An Roinn Talmhaíochta,
Bia agus Mara
Department of Agriculture,
Food and the Marine

21st May 2021

Your Ref: **AP1/2021**

Ms Mary O'Hara

Secretary to the Board

Aquaculture Licences Appeals Board

Kilminchy Court

Dublin Road

Portlaoise

Co. Laois

Dear Mary,

I wish to acknowledge receipt of your letter dated 05th May 2021 to Mr. Charlie McConalogue T.D., Minister for Agriculture, Food and the Marine (and copied to Ms. Sinead McSherry) which was received by the Department on 07th May 2021, regarding the appeal against the decision to refuse to grant an Aquaculture Licence to Killian Tighe in relation to site **T05/546A** in Cork Harbour, Co. Cork.

I am attaching the following documentation:-

1. Copy of the submission to Minister, which includes the following documents;
    - Copy of the application form maps and drawings,
    - Copies of reports received in relation to the application,
    - Copy of the Appropriate Assessment for Aquaculture activities in Cork Harbour SAC and Great Island SPA, June 2019

An Lárionad Bia Mara Náisiúnta, An Cloichín, Cloich na Coillte, Corcaigh, P85 TX47
National Seafood Centre, Clogheen, Clonakilty, Co. Cork P85 TX47
T +353 (0)23 8859538 bernie.mcdonald@agriculture.gov.ie
www.agriculture.gov.ie

- Appropriate Assessment Conclusion Statement by Licensing Authority in support of the Appropriate Assessment of Aquaculture in Great Island SAC and Cork Harbour SPA

2. Copy of the notification of the Minister's decision to the applicant,

3. Location map of the surrounding area including the following:
    - Sites under application,
    - Licensed sites,
    - Sites currently under appeal (if any).

If you require anything further please let me know.

Yours sincerely

James O'Connell

Aquaculture and Foreshore Management Division

An Bord Achomharc Um Cheadúnais Dobharshaothraithe
Aquaculture Licences Appeals Board

Charlie McConalogue TD
Minister for Agriculture, Food and the Marine
Agriculture House
Kildare Street
Dublin 2

5 May 2021

Our Ref: AP1/2021
Site Ref: T05/546A

Re: Appeal against the decision of the Minister for Agriculture, Food and the Marine to refuse an Aquaculture licence for the cultivation of oysters on bags and trestles at Sites T05/546A on the foreshore in Cork Harbour.

Dear Minister,

Attached please find copy of an appeal received for determination by the Aquaculture Licences Appeals Board, forwarded in accordance with Section 43(1) of the Fisheries Amendment Act 1997, ("the Act").

Please submit to the Board **within 14 days of receipt of this letter** (as required by Section 43(2) of the Act):

(a) A copy of the aquaculture licence concerned and of any drawings, maps, particulars, evidence, environmental impact statement, other written study or further information received or obtained from the applicant for the licence in accordance with a requirement of or under regulations under the Act.
(b) A copy of any report prepared for you in relation to the application, revocation or amendment and
(c) A copy of any document recording your decision in respect of the application, revocation or amendment and of the notification of the decision given to the applicant.

Please include, as part of the above, a location map of the surrounding area to include:

(i) Sites under application
(ii) Sites lapsed
(iii) Licensed sites
(iv) Sites currently under appeal (if any).

Section 44(2) of the Act entitles you and each other party, except the appellant, make submissions or observations in writing to the Board in relation to the appeal within a period of 30 days beginning on the day on which a copy of the Notice of Appeal is sent to that party by the Board.

In accordance with the foregoing, I would be grateful if you would:

(i) Acknowledge receipt of the Board's letter and forward the necessary documentation and

(ii) Make, if necessary, any submission(s) or observations in accordance with Section 44(2) of the Act in writing to be received by the Board on or before 4th June 2021.

Yours sincerely,

_____

Mary O'Hara
Secretary to the Board

cc Ms S McSherry, Aquaculture and Foreshore Management Division

Submission AGR 00108-21: Recommendation to refuse Aquaculture and Foreshore Licences for 3 sites (T05/546A, T05/546B and T05/546C)

TO:	Minister	AUTHOR:	OConnell, James
STATUS:	Completed	OWNER:	OConnell, James
PURPOSE:	Approval	REVIEWERS:	Horan, Helena McSherry, Sinead Beamish, Cecil Caulfield, Lorcan
DIVISION:	Coastal Zone Management		
DECISION BY:			

Final comment

The Minister agrees with the recommendation as set out for the reasons given. AK 12/03

Action required

Ministerial Determination on Aquaculture/Foreshore Licensing Application (T05/546)

Executive summary

The Ministers determination is requested in relation to an application for Aquaculture Licences from Killian Tighe, 8 Orilia Tce., Cobh, Co. Cork. The application is for the cultivation of Oysters using bags and trestles on Sites T05/546A (6.015 HA), T05/546B (1.096 Ha) and T05/546C (0.7932 Ha) totalling 7.9044 hectares on the foreshore in Cork Harbour, Co Cork.

A submission in respect of the application for the Foreshore Licences is also set out for the Minister's consideration.

It is recommended that the Minister determines that the Aquaculture and Foreshore Licences **not be granted** for the reasons outlined in the 'Detailed Information' section below.

Detailed information

DECISION SOUGHT

The Minister's determination is requested in relation to an application for Aquaculture Licences from Killian Tighe, 8 Orilia Terrace, Cobh, Co. Cork, for 3 sites in Cork Harbour, Co. Cork.

A submission in respect of the accompanying Foreshore Licences is also set out below, for the Minister's consideration.

Note: Tabs attached to this submission may contain additional information which is subject to redaction if transmitted to third parties.

BACKGROUND

Marine aquaculture operations require separate Aquaculture and Foreshore Licences and Ministerial approval is required in respect of this submission (Aquaculture Submission) and submission underneath (Foreshore Submission), which refer to the same site.

The Aquaculture Licence defines the activity that is permitted on a particular site and the Foreshore Licence allows for the occupation of that particular area of foreshore. The continuing validity of each licence is contingent on the other licence remaining in force.

APPLICATION FOR AQUACULTURE LICENCES

An application for Aquaculture Licences has been received from the applicant referred to above (in conjunction with an application for Foreshore Licences), for the cultivation of Oysters using bag and trestles in relation to 3 sites totalling 7.9044 on the foreshore in Cork Harbour, Co. Cork (numbered T05/546A = 6.015 ha, T05/546B = 1.096ha and T05/546C =0.7932ha – see **TAB A**).

LEGISLATION

Section 7 of the Fisheries (Amendment) Act 1997 provides that the licensing authority (i.e. Minister, delegated officer or, on appeal, the Aquaculture Licences Appeals Board) may, if satisfied that it is in the public interest to do so, license a person to engage in aquaculture.

Article 6 (3) of the Habitats Directive provides that *"Any plan or project not directly connected with or necessary to the management of the site but likely to have a significant effect thereon … shall be subject to appropriate assessment of its implications for the site in view of the site's conservation objectives … the competent national authorities shall agree to the plan or project only after having ascertained that it will not adversely affect the integrity of the site concerned …"*

CONSULTATION AND PUBLIC COMMENT

The application was sent to the Department's technical experts, statutory consultees and was also publicly advertised in a composite public notice covering both aquaculture and foreshore elements.

Technical Consultation – TAB B

Marine Engineering Division (MED): MED recommended the refusal of Licences for the 3 sites. The proposed site A is located adjacent to the landing pier for Spike Island in Cork Harbour and the proposed Site C is located at a relatively sheltered location on the western shore of Spike Island. The Visual Impact Assessment Report carried out by MED found that both sites have the potential to significantly negatively impact the visual amenity of the area. The proposed Site B is located at a relatively sheltered location on the western shore of Corkbeg Island in Cork Harbour. That site has the potential to significantly negatively impact Corkbeg Strand as a public amenity area. It is one of only a few sandy beaches in Cork Harbour.

Marine Survey Office (MSO): The MSO reported that the application may pose a security risk at site B and sites A & C may interfere with harbour development and referred the application to the Harbour Master for comments. No comments were received from the Harbour Master in relation to these sites in relation to these possible issues.

Sea Fisheries Protection Authority (SFPA): The SFPA made the following observations. The application if successful would not hinder the operations of the SFPA in the areas outlined. The sites will not interfere with any local fishery or fisheries control. The only possible food safety concern pertains to sites T05-546B and T05-546C as they are both in close proximity to active and former heavy industry. T05-546B is sited adjacent to the Whitegate Oil Refinery and site 546C adjacent to the former Irish Steel/ISPAT site that was subject to a large amount of ground pollution as a result of the former steel works.

Statutory Consultation – TAB C

Regulation 10 of the Aquaculture (Licence Application) Regulations, 1998 requires certain statutory bodies to be notified of an Aquaculture Licence application.

Comments were received from the following statutory bodies:

Marine Institute (MI): The MI recommended that the implications of licensing sites that are not located within a designated Shellfish Growing Waters Area should be fully considered as part of the licence determination process. They also advised that, if licenced, triploid oysters be used in order to mitigate the risk of the reproduction of the Pacific oyster in the bay.

The Marine Institute is of the view that there will be no significant impacts on the marine environment and that the quality status of the area will not be adversely impacted.

Commissioner of Irish Lights (CIL): Has no objection to the issue of Licences. They asked that no navigable inter-tidal channels be impeded by any structures.

Inland Fisheries Ireland (IFI): IFI have no objection to the licensing of these sites and requested that only native seed stocks be used and that all necessary measures be undertaken in relation to bio-security.

Fáilte Ireland: The comments received pointed out the importance of the area for tourism. The response mentions the significant investment in Spike Island and the numbers of tourists visiting the site and the high profile it has achieved. The report also outlined that there are further plans to enhance tourism in the area.

Fáilte Ireland concluded that having regard to the location of the proposed development, it is considered that it has the potential to negatively impact;

- On the surrounding environment and visual amenitities of the area particularly at the low tide within this area of the harbour, an area renowned for its views and natural landscape,
- Other Marine users and leisure activities particularly due to accessibility issues,
- The setting, close to a National Monument.

Public Consultation

The application was publicly advertised using a composite public notice covering both aquaculture and foreshore elements, in the 'Irish Examiner' on 21st August, 2019. The application and supporting documentation were available for inspection at Cobh Garda Station for a period of 4 weeks from the date of publication of the notice in the newspaper.

There were no objections/comments received from the public consultation process.

A copy of all the observations/submissions received at the Public/Statutory consultation stage was forwarded to the applicant.

CRITERIA IN MAKING LICENSING DECISIONS

The licensing authority, in considering an application, is required by statute to take account of, as appropriate, the following points and must also be satisfied that it is in the public interest to license a person to engage in aquaculture:

a) the suitability of the place or waters

Scientific advice is to the effect that the waters are suitable for the cultivation of oysters;

b) other beneficial uses of the waters concerned

The project may have a negative effect on public access to recreational and other activities;

c) the particular statutory status of the waters

(i) Natura 2000

The sites are located adjacent to the Great Island SAC and the Cork Harbour SPA. An Article 6 Appropriate Assessment has been carried out in relation to aquaculture activities in this SAC and/or SPA. This Assessment and its findings were examined by the Department and its scientific/technical advisors. This led to the Licensing Authority (i.e. the Minister) producing a Conclusion Statement outlining how it is proposed to licence and manage aquaculture activities in the above Natura sites in compliance with the EU Habitats and Birds Directives.

(ii) Shellfish Waters

The sites are not located within Shellfish Designated Waters.

Oysters in these waters are not currently classified.

d) the likely effects on the economy of the area

Aquaculture has the potential to provide a range of benefits to the local community, such as attraction of investment capital, development of support services, etc.

e) the likely ecological effects on wild fisheries, natural habitats, flora and fauna

No significant issues arose regarding wild fisheries. The potential ecological impacts of aquaculture activities on natural habitats, flora and fauna are addressed in the Article 6 Appropriate Assessment for Cork Harbour and in the Licensing Authority's Conclusion Statement.

The Department of Culture, Heritage and the Gaeltacht (DCHG) raised no objection on nature conservation grounds.

f) the effect on the environment generally

The Department's Scientific advisor the Marine Institute, is of the view that there will be no significant impacts on the marine environment and that the quality status of the area will not be adversely impacted.

g) DCHG raised no objection to the development from an underwater archaeological perspective.

RECOMMENDATION

It is recommended that the Minister:

Refuse the granting of 3 Aquaculture Licences to Killian Tighe, 8 Orilia Terrace, Cobh, Co Cork. The reasons for the recommendation are:

- The Visual Impact Assessment carried out in respect of sites T05/546A and T05/546C found that the landscape and visual impacts of the application are of substantial impact significance and refusal was recommended.
- The potential for Site T05/546B to significantly negatively impact on a public amenity, namely Corkbeg Strand.
- The concerns expressed by Fáilte Ireland regarding the effect on the surrounding environment and visual amenities of the area, on other marine users, on leisure activities particularly due to accessibility issues, and its proximity to Spike Island, a national monument and tourist attraction.

REASONS FOR DECISION

The Minister for Agriculture, Food and the Marine is required to give public notice of both the licensing determination and the reasons for it. To accommodate this, it is proposed to publish the following on the Department's website, subject to the Minister approving the above recommendation:

"Determination of Aquaculture/ Foreshore Licensing application – T05/546A, T05/546B and T05/546C

Killian Tighe has applied for authorisation to cultivate oysters using bags and trestles on the inter-tidal foreshore on 3 sites totalling 7.9044 hectares on the foreshore in Cork Harbour, Co. Cork.

The Minister for Agriculture, Food and the Marine has determined that it is not in the public interest to grant the licences sought. In making his determination the Minister considered those matters which by virtue of the Fisheries (Amendment) Act 1997, and other

relevant legislation, he was required to have regard. Such matters include any submissions and observations received in accordance with the statutory provisions. The following are the reasons and considerations for the Minister's determination to refuse the licences sought: -

- The Visual Impact Assessment carried out in respect of sites T05/546A and T05/546C found that the landscape and visual impacts of the application are of substantial impact significance and refusal was recommended.
- The potential for Site T05/546B to significantly negatively impact on a public amenity, namely Corkbeg Strand.
- The concerns expressed by Fáilte Ireland regarding the effect on the surrounding environment and visual amenities of the area, on other marine users, on leisure activities particularly due to accessibility issues, and its proximity to Spike Island, a national monument and tourist attraction.

Recommendation to Refuse a Foreshore Licence application (T05/546A,T05/546B and T05/546C)

DECISION SOUGHT

The Minister's determination is requested please in relation to the application for Foreshore Licences from Killian Tighe, 8, Orilia Tce., Cobh, Co.Cork, for 3 sites in Cork Harbour, Co. Cork, in which it is proposed to conduct aquaculture.

BACKGROUND

Marine aquaculture operations require separate Aquaculture and Foreshore Licences and Ministerial approval is required in respect of this submission (Foreshore Submission) and submission above (Aquaculture Submission), which refer to the same site.

The Foreshore Licence allows for the occupation of the particular area of foreshore while the Aquaculture Licence defines the activity that is permitted in this area. The continuing validity of each licence is contingent on the other licence remaining in force.

APPLICATION FOR A FORESHORE LICENCE

An application for a Foreshore Licence has been received from the applicant referred to above (in conjunction with an Aquaculture Licence application), relating to the occupation of the foreshore associated with the Aquaculture Licence application for 3 sites which covers a total of 7.9044ha on the foreshore in Cork Harbour, Co. Cork (numbered T05/546A = 6.015ha, T05/546B = 1.096ha and T05/546C = 0.7932ha - See **TAB A**).

LEGISLATION

Section 3 of the Foreshore Act, 1933 gives power to the Minister to license the use of foreshore, if he is of the opinion that it is in the public interest to do so.

CONSULTATION AND PUBLIC COMMENT

The application was sent to the Department's technical experts, and was also publicly advertised in a composite public notice covering both aquaculture and foreshore elements.

This application was also sent to the Department of Housing, Planning and Local Government (DHPLG) in accordance with subsection (1B) of Section 3 of the Foreshore Act, 1933, which requires consultation between the Minister for Agriculture, Food and the Marine and the Minister for Housing, Planning and Local Government. Whilst aquaculture legislation requires certain statutory bodies to be notified of an aquaculture application, no other statutory bodies are prescribed consultees under Fisheries related foreshore legislation.

Department of Housing Planning and Local Government (DHPLG):

There were no comments received from a water quality or foreshore perspective.

Technical Consultation – TAB B

Marine Engineering Division (MED): MED has recommended the refusal of Licences for the 3 sites. The proposed site A is located adjacent to the landing pier for Spike Island in Cork Harbour and the proposed Site C is located at a relatively sheltered location on the western shore of Spike Island. Both sites have the potential to significantly negatively impact the visual amenity of the area. The proposed Site B is located at a relatively sheltered location on the western shore of Corkbeg Island in Cork Harbour. That site has the potential to significantly negatively impact Corkbeg Strand as a public amenity area. It is one of only a few sandy beaches in Cork Harbour.

Marine Survey Office (MSO): The MSO reported that the application may pose a security risk at site B and sites A & C may interfere with harbour development and referred the application to the Harbour Master for comments. Nothing was received from the Harbour Master at this stage or the statutory consultation stage.

Sea Fisheries Protection Authority (SFPA): The SFPA made the following observations. The application if successful would not hinder the operations of the SFPA in the areas outlined. The sites will not interfere with any local fishery or fisheries control. The only possible food safety concern pertains to sites T05/546B and T05/546C as they are both in close proximity to active and former heavy industry. T05/546B is sited adjacent to the Whitegate Oil Refinery and site T05/546C is adjacent to the former Irish Steel/ISPAT site that was subject to a large amount of ground pollution as a result of the former steel works.

Public Consultation

The application was publicly advertised using a composite public notice covering both aquaculture and foreshore elements, in the 'Irish Examiner' on 21st August, 2019. The application and supporting documentation were available for inspection at Cobh Garda Station for a period of 4 weeks from the date of publication of the notice in the newspaper.

There were no objections/comments received from the public consultation process.

CRITERIA IN MAKING LICENSING DECISIONS

The Minister, in considering an application for a Foreshore Licence, may, if satisfied that it is in the public interest to do so, grant such a licence.

Section 82 of the Fisheries (Amendment) Act, 1997 stipulates that the Minister, in considering an application for a licence under the Foreshore Acts, which is sought in connection with the carrying on of aquaculture pursuant to an Aquaculture Licence, shall have regard to any decision of the licensing authority in relation to the Aquaculture Licence.

RECOMMENDATION

It is recommended that the Minister:

refuses the granting of a Foreshore Licence to Killian Tighe, 8 Orilia Terrace, Cobh, Co Cork for 3 sites in Cork Harbour having regard to the decision in relation to the Aquaculture Licence application. The reasons for the decision are;-

- The Visual Impact Assessment carried out in respect of sites T05/546A and T05/546C found that the landscape and visual impacts of the application are of substantial impact significance and refusal was recommended.
- The potential for Site T05/546B to significantly negatively impact on a public amenity, namely Corkbeg Strand.
- The concerns expressed by Fáilte Ireland regarding the effect on the surrounding environment and visual amenities of the area, on other marine users, on leisure activities particularly due to accessibility issues, and its proximity to Spike Island, a national monument and tourist attraction.

Related submissions

There are no related submissions.

User details

INVOLVED:	OConnell, James Horan, Helena McSherry, Sinead Beamish, Cecil Sub Sec Gens Office eSub Sec Gen eSub Ministers Office eSub Minister
READ RECEIPT:	OConnell, James Horan, Helena McSherry, Sinead Beamish, Cecil Conneely, Brid Kelly, Aiden Caulfield, Lorcan

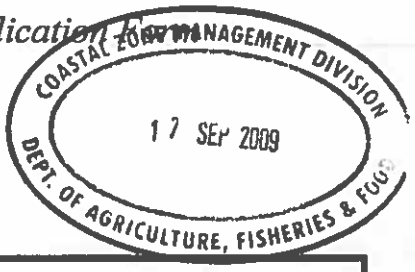
AQUACULTURE - LICENSING UNDER

FISHERIES (AMENDMENT) ACT, 1997 and

FORESHORE ACT, 1933

SHELLFISH AND FINFISH

Aquaculture and Foreshore Licence Application



Important Note

Section 4 of the Fisheries and Foreshore (Amendment) Act, 1998 (No. 54) prohibits any person making an application on or after 10 December 1998 for an Aquaculture Licence from commencing aquaculture operations until duly licensed under the Fisheries (Amendment) Act, 1997 (No. 23), and provides that a breach of that prohibition will cause the application to fail.

Coastal Zone Management Division
Department of Agriculture, Fisheries & Food
Clogheen
Clonakilty, Co. Cork

Fax: (023) 8821782

AQUACULTURE AND FORESHORE LICENSING APPLICATION FORM, for purposes of FISHERIES (AMENDMENT) ACT, 1997 and FORESHORE ACT, 1933

Accompanying Guidance Notes should be read before completing this form.

Note: Details provided in Parts 1 and 2 will be made available for public inspection.
Details provided in Part 3 are confidential and are not for public disclosure.

For Office Use
Application Ref. No. T5/546
Date of receipt, (Dept. Stamp):

USE BLOCK CAPITALS IN BLACK INK

PART 1: PRELIMINARY DETAILS

Name(s) of Applicant(s) in full:	
1.A KILLIAN TIGHE	
1.B	
Address(es) of Applicant(s) in full:	
1 [redacted]	1.B
RSI/PPS No:/CRO No:	
Tel: [redacted] Fax:	Tel: Fax:

1.C TYPE OF APPLICATION — Insert X in relevant box

Indicate the relevant type of application:

-(i) Aquaculture Licence	X
-(ii)Trial Licence	
-(iii)Review of Aquaculture Licence	
-(iv)Renewal of Aquaculture Licence	
-(v) Foreshore Licence	

(This Application Form is valid for each type of application.)

1.D TYPE OF AQUACULTURE

Indicate the relevant type of application:

-(i) Land-based	
-(ii) Marine-based	
-Shellfish	
(iii) - extensive	
(iv) – intensive	X
-(v) Finfish	

1.E DOCUMENTS ENCLOSED WITH THIS APPLICATION

The following documents are enclosed with this application:

(1) - Ordnance Survey Map (Scale of 1: 10,560, ie, a six inch map) *OBLIGATORY* [X]

(2) - British Admiralty Chart (largest available scale) [X]

(3) - Decision of planning authority under Planning Acts [ ]

(4) - Copy of licence under Section 4 of Local Government Water Pollution) Act, 1977 [ ]

(5) - Environmental Impact Statement [ ]

(6) - Drawing of the structures to be used and/or the layout of the farm *OBLIGATORY* [X]

(7) - Water Quality Analysis Report (required for Land-based sites only) [ ]

(8) - Application Fee OBLIGATORY [X]

(9) - Other (specify): _____

PART 2: DETAILS RELATING TO PROPOSED AQUACULTURE PROJECT

2.A Employment, Qualifications, Experience, Etc.

(i) Details of Applicant's qualifications and experience in aquaculture: 16+ years experience running oyster farms.

(ii) Other relevant experience (courses attended, etc): Various B.I.M courses attended over the years.

(iii) Details of projected employment creation during first four years of proposed development:

Year 1 + 2 will be primarily setting up and seeding the sites, and employment would be low. Years 3 + 4 would see employment rise as sales take place

(iv) Projected employment (number of persons):

Year 1:	3	Year 2:	4	Year 3:	6	Year 4:	8

Land-based Site (continued)

2.D The following must be supplied:

- (i) Sketch of the layout of the site in relation to the river(s), road(s) and buildings;
- (ii) Water quality Analysis Report, which should be drawn up in accordance with the parameters set out in Annex C of the Guidance Notes.

2.E The following conditions must be met in order to allow for consideration of licensing of land-based aquaculture:

- (i) the buildings and equipment must be put in place to the Department's satisfaction; an
-(i) the operation must comply with Local Authority requirements.

2.F Marine-based Site(s)
(To be completed if appropriate)
Location -(i) Bay: CORK HARBOUR

-(ii) County: CORK

(iii) OS Map No: CH087 CH088

(iv) Site Co-ordinates _____

(v) Size (hectares): 8 hectares

(vi) Species (common and scientific name):

Crassostrea Gigas

-Aquatic Plant(s)
-Any form of aquatic food suitable for the nutrition of fish

(vi) Method of culture (e.g., nets, ropes, tanks, trestles, etc.) Bag + trestle, cages.

(vii) Drawings of structures to be used in method of culture should be enclosed.

(viii) If cages or tanks are proposed, state:

-(a) Number: _____

-(b) Type and shape: _____

-(c) Cubic Capacity: _____

-(d) Depth: _____

(ix) Proposed specific site locations (with reasons): _____

(x) Describe proposed purification facilities to be used, where appropriate: _____

2.B Aquaculture Site Details

Indicate type of site:

- (i) Land-based [ ]
- (ii) Marine-based [X]

2.C Land-Based Site

(To be completed if appropriate)

(i) State species to be farmed: _____

_____

(ii) State proposed system of culture e.g., pond, raceway, circular tank or other method: _____

_____

_____

(iii) Full address of proposed site including Townland and County: _____

_____

(iv) Tonnage to be produced:

Year 1:		Year 2:		Year 3:		Year 4:	

(v) Proposed source of stock: _____

(vi) Name of river(s) supplying site with water: _____

_____

(vii) Estimate drought flow in gallons per minute: _____

(viii) Is there a fall of 1.5 metres in the water level at this site or can this be obtained by damming the river without giving rise to flooding of your own or neighbour's land upstream of the site? _____

_____

(ix) Area of proposed site (hectares): _____

(x) Details of services available on the site e.g., main road access, electricity: _____

_____

_____

(xi) Are there at present any possible sources of pollution upstream of the site, e.g. discharge from sewerage plant, farmyard, sheep dip facility, silage effluent, quarry, sandpit or factory? YES [ ] NO [ ]

(xii) If yes, supply details: _____

_____

_____

Marine-based Site(s) (continued)

2.G Give details of any special requirements relating to the health of the proposed project and the wider matters of public health and safety: There are no foreseeable issues relating to public health and safety.

2.H Tonnage to be produced:

Species (To state)	Year 1:	Year 2:	Year 3:	Year 4:
C. Gigas	0	0	160	240

2.I Reasons for selection of site(s): The sites are accessable at low water and the ground is firm. The sites are sheltered from the prevailing winds.

Note: The proposed access route to the site(s) from public road across tidal foreshore area Must be indicated on the OS map accompanying the application.

2.J Environmental Impact Statement (EIS).

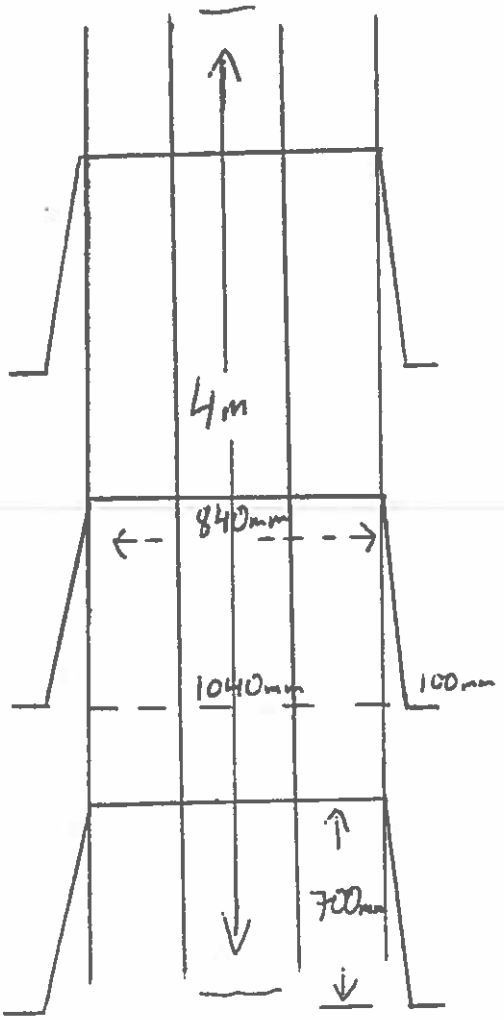
A copy of an EIS, if required, should be enclosed with the application. The EIS should contain the information specified in Annex B of the Guidance Notes.

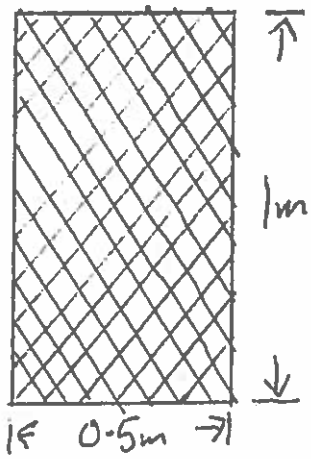
2.K Trial Licence.
(To be completed if appropriate)

Describe experimental or investigative nature of the proposed project:

[Use separate page if required – to be signed and dated]

All steel used would be 16mm. re-bar.

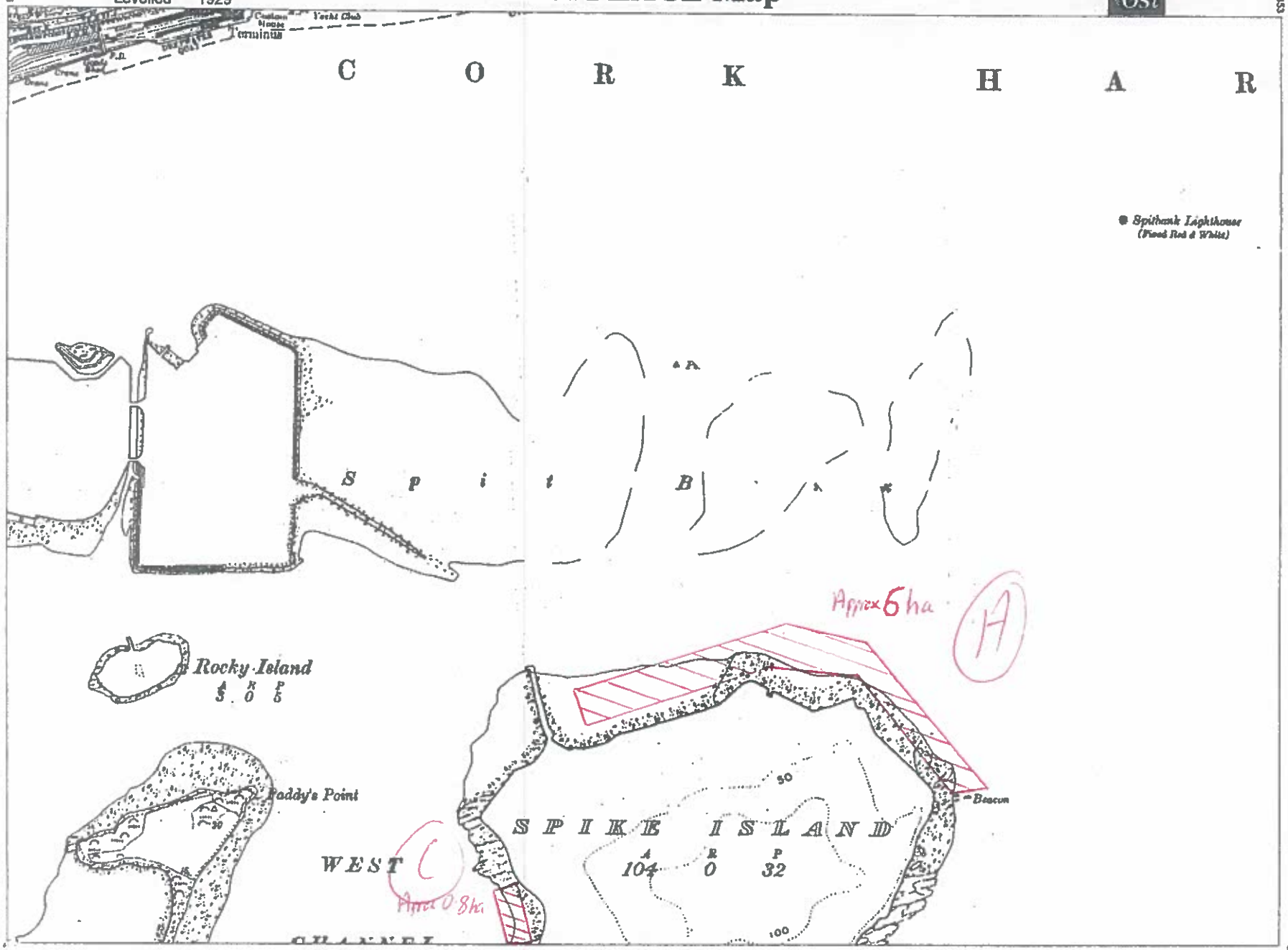




The trestles would be laid in an east to west direction.

Revised 1929
Levelled 1929

Rural PLACE Map



Scale:- 1:10,560
Scála:- 1:10,560

0 200 400 600 800 1,000 Metres
0 500 1,000 1,500 2,000 2,500 Feet

Plot Ref. No. 1376155_1_1
Plot Date 24-AUG-2009

ITM CENTRE PT. COORDS
580178,565422

DESCRIPTION

MAP SHEETS
6 inch
CK087

NATIONAL MAP SERVICES
ORDNANCE SURVEY IRELAND

Produced by National Map Services,
Unit 7, South Ring Business Park,
Kinsale Road,
Co. Cork
On behalf of Ordnance Survey Ireland,
Phoenix Park, Dublin 8.

N

B. MARKETING (continued)

3. Will the product be processed or packaged? YES [ ] NO [X]

4. If yes, give details: _____

I/We hereby declare the information provided in Parts 1, 2 and 3 above to be true to the best of my/our knowledge. I/We enclose an application fee* of €95.23 with this application.

Signature(s) of Applicant(s): _____

Date: 16.9.09.

*Preferred method of payment is by cheque or bank draft. The fee should be made payable to the Department of Agriculture, Fisheries and Food.

This form should be forwarded, with the required documents and application fee, to:

Aquaculture Licensing
Coastal Zone Management Division
Clogheen
Clonakilty,
Co. Cork

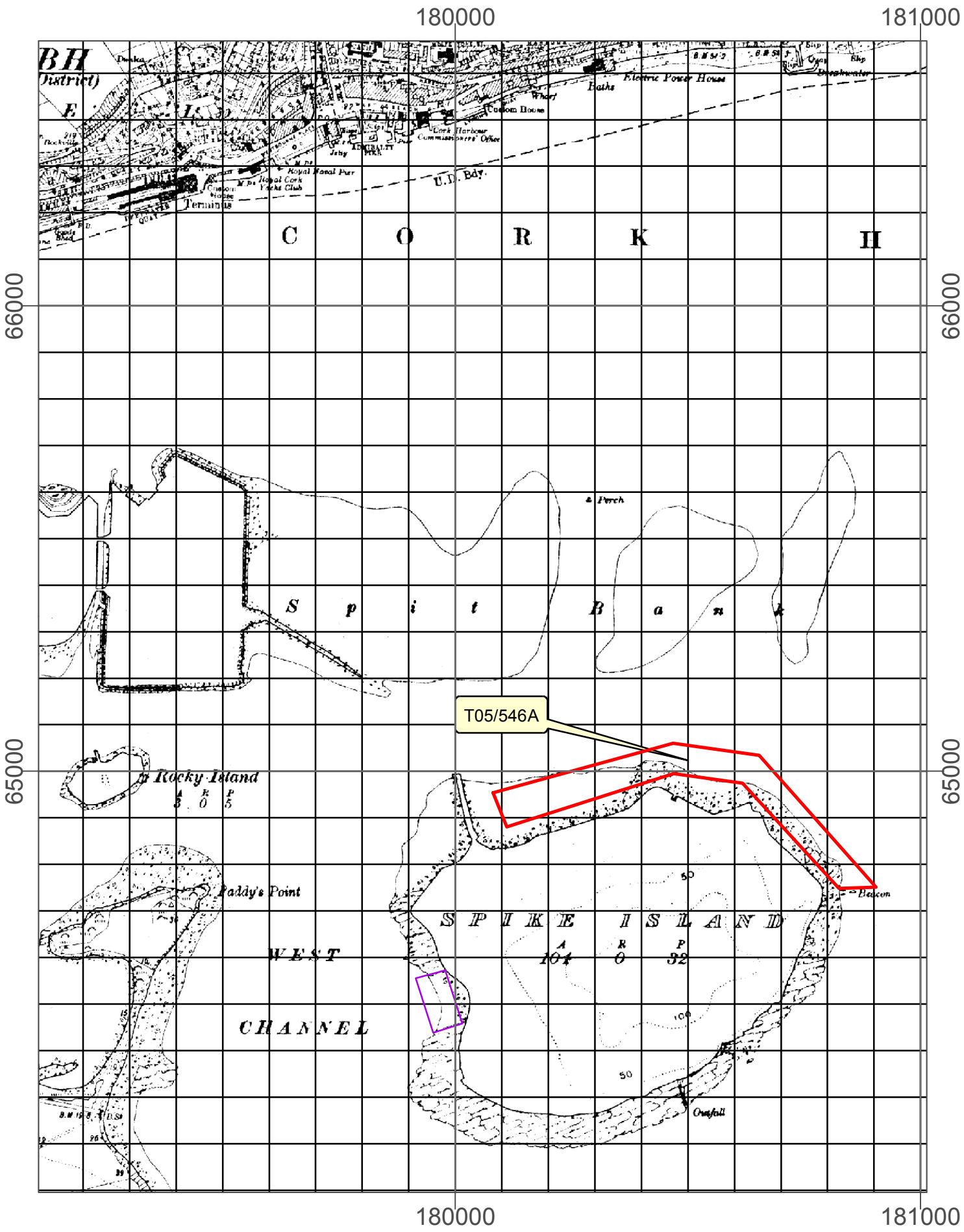
1 NO. SITE AT CORK HARBOUR CO.CORK

Co-ordinates & Area

Site T06/546A (6.0152 Ha)

The area seaward of the high water mark and enclosed by a line drawn from Irish National Grid Reference point

180082, 064954 to Irish National Grid Reference point
180468, 065060 to Irish National Grid Reference point
180653, 065034 to Irish National Grid Reference point
180904, 064751 to Irish National Grid Reference point
180824, 064748 to Irish National Grid Reference point
180618, 064975 to Irish National Grid Reference point
180469, 064995 to Irish National Grid Reference point
180111, 064880 to the first mentioned point.



Aqua Culture Sites

<all other values>

Site_Status

Application

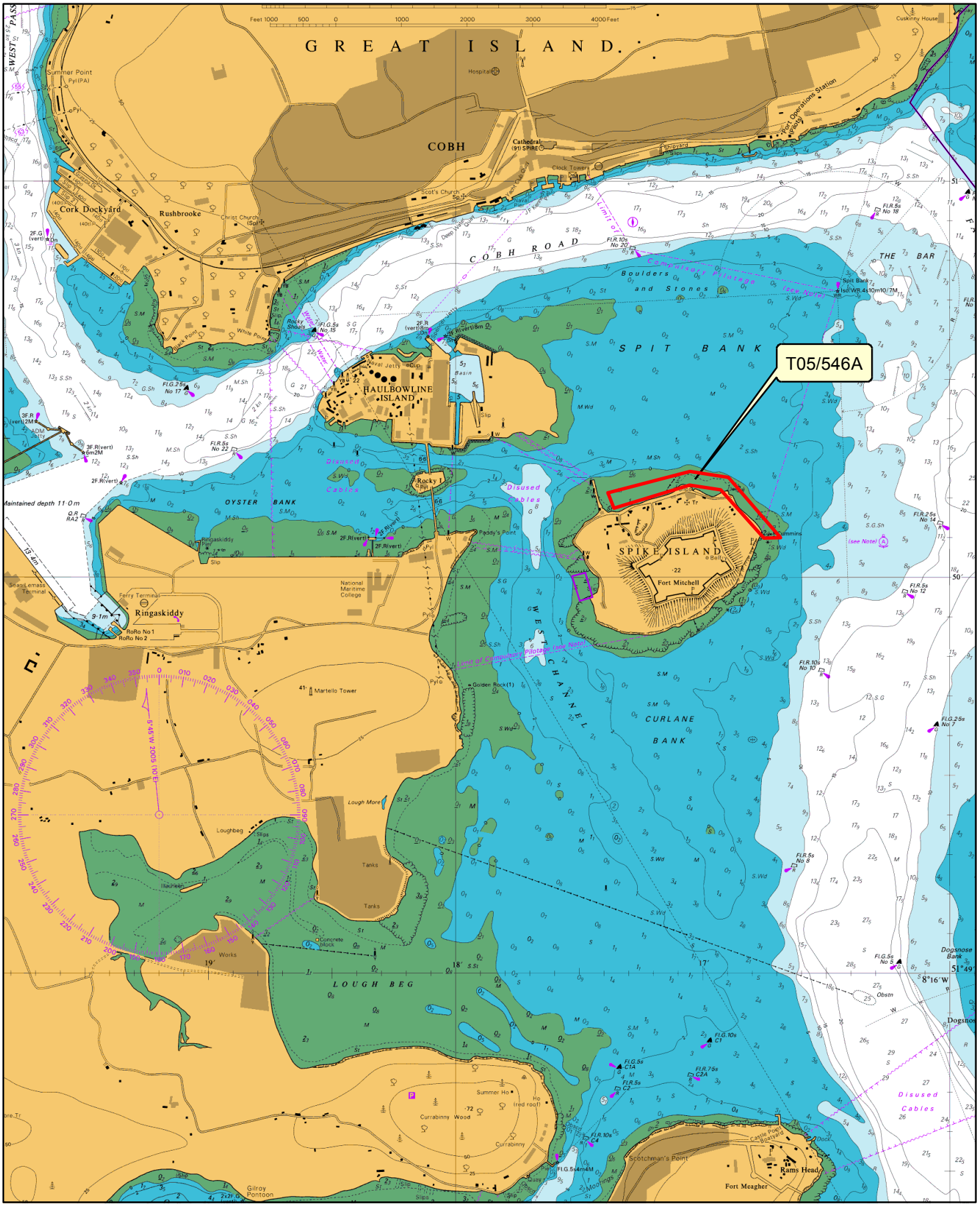
Licensed

100 Meter Reference Grid

1:10,560

Sites highlighted in red denotes Application

An Roinn Talmhaíochta, Bia agus Mara
Department of Agriculture, Food and the Marine



Aqua Culture Sites

<all other values>

Site_Status

Under Appeal
Application
Lapsed
Licensed
Refused
Revoked
Surrendered
Withdrawn

1:24,000

Sites highlighted in red denotes Application

Part of Admiralty Chart No =1777-0
Not to be used for Navigation

An Roinn Talmhaíochta, Bia agus Mara
Department of Agriculture, Food and the Marine

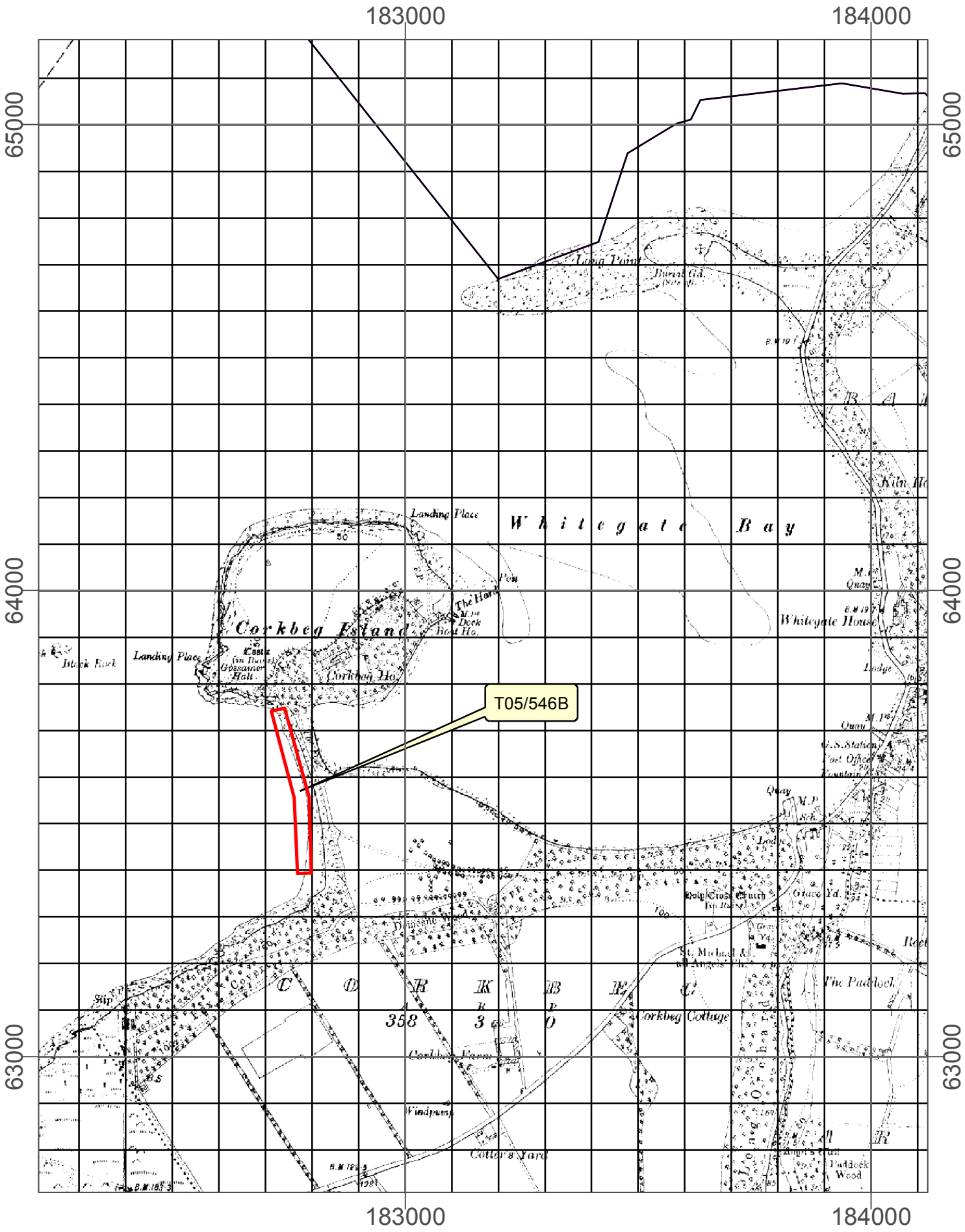
1 NO. SITE AT CORK HARBOUR CO.CORK

Co-ordinates & Area

Site T06/546B (1.096 Ha)

The area seaward of the high water mark and enclosed by a line drawn from Irish National Grid Reference point

182741, 063748 to Irish National Grid Reference point
182793, 063557 to Irish National Grid Reference point
182799, 063394 to Irish National Grid Reference point
182769, 063393 to Irish National Grid Reference point
182762, 063556 to Irish National Grid Reference point
182712, 063741 to the first mentioned point.



Aqua Culture Sites

<all other values>

Site_Status

Application

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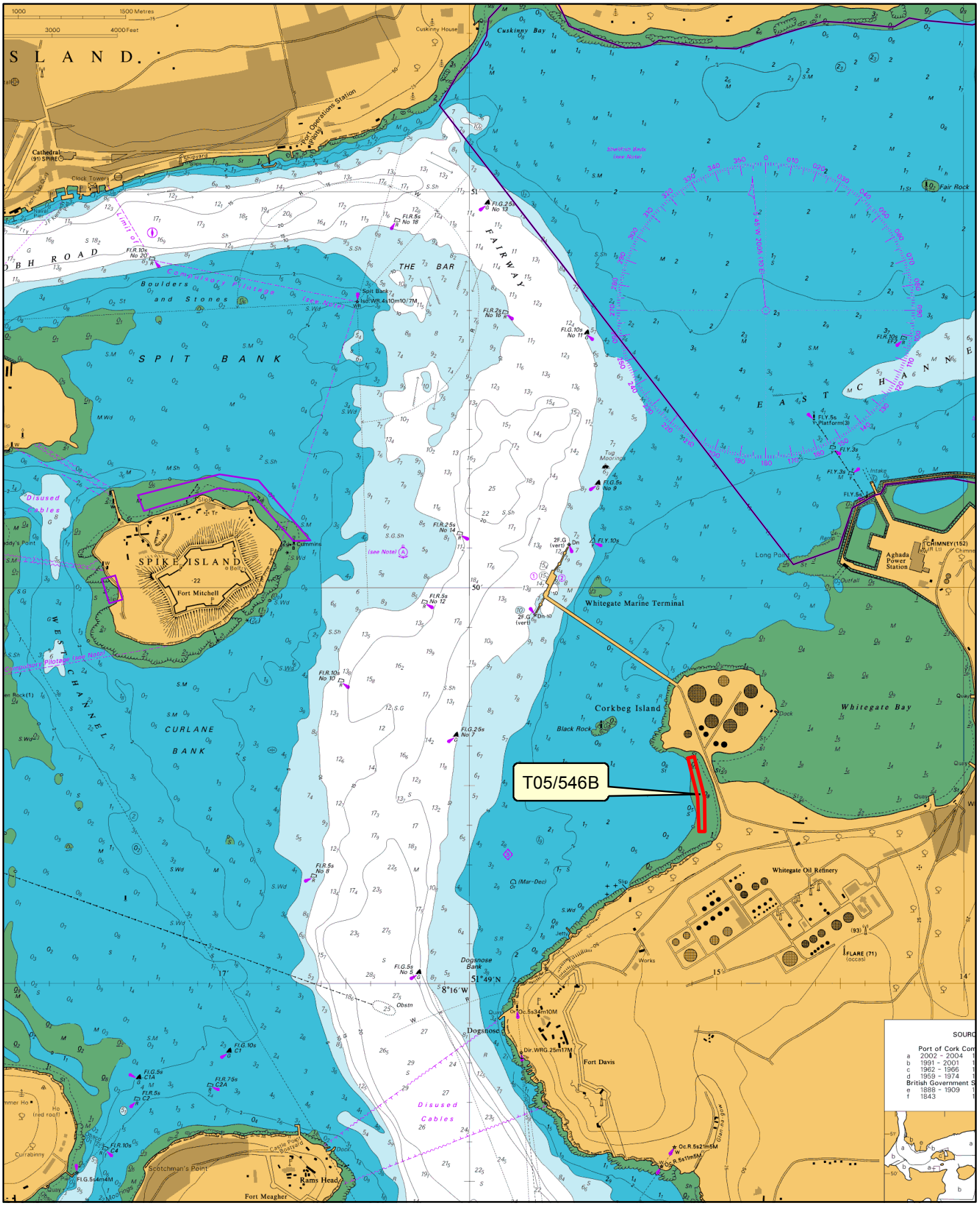
Department of Agriculture, Food and the Marine



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Application
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Refused
Revoked
Surrendered
Withdrawn

An Roinn Talmhaíochta, Bia agus Mara
Department of Agriculture, Food and the Marine

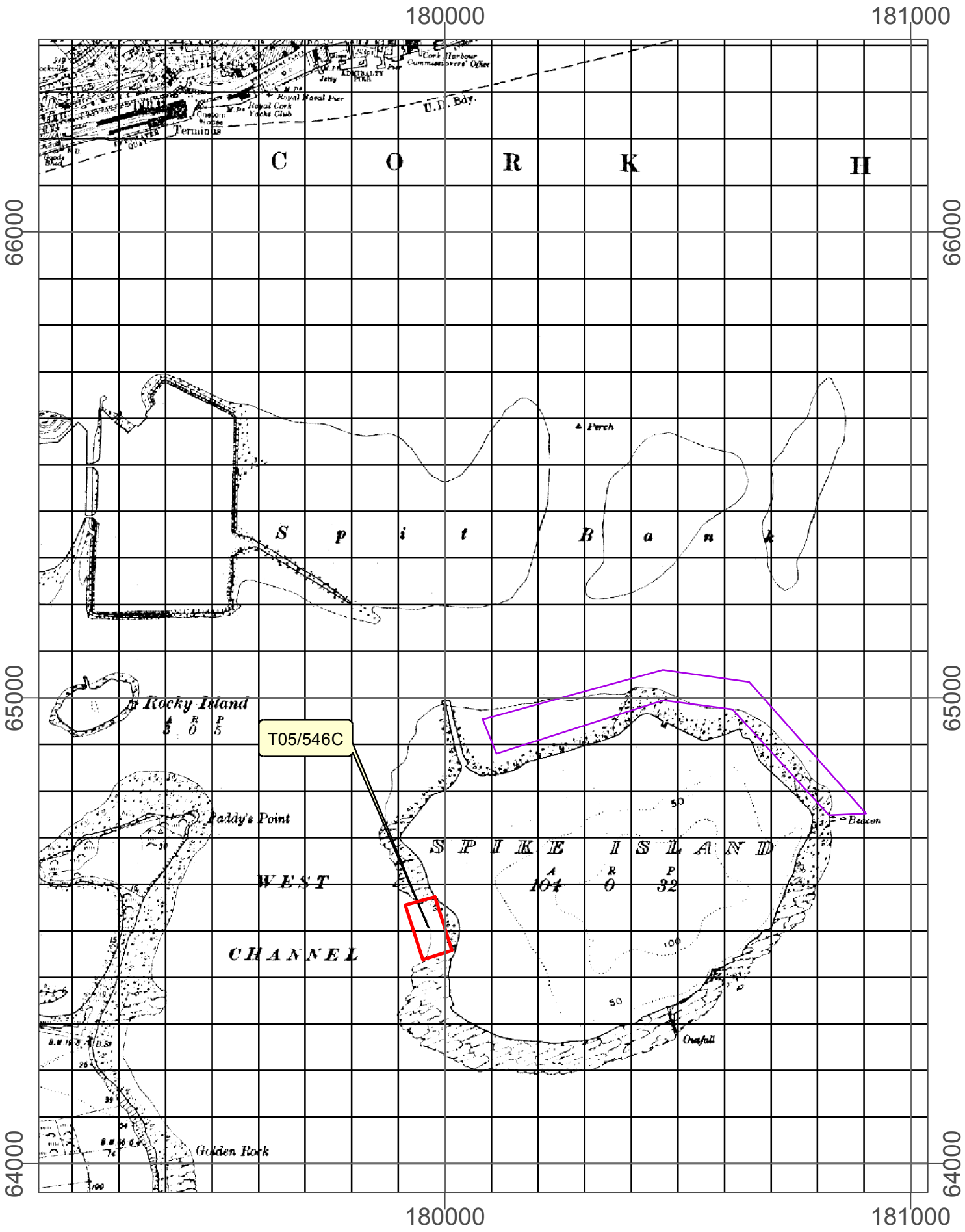
1 NO. SITE AT CORK HARBOUR CO.CORK

Co-ordinates & Area

Site T06/546C (0.7932 Ha)

The area seaward of the high water mark and enclosed by a line drawn from Irish National Grid Reference point

179978, 064573 to Irish National Grid Reference point
180015, 064458 to Irish National Grid Reference point
179953, 064438 to Irish National Grid Reference point
179915, 064555 to the first mentioned point.



