue to be carried out by Water Management Unit when possible pollution has been reported through the Emergency Pollution Hotline or identified by WMU staff. Since 2012 the overall number of pollution investigations appears to be decreasing, 2016 was the exception to this where there were 13 investigations. 2016 also had the only high severity investigation in the time period.

DAERA – Water Management Unit

Ongoing

	High	Medium	Low	Total Incidents
2012	0	1	9	**10**
2013	0	1	12	**13**
2014	0	0	11	**11**
2015	0	0	9	**9**
2016	1	1	11	**13**
2017	0	0	7	**7**
2018	0	1	7	**8**

Actions In Reducing Agricultural Inputs

Farm advisory visits have been carried out in the Dundrum catchment annually. The exact number of these is not available but only one issue was found during these visits.

Water Management Unit

Ongoing

Cross compliance visits in Dundrum Catchment. 71 cross compliance visits have been carried out since 2012. From these there were 6 breaches recorded; 4 of insufficient storage <22 weeks; 1 over 170kg limit and 1 silage effluent entering waterway.

Water management Unit

Ongoing

<table><tr><th>Water body</th><th>Stabilisation</th><th>Riparian</th><th>No. of Business IDs</th></tr><tr><td>Blackstaff (South Down) River</td><td>0.899 km</td><td>0 km</td><td>3 (6 fields)</td></tr><tr><td>Ardilea River</td><td>0 km</td><td>0.3 km</td><td>1 (1 field)</td></tr><tr><td>Moneycarragh River (Claragh)</td><td>0.13 km</td><td>0 km</td><td>1 (2 fields)</td></tr><tr><td>Moneycarragh Feeder</td><td>0.578 km)</td><td>0 km</td><td>1 (5 fields)</td></tr><tr><td>Moneycarragh River (Dundrum)</td><td>0.647 km</td><td>0 km</td><td>1 (2 fields)</td></tr><tr><td>Carrigs River</td><td>5.123 km</td><td>0 km</td><td>5 (20 fields)</td></tr><tr><td>TOTAL</td><td>7.377 km</td><td>0.3 km</td><td>12</td></tr></table> Environmental Farming Scheme Water quality options uptake in EFS Tranche 1 within the Dundrum Bay catchment	DAERA	Ongoing
Inspection and enforcement of the NAP Regulations is carried out by NIEA. Around 300 farm businesses are now selected for scheduled inspection each year and all are assessed for compliance with the Nitrates Directive. **The levels of non-compliance were found to be reducing from 2014 to 2016. However in 2017 the levels of non-compliance increased and the same increased level of non-compliance was found in 2018.** The main non-compliances found over the period were nitrate pollution and defective effluent storage, with N loading in 2017 and spreading issues last year due to the exceptionally wet winter in 2017-2018.	Water Management Unit	Ongoing
Overall Management Actions		
Investigation into sources of pollution in Inner Dundrum Bay, utilising MST, statistical and mathematical techniques	NI Water/Mc	Completed 2015

to identify risk of pollution from both agricultural and human sources. Inner North ambient water microbial concentrations slightly lower than Inner South. Predominance of human loading during winter but compounded by increased ruminant loading during summer months. Recommendations: • further intensive study on Carrigs River • Upgrade of Kielty's School CSO to reduce microbial contribution to Inner North • Potential improvements to Dundrum Network to be agreed with NIEA	Adam Design	Reported 2017 Further investigation completed and report being prepared

Annex B

Contaminants in shellfish flesh monitored by DAERA and FSA in NI

Metals	Polyaromatic Hydrocarbons
Arsenic	Naphthalene
Silver	Phenanthrene
Cadmium	Anthracene
Chromium	Fluoranthene
Copper	Pyrene
Iron	Benzo (a) Anthracene
Mercury	Chrysene
Nickel	5 Methyl Chrysene
Lead	Benzo (b) Fluoranthene
Zinc	Benzo (k) Fluoranthene
Selenium	Benzo (j) Fluoranthene
	Benzo (c) Fluorene
	Benzo (a) Pyrene
	Indeno (123,cd) Pyrene
	Dibenzo (a,h) Anthracene
	Benzo (ghi) Perylene
	Dibenzo (a,l) Pyrene
	Dibenzo (a,e) Pyrene
	Dibenzo (a,i) Pyrene
	Dibenzo (a,h) Pyrene
	Cylcopenta (c,d) Pyrene

Polychlorinated Biphenyls
PCB 28
PCB 52
PCB 101
PCB 118
PCB 138
PCB 153
PCB 180

Dibenzo-p-dioxins (PCDDs)
2,3,7,8-TCDD
1,2,3,7,8-PeCDD
1,2,3,4,7,8-HxCDD
1,2,3,6,7,8-HxCDD

1,2,3,7,8,9-HxCDD
1,2,3,4,6,7,8-HpCDD
OCDD

Department of Agriculture, Environment and
Rural Affairs
Marine and Fisheries Division
17 Antrim Road
Tonagh
Lisburn
BT28 3AL

Water Pollution Hotline: 0800 807060
Email: Marine.InfoRequests@daera-ni.gov.uk

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Department of
Agriculture, Environment
and Rural Affairs
www.daera-ni.gov.uk

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