Aqua Culture Sites

<all other values>

Site_Status

Application

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100 Meter Reference Grid

1:10,560

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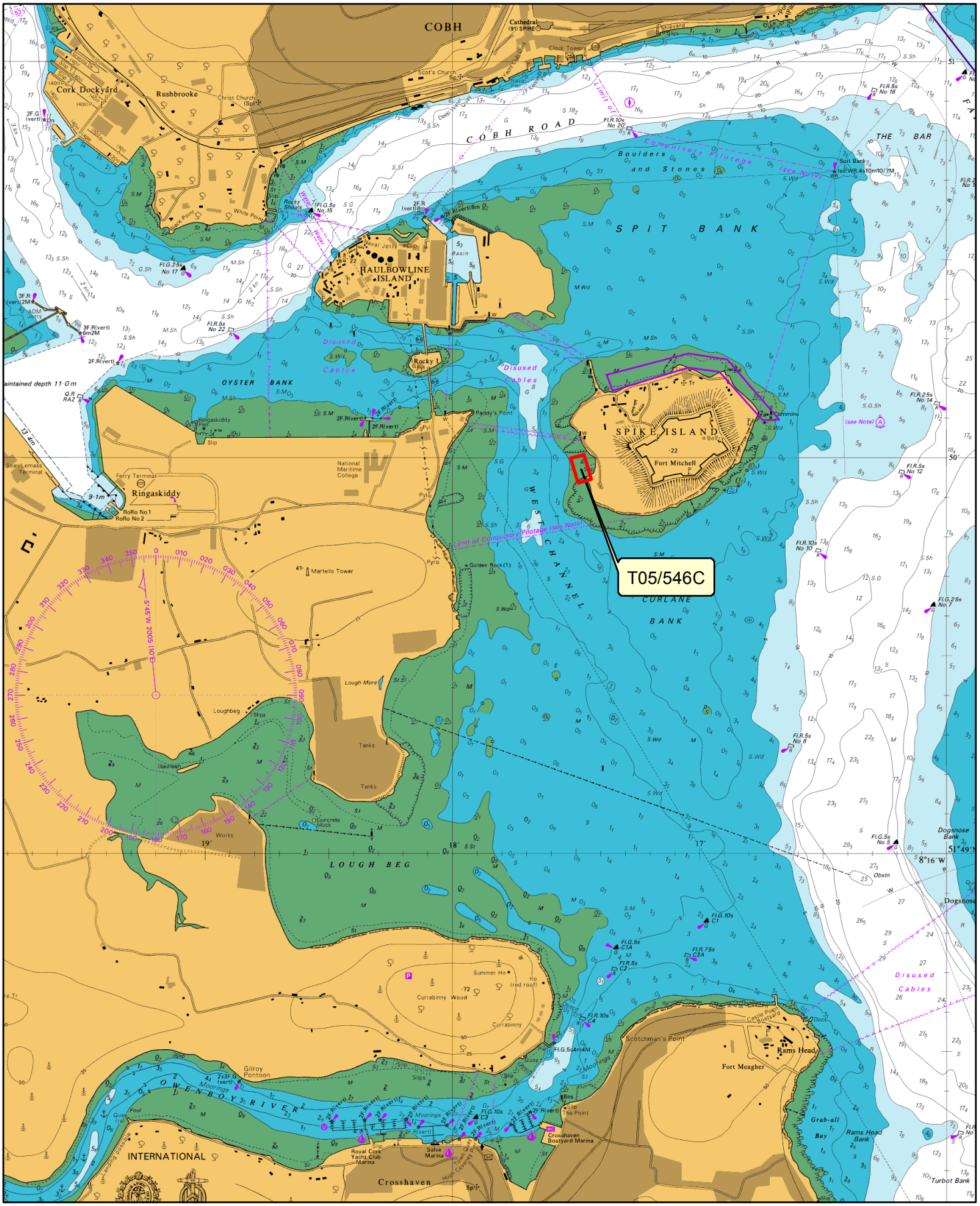
Department of Agriculture, Food and the Marine



1:24,000

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Aqua Culture Sites
<all other values>

Site_Status
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Application
Lapsed
Licensed
Refused
Revoked
Surrendered
Withdrawn

An Roinn Talmhaíochta, Bia agus Mara
Department of Agriculture, Food and the Marine

McCull, Mary

From: McCull, Mary
Sent: 27 September 2019 17:00
To: McCull, Mary
Subject: T05-546 Killian Tighe

From: Michael McPartland [mailto:Michael.McPartland@fisheriesireland.ie]
Sent: 10 September 2019 15:24

Subject: T05-546 Killian Tighe

Bernie
I refer to the above-mentioned applications
IFI would ask that a) only native species seed stocks are used and b) all necessary measures are undertaken in relation to bio-security
Michael Mc Partland
Senior Fisheries Environmental Officer.

Iascach Intíre Éireann
Inland Fisheries Ireland
Tel + 353 (0)26 412 21/2
Fax + 353 (0)26 412 23
Email michael.mcpartland@fisheriesireland.ie
Web www.fisheriesireland.ie
Sunnyside House, Macroom, Co. Cork, Ireland. P12 X602

Help Protect Ireland's Inland Fisheries

Fáilte Ireland

Department of Agriculture, Food and Marine

Aquaculture & Foreshore Management Division

Clonakility

Co. Cork

P85 TX47

23rd September 2019

Re: Aquaculture Licence Application for a site in Cork Harbour, Co. Cork –Ltd, Ref T05/546 (A & C)

A Chara,

I refer to the above-named Aquaculture Licence application at Cork Harbour. Fáilte Ireland have reviewed the proposal to determine the potential impacts on tourism amenities. It is the policy of Fáilte Ireland to support the sustainable development of the aquaculture sector and support its contribution to the economy in the region at appropriate locations and in accordance with proper planning and sustainable development.

We note this application was lodged in 2009 prior to the reopening of Spike Island in 2016 as a visitor attraction on foot of significant capital investment of over 7 million euro. In excess of 70,000 people visited the attraction in 2018 and further growth in 2019 and beyond is projected with the aim to achieve 100,000 visitors annually. The attraction was the winner of Europe's leading tourist attraction in 2017 and has been shortlisted in the world's best attraction category at this year's International Travel and Tourism Awards (ITTA).

The Cobh Triathlon Club host their annual 'Jailbreak' Triathlon in the area with the swim leg of the event starting adjacent to the eastern side of the pier at Spike Island. The event is part of the Irish National Triathlon Series and attracts hundreds of participants annually.

Furthermore, Cork Harbour is of strategic importance within Ireland's Ancient East, one of Fáilte Ireland's four regional experience brands introduced in early 2016, promoting Ireland to international tourists so they will visit, stay longer and spend more. Ireland's Ancient East showcases Ireland's living culture and ancient heritage. Fáilte Ireland is currently developing a 'Maritime' Visitor

An tÚdarás Náisiúnta Forbartha Turasóireachta
Áras Fáilte, 88–95 Sráid Amiens
Baile Átha Cliath 1
D01 WR86
Éire

National Tourism Development Authority
Áras Fáilte, 88 - 95 Amiens Street
Dublin 1
D01 WR86
Ireland

Phone 1890 525 525
or +353 1 884 7700
Email info@failteireland.ie
www.failteireland.ie

Experience Development Plan which aims to bring to life East Cork, Cork Harbour and Cork City's strong maritime heritage and unlock the economic growth potential of the area by developing existing and new experiences that will attract more visitors.

With the above in mind, it is important that tourism is considered when identifying the potential receptors that may be affected by an aquaculture development.

Having regard to the location of the proposed development, it is considered that it has the potential to negatively impact;

- On the surrounding environment and visual amenities of the area particularly at low tide within this area of the harbour an area renowned for its views and natural landscape
- Significant implications for other marine users and leisure activities particularly due to accessibility issues
- The setting of the national monument

Therefore, Fáilte Ireland respectfully request that the potential for impacts on the tourism, recreation and amenity value of the area as a result of the proposed development be given due consideration in the determination of this licence application.

Should you have any queries on this please do not hesitate to contact me.

Is mise le meas,

Shane Dineen

_____

Environment & Planning Manager, Fáilte Ireland

Rinville,
Oranmore,
Co. Galway
Tel: 091 387200
Date: 18 September 2019

Mary McCull
Aquaculture and Foreshore Management Division
Department of Agriculture, Food and the Marine
Clogheen,
Clonakilty
Co. Cork.

Advice on Aquaculture Licence Application

Applicant	**Killian Tighe**
Application type	**New**
Site Reference No	**T05/546A**
Species	**Pacific Oysters (*C. gigas*) using Bags and Trestles**
Site Status	**Not located within a Natura 2000 site** **Not located within a designated Shellfish Growing Waters Area.**

Dear Mary

This is an application for a new aquaculture licence for the cultivation of pacific oysters (*Crassostrea gigas)* using bags and trestles at Site T05/546A on the foreshore in Cork Harbour. The area of foreshore at Site T05/546A is 6.0152

The site is not located within a designated Shellfish Growing Waters Area. It is recommended that the implications of licencing sites that are not located within a designated Shellfish Growing Waters Area should be fully considered by DAFM as part of the licence determination process.

Oysters in this part of Cork Harbour are not currently classified under Annex II of EU Regulation 854/2004.

The cultivation of shellfish at these sites will produce faeces and pseudofaeces. Any impact will be limited to the area of the sites. The build-up of excess organic matter beyond the footprint of the sites is not considered likely. On the basis of targeted research[1], the impact of intertidal oyster cultivation using bags and trestles on the majority of community types is considered not significant.

No chemicals or hazardous substances will be used during the production process.

Considering the location, nature and scale of the proposed aquaculture activity, and in deference to our remit under the Marine Institute Act, and the considerations implicit to Sections 61(f) of the Fisheries (Amendment) Act, 1997 the Marine Institute is of the view that there will be no significant impacts on the marine environment and that the quality status of the area will not be adversely impacted.

Site T05/546A is not located within a designated Natura 2000 site. The site is located circa 1.2Km from the nearest boundary of the Cork Harbour SPA (Site Code 004030) at Whitegate Bay and circa 4.6Km from the nearest boundary of the Great Island Channel SAC (Site Code 001058.

We note the findings of the Appropriate Assessment reports[2, 3] and the Department's draft Natura Conclusion Statement[4] in regard to the impacts on the Conservation Objectives within the Great Island Channel SAC and the Cork Harbour SPA.

[1] Forde, J., F. O'Beirn, J. O'Carroll, A. Patterson, R. Kennedy. 2015. Impact of intertidal oyster trestle cultivation on the Ecological Status of benthic habitats. Marine Pollution Bulletin 95, 223–233.

[2] https://www.agriculture.gov.ie/media/migration/seafood/aquacultureforeshoremanagement/aquaculturelicensing/appropriateassessments/cork/GreatIslandSACAAReport030719.pdf

In making the final determination with respect to this application it is recommended that DAFM take full account of the conclusions and recommendations of the Appropriate Assessment report and the proposed mitigation measures set out in the Department's Draft Natura Conclusion Statement.

Information on the source of seed for the site has not been provided and the MI recommends that this information be sought from the applicant prior to any final licence determination being made.

In order to be able to assess and manage the potential risk of the introduction of invasive non-native species the MI recommends that the initial source of seed and other sources which may be used at any point in the future should be approved by the Minister. This approval should be a specific condition of any licence that may issue. It should be noted that the control of alien species is a separate issue to the control of diseases in the context of the current Fish Health legislation.

Notwithstanding the recommendation outlined above, and in the event that an Aquaculture Licence is granted, the movement of stock in and out of the site should follow best practice guidelines as they relate to the risk of introduction of invasive non-native species (e.g. Invasive Species Ireland). In this regard it is recommended that, prior to the commencement of operations at the sites, the applicant be required to draw up a contingency plan, for the approval of DAFM, which shall identify, *inter alia*, methods for the removal from the environment of any invasive non-native species introduced as a result of operations at these sites. If such an event occurs, the contingency plan shall be implemented immediately.

In the event that invasive non-native species are introduced into a site as a result of aquaculture activity the impacts may be bay -wide and thus affect other aquaculture operators in the bay. In this regard, therefore, the Marine Institute considers that the CLAMS process may be a useful and appropriate vehicle for the development and implementation of alien species management and control plans.

The Marine Institute recommends that oyster culture utilise triploid oysters only in order to mitigate the risk of the reproduction of the Pacific oyster in the bay.

It is statutory requirement that a Fish Health Authorisation as required under Council Directive 2006/88/EC be in place prior to the commencement of the aquaculture activities proposed.

Kind regards,

Dr. Terry McMahon
Section Manager, Marine Environment and Food Safety Services,
The Marine Institute.

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3 https://www.agriculture.gov.ie/media/migration/seafood/aquacultureforeshoremanagement/aquaculturelicensing/appropriateassessments/cork/CorkHarbourSPAAAReport030719.pdf

4 https://www.agriculture.gov.ie/media/migration/seafood/aquacultureforeshoremanagement/aquaculturelicensing/appropriateassessmentconclusionstatement/2019new/1CorkHarbour%20draftconclusion020819.pdf

☑ Shellfish Waters Directive Area

☑ Aquaculture Site

☑ Special Area of Conservation

☑ Special Protection Areas

Rinville,
Oranmore,
Co. Galway
Tel: 091 387200
Date: 18 September 2019

Mary McCull
Aquaculture and Foreshore Management Division
Department of Agriculture, Food and the Marine
Clogheen,
Clonakilty
Co. Cork.

Advice on Aquaculture Licence Application

Applicant	**Killian Tighe**
Application type	**New**
Site Reference No	**T05/546B**
Species	**Pacific Oysters (*C. gigas*) using Bags and Trestles**
Site Status	**Not located within a Natura 2000 site** **Not located within a designated Shellfish Growing Waters Area.**

Dear Mary

This is an application for a new aquaculture licence for the cultivation of pacific oysters (*Crassostrea gigas)* using bags and trestles at Site T05/546A on the foreshore in Cork Harbour. The area of forehsore at Site T05/546B is 1.096Ha

The site is not located within a designated Shellfish Growing Waters Area. It is recommended that the implications of licencing sites that are not located within a designated Shellfish Growing Waters Area should be fully considered by DAFM as part of the licence determination process.

Oysters in this part of Cork Harbour are not currently classified under Annex II of EU Regulation 854/2004.

The cultivation of shellfish at these sites will produce faeces and pseudofaeces. Any impact will be limited to the area of the sites. The build-up of excess organic matter beyond the footprint of the sites is not considered likely. On the basis of targeted research[1], the impact of intertidal oyster cultivation using bags and trestles on the majority of community types is considered not significant.

No chemicals or hazardous substances will be used during the production process.

Considering the location, nature and scale of the proposed aquaculture activity, and in deference to our remit under the Marine Institute Act, and the considerations implicit to Sections 61(f) of the Fisheries (Amendment) Act, 1997 the Marine Institute is of the view that there will be no significant impacts on the marine environment and that the quality status of the area will not be adversely impacted.

Site T05/546B is not located within a designated Natura 2000 site. The site is located circa 1.2Km from the nearest boundary of the Cork Harbour SPA (Site Code 004030) and circa 4.6Km from the nearest boundary of the Great Island Channel SAC (Site Code 001058.

We note the findings of the Appropriate Assessment reports[2, 3] and the Department's draft Natura Conclusion Statement[4] in regard to the impacts on the Conservation Objectives within the Great Island Channel SAC and the Cork Harbour SPA.

[1] Forde, J., F. O'Beirn, J. O'Carroll, A. Patterson, R. Kennedy. 2015. Impact of intertidal oyster trestle cultivation on the Ecological Status of benthic habitats. Marine Pollution Bulletin 95, 223–233.

[2] https://www.agriculture.gov.ie/media/migration/seafood/aquacultureforeshoremanagement/aquaculturelicensing/appropriateassessments/cork/GreatIslandSACAAReport030719.pdf

In making the final determination with respect to this application it is recommended that DAFM take full account of the conclusions and recommendations of the Appropriate Assessment report and the proposed mitigation measures set out in the Department's Draft Natura Conclusion Statement.

Information on the source of seed for the site has not been provided and the MI recommends that this information be sought from the applicant prior to any final licence determination being made.

In order to be able to assess and manage the potential risk of the introduction of invasive non-native species the MI recommends that the initial source of seed and other sources which may be used at any point in the future should be approved by the Minister. This approval should be a specific condition of any licence that may issue. It should be noted that the control of alien species is a separate issue to the control of diseases in the context of the current Fish Health legislation.

Notwithstanding the recommendation outlined above, and in the event that an Aquaculture Licence is granted, the movement of stock in and out of the site should follow best practice guidelines as they relate to the risk of introduction of invasive non-native species (e.g. Invasive Species Ireland). In this regard it is recommended that, prior to the commencement of operations at the sites, the applicant be required to draw up a contingency plan, for the approval of DAFM, which shall identify, *inter alia*, methods for the removal from the environment of any invasive non-native species introduced as a result of operations at these sites. If such an event occurs, the contingency plan shall be implemented immediately.

In the event that invasive non-native species are introduced into a site as a result of aquaculture activity the impacts may be bay -wide and thus affect other aquaculture operators in the bay. In this regard, therefore, the Marine Institute considers that the CLAMS process may be a useful and appropriate vehicle for the development and implementation of alien species management and control plans.

The Marine Institute recommends that oyster culture utilise triploid oysters only in order to mitigate the risk of the reproduction of the Pacific oyster in the bay.

It is statutory requirement that a Fish Health Authorisation as required under Council Directive 2006/88/EC be in place prior to the commencement of the aquaculture activities proposed.

Kind regards,

_____

Dr. Terry McMahon
Section Manager, Marine Environment and Food Safety Services,
The Marine Institute.

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3 https://www.agriculture.gov.ie/media/migration/seafood/aquacultureforeshoremanagement/aquaculturelicensing/appropriateassessments/cork/CorkHarbourSPAAAReport030719.pdf

4 https://www.agriculture.gov.ie/media/migration/seafood/aquacultureforeshoremanagement/aquaculturelicensing/appropriateassessmentconclusionstatement/2019new/1CorkHarbour%20draftconclusion020819.pdf

☑ Shellfish Waters Directive Area

☑ Aquaculture Site

☑ Special Area of Conservation

☑ Special Protection Areas

Rinville,
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Tel: 091 387200
Date: 18 September 2019

Mary McCull
Aquaculture and Foreshore Management Division
Department of Agriculture, Food and the Marine
Clogheen,
Clonakilty
Co. Cork.

Advice on Aquaculture Licence Application

Applicant	**Killian Tighe**
Application type	**New**
Site Reference No	**T05/546C**
Species	**Pacific Oysters (*C. gigas*) using Bags and Trestles**
Site Status	**Not located within a Natura 2000 site** **Not located within a designated Shellfish Growing Waters Area.**

Dear Mary

This is an application for a new aquaculture licence for the cultivation of pacific oysters (*Crassostrea gigas)* using bags and trestles at Site T05/546C on the foreshore in Cork Harbour. The area of foreshore at Site T05/546C is 0.7932Ha

The site is not located within a designated Shellfish Growing Waters Area. It is recommended that the implications of licencing sites that are not located within a designated Shellfish Growing Waters Area should be fully considered by DAFM as part of the licence determination process.

Oysters in this part of Cork Harbour are not currently classified under Annex II of EU Regulation 854/2004.

The cultivation of shellfish at these sites will produce faeces and pseudofaeces. Any impact will be limited to the area of the sites. The build-up of excess organic matter beyond the footprint of the sites is not considered likely. On the basis of targeted research[1], the impact of intertidal oyster cultivation using bags and trestles on the majority of community types is considered not significant.

No chemicals or hazardous substances will be used during the production process.

Considering the location, nature and scale of the proposed aquaculture activity, and in deference to our remit under the Marine Institute Act, and the considerations implicit to Sections 61(f) of the Fisheries (Amendment) Act, 1997 the Marine Institute is of the view that there will be no significant impacts on the marine environment and that the quality status of the area will not be adversely impacted.

Site T05/546C is not located within a designated Natura 2000 site. The site is located circa 0.9Km from the nearest boundary of the Cork Harbour SPA (Site Code 004030) at Lough Beg and circa 5.0Km from the nearest boundary of the Great Island Channel SAC (Site Code 001058).

We note the findings of the Appropriate Assessment reports[2, 3] and the Department's draft Natura Conclusion Statement[4] in regard to the impacts on the Conservation Objectives within the Great Island Channel SAC and the Cork Harbour SPA.

[1] Forde, J., F. O'Beirn, J. O'Carroll, A. Patterson, R. Kennedy. 2015. Impact of intertidal oyster trestle cultivation on the Ecological Status of benthic habitats. Marine Pollution Bulletin 95, 223–233.

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Kind regards,

Dr. Terry McMahon
Section Manager, Marine Environment and Food Safety Services,
The Marine Institute.

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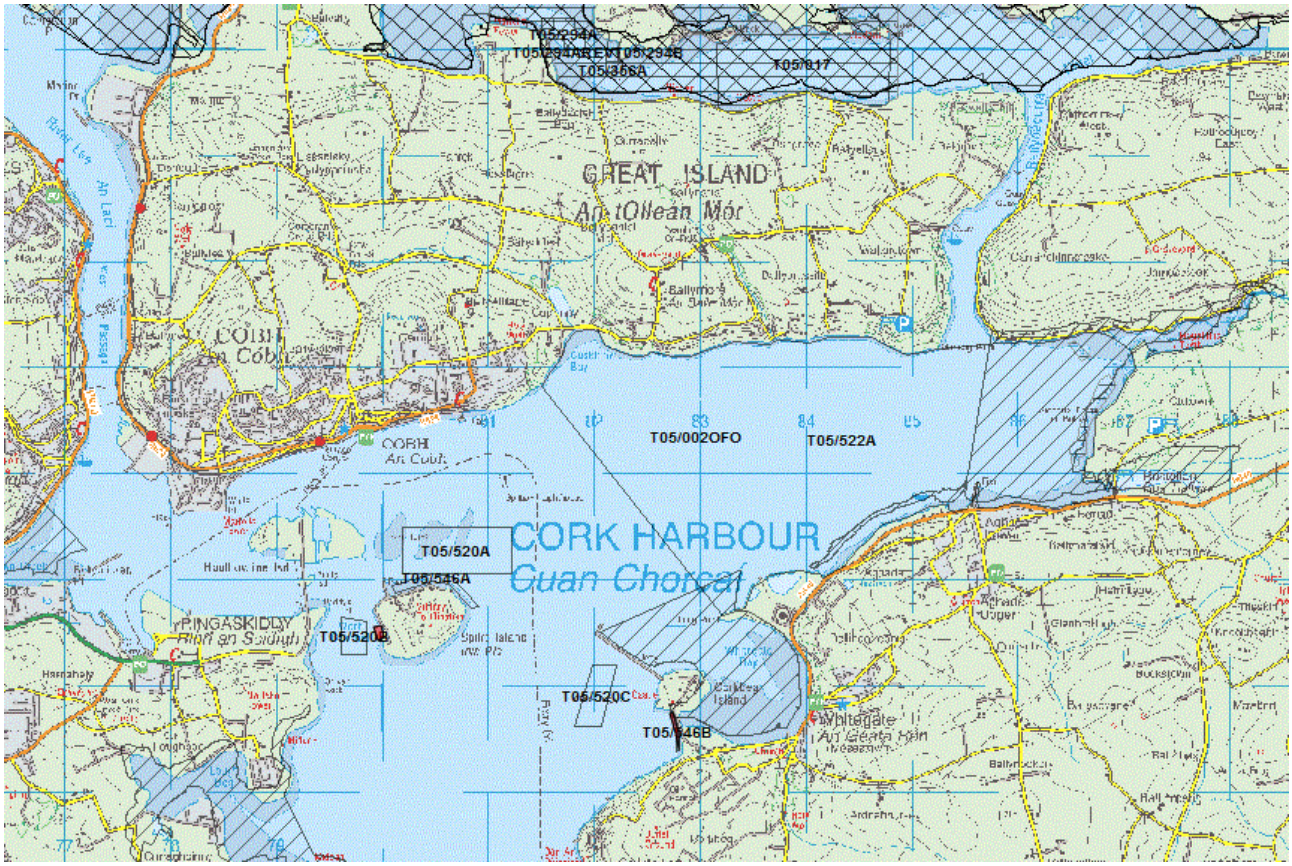
4 https://www.agriculture.gov.ie/media/migration/seafood/aquacultureforeshoremanagement/aquaculturelicensing/appropriateassessmentconclusionstatement/2019new/1CorkHarbour%20draftconclusion020819.pdf



☑ Shellfish Waters Directive Area

☑ Aquaculture Site

☑ Special Area of Conservation

☑ Special Protection Areas

Appropriate Assessment Conclusion Statement by Licensing Authority in support of the Appropriate Assessment of Aquaculture in Great Island SAC (Site Code 001058) and Cork Harbour SPA (Site Code: 004030)

This Conclusion Statement outlines how it is proposed to licence and manage aquaculture activities in the above Special Area of Conservation (SAC) and Special Protection Area (SPA)– Natura 2000 sites - in compliance with the Habitats Directives. Aquaculture in these Natura Sites will be licensed in accordance with the standard terms and conditions as set out in the aquaculture licence templates. These are available for inspection on the Department's website at http://www.agriculture.gov.ie/seafood/aquacultureforeshoremanagement/aquaculturelicensing/

Furthermore, the licences will also incorporate specific conditions so as to accommodate Natura requirements, as appropriate, in accordance with the principles set out in this document.

An Article 6 (Habitats) Assessment and, specifically, an Appropriate Assessment report relating to aquaculture on habitats in the Great Island SAC has been prepared by the Marine Institute and Atkins/Marine Institute in relation to bird species in the Cork Harbour SPA on behalf of the Department of Agriculture, Food and the Marine. The Appropriate Assessment Report considered the potential ecological impacts of aquaculture activities on Natura features in the SAC and SPA.

In addition to the Great Island SAC and Cork Harbour SPA there are a number of other SACs and SPAs proximate to the proposed aquaculture activities and a screening was carried out on their likely interaction with aquaculture.

The information upon which the Appropriate Assessment is based is on a list of applications and extant licenses for aquaculture available at the time of assessment. This information was provided by the Department of Agriculture, Food and the Marine.

Existing and proposed Aquaculture Activity in Great Island SAC and Cork Harbour SPA

A total of six aquaculture sites, covering a total area of 922 ha, occur within Cork Harbour. These include two sites in the North Channel with a total area of 11 ha, and four application sites in the lower harbour with a total area of 911 ha. Five of the six sites are small (circa 17.5 ha combined) sites where suspended oyster cultivation using the bag and trestle method (oyster trestle cultivation) currently takes place, or is proposed, but only two of these sites are within the Cork Harbour SPA. The sixth site is a very large site covering most of the East Harbour zone and bottom mussel cultivation is proposed for this site. Around 20% of this site is within the Cork Harbour SPA.

Within the Great Island Channel SAC aquaculture focuses on the cultivation of the Pacific oyster *Crassostrea gigas* predominantly on trestles in intertidal areas. There is one company actively farming two bag and trestle Pacific oyster sites. They have applied to amalgamate these two sites into one site totalling 9 hectares. There are no applications to licence any new sites in the SAC. The company licensed for the above 2 Pacific oyster sites have applied to also grow the oysters in floating bags, in the deeper parts of the site. The floating oyster bags would be attached to a longline which is moored to the seabed. This would allow the operator to utilise the deeper parts of their site which are too deep for bag and trestle culture. They are also planning to cultivate two native red seaweeds, namely *Porphyra sp.* and *Palmaria palmate*.

There are two Oyster Fishery Orders within the North Channel. Within these Orders oysters can be cultivated on the bottom. This is primarily for Native oyster production although at times Pacific oysters are fattened on the bottom.

Great Island SAC

The Great Island Channel stretches from Little Island to Midleton, with its southern boundary being formed by Great Island. It is an integral part of Cork Harbour which contains several other sites of conservation interest. Geologically, Cork Harbour consists of two large areas of open water in a limestone basin, separated from each other and the open sea by ridges of Old Red Sandstone. Within this system, Great Island Channel forms the eastern stretch of the river basin and, compared to the rest of Cork Harbour, is relatively undisturbed. Within the site is the estuary of the Owennacurra and Dungourney Rivers.

These rivers, which flow through Midleton, provide the main source of freshwater to the North Channel

Qualifying Interests

An initial screening exercise resulted in the following habitat feature being excluded from further consideration by virtue of the fact that no spatial overlap or likely interaction with the culture activities was expected to occur; Atlantic salt meadows (*Glauco-Puccinellietellia maritimae*) (1330).

A full assessment was carried out on the likely interactions between existing and proposed culture operations and the feature Annex 1 habitats of 1140 Mudflats and Sandflats not covered by seawater at low tide.

The likely effects of the aquaculture activities (species, structures, access routes) were considered in light of the sensitivity of constituent habitats and species of the Annex 1 habitat 1140 Mudflats and Sandflats not covered by seawater at low tide. The Annex I 1140 constituent community considered was limited to 'Mixed sediment to sandy mud with polychaetes and oligochaetes community complex'.

SCREENING OF ADJACENT SAC FOR *EX-SITU* EFFECTS

The nearest SACs to the Great Island Channel SAC, are the Ballymacoda (Clonpriest and Pillmore) SAC (Site Code IE000077) and the Courtmacsherry Estuary SAC (Site Code IE001230). The former is 24.6km east and the latter is 54.6km southwest of the Great Island Channel SAC and as a result were screened out.

CONSERVATION OBJECTIVES FOR GREAT ISLAND SAC

The natural condition of the designated features should be preserved with respect to their area, distribution, and extent and community distribution. Habitat availability should be maintained for designated species and human disturbance should not adversely affect such species.

ASSESSMENT OF THE EFFECTS OF AQUACULTURE PRODUCTION ON THE SAC CONSERVATION OBJECTIVES

Intertidal oyster aquaculture activities overlap the community type listed under the habitat feature of Mud and sandflats not covered by seawater at low tide (1140), Mixed sediment to sandy mud with polychaetes and oligochaetes community complex a 15% threshold of overlap between a disturbing activity and a habitat is given in the NPWS guidance. Below this threshold disturbance is deemed to be non-significant.

The spatial overlap of licensed oyster trestle culture activities with this community types is 0.25%. There are no new applications and consequently, adverse impacts of activities occurring at oyster cultivation sites within the Qualifying Interests of (1140) Mud and sandflats not covered by seawater at low tide can be discounted.

In summary, it is concluded (based primarily upon the spatial overlap and sensitivity analysis) current intertidal oyster aquaculture activities individually and in-combination do not pose a risk of significant disturbance to the conservation habitats (1140 and constituent marine community type) in the Great Island Channel SAC. In addition, the contained subtidal cultivation of native oysters does not pose a significant risk to the Conservation Objectives of marine benthic habitat features for which the SAC is designated. The risk posed by the introduction of seed stock (e.g. ½ grown oysters or seed) from outside of the jurisdiction cannot be discounted. The risk of successful Pacific oyster reproduction in Great Island SAC (and Cork Harbour) posed by the culture of non-triploid (reproductively sterile) oysters cannot be discounted on the basis of the area having long residence times and large intertidal areas.

IN-COMBINATION EFFECTS OF AQUACULTURE, FISHERIES AND OTHER ACTIVITIES

Subtidal Oyster Cultivation

There are two Oyster Fishery Orders within the North Channel. Within these Orders oysters can be cultivated on the bottom. This is primarily for Native oyster production although at times Pacific oysters are fattened on the bottom.

The Fishery Order overlaps with 9.62% of habitat 1140 and 9.62% of the constituent marine community types 'Mixed sediment to sandy mud with polychaetes and oligochaetes community complex'

Monoculture - Bottom culture

Mixed sediment communities have high level of resistance and resilience to the pressure resulting from an oyster dredge. The low frequency of dredging (once every 3 years) will reduce the risk from this activity to this community type further.

Pollution

Pressures resulting from intertidal aquaculture activities are primarily localised compaction of sediment along access routes. It was, therefore, concluded that given the pressure resulting from point discharge location such as the urban waste-water treatment and/or combined sewer outfalls would likely impact on physico-chemical parameters in the water column, any in-combination effects with aquaculture activities are considered to be minimal or negligible.

Conclusion

Based on the level of overlap (less than the 15% threshold) and the resilience of the community types (and associated species) with oyster bottom culture and dredging, significant disturbance could be discounted for the following constituent habitat of Qualifying Interests (1140) Mudflats and sandflats not covered by seawater at low tide: Mixed sediment to sandy mud with polychaetes and oligochaetes community complex. In addition, as oyster trestles are considered non-disturbing as they will have no in-combination effect with other activities.

Consequently, in-combination effects of fisheries with intertidal trestle aquaculture activities on designated habitats (and constituent community types) can be discounted.

Cork Harbour SPA

Cork Harbour SPA comprises several discrete sections scattered around Cork Harbour and includes one section (the Ringabella Estuary), which is located outside the harbour proper.

However, several of the SCI species, particularly those associated with subtidal habitats, make significant use of areas outside the SPA and, for some of these species, the majority of their habitat is outside the SPA. Therefore the area of interest is defined as comprising of the entire tidal habitat within Cork Harbour.

Screening

Three of the aquaculture sites are within, or partly within, the Cork Harbour SPA, while another three aquaculture sites that are outside the SPA are also included in the assessment. Therefore, the assessment covers all the aquaculture sites in Cork Harbour. The Cork Harbour SPA is the primary focus of this assessment. In addition, following a screening exercise, Special Conservation Interests (SCIs) from two other SPAs are included in this assessment. These SPAs are: Courtmacsherry Bay SPA and The Gearagh SPA.

Conservation Objectives for Cork Harbour SPA.

The conservation objectives for the wintering populations of SCIs in Cork harbour are to maintain their favourable conservation condition. The SCIs are: Shelduck, Wigeon, Teal, Pintail, Shoveler, Red-breasted Merganser, Cormorant, Grey Heron, Little Grebe, Great Crested Grebe, Oystercatcher, Golden Plover, Grey Plover, Lapwing, Curlew, Blacktailed Godwit, Bar-tailed Godwit, Dunlin, Redshank, Black-headed Gull, Common Gull and Lesser Black-backed Gull.

The conservation objective for the Common Tern breeding population in the Cork Harbour SPA is to maintain its favourable conservation condition. The favourable conservation condition of this population is defined by the following attributes: breeding population abundance, productivity rate, distribution of breeding colonies, availability of prey biomass, barriers to connectivity, and disturbance at the breeding site. Site specific conservation objectives have not yet been prepared for The Gearagh SPA. However, it can be assumed that the attributes and targets listed for SCIs in Cork Harbour SPA also apply to Mallard, the SCI of The Gearagh SPA.

Current and proposed future extent of the aquaculture activities

A total of six aquaculture sites, covering a total area of 922 ha, occur within Cork Harbour. These include two sites in the North Channel with a total area of 11 ha, and four application sites in the lower harbour with a total area of 911 ha. Five of the six sites are small (circa 17.5 ha combined) sites where suspended oyster cultivation using the bag and trestle method (oyster trestle cultivation) currently takes place, or is proposed, but only two of these sites are within the Cork Harbour SPA. The sixth site is a very large site covering most of the East Harbour zone and bottom mussel cultivation is proposed for this site. Around 20% of this site is within the Cork Harbour SPA. In addition to the aquaculture sites, there are four areas within Cork Harbour covered by Fishery Orders.

Assessment of oyster trestle cultivation activity

The small scale of the oyster trestle cultivation activity covered by this assessment, and the location of three of the five sites in areas of the harbour that do not hold high concentrations of intertidal/shallow subtidal waterbirds, mean that no significant displacement impacts are likely to occur. There is a possibility of disturbance impacts to Common Tern roosts on Spike Island. Any such impacts are unlikely to be significant, but further information about Common Tern usage of the Spike Island and about the intensity of husbandry activity, would be required to definitively assess this potential impact.

Assessment of bottom mussel cultivation

The original target production level for the bottom mussel culture site in the East Harbour indicates that high levels of husbandry and harvesting activity will be involved in the cultivation of this site. These activities have the potential to cause significant disturbance impacts to Redbreasted Merganser, Cormorant and Great Crested Grebe roost sites located within the aquaculture site. These are primarily night roost sites but the Great Crested Grebe roost sites is also sometimes occupied during the day. There is also potential for displacement impacts to foraging Redbreasted Mergansers, which could prevent reoccupation of the East Harbour zone in the event of a recovery of the Cork Harbour Redbreasted Merganser population. Smaller scale displacement impacts to foraging Cormorant and Great Crested Grebe are also possible. Wigeon, Mallard and Oystercatchers

using shoreline feeding areas and/or roost sites around the edge of the aquaculture site could also be affected by disturbance from the activity.

Assessment of cumulative impacts

Oyster trestle cultivation

SCI species Wigeon and Mallard are potentially sensitive to negative impacts from oyster trestle cultivation from the mussel fishery in the East Harbour aquaculture site. However displacement impact from full occupation of the Rossmore Fishery Order along with the North Channel aquaculture sites is effectively negligible at 0.4% - 0.6%.

Oyster fisheries

The re-opening of the oyster fishery in the Brick Island Fishery Order would have the potential to have significant cumulative impacts in combination with potential disturbance impacts to Redbreasted Merganser from the mussel fishery in the East Harbour zone, although the major impact would be from the Brick Island Fishery Order. Reopening of the oyster fishery in the East Harbour Fishery Order would cause additional boat activity to that involved in the mussel fishery and may, therefore, increase the cumulative impacts on the Cork Harbour Redbreasted Merganser population.

Re-opening of the oyster fishery in the Brick Island Fishery Order would have the potential to have significant cumulative impacts on the Cork Harbour Oystercatcher population in combination with potential disturbance impacts to Oystercatcher from the mussel fishery in the East Harbour zone. Reopening of the oyster fishery in the East Harbour Fishery Order would cause additional boat activity to that involved in the mussel fishery and may, therefore, increase the cumulative impacts on the Cork Harbour Oystercatcher population.

Findings of the Article 6(3) Appropriate Assessment of Great Island SAC and Cork Harbour

SPA Great Island SAC

- Based upon the scale of spatial overlap of current and proposed intertidal oyster aquaculture activities (including access route activity) and the relatively high tolerance levels of the habitats and associated species, the general conclusion is that

current and proposed intertidal culture activities are non-disturbing to the SAC Qualifying Interests and their constituent community types.

- The subtidal relaying and dredging of Native oysters subtidally, either individually or in-combination with aquaculture activities, are considered non-disturbing to the Qualifying Interest and its constituent community types.
- Based upon experience elsewhere, the introduction of '½ grown' or 'wild' oyster or mussel seed stock into aquaculture plots (both within and proximate to the SAC) from outside of Ireland does pose a clear risk of establishment of non-native species in the SAC.
- The culture on non-sterile Pacific oysters (in contained systems and subtidally un-contained on the seafloor) in the SAC presents as risk of successful reproduction and recruitment of this species within the SAC.

Cork Harbour SPA

- The small scale of the oyster trestle cultivation activity covered by this assessment, and the location of the culture sites in areas of the harbour that do not hold high concentrations of intertidal/shallow subtidal waterbirds, mean that no significant displacement impacts are likely to occur. There is a possibility of disturbance impacts to Common Tern roosts on Spike Island. Any such impacts are unlikely to be significant, but further information about Common Tern usage of the Spike Island would be required to determine the acceptable level of activity at the site.
- The target production level for the bottom mussel culture site in the East Harbour indicates that high levels of husbandry and harvesting activity will be involved in the cultivation of this site. These activities have the potential to cause significant disturbance impacts to Redbreasted Merganser, Cormorant and Great Crested Grebe roost sites located within the aquaculture site. These are primarily night roost sites but the Great Crested Grebe roost sites is also sometimes occupied during the day.
- There is also potential for displacement impacts to foraging Redbreasted Mergansers, which could prevent reoccupation of the East Harbour zone in the event of a recovery of the Cork Harbour Redbreasted Merganser population.

- Smaller scale displacement impacts to foraging Cormorant and Great Crested Grebe are also possible. Wigeon, Mallard and Oystercatchers using shoreline feeding areas and/or roost sites around the edge of the aquaculture site could also be affected by disturbance from the activity.
- Reopening of the oyster fisheries in the Brick Island and East Harbour Fishery Orders, oyster trestle cultivation in the Rossmore and East Harbour Fishery Orders, disturbance from wildfowling activity in the North Channel, other boat traffic and recreational watercraft activity and shoreline pedestrian activity could all have significant additional cumulative impacts on one or more of the above species in combination with the impact from the bottom mussel culture activity.
- Bottom mussel culture in the East Harbour aquaculture site could potentially cause significant disturbance impacts to Mallard feeding and/or roosting in shallow subtidal habitat along the eastern and southern edges of the aquaculture site. This could cause displacement of a significant proportion of the Cork Harbour population of this species. If there is significant population interchange between Cork Harbour and the Gearagh, this could have a negative impact on attribute 1 (population trends, of the conservation objective for this SCI.
- If there is significant population interchange between the Wigeon populations in Cork Harbour and any of these SPAs, the potential impacts from bottom mussel culture in Cork Harbour could have a negative impact on attribute 1 (population trends) of the conservation objective for these SCIs.

Mitigation Measures

- In order to mitigate the risk of introduction of alien species into the SAC as a result of aquaculture activities all movement of stock in and out of the Great Island Channel SAC should adhere to relevant legislation and follow best practice guidelines.
- It is recommended that triploid *C. gigas* oysters be used in a contained fashion only in licenced aquaculture areas.
- All vessel activities will take place during daylight hours (before 1 hour before sunset and 1 hour after sunrise).

- A truncated licence area for the culture of bottom mussels allied with constraints surrounding the timing of activities in the harbour may mitigate the disturbance risks identified in the Cork Harbour SPA AA report. Given a revised goal of producing 500 tonnes of mussels per annum and assuming a stocking density of 20-25 Tonnes per hectare the required area would be approximately 50ha (assuming a 2-year production cycle). This falls considerably short of the 900ha which was originally sought. This will need to be verified and separately assessed.

Conclusion

The Licensing Authority concludes that in general from a Natura 2000 perspective, given the conclusions and recommendations of the Appropriate Assessment process, the risk of significant disturbance from the proposed aquaculture activities cannot be discounted. Application T05/294 for intertidal oyster and seaweed culture is unlikely to have any impact on habitat conservation features or SCIs. Following the public and statutory consultation process application T05/546 for oyster cultivation was found to have the potential to significantly negatively impact the visual amenity of the area and negatively impact Corkbeg Strand as a public amenity area. Application T05/22 for a mussel cultivation licence could adversely affect the integrity of the Natura 2000 sites through disturbance. A truncated licence area for the culture of bottom mussels allied with constraints surrounding the timing of activities in the harbour may mitigate the disturbance risks. This will need to be verified and separately assessed.

An Roinn Talmhaíochta, Bia agus Mara
Department of Agriculture, Food and the Marine

Marine Engineering Division

Report on Aquaculture Licence Application

Application Reference No: T05/546A

Report Prepared by:	**Gearoid O'Shea, Engineer**
Date:	03 December 2018
Applicant	Killian Tighe
Location	Spike Island, Cork Harbour
Applicant Type	Aquaculture/Foreshore Licence
Site	A
Site Area (Ha)	6
Species	Pacific Oysters (Crassosprea Gigas)
Cultivation Method	Trestles & Net Bags
Intertidal/Non-Intertidal	Intertidal
Source of Seed / Spat	Not specified
Annual Production Estimates	240 Tonnes over 3 No. Sites (8 Ha in total)
Shellfish Waters Designation Reference:	Yes ☐ No ☒
Environmental Designation Reference:	Yes ☐ No ☒
Development Plans	Yes ☒ No ☐
Reference:	Cork County Development Plan 2014, Section 6.11
Pre-Consultation Meeting	Yes ☐ No ☒

Drawing Validation Sheet

OSI Maps **Yes** ☒ **No** ☐

Comment: Sites sketched on OSi Ordnance Survey Map

BA Chart **Yes** ☐ **No** ☒

Comment: MED BA Chart

Farm Layout Drawing **Yes** ☐ **No** ☒

Directional Arrow	Yes	☐	No	☒
Scale	Yes	☐	No	☒
Title Block	Yes	☐	No	☒
Date	Yes	☐	No	☒

Comment:

Drawings of structures **Yes** ☒ **No** ☐

Comment: Sketched drawing of typical trestles & net bags

Details of Proposed Navigation Marking **Yes** ☐ **No** ☒

Comment:

Site Access Indicated **Yes** ☐ **No** ☒

Comment: Site Access by Boat

Site Co-Ordinates Indicated **Yes** ☐ **No** ☒

Comment: Site boundary estimated from submitted maps

Site Overlap **Yes** ☐ **No** ☒

Comment:

Oyster Fishery Order Overlap **Yes** ☐ **No** ☒

Comment:

☐ **The application is submitted with each of the requirements listed and is therefore deemed to be a valid application.**

☒ **AFMD should be aware that insufficient details have been submitted as per above.**

Site Suitability Assessment

Site Location

The site is located at a sheltered location on the northern shore of Spike Island in Cork Harbour. Spike Island is a popular tourist attraction with ferry trips from Cobh and guided tours of the island and fortress. The proposed site is located adjacent to the landing pier for Spike Island.

Proposed Site Layout and Structures

The applicant proposes to use typical trestles and oysters bags to cultivate oysters.

Land Based Facilities / Site Access

No site access or land based facilities were specified in the application. The site would need to be accessed by boat.

Navigation

No navigation marks were proposed by the applicant in the submitted drawings. The MSO and Port of Cork should be consulted regarding providing a safe system of navigation for all marine users.

Visual Impact

As mentioned above, Spike Island is a popular tourist attraction with ferry trips from Cobh and guided tours of the island and fortress. Sightseers arriving by ferry visiting Spike Island would have extended views of the proposed site.

There is currently no existing aquaculture activity in this area. In my opinion, the proposed site has the potential to negatively impact the visual amenity of the area.

Recommendation:

Due to the sites potential to significantly negatively impact the visual amenity of the area, in my opinion, the relevant foreshore and aquaculture licence application should not be licensed.

An Extract from the Spike Island Master Plan indicating Future Developments in the Area of the Proposed Site

An Roinn Talmhaíochta, Bia agus Mara
Department of Agriculture, Food and the Marine

Marine Engineering Division

Report on Aquaculture Licence Application

Application Reference No: T05/546B

Report Prepared by:	**Gearoid O'Shea, Engineer**
Date:	03 December 2018
Applicant	Killian Tighe
Location	Corkbeg Island, Cork Harbour
Applicant Type	Aquaculture/Foreshore Licence
Site	B
Site Area (Ha)	1.1
Species	Pacific Oysters (Crassosprea Gigas)
Cultivation Method	Trestles & Net Bags
Intertidal/Non-Intertidal	Intertidal
Source of Seed / Spat	Not specified
Annual Production Estimates	240 Tonnes over 3 No. Sites (8 Ha in total)
Shellfish Waters Designation Reference:	Yes ☐ No ☒
Environmental Designation Reference:	Yes ☐ No ☒
Development Plans	Yes ☒ No ☐
Reference:	Cork County Development Plan 2014, Section 6.11
Pre-Consultation Meeting	Yes ☐ No ☒

Drawing Validation Sheet

OSI Maps **Yes** ☒ **No** ☐

Comment: Sites sketched on OSi Ordnance Survey Map

BA Chart **Yes** ☐ **No** ☒

Comment: MED BA Chart

Farm Layout Drawing **Yes** ☐ **No** ☒

Directional Arrow	Yes	☐	No	☒
Scale	Yes	☐	No	☒
Title Block	Yes	☐	No	☒
Date	Yes	☐	No	☒

Comment:

Drawings of structures **Yes** ☒ **No** ☐

Comment: Sketched drawing of typical trestles & net bags

Details of Proposed Navigation Marking **Yes** ☐ **No** ☒

Comment:

Site Access Indicated **Yes** ☐ **No** ☒

Comment:

Site Co-Ordinates Indicated **Yes** ☐ **No** ☒

Comment: Site boundary estimated from submitted maps

Site Overlap **Yes** ☐ **No** ☒

Comment:

Oyster Fishery Order Overlap **Yes** ☐ **No** ☒

Comment:

☐ **The application is submitted with each of the requirements listed and is therefore deemed to be a valid application.**

☒ **AFMD should be aware that insufficient details have been submitted as per above.**

Site Suitability Assessment

Site Location

The site is located at a relatively sheltered location on the western shore of Corkbeg Island in Cork Harbour. The site is located along a 400 metre stretch of sand/gravel that forms Corkbeg Strand.

Proposed Site Layout and Structures

The applicant proposes to use typical trestles and oysters bags to cultivate oysters.

Land Based Facilities / Site Access

No site access or land based facilities were specified in the application.

Navigation

No navigation marks were proposed by the applicant in the submitted drawings. The MSO and Port of Cork should be consulted regarding providing a safe system of navigation for all marine users.

Impact/ Cumulative Impact

There is currently no existing aquaculture activity in this area. In my opinion, the proposed site has the potential to negatively impact the visual amenity of the area.

There are only a small number of sandy beaches within Cork Harbour. The relevant site is also located adjacent to other public amenities areas. In my opinion, the relevant beach should be preserved as a public leisure amenity.

Recommendation:

Due to the sites potential to significantly negatively impact Corkbeg Strand as a public amenity area, in my opinion, the relevant foreshore and aquaculture licence application should not be licensed.

Location of Proposed Site T05/546 on Sand/Gravel Corkbeg Strand,
Adjacent Amenity Areas also indicated

An Roinn Talmhaíochta, Bia agus Mara
Department of Agriculture, Food and the Marine

Marine Engineering Division

Report on Aquaculture Licence Application

Application Reference No: T05/546C

Report Prepared by:	**Gearoid O'Shea, Engineer**
Date:	03 December 2018
Applicant	Killian Tighe
Location	Spike Island, Cork Harbour
Applicant Type	Aquaculture/Foreshore Licence
Site	C
Site Area (Ha)	0.8
Species	Pacific Oysters (Crassosprea Gigas)
Cultivation Method	Trestles & Net Bags
Intertidal/Non-Intertidal	Intertidal
Source of Seed / Spat	Not specified
Annual Production Estimates	240 Tonnes over 3 No. Sites (8 Ha in total)
Shellfish Waters Designation Reference:	Yes ☐ No ☒
Environmental Designation Reference:	Yes ☐ No ☒
Development Plans	Yes ☒ No ☐
Reference:	Cork County Development Plan 2014, Section 6.11
Pre-Consultation Meeting	Yes ☐ No ☒

Drawing Validation Sheet

OSI Maps **Yes** ☒ **No** ☐

Comment: Sites sketched on OSi Ordnance Survey Map

BA Chart **Yes** ☐ **No** ☒

Comment: MED BA Chart

Farm Layout Drawing **Yes** ☐ **No** ☒

Directional Arrow	Yes	☐	No	☒
Scale	Yes	☐	No	☒
Title Block	Yes	☐	No	☒
Date	Yes	☐	No	☒

Comment:

Drawings of structures **Yes** ☒ **No** ☐

Comment: Sketched drawing of typical trestles & net bags

Details of Proposed Navigation Marking **Yes** ☐ **No** ☒

Comment:

Site Access Indicated **Yes** ☐ **No** ☒

Comment: Site Access by Boat

Site Co-Ordinates Indicated **Yes** ☐ **No** ☒

Comment: Site boundary estimated from submitted maps

Site Overlap **Yes** ☐ **No** ☒

Comment:

Oyster Fishery Order Overlap **Yes** ☐ **No** ☒

Comment:

☐ **The application is submitted with each of the requirements listed and is therefore deemed to be a valid application.**

☒ **AFMD should be aware that insufficient details have been submitted as per above.**

Site Suitability Assessment

Site Location

The site is located at a relatively sheltered location on the western shore of Spike Island in Cork Harbour. Spike Island is a popular tourist attraction with ferry trips from Cobh and guided tours of the island and fortress.

Proposed Site Layout and Structures

The applicant proposes to use typical trestles and oysters bags to cultivate oysters.

Land Based Facilities / Site Access

No site access or land based facilities were specified in the application. The site would need to be accessed by boat.

Navigation

No navigation marks were proposed by the applicant in the submitted drawings. The MSO and Port of Cork should be consulted regarding providing a safe system of navigation for all marine users.

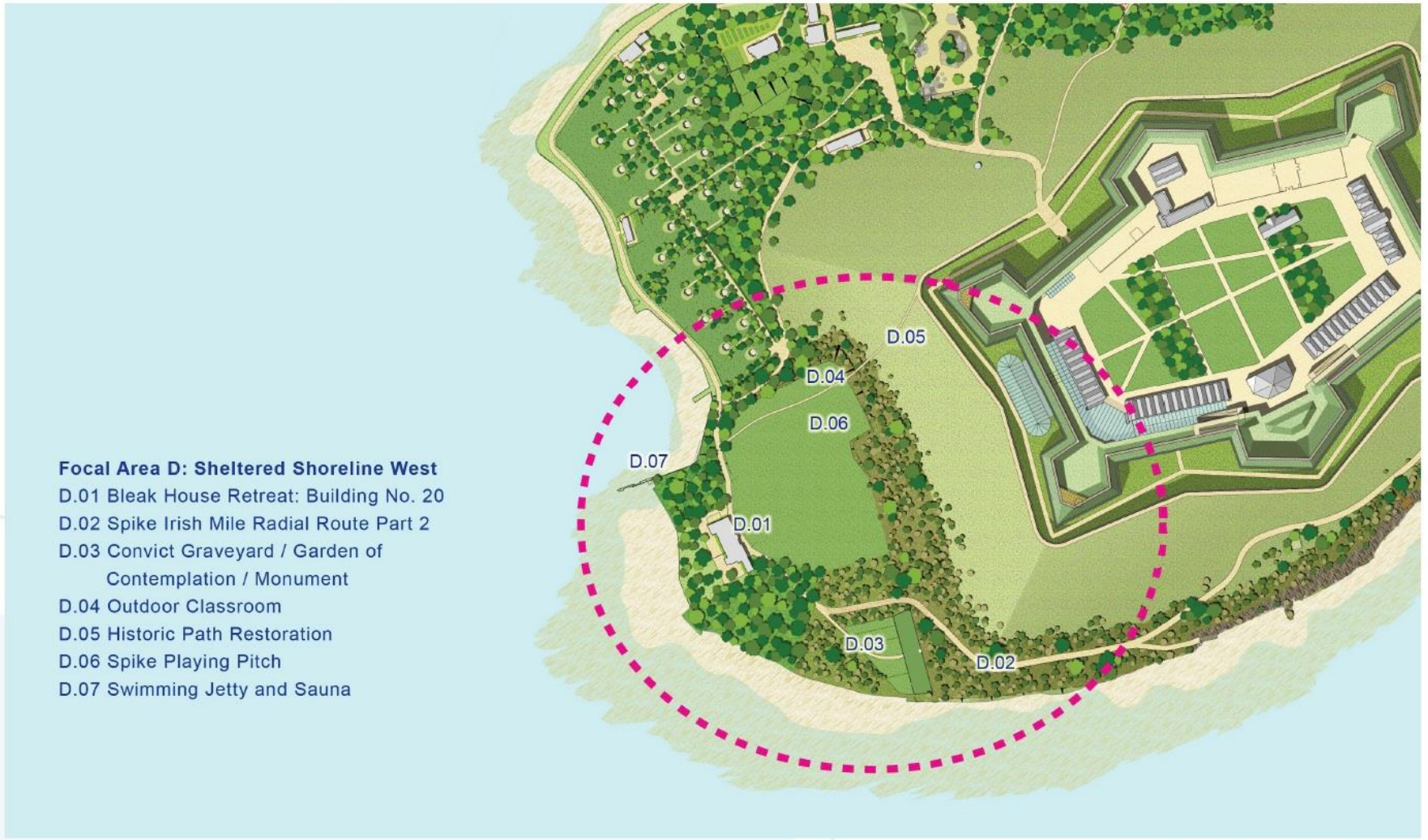
Visual Impact

As mentioned above, Spike Island is a popular tourist attraction with ferry trips from Cobh and guided tours of the island and fortress. The Spike Island Master Plan indicates the development of a swimming jetty adjacent to the relevant site.

There is currently no existing aquaculture activity in this area. In my opinion, the proposed site has the potential to negatively impact the visual amenity of the area.

Recommendation:

Due to the sites potential to significantly negatively impact the visual amenity of the area, in my opinion, the relevant foreshore and aquaculture licence application should not be licensed.



An Extract from the Spike Island Master Plan indicating Future Developments in the Area of the Proposed Site

An Roinn Talmhaíochta, Bia agus Mara
Department of Agriculture, Food and the Marine

Marine Engineering Division

Aquaculture Licence Application
Visual Impact Assessment

Reference No. T05/546 A&C

Prepared by Gearóid O'Shea
Date: 15 August 2019

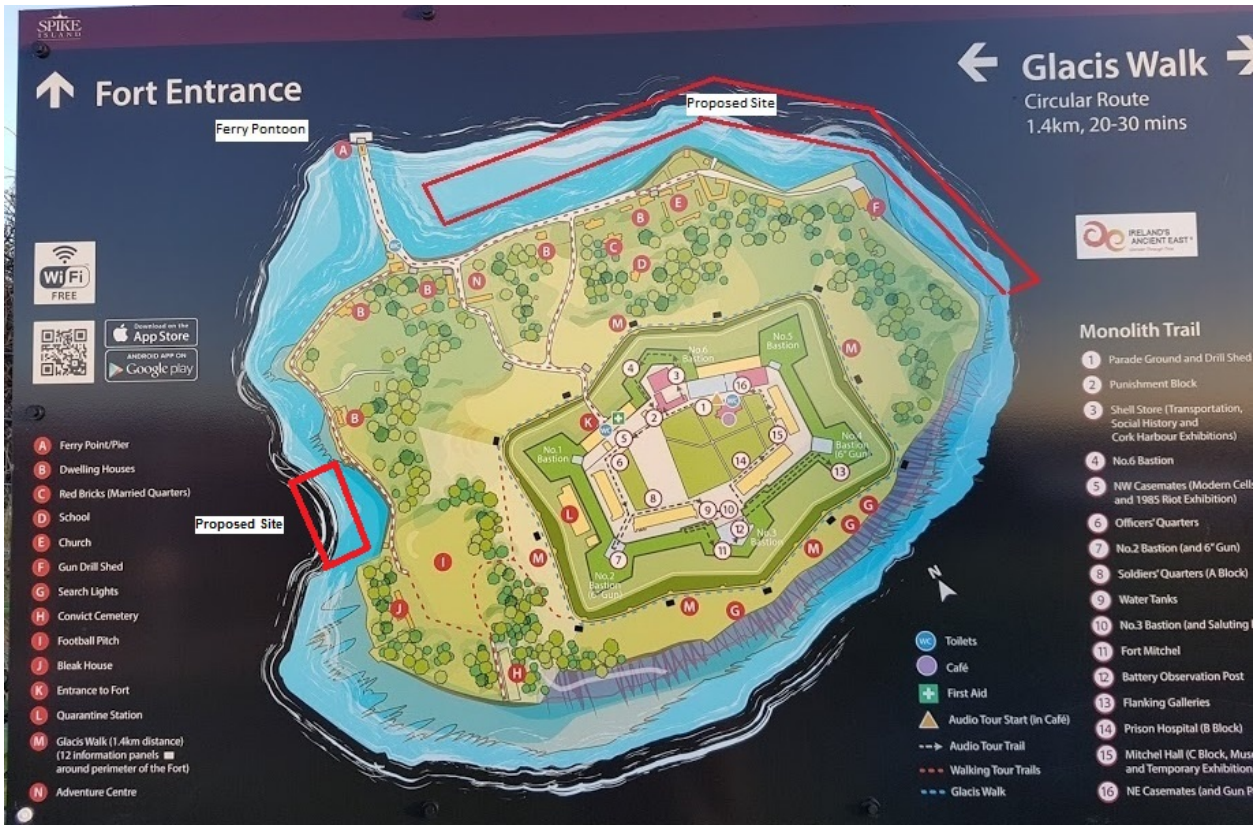
Background to the Proposed Development

Spike Island is a leading historical tourist attraction within Cork Harbour. The development of two oyster cultivation sites has been proposed on the islands northern and western shorelines in a coastal region whose landscape is identified in the County Development Plan as being of high scenic value. The proposal consists of oyster bags on trestles being installed along the low water mark for approx. 1000m. The results of the assessment are summarised in the table below.

Baseline Landscape and Visual Environment	**Predicted Landscape Impacts**	**Predicted Visual Impacts**
Landscape Receptors The sites are located on the northern and western shorelines of Spike Island within the intertidal area. The landscape is identified in the County Development Plan as being of high scenic value. There are no existing oyster farms in the vicinity. **Visual Receptors** All visitors to Spike Island land at Spike Pier which overlooks Site A. Views from the pier create first impressions of the island. The full extents of the sites will be seen by visitors at low tide along the islands pedestrian routes. It would be difficult to see how screening or planting could be used to minimise the visual impact, without obstructing the direct views towards Cobh and across Cork harbour. Overall there is **moderate landscape** sensitivity to change and a **high visual** sensitivity to change.	The introduction of a new relatively large scale installation of oyster bags on trestles on the foreshore would not be in keeping with the islands historical use as a fort and future use as a visitor experience. The scenic quality of the landscape will be damaged. The magnitude of impact on the landscape character may be classed as **moderate.**	Large tourist numbers visiting the area will be adversely affected when using the ferry landing point at the island pier and the along the newly opened 'Ring of Spike' scenic walking trail. Overall the magnitude of the visual impact may be described as **moderate.**
Overall Impact Assessment	Moderate sensitivity and moderate impact magnitude result in a **moderate impact significance**	High visual sensitivity and moderate impact magnitude result in **substantial impact significance**

Conclusion

The landscape and visual impacts of the application as currently submitted are substantial impact significance. It is recommended not to grant a licence for this site.



Information Sign on Spike Island

Aerial View of Spike Island

Deirdre Fitzpatrick
CZMD
Thursday, 17 December 2009

Ref: T5/546 – Cork Harbour

This application may pose a security risk at site B and may interfere with harbour development at sites A&C.

The development has been referred to the harbour master at Cork for his comments.

Capt. Neil Forde
Nautical Surveyor

SFPA
AN t-ÚDARÁS UM CHOSAINT IASCAIGH MHARA
SEA FISHERIES PROTECTION AUTHORITY

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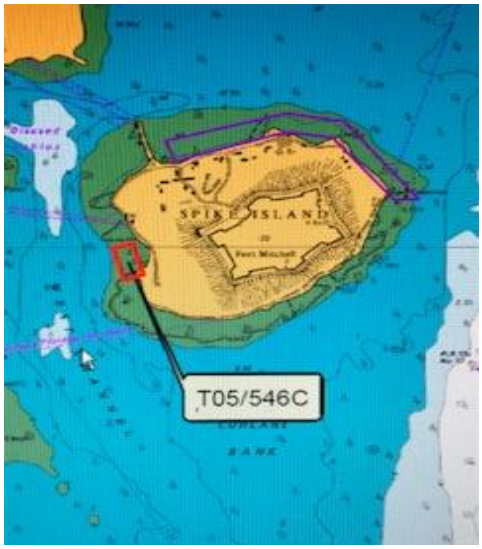
DAFM Ref T05/546

Report IRO Aquaculture and Foreshore Application operated by Mr. Killian Tighe in Cork Harbour

1. There are three proposed sites referred to in this application, two of which is located on the foreshore of Spike Island in the centre of Cork Harbour, T05-546A is located on the north-western facing shoreline and T05-546C on the western facing shoreline of the Island. The third site is on the southern side of Corkbeg Island in the vicinity of the Whitegate Oil Refinery (T05-546B) which is on the Eastern side of Lower Cork Harbour. Figure 1 below shows the proposed sites on Spike Island

Fig.1



There is currently a significant active pot fishery the waters around Spike Island fished by a small fleet operating from Cobh and Crosshaven. Both the areas highlighted in the charts above dry out at low water and therefore would not interfere with this pot fishery. The application is for the use of trestles and bags for growing Oysters, again the operator will require access to these trestles at low water to tend to the Oysters and again this will not interfere with any local fishery or fisheries control.

Fig 2.

SFPA
AN t-ÚDARÁS UM CHOSAINT IASCAIGH MHARA
SEA FISHERIES PROTECTION AUTHORITY

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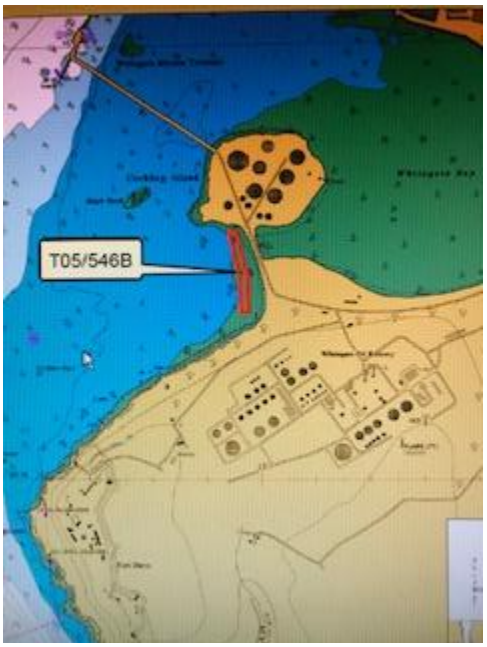


The above chart highlights the proposed area in the vicinity of Corkbeg Island and the Whitegate Oil Refinery. This area again has a significant local pot fishery, similar to the Spike Island proposed sites the above area dry's out at low water and will not interfere with any local fishery or fisheries control activity.

2. The only possible food safety concern pertains to sites T05-546B and T05-546C as they are both in close proximity to active heavy industry IRO 546B adjacent to the Whitegate Oil Refinery and site 546C is adjacent to the former Irish Steel/ISPAT site that was subject to a large amount of ground pollution as a result of the former steel works.

3. This application if successful would not hinder the operations of the SFPA in these areas.

4. Submitted.

Ken McNamara/Alan Mullery
Sea Fisheries Protection Officers.

COMMISSIONERS OF IRISH LIGHTS

Harbour Road, Dun Laoghaire, Co. Dublin.

Marine Department

Tel: +353 1 271 5400 E-mail: marine@cil.ie
Fax: +353 1 271 5566 Web: www.cil.ie

Ms Deirdre Fitzpatrick
Coastal Zone Management Division
Department of Agriculture, Fisheries and Food
Clogheen
Clonakilty
Co. Cork

Your Ref:

Our Ref: LA0017.3010 (Site A)
LA0017.3020 (Site B) &
LA0017.3030 (Site C)

Date: 17 Dec. 09

COASTAL ZONE MANAGEMENT DIVISION
22 DEC 2009
DEPT OF AGRICULTURE, FISHERIES & FOOD

Ref: T05/546 A, B & C - Oysters/Trestles
Applicant: Mr Killian Tighe, Alms House, Roches Terrace, Cobh, Co. Cork.
Site: 3 sites, Cork Lower Harbour.

Dear Ms Fitzpatrick,

Thank you for your letter advising us of this application. Based on the information supplied, there appears to be no objection to the development. It is important to ensure that no navigable inter-tidal channels are impeded by any structures.

If a licence is granted, all structures must be clearly marked as required by Regulations and Licensing Permit conditions and to the approval of the Nautical Surveyor with the Marine Survey Office.

We would request that you include the following terms in the licence(s) if granted.

- That the applicant(s) secures Statutory Sanction from the Commissioners of Irish Lights, for the aids to navigation that may be required by the Marine Survey Office. These aids should be in place before development on the site commences.

- The size and specification of aids to navigation should be of the design and specification approved by the Marine Survey Office and must be agreed in advance with the Commissioners of Irish Lights.

It is recommended that local fishing and leisure interests be consulted prior to a decision being made.

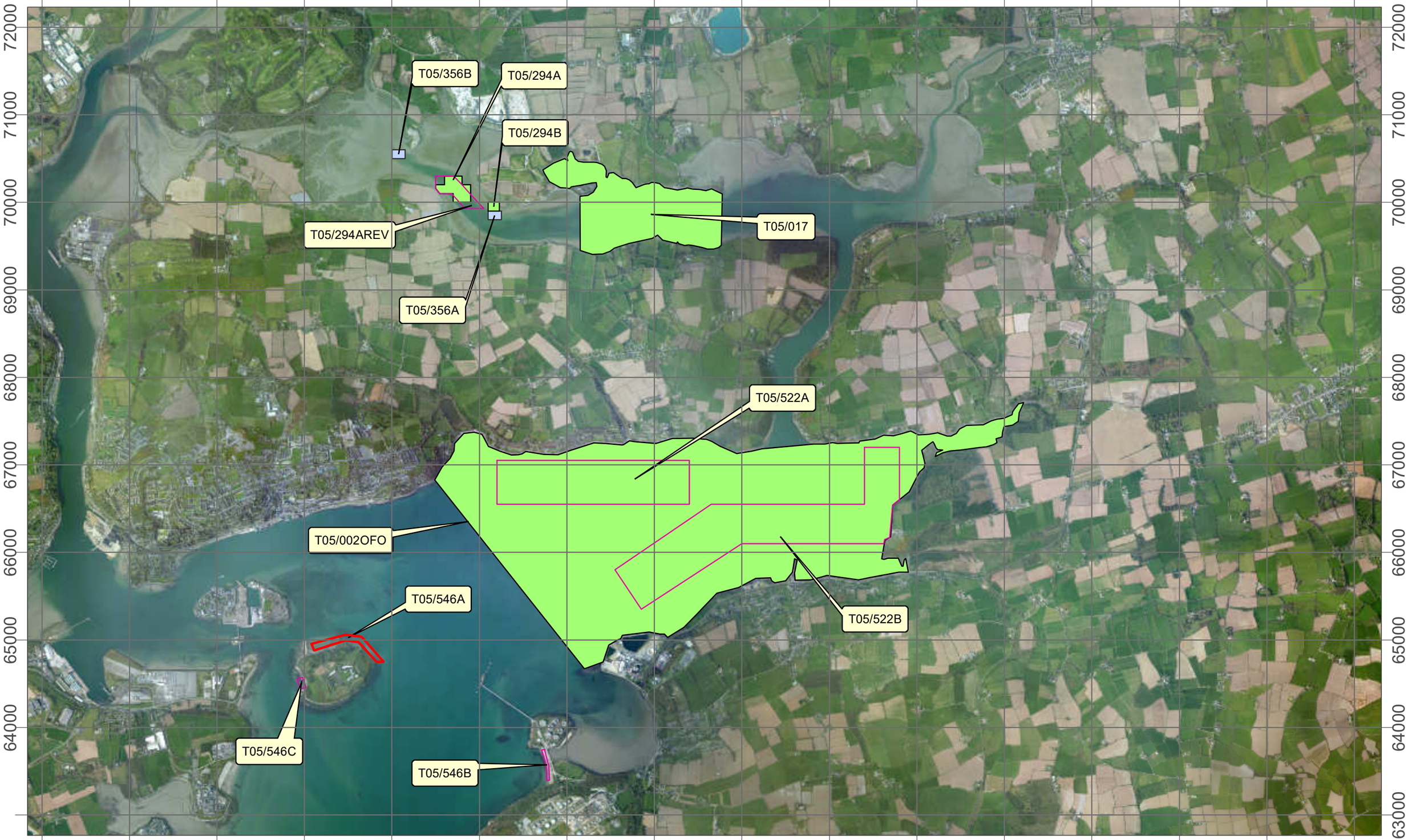
Furthermore, if a licence is granted the UK Hydrographic Office at Taunton must be informed of the development's geographical position(s) in order to update nautical charts and other nautical publications.

Yours sincerely

Desmond O'Brien

Desmond O'Brien
***for* Head of Marine**

cc Capt. N. Forde, Dept. of Transport, Marine Survey Office



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CORK HARBOUR AQUACULTURE SITES

Site_Status

- Application
- Lapsed
- Licensed
- Under Appeal

Drawn : 18-05-2021

An Roinn Talmhaíochta, Bia agus Mara
Department of Agriculture, Food and the Marine

Marine Institute

Cork Harbour SPA

Cork Harbour: Appropriate Assessment of Aquaculture

June 2019

ATKINS

Marine Institute Bird Studies

Cork Harbour: Appropriate Assessment of Aquaculture

June 2019

Notice

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Executive Summary

This report present the results of an Appropriate Assessment of aquaculture in Cork Harbour. There are a total of six aquaculture sites, covering a total area of 922 ha, within Cork Harbour. Five of the sites are small oyster trestle sites (combined area of 19 ha). Two of these sites occur in the North Channel within the Cork Harbour SPA, and three are in the lower harbour outside the SPA. The sixth site is a large bottom mussel culture site (total area of 903 ha), which occupies a large part of the East Harbour zone and is partly within the SPA.

The report assesses the potential impact of the development of these aquaculture sites on the Special Conservation Interests (SCIs) of the Cork Harbour SPA, and on the SCIs of other SPAs where these SCIs may have connectivity with Cork Harbour. The potential for cumulative impacts from development of these aquaculture sites in combination with other relevant activities and plans is also assessed. The in-combination activities and plans assessed include: four Fishery Orders, which permit additional aquaculture development in Cork Harbour, marine traffic, shoreline access for recreation and shellfish collecting, and wildfowling.

The SCIs of the Cork Harbour SPA covered by this assessment are: Shelduck, Wigeon, Teal, Pintail, Shoveler, Red-breasted Merganser, Cormorant, Grey Heron, Little Grebe, Great Crested Grebe, Oystercatcher, Golden Plover, Grey Plover, Lapwing, Curlew, Black-tailed Godwit, Bar-tailed Godwit, Dunlin, Redshank, Black-headed Gull, Common Gull, Lesser Black-backed Gull and Common Tern. The SCIs of other SPAs covered by this assessment are: the wintering Mallard population of the Gearagh SPA, and the breeding Cormorant population of the Sovereign Islands SPA.

The small scale of the oyster trestle cultivation activity covered by this assessment, and the location of three of the five sites in areas of the harbour that do not hold high concentrations of intertidal/shallow subtidal waterbirds, mean that no significant displacement impacts are likely to occur. There is a possibility of disturbance impacts to Common Tern roosts on Spike Island. Any such impacts are unlikely to be significant, but further information about Common Tern usage of the Spike Island and about the intensity of husbandry activity, would be required to definitively assess this potential impact.

The target production level for the bottom mussel culture site in the East Harbour indicates that high levels of husbandry and harvesting activity will be involved in the cultivation of this site. These activities have the potential to cause significant disturbance impacts to Red-breasted Merganser, Cormorant and Great Crested Grebe roost sites located within the aquaculture site. These are primarily night roost sites but the Great Crested Grebe roost sites is also sometimes occupied during the day. There is also potential for displacement impacts to foraging Red-breasted Mergansers, which could prevent reoccupation of the East Harbour zone in the event of a recovery of the Cork Harbour Red-breasted Merganser population. Smaller scale displacement impacts to foraging Cormorant and Great Crested Grebe are also possible. Wigeon, Mallard and Oystercatchers using shoreline feeding areas and/or roost sites around the edge of the aquaculture site could also be affected by disturbance from the activity. Reopening of the oyster fisheries in the Brick Island and East Harbour Fishery Orders, oyster trestle cultivation in the Rossmore and East Harbour Fishery Orders, disturbance from wildfowling activity in the North Channel, other boat traffic and recreational watercraft activity and shoreline pedestrian activity could all have significant additional cumulative impacts on one or more of the above species in combination with the impact from the bottom mussel culture activity.

1. Introduction

1.1 Atkins (Ecology) was commissioned by the Marine Institute to provide ornithological services in relation to the appropriate assessment of aquaculture and shellfisheries on coastal Special Protection Areas (SPAs).

1.2 This report presents an Appropriate Assessment of aquaculture in Cork Harbour. The subject of the assessment are areas that have either already been licensed for aquaculture, or for which there are applications for such licenses; these are collectively referred to as aquaculture sites. The information on the licensing status of aquaculture sites used in this report was provided by the Department of Agriculture, Food and the Marine.

1.3 Three of the aquaculture sites are within, or partly within, the Cork Harbour SPA, while another three aquaculture sites that are outside the SPA are also included in the assessment. Therefore, the assessment covers all the aquaculture sites in Cork Harbour. The Cork Harbour SPA is the primary focus of this assessment. In addition, following a screening exercise, Special Conservation Interests (SCIs) from two other SPAs are included in this assessment. These SPAs are: Courtmacsherry Bay SPA and The Gearagh SPA. The SPAs covered by this assessment are shown in Figure 1.1.

1.4 This assessment is based on a desktop review of existing information. Where relevant, it identifies information gaps that may affect the reliability of the conclusions of this assessment. Both authors have a high level of knowledge of Cork Harbour and its waterbird populations, which has informed the assessment.

1.5 Tom Gittings has carried out regular I-WeBS counts in Cork Harbour since 1996 and has been coordinator of the Cork Harbour I-WeBS counts since 2002. He is currently the regular counter of five I-WeBS subsite, and has carried out counts in all the other I-WeBS subsites in Cork Harbour. He has also carried out numerous other waterbird counts and studies in Cork Harbour for a wide range of projects and has recently published the results of a study of Great Crested Grebe roosting behaviour based largely upon work in Cork Harbour (Gittings, 2017).

1.6 Paul O'Donoghue is also an IWeBS counter having carried out counts in three I-WeBS subsites in Cork Harbour. He has also carried out numerous other waterbird counts and studies in Cork Harbour for a wide range of projects and has recently undertaken a review of the spatial distribution of birds in Cork Harbour for Cork County Council.

1.7 This report relies heavily on the research carried out for a previous Marine Institute project: *The effects of intertidal oyster culture on the spatial distribution of waterbirds*. The results of this project have been published as technical report (Gittings and O'Donoghue, 2012) and a scientific paper (Gittings and O'Donoghue, 2016b). The report and paper, and additional unpublished data from this project, are referred to hereafter as the *trestle study*.

1.8 The data analysis and report writing was done by Tom Gittings. Paul O'Donoghue assisted with project design, document preparation and undertook document review.

1.9 Scientific names and British Trust for Ornithology (BTO) species codes of bird species mentioned in the text are listed in Appendix A.

Structure of this report

1.10 The structure of the report is as follows: -

- Chapter 2 of the report describes the methodology used for the assessment.
- Chapter 3 of the report contains a preliminary screening assessment that reviews the Special Conservation Interests (SCIs) of the Cork Harbour SPA, and the SCIs of other SPAs in the wider vicinity, and screens out SCIs that do not show any significant spatial overlap with the activities being assessed.
- Chapter 4 of the report describes the Conservation Objectives, and their attributes and targets, of the SCIs that were screened in for this assessment.
- Chapter 5 of the report contains a summary of waterbird habitats and distribution in the Cork Harbour SPA, and of the status and distribution of the SCI species included in the assessment.
- Chapter 6 provides a description of the current and proposed future extent of the aquaculture activities covered by this assessment and the nature of their operations.
- Chapter 7 assesses the likely impact of the oyster trestle cultivation activity included in this assessment on the SCIs that were screened in for this assessment.
- Chapter 8 assesses the likely impact of the bottom mussel cultivation activity included in this assessment on the SCIs that were screened in for this assessment.
- Chapter 9 contains an assessment of cumulative impacts.
- Chapter 10 concludes the report by assessing the impact of aquaculture activities in the Cork Harbour, and any in-combination impacts (if relevant), on the conservation objectives of the SCIs included in this assessment.

Constraints to this assessment

1.11 Little detail was available about the existing and proposed aquaculture activities in the aquaculture sites included in this assessment. Therefore, we have had to make various assumptions about the likely intensities and patterns of activity. This was particularly an issue for the bottom mussel culture site.

1.12 There is a lot of detailed information available about waterbird populations in Cork Harbour and we have also been able to use our personal knowledge to inform the assessment. However, there are still some information gaps. In particular, there is very little waterbird count data available for the areas around the Corkbeg Bay and Spike Island aquaculture sites, although the small scale of these aquaculture sites means that this is not a critical information gap.

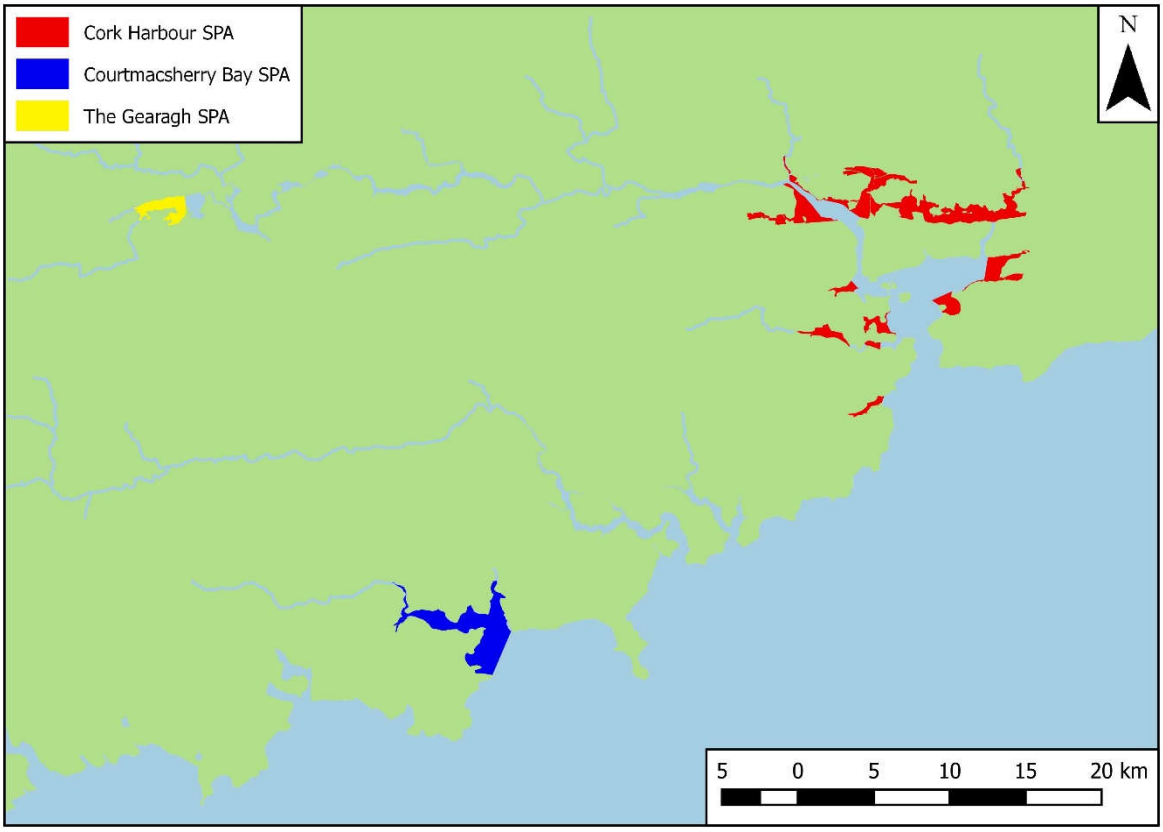


Figure 1.1 – SPAs included in this assessment.

2. Methodology

General

2.1 This assessment is based on a desktop review of existing information about waterbird population trends and distribution in Cork Harbour, supplemented by site visits to assess the habitat characteristics and tidal regimes in the areas around the aquaculture sites.

2.2 The authors have very detailed personal knowledge of the waterbird habitats and distribution patterns in Cork Harbour and this has also been used to inform the assessment. Unless otherwise stated, all comments on waterbird status, distribution, habitat use and behaviour in Cork Harbour are based on the authors' personal knowledge.

Data sources

2.3 The SPA boundaries are derived from NPWS shapefiles[1] (which were last updated in September 2018).

2.4 The spatial extents of the aquaculture sites have been derived from shapefiles supplied by the Marine Institute (shapefile dated November 2017).

2.5 Information on the development and current practices of aquaculture activities in Cork Harbour was obtained from the aquaculture profile document compiled by Bord Iascaigh Mhara (BIM) in March 2018.

2.6 The bird data sources used for the assessment are as follows:

- Irish Wetland Bird Survey (I-WeBS) counts, 1994/95-2017/18.
- NPWS Waterbird Survey Programme (WSP) 2010/11 counts.
- The descriptions of waterbird distribution within the Cork Harbour SPA in the SPA Conservation Objectives Supporting Document (NPWS, 2014c).
- Other relevant publications (Smiddy *et al.*, 1995; Gittings, 2017; O'Mahony and Smiddy, 2017).
- The authors' personal knowledge based on monitoring waterbirds in Cork Harbour since 1995.

2.7 Information on the distribution of biotopes was taken from the surveys of intertidal habitats by MERC (2012) and subtidal habitats by Ecoserve (2012).

2.8 Data on the timing and height of low tides were obtained from the United Kingdom Hydrographic Offices Admiralty EasyTide website (http://easytide.ukho.gov.uk/).

[1] www.npws.ie/maps-and-data/designated-site-data/download-boundary-data (accessed 19th January 2017).

Mapping

Intertidal habitat definitions and mapping

2.9 The intertidal habitat mapping is based on the Ordnance Survey Ireland (OSI) Discovery Series mapping. We edited this mapping to align with the current shoreline configuration and current configuration of major tidal channels using recent aerial imagery. We also separately mapped significant areas of *Spartina* and other saltmarsh habitat. Therefore, the intertidal habitat was divided into three categories: unvegetated intertidal habitat (referred to as intertidal habitat); *Spartina* beds (referred to as *Spartina*); and other saltmarsh (referred to as saltmarsh).

2.10 The lower limit of the intertidal zone in the OSI mapping represents the mean low tide mark but is based on mapping from the early 20th century. While it would be desirable to update this mapping, such an exercise was beyond the scope of this assessment. In any case, due to the enclosed estuarine nature of most of the intertidal areas in Cork Harbour, changes to the overall distribution of the intertidal habitat at the scales analysed in this assessment will have been relatively minor.

Subtidal habitat definitions and mapping

2.11 We divided subtidal habitats into three categories to reflect waterbird usage of the habitat: shallow, moderately deep and deep. We defined shallow subtidal habitat as subtidal habitat less than 0.5 m deep. This corresponds to the depth range used by most species of geese and dabbling ducks for foraging (Kirby *et al.*, 2000; Cramp and Simmons, 2004). We defined moderately deep subtidal habitat as subtidal habitat less than 5 m deep. This corresponds to the depth range used by various species of seaduck and grebes, including Red-breasted Merganser and Great Crested Grebe (Kirby *et al.*, 2000; Cramp and Simmons, 2004). All subtidal habitat more than 5 m deep was defined as deep subtidal habitat. Species associated with offshore and pelagic habitats, including Cormorant, can feed in this depth range.

2.12 We used the Admiralty Chart mapping to assess the distribution of these subtidal habitat categories within the Cork Harbour SPA. We defined the shallow subtidal zone as the zone between the OSI intertidal/subtidal boundary and the 0 m contour on the Admiralty Chart, which represents the lowest astronomical tides, and we used -5 m contour on the Admiralty Chart to define the boundary between the moderately deep and deep subtidal zones. In reality the spatial extent of the shallow subtidal zone will vary on each low tide, but the overall distribution of the zone between subsites is likely to remain similar. Varying amounts of the shallow subtidal zone will be exposed on spring low tides. Therefore, the shallow subtidal zone was also treated as being available to birds that feed in the intertidal zone on spring low tides.

Site definition and divisions

Site definition

2.13 The Cork Harbour SPA comprises a number of discrete sections scattered around the harbour and includes one section (the Ringabella Estuary), which is located outside the harbour proper. However, several of the SCI species, particularly those associated with subtidal habitats, make significant use of areas outside the SPA and, for some of these species, the majority of their habitat is outside the SPA. Therefore, it does not make sense to consider the SPA in isolation and for this assessment we have defined the area of interest as comprising all the tidal habitat within Cork Harbour. The outer boundary of Cork Harbour is generally taken as a line running due west from Roches Point. However, because the Ringabella Estuary is outside this boundary, but is included

within the SPA, we have instead defined the outer boundary as a line running from Roches Point to the headland on the southern side of Ringabella Bay (Figure 2.1).

Broad zones

2.14 Cork Harbour is a complex site with a number of separate estuarine areas separated by extensive areas of subtidal habitat. Therefore, to help summarise waterbird distribution patterns, we have divided the harbour into six broad zones: the Inner Harbour, Fota Channel, North Channel, Owenacurra Estuary, East Harbour, West Harbour and Outer Harbour (Figure 2.1). The Inner Harbour, Fota Channel, North Channel and Owenacurra Estuary are collectively referred to as the upper harbour, while the West Harbour, East Harbour and Outer Harbour are collectively referred to as the lower harbour. The zones are based on our knowledge of waterbird distribution patterns and, particularly the relationship between high and low tide distribution. Ideally, all the waterbirds that feed in a zone at low tide would roost there at high tide although, in practice this is not always the case. In addition, for two species (Red-breasted Merganser and Great Crested Grebes) species-specific sectors have been defined (merganser sectors and grebe sectors) to better reflect their distribution patterns (see species accounts in Chapter 5).

Waterbird count subsites

2.15 The Cork Harbour SPA includes two distinct I-WeBS sites: Cork Harbour (0L403) and Ringabella Creek (0L423).

2.16 The Cork Harbour I-WeBS site is currently divided into 21 subsites for I-WeBS counts while Ringabella Creek comprises a single subsite (Figure 2.2). The Cork Harbour subsites are grouped into eleven count units, with each count unit representing a discrete area that can be covered by a single counter during a single high tide period. The subsites cover most of the intertidal habitat within Cork Harbour. There have been various minor changes in subsite coverage over the I-WeBS monitoring period but the overall level of spatial coverage has remained broadly equivalent.

2.17 Cork Harbour including Ringabella Creek was divided into 74 subsites for the WSP counts (Figure 2.3). These subsites were based on the I-WeBS subsites, but some were sub-divided to allow finer scale recording of waterbird distribution, while additional subsites were included in areas not covered by the I-WeBS counts.

Wintering waterbird datasets

I-WeBS

2.18 Waterbird populations and distribution in the Cork Harbour have been monitored as part of the Irish Wetland Bird Survey (I-WeBS) each winter since 1994/95.

2.19 The I-WeBS scheme aims to carry out monthly counts each winter between September and March in all sites that are important for non-breeding waterbird populations. However, this level of coverage is not always possible to achieve in a volunteer-based scheme. In most winters, coordinated monthly counts have been carried out in at least five of the seven months but there have been significant gaps in subsite coverage in some winters (Gittings, 2006). Coverage has been relatively good since 2011/12, and the 2011/12-2017/18 dataset has been used for most of the analyses in this report.

2.20 The Cork Harbour I-WeBS counts are mainly carried out around high tide. However, in recent winters some counts in the East Harbour zone have been carried out at low tide due to limited counter availability.

Waterbird Survey Programme

2.21 Details of the Waterbird Survey Programme (WSP) methodology and results in Cork Harbour are described in Cummins and Crowe (2011), NPWS (2014c) and Lewis and Tierney (2014).

2.22 Four low tide and one high tide counts were carried out. The counts were carried out by a coordinated team of eight professional counters. Each count was completed over two days (Cummins and Crowe, 2011). The low tide counts were carried out on 7th-8th October 2010, 8th-9th November 2010, 6th-7th December 2010 and 3rd-4th February 2011. The high tide count was carried out on 13th-14th January 2011.

2.23 The WSP counted feeding and roosting birds separately. However, we have not analysed their distribution separately. In general, birds at low tide usually roost in the same area as they feed and often the roosting birds are mainly just roosting for short periods of time before resuming feeding. Therefore, the division between feeding and roosting may be a matter of chance depending upon the exact timing of the count.

2.24 As part of the WSP, a high tide roost survey was carried out in November 2010. This survey counted each high tide roost and mapped its position. However, as a one-off survey this does not provide very reliable information on high tide roost distribution and usage patterns. Instead, most of the information on high tide roosts used in this assessment derives from the high tide roost database (see below), supplemented by the authors' personal knowledge and data.

High tide roost database

Identification and mapping of roost sites

2.25 The main sources used for mapping high tide roosts were roost questionnaires completed by I-WeBS counters. The roost questionnaires were originally completed in 2011-2014, as part of a national information gathering exercise organised by the I-WeBS office. The information compiled for the roost questionnaires included: the frequency of usage of the roost (regular, occasional, seldom used, or used in the past but not in the past five years); the state of the tide when the roost is used; and the typical numbers of each waterbird species using the roost. Roost questionnaire information was not available for Ringabella Creek, and data on high tide roosts in Ringabella Creek have not been used in the analyses carried out for this assessment.

2.26 We used the information from the roost questionnaires to compile a GIS database of all high tide roosts listed in the questionnaires (excluding those that were categorised as used in the past but not in the past five years). This database included details of the frequency of usage, and numbers of each SCI species, for each roost site. Where the questionnaire gave a range for the numbers of any species, the midpoint of the range was used. Where the questionnaire, gave numbers in the form of c. 50, or 50+, the value of the number given was used. In a few cases, where there appeared to be obvious errors in the information in the roost questionnaires, we made corrections based on our knowledge of waterbird roost sites in Cork Harbour.

2.27 As I-WeBS counts do not cover all of Cork Harbour, we used a variety of other sources to identify additional high tide roost sites, which we added to the GIS database. For each of these additional roost sites we compiled data on the frequency of usage of the roost (using the same categorisation as used in the roost questionnaires) and the typical numbers of each waterbird species using the roost. Where there was limited data available on the usage of the roost, we made a precautionary assumption of regular usage of the roost. The sources used to identify these additional roost sites are described below.

2.28 Information on additional high tide roost locations in the West Harbour zone was obtained from surveys carried out for the Lower Harbour Wind Turbine project (DePuy, 2011; Janssen, 2011; Novartis, 2011; Simms *et al.*, 2011, SKB, 2011) and for the Port of Cork development (RPS, 2012, 2014). These sources present the results of regular surveys across one or more winters, so roost sites identified by these sources can be assumed to be regularly occupied.

2.29 High tide roost locations in Cork Harbour were also mapped by the WSP in November 2011 (see paragraph 2.24). However, this was a one-off survey and many of the roost locations mapped only held a handful of birds. Therefore, use of this information requires a degree of interpretation. We have only mapped additional roost locations from the WSP survey data where these roosts satisfy three conditions: they are located in areas that are not regularly covered by I-WeBS counts; there was either no information available from other sources about these roost sites, or the information available from other sources supported the occurrence of a regular roost site at the location; and they held at least 20 SCI ducks and waders.

2.30 Most respondents to the roost questionnaires, and most of the information from other sources, only identified shoreline roosts. However, the dabbling duck SCI species can use both shoreline and open water areas for roosting. Therefore, for each count unit, we reviewed the roost information for the dabbling duck species and, where there were apparent missing birds, we used our knowledge of the distribution patterns of these species to designate additional open water roosts.

Quantification of roost capacity

2.31 Usage of individual roost sites varies significantly with some roost sites used on most high tides and other roost sites used less frequently (e.g., only on neap or spring tides, or only in particular weather conditions). Therefore, to assess the importance of an individual roost site it is necessary to consider both the typical numbers of birds using the site when it is occupied, and the frequency with which it is used. In this assessment we have combined these factors to quantify the roost capacity of each site.

2.32 In the information compiled for the roost questionnaires the frequency of usage of each roost site was categorised as regular (75-100% of counts), occasional (25-75% of counts), or seldom used (0-25% of counts). For each roost site, we took the midpoint of these ranges and multiplied the numbers of each species using the roost by the appropriate value (0.875, 0.5, or 0.125) to give the roost capacity for each species. The roost capacity parameter, therefore, provides an index of the importance of each roost site for each species.

Other datasets

Cormorant

2.33 Cormorants roost in shoreline and terrestrial habitats and uses separate locations for daytime and nocturnal roosts.

2.34 Co-ordinated annual counts of Cormorant nocturnal roosts in Cork Harbour have been carried out since 2013 during the period of peak occurrence of Cormorant in Cork Harbour (Gittings, 2018).

2.35 We used the information sources listed above for high tide roosts to identify Cormorant daytime roosts and assess the numbers using the roosts, and we compiled a GIS database of these roost sites. As data on the frequency of many of the Cormorant daytime roosts was not available, we quantified the roost capacity of these roosts as simply being the typical numbers supported by these roosts.

Great Crested Grebe and Red-breasted Merganser

2.36 A detailed study of Great Crested Grebe distribution and roosting behaviour in Cork Harbour was carried out by one of the present authors between 2015 and 2017. The results of this study are reported by Gittings (2017). Data on Red-breasted Merganser distribution and roosting behaviour was also collected as part of this study (Gittings, unpublished data).

Common Tern

2.37 Common Tern breeding colonies in Cork Harbour have been monitored annually since 1983 (O'Mahony and Smiddy, 2017). Common Tern post-breeding/autumn roosts in the Lough Beg area were monitored by one of the present authors between 2016 and 2018 (Gittings, unpublished data).

Cormorant disturbance responses

2.38 An ongoing study is being carried out by one us (Tom Gittings) on the responses to marine traffic of Cormorant (among other species) at Roches Point in the outer part of Cork Harbour.

Analyses of waterbird distribution

2.39 The quantitative analyses of waterbird distribution in this assessment focus on distribution patterns of feeding, or potentially feeding birds, as the main potential impacts will be to the availability and/or quality of feeding habitat. However, we have included assessment of potential impacts on roosting birds, where relevant.

2.40 We compared the broad waterbird distribution patterns of waterbirds across Cork Harbour by calculating the mean percentage of each I-WeBS and each WSP count that occurred in each of the zones. The analyses of the I-WeBS counts used the 2011/12-2017/18 dataset, excluded counts with incomplete coverage and, for each species, excluded months outside their main periods of occurrence in Cork Harbour. For the WSP counts, this analysis was restricted to birds that were recorded in intertidal and subtidal habitat on the low tide counts, but included birds recorded in supratidal and terrestrial habitat on the high tide count (as many of the birds that feed in intertidal habitat at low tide may roost in supratidal or terrestrial habitat at high tide). Counts with very low overall totals were excluded from the analyses.

2.41 Similar analyses were carried out to assess waterbird distribution within zones in relation to specific aquaculture sites.

2.42 We also analysed changes in Red-breasted Merganser and Great Crested Grebe distribution patterns across three time periods: 1994/95-1999/00, 2002/03-2008/09 and 2010/11-2017/18. These analyses were restricted to data from November-February which is the main period of seasonal occurrence of both species in Cork Harbour. The Lough Mahon subsites (Douglas Estuary, Dunkettle and East Lough Mahon) were excluded from the analyses, due to coverage issue, and only included counts where all other relevant subsites were covered. The analyses compared the mean counts of Red-breasted Merganser and Great Crested Grebe in each of the merganser/grebe sectors between the three time periods.

Assessment methodology

Screening

2.43 The SCIs of the Cork Harbour SPA were reviewed and screened in for detailed assessment if:

- The SCI was considered likely to have significant spatial overlap with the aquaculture activities in Cork Harbour, or the potential for such overlap could not be discounted; and
- The SCI was considered likely to be adversely impacted by the aquaculture activities, or the potential for adverse impacts could not be discounted.

2.44 For SCIs of other SPAs it is difficult to determine the likelihood of spatial overlap as there is generally little information about movements of wintering birds between sites, or about the foraging ranges from breeding colonies. Most of the SCIs of the other SPAs away from Cork Harbour are also SCIs of the Cork Harbour SPA. Therefore, these species were screened as part of the screening of the SCIs of the Cork Harbour SPA.

2.45 For additional waterbird SCIs of other SPAs designated for their wintering populations, we considered the general ecology of the species and, in particular, their Cork Harbour status and/or the degree of site faithfulness.

2.46 For SCIs designated for their breeding populations, we used information from the literature to define typical foraging ranges for various species.

2.47 The main source for our information on foraging ranges was the BirdLife Seabird Foraging Database (Thaxter *et al.*, 2012). This provides a range of values for foraging ranges (the mean, the mean maximum and the maximum). The explanatory document for the BirdLife Seabird Foraging Database (Lascelles, 2008) says "*it may be useful to think of areas within the average foraging range as a core zone of activity being exploited by the majority of the birds the majority of the time, and those between the average and the maximum foraging range as a buffer zone, exploited by fewer birds for less of the time*" (although it also acknowledges that this is not always the case). Therefore, we have generally focused on the mean foraging range (rather than the mean maximum or maximum) to give an indication of the core foraging zones.

2.48 It should be noted that the above approach is analogous to the approach recommended by Scottish Natural Heritage for considering connectivity between SPAs and wind farm developments for the purposes of screening (Scottish Natural Heritage, 2016). The Scottish Natural Heritage guidance states that:

> "*In most cases the core range should be used when determining whether there is connectivity between the proposal and the qualifying interests. Maximum ranges are also provided to indicate that birds will, at times, travel further. In exceptional cases distances up to the maximum foraging range may be considered; for example, whilst osprey core foraging range is 10 km an osprey foraging at a loch well beyond this distance from its SPA may still be connected if there is a lack of other closer foraging sites.*"

2.49 We are not aware of any other explicit guidance relating to this issue. Therefore, we consider that our approach for screening the SCIs designated for their breeding populations is in accordance with recognised best practise for assessing potential connectivity between breeding bird populations and development proposals.

Identification of potential impacts

2.50 The potential impacts of the activities covered in this assessment were assessed under three broad categories: ecosystem effects, habitat impacts and disturbance impacts.

Ecosystem effects

2.51 Large-scale bivalve aquaculture could, theoretically, have impacts on ecosystem functioning and reduce the abundance of food resources for waterbird species. This could occur as a result of reduced recruitment (due to direct consumption of eggs and larvae by the cultured bivalves), and/or through indirect food web effects (e.g., consumption of organic matter by the cultured bivalves that would have otherwise been available to support other species). We describe these potential impacts as ecosystem effects as they are not spatially restricted to the areas in the vicinity of the aquaculture sites, but could affect the whole ecosystem.

2.52 Detailed consideration of ecosystem effects and / or ecosystem modelling in order to provide a robust assessment of potential impacts is beyond the scope of this assessment. However, the scale of the aquaculture activities covered by this assessment, relative to the overall size of the Cork Harbour ecosystem indicates that ecosystem effects from these activities are unlikely to be an issue at the whole harbour scale. Therefore, we have not analysed potential ecosystem impacts in this assessment.

Habitat and disturbance impacts

2.53 Potential negative impacts to SCI species have been identified where the activity may cause negative impacts to prey resources and/or cause disturbance impacts, where there is evidence of a negative response to the activity by the species from previous work, and/or where a negative response is considered possible by analogy to activities that have similar types of impacts on habitat structure and/or by analogy to ecologically similar species.

2.54 For each of the aquaculture activities included in this assessment, we reviewed the scientific literature to assess the potential impact of the activity of intertidal and subtidal habitat structure and function and how this might affect the availability of food resources for the SCI species covered by this assessment.

2.55 For the assessment of oyster trestle cultivation we were able to use the results of detailed research to directly assess the potential impacts on waterbirds (Gittings and O'Donoghue, 2012, 2016b; referred to as the trestle study). The trestle study was carried out during periods with typical levels of husbandry activity so the effects of disturbance due to husbandry activity are included in the categorisation of species responses by these studies.

2.56 The trestle study focused on species associated with the intertidal and/or shallow subtidal habitats and did not assess potential impacts to fish-eating species that may use the trestle areas at high tide, while detailed scientific information on the potential impacts to waterbirds of bottom mussel cultivation is not available. For these potential impacts/activities, we used the literature review of the potential impact on food resources, as well as information from studies of analogous types of physical impacts, to assess the potential impacts of habitat alteration, and we used information on the timing and frequency of husbandry activity, and the sensitivity of the species concerned, to assess the potential impact of disturbance.

Assessment of impact magnitude

Displacement impacts

2.57 Where potential impacts from an aquaculture activity on a SCI species have been identified, or cannot be ruled out, the spatial overlap between the distribution of the species and the spatial extent of the activity was assessed. This overlap is considered to represent the potential magnitude of the impact, as it represents the maximum potential displacement if the species has a negative response to aquaculture activity.

Impacts on population trends

2.58 There has been aquaculture activity in the Cork Harbour SPA for over 100 years. Therefore, in theory, analysis of waterbird population trends in relation to the development of the aquaculture activity could reveal evidence about the nature of any impacts from aquaculture on the waterbird populations. However, the information on the timing of the development of aquaculture activity in Cork Harbour is very limited. Therefore, we do not consider that it would be appropriate to carry out detailed assessments of the potential impact of past aquaculture development on waterbird population trends in Cork Harbour. However, we have made comments on potential impacts in relation to some specific activities and species.

Assessment of significance

2.59 The significance of any potential impacts identified has been assessed with reference to the attributes and targets specified by NPWS (2014a). Potential negative impacts are either assessed as significant (if the assessment indicates that they will have a detectable effect on the attributes and targets) or not significant. The significance levels of potential positive impacts have not been assessed.

Attribute 2 – Distribution

2.60 For these SCIs, we have focused on attribute 2 (distribution) of the conservation objectives.

2.61 Assessing significance with reference to attribute 2 is difficult because the level of decrease in the range, timing or intensity of use of areas that is considered significant has not been specified by NPWS. There are two obvious ways of specifying this threshold: (i) the value above which other studies have shown that habitat loss causes decreases in estuarine waterbird populations; and (ii) the value above which a decrease in the total Cork Harbour population would be detectable against background levels of annual variation.

2.62 There have been some studies that have used individual-based models (IBMs; see Stillman and Goss-Custard, 2010) to model the effect of projected intertidal habitat loss on estuarine waterbird populations. West *et al.* (2007) modelled the effect of percentage of feeding habitat of average quality that could be lost before survivorship was affected. The threshold for the most sensitive species (Black-tailed Godwit) was 40%. Durell *et al.* (2005) found that loss of 20% of mudflat area had significant effects on Oystercatcher and Dunlin mortality and body condition, but did not affect Curlew. Stillman *et al.* (2005) found that, at mean rates of prey density recorded in the study, loss of up to 50% of the total estuary area had no influence on survival rates of any species apart from Curlew. However, under a worst-case scenario (the minimum of the 99% confidence interval of prey density), habitat loss of 2-8% of the total estuary area reduced survival rates of Grey Plover, Black-tailed Godwit, Bar-tailed Godwit, Redshank and Curlew, but not of Oystercatcher, Ringed Plover, Dunlin and Knot. Therefore, the available literature indicates that generally quite high amounts of habitat loss are required to have significant impacts on estuarine waterbird populations, and that very low levels of displacement are unlikely to cause significant impacts. However, it would be difficult to specify a threshold value from the literature as these are likely to be site specific.

2.63 If a given level of displacement is assumed to cause the same level of population decrease (i.e., all the displaced birds die or leave the site), then displacement will have a negative impact on the conservation condition of the species. However, background levels of annual variation in recorded waterbird numbers are generally high, due to both annual variation in absolute population size and the inherent error rate in counting waterbirds in a large and complex site. Therefore, low levels of population decrease will not be detectable (even with a much higher monitoring intensity than is currently carried out). For example, a 1% decrease in the baseline population of Turnstone would be a decrease of two birds. The minimum error level in large-scale waterbird monitoring is

considered to be around 5% (Hale, 1974; Prater, 1979; Rappoldt, 1985). Therefore, any population decrease of less than 5% is unlikely to be detectable, so 5% can be taken to be the threshold value below which displacement effects are not considered to be significant. This is a conservative threshold, as error levels combined with natural variation are likely to, in many cases; prevent detectability of higher levels of change. This threshold is also likely to be very conservative in relation to levels that would cause reduced survivorship (see above).

Attribute 1 - Population trends

2.64 Impacts on this attribute are only likely to occur if there are high levels of displacement impacts. However, there is a high level of uncertainty about the magnitude of the displacement impacts that are likely to occur. Therefore, we do not consider that it would be appropriate to attempt to quantitatively assess the impact on this attribute given the current level of available data.

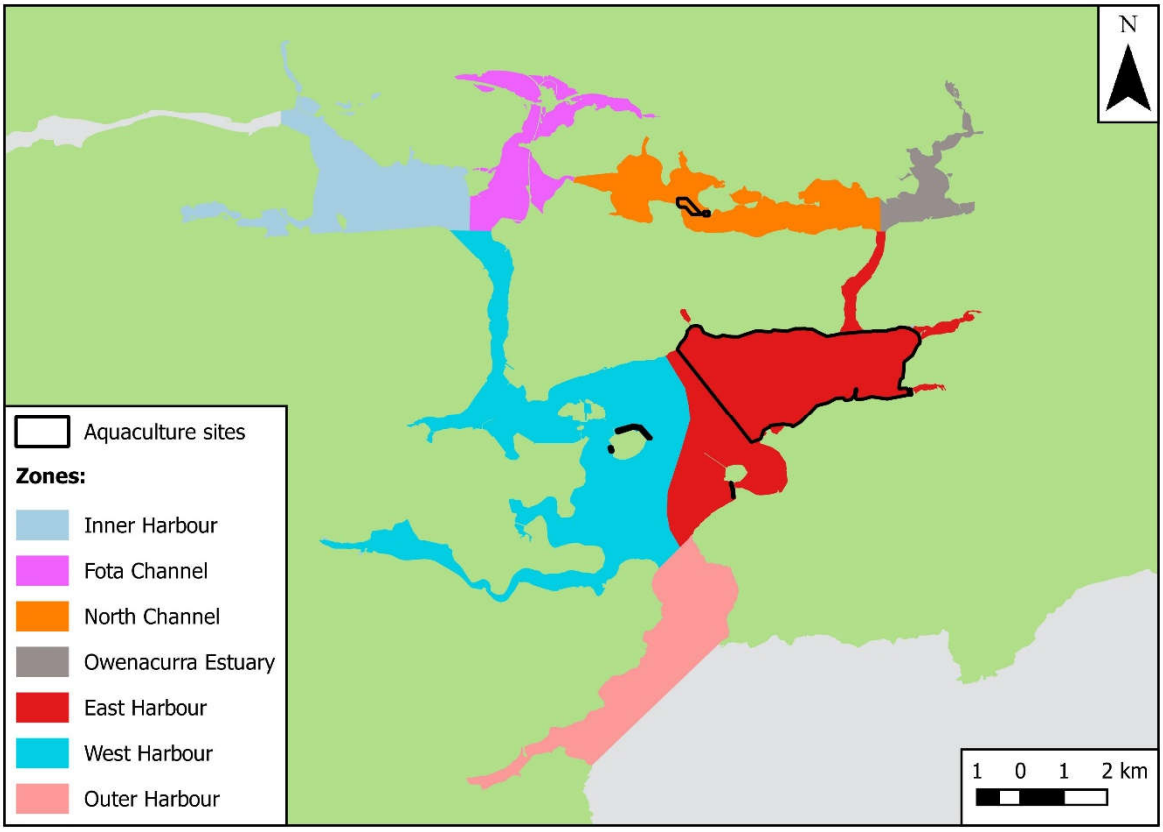


Figure 2.1 – Overall extent of Cork Harbour, as defined for this assessment, and the broad zones used for analysing waterbird distribution.

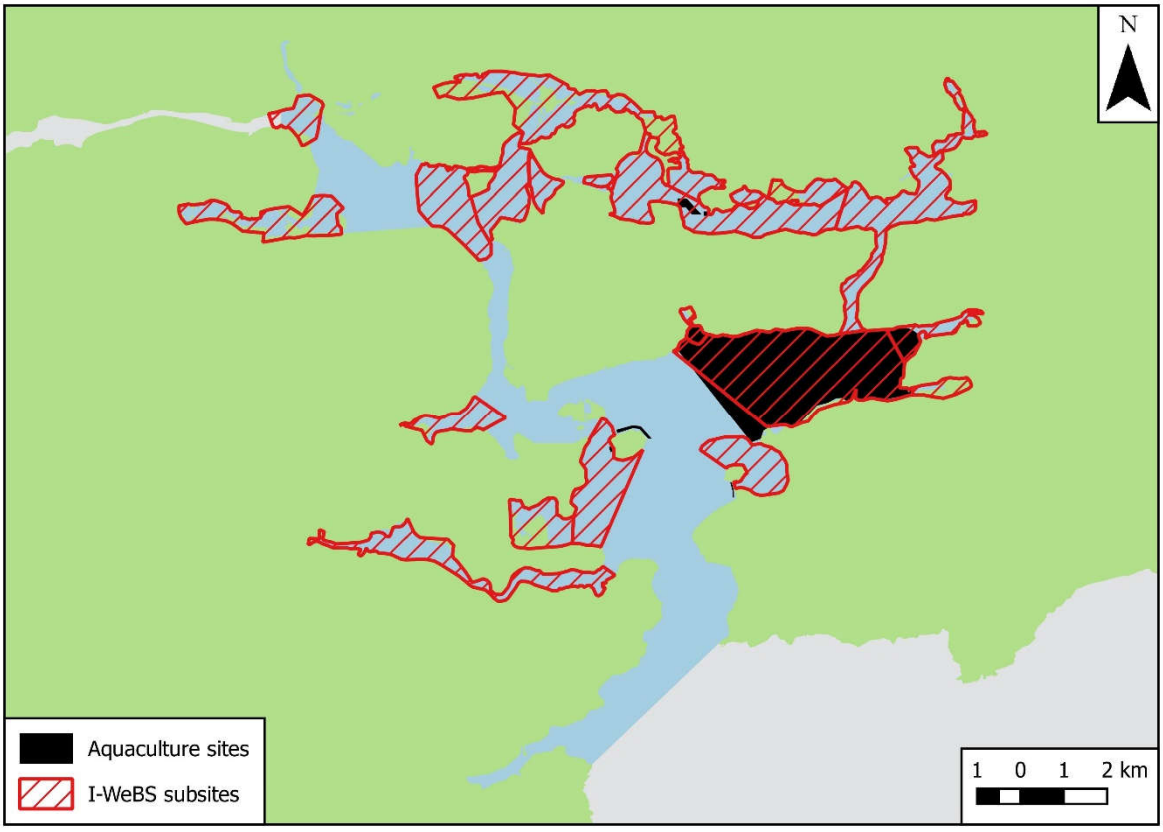


Figure 2.2 – Current subsite divisions used for Irish Wetland Bird Survey (I-WeBS) counts of Cork Harbour.

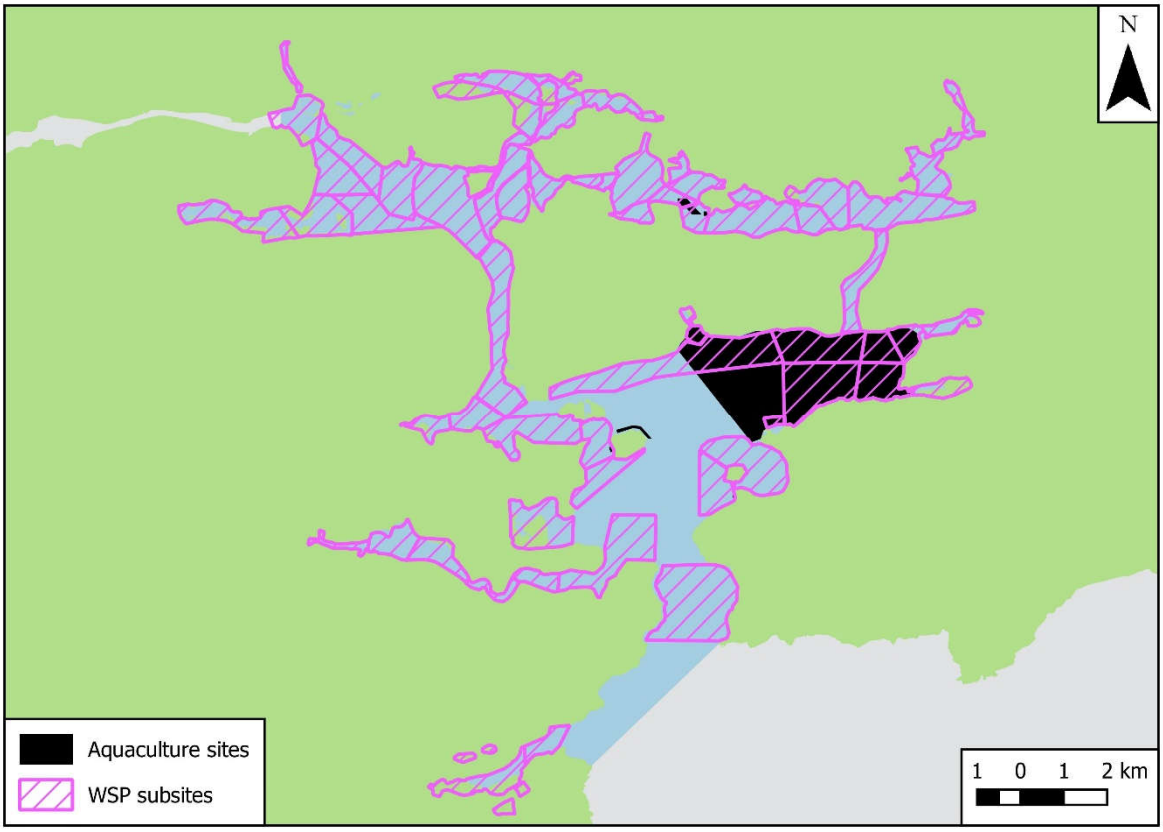


Figure 2.3 - Subsite divisions used for the 2010/11 Waterbird Survey Programme (WSP) counts of Cork Harbour

3. Screening

Introduction

3.1 In addition to the Cork SPA, the Ballycotton Bay SPA is also within 15 km of the aquaculture sites in the Cork Harbour (Figure 3.1). There is also potential connectivity with a number of other SPAs located in the wider vicinity of Cork Harbour (Figure 3.1).

Cork Harbour SPA

Waterbird SCIs

3.2 All of the SCI species make significant use of subtidal and/or intertidal habitat in Cork Harbour. The aquaculture activities covered in this assessment will affect 920 ha of intertidal and subtidal habitat and have the potential to cause significant changes to habitat structure and/or food availability, and/or cause disturbance impacts to the SCI species. Therefore, the activities being assessed could potentially have significant impacts on SCIs that use subtidal and/or intertidal habitat.

Wetlands and waterbirds

3.3 The Conservation Objectives define the favourable conservation condition of the wetlands and waterbird SCI in the Cork Harbour SPA purely in terms of habitat area.

3.4 None of the activities being assessed will cause any change in the permanent area occupied by wetland habitat. Therefore, the activities being assessed are not likely to have any significant impact on this SCI and it has been screened out from any further assessment.

Other SPAs

3.5 SPAs in the wider vicinity of Cork Harbour are shown in Figure 3.1. There are a number of SPAs along the coastline on either side of Cork Harbour, and inland from Cork Harbour, that are designated for various waterbird and/or seabird species. It is known that some waterbird species regularly move between some of these SPAs: e.g., Black-tailed Godwits move between the various coastal SPAs and the Blackwater Callows SPA. Therefore, it is necessary to consider the potential for impacts to Special Conservation Interests (SCIs) of other SPAs away from Cork Harbour.

3.6 Most of the SCIs of the other SPAs away from Cork Harbour are also SCIs of the Cork Harbour SPA. Therefore, these species will be assessed as part of the assessment of the potential impact to the Cork Harbour SPA. The additional waterbird and seabird species that are SCIs of other the SPAs are listed in Table 3.1.

3.7 Two of the additional waterbird species listed in Table 3.1 (Whooper Swan and Sanderling) are only rare visitors to Cork Harbour. Therefore, these SCIs can be screened out from further assessment.

3.8 Another four of the additional waterbird species listed in Table 3.1 are known to have high site fidelity to their wintering grounds (Light-bellied Brent Goose, Great Northern Diver, Ringed Plover and Turnstone). This means that individuals generally return to the same site each winter. Therefore, for these species, there is unlikely to be significant interchange between the SCI populations and the Cork Harbour populations and these SCIs can be screened out from further assessment.

3.9 One of the additional waterbird species (Mallard) listed in Table 3.1 has moderate site fidelity. Therefore, for these species, there is the possibility of significant interchange between the SCI populations and the Cork Harbour populations and these SCIs cannot be screened out from further assessment.

3.10 There are four seabird species that are listed as SCIs for their breeding populations in coastal SPAs: Cormorant, Herring Gull, Kittiwake and Guillemot.

Table 3.1 - Waterbird and seabird SCIs of other SPAs in the wider vicinity of Cork Harbour that are not SCIs of the Cork Harbour SPA.

Species	SPA	Cork Harbour status	Site fidelity	Preliminary screening
Whooper Swan	Blackwater Callows SPA	very rare	moderate/high	screened out
Light-bellied Brent Goose	Dungarvan Harbour	small wintering population	high	screened out
Mallard	The Gearagh SPA	large wintering population	moderate	screened in
Cormorant (breeding population)	Helvick Head to Ballyquin	non-breeding resident with large wintering population and significant numbers present in summer	-	screened out
Cormorant (breeding population)	Sovereign Islands	non-breeding resident with large wintering population and significant numbers present in summer	-	screened in
Great Northern Diver	Courtmacsherry Bay	small wintering population	high	screened out
Coot	The Gearagh SPA	very small wintering population	unknown	screened out
Ringed Plover	Ballycotton Bay	small wintering population	high	screened out
Sanderling	Ballymacoda Bay	rare	high	screened out
Turnstone	Ballycotton Bay, Ballymacoda Bay, Dungarvan Harbour	small wintering population	high	screened out
Herring Gull	Helvick Head to Ballyquin	non-breeding resident with large wintering population and significant numbers present in summer	-	screened out
Kittiwake	Helvick Head to Ballyquin, Old Head of Kinsale	regular visitor to the Outer Harbour	-	screened out
Guillemot	Old Head of Kinsale	scarce winter visitor	-	screened out

Site fidelity categorisations based on the classifications in the NPWS Conservation Objectives Supporting Documents, except for Great Northern Diver, which is based on East et al. (2015).

3.11 Cormorant is a SCI of the Cork Harbour SPA but is presumed to be listed for its wintering population. It is listed as a SCI of two SPAs: the Helvick Head to Ballyquin SPA (c. 50 km by sea from Cork Harbour) and the Sovereign Islands SPA (c. 18 km by sea from Cork Harbour). The mean foraging range of Cormorants from their breeding colonies is 5.2 km, with a mean maximum of 25 km and a maximum of 35 km (Thaxter *et al.*, 2012). Therefore, birds from the Helvick Head to Ballyquin SPA are unlikely to use Cork Harbour. There is potential for birds from the Sovereign Islands colony to make some usage of Cork Harbour, but it is likely to be a peripheral area.

3.12 Herring Gull is a SCI of the Helvick Head to Ballyquin SPA (c. 50 km by sea from Cork Harbour). Cramp and Simmons (2004) quote foraging ranges from breeding colonies in various studies ranging from 22-63 km, while Ratcliffe *et al.* (2000, quoted by Langston, 2010) gave a foraging

range of 40 km from breeding colonies. Therefore, Cork Harbour may be within the foraging range of the Helvick Head to Ballyquin SPA population. However, while significant numbers of this species are present in summer in Cork Harbour these are mainly immature birds. Therefore, it is unlikely that the Helvick Head to Ballyquin SPA population makes significant use of Cork Harbour and this SCI can be screened out from further assessment.

3.13 Kittiwake is a SCI of the Helvick Head to Ballyquin SPA (c. 50 km by sea from Cork Harbour) and the Old Head of Kinsale SPA (c. 28 km by sea from Cork Harbour). This species can occur in large numbers in Cork Harbour, particularly after storms. However, it mainly occurs in the Outer Harbour zone and rarely comes further into the harbour in any numbers. Therefore, as there are no proposed aquaculture sites in the Outer Harbour zone, these SCIs can be screened out from further assessment.

3.14 Guillemot is a SCI of Old Head of Kinsale SPA (c. 28 km by sea from Cork Harbour). This species is a scarce winter visitor to Cork Harbour, although large numbers can occur occasionally after storms. However, during the summer it rarely comes into the harbour. Therefore, as the SCI is listed for its breeding population, this SCI can be screened out from further assessment.

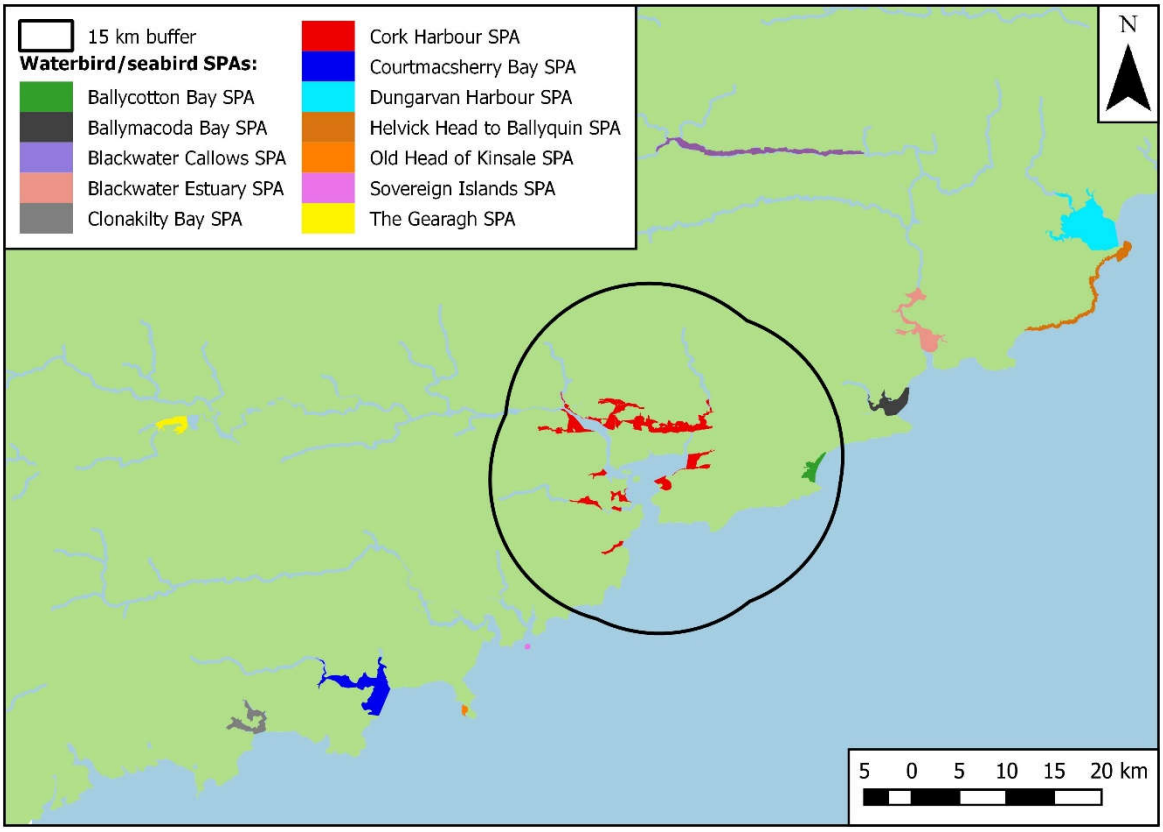


Figure 3.1 - Waterbird/seabird SPAs in the vicinity of Cork Harbour.

4. Conservation objectives

Cork Harbour SPA

SCIs listed for their wintering populations

4.1 The conservation objectives for the wintering populations of Shelduck, Wigeon, Teal, Pintail, Shoveler, Red-breasted Merganser, Cormorant, Grey Heron, Little Grebe, Great Crested Grebe, Oystercatcher, Golden Plover, Grey Plover, Lapwing, Curlew, Black-tailed Godwit, Bar-tailed Godwit, Dunlin, Redshank, Black-headed Gull, Common Gull and Lesser Black-backed Gull are to maintain their favourable conservation condition (NPWS, 2014a).

4.2 The favourable conservation conditions of these SCIs in the Cork Harbour SPA are defined by various attributes and targets, which are shown in Table 4.1.

Table 4.1 - Attributes and targets for the conservation objectives for the wintering populations of Shelduck, Wigeon, Teal, Pintail, Shoveler, Red-breasted Merganser, Cormorant, Grey Heron, Little Grebe, Great Crested Grebe, Oystercatcher, Golden Plover, Grey Plover, Lapwing, Curlew, Black-tailed Godwit, Bar-tailed Godwit, Dunlin, Redshank, Black-headed Gull, Common Gull and Lesser Black-backed Gull in the Cork Harbour SPA.

Attribute	Measure	Target	Notes
1 Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the Conservation Objectives Supporting Document
2 Distribution	Range, timing and intensity of use of areas	There should be no significant decrease in the range, timing and intensity of use of areas by … [SCI species] other than that occurring from natural patterns of variation	Waterbird distribution from the 2010/2011 waterbird survey programme is discussed in part five of the Conservation Objectives Supporting Document

Source: NPWS (2014a).

Attributes are not numbered in NPWS (2014a), but are numbered here for convenience.

SCI listed for its breeding population

4.3 The conservation objective for the Common Tern breeding population in the Cork Harbour SPA is to maintain its favourable conservation condition (NPWS, 2014a). The favourable conservation condition of this population is defined by the following attributes: breeding population abundance, productivity rate, distribution of breeding colonies, availability of prey biomass, barriers to connectivity, and disturbance at the breeding site (NPWS, 2014a).

The Gearagh SPA

4.4 Site-specific conservation objectives have not yet been prepared for The Gearagh SPA. However, it can be assumed that the attributes and targets listed in Table 4.1 also apply to the Mallard SCI of The Gearagh SPA.

5. Status and habitats and distribution of the SCI species

Status of the SCI species

Cork Harbour SPA

5.1 The current status of the non-breeding SCI species in Cork Harbour is summarised in Table 5.1. It should be noted that Ringabella Creek, which lies just outside the harbour, was only added to the SPA in 2015. Ringabella Creek has been counted separately from the rest of Cork Harbour, and the data from Ringabella Creek was not included in the assessment of site trends reported by NPWS (2014c).

Table 5.1 – Non-breeding Special Conservation Interests of the Cork Harbour SPA.

Species	5 year means		Site trend[3]	National trend[4]	International trend[5]
	Cork Harbour[1]	Ringabella Creek[2]			
Shelduck	1060	24	Unfavourable	Stable	Increasing
Wigeon	1556	30	Unfavourable	Declining	Stable
Teal	1323	114	(Intermediate) Unfavourable	Stable	Increasing
Pintail	20	1	Highly Unfavourable	Increasing	Increasing
Shoveler	22	0	Highly Unfavourable	Increasing	Increasing
Red-breasted Merganser	72	0	Highly Unfavourable	Stable	n/c
Cormorant	352	3	Highly Unfavourable	Increasing	Stable
Grey Heron	105	3	(Intermediate) Unfavourable	Stable	Increasing
Little Grebe	85	6	Favourable	Stable	Increasing
Great Crested Grebe	109	0	Unfavourable	Declining	Declining?
Oystercatcher	1587	11	(Intermediate) Unfavourable	Stable	Declining
Golden Plover	2418	0	Favourable	Declining	Declining
Grey Plover	20	0	Highly Unfavourable	Declining	Declining?
Lapwing	1696	109	Highly Unfavourable	Declining	Stable
Curlew	1535	105	Unfavourable	Declining	Declining
Black-tailed Godwit	3308	140	Favourable	Increasing	Increasing
Bar-tailed Godwit	270	0	Favourable	Stable	Increasing
Dunlin	3285	84	Unfavourable	Declining	Stable
Redshank	1636	54	Unfavourable	Stable	Stable/Increasing?
Black-headed Gull	3645	168	Highly Unfavourable	n/c	n/c
Common Gull	377	77	Highly Unfavourable	n/c	n/c
Lesser Black-backed Gull	171	56	Highly Unfavourable	n/c	n/c

[1] 5-year mean annual peak counts, 2013/14-2017/18 (Gittings, 2018). The 5-year means for Shelduck, Golden Plover, Lapwing, Curlew, Black-tailed Godwit, Bar-tailed Godwit and Dunlin exclude data from 2016/17 as the annual maxima for that winter is considered to have been significantly affected by missing data from the Douglas Estuary for these species.

[2] 5-year mean annual peak counts, 2011/12-2015/16 (I-WeBS site summary table for 0L423 Ringabella Creek; data were supplied by the Irish Wetland Bird Survey (I-WeBS), a joint scheme of BirdWatch Ireland and the National Parks and Wildlife Service of the Department of Arts, Heritage & the Gaeltacht).

[3] Change between the 1995/96-1999/00 and 2008/09-2012/13 mean annual peak counts (NPWS, 2014c).

[4] All-Ireland trend 1999/00-2010/11 from NPWS (2014c), where a species is deemed to be increasing or declining if the annual rate of change is equal to or greater than 1.2%, after Crowe and Holt (2013).

[5] Current international trend from NPWS (2014c), after Wetlands International (2012).

n/c = not classified.

5.2 Common Tern is listed as a SCI of the Cork Harbour SPA for its breeding population. The conservation condition of this SCI has not been formally assessed by NPWS. However, the breeding population has increased significantly in recent years and is now at its highest recorded levels with a five-year (2013-2017) mean of 127 apparently occupied nests (O'Mahony and Smiddy, 2017).

The Gearagh SPA

5.3 The conservation condition of the Mallard SCI of The Gearagh SPA has not been assessed by NPWS.

Waterbird habitats in Cork Harbour

A total of around 1840 ha of intertidal habitat and 4350 ha of subtidal habitat occurs in Cork Harbour (Table 5.2). The Cork Harbour SPA includes around 85% of the intertidal habitat in the harbour, but only includes around 20% of the subtidal habitat (Table 5.2). The intertidal habitat mainly occurs in the upper harbour with additional more isolated areas in estuaries and bays in the lower harbour, while the large central section of the harbour is mainly occupied by subtidal habitat (Figure 5.1).

Table 5.2 – Percentage distribution of waterbird habitats between the zones of Cork Harbour.

Zones	Intertidal		Subtidal					
			shallow		moderate		deep	
	all	SPA	all	SPA	all	SPA	all	SPA
Inner Harbour	17%	18%	39%	37%	6%	1%	4%	1%
Fota Channel	17%	19%	7%	12%	3%	11%	1%	0%
North Channel	22%	24%	5%	9%	8%	40%	2%	75%
Owenacurra Estuary	9%	10%	4%	8%	1%	5%	0%	23%
East Harbour	11%	9%	13%	20%	43%	34%	23%	0%
West Harbour	19%	16%	26%	8%	33%	9%	37%	1%
Outer Harbour	6%	3%	5%	5%	6%	1%	34%	0%
Total area (ha)	**1840**	**1592**	**724**	**383**	**2136**	**428**	**1496**	**31**

Intertidal includes *Spartina* beds and other saltmarsh. Subtidal habitats: shallow = between mean low tide and 0 m chart datum; moderate = subtidal habitat of 0-5 m deep; deep = subtidal habitat > 5 m depth.

5.4 The intertidal habitat is mainly littoral sediment habitat. Some littoral rock habitat occurs in the East Harbour, West Harbour and Outer Harbour. Extensive *Spartina* beds occur in the North Channel where they form around 20% of the total extent of intertidal habitat in this zone. Small amounts of *Spartina* beds also occur in all the other zones, apart from the Outer Harbour. Apart from *Spartina*, saltmarsh is a very rare habitat in Cork Harbour and does not comprise more than 1-2% of the total extent of intertidal habitat in any of the zones.

5.5 The intertidal habitat within the Cork Harbour SPA (excluding Ringabella Creek) was surveyed by MERC Consultants (2012). Most of the intertidal soft sediment habitat was classified as the *littoral mud (LS.LMu)* biotope. The intertidal habitat in Whitegate Bay and on the shore of the Mahon peninsula was classified as the *polychaete/bivalve dominated muddy sand shores (LS.LSa.MuSa)*. Sections of shoreline in the North Channel, Owenacurra Estuary, East Harbour and West Harbour were classified as the *littoral mixed sediment (LS.LMx)*. NPWS have classified nearly all of the

intertidal habitat within the SPA as the *mixed sediment to sandy mud with polychaetes and oligochaetes community complex* (NPWS, 2014e)[2].

5.6 Macroalgal blooms occur in intertidal areas in the upper harbour in late summer/autumn with the Glounthaune Estuary in the Fota Channel and Rossmore Bay in the North Channel being two areas that are particularly prone to such blooms.

5.7 Apart from the Outer Harbour, most of the subtidal habitat within Cork Harbour is moderately deep. Deep subtidal habitat occupies most of the Outer Harbour and continues into the harbour along the navigation channel, progressively narrowing until it reaches the Inner Harbour, where the channel is maintained by dredging (Figure 5.1). There is also a channel of deep subtidal habitat running from the East Harbour through the East Ferry Channel and just reaching the North Channel and Owenacurra Estuary. The benthic sediments in subtidal habitats in the East Harbour, West Harbour and Outer Harbour are mainly slightly gravelly muddy sand, with sandy silt predominating in the Inner Harbour and heterogeneous sediments ranging throughout the sampling area from sandy silt to gravelly sand in the North Channel (Ecoserve, 2012). There does not appear to have been any classifications of the subtidal biotopes/community complexes in Cork Harbour.

5.8 Several lagoons occur around Cork Harbour, most of which are of artificial origin formed by the impoundment of the upper sections of intertidal areas (Figure 5.1). The most important of these for waterbirds are the Harper's Island borrow dyke and Slatty Pool in the Fota Channel; Cuskinny Marsh and Rostellan Lake in the East Harbour; and at Lough Beg in the West Harbour. A lagoon at Ballintubbrid was also formerly an important area but this habitat has been infilled in recent years.

5.9 Several of the waterbird SCIs of the Cork Harbour SPA make significant use of fields around the harbour as foraging habitats. Field areas that are particularly important for these SCIs are: the Bloomfield House field in the Inner Harbour; the Harper's Island and Slatty Pool fields in the Fota Channel; the Ballintubbrid fields in the North Channel and fields on the western side of Lough Beg in the West Harbour (Figure 5.1). These areas are all immediately adjacent to tidal habitats/lagoons. However, the field feeding waders and gulls will also range more widely away from the harbour and make opportunistic use of fields over a buffer of several kilometres around the harbour.

Waterbird distribution in Cork Harbour

Habitat use

5.10 The broad habitat usage recorded in the WSP low tide counts is summarised in Table 5.3. The Shelduck, waders and gulls mainly occurred in intertidal habitat. The WSP counts recorded relatively low numbers of waders in terrestrial habitats. However, this reflects the survey methodology and under-represents the importance of such habitats for the Cork Harbour populations of five of these wader species (Golden Plover, Lapwing, Oystercatcher, Curlew and Black-tailed Godwit). For example, counts of nocturnal Curlew roosts indicate that around half of the mid-winter Curlew population in Cork Harbour feed on fields during the day.

5.11 The dabbling duck species showed varied patterns of habitat use, reflecting differences in their foraging behaviour. Wigeon occurred in relatively high numbers in terrestrial habitats, which reflects the importance of a small number of field-feeding sites for the Cork Harbour population of this species. Teal and Pintail mainly occurred in intertidal habitat, while Mallard and Shoveler occurred in relatively high numbers in subtidal habitat.

[2] The mapped distribution of this community complex shown in Figure 2 of NPWS (2014e) excludes the Douglas Estuary. However, this is presumably a mapping error.

5.12 Red-breasted Merganser, Little Grebe and Great Crested Grebe occurred mainly, or exclusively, in subtidal habitat, as would be expected for these species. The high percentage of Cormorant in the intertidal zone might seem surprising, as this species normally feeds in subtidal habitat. However, all the birds recorded feeding were in subtidal habitat. The high percentage in the intertidal zone reflects the habit of this species in forming daytime roosts in the intertidal zone.

Table 5.3 - Habitat use in the 2010/11 WSP low tide counts.

Species	Mean percentage of total count in habitat zones:			
	Intertidal	Subtidal	Supratidal	Terrestrial
Shelduck	85%	15%	0%	0%
Wigeon	28%	26%	0%	46%
Teal	68%	17%	0%	15%
Mallard	26%	45%	1%	28%
Pintail	100%	0%	0%	0%
Shoveler	17%	65%	13%	5%
Red-breasted Merganser	0%	100%	0%	0%
Cormorant	43%	32%	6%	19%
Grey Heron	34%	39%	19%	9%
Little Grebe	1%	67%	0%	32%
Great Crested Grebe	0%	100%	0%	0%
Oystercatcher	93%	4%	1%	2%
Golden Plover	98%	2%	0%	0%
Grey Plover	100%	0%	0%	0%
Lapwing	84%	0%	0%	16%
Curlew	87%	4%	0%	9%
Black-tailed Godwit	84%	4%	0%	12%
Bar-tailed Godwit	100%	0%	0%	0%
Dunlin	100%	0%	0%	0%
Redshank	96%	4%	0%	0%
Black-headed Gull	72%	23%	0%	5%
Common Gull	72%	23%	1%	4%
Lesser Black-backed Gull	85%	9%	4%	2%

Data source: 2010/11 Waterbird Survey Programme as undertaken by the National Parks & Wildlife Service.

Sample sizes: n = 4 for all species, except Pintail (n = 1), Shelduck, Shoveler, Grey Plover and Lapwing (n = 2), Wigeon, Red-breasted Merganser, Great Crested Grebe, Golden Plover, Bar-tailed Godwit and Dunlin (n =3) and Light-bellied Brent Goose (n =2).

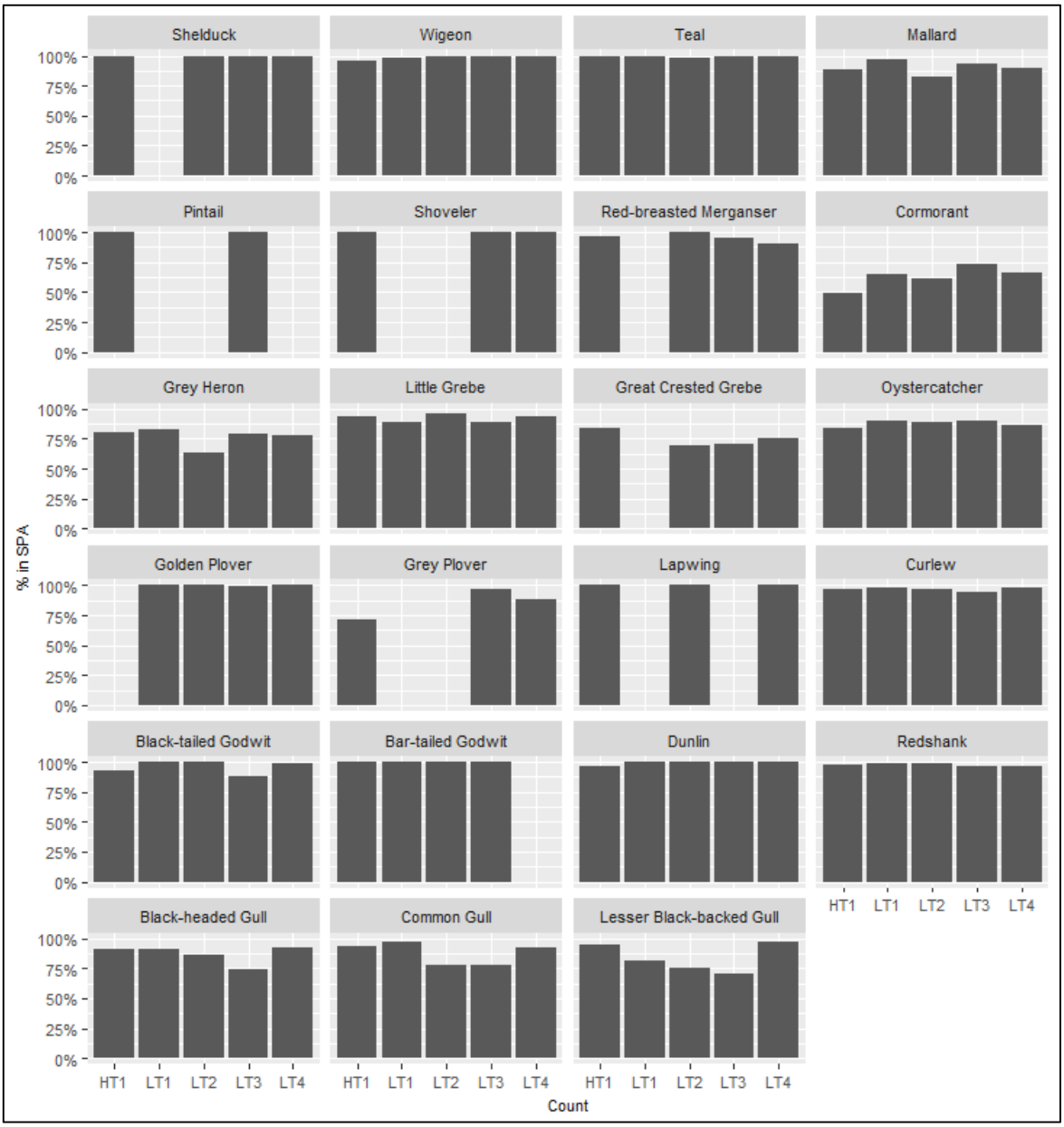
Distribution (non-breeding waterbirds)

Broad distribution patterns

5.13 The Cork Harbour SPA only includes around 40% of the total area of tidal habitat in Cork Harbour. However, for most species during the WSP counts, over 90% of the total count was recorded in the SPA (Text Figure 5.1). This partly reflects the fact that the SPA contains over 75% of the intertidal and shallow subtidal habitat within the harbour, nearly all of which was covered by the WSP counts, and these are the primary habitats for 16 of the 24 species. The species that occurred in relatively low percentages were mainly species associated with subtidal habitats, reflecting the fact that the SPA contains less than 20% of the total area of subtidal habitat within the harbour. The WSP counts did not cover most of the moderately deep and deep subtidal habitat outside the SPA, so Text Figure 5.1 may overestimate the percentage SPA occupancies of the species associated with subtidal habitat.

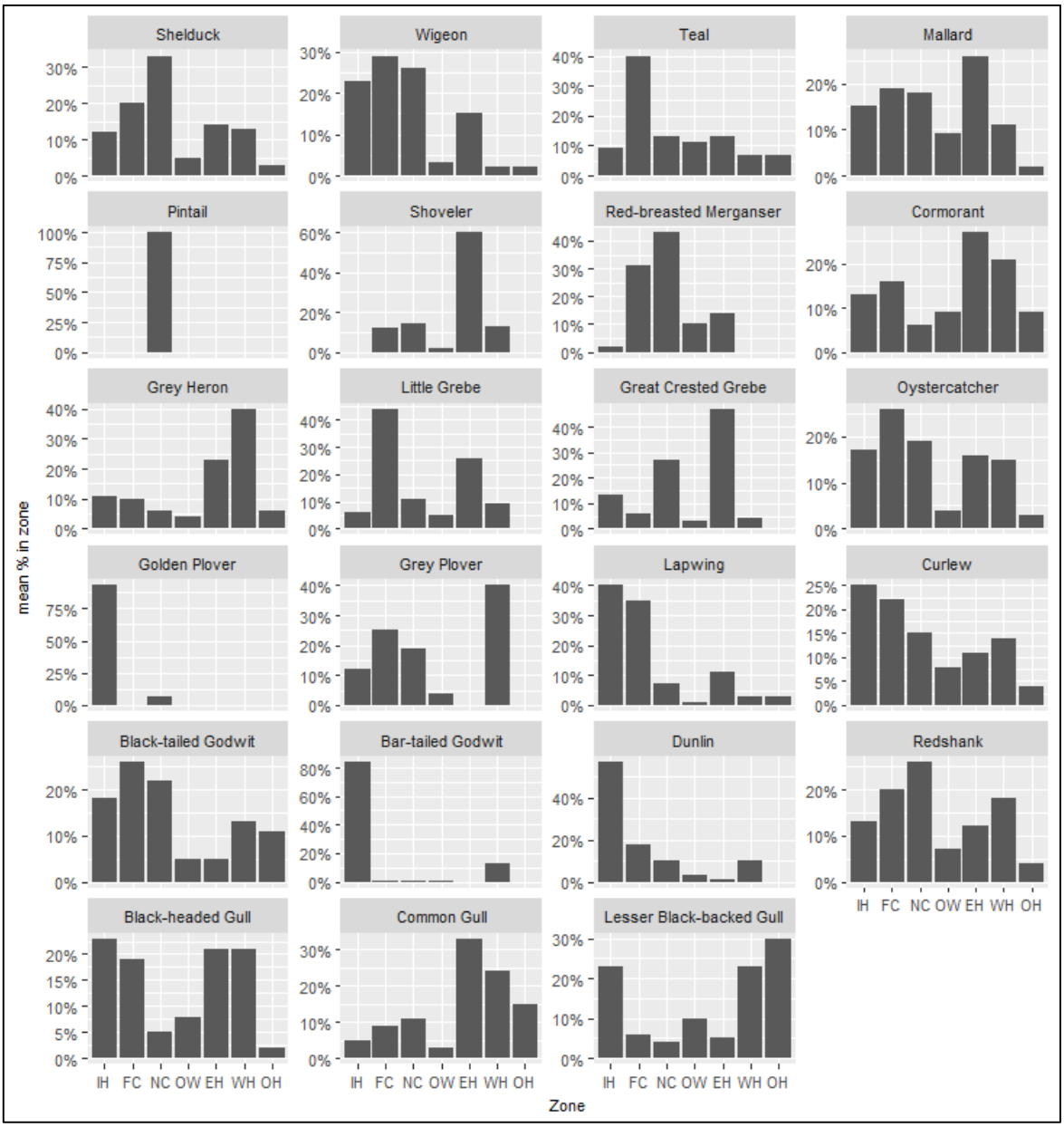
5.14 The broad patterns of distribution of waterbird species during the WSP low tide counts and recent I-WeBS counts (mainly carried out at high tide) is compared in Text Figure 5.2.

5.15 The Outer Harbour zone is not included in the analyses in Text Figure 5.2, as it is not included in the I-WeBS dataset. However, this zone was covered during the WSP counts (Text Figure 5.3).



Text Figure 5.1 – Percentage of total Cork Harbour count recorded within the Cork Harbour SPA during the WSP counts.

Text Figure 5.2 – Comparison of distribution patterns of waterbird species between broad zones of Cork Harbour (excluding the Outer Harbour) in the I-WeBS and WSP low tide counts datasets. Zones: IH = Inner Harbour; FC = Fota Channel; NC = North Channel; OW = Owenacurra Estuary; EH = East Harbour; WH = West Harbour.



Text Figure 5.3 - Distribution patterns of waterbird species between broad zones of Cork Harbour (including the Outer Harbour) in the WSP low tide count dataset. Zones: IH = Inner Harbour; FC = Fota Channel; NC = North Channel; OW = Owenacurra Estuary; EH = East Harbour; WH = West Harbour.

Shelduck, Wigeon, Teal and Mallard

5.16 These four species are dabbling ducks feeding in muddy estuarine areas. Their distribution in Cork Harbour is principally associated with the estuarine areas in one or more of the Inner Harbour, Fota Channel and North Channel zones and is largely confined to the SPA sections of the harbour. In the lower harbour, some birds occur in Saleen Creek, Whitegate Bay, Ringabella Creek, the Owenboy Estuary, Lough Beg and Monkstown Creek. Mallard are relatively more evenly distributed around the harbour than the other three species, with a lower overall occupancy of the SPA. Wigeon also graze fields adjacent to estuarine areas in a few locations such at Bloomfield House in the Douglas Estuary, Harper's Island and Slatty Pool in Slatty Water, and (formerly) Ballintubbrid in the North Channel. Teal also utilise small brackish and freshwater wetlands in various locations around the harbour.

Pintail and Shoveler

5.17 These two species are dabbling ducks that occur in very low numbers in Cork Harbour. Pintail occur mainly in the North Channel between Belvelly Bridge and Rossleague. Shoveler occur erratically in various locations around the harbour, but are most frequent in the East Harbour zone, particularly in Whitegate Bay. Both species occur almost exclusively within the SPA.

Red-breasted Merganser

5.18 Red-breasted Merganser feed exclusively in subtidal habitat. They also usually roost in subtidal habitat, although they may sometimes use gravel banks, etc. They mainly occur in waters of less than 3·5 m depth (Cramp and Simmons, 2004). Therefore, the potential extent of suitable habitat in Cork Harbour can be broadly defined by the 5 m depth contour on the Admiralty charts. However, mergansers do not occupy all the available habitat within this depth zone in Cork Harbour. Therefore, Cork Harbour can be divided into four discrete sectors of merganser habitat: Lough Mahon and the Fota Channel; the North Channel from Rossmore to Rathcoursey; the open water in the East Harbour between Great Island, Whitegate, Aghada and Saleen; and the open water in the West Harbour from Haulbowline and around Spike Island to Lough Beg and Crosshaven (Figure 5.2).

5.19 The North Channel is the favoured area for Red-breasted Merganser in Cork Harbour, with birds typically occurring along the channel from Rossmore to Rathcoursey. A nocturnal roost occurs at Ballintubbrid, although some birds from the North Channel commute to the East Harbour roost, while others may commute to the Lough Mahon roost. A daytime roost also appears to occur in the enclosed waters behind Brick Island.

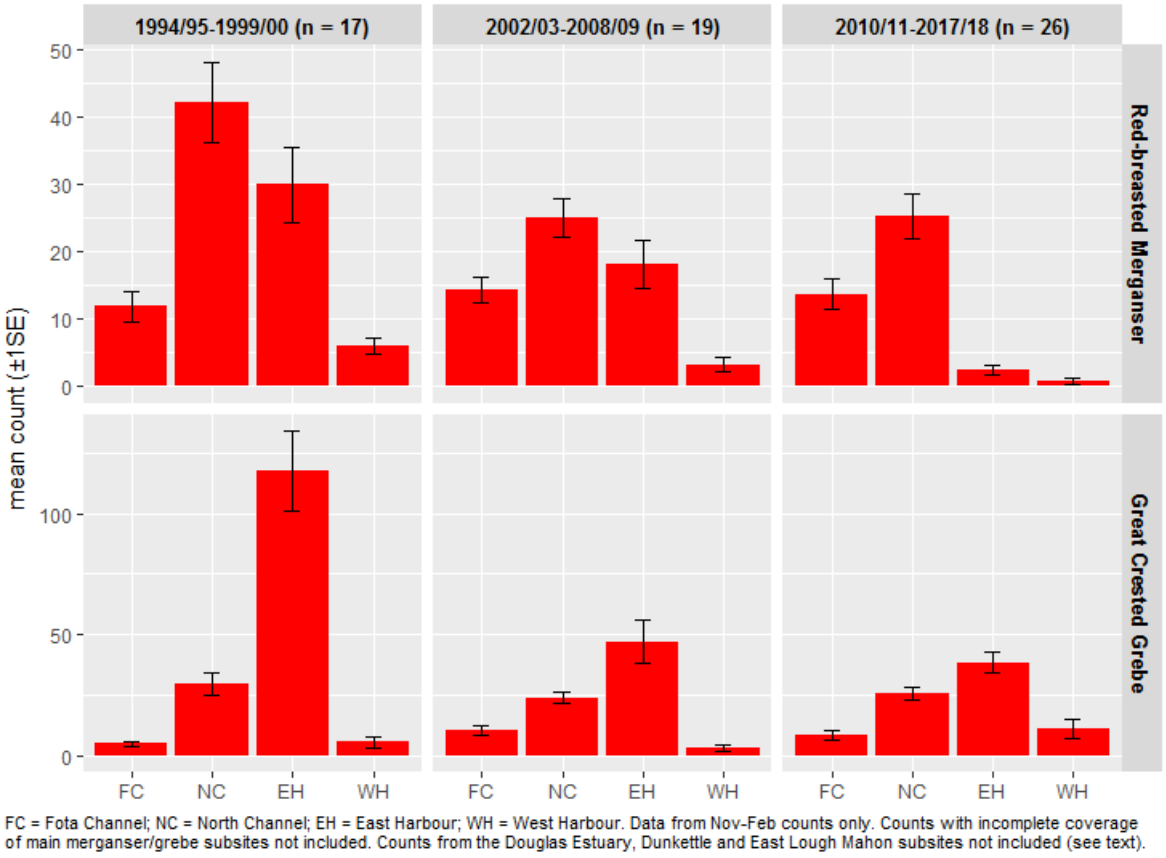
5.20 Fota Channel is the next most favoured area, with birds feeding along the channel from the southern end of the Carrigrennan peninsula to the N25 bridge over the Glounthaune Estuary and the lower part of Slatty Water. Mergansers formerly occurred further up both estuaries, but there have been very few records from these latter areas in recent years. The Fota Channel birds commute to a nocturnal roost in Lough Mahon just off the southern shore of Little Island. However, mergansers only occasionally feed in Lough Mahon during the day, although small numbers can also occur in the tidal impoundment at Dunkettle.

5.21 Red-breasted Merganser also occur in the East Harbour in the open waters between Great Island and Aghada, and in Whitegate Bay. In recent winters, only small numbers have been recorded in these areas during the day, mainly in the bay to the east of Aghada Pier and in Whitegate Bay. However, there is a regular nocturnal roosting flock of around 20 birds off the south-eastern shore of Great Island and at least some of these birds commute down the East Ferry Channel to this roost. A small roost also occurs in Whitegate Bay. In 2003/04, small numbers of mergansers were recorded on two dates feeding in the lagoons in the ESB Aghada Generating Station (ESB, 2004). As these lagoons are not covered by I-WeBS counts, and are not generally accessible, their significance for the Cork Harbour merganser population is not known.

5.22 Red-breasted Merganser are only occasionally recorded during the day in the West Harbour, in the open waters south of Spike Island. However, there does appear to be a regular nocturnal roost of a handful of birds off the mouth of Lough Beg.

5.23 There has been a decline in overall Red-breasted Merganser numbers in Cork Harbour across the I-WeBS survey period (Text Figure 5.4) and this appears to be a continuation of a long-term decline (cf. Smiddy *et al.*, 1995). However, this decline has not been equally distributed around the harbour. Numbers in the East Harbour and West Harbour have shown a severe decline, with a much more moderate decline in the North Channel (Text Figure 5.4). Numbers in the Fota Channel appear to

have been relatively stable (Text Figure 5.4). However, this could possibly represent a shift of birds from Lough Mahon, which was not included in this analysis due to coverage issues.



FC = Fota Channel; NC = North Channel; EH = East Harbour; WH = West Harbour. Data from Nov-Feb counts only. Counts with incomplete coverage of main merganser/grebe subsites not included. Counts from the Douglas Estuary, Dunkettle and East Lough Mahon subsites not included (see text).

Text Figure 5.4 – Changes in Red-breasted Merganser and Great Crested Grebe distribution patterns recorded by I-WeBS counts in Cork Harbour.

Cormorant

5.24 Cormorants feed in subtidal habitat, but roost in intertidal and terrestrial habitats. Their distribution in Cork Harbour does not appear to be restricted by water depth and birds can occur throughout the harbour. As a result, only around 50-75% of the birds counted in the WSP counts were within the SPA, and these figures overestimate the occupancy of the SPA due to lack of coverage of significant areas of subtidal habitat.

5.25 Cormorants typically feed individually, or in small, loose groups. However large feeding aggregations can occur at times. During the WSP low tide counts, feeding Cormorants occurred at relatively uniform densities (1-5 birds/km^2) across most of the subsites (Figure 5.3). Much higher densities occurred in the upper sections of some of the estuaries. However, these high densities reflected the fact that, at low tide, the amount of subtidal habitat in these subsites is very small, so even a very small number of feeding Cormorants would result in very high densities.

5.26 Cormorant have distinct day and night roosts. During the day, they roost on piers, jetties, gravel banks, etc. There are a large number of day roosts holding small numbers of Cormorants in Cork Harbour, but a few large day roosts occur (Figure 5.4). The largest day roost is on the ADM jetty at the mouth of Monkstown Creek, while other sizeable day roosts occur on the sea wall enclosing the Dunkettle tidal impoundment, on a gravel bank on the northern shore at Rathcoursey and on a platform 500 m offshore from the northern side of ESB Aghada Generating Station. At night, the Cork Harbour Cormorant population is concentrated into a smaller number of roosts (Figure 5.4).

These are mainly on trees where there are wooded shorelines, but some Cormorants commute to a night roost outside the harbour on cliffs at Finure. If feeding birds are assumed to commute to the nearest roost, then the density of birds supported by the available habitat for each roost ranges from 12-30 birds/km^2, apart from the Rostellan Lake/Siddon's Tower and Finure roosts (Table 5.4). The low density apparently supported by the Rostellan Lake/Siddon's Tower may be due to some birds in the surrounding area commuting to the Bagwell's Hill roost, as we have observed Cormorants commuting up the East Ferry Channel close to dusk. Some of the birds at the Glanmire Wood roost probably commute from the River Lee within, and maybe above, Cork City, so the density apparently supported by this roost in Table 5.4 is probably exaggerated.

5.27 The overall density apparently supported by the night roosts (11 birds/km^2) is an order of magnitude higher than the overall density of feeding birds recorded in the WSP counts (1 bird/km^2). This will partly reflect the fact that at any time during the day some of the Cormorants will be at day roosts. Also, the roost counts were carried out during the peak period of occurrence of Cormorants, while the WSP counts include some late winter counts when numbers of Cormorants in Cork Harbour are lower. However, the magnitude of the difference in densities suggests that the WSP counts under-recorded numbers of feeding Cormorant, which is not unusual for a species that feeds by diving in offshore waters. Time budget analyses by Gremillett *et al.* (2003) found that wintering Cormorant spent approximately 60% of daylight hours in the water. Therefore, this would suggest a mean density of feeding Cormorant in Cork Harbour of 6.6 birds/km^2.

Table 5.4 - Cormorant night roost counts, Cork Harbour.

Roost	Roost counts					Habitat (km^2)	Density (birds/km^2)
	2013	2014	2016	2017	mean		
Drake's Pool, Owenboy Estuary	19	18	19	19	19	1.6	12
Monkstown Creek	151	169	200	203	181	17.0	11
Glanmire Wood, Glashaboy Estuary	109	86	118	109	106	3.2	33
Fota Island	76	111	110	84	95	8.0	12
Bagwell's Hill, North Channel and East Ferry Channel	49	93	105	79	82	4.7	17
Rostellan Lake and Siddon's Tower, Saleen Creek	57	40	63	30	48	10.3	5
Finure	no count	27	0	30	19	3.2	6
Totals	461	544	618	551	544	48	11

Counts carried out on 07-08/12/2013, 02-03/11/2014, 27/11/2016 and 04/11/2017. The North Channel roost was not counted in December 2013 and the Rostellan Lake roost was not counted in November 2016. The birds at the Drake's Pool roost in November 2016 birds flushed and abandoned roost before dusk, so may have been double-counted elsewhere. Data source: Gittings (2018).

Grey Heron

5.28 Grey Heron is widely distributed throughout the harbour but occurs in the highest numbers in the lower harbour. As a result, only around 50-75% of the birds counted in the WSP counts were within the SPA. Small numbers (up to five birds) occur at various high tide shoreline roosts. However, the roost on the ADM jetty at the mouth of Monkstown Creek regularly holds larger numbers (15-25 birds). Herons also regularly roost on trees adjacent to the water, including along the shores of Fota Island, in Ballyannan Wood, in Marlogue Wood at the southern end of the East Ferry Channel and in Currabinny Wood on the southern shore of Lough Beg. These roosts may be particularly used at night, but the herons appear to move into the trees at this time and are not often visible. Some of these roosts are also heronries where breeding takes place in spring/early summer.

Little Grebe

5.29 Little Grebe occur in estuarine areas and lagoons around Cork Harbour. The most favoured areas are the East Harbour and the Fota Channel. In the East Harbour, they mainly occur on Rostellan Lake, with a few birds usually present at the mouth of Saleen Creek. In the Fota Channel, they mainly occur upstream of Fota Island, particularly in Slatty Pool and the Harper's Island borrow dyke, with a few birds often present downstream of Fota and/or between the railway line and Great Island. During the WSP counts, around 90% of the birds were recorded within the SPA, with Cuskinny Marsh being the only non-SPA area of significance for this species.

5.30 During the day, groups of 10-20 roosting Little Grebe can sometimes gather in favoured areas (Rostellan Lake, the section of the Fota Channel between the N25 and Fota Island, and Harper's Island). It is not known whether they congregate to form nocturnal roosts, but no such roosts have been observed in any of the open water areas around the harbour.

Great Crested Grebe

5.31 Great Crested Grebe feed and roost exclusively in subtidal habitat. They typically feed in waters of depths less than 4 m (Cramp and Simmons, 2004). Therefore, the potential extent of suitable habitat in Cork Harbour can be broadly defined by the 5 m depth contour on the Admiralty charts. However, they do not occupy all the available habitat within this depth zone in Cork Harbour and do not usually occur in the upper estuarine areas. Therefore, Cork Harbour can be divided into four discrete sectors of grebe habitat: Lough Mahon and the Fota Channel; the North Channel from Rossmore to Rathcoursey; the open water in the East Harbour between Great Island, Whitegate, Aghada and Saleen; and the open water in the West Harbour from Haulbowline and around Spike Island to Lough Beg and Crosshaven (Figure 5.5).

5.32 Great Crested Grebes in Cork Harbour roost communally at night. In each of the four sectors of grebe habitat, there are primary roost locations, where all, or most of, the grebes from that sector usually roost each night (Figure 5.5). There are also a number of secondary roost locations, which are used less frequently, and/or by smaller numbers of grebes (Figure 5.5). In the East Harbour sector, the E2 roost is the main roost used at the start of the season, with birds gradually switching to the E1 roost as the winter progresses.

5.33 Accurate daytime counts of grebes in Cork Harbour are difficult to achieve, but dusk roost counts provide a reliable index of grebe numbers in each of the four sectors of grebe habitat (Gittings, 2017). The East Harbour sector supports the highest numbers of grebes, followed by the Lough Mahon/Fota Channel sector (Table 5.5). The North Channel and West Harbour sectors generally support lower numbers and appear to be occupied later in the winter. The distribution of roosting grebes between the sectors was broadly similar to the distribution of foraging habitat, although the East Harbour sector held relatively higher densities compared to the North Channel and West Harbour sectors (Table 5.6). The overall density apparently supported by the night roosts (5-7 birds/km^2) is around twice the mean density of feeding grebes recorded in the WSP counts (3 birds/km^2), which probably reflects the fact that, at any one time during the day, up to 50% of the grebes are roosting.

5.34 During the WSP counts, around 75% of birds counted occurred within the SPA. However, this significantly overestimates the occupancy of the SPA for this species due to the limited coverage of the East Harbour sector. Based on the grebe distribution between sectors recorded in the roost counts, and the proportion of grebe habitat within the SPA in each sector, the SPA only holds around 30% of the total Cork Harbour population.

Table 5.5 - Mean (and ranges) of dusk roost counts of Great Crested Grebes at Cork Harbour.

Sector	Parameter	2014/15	2015/16		2016/17	
		Jan-Feb	Oct-Nov	Jan-Feb	Oct-Nov	Jan-Feb
East Harbour	mean	105	93	79	86	109
	range	(95-114)	(76-120)	(54-103)	(49-119)	(98-120)
	n	3	8	4	4	2
Lough Mahon/Fota Channel	mean	33	35	50	54	35
	range	(20-42)	(24-50)	(41-64)	(42-64)	(28-47)
	n	4	4	3	3	3
North Channel	mean	39	8	26	8	9
	range	(35-44)	(4-12)	(26-27)	-	-
	n	3	2	3	1	1
West Harbour	mean	35	5	39	16	46
	range	(30-39)	(3-9)	(35-45)	(11-21)	(44-47)
	n	3	3	3	2	2
Total		212	142	194	164	199

Data source: Gittings (2017).

Table 5.6 - Comparison of distribution of Great Crested Grebes in Cork Harbour with the availability of grebe foraging habitat.

Sector	% of grebe habitat		% of grebe population
	subtidal	intertidal and subtidal	
East Harbour	42%	37%	53% (41-66%)
Lough Mahon/Fota Channel	21%	23%	23% (16-33%)
North Channel	10%	15%	9% (5-18%)
West Harbour	27%	25%	15% (10-23%)

Data source: Gittings (2017).

Waders

General distribution patterns

5.35 Oystercatcher, Curlew and Redshank are widely distributed around the harbour. The highest numbers occur in one or more of the Inner Harbour, Fota Channel and North Channel zones, probably reflecting the distribution of preferred muddy intertidal habitat. Black-tailed Godwit shows a broadly similar distribution patterns. However, they show a high concentration in the Fota Channel zone in the I-WeBS dataset, but this is not reflected in the WSP low tide count dataset, probably reflecting observed movement patterns of birds from the Inner Harbour and North Channel zones to high tides roosts in the Fota Channel zone. Oystercatcher, Curlew and Black-tailed Godwit also feed on fields around the harbour and, in mid-winter, the numbers of birds feeding on the fields may be higher than those feeding in the intertidal zone. The field feeding birds return to the estuaries to roost at night.

5.36 During the WSP counts, most of these species occurred almost exclusively within the SPA. However, Oystercatcher had a slightly lower occupancy of the SPA, reflecting the more dispersed distribution of this species which extends out to mixed sediment and littoral rock shores in the lower and outer harbour. The WSP counts will also have significantly exaggerated the SPA occupancy for Oystercatcher, Golden Plover, Lapwing, Curlew and Black-tailed Godwit as there was only limited coverage of field feeding areas during the counts.

5.37 Golden Plover and Lapwing mainly feed on fields and use the estuaries for roosting. These species are primarily associated with the Inner Harbour and Fota Channel zones, and Golden Plover is rarely recorded away from these areas.

5.38 Grey Plover is currently a scarce species of somewhat erratic occurrence in Cork Harbour. The main areas for this species are the Belvelly area in the Fota Channel and North Channel zones and Lough Beg in the West Harbour zone.

5.39 Bar-tailed Godwit shows a very concentrated distribution pattern in Cork Harbour, with the vast majority occurring in the Inner Harbour, where they feed on the extensive mudflats in Lough Mahon at low tide, and roost in the Douglas Estuary at high tide. Small numbers occur quite regularly at Lough Beg in the West Harbour zone.

High tide roosts

5.40 The distribution of high tide wader roosts in Cork Harbour is shown in Figure 5.6. The majority of the roost sites, and nearly all of the major roost sites, occur in the upper harbour at the Douglas Estuary, Dunkettle, the Glounthaune Estuary/Slatty Water and along the North Channel to Rathcoursey. Clusters of smaller roosts occur in the East and West Harbour zones at the Owenboy Estuary, Lough Beg, Monkstown Creek, Saleen Creek and Whitegate Bay. There are very few, or no, roosts along the Passage West channel, the southern shore of Great Island, the East Ferry Channel, the coastline between Saleen and Whitegate, and in the Outer Harbour (excluding Ringabella Creek).

Gulls

5.41 Black-headed Gulls occur throughout the harbour. In autumn, particularly large numbers occur in Fota Channel and the East Harbour but they are common in all parts of the harbour. Common Gulls occur mainly in the East Harbour and West Harbour, particularly in the Lough Beg subsite, with only low numbers elsewhere in the harbour. Lesser Black-backed Gulls occur mainly in the Inner Harbour and the West Harbour and the Outer Harbour.

5.42 During the WSP counts, most Black-headed Gulls were recorded within the SPA, with slightly lower SPA occupancy being recorded for Common Gull and Lesser Black-backed Gull, reflecting the distribution of the latter species in the lower harbour. The WSP counts will have overestimated the occupancy of the SPA due to lack of coverage of significant areas of subtidal habitat. Large numbers of gulls can occur in subtidal habitats in the lower harbour: e.g., in the autumn and early winter of 2016, when there were exceptional levels of juvenile fish and sprat in the harbour, 500-1000 Black-headed Gulls were regularly present in the East Harbour zone feeding over open water between Great Island and Aghada.

5.43 Gulls often occur at high tide wader roosts but can also roost on open water. At low tide, gulls may form roosts in intertidal areas. The numbers of gulls in Cork Harbour increase at night when large numbers commute to the harbour to roost from inland feeding grounds. The main Black-headed Gull nocturnal roost occurs in the Inner Harbour where tens of thousands roost off the Mahon peninsula. This is also a major Lesser Black-backed Gull nocturnal roost. There are a number of other Black-headed Gull nocturnal roosts around the harbour, while a significant Common Gull nocturnal roost occurs in the open water off Lough Beg.

Distribution (Common Tern)

5.44 The Cork Harbour Common Tern population is distributed between a variable number of breeding colonies in the Fota Channel and West Harbour zones (Figure 5.7). In recent years, the most important colonies have been on the Marino Point Martello Tower in the Fota Channel and the Port of Cork deepwater quay in the West Harbour (means of 41 and 58 apparently occupied nests, 2013-2017; O'Mahony and Smiddy, 2017). Other sites occupied in some recent years are the Raffeen Golf Club lagoon, the rocky island in Lough Beg and the Ballybricken Point ADM jetty (O'Mahony and Smiddy, 2017).

5.45 Between late July and early September, post-breeding roosts of Common Terns occur in the western part of the harbour, although these may be supplemented by migrant birds (Figure 5.7). The main roost usually occurs in Lough Beg where birds roost on the intertidal in the outer part of the lough at low tide and on the rocks around the peninsula at the mouth of the lough, or on the island, at high tide. Peak annual dusk roost counts here in recent autumns were 200 in 2016, 45 in 2017 and 400 in 2018[3] (T. Gittings, unpublished data). Other roosting sites include the ADM jetty (up to 80 birds; T. Gittings, unpublished data) and small numbers at the Cork Harbour Marina at Monkstown, the CMRC pontoons and the western shore of Spike Island.

5.46 Feeding terns occur widely throughout most of the harbour, although they are rarely recorded in the Outer Harbour zone during the breeding season. Typical foraging range distances from breeding colonies are 4.5 km (mean), 15.2 km (mean max) and 20 km (max) (Thaxter *et al.*, 2012). This suggests that the core foraging areas for the Cork Harbour Common Tern population are in the western side of the harbour (Figure 5.7), although the entire harbour is likely to be used at times.

5.47 The Port of Cork colony is outside the SPA, while the other three colonies are inside the SPA. The main roost at Lough Beg is also inside the SPA. Feeding terns are not restricted by water depth. As most of the subtidal habitat in the vicinity of the colonies is outside the SPA, it is likely that the occupancy of the SPA by feeding terns is relatively low.

[3] Note that these are counts of Commic Terns (Common/Arctic Terns) although the majority of birds will have been Common Terns.

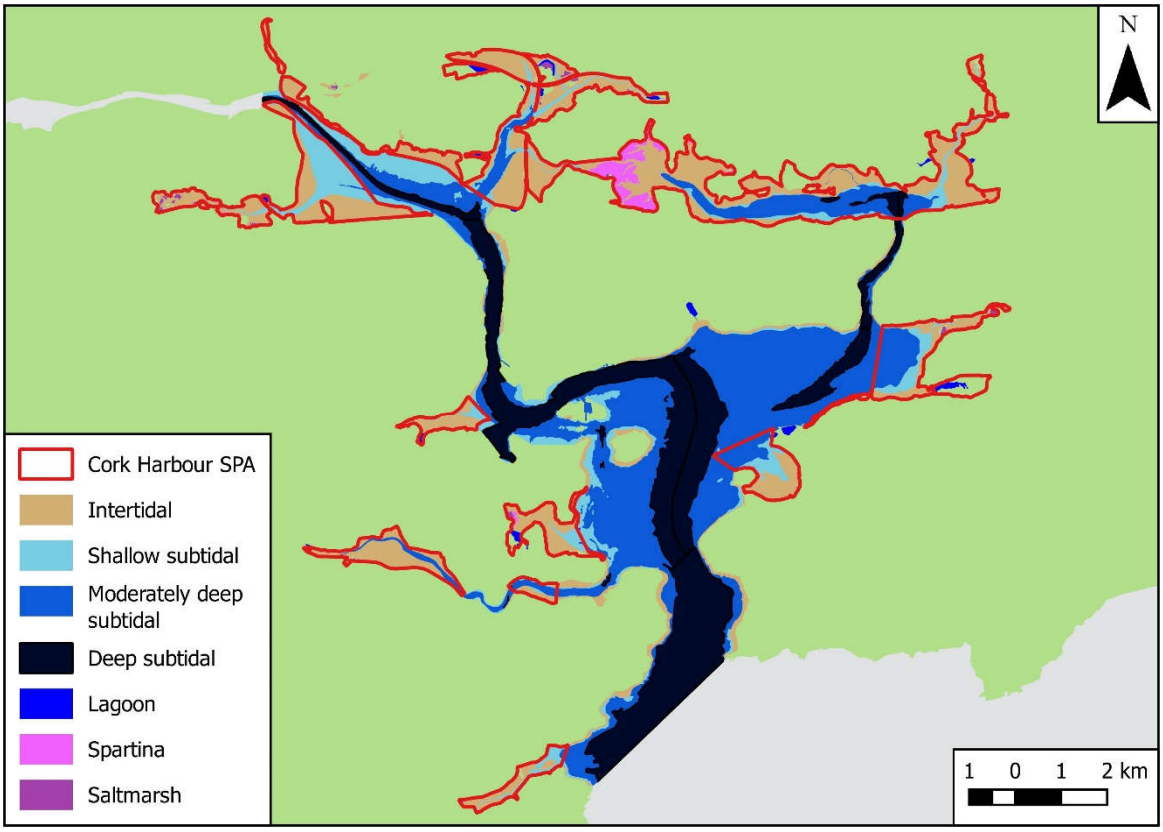


Figure 5.1 – Waterbird habitats in Cork Harbour.

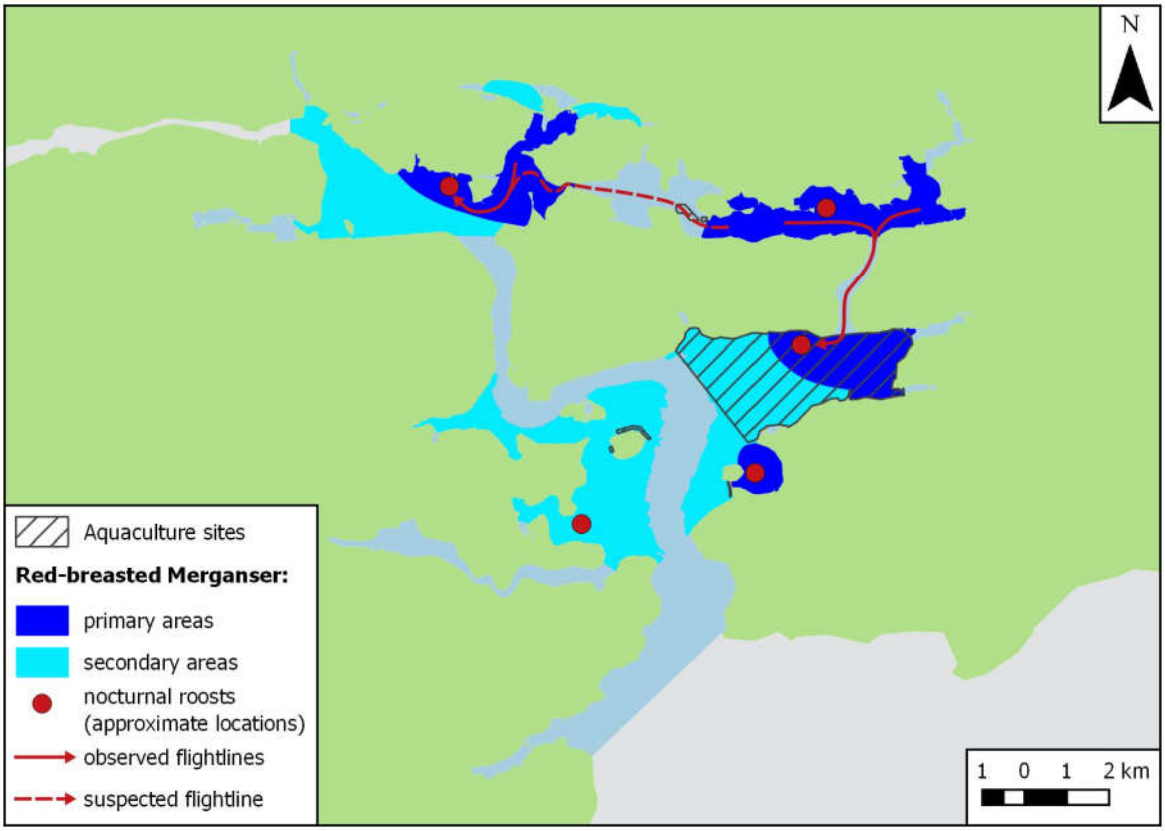


Figure 5.2 – Distribution of Red-breasted Merganser habitat and nocturnal roost locations in Cork Harbour.

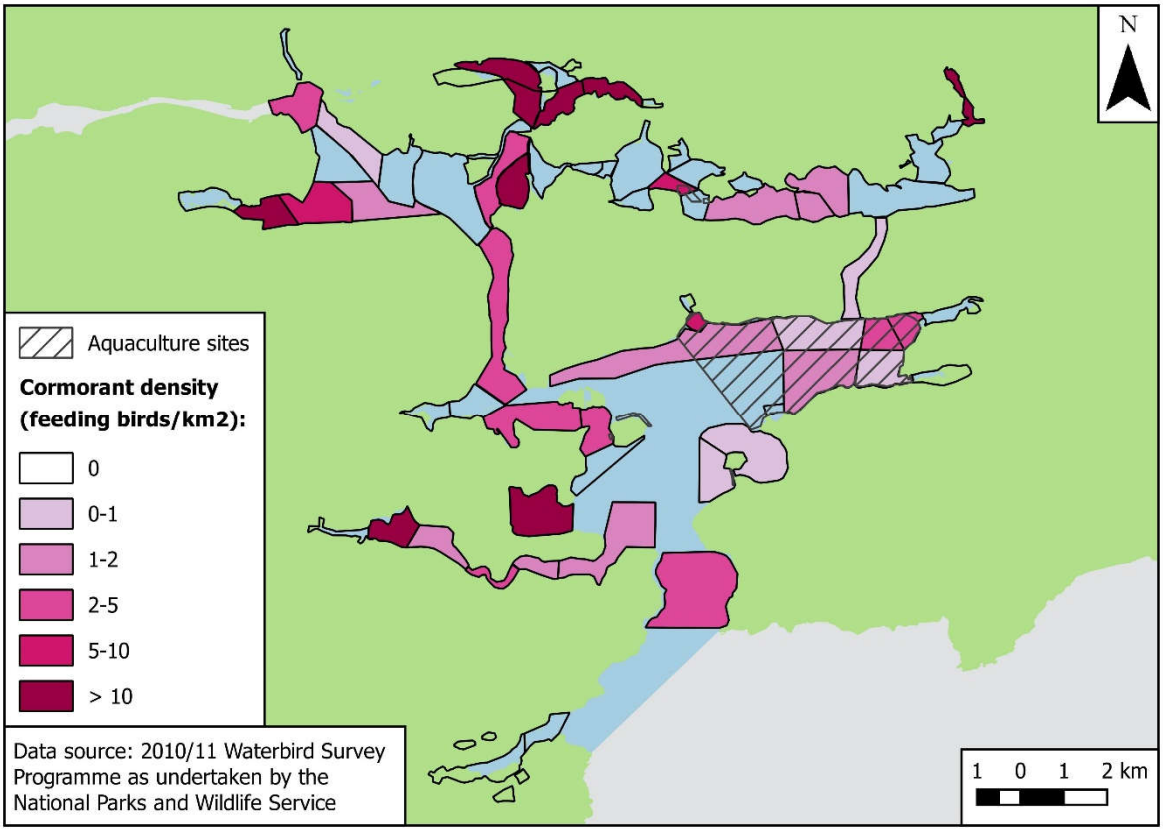


Figure 5.3 - Mean densities of feeding Cormorant recorded during the 2010/11 WSP low tide counts.

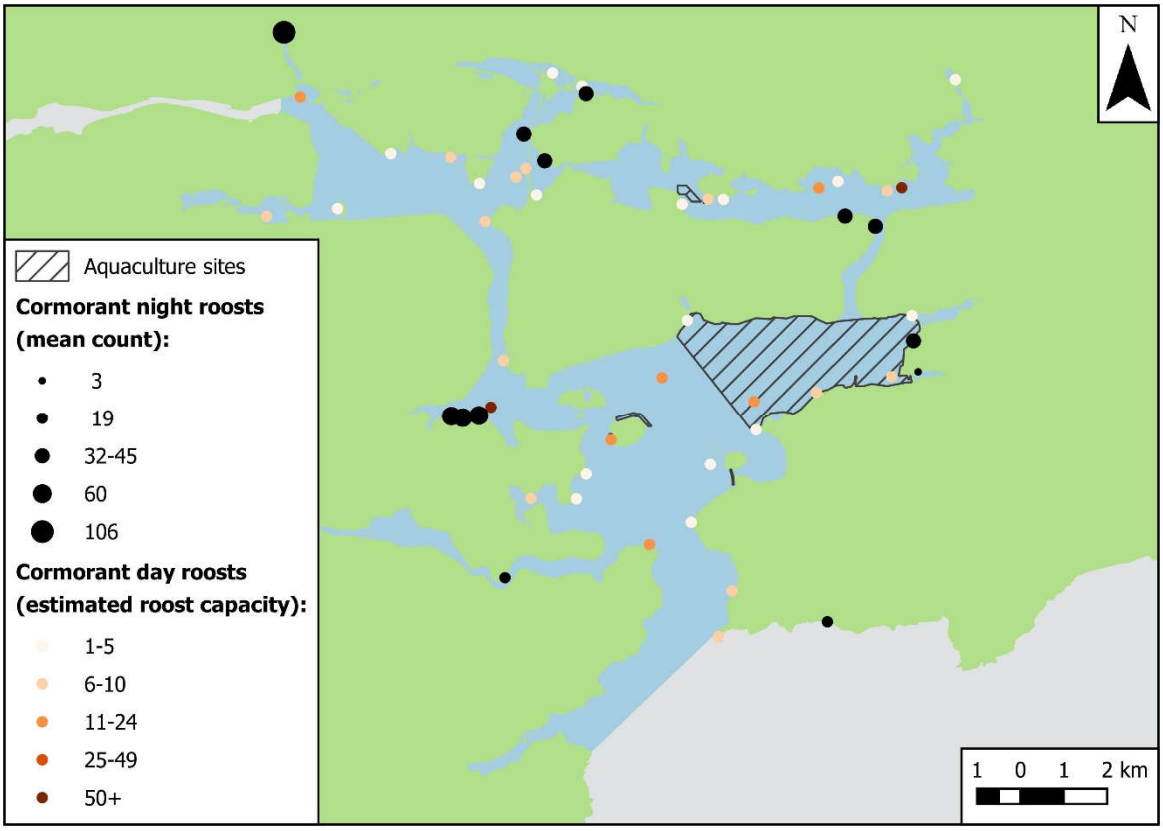


Figure 5.4 – Cormorant roost sites in Cork Harbour.

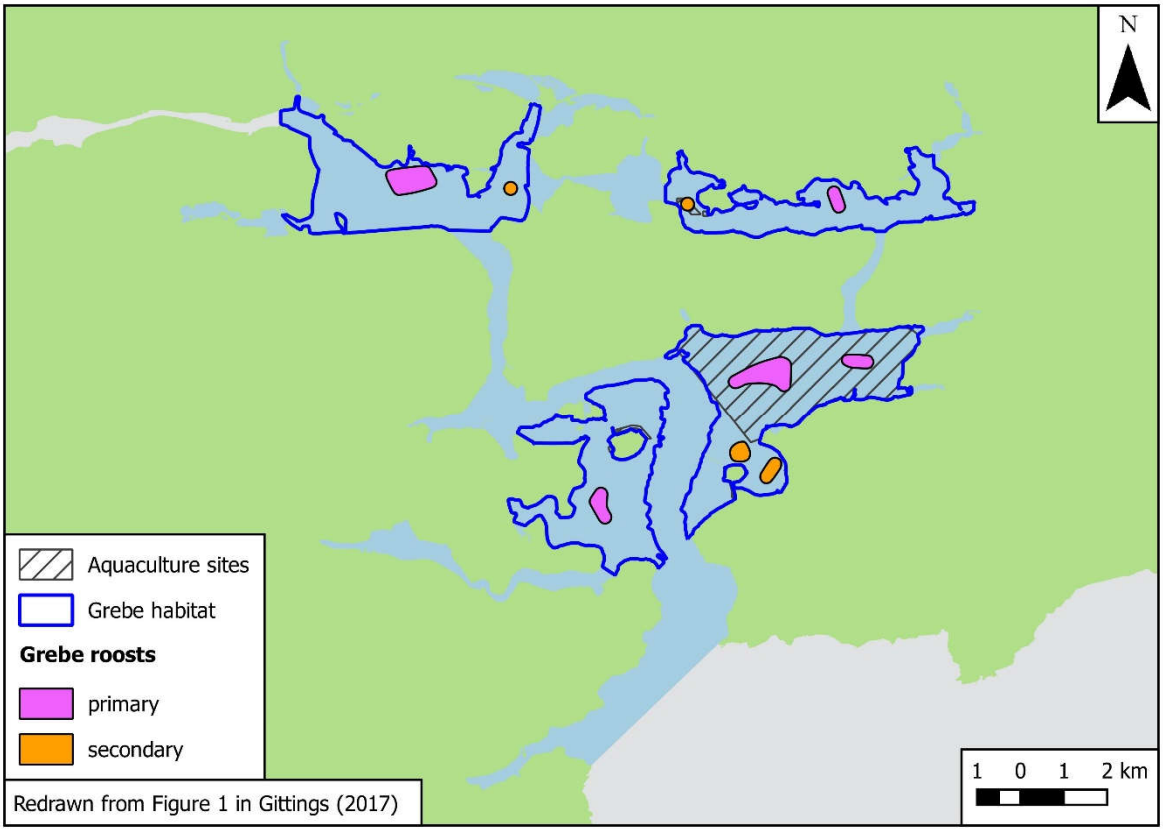


Figure 5.5 – Distribution of Great Crested Grebe habitat and nocturnal roost locations in Cork Harbour.

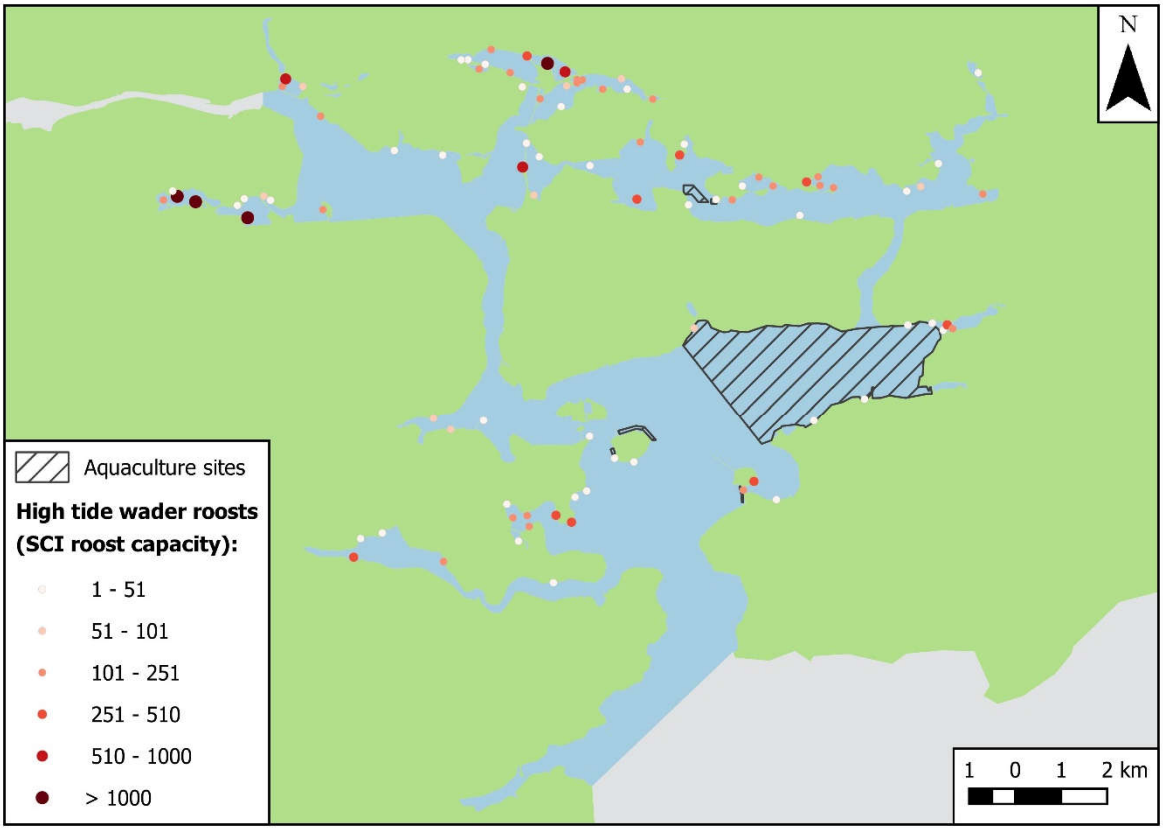


Figure 5.6 – High tide wader roost sites in Cork Harbour.

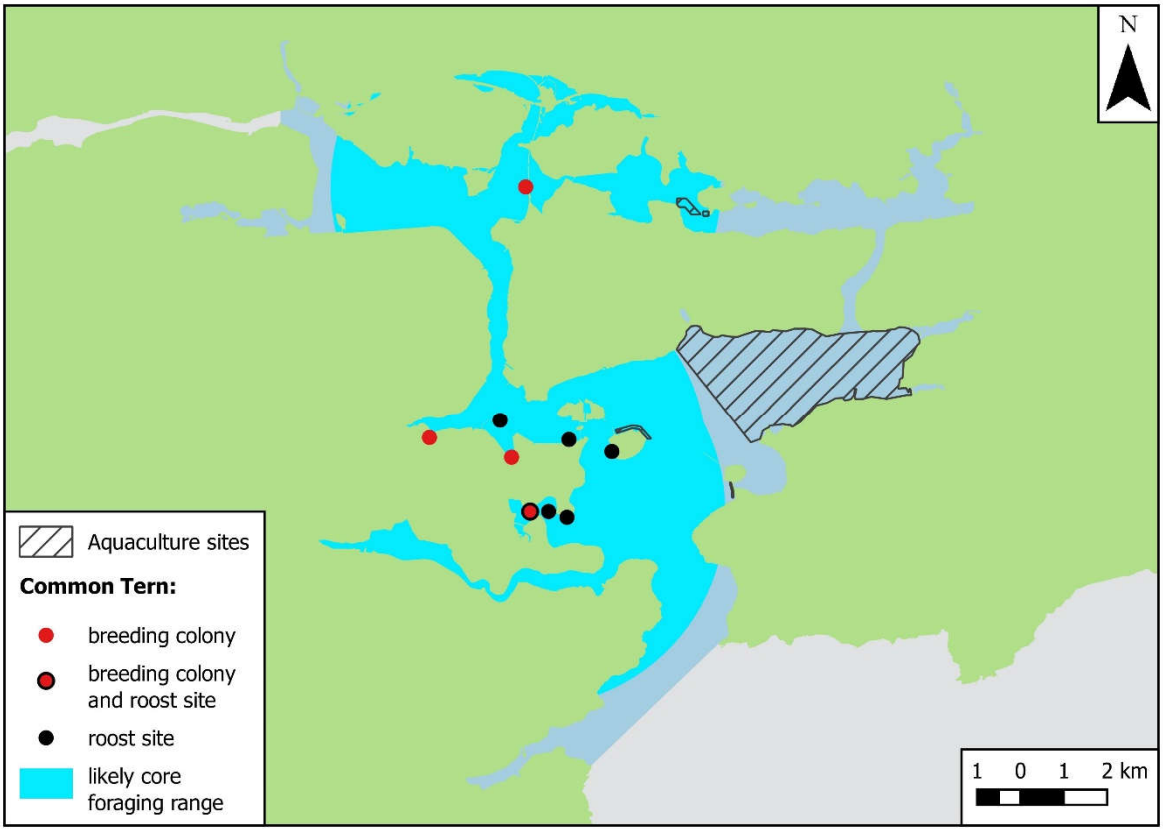


Figure 5.7 – Common Tern breeding colonies and roost sites in Cork Harbour.

6. Aquaculture activities within Cork Harbour

Scope of activity

6.1 A total of six aquaculture sites, covering a total area of 922 ha, occur within Cork Harbour. These include two sites in the North Channel with a total area of 11 ha, and four application sites in the lower harbour with a total area of 911 ha. The distribution of these aquaculture sites is shown in Figure 6.1 and summarised in Table 6.1. Five of the six sites are small (1-9 ha) sites where suspended oyster cultivation using the bag and trestle method (oyster trestle cultivation) currently takes place, or is proposed, but only two of these sites are within the Cork Harbour SPA. The sixth site is a very large site covering most of the East Harbour zone and bottom mussel cultivation is proposed for this site. Around 20% of this site is within the Cork Harbour SPA.

6.2 In addition to the aquaculture sites, there are four areas within Cork Harbour covered by Fishery Orders (Figure 6.2). These areas are not the subject of the present assessment, but are included within the in-combination assessment (Chapter 9).

Table 6.1 – Aquaculture sites in Cork Harbour.

Site	Location	Type	Activity	Area (ha)	
				Total	within SPA
T05/294A	North Channel	Application*	Oysters (bag and trestle)	9.48	9.43
T05/294B	North Channel	Renewal	Oysters (bag and trestle)	1.3	1.1
T05/522A	East Harbour	Application	Bottom mussels	903	190
T05/546A	Spike Island	Application	Oysters (bag and trestle)	6.0	0
T05/546B	Spike Island	Application	Oysters (bag and trestle)	1.1	0
T05/546C	Corkbeg	Application	Oysters (bag and trestle)	0.8	0

* T05/294A is an application for a revised site boundary to replace the existing licensed site 294A.

Oyster trestle cultivation

6.3 Oyster trestle cultivation has taken place in the North Channel and the East Harbour since at least the 1990s. In the North Channel oyster trestle cultivation has taken place in the old site 294A as well as in other areas within the Rossmore Fishery Order. In the East Harbour, oyster trestle cultivation has taken place along the shoreline between Rostellan and the mouth of Saleen Creek within the East Harbour Fishery Order. The only recently active area of cultivation is in site 294A and there has been no oyster trestle cultivation activity in the East Harbour for many years.

6.4 Site 294A currently holds around 2 ha of trestles. These are located in the tidal channel at the north-western end of the site and are unusual compared to other typical oyster trestle cultivation sites because the sediment under the trestles is not exposed even on spring low tides, although the bags are exposed. The current annual production levels are 50-100 tonnes. The aim is to expand the trestles, as well as to use floating bag cultivation in the deeper parts of the site, to increase production to 700 tonnes/year. It is also proposed to cultivate native red seaweeds (*Porphyra* sp. and *Palmaria palmata*) with a production target of 2 tonnes/year. Site 294B is held by the same operator and may be included in the above plans.

6.5 Sites 546A-C are new applications in areas where there has been no previous oyster trestle cultivation. The operator aims to produce 240 tonnes/year in these sites.

6.6 The combined production target of 940 tonnes across all the oyster trestle cultivation sites equates to 50 tonnes/ha and the actual production density will be higher as not all parts of the sites will be occupied by trestles. This appears to be an ambitious target relative to production levels at other sites: e.g., at Dungarvan Harbour mean production over the last ten years of around 1800 tonnes from around 110 ha of trestles represents a production density of around 17 tonnes/ha.

6.7 The aquaculture profile provides the following information about the oyster trestle cultivation husbandry methods and associated details:

> *Pacific oysters are predominantly grown in trestles and bags. Trestles are typically 0.6 m-1 m in height, 3 metres long and carry 5-6 bags, but this can vary.*
>
> *Seed is generally imported in the spring and in the autumn of each year, or as half grown. The intake size ranges, packed in oyster bags at a predetermined density and taken to the inter-tidal zone, where the bags are attached to trestles for the growing process to begin.*
>
> *Packing densities of seed is individually determined by each producer.*
>
> *Oysters are thinned out and graded as the oysters grow. As the oysters grow, they are taken to a handling / sorting facility or foreshore area for splitting and re-packing, and returned to the trestles. The seed will be split following a few months once growth starts. Producers generally split the oysters either once or twice over the growth cycle. Again the density following splitting varies from producer to producer.*
>
> *Producers generally turn each bag on site once a month. Turning takes place when the oysters are growing. This means turning takes place from March up to Oct/Nov depending on growth. Both spring tides of each month are generally used by producers to get out to their sites.*
>
> *The trestles are arranged in rows and blocks on site. Rows are often set out in pairs with sufficient gap between pairs for flat-bottomed vessels or tractors to pass, allowing servicing.*
>
> *The sites will either be accessed by boat from a nearby pier or by tractor across the foreshore.*

6.8 In relation to sites 294 A and 294B, husbandry activity averages 14 days per month, and four hurs per day (David Millard, BIM, pers. comm.).

Bottom mussel cultivation

6.9 There is one application site for bottom mussel cultivation. This site covers most of the East Harbour zone, extending from the western side of Cuskinny Bay and the Long Point east to Rostellan and the mouth of Saleen Creek.

6.10 It is proposed to use natural mussel seed fished from around Spike Island to stock this site. This mussel seed would then be placed on the bottom for approximately 12 months until harvested by dredge.

6.11 If this application is permitted, it is proposed to begin trials with an initial annual production target of 500 tonnes, building up to an annual production of 4,000 tonnes if the trials are successful.

6.12 No further details are available about this proposed activity. However, the production targets indicate very intensive levels of activity. Wexford Harbour, which has the largest mussel fishery in

Ireland, has mean annual production levels of around 2,000-9,000 tonnes (Gittings and O'Donoghue, 2016c).

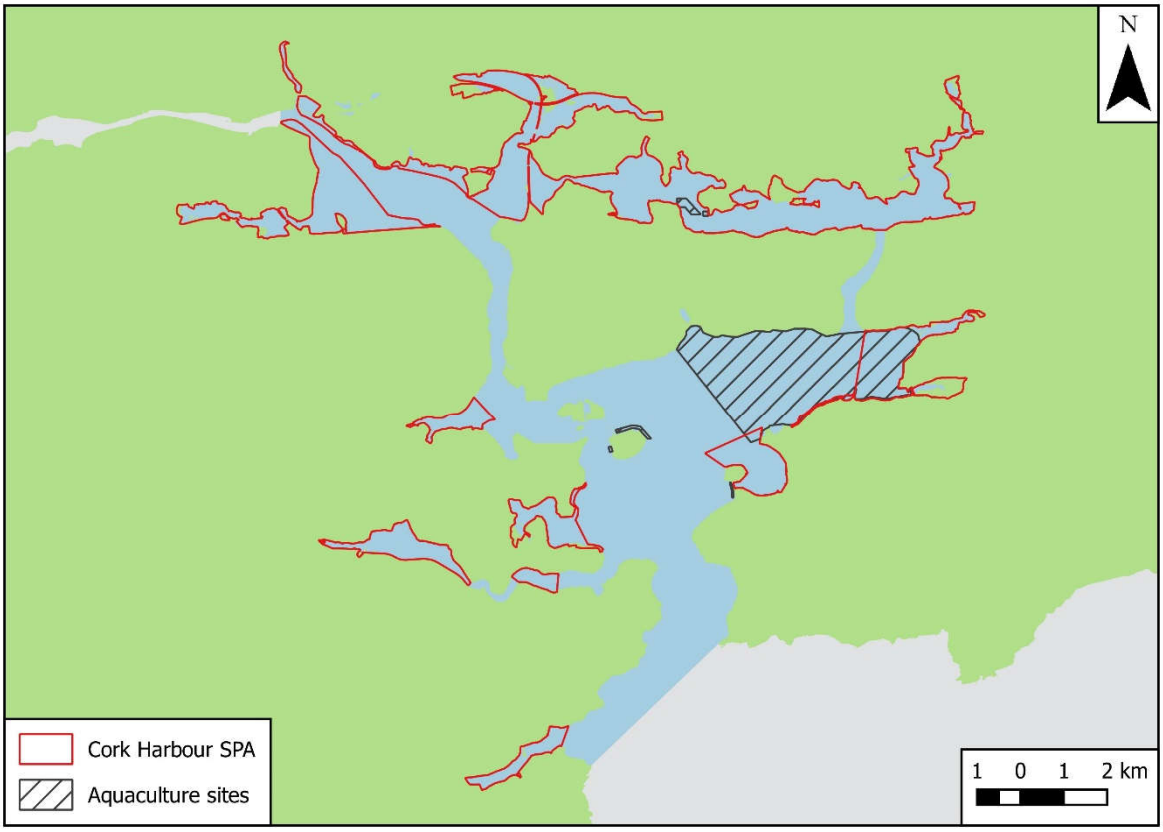


Figure 6.1 – Aquaculture sites in Cork Harbour.

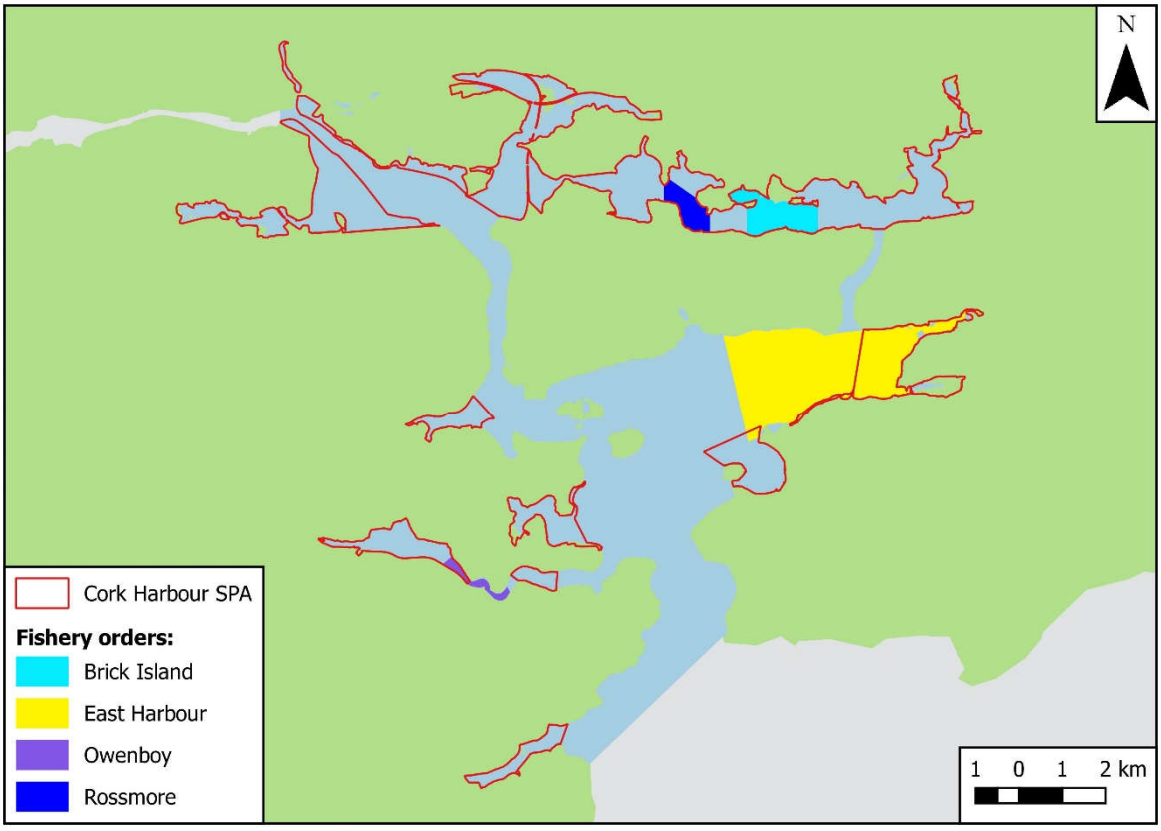


Figure 6.2 - Fishery Order areas within Cork Harbour.

7. Assessment of oyster trestle cultivation activity

Introduction

7.1 This section presents a detailed assessment of the potential impacts of the existing and proposed oyster trestle cultivation activities in Cork Harbour on the SCI species covered by this assessment.

7.2 Husbandry activity takes place in a 3-4 hour period around low tide. Therefore, husbandry activities will not cause any disturbance impacts outside the low tide period and will not cause impacts to any high tide roosts.

7.3 Parts of the North Channel oyster trestle cultivation sites will be used for floating bag cultivation of Pacific Oysters, while the trestles will also be used for seaweed cultivation. These activities are likely to have similar (seaweed cultivation) or lesser (floating bag cultivation) impacts on waterbirds, so for the purposes of this assessment all of the North Channel oyster trestle cultivation sites are treated as though they will be used for oyster trestle cultivation.

Potential impacts

Habitat structure

7.4 Oyster trestle cultivation causes a significant alteration to the three-dimensional structure of the tidal habitat (which includes the air and water space occupied by birds feeding on the habitat) through the placement of physical structures (oyster trestles) on substrate. This alteration may alter the suitability of the habitat for waterbirds by interfering with sightlines and/or creating barriers to movement. Based on the characteristics of species showing positive/neutral or negative responses to trestles, we have hypothesised that trestles may interfere with flocking behaviour causing species that typically occur in large, tightly packed flocks to avoid the trestles. Trestles could also interfere with the visibility of potential predators causing increased vigilance and reduced foraging time (Gittings and O'Donoghue, 2012, 2016b).

Food resources (benthic fauna)

7.5 Oyster trestle cultivation may cause impacts to benthic invertebrates and this could potentially affect food resources for waterbird species.

7.6 In a review of the literature, Dumbauld *et al.* (2009) found variation in the effects of intertidal oyster cultivation on the benthic fauna. In studies in England, France and New Zealand, intertidal oyster cultivation caused increased biodeposition, lower sediment redox potential and reduced diversity and abundance of the benthic fauna. However in studies in Ireland and Canada, few changes in the benthic fauna were reported, due to high currents preventing accumulation of biodeposits.

7.7 The Irish study referred to above was carried out at Dungarvan Harbour (De Grave *et al.*, 1998). This study compared an oyster trestle block (in the north-eastern section of the main block of trestles) with a control site approximately 300 m away, with both areas being at the mean tide level. Within the trestle block areas underneath trestles and areas in access lanes were compared. The study found no evidence of elevated levels of organic matter or high densities of organic enrichment indicator species within the trestle blocks. There were minor differences in the benthic community between the control area and the areas sampled under the trestles (higher densities of *Nephtys*

hombergii, *Bathyporeia guiiliamsoniana*, *Gammarus crinicomis*, *Microprotopus maculatus* and *Tellina tenuis* including increased abundance of *Capiteila capitata* in the latter area), but these were considered to be probably due to increased predation by epifaunal decapods and fishes. There appeared to be stronger changes in the benthic community in the access lanes with increased densities of three polychaete species (*Scolopos armiger*, *Eteone longa* and *Sigalion mathildae*) and higher overall diversity, and these changes were considered to be due to the compaction of the habitat by vehicular traffic.

7.8 In more recent work commissioned by the Marine Institute, Forde *et al.* (2015) looked at benthic invertebrates along access tracks, under trestles and in close controls at a four sites along the west and south coasts of Ireland. There was a strong site effect from the study in that significant differences were observed using a variety of invertebrate response (dependent) variables among the sites. Access routes were considered more disturbed than trestle and control locations; most likely due to the influence of compaction from regular vehicle movements. Abundance (among other variables) was significantly higher in control and trestle samples when compared with those derived from access routes. No noticeable difference between control and trestle samples was detected. This research indicates that oyster trestle cultivation in typical Irish sites is unlikely to have had major impacts on food resources for waterbirds that feed on benthic fauna.

Food resources (fish and other nekton fauna)

7.9 Dumbauld *et al.* (2009) reviewed studies of the effects of bivalve shellfish aquaculture on nekton (fish and mobile invertebrates such as crabs). There was only one study that specifically examined intertidal oyster cultivation using bags and trestles (Laffargue *et al.*, 2006). This study found that, in an experimental pond mesocosm, sole used the oyster trestles as resting areas during the day, moving out into the open areas (which simulated tidal flats) to forage at night and the authors considered that the "*oyster trestles offered cover, camouflage, and safety and were therefore attractive to sole (as artificial reef-structuring effects)*". Similarly, De Grave *et al.*, (1998) noted that the trestles in their Dungarvan Harbour study site acted as refuges for scavenging crabs and shrimps. There were also a number of studies reviewed by Dumbauld *et al.* (2009) of related types of oyster cultivation (included suspended culture in subtidal waters, rack and bag systems, longlines and oyster grow-out cages). These all involve placing physical structures in the intertidal or subtidal waters and the potential impacts from organic enrichment and benthic community changes associated with oyster cultivation, so provide some degree of analogous situations to intertidal oyster cultivation using bags and trestles. These have generally found either little differences between oyster cultivation areas and nearby uncultivated habitats, or higher densities of nekton in the oyster cultivation areas.

Disturbance

7.10 Oyster trestle cultivation requires intensive husbandry activity and this may cause impacts to waterbirds using intertidal and/or shallow subtidal habitats through disturbance. Disturbance will not affect high tide roosts, or waterbirds that mainly, or only, use trestle areas when they are covered at high tide (such as Red-breasted Merganser, Cormorant and Great Crested Grebe), because no husbandry activity takes place during the high tide period.

7.11 There is a very extensive literature on the impact of disturbance from human activity on waterbirds. However, the trestle study (Gittings and O'Donoghue, 2012, 2016b) examined the combined potential effects of habitat alteration and disturbance from husbandry activity. The sites included in the study included some with very high levels of husbandry activity. Therefore, it is not necessary to consider the disturbance component of the potential impacts separately for the species covered by the trestle study.

Waterbird responses

Trestle study

7.12 The results of the trestle study (Gittings and O'Donoghue, 2012, 2016b) allowed us to categorise the nature of the association between oyster trestles and bird distribution patterns for many of the species included in this assessment.

7.13 Grey Plover appear to be completely excluded from areas occupied by oyster trestles. This was first demonstrated in the data from the trestle study and has been further supported by subsequent monitoring work at Dungarvan Harbour (Gittings and O'Donoghue, 2015, 2018a, 2018b).

7.14 Dunlin and Bar-tailed Godwit both showed strong avoidance of oyster trestles in the data from the trestle study. For Bar-tailed Godwit, this avoidance was further supported by subsequent monitoring work at Dungarvan Harbour (Gittings and O'Donoghue, 2015, 2018a, 2018b). However, the monitoring work at Dungarvan Harbour has shown a more complex picture for Dunlin with distribution patterns in relation to the presence of oyster trestles being complicated by apparent variation in the distribution of food resources.

7.15 Mallard and Lesser Black-backed Gull were also classified as having a negative response to trestles. However, this was based on limited data. In the case of Lesser Black-backed Gull, this largely reflected apparent avoidance of trestles by roosting flocks, rather than impacts on feeding birds.

7.16 The trestle study only produced limited data for Wigeon, with a neutral/positive patterns of association at one site, and negative pattern at another site. This species can feed on the algae that attaches to the trestle bags.

7.17 Curlew, Black-headed Gull and Common Gull also showed a variable response pattern in the trestle study with neutral/positive patterns of association at some sites, and negative patterns at other sites[4].

7.18 Oystercatcher and Redshank were classified as having an overall neutral/positive pattern of association with oyster trestles. Oystercatcher often feeding the trestles, where depending on the mesh size of the bags, they can extract oysters through the mesh when the shells are gaping on ebb and flood tides.

Species not covered by the trestle study

7.19 The other intertidal/shallow subtidal species included in this assessment are: Shelduck, Teal, Pintail, Shoveler, Grey Heron, Golden Plover, Lapwing, Black-tailed Godwit and Greenshank. These species were not recorded in sufficient numbers in the trestle study to carry out formal analyses of their association with trestles across sites. This reflects that fact that these species tend to occur on muddier sediments, unlike the sandier sediments typically used for intertidal oyster cultivation. However, for Shelduck, Lapwing and Black-tailed Godwit, the trestle study found some weak evidence of negative (Shelduck, Lapwing and Black-tailed Godwit), or positive (Grey Heron) association with trestles, from ordination analyses and/or qualitative assessment of count data (Gittings and O'Donoghue, 2012). For Golden Plover, we have some evidence of a negative association with trestles from other work (Gittings and O'Donoghue, 2015 and unpublished data).

[4] Note that Curlew was classified as having a neutral/positive pattern of association in Gittings and O'Donoghue (2012), but, based on further analysis of the dataset, was re-classified as variable in Gittings and O'Donoghue (2016b).

7.20 Shelduck are large ducks that stand over 0.5 m tall. Therefore, trestles may impede their movements while foraging as, unlike smaller waders, they will not be able to freely move under the trestles.

7.21 Golden Plover and Lapwing mainly use intertidal areas for roosting. Golden Plover typically roost in large expanses of open mudflat or sandflat, while Lapwing use more varied substrates for roosting, including mixed sediments and rocky shores. It is very unlikely that Golden Plover would roost within trestle blocks but one could imagine that Lapwing might roost on trestles. Monitoring work at Dungarvan Harbour has provided some evidence that roosting Golden Plover flocks avoid trestles (Gittings and O'Donoghue, 2015 and unpublished data).

7.22 Black-tailed Godwit is behaviourally and ecologically similar to Bar-tailed Godwit, as indicated by the fact that small numbers of Bar-tailed Godwits often associate with Black-tailed Godwits in Cork Harbour. Therefore, it seems likely that Black-tailed Godwit will show a similarly strong negative response to trestles, as shown by Bar-tailed Godwit.

7.23 We have no evidence about the nature of the response of Teal, Pintail and Shoveler to trestles. For these species, we have made a precautionary classification of a negative response.

7.24 Red-breasted Merganser, Cormorant, Great Crested Grebe are species that primarily, or exclusively, exploit subtidal habitats, although Cormorant will roost in exposed intertidal areas. These species were not covered by the trestle study. Red-breasted Merganser, Cormorant and Great Crested Grebe feed mainly on fish and mobile invertebrates such as crabs and oyster trestles are likely to have neutral or positive impacts on these food resources (see paragraph 7.9). Both Red-breasted Merganser and Great Crested Grebe regularly feed over the oyster trestle blocks in Dungarvan harbour when these are flooded at high tide. Therefore, Red-breasted Merganser, Cormorant and Great Crested Grebe are likely to have a neutral/positive response to oyster trestles.

7.25 Little Grebe also primarily exploits subtidal habitats and was not covered by the trestle study. Fish are a significant component of their diet, but insects, small crustaceans and benthic invertebrates are also important (Cramp and Simmons, 2004). Little Grebe generally feed in very shallow water and occur in narrow tidal channels within exposed mudflats at low tide. Therefore, Little Grebe could potentially exploit habitats within oyster trestle sites at low tide when the trestle structures could potentially interfere with their use of these sites. Therefore, we have made a precautionary classification of a negative response for this species.

7.26 Common Tern is a summer visitor to Ireland and was not, therefore, covered by the trestle study (which was carried out in winter). This species primarily exploits subtidal habitats for feeding where it feeds on fish and mobile invertebrates. However, intertidal habitats are important as roost sites, both as daytime and nocturnal roosts. The impact of trestles on the utilisation of intertidal habitat be roosting terns is not known. Terns will often use artificial structures for roosting such as piers and jetties. However, any husbandry activity within the trestles would be likely to flush the terns. For this assessment, we have made a precautionary classification of a negative response for this species when roosting in intertidal habitat.

Cork Harbour study

7.27 Hilgerloh *et al.* (2001) studied the distribution and behaviour of waterbirds in relation to oyster trestle cultivation at Cork Harbour. They used one plot with oyster trestles and one control plot (both 1 ha) located on mudflats in Saleen Creek on the eastern side of Cork Harbour. From the information in the paper, it appears that their trestle plot corresponds to the isolated block of now derelict trestles at the mouth of Saleen Creek and that the control plot was immediately adjacent on either the eastern or western side of the trestle block. They carried out 64 scan counts and a series of focal observations on four days between 2nd and 7th March 1999.

7.28 Oystercatcher, Curlew, Black-headed Gull and Common Gull occurred in significantly lower numbers[5] in the trestle area compared to control plot, while there was no difference in the numbers of Dunlin and Redshank. There was no significant difference in the percentage of feeding birds of any of these species between the plots and the feeding rate of Oystercatchers did not differ between the plots. They also report various data on the behaviour of birds in areas of trestles with bags compared to areas without bags.

7.29 This study has no replication of treatments and the authors acknowledge that "the differences observed in the distribution of the other species [Oystercatcher, Curlew, Black-headed Gull and Common Gull] cannot only be explained by the presence of the trestles, since not all environmental parameters were identical in both areas". Furthermore, the very limited temporal range of the study (five days between the first and last count days) means that the results may not be very representative of overall distribution patterns.

7.30 Due to the methodological issues discussed above, and acknowledged by the authors, we do not consider that this study provides reliable information on waterbird responses to oyster trestle cultivation and we have not used its results in this assessment.

Assessments

North Channel sites

Habitats

7.31 The aquaculture sites in the North Channel are located in a narrow section of the channel between the eastern side of the Rossleague peninsula and the western side of Rossmore peninsula. This section of the North Channel has a wide channel of moderately deep subtidal habitat with 100-300 m wide bands of mudflats on either side. Immediately to the north and west of the aquaculture sites, the North Channel widens into large bays with extensive mudflats.

7.32 The larger of the aquaculture sites is largely occupied by the tidal channel. This is mainly mapped as moderately deep subtidal habitat, but with an area mapped as shallow subtidal habitat, which corresponds approximately to the location of the trestles. On the site visit on 10th October 2018, during a low spring tide, there was no intertidal habitat exposed under the trestles, although some of the trestles were in very shallow water.

7.33 The smaller of the aquaculture sites is mainly occupied by intertidal and shallow subtidal habitat. Around half of the intertidal habitat within the site is mixed sediment, with the remainder being mudflat.

7.34 The two aquaculture sites occupy a combined area of around 1% of the total intertidal habitat in the North Channel, and 2% of the total intertidal habitat in the Rossmore section (Table 7.1).

[5] The authors present data on densities in the tables in the paper but refer to numbers in the text.

Table 7.1 – Tidal habitats in the North Channel aquaculture sites.

Habitat	Area (ha)	% of total area in	
		Rossmore	North Channel
Saltmarsh	0	0%	0%
Intertidal	1.9	2%	1%
Intertidal and shallow subtidal	3.8	4%	1%
Shallow and moderately deep subtidal	7.1	24%	4%
Deep subtidal	0	-	0%

Waterbird distribution

7.35 The percentage of the total Cork Harbour count recorded in the North Channel during the I-WeBS counts and the WSP low tide counts is compared in Table 7.2. The occurrence patterns in the I-WeBS dataset are quite consistent for most species as indicated by the narrow confidence intervals. The occurrence patterns in the WSP dataset are broadly comparable to those in the I-WeBS dataset. Given the fact that the WSP dataset only includes four counts from a single winter this is quite impressive.

Table 7.2 – Mean percentages of the total Cork Harbour count recorded in the North Channel during the I-WeBS counts and the WSP low tide counts.

Species	I-WeBS	WSP
Shelduck	39% (33-44%)	34%
Wigeon	26% (21-32%)	27%
Teal	17% (14-21%)	14%
Mallard	8% (6-10%)	18%
Pintail	88% (66-110%)	100%
Shoveler	27% (12-42%)	14%
Little Grebe	12% (8-16%)	11%
Golden Plover	0%	7%
Grey Plover	8% (1-16%)	19%
Lapwing	6% (1-10%)	7%
Curlew	21% (18-24%)	16%
Black-tailed Godwit	12% (8-16%)	25%
Bar-tailed Godwit	0%	1%
Dunlin	3% (1-6%)	10%
Black-headed Gull	10% (7-13%)	5%
Common Gull	5% (1-8%)	13%
Lesser Black-backed Gull	7% (3-10%)	5%

95% confidence intervals for the I-WeBS percentages are shown in parentheses. The WSP analyses exclude data from the Outer Harbour zone.

7.36 The low tide distribution patterns, as recorded in the WSP counts, are summarised in Table 7.3. Shelduck mainly occur in the extensive muddy bays of the Belvelly and Rossmore sectors. Ballintubbrid was the key area for most of the dabbling duck species, except for Pintail which occurred exclusively in the Belvelly sector. Most of the waders and gulls were quite widely distributed and some of the variation in distribution patterns will be random effects due to small numbers and/or erratic occurrence of the species concerned.

7.37 The two subsites containing the aquaculture sites hold around 9% of the total area of intertidal habitat in the North Channel and this is reflected in the percentage occurrence of several of the species that feed on intertidal habitat (Shelduck, Curlew, Black-tailed Godwit, Bar-tailed Godwit and

Black-headed Gull) which ranged from 7-14% (Table 7.3). Grey Plover had a relatively high percentage occurrence but this was based on a combined total across all the counts of just 17 birds.

Table 7.3 – Percentage distribution of waterbirds between the four sectors of the North Channel, and percentage occurrence in the aquaculture sites subsites, during the WSP low tide counts.

Species	North Channel sectors				Aqua subsites
	Belvelly	Rossmore	Brick Island	Ballintubbrid	
Shelduck	41%	38%	17%	5%	10%
Wigeon	16%	3%	5%	75%	3%
Teal	38%	2%	3%	57%	2%
Mallard	2%	2%	25%	71%	2%
Pintail	100%	0%	0%	0%	0%
Shoveler	0%	0%	0%	100%	0%
Little Grebe	57%	7%	16%	19%	7%
Golden Plover	100%	0%	0%	0%	3%
Grey Plover	24%	24%	18%	35%	24%
Lapwing	44%	31%	0%	25%	0%
Curlew	35%	22%	21%	22%	9%
Black-tailed Godwit	27%	45%	21%	7%	14%
Bar-tailed Godwit	57%	14%	29%	0%	14%
Dunlin	43%	25%	1%	32%	0%
Black-headed Gull	25%	45%	21%	9%	8%
Common Gull	0%	19%	56%	25%	33%
Lesser Black-backed Gull	56%	0%	44%	0%	0%

Percentages are the mean percentages across the four WSP counts, with the exception of Pintail, Shoveler, Grey Plover, Bar-tailed Godwit and Dunlin for which the percentages are based on the summed count data (due to the low numbers of birds recorded).

7.38 Feeding Common Tern occur within the North Channel, but there are no known Common Tern roosts within the North Channel.

Assessment

7.39 The predicted displacement impacts that would result from full occupation of the aquaculture sites T05/294A and T05/294B in the North Channel are shown in Table 7.4. For most species, the predicted displacement in < 0.05% and the highest predicted displacement impact is only 0.3-0.6% (for Shelduck). Therefore, as the predicted displacement impacts are an order of magnitude below the 5% threshold, and the predictions are based on worst-case assumptions, it can be safely concluded that full occupation of these aquaculture sites will not cause significant impacts to any of the waterbird species covered by this assessment.

7.40 As there are no known intertidal Common Tern roosts within the North Channel, no impacts to this species are predicted to result from full occupation of the North Channel aquaculture sites.

Table 7.4 – Potential displacement impact (% of Cork Harbour population) predicted from full occupation of the aquaculture sites T05/294A and T05/294B in the North Channel.

Species	Likelihood of negative impact	Displacement based on waterbird occupancy of:	
		Rossmore sector	aquaculture subsites
Shelduck	2	0.5-0.6%	0.3-0.5%
Wigeon	1	0.0%	0.1-0.1%
Teal	1	0.0%	0.0%
Mallard	2	0.0%	0.0%
Pintail	1	0.0%	0.0%
Shoveler	1	0.0%	0.0%

Species	Likelihood of negative impact	Displacement based on waterbird occupancy of:	
		Rossmore sector	aquaculture subsites
Little Grebe	1	0.2-0.4%	0.2-0.4%
Golden Plover	2	0.0%	0.0%
Grey Plover	3	0-0.1%	0-0.2%
Lapwing	2	0-0.1%	0.0%
Curlew	1	0.1-0.1%	0.1-0.1%
Black-tailed Godwit	2	0.1-0.2%	0.1-0.2%
Bar-tailed Godwit	3	0.0%	0.0%
Dunlin	3	0-0.1%	0.0%
Black-headed Gull	1	0.1-0.2%	0.1-0.1%
Common Gull	1	0-0.1%	0-0.4%
Lesser Black-backed Gull	2	0.0%	0.0%

Likelihood of a negative impact: 1 = species shows a variable response to oyster trestles, so a neutral or positive impact may occur, or species with no evidence available about response to trestles; 2 = species considered to show a negative response to oyster trestles but evidence for this is weak; 3 = strong evidence that species shows a negative response to oyster trestles.

Lower Harbour aquaculture sites

Habitats

7.41 The aquaculture sites in the LH are located in Corkbeg Bay in the East Harbour zone and on Spike Island in the West Harbour zone.

7.42 The Corkbeg aquaculture site is located on Corkbeg Beach. This is a narrow, moderately sloping, sand beach on the western side of the causeway that leads out to Corkbeg Island. The beach is around 400 m long with a maximum exposure at low tide of less than 50 m width. This beach holds the only soft sediment intertidal habitat in Corkbeg Bay, with littoral rock habitat occurring along the western side of Corkbeg Island and along the southern shore of the bay.

7.43 The Spike Island aquaculture sites are located on the northern and western shores of Spike Island. Littoral rock/mixed sediment shore occupies most of the Spike Island shoreline. Areas of muddy sand occur in the lower part of the intertidal zone and the larger of the two aquaculture sites occupies the most extensive such area in the bay to the east of the pier.

Table 7.5 – Tidal habitats in the Corkbeg aquaculture site.

Habitat	Area (ha)	% of total area in	
		Corkbeg Bay	East Harbour
Saltmarsh	0	0%	0.0%
Intertidal	0.4	7%	0.2%
Intertidal and shallow subtidal	1.1	11%	0.2%
Shallow and moderately deep subtidal	0	0%	0.0%
Deep subtidal	0	0%	0.0%

Table 7.6 – Tidal habitats in the Spike Island aquaculture sites.

Habitat	Area (ha)	% of total area in	
			West Harbour
Saltmarsh	0	0%	0.0%
Intertidal	2.7	8%	0.8%
Intertidal and shallow subtidal	6.5	8%	0.9%
Shallow and moderately deep subtidal	0.3	0%	0.0%
Deep subtidal	0	0%	0.0%

Waterbird distribution

7.44 Corkbeg Bay is not covered by the Cork Harbour I-WeBS counts. During the WSP counts, four of the SCI species covered in this assessment were recorded in Corkbeg Bay. The counts of Black-headed Gulls were mainly birds roosting in subtidal waters (Table 7.7). From our own casual observations, other SCI species covered by this assessment which can occur in Corkbeg Bay include Wigeon, Lesser Black-backed Gull and Common Tern. However, all these species occur irregularly and/or in very low numbers. There are no records of Common Tern breeding colonies or roost sites from Corkbeg Bay.

Table 7.7 - Waterbird counts of Corkbeg Bay, 2010/11.

Species	07/10/2010	08/11/2010	06/12/2010	13/01/2011	03/02/2011
Mallard	0	0	0	9	14
Curlew	0	2	2	0	0
Black-headed Gull	0	16	55	0	2
Common Gull	0	0	6	0	0

Source: 2010/11 Waterbird Survey Programme as undertaken for the National Parks and Wildlife Service.

7.45 The western and southern shores of Spike Island are included in the Spike Island I-WeBS subsite (Table 7.8) and were also covered by the WSP counts (Table 7.9).

7.46 At high tide, small numbers of Shelduck, Curlew and Black-headed Gulls roost on the western shoreline of Spike Island and these birds may remain on Spike Island at low tide. There is also a Cormorant day roost on the western shoreline of Spike Island, which can be occupied at low tide. There is a semi-regular Grey Plover, Dunlin and gull roost on Luc Strand[6], while there is also at least one record of Dunlin roosting on Spike Island. Most of the Grey Plover and Dunlin probably feed in Lough Beg at low tide, while Dunlin may also commute across the harbour to Whitegate Bay. The Black-headed Gulls recorded in the WSP low tide counts were mainly feeding in intertidal habitats and are most likely to have been on Luc Strand.

7.47 Small aggregations of roosting terns (including Common Tern) can occur on the southern and western shorelines of Spike Island during spring (April-early May) and late summer/autumn (July-September). These are mainly daytime roosts but it is possible that Spike Island is also a disturbance refuge used when the terns are flushed from the Lough Beg nocturnal roost site.

7.48 The northern and eastern shorelines of Spike Island contains around 7.5 ha of intertidal habitat (compared to 25 ha in the adjacent WSP subsites) and 6 ha of shallow subtidal habitat (compared to 39 ha in the adjacent WSP subsites). This includes a muddy/sandy bay along the northern shoreline, with rocky shore habitat along the eastern shoreline. There does not appear to be any

[6] During the winters of 2012/13-2015/16, the regular I-WeBS counter did not count Luc Strand so the I-WeBS data for the Spike Island subsite for those winters does not reflect the usage of Luc Strand as a roost site by Grey Plover and Dunlin.

waterbird count data available for these areas. However, given the low numbers of SCI species using the Haulbowline, Luc Strand and Spike Island WSP subsites, which contain much larger areas of habitat (25 ha of intertidal habitat and 39 ha of shallow subtidal habitat), and the isolated position of Spike Island, it is very unlikely that significant numbers of SCI species feed on the northern and eastern shorelines of Spike Island at low tide. It is possible that high tide and/or tern roosts occur on these shorelines (particularly the northern shoreline).

Table 7.8 – Annual maximum counts in the Spike Island I-WeBS subsite, 2011/12-2017/18.

Species	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18
Shelduck	32	2	7	9	6	4
Grey Plover	0	0	0	0	0	10
Curlew	1	2	8	0	31	8
Black-tailed Godwit	0	0	6	0	0	0
Dunlin	0	0	0	2	60	250
Black-headed Gull	2	13	76	106	12	6
Common Gull	1	2	6	30	0	2
Lesser Black-backed Gull	1	6	43	4	0	3

Source: Irish Wetland Bird Survey (I-WeBS), a joint scheme of BirdWatch Ireland and the National Parks and Wildlife Service of the Department of Arts, Heritage & the Gaeltacht.

Table 7.9 - Waterbird counts of the Haulbowline, Luc Strand and Spike Island area, 2010/11.

Species	07/10/2010 (low tide)	08/11/2010 (low tide)	06/12/2010 (low tide)	13/01/2011 (high tide)	03/02/2011 (low tide)
Wigeon	0	0	0	0	5
Grey Plover	0	0	2	13	3
Curlew	2	3	6	0	5
Dunlin	0	0	6	200	0
Black-headed Gull	0	82	96	16	35
Common Gull	0	0	7	0	7
Lesser Black-backed Gull	1	4	3	2	3

Source: 2010/11 Waterbird Survey Programme as undertaken for the National Parks and Wildlife Service.

Assessment

7.49 The aquaculture site in Corkbeg Bay occupies a small area of intertidal and shallow subtidal habitat which comprises a tiny fraction of the total extent of intertidal and shallow subtidal habitat in the East Harbour zone. The SCI species covered by this assessment only occur irregularly and/or in very small numbers in the intertidal and shallow subtidal habitat in Corkbeg Bay. Therefore, development of this site for oyster trestle cultivation is not likely to have any measurable negative impacts on the SCIs species covered by this assessment.

7.50 The aquaculture sites in on Spike Island occupy small areas of intertidal and shallow subtidal habitat which comprises a tiny fraction of the total extent of intertidal and shallow subtidal habitat in the West Harbour zone. Apart from Cormorant and Common Tern, these areas are unlikely to support significant numbers of SCI species at low tide. High tide roost usage will not be affected by development of the aquaculture sites as husbandry activities will only take place at low tide and the trestles will be flooded at high tide.

7.51 The Cormorant day roost on the western shoreline of Spike Island typically holds around 20 birds during the autumn/early winter period, which is around 15% of the mapped Cormorant day roost capacity in the West Harbour. This roost can be occupied at low tide when birds move down to exposed rocks lower down the foreshore. It is also possible that Cormorant day roosts occur on the northern and/or eastern shorelines of Spike Island, which were not covered by the mapping

exercise. Cormorant routinely roost on artificial structures in Cork Harbour and we have observed Cormorant roosting on trestles in Dungarvan Harbour. Therefore, the presence of the trestles would not necessarily deter terns from roosting on the Spike Island shoreline. However, husbandry activity would be likely to flush the birds. There are a total of 37 mapped Cormorant day roosts in Cork Harbour, and there are likely to be additional unmapped day roosts. Cormorants are a mobile species and are frequently observed flying around the harbour. In general, Cormorants disturbed from one day roost are likely to be able to resettle on another day roost nearby. As husbandry activity will be limited to a few low tides per month, any disturbance impact is unlikely to be significant.

7.52 Common Tern roosts may occur on the Spike Island shoreline during the spring and post-breeding/autumn migration period and these roosts may occur at low tide. Terns routinely roost on artificial structures in Cork Harbour (such as the naval college slipway and the jetty at Ballybricken Point, so the presence of the trestles would not necessarily deter terns from roosting on the Spike Island shoreline. However, husbandry activity would be likely to flush the terns. Common Tern tend to roost in large concentrations in a small number of sites, so, unlike Cormorant, disturbance to a single roost site has the potential to cause significant impacts. There are several alternative roost sites available nearby, although these are all probably subject to higher levels of disturbance than the Spike Island roost sites. Overall, due to the small size of the aquaculture sites on Spike Island, and the presumed low intensity of husbandry activity, it seems unlikely that development of these aquaculture sites would cause significant disturbance impact to roosting Common Terns during the post-breeding/autumn migration period. However, further information about the usage of the Spike Island shoreline by roosting Common Tern (particularly the northern shoreline) and about the intensity of husbandry activity that would result from the development of the aquaculture sites, would be required to definitively assess this potential impact.

7.53 No information has been provided about the routes that would be used to access the aquaculture sites. We presume that the sites will have to be accessed by boat. Any such access routes would have the potential to cause disturbance to Red-breasted Mergansers, Cormorants and Great Crested Grebes. Red-breasted Mergansers are currently rare during the day in the East Harbour and West Harbour zones, while their night time roost sites occur away from any likely access routes. However, in the event of a recovery of the Red-breasted Merganser population, boat disturbance in the East Harbour and West Harbour zones may become a significant factor limiting their usage of these areas. Cormorants and Great Crested Grebes are generally not very sensitive to boat disturbance while foraging, and the Great Crested Grebe roost sites occur away from any likely access routes. Overall, due to the presumed low intensity of husbandry activity associated with these aquaculture sites, it seems unlikely that boat access to the sites would cause significant disturbance impacts to the Cork Harbour Red-breasted Merganser, Cormorant and Great Crested Grebe populations. However, further information about the intensity of husbandry activity would be required to definitively assess these potential impacts.

Conclusions

7.54 The small scale of the oyster trestle cultivation activity covered by this assessment, and the location of three of the five sites in areas of the harbour that do not hold high concentrations of intertidal/shallow subtidal waterbirds, mean that no significant displacement impacts are likely to occur.

7.55 There is a possibility of disturbance impacts to Common Tern roosts on Spike Island. Any such impacts are unlikely to be significant, but further information about Common Tern usage of the Spike Island and about the intensity of husbandry activity, would be required to definitively assess this potential impact.

8. Assessment of bottom mussel cultivation

Introduction

8.1 This chapter assesses the likely impact of bottom mussel cultivation in site T05/522A.

8.2 Detailed information about the proposed spatial occupation and husbandry activity in this site was not available. Therefore, based on the limited available information about the proposed activity in this site, and the characteristics of bottom mussel cultivation at other Irish sites, we have made the following assumptions for the purposes of this assessment:

- Only the areas of permanent subtidal habitat (below the 0 m chart datum) will be used.
- The mussel dredgers will have drafts of 1-2 m.
- The intensity of husbandry and harvesting activity will be similar to levels at Wexford Harbour.

Potential impacts

Habitat alteration impacts

8.3 Bottom culture of mussels can be disturbing to certain subtidal biotopes, due to extirpation of the characteristic infaunal species from the area covered by mussels, and, in some cases, the sensitivity of characteristic species to organic enrichment, smothering and/or physical disturbance from dredging (Marine Institute, 2013).

8.4 From a review of the literature (Appendix B), the following general patterns can be identified. Mussel culture beds can increase the diversity and abundance of epibenthic fauna by providing an additional food resource for species that predate on the mussels themselves or other species that may be attracted to the mussel bed to predate on the species that are attracted to the mussel beds for refuge. This change in epibenthic fauna contrasts with a reduction in diversity of infaunal species as increased organic rich sediments deposited by the mussels changes the characteristics of the sediments beneath the culture plot (assuming that deposition rates are high; Francis O'Beirn, Marine Institute, pers. comm.). There is disagreement as to the nature of the effect of mussel beds on the abundance of other filter feeding benthic species: a positive effect, by providing an additional habitat for larvae to establish; or a negative effect, by consuming the larvae of other species that may otherwise occupy the area. In general, it appears the effects of bottom mussel culture have been found to be localised in extent but may persist in time depending on the biotic and abiotic processes operating in the area.

8.5 Increasing the density of mussels has been demonstrated to cause reduced abundance and diversity of invertebrates. This is due to complete dominance of mussels in terms of space and quite likely filtration (competitive exclusion). There is very little reference to fishes in mussel literature and speculation might lead us to assume that tightly packed mussels will result in homogeneous habitat and little provision of refugia for fishes. This scenario would be more likely to refer to natural seed beds found intertidally which would not have been subject to any erosion or stratification due to aging of the mussels in the beds and which would be uniform in terms of age and size. However, if an area comprises patches of mussels (of varying densities) among sandy/muddy habitat then this could provide sufficient complexity of habitat to support a diverse fish assemblage. This scenario is more likely to apply to cultivated mussel beds (Francis O'Beirn, Marine Institute, pers. comm.).

8.6 In Wexford Harbour, which has the most intensive development of this activity in Ireland, analysis of aerial imagery indicates that the second scenario applies to the cultivated mussel beds (Gittings and O'Donoghue, 2016c). Furthermore, the SAC assessment for Wexford Harbour (Marine Institute, 2016) states that: "*in Wexford Harbour, mussel culture practices result in a mottled distribution of mussels on the seabed forming in a heterogeneous habitat structure" and that "such a structural arrangement is likely to benefit overall system diversity*" in line with the conclusions of other studies "*that mussel reef systems (on sedimentary habitats), as found in Wexford, enhance habitat heterogeneity and species diversity at the ecosystem level*".

8.7 If the patterns of bottom mussel cultivation in Wexford Harbour are typical of the likely development of this activity in Cork Harbour, it can be concluded that bottom culture of mussels is unlikely to reduce food resources for benthic invertebrate eating, and/or fish-eating, species.

Disturbance

8.8 Subtidal bottom mussel cultivation could cause impacts to waterbirds using moderately deep, or deep, subtidal habitat, and/or using high tide shallow subtidal or shoreline roosts, through disturbance associated with husbandry activities and/or travel to/from the sites. Disturbance impacts to waterbirds using intertidal and shallow subtidal habitats at low tide are also possible but the potential for such impacts will be limited by constraints on husbandry activity at low tide imposed by the draft of the mussel dredgers.

8.9 Disturbance impacts can affect bird populations in two ways. If disturbance levels are intense enough, birds may completely abandon an area and the displacement impact is, therefore, analogous to habitat loss. At lower disturbance intensities, birds may continue to use an area but may suffer energetic impacts due to loss of foraging time and energy expended in evasive behaviour.

8.10 For disturbance to cause displacement impacts, the disturbance pressure will have to operate over a wide area (relative to the size of the site) and be more or less continuous. For disturbance to cause significant energetic impacts, birds must be disturbed with sufficient frequency, and/or forced to engage in energetically expensive evasive behaviour (e.g., long flights, or extended interruption of feeding). Various modelling studies have indicated that multiple disturbance events per daylight hour are required to cause impacts on wader survival rates (Goss-Custard *et al.*, 2006; West *et al.*, 2007; Durell *et al.*, 2008).

Species responses

8.11 No information is available on the responses of species associated with subtidal habitat to habitat alteration caused by bottom mussel culture. However, there is some evidence that mussel dredging activity associated with bottom mussel culture in Wexford Harbour may cause significant disturbance impacts to Red-breasted Mergansers and possibly some other species (Gittings and O'Donoghue, 2016a, 2016c). This evidence is discussed further in the relevant species accounts below.

Assessments

Red-breasted Merganser

Occurrence in the aquaculture site

8.12 The East Harbour zone contains suitable subtidal habitat for Red-breasted Mergansers and used to support significant numbers of mergansers. However, in recent years, only small numbers have

been recorded in these areas during the day (mean of 5% of the total I-WeBS count; 2010/11-2017/18). Mergansers from the North Channel commute down the East Ferry Channel in the evening and a regular nocturnal roosting flock of around 20 birds occurs off the south-eastern shore of Great Island.

Habitat impacts

8.13 Red-breasted Mergansers are fish-eating birds. In general bottom mussel cultivation is likely to either have no effect on, or increase local abundances of fish (see paragraphs 8.4-8.7). Therefore, development of bottom mussel culture in site T05/522A is not likely to have negative effects on the availability of food resources for the Red-breasted Merganser SCI of the Cork Harbour SPA.

Disturbance impacts

8.14 Observations that we made during survey work in Wexford Harbour indicate that Red-breasted Mergansers can be very sensitive to disturbance from marine traffic (Gittings and O'Donoghue, 2016a, 2016c). A disturbance response was noted in 32 out of the 45 interactions between mergansers and boats that we observed, with birds being flushed on 22 occasions. The disturbance response was related to the lateral distance of the birds from the path of the boat, with 90% of observations within 250 m showing a disturbance response, compared to only 29% of the observations at distances of over 500 m from the path of the boat. Overall 84% of observations within 500 m showed a disturbance response. The birds that did show a response often flushed at long distances from the boat, with some birds flushing at distances of over 1 km, but these were mainly birds that were close to the path of the boat (i.e., the boat was heading straight towards them). While our dataset includes responses to three types of boat (a cot, small inshore potting vessels and dredgers), there was no detectable difference in the responses to these boat types (although our analysis was constrained by limited data for the disturbance response to cots at large lateral distances).

8.15 During these surveys in Wexford Harbour, most of the responses to dredgers were recorded while the dredgers were travelling to/from the fishing sites. Only six interactions were recorded while the boats were dredging for mussels or starfish mopping: two no. responses at around 500 m, one no. response at more than 500 m, one alert response at more than 500 m and two flushes at more than 500 m. This reflects the fact that very few mergansers were observed in the vicinity of boats while they were dredging: during 11 hours 45 minutes of watching boats dredging or starfish mopping, these were the only observations of mergansers within around 0.5-1 km of the boats (although in some cases the boats were very distant and birds on the far sides of the boats could have been missed). It is notable that during all this time we made no observations of mergansers in close proximity (within a few 100 m) to boats while they were dredging for mussels or starfish mopping. The mean encounter rate that we recorded of one bird/38 ha would predict that, on average, two mergansers would occur within 500 m of a dredger. Therefore, while some mergansers appear to be able to tolerate close approach while the boats are travelling to/from the dredging sites, sustained fishing activity in one area appears to cause complete exclusion of mergansers from within at least 500 m of the fishing activity.

8.16 Changes in Red-breasted Merganser distribution patterns in Cork Harbour may also indicate sensitivity to disturbance from marine traffic (Text Figure 5.4). The areas with the largest declines (the East Harbour and the West Harbour zones) are the areas with the highest levels of marine traffic, while the North Channel (moderate decline) and the Fota Channel (no apparent decline) have very little, if any, marine traffic during the mid-winter period. Furthermore, the decline in the North Channel occurred in the late 1990s when the North Channel oyster fishery was still open, while no further decline appears to have occurred since closure of the fishery in 2002.

8.17 Therefore, while specific information on Red-breasted Merganser disturbance responses in Cork Harbour is not available, for the purposes of this assessment we have assumed similar responses to those shown in Wexford Harbour.

Assessment

8.18 Our observations in Wexford Harbour indicated that mussel dredging and starfish mopping may cause complete exclusion of mergansers within around 500 m of the boat, while mergansers that are flushed by boats typically flush before the boat comes to within around 500 m of the birds. In addition, our observations of the reactions of mergansers to the approach of boats indicated that they show a behavioural response (alert reaction and/or swimming away) for a short period of time before they actually flush. Most of these observations were of birds responding to boats travelling at speeds of 5-10 knots (2.5-5 m/s). Therefore, there is an additional disturbance distance of up to 150 m on top of the flush distance (i.e., a boat approaching for 30 seconds at a speed of 10 knots). Given our limited data, and the constraints on the accuracy of our distance estimation in the field, it is prudent to add another 100 m as a margin of error. This gives a total disturbance distance of 750 m.

8.19 Applying a 750 m buffer, the instantaneous area disturbed around a boat is 176 ha. However, depending upon the position of the plot being fished, some of this area may be land, etc. Also, when multiple boats are fishing at the same time there may be overlaps between the disturbance zones around each boat. In simulations of fishing activity at Wexford Harbour the mean area potentially disturbed by seven boats was 670 ha, which amounts to around 50% of the theoretical maximum area that could be disturbed if there was no overlap and all the boats were at least 750 m from the shoreline (Gittings and O'Donoghue, 2016c). Given the lack of information about the proposed mussel fishing activity in Cork Harbour it is not possible to carry out a similar simulation exercise.

8.20 The total area of primary Red-breasted Merganser habitat in the East Harbour zone is around 500 ha, while secondary habitat occupies another 730 ha. Therefore, it is clear that high levels of mussel fishing activity in the aquaculture site could disturb a large proportion of this habitat. At present, only small numbers of mergansers use the East Harbour zone during the day, so disturbance from mussel fishing activity during the day may not have significant energetic or displacement impacts on the Cork Harbour Red-breasted Merganser population. However, in the event of a recovery of the Red-breasted Merganser population, disturbance from mussel fishing activity during the day could become a significant factor limiting their usage of East Harbour zone.

8.21 The East Harbour roost is occupied from around 30-60 minutes before sunset. Therefore, evening and night mussel fishing activity could cause disturbance to this roost. The reason why mergansers roost communally at night, and the significance of the particular areas that they choose, is not known. It is possible that the birds select areas in relation to factors such as tidal-related currents: e.g., the mergansers could choose areas with relatively slack tidal currents. If this is the case, disturbance by mussel fishing activity could displace birds into less favourable roosting locations. The East Harbour roost probably holds around 25-33% of the Cork Harbour Red-breasted Merganser population. Therefore, regular disturbance of this roost could cause significant impacts to the Cork Harbour Red-breasted Merganser population.

Cormorant

Occurrence in the aquaculture site

8.22 The aquaculture site contains around 15-20% of the total extent of Cormorant habitat within Cork Harbour. The nocturnal roosts adjacent to the aquaculture site support around 10% of the Cork Harbour Cormorant population, although some birds that feed in the aquaculture site during the day may commute to other nocturnal roosts. Similarly, the daytime roosts within/adjacent to the

aquaculture site contain around 10% of the total estimated Cormorant daytime roost capacity within the harbour, but some birds that forage within the aquaculture site may commute to daytime roosts away from the aquaculture site (e.g., on Spike Island or on the Spitbank Lighthouse). Therefore, the aquaculture site appears to be likely to support around 10-20% of the Cork Harbour Cormorant population.

Habitat impacts

8.23 Cormorant are fish-eating birds. In general bottom mussel cultivation is likely to either have no effect on, or increase local abundances of fish (see paragraphs 8.4-8.7). Therefore, development of bottom mussel culture in site T05/522A is not likely to have negative effects on the availability of food resources for the Cork Harbour Cormorant population.

Disturbance impacts (foraging birds)

8.24 In Cork Harbour, disturbance responses were observed on 8-15% of occasions during 102 observations of interactions with shipping at Roches Point, including 19-30% of observations involving lateral response distances of up to 200 m. These disturbance responses mainly involved birds flushing and flying out of the area. These observations mainly involved large commercial vessels travelling at speeds of around 10 knots.

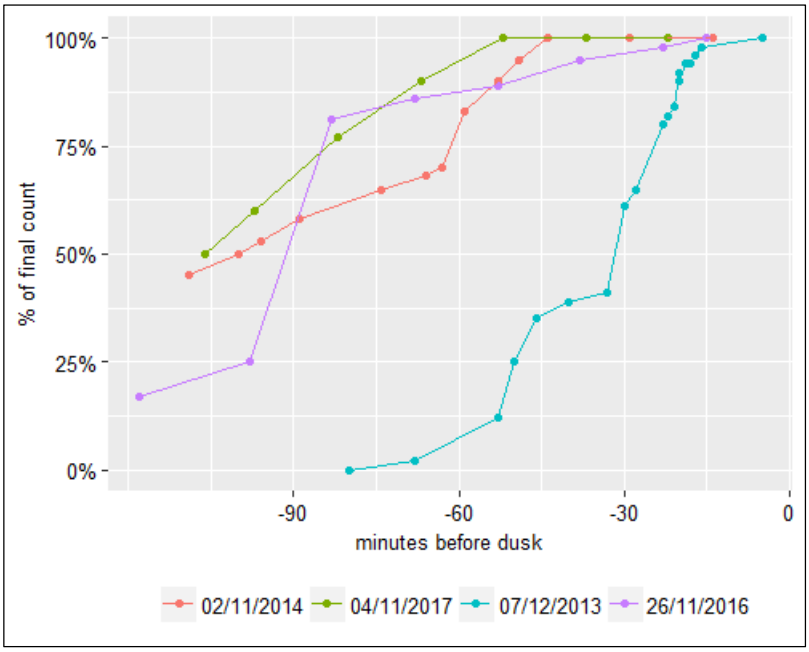
8.25 In Wexford Harbour, Cormorant appeared to be relatively tolerant of disturbance by marine traffic in Wexford Harbour (Gittings and O'Donoghue, 2016c). We observed numerous instances of boats travelling past Cormorants within a few hundred metres without any discernible response from the birds. However, their response to sustained fishing activity in one area was not clear.

Disturbance impacts (roosting birds)

8.26 Chatwin *et al.* (2013) reported the probability of agitation due to approach by motorboats and kayaks for roosting Double-Crested Cormorant on Vancouver Island ranging from 2.5% at a distance of 70 m to 15% at a distance of 30 m. In Wexford Harbour, Cormorants roosting on the training walls along the navigation channel generally showed no disturbance response to marine traffic (Gittings and O'Donoghue, 2016c). In Cork Harbour, Cormorants roost on the Cow Rock at Roches Point appear to tolerate kayaks and small boats passing within 50-100 m on the outer side of the rock but will flush at a distance of around 50 m if a kayak passes along the narrow channel between the rock and the headland. During a boat survey in Cork Harbour covering most of the East Harbour, West Harbour and Inner Harbour zones in August 2016 (using a small cabin cruiser), birds flushed from all the Cormorant day roosts that we passed, usually at distances of around 50-100 m. The variations in the responses in the above locations may reflect differences in habituation to vessel activity. As mussel fishing activity is unlikely to be sufficiently predictable for birds to develop high levels of habituation, fishing close to the roost sites is likely to flush the roosting birds. There are a total of 37 mapped Cormorant day roosts in Cork Harbour, and there are likely to be additional unmapped day roosts. Cormorants are a mobile species and are frequently observed flying around the harbour. In general, Cormorants disturbed by boats from one day roost are likely to be able to resettle on another day roost nearby without significant energy expenditure and the disturbance impact is unlikely to be significant.

8.27 There does not appear to be any information in the literature on the potential disturbance impact from marine traffic to Cormorants roosting in trees at night. However, as some birds in the night roosts occur in branches low down over the water, it is likely that vessel activity close to the roost would flush at least some of the birds. In the Owenboy Estuary, kayaking activity has been observed to cause abandonment of the Drake's Pool roost site. The Siddon's Tower roost is not normally occupied during the day but the build-up of the night roost can begin from more than 100 minutes

before dusk (Text Figure 8.1). Therefore, evening/night mussel fishing activity close to the Siddon's Tower roost could cause this roost to be temporarily abandoned.



Text Figure 8.1 – Build-up pattern of the Siddon's Tower Cormorant nocturnal roost.

8.28 The nearest alternative night roost sites are at Bagwell's Hill around 6.5 km away. The typical speed of a flying Cormorant is 15.2 m/sec (Alerstam *et al.*, 2007), so this flight would take around seven minutes. Based on the figures in Gremillet *et al.* (2003), a 3% increase in daily food consumption would be required to offset the additional energy expenditure involved in a flight of this length. However, birds disturbed from the roost would be unlikely to fly directly to the alternative roost site, but would, instead, probably circle around several times before departing, while there may also be additional flight time required the following morning. Also, there may not be spare capacity at the Bagwell's Hill roosts to accommodate all the birds displaced from the Siddon's Tower: it is common to observe during roost counts birds circling around several times before finding a suitable perch to roost on with, occasionally, birds departing without settling at the roost. Therefore, the actual impact of disturbance to the Siddon's Tower roost could require a significantly greater than 3% increase in daily food consumption. This suggests that frequent disturbance of the Siddon's Tower roost could result in significant negative impacts to the Cork Harbour Cormorant population, if birds are energetically stressed and/or of food resources are limited.

Great Crested Grebe

Occurrence in the aquaculture site

8.29 The East Harbour zone is the most important part of the harbour for Great Crested Grebes and supports around half of the total population within the harbour. The grebes disperse widely during the day to feed, but assemble at night into communal roosts in specific areas within the East Harbour zone. These roosts may also be occupied irregularly during the day.

8.30 The aquaculture site holds around 75% of the grebe habitat within the East Harbour zone. The two principal grebe roosts in the East Harbour zone occur within the aquaculture site: in the open water off Aghada Pier (mainly occupied in the early part of the winter); and in the open water around the Fair Rock (mainly occupied in mid and late winter).

Disturbance impacts (foraging birds)

8.31 Foraging Great Crested Grebes appear to be generally very tolerant of vessel activity. In Wexford Harbour, we observed numerous instances of boats travelling past foraging grebes within a few hundred metres without any discernible response from the grebes, although we did observe one instance of feeding grebes flushed by a boat when the boat drove through an area with grebes directly in its path (Gittings and O'Donoghue, 2016c). However, across 11 hours 45 minutes of watching boats dredging or fishing for starfish, we only made two observations of grebes within around 500 m from the boats (Gittings and O'Donoghue, 2016c). Therefore, while Great Crested Grebes appear to be able to tolerate close approach while the boats are travelling to/from the dredging sites, it is possible that sustained dredging/fishing activity in one area may cause exclusion of grebes from within a few 100 m of the dredging/fishing activity.

8.32 As Great Crested Grebes generally do not show a disturbance response to the passage of marine traffic, the mean response rate will be orders of magnitude below one per bird per day and the energetic impact of disturbance to these species will not be significant. High levels of mussel fishing activity may, however, cause significant displacement impacts, although to a lesser degree than for Red-breasted Merganser.

Disturbance impacts (roosting birds)

8.33 Great Crested Grebe roosting flocks appear to be much more sensitive to disturbance than birds foraging individually. We have observed ten instances of flocks being apparently disturbed by vessel activity in Cork Harbour (Table 8.1). These mainly occurred when boats were heading on routes that would pass within a few hundred metres of the roosting flock and the birds could respond at distances of more than 1.5 km from the boat. The disturbance caused the roosting flocks to break up, with birds swimming rapidly away looking alert and looking around behind them, and with some birds diving and/or flapping their wings. Usually the grebes swam into the shore. We also observed a few instances of flocks breaking up and birds dispersing when there was no obvious disturbance source, which may be analogous to the way that roosting flocks of waders can "spook" for no apparent reason. However, we have also observed four incidences of boats passing within around 500 m of roosting flocks without any apparent disturbance response.

8.34 The night roosts generally build up from around two hours before dusk (Text Figure 8.2) but appear to disperse rapidly shortly after dawn (Gittings, 2017). The roosts may also be occupied during the day, but usually by smaller numbers of birds. Therefore any evening/night fishing is likely to cause disturbance to the roosts, while daytime fishing may also cause some disturbance.

8.35 The typical response of roosting grebes to disturbance is for the flock to break up with birds dispersing into the shore, and the roosting flock appears to be able to reassemble within a relatively short period of time (Table 8.1). Therefore, occasional disturbances are unlikely to cause abandonment of the roost. However, sustained disturbance (e.g. regular evening/night fishing) might have a more long-term impact. The Lough Mahon roosting area may be particularly vulnerable to disturbance impacts as it is often used during the day.

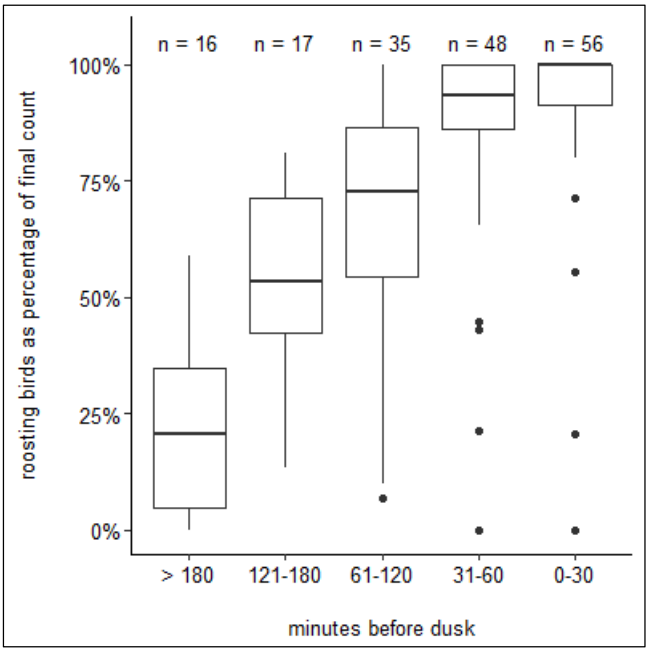
8.36 The reason why grebes roost communally at night, and the significance of the particular areas that they choose, is not known. It is possible that the birds select areas in relation to factors such as tidal-related currents: e.g., the grebes could choose areas with relatively slack tidal currents. If this is the case, disturbance by mussel fishing activity could displace birds into less favourable roosting locations. Any disturbance by mussel fishing activity would be limited to a short period of time at the start of the roosting period as there will not be any significant amount of mussel fishing activity after it gets dark. Therefore, such disturbance may not have significant effects on the use of the roosts. However, it is possible that repeated disturbance close to dusk could disrupt their behaviour patterns and cause abandonment of the roosts.

8.37 Grebes will also incur an energetic cost in responding to disturbance of their roosts as this will cause additional swimming activity. The East Harbour roosts hold around half of the Cork Harbour Great Crested Grebe population. Therefore, frequent disturbance of the East Harbour roosts could result in significant negative impacts to the Cork Harbour Great Crested Grebe population, if birds are energetically stressed and/or of food resources are limited.

Table 8.1 - Observations of disturbance to Great Crested Grebe roosting flocks by vessel activity In Cork Harbour.

Date	Time	Location	Vessel type	Flock size	Disturbance response
03/10/2015	19:41	Inner Harbour	Large ship	28	Flock close to navigation channel, broke up and swam into shore as ship approached.
12/10/2015	18:56	East Harbour	RIB	54	Flock reacted to noise of boat when boat was over 1 km from flock and not visible to flock. Flock scattered with birds swimming rapidly away.
31/10/2015	15:50	East Harbour	RIB	24	Flock broke up and swam into shore.
31/10/2015	17:27	East Harbour	Cabin cruiser	68	Flock broke up and swam into shore. The flock then gradually re-coalesced over a period of 10-20 minutes.
13/02/2016	16:37	West Harbour	Inshore potting vessel	13	Flock broke up and swam into shore when boat was over 1.5 km from flock. The flock then re-coalesced over a period of 20 minutes.
28/02/2016	15:10	Inner Harbour	Currach	9	Flock close to navigation channel disturbed by rowers and flew in towards the Little Island shore.
19/11/2016	14:45	Inner Harbour	Small ship	24	Flock close to navigation channel broke up and swam in towards another flock which was further away from the navigation channel.
19/11/2016	15:45	Inner Harbour	Trawler	35	Flock some distance from the navigation channel reacted to passage of vessel by becoming alert and swimming around, and a few diving, but flock not breaking up.
19/11/2016	16:40	Inner Harbour	Small ship and trawler	40	Flock close to navigation channel broke up broke up and became widely dispersed with the flock not reforming in the next 35 minutes before dusk.
07/01/2017	16:40	West Harbour	Small boat	23	Flock began spreading out and some diving when hit by wake of boat going into Crosshaven.

Adapted from Gittings (2017).



Text Figure 8.2 – Boxplot showing build-up of dusk roosts of Great Crested Grebes, as percentages of roosting birds in dusk roost locations in five time periods relative to dusk. Data is only included from counts where a final count was taken in the 0-30 minutes before dusk time period and another count was taken in at least one other time period. Adapted from Gittings (2017).

Dabbling ducks

8.38 Five of the six dabbling duck SCI species regularly occur within the East Harbour zone (Table 8.2). The sixth species (Pintail) only occurs very occasionally (five records of 1-3 birds during I-WeBS counts; 2011/12-2017/18). The Saleen subsite generally holds the largest high tide numbers of dabbling ducks in the East Harbour zone (Table 8.3) and these ducks mainly roost in the creek. However, some Mallard and, occasionally, Wigeon roost in the open water outside the creek, while a small Wigeon roost also occurs around the rocks opposite Rostellan village. At low tide, the Shelduck and Teal mainly remain within the creek, while the Wigeon and Mallard move out to the shallow subtidal habitat outside the creek extending into the Aghada subsite.

Table 8.2 – Mean percentages of the total Cork Harbour count recorded in the East Harbour zone during the I-WeBS counts and the WSP low tide counts, and percentage of total Cork Harbour high tide roost capacity occurring within the East Harbour zone.

Species	I-WeBS	WSP	Roost capacity
Shelduck	5% (3-7%)	14%	5%
Wigeon	11% (9-14%)	15%	5%
Teal	11% (9-12%)	14%	4%
Mallard	31% (26-36%)	27%	21%
Pintail	9% (0-24%)	0%	-
Shoveler	47% (27-67%)	60%	-

95% confidence intervals for the I-WeBS percentages are shown in parentheses. The WSP analyses exclude data from the Outer Harbour zone.

Table 8.3 – Mean high tide I-WeBS counts in the four subsites of the East Harbour zone, 2011/12-2017/18.

Species	Months	Saleen	Rostellan Lake	Aghada	Whitegate
Shelduck	Dec-Feb	17 (12-22)	0	0	32 (13-51)
Wigeon	Dec-Feb	65 (45-84)	8 (2-15)	32 (13-51)	14 (7-22)
Teal	Dec-Feb	104 (81-127)	6 (0-12)	3 (0-8)	1 (0-2)
Mallard	Sep-Jan	33 (21-45)	11 (3-19)	3 (1-4)	25 (16-33)
Shoveler	Nov-Feb	1 (0-2)	1 (0-3)	1 (0-2)	3 (1-5)

Months included in the analyses represent the period of peak occurrence of the species in Cork Harbour. Sample sizes: Dec-Feb = 19; Sep-Jan = 30; Nov-Feb = 27; 95% confidence intervals for the mean counts are shown in parentheses.

8.39 Mussel fishing activity at high tide may extend over the entire area of permanent subtidal habitat. The main dabbling duck roosting areas within Saleen Creek are over 500 m from any permanent subtidal habitat, so are not likely to be affected by disturbance impacts. However, fishing activity could extend to within 100-200 m of roosting areas in the outer part of the Saleen subsite, opposite Rostellan village and adjacent to the Aghada Generating Station. These areas hold around 30% and 5% of the total roost capacity in the East Harbour zone for Wigeon and Mallard, respectively.

8.40 Mussel fishing activity at low tide will be constrained by the draft of the dredgers, which means that the minimum depth of water that they can fish will be around 1-2 m. The dabbling ducks can feed in depths of up to around 0.5 m of water. Therefore, based on Admiralty Chart data, mussel fishing activity at low tide could take place at distances of around 100-200 m from Wigeon and Mallard feeding in shallow subtidal water in the eastern part of the aquaculture site. This may be close enough to cause disturbance impacts. As there is limited alternative shallow subtidal habitat in the area, sustained disturbance impacts could cause displacement of birds from the entire area. These areas hold more than 5% of the total Cork Harbour populations of these species.

Waders

Occurrence in the aquaculture site

8.41 Five SCI wader species regularly occur in significant numbers in the East Harbour zone, and around 5-12% of the total roost capacity in the harbour for these species occurs in the East Harbour zone. The main concentrations of these roosting waders occur in Saleen Creek and Whitegate Bay with a few minor roosts along the Aghada shoreline and in Cuskinny Bay (Table 8.6).

Table 8.4 – Mean percentages of the total Cork Harbour count recorded in the East Harbour zone during the I-WeBS counts and the WSP low tide counts, and percentage of total Cork Harbour high tide roost capacity occurring within the East Harbour zone.

Species	I-WeBS	WSP	Roost capacity
Oystercatcher	16% (14-19%)	16%	11%
Golden Plover	0% (0-0%)	0%	0%
Grey Plover	0% (0-0%)	0%	0%
Lapwing	4% (0-7%)	11%	0%
Curlew	10% (8-11%)	12%	6%
Black-tailed Godwit	6% (4-8%)	6%	5%
Bar-tailed Godwit	1% (0-4%)	0%	0%
Dunlin	12% (9-16%)	1%	8%
Redshank	15% (14-17%)	12%	12%

95% confidence intervals for the I-WeBS percentages are shown in parentheses. The WSP analyses exclude data from the Outer Harbour zone.

Table 8.5 – Mean high tide I-WeBS counts in the four subsites of the East Harbour zone, 2011/12-2017/18.

Species	Months	Saleen	Rostellan Lake	Aghada	Whitegate
Oystercatcher	Sep-Feb	73 (59-87)	0	17 (9-24)	37 (30-44)
Curlew	Sep-Feb	41 (32-50)	1 (0-3)	3 (0-8)	37 (28-45)
Black-tailed Godwit	Sep-Mar	59 (44-74)	3 (0-6)	0 (0-1)	31 (14-48)
Dunlin	Dec-Feb	64 (37-90)	0	27 (2-51)	230 (140-322)
Redshank	Sep-Feb	97 (86-108)	0	3 (2-4)	101 (84-118)

Months included in the analyses represent the period of peak occurrence of the species in Cork Harbour. Sample sizes: Sep-Feb = 33; Sep-Mar = 37; Nov-Feb = 27; 95% confidence intervals for the mean counts are shown in parentheses.

Table 8.6 – Distribution of high tide wader roost capacity in the East Harbour zone.

Species	WG	SA1	SA2	Curlew	AG	Total
Oystercatcher	44	35	59	53	8	198
Curlew	26	79	0	0	0	105
Black-tailed Godwit	61	96	0	0	0	158
Dunlin	413	53	0	0	35	500
Redshank	178	141	0	0	0	319

WG = Whitegate Bay; SA1 = Saleen Creek (inner); SA2 = Saleen Creek (outer); Curlew = Cuskinny Bay; AG = Aghada.

8.42 The roosts in Whitegate Bay are outside the aquaculture site and too distant from it to be affected by any activity within the site. The other roosts are adjacent to, or close to the aquaculture site. The main roosting area in Saleen Creek is on the inner side of the shingle bank at the mouth of the creek, while Oystercatcher also roost on at two locations on the northern shoreline to the west of the mouth of the creek. In Cuskinny Bay, an Oystercatcher roost occurs on the western side of the bay, while a small, and infrequently used Oystercatcher roost occurs along the southern shoreline of the aquaculture site adjacent to the Aghada Generating Station. A Dunlin roost occurs on the shingle bank adjacent to Aghada Pier. This roost normally holds small numbers of birds but occasionally 100 or more Dunlin can occur here.

8.43 At low tide, some of the waders roosting in Saleen Creek move out to the intertidal habitat in the outer part of the Saleen subsite and may also move to intertidal areas within the Aghada subsite. A concentration of Oystercatcher usually occurs in a mussel bed just outside the mouth of Saleen Creek while, on spring low tides, sizeable numbers of Black-tailed Godwit and Dunlin can feed in in the intertidal area along the southern shoreline of the Aghada subsite between Rostellan village and Aghada Pier.

Disturbance impact

8.44 There is little published information on the potential disturbance impact from watercraft to waterbirds using intertidal and shallow subtidal habitat. Smit and Visser (1993) cite the work of Koepff and Dietrich (1986), who studied the effects of kayaks and windsurfers on roosting waders and Shelduck in the Jadebusen, which is a large tidal bay in the German Wadden Sea. They reported mean flight distances due to kayak and windsurfer disturbances ranging from around 50-150 m for Oystercatcher to 240-400 m for Curlew. The flight distances caused by windsurfers were generally considerably larger than those caused by kayakers. Liley *et al.* (2010) studied the effects of disturbance on waterbirds in the Solent in southern England. They found that water-based activity generally caused stronger disturbance effects than land-based activity. For mixed water-based activity, they reported response distances for five wader species of ranging from 30 m for Turnstone to 124 m for Dunlin and displacement distances ranging from 155 m for Turnstone to 287 m for Redshank.

8.45 In Cork Harbour, kayaking and small boat activity has been observed to cause disturbance to wader roosts at distances of around 50-100 m from the roost. The consequences of the disturbance can

result in short-term abandonment of the entire area and potentially significant energy expenditure: e.g., in August 2016, kayakers flushed the Curlew roost in Saleen Creek and all the birds in the roost abandoned the area and flew over 5 km to roost sites in Whitegate Bay.

8.46 Mussel fishing activity at high tide may extend over the entire area of permanent subtidal habitat. The main wader roosting areas within Saleen Creek are over 500 m from any permanent subtidal habitat, so are not likely to be affected by disturbance impacts. However, fishing activity could extend to within 100 m of one of the Oystercatcher roosts on the northern shoreline in the outer part of the Saleen subsite and the Oystercatcher roost in Cuskinny Bay, and to within 50 m of the Oystercatcher roost adjacent to the Aghada Generating Station and the Dunlin roost adjacent to Aghada Pier. These roosts hold around 40% of the total Oystercatcher roost capacity in the East Harbour zone. As the East Harbour zone holds around 16% of the total Cork Harbour Oystercatcher population, disturbance of these roosts would affect over 5% of the Cork Harbour Oystercatcher population. The Aghada Pier Dunlin roost holds around 6% of the total Dunlin roost capacity in the East Harbour zone and less than 1% of the total Dunlin roost capacity in Cork Harbour. Also, birds using this roost are likely to be habituated to vessel activity due to the proximity of the roost to Aghada Pier.

8.47 Mussel fishing activity at low tide will be constrained by the draft of the dredgers, which means that the minimum depth of water that they can fish will be around 1-2 m. Based on the Admiralty Chart data, any mussel fishing activity at low tide will be a minimum of around 300-500 m from the main intertidal wader feeding areas in the eastern part of the aquaculture site so disturbance impacts to waders feeding in these areas are unlikely.

Other species

8.48 The other SCI species that occur in the East Harbour zone are Grey Heron, Little Grebe, Black-headed Gull, Common Gull, Lesser Black-backed Gull and Common Tern. Grey Heron are thinly distributed throughout the zone, with a nocturnal roost in Marloag Woods. Little Grebe mainly occur on Rostellan Lake with small numbers also occurring in the mouth of Saleen Creek. The main high tide gull roosts occur around Rostellan village with birds distributed between the south-eastern corner of the Aghada subsite and Rostellan Lake, and in Whitegate Bay with a smaller roost at the mouth of Saleen Creek. A large nocturnal gull roost, holding thousands of gulls, occurs in the open water between Aghada Pier and the East Ferry Channel. At low tide, the gulls feed in the intertidal areas, while, in some years, large numbers also feed in the subtidal water in the middle of the zone. No Common Tern breeding colonies or regular post-breeding/autumn roost sites occur in the East Harbour zone, although they probably feed regularly within the zone during the summer months.

Table 8.7 – Mean percentages of the total Cork Harbour count recorded in the East Harbour zone during the I-WeBS counts and the WSP low tide counts, and percentage of total Cork Harbour high tide roost capacity occurring within the East Harbour zone.

Species	I-WeBS	WSP
Grey Heron	14% (11-17%)	25%
Little Grebe	35% (28-43%)	26%
Black-headed Gull	17% (12-22%)	22%
Common Gull	30% (19-40%)	39%
Lesser Black-backed Gull	3% (1-5%)	6%

95% confidence intervals for the I-WeBS percentages are shown in parentheses. The WSP analyses exclude data from the Outer Harbour zone.

Table 8.8 – Mean high tide I-WeBS counts in the four subsites of the East Harbour zone, 2011/12-2017/18.

Species	Months	Saleen	Rostellan Lake	Aghada	Whitegate
Grey Heron	Sep-Feb	2 (1-2)	1 (0-2)	2 (1-2)	3 (2-5)
Little Grebe	Sep-Feb	3 (2-4)	10 (8-13)	0	0
Black-headed Gull	Sep-Mar	51 (26-75)	26 (13-38)	197 (125-269)	92 (17-167)
Common Gull	Jan-Mar	4 (0-8)	0 (0-1)	25 (9-41)	10 (3-17)
Lesser Black-backed Gull	Nov-Feb	1 (0-2)	0 (0-1)	0	0 (0-1)

Data for the winters of 2011/12 and 2012/13 are not included for Black-headed Gull, Common Gull and Lesser Black-backed Gull. Months included in the analyses represent the period of peak occurrence of the species in Cork Harbour. Sample sizes: Grey Heron and Little Grebe = 33; Black-headed Gull and Lesser Black-backed Gull = 25; Common Gull = 12; 95% confidence intervals for the mean counts are shown in parentheses.

8.49 General observations of heron behaviour in the harbour indicates that they are unlikely to be very sensitive to disturbance from mussel fishing activity. Herons feed widely around the shoreline of the harbour and generally tolerate close approach by pedestrians. When they are disturbed, they usually fly short distances and then resume feeding. Nocturnal roosts are unlikely to be affected by mussel fishing activity as the birds appear to move into the trees, away from the water, at night.

8.50 The Little Grebes in Saleen Creek generally do not occur within around 300-400 m of permanent subtidal habitat. Therefore, they are unlikely to be disturbed by mussel fishing activity.

8.51 Gulls are generally regarded as being very tolerant of human disturbance, often exploiting highly disturbed habitats and feeding in large numbers in very close proximity to human activity. However, flocks of gulls on intertidal habitats will flush in response to disturbance. Laursen *et al.* (2005) reported escape distances (EDs) for Black-headed Gulls in the Danish Wadden Sea of 116 m (95% C.I.: 98-137 m), which were comparable to the EDs shown by some of the wader species in that study, but their study was carried out in an area with a very low level of human activity, and with ample undisturbed habitat for birds to move to, so the birds would not have been habituated to disturbance, and the costs of moving would have been low. Burger *et al.* (2007) found that Laughing Gulls on a New Jersey beach recovered very quickly after disturbance events, with birds returning within 30 seconds, and numbers reaching the pre-disturbance levels within five minutes, in contrast to the wader species, whose numbers still had not reached the pre-disturbance levels after ten minutes.

8.52 In Cork Harbour, the main Black-headed Gull and Lesser Black-backed Gull nocturnal roost occurs in Lough Mahon around the shipping channel into Tivoli Docks. We have observed the passage of large ships through this roost without any significant disturbance effects. Daytime gull roosts can occur both on shoreline areas (usually in association with high tide wader roosts) and on open water. The gulls will flush when disturbed but will usually resettle nearby. For example, a typical pattern would be for gulls flushed from a shoreline roost to resettle on open water nearby.

8.53 Due to their tolerance of human disturbance, mussel fishing activity is unlikely to result in any disturbance responses from gulls foraging in subtidal habitat. Mussel fishing may result in disturbance responses from roosting flocks of gulls. However, as discussed above, any such disturbance responses are only likely to cause short distance local movements and are, therefore, unlikely to cause significant energetic impacts, or to cause gulls to be displaced from an area.

8.54 Foraging Common Terns are generally tolerant of human disturbance and Furness *et al.* (2013) gave Common Tern a low vulnerability score for disturbance by ship traffic, referencing “slight avoidance at short range”. In Irish coastal waters they often feed in very close proximity to human activity.

Conclusions

8.55 The target production level for the bottom mussel culture site in the East Harbour indicates that high levels of husbandry and harvesting activity will be involved in the cultivation of this site. These activities have the potential to cause significant disturbance impacts to Red-breasted Merganser, Cormorant and Great Crested Grebe roost sites located within the aquaculture site. These are primarily night roost sites but the Great Crested Grebe roost sites is also sometimes occupied during the day. There is also potential for displacement impacts to foraging Red-breasted Mergansers, which could prevent reoccupation of the East Harbour zone in the event of a recovery of the Cork Harbour Red-breasted Merganser population. Smaller scale displacement impacts to foraging Cormorant and Great Crested Grebe are also possible. Wigeon, Mallard and Oystercatchers using shoreline feeding areas and/or roost sites around the edge of the aquaculture site could also be affected by disturbance from the activity.

9. Assessment of cumulative impacts

Introduction

9.1 This chapter examines the potential for cumulative impacts from the aquaculture activities covered by this assessment in combination with other relevant activities. The chapter first considers Fishery Orders, which permit additional aquaculture development and shellfishing activity in Cork Harbour. The chapter then reviews a wide range of other activities that occur in Cork Harbour and which have potential for impacts on waterbird populations.

9.2 We only considered potential for cumulative impacts to species for which the assessments in Chapters 7 and 8 have identified potential for significant, or non-significant but not negligible, impacts.

Fishery Orders

Aquaculture activities

9.3 There are four Fishery Orders within Cork Harbour.

9.4 Two Fishery Orders occur in the North Channel. The Rossmore Fishery Order overlaps the aquaculture sites and covers the section of the North Channel between Weir Island and Rossmore. This fishery order appears to have been used for oyster trestle cultivation as there are old trestles outside the currently licensed sites. The Brick Island Fishery Order covers the section of the North Channel between Brick Island and Brown Island, including the bay behind Brick Island. This Fishery Order has been used for bottom cultivation of Native and Pacific Oysters using seed from the hatchery on Brick Island. However, the fishery has been closed since 2002, although oysters are still held here for shellfish testing purposes.

9.5 There is one Fishery Order in the East Harbour zone, overlapping the East Harbour aquaculture site, but extending up Saleen Creek. This Fishery Order has been used for bottom cultivation of Native and Pacific Oysters, with oyster trestle cultivation along the shoreline between Saleen Creek and Rostellan. As in the North Channel, this oyster fishery has also been closed since 2002, while the trestles have not been actively worked for many years.

9.6 There is also a Fishery Order in the Owenboy Estuary. However, no information has been provided about the activities (if any) in this Fishery Order, so it is not considered further in this assessment.

Potential in-combination effects

Oyster trestle cultivation

9.7 The only potential non-negligible impacts from development of the aquaculture sites considered in this assessment to SCI species that are potentially sensitive to negative impacts from oyster trestle cultivation are the potential disturbance impacts to Wigeon and Mallard from the mussel fishery in the East Harbour aquaculture site.

9.8 Full occupation of the Rossmore Fishery Order by trestles would potentially cause displacement of 0.4-0.6% of the Cork Harbour Wigeon and Mallard population. Note that the North Channel aquaculture sites are included within this Fishery Order, so this displacement impact includes that of the aquaculture sites. This level of displacement is still effectively negligible so development of oyster trestles in the Rossmore Fishery Order is not likely to have cumulative impacts to Wigeon

and Mallard in combination with potential disturbance impacts from the mussel fishery in the East Harbour aquaculture site.

9.9 Development of oyster trestle cultivation in the East Harbour Fishery Order is likely to be constrained by limited suitability of the intertidal habitat along much of the shoreline of the Fishery Order. The most suitable habitat for oyster trestle cultivation is likely to be along the shoreline extending east from Aghada Pier to Rostellan village and north to the mouth of Saleen Creek, with the existing trestles being located in the latter area. This is also the area exploited by Wigeon and Mallard at low tide. Therefore, extensive development of oyster trestle cultivation in this area could potentially have significant negative cumulative impacts to Wigeon and Mallard in combination with potential disturbance impacts from the mussel fishery in the East Harbour aquaculture site. However, Wigeon appears to have variable responses to oyster trestle cultivation, while the evidence for Mallard responses to oyster trestle cultivation is limited. Also, information received from the operator indicates that they have no plans at present to expand along the area currently occupied by trestles.

9.10 Note also that development of oyster trestle cultivation in the East Harbour Fishery Order may have negative impacts on other SCI species, but these impacts would not have the potential to cause significant impacts in combination with impacts from the aquaculture sites considered in this assessment.

Oyster fisheries

9.11 The Brick Island Fishery Order is located in the central area of Red-breasted Merganser distribution within the North Channel. Red-breasted Merganser appear to be very sensitive to boat activity and there is currently very little boat activity in this area in winter. Therefore, the North Channel is currently a disturbance refuge for Red-breasted Merganser in Cork Harbour and any development that increases boat activity in winter in this area may have very significant negative impacts on the Cork Harbour Red-breasted Merganser population. It is notable that the decline in the North Channel Red-breasted Merganser population occurred in the late 1990s when the Brick Island Fishery Order was still open, while there does not seem to have been any subsequent decline during the period when the fishery has been closed, in contrast to ongoing declines in the East Harbour and West Harbour zones (Text Figure 5.4). Therefore, reopening of the oyster fishery in the Brick Island Fishery Order would have the potential to have significant cumulative impacts in combination with potential disturbance impacts to Red-breasted Merganser from the mussel fishery in the East Harbour zone, although the major impact would be from the Brick Island Fishery Order. Reopening of the oyster fishery in the East Harbour Fishery Order would cause additional boat activity to that involved in the mussel fishery and may, therefore, increase the cumulative impacts on the Cork Harbour Red-breasted Merganser population.

9.12 Two Oystercatcher high tide roosts occur along the shoreline around the Brick Island Fishery Order in positions where they are potentially vulnerable to disturbance impacts from oyster fishing. These roosts have a total capacity of around 50 birds, which is around 3% of the total Oystercatcher roost capacity in Cork Harbour. Therefore, reopening of the oyster fishery in the Brick Island Fishery Order would have the potential to have significant cumulative impacts on the Cork Harbour Oystercatcher population in combination with potential disturbance impacts to Oystercatcher from the mussel fishery in the East Harbour zone. Reopening of the oyster fishery in the East Harbour Fishery Order would cause additional boat activity to that involved in the mussel fishery and may, therefore, increase the cumulative impacts on the Cork Harbour Oystercatcher population.

Other activities

Wigeon

9.13 The conservation condition of the Wigeon population in Cork Harbour has been assessed as unfavourable (NPWS, 2014c) although it is also declining at a national scale. While Wigeon is widely distributed around the harbour, there are a few key locations for the species where there is suitable grassland feeding habitat with unimpeded access to water refuges. The recent loss of one of these areas at Ballintubbrid in the North Channel may have negatively affected the Cork Harbour population, although this may have been offset by the development of new habitat in the Harper's Island Wetland Centre over the same period of time.

9.14 Most of the areas holding significant concentrations of Wigeon in Cork Harbour have limited shoreline access and do not experience high levels of boat activity in winter, so pedestrian and boat disturbance are not likely to be having significant disturbance impacts to the Cork Harbour population. However, it is possible that the current distribution patterns are influenced by these activities: e.g., the near-absence of Wigeon from the Owenboy Estuary might reflect the high levels of marine activity here.

9.15 Disturbance from wildfowling activity may be causing significant disturbance impacts to the Cork Harbour Wigeon population. Wildfowling on state-owned foreshore in Cork Harbour is licensed by NPWS, although the activity is excluded from the Douglas Estuary, which is a Wildfowl Sanctuary. In addition, wildfowling takes place on land adjacent to the foreshore. In recent winters, increasing levels of confirmed, or suspected, disturbance from wildfowling has been recorded during I-WeBS counts in the North Channel (Gittings, 2018). This activity takes place on the foreshore in the western section of the North Channel between Belvelly Bridge and Rossleague and can cause high levels of displacement lasting several hours after the activity ceases. This area holds around 10% of the Cork Harbour Wigeon population at high tide. In addition, wildfowling has been recorded at Slatty Pool and Harper's Island, which together hold around 30-40% of the Cork Harbour Wigeon population. However, wildfowling at Harper's Island has ceased in recent winters due to the development of the Harper's Island Wetland Centre. Wildfowling also takes place in Lough Beg, where it has been a regular activity over many years, and this may possibly explain the near-absence of Wigeon from this area. Therefore, disturbance from wildfowling may have significant cumulative impacts to the Cork Harbour Wigeon population in combination with potential disturbance impacts from the mussel fishery in the East Harbour aquaculture site.

Mallard

9.16 The conservation condition of the Cork Harbour Mallard population was not assessed by NPWS (2014c) as it is not a SCI of the Cork Harbour SPA. However, it has shown a declining trend over the duration of the I-WeBS counts, and this appears to be a continuation of a long-term decline since the 1970s (Smiddy *et al.*, 1995).

9.17 Over 50% of the Cork Harbour Mallard population occurs in the East Harbour and West Harbour zones, which are areas with relatively high levels of shoreline access and marine activity. Therefore, pedestrian disturbance and disturbance from boat traffic and recreational watercraft could potentially have significant cumulative impacts to the Cork Harbour Mallard population in combination with potential disturbance impacts from the mussel fishery in the East Harbour aquaculture site.

Red-breasted Merganser

9.18 The conservation condition of the Red-breasted Merganser population in Cork Harbour has been assessed as highly unfavourable (NPWS, 2014c), although there have been significant differences between different sections of the harbour in the population trends (Text Figure 5.4). Disturbance from boat traffic and recreational watercraft may well be influencing the current distribution patterns, resulting in the concentration of birds in the Fota Channel and North Channel, which are areas with very low levels of marine activity in winter. In recent winters, increasing levels of recreational watercraft activity has been recorded during I-WeBS counts (Gittings, 2018), including activity in the Fota Channel and North Channel. Therefore, boat traffic and recreational watercraft could potentially have significant cumulative impacts to the Cork Harbour Red-breasted Merganser population in combination with potential disturbance impacts from the mussel fishery in the East Harbour aquaculture site.

Cormorant

9.19 The conservation condition of the Cormorant population in Cork Harbour has been assessed as highly unfavourable (NPWS, 2014c). However, this assessment may just reflect exceptionally high numbers in the mid-1990s at the start of the I-WeBS count period, as numbers recorded in waterbird counts in the 1970s, 1980s and early 1990s were much lower (Smiddy *et al.*, 1995). Cormorant are less sensitive to disturbance than Red-breasted Merganser. However, they are widely distributed throughout the harbour, including in areas with high levels of marine activity. The nocturnal roost at Drakes Pool in the Owenboy Estuary is in an area with a high level of marine activity, and disturbance to this roost has been observed (see paragraph 8.27), while the nocturnal roosts at Siddon's Tower and Bagwell's Hill are also potentially vulnerable to disturbance from marine activity. Therefore, it is possible that boat traffic and recreational watercraft activity could have significant cumulative impacts to the Cork Harbour Cormorant population in combination with potential disturbance impacts from the mussel fishery in the East Harbour aquaculture site.

Great Crested Grebe

9.20 The conservation condition of the Great Crested Grebe population in Cork Harbour has been assessed as unfavourable (NPWS, 2014c), although there have been significant differences between different sections of the harbour in the population trends (Text Figure 5.4). This species is probably not very sensitive to disturbance when foraging, but appears to be very sensitive to disturbance when they gather into communal roosts. The roosting areas in the Inner Harbour, East Harbour and West Harbour zones are all in areas with relatively high levels of marine activity, although the impact on the roosting grebes is mitigated by the fact that the roosts are mainly occupied at night when there is relatively little activity. Therefore, it is possible that boat traffic and recreational watercraft activity could have significant cumulative impacts to the Cork Harbour Great Crested Grebe population in combination with potential disturbance impacts from the mussel fishery in the East Harbour aquaculture site.

Oystercatcher

9.21 The conservation condition of the Oystercatcher population in Cork Harbour has been assessed as (intermediate) unfavourable (NPWS, 2014c), although after high numbers in two winters in the mid-1990s the population has remained largely stable. Around 30% of the Cork Harbour population occurs in the the East Harbour and West Harbour zones, which are areas with relatively high levels of shoreline access and marine activity. Oystercatcher are probably relatively tolerant of disturbance impacts at low tide and birds in areas with high levels of shoreline access generally show very low response distances to human activity. However, Oystercatcher in high tide roosts are more sensitive to disturbance impacts and we have observed Oystercatcher roosts in Saleen Creek being flushed

by pedestrian and kayaking activity. Therefore, pedestrian activity, boat traffic and recreational watercraft activity could have significant cumulative impacts to the Cork Harbour Oystercatcher population in combination with potential disturbance impacts from the mussel fishery in the East Harbour aquaculture site.

9.22 There appears to be a high level of winkle picking activity in the East Harbour, West Harbour and Outer Harbour zones, with apparently commercial scales of operation in some areas. The areas exploited by the winkle pickers also hold concentrations of Oystercatcher, which is not surprising as both the Oystercatcher and the winkle pickers are exploiting the same resource. It is possible that winkle picking is having a negative impact on Oystercatcher food resources, in which case winkle picking could have significant cumulative impacts to the Cork Harbour Oystercatcher population in combination with potential disturbance impacts from the mussel fishery in the East Harbour aquaculture site.

10. Assessment of impacts on conservation objectives

Introduction

10.1 The implications of the potentially significant impacts identified in this assessment for the achievement of the conservation objectives of the relevant SCIs are discussed in this chapter.

Cork Harbour SPA

Wigeon

10.2 Bottom mussel culture in the East Harbour aquaculture site could potentially cause significant disturbance impacts to Wigeon feeding and/or roosting in shallow subtidal habitat along the eastern and southern edges of the aquaculture site. This could cause displacement of a significant proportion of the Cork Harbour population of this species, which would have a negative impact on attribute 2 (distribution) of the conservation objective for this SCI. There is also potential for oyster trestle cultivation in the Rossmore and East Harbour FOs, and disturbance from wildfowling activity in the North Channel, to have additional cumulative impacts on this SCI in combination with the impact from the bottom mussel culture activity.

Red-breasted Merganser

10.3 Bottom mussel culture in the East Harbour aquaculture site could potentially cause significant disturbance impacts to the Red-breasted Merganser night roost site off the south-eastern shore of Great Island. Regular displacement of birds from this roost site would have a negative impact on attribute 2 (distribution) of the conservation objective for this SCI. The energetic costs of disturbance could have impacts on survival rates of the Cork Harbour Red-breasted Merganser population in which case they could have a negative impact on attribute 1 (population trend) of the conservation objective for this SCI. Reopening of the oyster fisheries in the Brick Island and East Harbour Fishery Orders, and other boat traffic and recreational watercraft activity in Cork Harbour, would be likely to have significant additional cumulative impacts on this SCI in combination with the impact from the bottom mussel culture activity.

Cormorant

10.4 Bottom mussel culture in the East Harbour aquaculture site could potentially cause significant disturbance impacts to the Cormorant night roost at Siddon's Tower on the eastern edge of the aquaculture site. Regular displacement of birds from this roost site would have a negative impact on attribute 2 (distribution) of the conservation objective for this SCI. The energetic costs of disturbance could have impacts on survival rates of the Cork Harbour Cormorant population in which case they could have a negative impact on attribute 1 (population trend) of the conservation objective for this SCI. Reopening of the oyster fishery in the East Harbour Fishery Order, and other boat traffic and recreational watercraft activity in Cork Harbour, could have significant additional cumulative impacts on this SCI in combination with the impact from the bottom mussel culture activity.

Great Crested Grebe

10.5 Bottom mussel culture in the East Harbour aquaculture site could potentially cause significant disturbance impacts to the Great Crested Grebe roosts in the middle of the aquaculture site. These roosts are primarily used at night but are also used, at times, during the day. Regular displacement of birds from these roost sites would have a negative impact on attribute 2 (distribution) of the conservation objective for this SCI. The energetic costs of disturbance could have impacts on survival rates of the Cork Harbour Great Crested Grebe population in which case they could have a negative impact on attribute 1 (population trend) of the conservation objective for this SCI. Reopening of the oyster fishery in the East Harbour Fishery Order, and other boat traffic and recreational watercraft activity in Cork Harbour, could have significant additional cumulative impacts on this SCI in combination with the impact from the bottom mussel culture activity.

Oystercatcher

10.6 Bottom mussel culture in the East Harbour aquaculture site could potentially cause significant disturbance impacts to the Oystercatcher roosts along the shoreline of the aquaculture site. Regular displacement of birds from these roost sites would have a negative impact on attribute 2 (distribution) of the conservation objective for this SCI. The energetic costs of disturbance could have impacts on survival rates of the Cork Harbour Oystercatcher population in which case they could have a negative impact on attribute 1 (population trend) of the conservation objective for this SCI. Reopening of the oyster fisheries in the Brick Island and East Harbour Fishery Orders, and other boat traffic, recreational watercraft and pedestrian activity in Cork Harbour, could have significant additional cumulative impacts on this SCI in combination with the impact from the bottom mussel culture activity.

The Gearagh SPA

Mallard

10.7 Bottom mussel culture in the East Harbour aquaculture site could potentially cause significant disturbance impacts to Mallard feeding and/or roosting in shallow subtidal habitat along the eastern and southern edges of the aquaculture site. This could cause displacement of a significant proportion of the Cork Harbour population of this species. If there is significant population interchange between Cork Harbour and the Gearagh, this could have a negative impact on attribute 1 (population trends) of the conservation objective for this SCI. There is also potential for oyster trestle cultivation in the Rossmore and East Harbour Fishery Orders, and disturbance from boat traffic, recreational watercraft and pedestrian activity in Cork Harbour, to have additional cumulative impacts on this SCI in combination with the impact from the bottom mussel culture activity.

Other SPAs

10.8 Wigeon is a SCI of several other SPAs in Co. Cork (Ballymacoda Bay SPA, Blackwater Callows SPA, Blackwater Estuary SPA, Courtmacsherry Bay SPA and The Gearagh SPA) and has weak site fidelity (NPWS, 2014c). Therefore, if there is significant population interchange between the Wigeon populations in Cork Harbour and any of these SPAs, the potential impacts from bottom mussel culture in Cork Harbour could have a negative impact on attribute 1 (population trends) of the conservation objective for these SCIs.

10.9 Red-breasted Merganser is an SCI of the Courtmacsherry Bay SPA and has unknown site fidelity (NPWS, 2014c). Therefore, if there is significant population interchange between Cork Harbour and

Courtmacsherry Bay, the potential impacts from bottom mussel culture in Cork Harbour could have a negative impact on attribute 1 (population trends) of the conservation objective for this SCI.

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Appendix A

Scientific names

Common name	Scientific names	BTO code
Bar-tailed Godwit	*Limosa lapponica*	BA
Black-headed Gull	*Chroicocephalus ridibundus*	BH
Black-tailed Godwit	*Limosa limosa*	BW
Coot	*Fulica atra*	CO
Common Gull	*Larus canus*	CM
Common Tern	*Sterna hirundo*	CN
Cormorant	*Phalacrocorax carbo*	CA
Curlew	*Numenius arquata*	CU
Double-Crested Cormorant	*Phalacrocorax auritus*	-
Dunlin	*Calidris alpina*	DN
Golden Plover	*Pluvialis apricaria*	GP
Great Crested Grebe	*Podiceps cristatus*	GG
Great Northern Diver	*Gavia immer*	ND
Grey Heron	*Ardea cinerea*	H.
Grey Plover	*Pluvialis squatarola*	GV
Guillemot	*Uria aalge*	GU
Herring Gull	*Larus argentatus*	HG
Kittiwake	*Rissa tridactyla*	KI
Lapwing	*Vanellus vanellus*	L.
Lesser Black-backed Gull	*Larus fuscus*	LB
Light-bellied Brent Goose	*Branta bernicla hrota*	PB
Little Grebe	*Tachybaptus ruficollis*	LG
Mallard	*Anas platyrhynchos*	MA
Oystercatcher	*Haematopus ostralegus*	OC
Pintail	*Anas acuta*	PT
Red-breasted Merganser	*Mergus serrator*	RM
Redshank	*Tringa totanus*	RK
Ringed Plover	*Charadrius hiaticula*	RP
Sanderling	*Calidris alba*	SS
Shelduck	*Tadorna tadorna*	SU
Shoveler	*Anas clypeata*	SV
Teal	*Anas crecca*	T.
Turnstone	*Arenaria interpres*	TT
Whooper Swan	*Cygnus cygnus*	WS
Wigeon	*Anas penelope*	WN

Appendix B

Literature review - Impacts of bottom mussel culture on benthic fauna

B.1 Review

B.1.1 Bottom culture accounts for about half of all mussels produced in Ireland (Heffernan, 1999). In 1995, 5,570 tonnes were produced. Bottom cultivation involves the location, collection and transplantation of wild mussel spat into richer, shallower waters using a dredger. Successful on-growing of re-laid spat requires sandy shallow beds. When the mussels reach commercial size (9-18 months later), they are harvested by dredger (Joyce, 1992 cited in Heffernan, 1999). This method is practised successfully on a large scale in Wexford Harbour and also in Carlingford Lough (Heffernan, 1999).

B.1.2 Heffernan (1999) could not find any literature on the impact of bottom culture on benthic fauna and it was presumed that the culture beds were analogous to natural mussel beds. In the intervening years, a number of studies have been undertaken to assess the impacts of bottom mussel culture on benthic fauna.

B.1.3 Smith and Shackley (2004) investigated the development of bottom mussel culture in inner Swansea Bay, Wales. The area was a shallow, sublittoral and high tidal energy environment. The results of this study found that the establishment of bottom mussel culture led to a reduction in the number and abundance of species due to habitat change and regular harvesting. There was an increase in abundance in carnivorous and deposit feeding species. In addition, the study found that the mussels reduced the chance of other filter feeding benthic species from becoming established by filtering their larvae or by physically smothering them. Smith and Shackley (2004) predicted that the establishment of bottom mussel culture at the Swansea site would lead to a change in benthic fauna and as a result, potentially impact the availability of prey species of juvenile flatfish that use the area as a nursery. Furthermore, an increased number of mussels in the area may reduce the potential food source of other filter feeding species in the area.

B.1.4 These finding are in contrast to those of Dolmer (2002) who reported that there is a positive relationship between mussel abundance and the number of associated species due to the increased complexity of the substratum in mussel beds compared to the surrounding sediments. In effect, the mussels become ‘ecosystem engineers’ (Jones *et al.* 1994; 1997). The presence of mussel beds can control the benthic environment directly by providing habitat and indirectly by enhancing larval settlement (Dolmer, 2002), providing shelter from predation, trapping sediment and altering water flow (Gutiérrez *et al.* 2003).

B.1.5 At study sites in western Sweden, Norling *et al.* (2015) examined the effects of blue mussel plots, one containing live mussels and the other with post mortem shells, on the epifaunal and infaunal assemblages. Notably, this study included the effect on fish species which were not considered in some of the other studies. This study supported previous studies which found that the ecosystem engineering effects of plots containing live mussels and dead shells both had an increase in epibenthic species richness, total abundance and biomass compared to the control plot which consisted of bare sand. Notably, small crustaceans were positively affected by the presence of blue mussel plots whereas fish species were positively affected by the presence of oyster plots which were also studied.

B.1.6 Ysebaert *et al.* (2009), made a comparison study between bottom mussel culture at sites in Denmark (a shallow, wind dominated, mixed water environment with microtidal range and low current conditions) and the Netherlands (a deeper, marine dominated environment with greater tidal range and currents). They reported the change in the habitat due the presence of bottom culture

mussels had a positive effect on the benthic community, especially in the Netherlands site where an increase in the number of epibenthic species was seen.

B.1.7 However, it is important to consider the impact of biodeposition on the benthic fauna, in particular the infaunal assemblages. The presence of bottom culture mussel beds means the habitat is dominated by single species on the seabed. This may lead to the transformation of an infaunal dominated community to an epifaunal dominated community and also cause alteration of sediment type and chemistry due to the production of mussel mud (Marine Institute, 2013). Relaid mussels lead to the development of mussel mud (a mix of dead shells, silt and faeces/pseudofaeces) beneath the mussel beds as the filtration and feeding activities of the mussels increase the sedimentation rate (Kaiser *et al.*, 1998). The effects of this were observed by Beadman *et al.* (2004) who noted that an increase in the abundance of mussels resulted in a decrease of both infaunal diversity and abundance through provision of a complex habitat, input of organically rich material and larval removal through filter feeding at a study site in Bangor Pier, north Wales. However, these impacts were local in nature (0 to 10 m) and were not detectable at greater distances.

B.1.8 Ysebaert *et al.* (2009) also found that the influence of bottom cultures on the sedimentary environment and on the macrobenthic community was found to be very local. Kaiser *et al.* (1998) argue that although local in extent, these changes may persist in time following the removal of mussel beds as although the fine sediments are reworked, the remaining shell material effectively creates a new benthic habitat that may have more long term effects on the composition of benthic fauna in the area.

B.1.9 In contrast, Van der Zee *et al.* (2012) reported that mixed blue mussel and oyster beds can have large scale effects (>100 m) as the beds have effects on consumer-resource interactions far beyond their own physical spatial boundaries in intertidal soft-sediment systems. This is a result of increasing organic matter in the sediment, increasing the silt fraction in the sediment and decreasing the redox potential all of which can influence the distribution of benthic species (Norling *et al.*, 2015).

B.1.10 In relation to the effects on surrounding sediment, Norling *et al.* (2015) again reported that the presence of live blue mussels on the seabed significantly increased the organic content in the surrounding sediment by both excreting organic-rich particles and also by trapping passing organic rich particles due to the heterogeneous structure of the mussel bed compared to the surround sandy seabed. However, no significant effects on infaunal species richness or abundance were found during this study though there was a trend towards reduced infaunal abundance in both oyster and blue mussel plots (both alive and dead). Dittmann (1990) reported that blue mussel beds reduce macroinfauna abundances compared to the surrounding sandflats with a change in the composition of the assemblages from Polychaeta in the sandflats to Oligochaeta in the mussel beds. Kochmann *et al.* (2008) report that the presence of mussel beds on the seabed results in a change in the species composition but not in richness. Species which are more tolerant to the changing organic content in the sediment move into the mussel beds whereas less tolerant species remain in the bare sand. The abundances of infaunal species increased under the mussel beds, possibly due to the cover provided by the mussels from predators.

B.1.11 With respect to fish species, Norling *et al.* (2015) found that live blue mussel beds had a positive effect on the fish assemblages with an increase in species richness, abundance and total biomass particularly for oyster beds but also to a lesser degree for live blue mussel beds. Similar positive relationships between blue mussel beds and fish in the Baltic Sea (Jansson *et al.*, 1985). However, the other studies cited in Norling *et al.* (2015) of observations of an increases in fish diversity and abundance over bivalve beds made by Norling *et al.* (2015) were all based on oyster beds (Breitburg, 1999; Posey *et al.*, 1999; Trolley and Volety, 2005) and in the United States by Peterson *et al.*, (2003). In particular the differences in physical structure of oyster beds compared to blue mussel beds to attract different suites of species, the ability of oyster beds to form reefs and so persist for much longer and the lack of information relating to use of fish on dead blue mussel beds are all factors that need to be considered when evaluating the impact of bivalve plots on benthic fauna.

B.1.12 The use of dredges to harvest the mussel beds had an impact on the non-target infaunal benthic fauna at a site in Denmark with polychaetes associated with mussel beds having a reduced density after dredging. In addition, gastropods and bivalves were also reduced in number after dredging. These impacts are reported to be short term in nature (Dolmer *et al.* 2002). The invasion of scavenging brown shrimps into the dredged area accelerates the transport of energy to higher trophic levels, and thereby changes the trophic structure of the ecosystem. (Dolmer *et al.* 2002).

B.1.13 Hoffmann and Dolmer (2000) found that the use of dredges had no long-term effects on the epifauna composition, however further studies suggest that taxa such as sponges, echinoderms, anthozoans, molluscs, crustaceans and ascideans occurred at reduced density or were not observed at all 4 months after an area had been fished, indicating that the fishery has a short-term effect on the epifauna (P. Dolmer, unpublished results). In contrast, harvesting, as well as habitat change, was proposed as an explanation for a decrease in the number of species and in the total number of individuals in their study site (Smith and Shakley, 2004).

B.1.14 In summary, it appears that mussel culture beds can increase the diversity and abundance of epibenthic fauna by providing an additional food resource for species that predate on the mussels themselves or other species that may be attracted to the mussel bed to predate on the species that are attracted to the mussel beds for refuge. This change in epibenthic fauna is contrasted with a change of infaunal species as increased organic rich sediments deposited by the mussels changes the characteristics of the sediments beneath the culture plot. There is disagreement as to the effectiveness of mussel beds to increase or decrease the abundance of other filter feeding benthic species positively by providing an additional habitat for larvae to establish or negatively by consuming the larvae of other species that may otherwise occupy the area. Local site specific factors may play an important role in determining the impact of bottom mussel plots on benthic fauna.

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Report supporting Appropriate Assessment of Aquaculture in Great Island Channel SAC (Site code: 001058)

Marine Institute

Rinville

Oranmore, Co. Galway

Version: June 2019

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1 PREFACE

In Ireland, the implementation of Article 6 of the Habitats Directive in relation to aquaculture and fishing projects and plans that occur within designated sites is achieved through sub-Article 6(3) of the Directive. Fisheries not coming under the scope of Article 6.3, i.e. those fisheries not subject to secondary licencing are subject to risk assessment. Identified risks to designated features can then be mitigated and deterioration of such features can be avoided as envisaged by sub-article 6.2.

Fisheries, other than oyster fisheries, and aquaculture activities are licenced by the Department of Agriculture, Food and Marine (DAFM). Oyster fisheries (in fishery order areas) are licenced by the Department of Communications Energy and Natural Resources (DCENR). The Habitats Directive is transposed in Ireland in the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. 477 of 2011). Appropriate assessments (AA) of aquaculture and risk assessments (RA) of fishing activities are carried out against the Conservation Objectives, and more specifically on the version of the Conservation Objectives that are available at the time of the Assessment, for designated ecological features, within the site, as defined by the National Parks and Wildlife Service (NPWS). NPWS are the competent authority for the management of Natura 2000 sites in Ireland. Obviously, aquaculture and fishing operations existed in coastal areas prior to the designation of such areas under the Directives. Ireland is thereby assessing both existing and proposed aquaculture and fishing activities in such sites. This is an incremental process, as agreed with the EU Commission in 2009, and will eventually cover all fishing and aquaculture activities in all Natura 2000 sites.

The process of identifying existing and proposed activities and submitting these for assessment is, in the case of fisheries projects and plans, outlined in S.I. 290 of 2013. Fisheries projects or plans are taken to mean those fisheries that are subject to annual secondary licencing or authorization. Here, the industry or the Minister may bring forward fishing proposals or plans which become subject to assessment. These Fishery Natura Plans (FNPs) may simply be descriptions of existing activities or may also include modifications to activities that mitigate, prior to the assessment, perceived effects to the ecology of a designated feature in the site. In the case of other fisheries, that are not projects or plans, data on activity are collated and subject to a risk assessment against the Conservation Objectives. Oyster fisheries, managed by DCENR, do not come under the remit of S.I. 290 of 2013 but are defined as projects or plans as they are authorized annually and therefore, should be subject to AA.

In the case of aquaculture, DAFM receives applications to undertake such activity and submits a set of applications, at a defined point in time, for assessment. The FNPs and aquaculture applications are then subject to AA. If the AA or the RA process finds that the possibility of significant effects cannot be discounted or that there is a likelihood of negative consequence for designated features then such activities will need to be mitigated further if they are to continue. The assessments are not explicit on how this mitigation should be achieved but rather indicate whether mitigation is required or not and what results should be achieved.

2 EXECUTIVE SUMMARY

2.1 THE SAC

Great Island Channel SAC is designated as a Special Area of Conservation (SAC) under the Habitats Directive. The marine area is designated for the habitat Mud and sandflats not covered by seawater at low tide. This habitat supports an intertidal sedimentary community. Conservation Objectives for this habitat were identified by NPWS (2014a) and relate to the requirement to maintain habitat distribution, structure and function, as defined by characterising (dominant) species in these habitats. Guidance on the conservation objectives is provided by NPWS (2014b; 2014c).

2.2 ACTIVITIES IN THE SAC

Within the Great Island Channel SAC aquaculture focuses on the cultivation of the Pacific oyster *Crassostrea gigas* predominantly on trestles in intertidal areas. The profile of the aquaculture industry in the SAC, used in this assessment, was prepared by BIM and is derived from the list of licence applications received by DAFM and provided to the MI for assessment in April 2018.

2.3 THE APPROPRIATE ASSESSMENT PROCESS

The function of an appropriate assessment is to determine if the ongoing and proposed aquaculture activities are consistent with the Conservation Objectives for the Natura site or if such activities will lead to deterioration in the attributes of the habitats and species over time and in relation to the scale, frequency and intensity of the activities. NPWS (2011a) provide guidance on interpretation of the Conservation Objectives which are, in effect, management targets for habitats and species in the SAC. This guidance is scaled relative to the anticipated sensitivity of habitats and species to disturbance by the proposed activities. Some activities are deemed to be wholly inconsistent with long term maintenance of certain sensitive habitats while other habitats can tolerate a range of activities. For the practical purpose of management of sedimentary habitats, a 15% threshold of overlap between a disturbing activity and a habitat is given in the NPWS guidance (NPWS 2011c). Below this threshold disturbance is deemed to be non-significant. Disturbance is defined as that which leads to a change in the characterizing species of the habitat (which may also indicate change in structure and function). Such disturbance may be temporary or persistent in the sense that change in characterizing species may recover to pre-disturbed state or may persist and accumulate over time.

The appropriate assessment process is divided into a number of stages consisting of a preliminary risk identification, and subsequent assessment (allied with mitigation measures, if necessary) which are covered in this report. The first stage of the process is an initial screening wherein activities which are deemed not to have any impact on the conservation features, because they do not spatially overlap with a given habitat or have a clear pathway for interaction. These activities are excluded from further consideration. The next phase is the Natura Impact Statement (NIS) where interactions (or risk of) are identified. Further to this, an assessment on the significance of the likely interactions between activities and conservation features is conducted. Mitigation measures (if necessary) will be introduced in situations where the risk of significant disturbance is identified. In situations where there is no obvious mitigation to reduce the risk of significant impact, it is advised that caution should be applied in licencing decisions. Overall the Appropriate Assessment is both the process and the assessment undertaken by the competent authority to effectively validate this

report and/or NIS. It is important to note that the screening process is considered conservative in that activities which may overlap with habitats but which may have very benign effects are retained for full assessment.

2.4 DATA SUPPORTS

Distribution of habitats and species population data are provided by NPWS[1]. Scientific reports on the potential effects of various activities on habitats and species have been compiled by the MI and provide the evidence base for the findings. The profile of aquaculture activities was provided by BIM. The data supporting the assessment of individual activities vary and provides for varying degrees of confidence in the findings.

2.5 FINDINGS

Aquaculture and Habitats/Species:

In the Great Island Channel SAC there are 2 valid oyster production licences using bag and trestle method. The company operating these 2 sites have applied to amalgamate them into one site and have applied to also grow the oysters in floating bags, in the deeper parts of the site. They are also planning to cultivate two native red seaweeds, namely *Porphyra sp.* and *Palmaria palmata*.

An initial screening exercise resulted in one habitat feature being excluded from further consideration. This habitat was Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) (1330) and none of the aquaculture activities (existing and/or proposed) overlaps or likely interacts with this feature and therefore it was excluded from further consideration in the assessment:

- 1140 Mudflats and Sandflats not covered by seawater at low tide

Table 2.1 - Community types recorded in Great Island Channel SAC and the Annex I habitats of (1140) Mudflats and sandflats not covered by seawater at low tide that overlap with overlap with current and existing aquaculture activities

Feature	Community Type	Overlap with intertidal oyster trestle cultivation activities*
Mudflats and Sandflats not covered by seawater at low tide (1140)	Mixed sediment to sandy mud with polychaetes and oligochaetes community complex.	✓

2.5.1 Habitats

A full assessment was carried out on the likely interactions between existing and proposed culture operations and the Annex 1 habitats of 1140 Mudflats and Sandflats not covered by seawater at low

[1] NPWS Geodatabase Ver: September 2015 - http://www.npws.ie/mapsanddata/habitatspeciesdata/

tide. Furthermore, the constituent community 'Mixed sediment to sandy mud with polychaetes and oligochaetes community complex' of habitat 1140 was considered.

Based upon the scale of spatial overlap of current and proposed intertidal oyster aquaculture activities (including access route activity) and the relatively high tolerance levels of the habitats and associated species, the general conclusion is that current and proposed intertidal culture activities are non-disturbing to the Qualifying Interests and their constituent community types.

The subtidal relaying and dredging of Native oysters subtidally, either individually or in-combination with aquaculture activities, are considered non-disturbing to the Qualifying Interest and its constituent community types.

2.5.2 Other considerations

Based upon experience elsewhere, the introduction of '½ grown' or 'wild' oyster or mussel seed stock into aquaculture plots (both within and proximate to the SAC) from outside of Ireland does pose a clear risk of establishment of non-native species in the SAC. In order to mitigate the risk of introduction of alien species into the SAC as a result of aquaculture activities all movement of stock in and out of the Great Island Channel SAC should adhere to relevant legislation and follow best practice guidelines.

Furthermore, the culture on non-sterile Pacific oysters (in contained systems and subtidally un-contained on the seafloor) in the SAC presents as risk of successful reproduction and recruitment of this species within the SAC. It is recommended that triploid *C. gigas* oysters be used in a contained fashion only in licenced aquaculture areas.

3 INTRODUCTION

This document assesses the potential ecological interactions of aquaculture activities within the Great Island channel SAC (Site code 001058) on the Conservation Objectives (COs) of the site. The information upon which this assessment is based is a list of applications and extant licences for aquaculture activities administered by the Department of Agriculture Food and Marine (DAFM) and forwarded to the Marine Institute; as well as aquaculture and fishery profiling information provided on behalf of the operators by Bord Iascaigh Mara. The spatial extent of aquaculture licences is derived from a database managed by the DAFM[2] and shared with the Marine Institute.

4 CONSERVATION OBJECTIVES FOR GREAT ISLAND CHANNEL SAC

The appropriate assessment of aquaculture and fisheries in relation to the Conservation Objectives for Great Island channel SAC is based on Version 1.0 of the objectives (NPWS 2014a - Version 1 June 2014) and supporting documentation (NPWS 2014b - Version 1 May 2014, NPWS 2014c - Version 1 May 2014). The spatial data for conservation features was provided by NPWS[3].

4.1 THE SAC EXTENT

The Great Island Channel stretches from Little Island to Midleton, with its southern boundary being formed by Great Island. It is an integral part of Cork Harbour which contains several other sites of conservation interest. Geologically, Cork Harbour consists of two large areas of open water in a limestone basin, separated from each other and the open sea by ridges of Old Red Sandstone. Within this system, Great Island Channel forms the eastern stretch of the river basin and, compared to the rest of Cork Harbour, is relatively undisturbed. Within the site is the estuary of the Owennacurra and Dungourney Rivers. These rivers, which flow through Midleton, provide the main source of freshwater to the North Channel. The full extent of the SAC is shown in **Figure 4.1** below.

4.2 QUALIFYING INTERESTS (SAC)

The SAC is designated for the following habitats and species (NPWS 2014a), as listed in Annex I and Annex II of the Habitats Directive:

- 1140 Mudflats and Sandflats not covered by seawater at low tide
- 1330 Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)

The spatial extent of the Annex 1 Qualifying Interest Mudflats and Sandflats not covered by seawater at low tide (1140) is illustrated in **Figure 4.2** and **Figure 4.3,** respectively (from NPWS 2014b).

Constituent communities and community complexes recorded within the Annex 1 habitats of Mudflats and Sandflats not covered by seawater at low tide (1140) are listed in NPWS (2014b), presented in **Table 4.1** below and illustrated in **Figure 4.4**.

[2] DAFM Aquaculture Database version Aquaculture: March 2015
[3] NPWS Geodatabase Ver: June 2015 - http://www.npws.ie/mapsanddata/habitatspeciesdata/

Table 4.1 - The community types recorded in Great Island Channel SAC and the Annex I habitats in which they occur (NPWS 2014b).

Community Type	Annex I Habitats
	Mudflats and Sandflats (1140)
Mixed sediment to sandy mud with polychaetes and oligochaetes community complex	✓

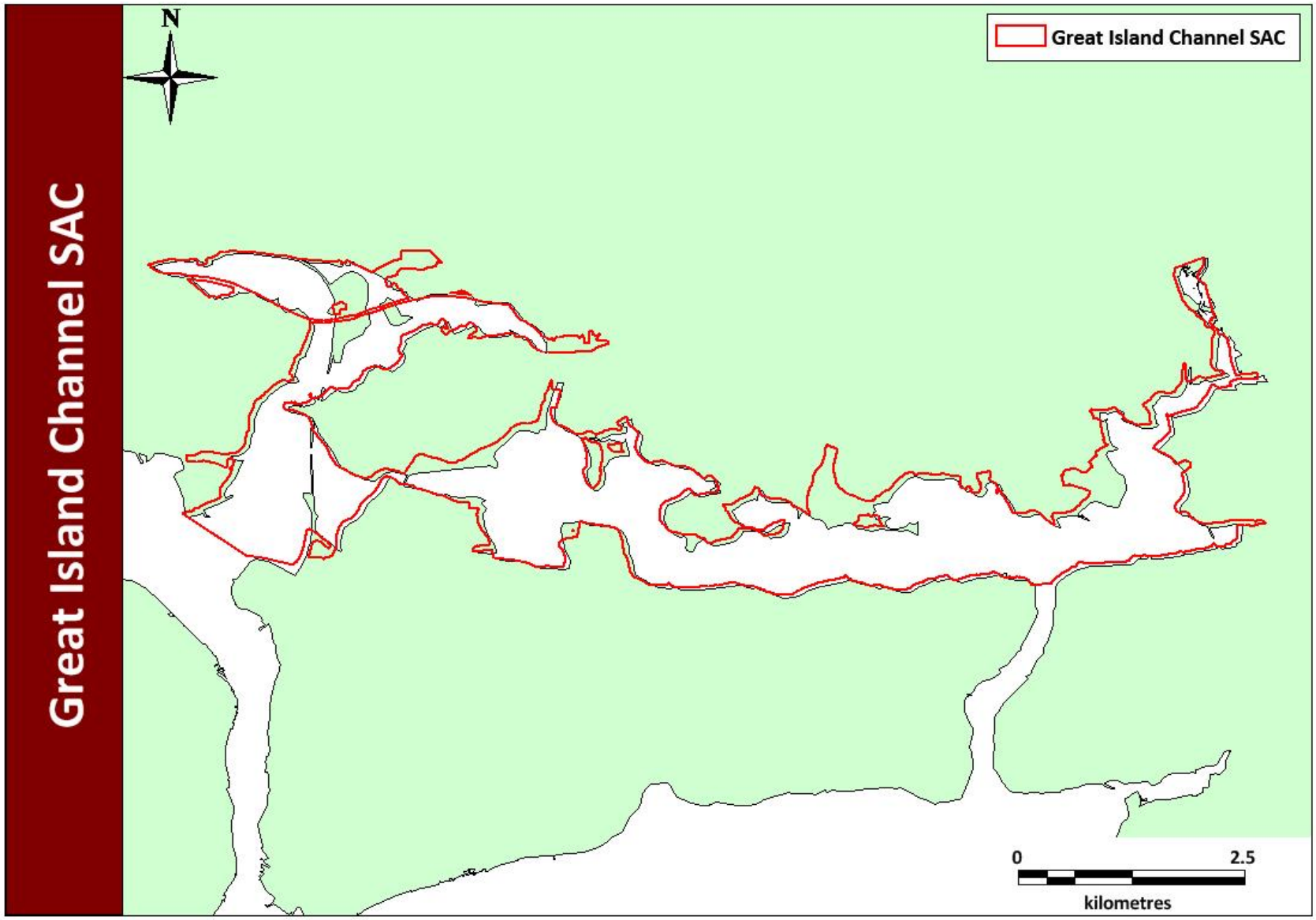

Figure 4.1 - The extent of the Great Island Channel SAC.

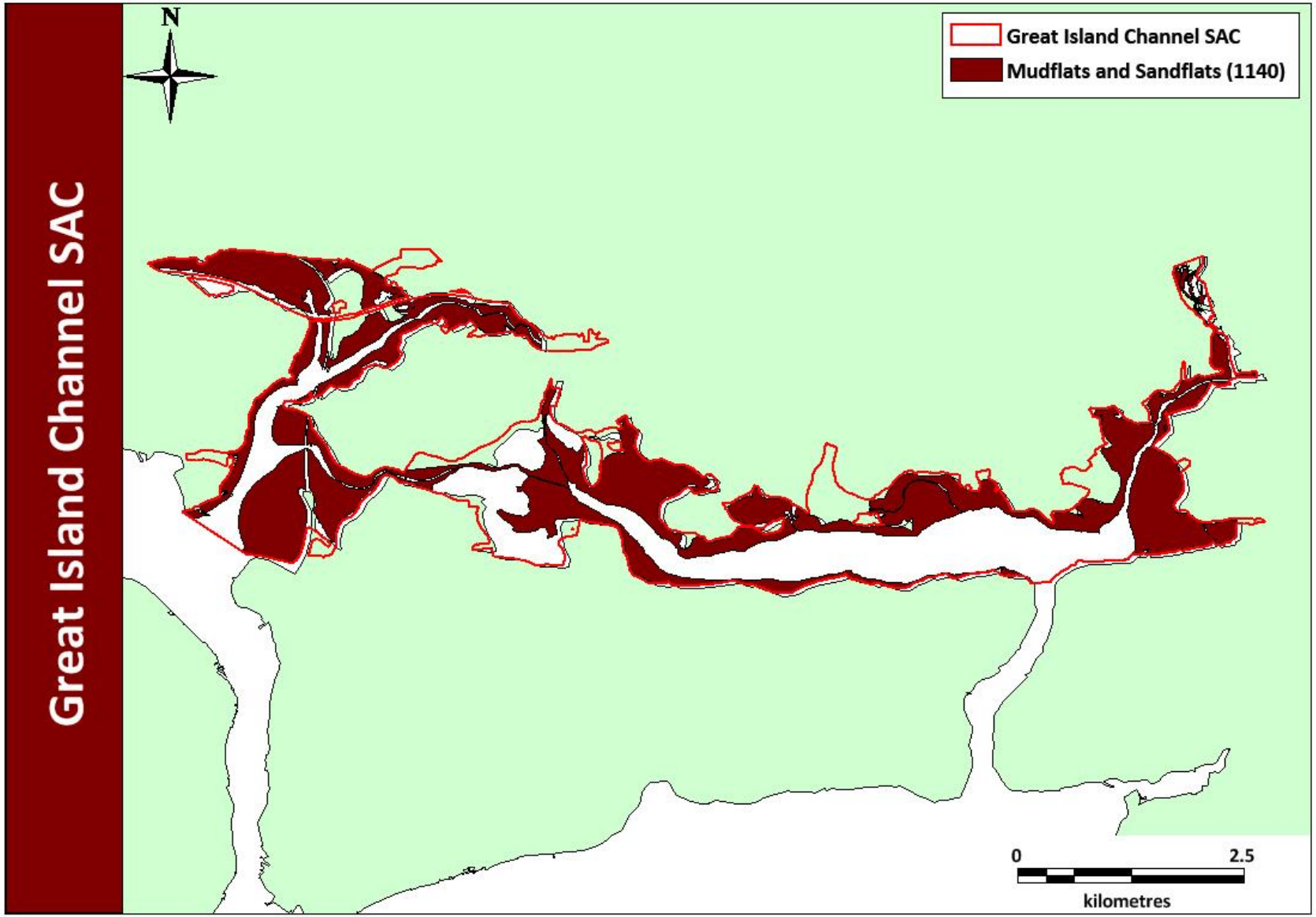

Figure 4.2 - The extent of the marine Annex I Qualifying Interest of (1140) Mudflats and Sandflats not covered by seawater at low tide within the Great Island Channel SAC.

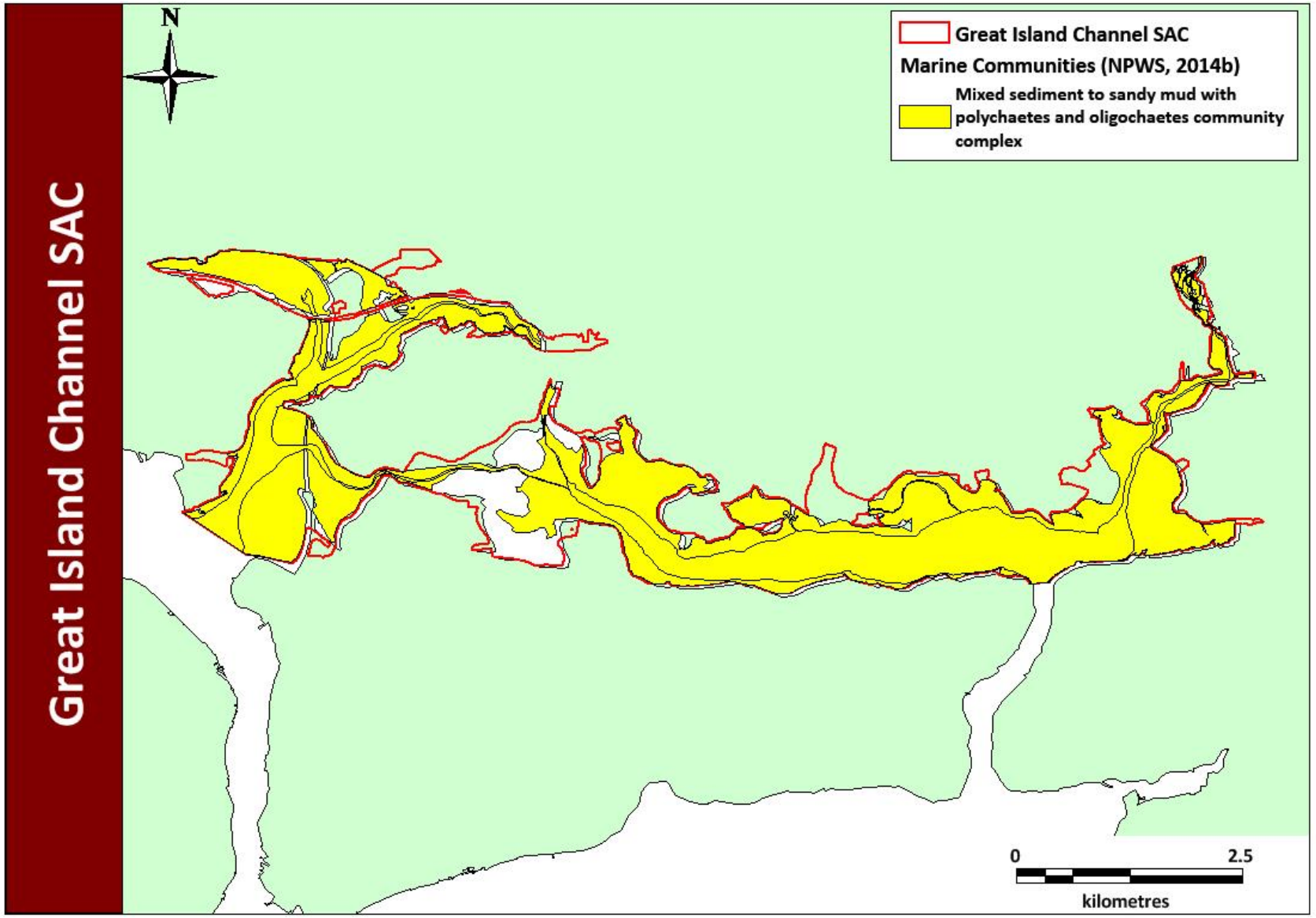

Figure 4.3 - Principal benthic communities recorded within the marine Annex I Qualifying Interests of (1140) Mudflats and Sandflats not covered by seawater at low tide within the Great Island Channel SAC (NPWS 2014b).

4.3 CONSERVATION OBJECTIVES FOR GREAT ISLAND CHANNEL SAC

The Conservation Objectives for the Qualifying Interests for the SAC were prepared by NPWS (NPWS 2014a). The natural condition of the designated features should be preserved with respect to their area, distribution, and extent and community distribution. Habitat availability should be maintained for designated species and human disturbance should not adversely affect such species. The features, objectives and targets of each of the Qualifying Interests within the SAC are listed in **Table 4.2** below.

Table 4.2 - Conservation Objectives and targets for marine habitats and species in Great Island Channel SAC (NPWS 2014a, 2014b). Annex I and II features listed in **bold**.

Feature (Community Type)	Objective	Target(s)
Mudflats and sandflats not covered by seawater at low tide (1140)	Maintain favourable conservation condition	723ha: estimated using OSI data. The target is to ensure the permanent habitat area is stable or increasing, subject to natural processes. Conserve the community type in a natural condition: mixed sediment to sandy mud with polychaetes and oligochaetes community complex. Based on intertidal and subtidal surveys undertaken in 2006 (AQUAFACT, 2007) and 2011 (EcoServe, 2012; MERC, 2012)
(Mixed sediment to sandy mud with polychaetes and oligochaetes community complex.)	Maintain favourable conservation condition	723ha; Likely area derived from intertidal surveys carried out in 2006 and 2011, along with a subtidal survey in 2011.
Atlantic salt meadows (1330)	Restore favourable conservation condition	18.90ha; Based on Saltmarsh Monitoring Project (McCorry and Ryle, 2009). No decline or change in habitat distribution, subject to natural processes. Maintain/restore natural circulation of sediments and organic matter, without any physical obstructions

4.4 SCREENING OF ADJACENT SAC FOR *EX-SITU* EFFECTS

The nearest SACs to the Great Island Channel SAC, are the Ballymacoda (Clonpriest and Pillmore) SAC (Site Code IE000077) and the Courtmacsherry Estuary SAC (Site Code IE001230). The former is 24.6km east and the latter is 54.6km southwest of the Great Island Channel SAC and as a result are screened out.

5 DETAILS OF THE PROPOSED PLANS AND PROJECTS

5.1 DESCRIPTION OF AQUACULTURE ACTIVITIES

Aquaculture activities within the Great Island Channel SAC focus on the intertidal cultivation of Pacific oysters (*Crassostrea gigas*). This assessment focuses on aquaculture activities which occur within the Qualifying Interests of (1140) Mudflats and Sandflats not covered by seawater at low tide for which the Great Island Channel SAC is designated. Descriptions of spatial extents of existing and proposed intertidal oyster aquaculture activities (provided below) within the Qualifying Interest were calculated using coordinates of activity areas in a GIS (**Figure 5.1**). The spatial extent of the cultivation activities (current and proposed) overlapping the Qualifying Interests of (1140) Mudflats and Sandflats not covered by seawater at low tide are presented in **Table 5.1 to 5.2**, while **Table 7.1 to 7.2** presents spatial overlap on constituent communities of the Qualifying Interests of 1140. In the calculation of these overlaps, where multiple species are proposed one site, the activity deemed more disturbing at a site is the activity assessed for that site *e.g.,* mussel longline culture is more disturbing that seaweed culture using longlines.

5.1.1 Intertidal Oyster Cultivation

5.1.1.1 Current activity

In the North Channel there is one company (Fota Oyster Farm) actively farming two bag and trestle Pacific oyster sites (see Figure 5.1). They have applied to amalgamate these two sites into one site totalling 9 hectares, aiming to increase production to 700 tonnes, from a current base of 50 to 100 tonnes. These half grown triploid oysters are transferred for maturation from a sister site in Gweedore, Co. Donegal.

Pacific oyster production has a life cycle from seed input to harvest for market of 2½ years. Oysters are sold fully grown at a size range from 60-140 grams. The oyster seed or half grown are either bought in from other farms in Ireland, or oyster nurseries in Ireland the UK and France.

Pacific oysters are predominantly grown in trestles and bags. Trestles are typically 0.6m-1m in height, 3 metres long and carry 5-6 bags, but this can vary. Seed is generally imported in the spring and in the autumn of each year, or as half grown. The intake size ranges, packed in oyster bags at a predetermined density and taken to the inter-tidal zone, where the bags are attached to trestles for the growing process to begin. Packing densities of seed is individually determined by each producer. Oysters are thinned out and graded as the oysters grow. As the oysters grow, they are taken to a handling / sorting facility or foreshore area for splitting and re-packing and returned to the trestles. The seed will be split following a few months once growth starts. Producers generally split the oysters either once or twice over the growth cycle. Again the density following splitting varies from producer to producer.

Producers generally turn each bag on site once a month. Turning takes place when the oysters are growing. This means turning takes place from March up to Oct/Nov depending on growth. Both spring tides of each month are generally used by producers to get out to their sites. The trestles are arranged in rows and blocks on site. Rows are often set out in pairs with sufficient gap between pairs for flat-bottomed vessels or tractors to pass, allowing servicing.

5.1.1.2 Proposed Activity

There are no applications to licence any new sites in the SAC. The company licensed for the above 2 Pacific oyster sites have applied to also grow the oysters in floating bags, in the deeper parts of the site. The floating oyster bags would be attached to a longline which is moored to the seabed. This would allow the operator to utilise the deeper parts of their site which are too deep for bag and trestle culture. They are also planning to cultivate two native red seaweeds, namely *Porphyra sp.* and *Palmaria palmata*, with seed being purchased from an Irish hatchery, aiming to produce 2 to 4 tonnes of wet seaweed annually.

The overlap of intertidal oyster cultivation activities with the Qualifying Interests of 1140 is presented in **Table 5.1** below. **Table 7.1** presents spatial overlap on constituent communities of the Qualifying Interests of 1140.

5.1.2 Access Routes

The site is accessed directly from the road which leads straight onto the licenced aquaculture site. The access point can be seen in Figure 5.1. As there is no access route between the road and the aquaculture site, there is no additional spatial overlap on constituent communities of Qualifying Interests of 1140 above the overlap from the licenced site itself.

Table 5.1 - Spatial extent (ha) of intertidal oyster aquaculture areas overlapping with the Qualifying Interest of Mudflats and sandflats not covered by seawater at low tide [1140] in the Great Island Channel SAC (Site Code 001058). Spatial extent of licenced areas presented according to Qualifying Interest and license status.

Licence Status	Culture Species	Qualifying Interest 1140 (722.24 ha)
		% Overlap (Overlap ha)
Licensed	Oysters Trestles	0.25% (1.77ha)
Total		**0.25% (1.77ha)**

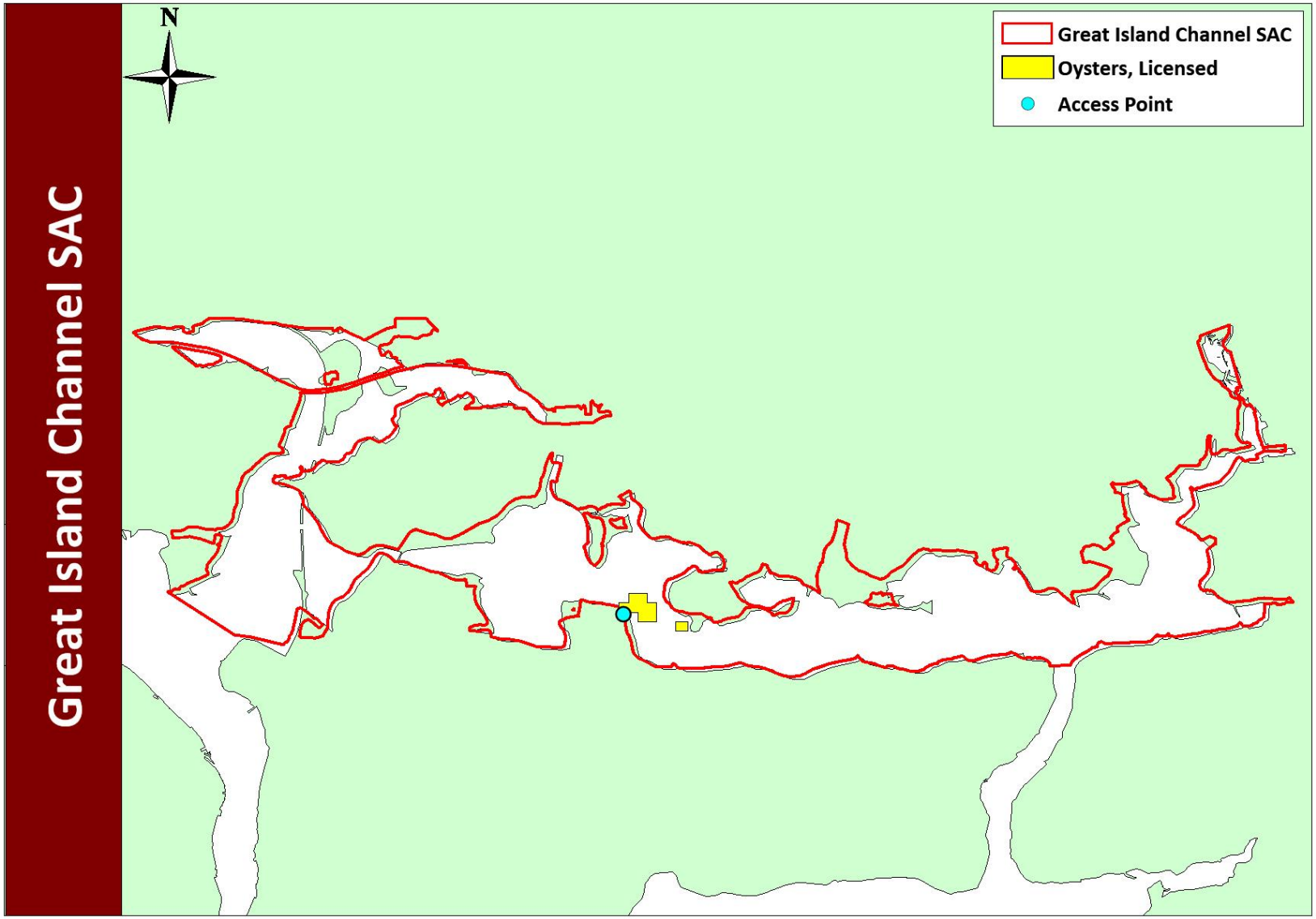

Figure 5.1- Aquaculture sites in the Great Island Channel SAC Bay.

6 NATURA IMPACT STATEMENT FOR THE PROPOSED ACTIVITIES

The potential ecological effects of activities on the Conservation Objectives for the site relate to the physical and biological effects of aquaculture cultivation structures and activities and human activities on designated species, intertidal habitats and invertebrate communities, and biotopes within those broad habitat types. The overall effect on the conservation status will depend on the spatial and temporal extent of fishing and aquaculture activities during the lifetime of the proposed plans and projects and the nature of each of these activities in conjunction with the sensitivity of the receiving environment. Bottom cultivation and harvesting of shellfish can, like fishing, alter the surrounding environment, both physically and biologically, not only due to the presence of the culture organisms (e.g. increased deposition, disease, shading, fouling, alien species) but also due to the activities associated with the culture mechanisms (e.g. structures resulting in current alteration, dredging, sediment compaction), the extraction of commercial and natural populations and the physical effects of dredging. In assessing the impact of the proposed aquaculture activities, the most disturbing activity at a site is brought forward for consideration e.g. intertidal clam culture is more destructive than oyster culture and the cuboidal cage system for oyster culture exerts more of a pressure than bag and trestle culture.

Aquaculture activities within the SAC focus on the intertidal (bags and trestle) cultivation of the Pacific oyster, *C. gigas*. Details of the potential biological and physical effects of this aquaculture activity on the habitat features, their sources and the mechanism by which the impact may occur are discussed below and summarised in **Table 6.1** below. The impact summaries identified in the table are derived from published primary literature and review documents that have specifically focused upon the environmental interactions of mariculture (e.g. Black 2001; McKindsey *et al.,* 2007; NRC 2010; O'Beirn *et al.,* 2012; Cranford *et al.,* 2012; ABPMer 2013a-h).

6.1 BIOLOGICAL EFFECTS OF AQUACULTURE – ALL CULTURE METHODS

Habitat/Sediment Disturbance - Suspended culture

Oysters, being suspension feeding bivalve molluscs, feed at the lowest trophic level feeding largely as herbivores, relying primarily on ingestion of phytoplankton. Therefore, the culture process does not rely on the input of feedstuffs into the aquatic environment. Suspension feeding bivalves filter suspended matter from the water column and the resulting faeces and pseudofaeces (non-ingested material) are then deposited onto the seafloor, this is known as biodeposition and is a component of a greater process called benthic-pelagic coupling. This deposition can accumulate on the seafloor beneath aquaculture installations (intertidal trestle and cage culture) and can alter the local sedimentary habitat type in terms of organic content and particle size which has, in certain circumstances been shown to alter the infaunal community therein.

Moderate enrichment due to deposition can lead to increased diversity due to increased food availability; however further enrichment can lead to a change in sediment biogeochemistry (e.g. oxygen levels decrease and sulphide levels increase) which can result in a reduction in species richness and abundance resulting in a community dominated by specialist species. In extreme cases of protracted organic enrichment anoxic conditions may occur where no fauna survives and the sediment may become blanketed by a bacterial mat. Changes to the sedimentary habitat due to deposition are indicated by a decrease in oxygen levels, increased sulphide reduction, decrease in REDOX depth and particle size changes.

Several factors can affect the rate of deposition onto the seafloor; these include structure and culture density, site hydrography and site history. Oysters and clams have a “plastic response” to increased levels of suspended matter in the water column and can modify their filtration rate accordingly and thus increase the production of pseudofaeces which results in an increase in transfer of particles to the seafloor. The degree to which the material disperses away from the footprint of the culture system (e.g. trestles & bags etc.) is governed by the density of oysters on the system, the depth of water and the water currents in the vicinity. It is likely that some overlap in effect will be realised. The duration and extent to which culture has been conducted on site may lead to cumulative impacts on the seabed, especially in areas where assimilation or dispersion of faeces/pseudofaeces is not rapid. A number of features of the site and culture practices will govern the speed at which faeces/pseudofaeces are assimilated or dispersed by the site. These relate to:

- Hydrography (residence time, tidal range, residual flow) govern how quickly the wastes disperse from the culture location and the density at which they will accumulate on the seafloor i.e. the greater the tidal range and residual flow then the greater the rate of dispersion and therefore the risk of accumulation is reduced.

- Turbidity in the water-the higher the water turbidity the greater the production of pseudo-faeces/faeces by the suspension feeding animal (“plastic response“) and therefore greater the risk of accumulation on the seafloor.

- Density of structures-high density of culture structures (e.g. cuboidal system cages, trestles & bags etc.) can result in the slowing of water currents/impediment of water flow (baffling effect), slow it down and cause localised deposition of material on the seafloor.

- Density of culture-the greater the density organisms the greater the risk of accumulations of material, suspended culture is considered a dense culture method with high densities of culture organisms over a small area. The density of culture organisms is a function of:

    - depth of the site (shallow sites have shorter droppers and hence fewer culture organisms),

    - husbandry practices – proper maintenance will result in optimum densities on the lines as well as ensuring a reduced risk of drop-off of culture animals to the seafloor as well as ensuring a sufficient distance among the longlines to reduce the risk of cumulative impacts in depositional areas.

Seston filtration - All culture methods

Suspension feeding bivalves such as oysters have a large filtration capacity and in confined areas, have been shown to alter the phytoplankton and zooplankton community abundance and structure and therefore potentially impact on the production of an area. This method of feeding may reduce water turbidity hence increasing light penetration, which may increase phytoplankton production and therefore food availability. This increase in light penetration can have positive effects on light sensitive species such as maerl, seagrass and macroalgae.

Shading - Suspended culture

The structures associated with suspended culture (e.g. trestles & bags, baskets & cages etc.) can prevent light penetration to the seabed and therefore potentially impact on light sensitive species such as maerl, seagrass and macroalgae.

Fouling/Habitat creation - All culture methods

The structures associated with aquaculture, and the culture organisms themselves provide increased habitat for fouling species to colonise and therefore increase diversity; results in increased secondary production and increased nekton production.

Introduction of Non-native species - All culture methods

Movement and introduction of bivalve shellfish can be a vector for the introduction and spread of non-native/alien species. In some instances the introduced species may proliferate rapidly and compete with and in some cases replace the native species. Recruitment of *C. gigas* has been documented in a number of bays in Ireland and appears to have become naturalised (i.e. establishment of a breeding population) in two locations (Kochmann *et al.,* 2012; 2013) and may compete with the native species for space and food.

Another means is the unintentional introduction of non-native species/diseases which are associated with the imported target culture species, and their subsequent spread and establishment. These associated species are referred to as ”hitch-hikers” and include animals and plants and/or parasites and diseases that potentially could cause outbreaks within the culture species or spread to other local species.

The introduction and establishment of non-native species can result in loss of native biodiversity due to increased competition for food and habitat and also predation and/or disease.

Disease risk - All culture methods

Due to the nature of the culture methods the risk of transmission of disease from cultured to wild stocks is high, e.g. the introduction of the parasitic protozoan *Bonamia ostreae*, which has caused the mass mortality within Irish native Oyster Beds. This risk can be limited by compiling a bio security plan, screening all introduced stock prior to transferring to on growing site and also good animal husbandry. Disease risk associated with movement of shellfish is governed by Fish health legislation on the movement of shellfish stocks into and out of culture areas and will not be considered further in this assessment.

By-catch mortality-Bottom culture

Mortality of organisms captured or disturbed during the harvest and damage to structural fauna or reefs.

Nutrient Exchange - All culture methods

By their suspension feeding nature, removing particulate matter from the water column and releasing nutrients in solid and dissolved forms, bivalves influence benthic-pelagic coupling of organic matter and nutrients. Intensive bivalve culture can cause changes in ammonium and dissolved inorganic nitrogen resulting in increased primary production. The removal of nitrogen from the system is caused by both removal via harvest or denitrification at sediment surface.

6.2 PHYSICAL EFFECTS OF AQUACULTURE

Current alteration - Suspended culture

The structures used in aquaculture (e.g. trestles & bags, baskets & cages etc.) can alter the hydrodynamics of an area i.e. increase/decrease water flow, this is known as the "Baffling effect". An increase in water flow will result in scouring of the seafloor leading to an increase in coarse sediment while a decrease in current flow will result in an increase in the amount of fine particles being deposited. Both result in a change in the sedimentary habitat structure and therefore can lead to change in the composition of the benthic infaunal community.

Surface disturbance-All culture methods

All aquaculture activities physically alter the receiving habitat, but the level of this disturbance depends on the culture method employed. The culture of bivalves on the seabed (on-bottom) in an uncontained fashion involves the dredging of the seafloor at various stages in the culture process i.e. laying of seed, routine maintenance, removal of predators ("mopping"), stock movements and finally harvesting. The frequency of dredging activity depends on site management and how often stock is moved to new ongrowing areas to maximise growth and minimise predation prior to harvest. This dredging activity physically disturbs the seafloor and the organisms therein, and has been demonstrated to cause habitat and community changes.

The intertidal culture of bivalves (e.g. bags & trestles, baskets & cages) does not require dredging and therefore is less damaging (physically) to the seafloor than the bottom culture method. However, the intertidal habitat can be affected by the presences of cages directly on the seabed and ancillary activities on-site i.e. servicing, vehicles on shore; human traffic and boat access lanes, causing an increased risk of sediment compaction resulting in sediment changes and associated community (infaunal and epifaunal) changes. Such activities can result in shallow and/or deep physical disturbance causing burrows to collapse, deeply burrowed organisms to die due to smothering and/or preventing siphon connection to the sediment surface or by directly crushing the animal.

Shading - Suspended culture

The structure associated with suspended culture (e.g. trestles & bags, baskets & cages etc.) have the potential to prevent light penetration to the seabed and therefore potentially impact on light sensitive species such as maerl, seagrass and macroalgae.

Table 6.1 - Potential indicative environmental pressures of aquaculture activities within the Qualifying Interests of Mudflats and sandflats not covered by seawater at low tide [1140] of the Great Island Channel SAC .

Activity	Pressure category	Pressure	Potential effects	Equipment / Gear	Duration (days)	Time of year	Factors constraining the activity
Intertidal Oyster Culture	Physical	Current alteration	Structures may alter the current regime and resulting increased deposition of fines or scouring.	Trestles and bags, baskets and cages and service equipment	365	All year	At low tide only
		Surface disturbance	Presence of cages directly on the seabed and ancillary activities at sites, e.g. servicing, transport increase the risk of sediment compaction resulting in sediment changes and associated community changes.				
		Shading	Prevention of light penetration to seabed potentially impacting light sensitive species				
	Biological	Non-native species introduction	Potential for non-native species (*C. gigas*) to reproduce and proliferate in SAC. Potential for alien species to be included with culture stock (hitch-hikers).				
		Disease risk	In event of epizootic the ability to manage disease in uncontained subtidal oyster populations is compromised.				
		Organic enrichment	Faecal and pseudofaecal deposition on seabed potentially altering community composition				
	Physical	Current alteration	Structures may alter the current regime and resulting increased deposition of fines or scouring.				

7 SCREENING OF AQUACULTURE ACTIVITIES

A screening assessment is an initial evaluation of the possible impacts that activities may have on the Qualifying Interests. The screening process is a filter, which may lead to exclusion of certain activities or Qualifying Interests from further assessment, thereby simplifying the process. Screening is a conservative filter that minimises the risk of false negatives.

In this report, screening of the Qualifying Interests against the proposed activities is based primarily on spatial overlap i.e. if the Qualifying Interests overlap spatially with the proposed activities then impacts due to these activities on the Conservation Objectives for the Qualifying Interests is not discounted (not screened out) except where there is absolute and clear rationale for doing so. Conversely, if there is no spatial overlap and no obvious interaction is likely to occur, then the possibility of significant impact is discounted and further assessment of possible effects is not deemed necessary.

Table 5.1 to **Table 5.3** highlights the spatial overlap between (existing and proposed) intertidal oyster aquaculture activities, and the habitat features of (1140) Mud sand sandflats not covered by seawater at low tide, while **Table 7.1** and **Table 7.2** presents spatial overlap on constituent community types of the habitat features of 1140.

7.1 AQUACULTURE ACTIVITY SCREENING

Where the overlap between intertidal oyster aquaculture activities and a feature is zero and there is no likely interaction of risk identified, it is screened out and not considered further. Therefore, the following habitats and species are excluded from further consideration in this assessment:

- 1330 Atlantic salt meadows (*Glauco-Puccinellietellia maritimae*)

When overlap was observed it was quantified in a GIS application and presented on the basis of coverage of specific activity representing different pressure types (i.e. intertidal oyster cultivation [bags and trestles] and subtidal oyster cultivation) and licence status (licenced or application) intersecting with designated conservation features and/or sub-features (community types) (see **Table 7.1**).

Intertidal oyster cultivation

Table 7.1 below provides an overview of overlap of aquaculture activities and specific marine community types (identified from Conservation Objectives (i.e. NPWS 2014a; b) within the broad habitat features of (1140) Mud and sandflats not covered by seawater at low tide.

Intertidal oyster aquaculture activities overlap the community type listed under the habitat feature of Mud and sandflats not covered by seawater at low tide (1140), Mixed sediment to sandy mud with polychaetes and oligochaetes community complex (see **Table 7.1**).

Access Routes

As the access point is within the licenced site there is no additional spatial overlap from access routes above the overlap from the licenced site.

Table 7.1- Habitat utilisation i.e. spatial overlap in percentage and hectares (given in parentheses) of intertidal oyster cultivation activity over community types within the Qualifying Interest 1140 Mudflats and sandflats not covered by seawater at low tide in the Great Island Channel SAC Spatial data based on licence database provided by DAFM. Habitat data provided in NPWS 2014b.

Licence Status	Culture Species / Method	Qualifying Interest 1140 (722.24 ha)
		Community Type
		Mixed sediment to sandy mud with polychaetes and oligochaetes community complex (722.24ha)
		Overlap % (Overlap ha)
Licensed	Oysters Trestles	0.25% (1.77ha)
Total		**0.25% (1.77ha)**

8 ASSESSMENT OF AQUACULTURE ACTIVITIES

8.1 DETERMINING SIGNIFICANCE

The function of an appropriate assessment is to determine if the ongoing and proposed aquaculture activities are consistent with the Conservation Objectives for the Natura site or if such activities will lead to deterioration in the attributes of the habitats and species over time and in relation to the scale, frequency and intensity of the activities. NPWS (2013b) provide guidance on interpretation of the Conservation Objectives which are, in effect, management targets for habitats and species in the SAC. This guidance is scaled relative to the anticipated sensitivity of habitats and species to disturbance by the proposed activities. Some activities are deemed to be wholly inconsistent with long term maintenance of certain sensitive habitats while other habitats can tolerate a range of activities. For the practical purpose of management of sedimentary habitats a 15% threshold of overlap between a disturbing activity and a habitat is given in the NPWS guidance. Below this threshold disturbance is deemed to be non-significant. Disturbance is defined as that which leads to a change in the characterising species of the habitat (which may also indicate change in structure and function). Such disturbance may be temporary or persistent in the sense that change in characterising species may recover to pre-disturbed state or may persist and accumulate over time.

The significance of the possible effects of the proposed activities on habitats, as outlined in the Natura Impact Statement (**Section 6**) and subsequent screening exercise (**Section 7**), is determined here in the assessment. The significance of effects is determined on the basis of Conservation Objective guidance for constituent habitats and species (**Figures 4.4** and NPWS 2013a; b).

Within the Great Island Channel SAC the qualifying habitats/species considered subject to potential disturbance and, therefore, carried further in this assessment are:

- 1140 Mudflats and sandflats not covered by seawater at low tide

For broad habitats and community types (**Figures 4.2, 4.3, 4.4**) significance of interaction is determined in relation to, first and foremost, spatial overlap (see **Section 5**; **Table 5.1)** and **Section 7**; **Table 7.1)**. Subsequent disturbance and the persistence of disturbance are considered as follows:

1. The degree to which the activity will disturb the Qualifying Interest. By disturb is meant change in the characterising species, as listed in the Conservation Objective guidance (NPW,S 2014b) for constituent communities. The likelihood of change depends on the sensitivity of the characterising species to the activities in question. Sensitivity results from a combination of intolerance to the activity and/or recoverability from the effects of the activity (see **Section 8.2** below).

2. The persistence of the disturbance in relation to the intolerance of the community. If the activities are persistent (high frequency, high intensity) and the receiving community has a high intolerance to the activity (i.e. the characterising species of the communities are sensitive and consequently impacted) then such communities could be said to be persistently disturbed.

3. The area of communities or proportion of populations disturbed. In the case of community disturbance (continuous or ongoing) of more than 15% of the community area it is deemed

to be significant. This threshold does not apply to the sensitive habitat *Zostera* where any spatial overlap of activities should generally be avoided.

Effects will be deemed to be significant when cumulatively they lead to long term change (persistent disturbance) in broad habitat/features (or constituent communities) resulting in an impact greater than 15% of the area.

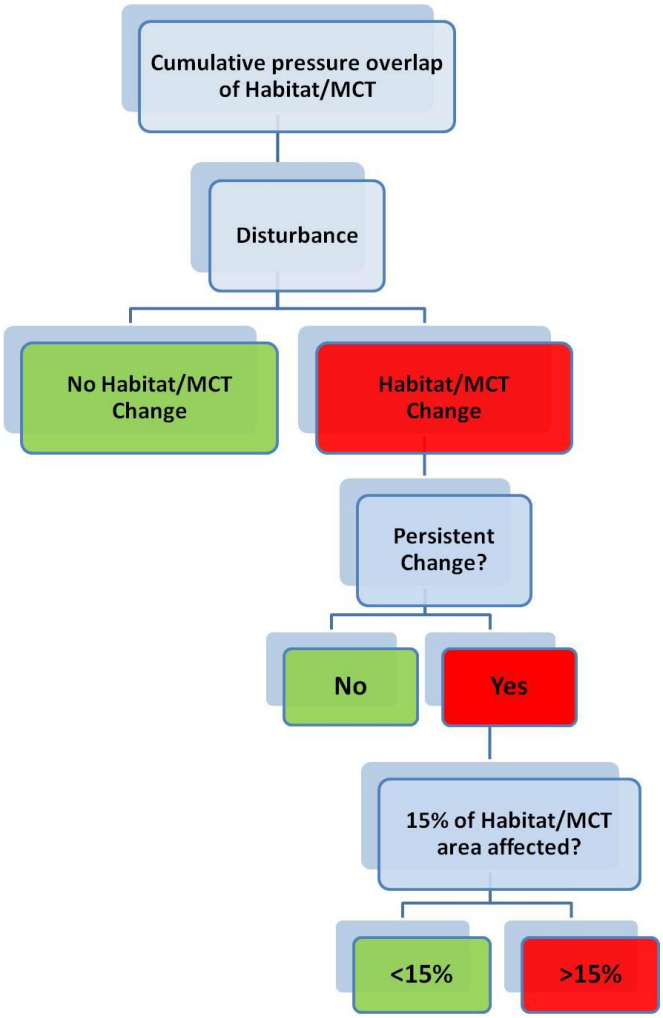

Figure 8.1 - Determination of significant effects on community distribution, structure and function for sedimentary habitats (following NPWS, 2014b).

8.2 SENSITIVITY AND ASSESSMENT RATIONALE

This assessment used a number of sources of information in assessing the sensitivity of the characterising species of each community recorded within the benthic habitats of Great Island Channel SAC. One source of information is a series of reviews commissioned by the Marine Institute which identify habitat and species sensitivity to a range of pressures likely to result from aquaculture and fishery activities (ABPMer 2013a-h). These reviews draw from the broader literature, including the MarLIN Sensitivity Assessment (Marlin.ac.uk) and the AMBI Sensitivity Scale (Borja *et al.,* 2000) and other primary literature. It must be noted that NPWS have acknowledged that given the wide range of community types that can be found in marine environments, the application of conservation targets to these would be difficult (NPWS 2013b). On this basis, NPWS have proposed

broad community complexes as management units. These complexes (for the most part) are very broad in their description and do not have clear surrogates which might have been considered in targeted studies and thus reported in the scientific literature. On this basis, the confidence assigned to likely interactions of the community types with anthropogenic activities are by necessity relatively low, with the exception of community types dominated by sensitive taxa, e.g. Maerl and *Zostera*. Other literature cited in the assessment does provide a greater degree of confidence in the conclusions. For example, the output of a recent study has provided greater confidence in terms of assessing likely interactions between intertidal oyster culture and marine habitats (Forde *et al.,* 2015). Sensitivity of a species to a given pressure is the product of the intolerance (the susceptibility of the species to damage, or death, from an external factor) of the species to the particular pressure and the time taken for its subsequent recovery (recoverability is the ability to return to a state close to that which existed before the activity or event caused change). Life history and biological traits are important determinants of sensitivity of species to pressures from aquaculture.

In the case of species, communities and habitats of conservation interest, the separate components of sensitivity (intolerance, recoverability) are relevant in relation to the persistence of the pressure:

- For persistent pressures i.e. activities that occur frequently and throughout the year recovery capacity may be of little relevance except for species/habitats that may have extremely rapid (days/weeks) recovery capacity or whose populations can reproduce and recruit in balance with population damage caused by aquaculture. In all but these cases and if sensitivity is moderate or high then the species/habitats may be negatively affected and will exist in a modified state. Such interactions between aquaculture and species/habitat/community represent persistent disturbance. They become significantly disturbing if more than 15% of the community is thus exposed (NPWS 2013b).

- In the case of episodic pressures i.e. activities that are seasonal or discrete in time both the intolerance and recovery components of sensitivity are relevant. If sensitivity is high but recoverability is also high relative to the frequency of application of the pressure then the species/habitat/community will be in Favourable Conservation Status for at least a proportion of time.

The sensitivities of the community types (or surrogates) found within the Great Island Channel SAC to pressures similar to those caused by aquaculture (e.g. smothering, organic enrichment and physical disturbance) are identified in **Table 8.1**. The sensitivities of species which are characteristic (as listed in the Conservation Objective supporting document) of benthic communities to pressures similar to those caused by aquaculture (e.g. smothering, organic enrichment and physical disturbance) are identified, where available, in **Table 8.2**. The following guidelines broadly underpin the analysis and conclusions of the species and habitat sensitivity assessment:

- Sensitivity of certain taxonomic groups such as emergent sessile epifauna to physical pressures is expected to be generally high or moderate because of their form and structure (Roberts *et al.,* 2010). Also high for those with large bodies and with fragile shells/structures, but low for those with smaller body size. Body size (Bergman and van Santbrink, 2000) and fragility are regarded as indicative of a high intolerance to physical abrasion caused by fishing gears (i.e. dredges). However, even species with a high intolerance may not be sensitive to the disturbance if their recovery is rapid once the pressure has ceased.

- Sensitivity of certain taxonomic groups to increased sedimentation is expected to be low for species which live within the sediment, deposit and suspension feeders; and high for those sensitive to clogging of respiratory or feeding apparatus by silt or fine material.

- Recoverability of species depends on biological traits (Tillin *et al.,* 2006) such as reproductive capacity, recruitment rates and generation times. Species with high reproductive capacity, short generation times, high mobility or dispersal capacity may maintain their populations even when faced with persistent pressures; but such environments may become dominated by these (r-selected) species. Slow recovery is correlated with slow growth rates, low fecundity, low and/or irregular recruitment, limited dispersal capacity and long generation times. Recoverability, as listed by MarLIN, assumes that the impacting factor has been removed or stopped and the habitat returned to a state capable of supporting the species or community in question. The recovery process is complex and therefore the recovery of one species does not signify that the associated biomass and functioning of the full ecosystem has recovered (Anand and Desrocher, 2004) cited in Hall *et al.,* 2008).

8.3 ASSESSMENT OF THE EFFECTS OF AQUACULTURE PRODUCTION ON THE CONSERVATION OBJECTIVES FOR HABITAT FEATURES IN THE GREAT ISLAND CHANNEL SAC

Aquaculture pressures on a given habitat are related to vulnerability (spatial overlap or exposure of the habitat to the equipment/culture organism combined with the sensitivity of the habitat) to the pressures induced by culture activities. To this end, the location and orientation of structures associated with the culture organism, the density of culture organisms, the duration of the culture activity are all important considerations when considering risk of disturbance of intertidal oyster cultivation activity to habitats and species. Similarly, important aspects of intertidal clam cultivation that must be considered include location, organism, the density of clam culture beds, and the duration of the culture activity and harvesting (i.e. dredging).

NPWS (2014b) provide lists of species characteristic of benthic communities occurring within Annex I features that are defined in the Conservation Objectives.

The constituent communities identified in the broad Annex 1 feature of (1140) Mudflats and sandflats not covered by seawater at low tide:

- Mixed sediment to sandy mud with polychaetes and oligochaetes community complex.

For **(1140) Mudflats and sandflats not covered by seawater at low tide** there are a number of attributes (with associated targets) relating to the following broad habitat features as well as constituent community types;

1. **Habitat Area -** it is unlikely that the activities proposed will reduce the overall extent of permanent habitat within the feature (1140) Mudflats and sandflats not covered by seawater at low tide. The habitat area is likely to remain stable.

2. **Community Distribution - (conserve a range of community types in a natural condition) -** this attribute considered interactions with the community types listed above. **Table 8.1** below indicates the community types, found within the Qualifying Interests of 1140 that

are considered further as part of the assessment (i.e. community types which overlap with current and existing aquaculture activities).

Table 8.1 - Community types recorded in Great Island Channel SAC and the Annex I habitats of (1140) Mudflats and sandflats not covered by seawater at low tide that overlap with overlap with current and proposed aquaculture activities

Feature	Community Type	Overlap with intertidal oyster trestle cultivation activities
Mudflats and Sandflats not covered by seawater at low tide (1140)	Mixed sediment to sandy mud with polychaetes and oligochaetes community complex.	✓

For community types listed under 1140 **Table 8.2** lists the habitats and **Table 8.3** lists the constituent taxa and both provide a commentary of sensitivity to a range of pressures. The risk scores are derived from a range of sources identified above. The pressures are listed as those likely to result from intertidal oyster culture (bags & trestle) and subtidal dredging for oysters within the SAC.

The likely interactions between (existing and proposed) intertidal oyster cultivation aquaculture activities and the broad habitat feature of 1140 and their constituent community types are described in **Table 8.5** together with a broad conclusion and justifications on whether the activities in isolation and/or cumulatively are considered disturbing to the feature in question. It must be noted that the sequence of distinguishing disturbance is as highlighted above, whereby activities with spatial overlap on habitat features are assessed further for their ability to cause persistence disturbance on the habitat. If persistent disturbance is likely then the spatial extent of the overlap is considered further.

Intertidal oyster cultivation

The combined spatial overlap of current oyster trestle cultivation (there is no new applications) occurs in the only constituent community type identified for the Qualifying Feature habitat of (1140) Mud and sandflats not covered by seawater at low tide (see **Table 7.1**). The spatial overlap of licensed oyster trestle culture activities with this community types is 0.25%. Also, published literature (Forde *et al.,* 2015; O'Carroll *et al.,* 2016) suggests that the presence of bags on trestles is considered non-disturbing to sedimentary habitats.

Consequently, adverse impacts of activities occurring at oyster cultivation sites within the Qualifying Interests of (1140) Mud and sandflats not covered by seawater at low tide **can be discounted** (see **Table 8.5**).

Introduction of non-native species

As already outlined oyster culture may present a risk in terms of the introduction of non-native species as the Pacific oyster (*Crassostrea gigas*) itself is a non-native species. Recruitment of *C. gigas* has been documented in a number of Bays in Ireland and appears to have become naturalised (i.e. establishment of a breeding population) in two locations (Kochmann *et al.,* 2012; 2013) and may

compete with the native species for space and food. In addition to having large number of oysters in culture, Kochmann *et al.,* (2013) identified long residence times and large intertidal areas as factors likely contributing to the successful recruitment of oysters in Irish bays. The risk of Pacific oysters naturalising in Great Island Channel **cannot be discounted.**

While there is minimal risk associated with the introduction of hitchhiker species with hatchery reared oyster seed, the risk posed by the introduction of '½-grown' or 'wild' seed originating from another jurisdiction (e.g. Britain, France) **cannot be discounted**.

8.3.1 Conclusion Summary

In summary, it is concluded (based primarily upon the spatial overlap and sensitivity analysis) current intertidal oyster aquaculture activities individually and in-combination **do not pose a risk** of significant disturbance to the conservation habitats (1140 and constituent marine community type) in the Great Island Channel SAC.

In addition, the contained subtidal cultivation of native oysters **does not pose** a significant risk to the Conservation Objectives of marine benthic habitat features for which the SAC is designated.

The risk posed by the introduction of seed stock (e.g. ½ grown oysters or seed) from outside of the jurisdiction **cannot be discounted**.

The risk of successful Pacific oyster reproduction in Great Island SAC (and Cork Harbour) posed by the culture of non-triploid (reproductively sterile) oysters **cannot be discounted** on the basis of the area having long residence times and large intertidal areas.

Table 8.2 - Matrix showing the characterising habitats sensitivity scores x pressure categories for habitats (or surrogates) in Great Island Channel SAC (ABPMer 2013a-h) (**Table 8.4** provides the code for the various categorisation of sensitivity and confidence.)

Community Type (Surrogate [EUNIS code])	Surface Disturbance	Shallow Disturbance	Deep Disturbance	Trampling – access by foot	Trampling – access by vehicle	Extraction	Siltation (addition of fine sediments, pseudofaeces, fish food)	Smothering (addition of materials biological or non-biological to the surface)	Changes to sediment composition- increased coarseness	Changes to sediment composition- increased fine sediment proportion	Changes to water flow	Increase in turbidity/suspended sediment	Decrease in turbidity/suspended sediment	Organic enrichment-water column	Organic enrichment of sediments-sedimentation	Increased removal of primary production-phytoplankton	Decrease in oxygen levels- sediment	Decrease in oxygen levels-water column	Introduction of non-native species	Removal of Target Species	Removal of Non-target species	Introduction of antifoulants	Introduction of medicines	Introduction of hydrocarbons	Prevention of light reaching seabed/features
Mixed sediment to sandy mud with polychaetes and oligochaetes community complex. (Polychaete/bivalve-dominated muddy sand shores [A2.24]/ Infralittoral medium sand [A5.24])	NS (***)	L (*)	L (***)	NS (*)	L (*)	L-M (*)	L-M (*)	L-M (*)	L-M (*)	NS (*)	L-M (*)	NS	NS (*)	NS (*)	NS (*)	NS (*)	L (*)	L (*)	H (***)	NS (*)	NS (*)	NS (*)	NS (*)	L (*)	NS (*)

Table 8.3 - Matrix showing the characterising species sensitivity scores x pressure categories for species in Great Island Channel SAC (ABPMer 2013a-h) (**Table 8.4** provides the code for the various categorisation of sensitivity and confidence.)

Community Type (Surrogate [EUNIS code])	Species (characterizing species identified from NPWS 2014b)	Surface Disturbance	Shallow Disturbance	Deep Disturbance	Trampling – access by foot	Trampling – access by vehicle	Extraction	Siltation (addition of fine sediments, pseudofaeces, fish food)	Smothering (addition of materials biological or non-biological to the surface)	Changes to sediment composition- increased coarseness	Changes to sediment composition- increased fine sediment proportion	Changes to water flow	Increase in turbidity/suspended sediment	Decrease in turbidity/suspended sediment	Organic enrichment-water column	Organic enrichment of sediments-sedimentation	Increased removal of primary production-phytoplankton	Decrease in oxygen levels- sediment	Decrease in oxygen levels-water column	Introduction of non-native species	Removal of Target Species	Removal of Non-target species	Introduction of antifoulants	Introduction of medicines	Introduction of hydrocarbons	Prevention of light reaching seabed/features
Mixed sediment to sandy mud with polychaetes and oligochaetes community complex. (Polychaete/bivalve-dominated muddy sand shores [A2.24]/ Infralittoral medium sand [A5.24])	*Hediste diversicolor*	NS (*)	L-M (**)	L-H (**)	NS (*)	L (*)	L-H (*)	NS (***)	L-M (*)	M-H (*)	NS (*)	NS (*)	NS (*)	NS (*)	NS (**)	NS (**)	NS (*)	NS (**)	NS (**)	L-M (*)	L-M (*)	NS (*)	NS (*)	M-H (**)	M-H (**)	NS (*)
	Nephtys hombergii	NS (*)	L (*)	L (***)	NS (*)	L (*)	L (*)	NS (**)	NS (*)	L (*)	NS (*)	NS (**)	NS (*)	NS (*)	NS (*)	NS (**)	NS (*	NS (***)	NS (***)	NS (*)	M (*)	NS (*)	NS (**)	NEv	M (***)	NS (*)
	Peringia ulvae	L-NS (*)	L (***)	L (*)	L-NS (*)	L-NS (*)	M (*)	NS (***)	L (*)	NS (*)	NS (*)	NS (*)	NS (*)	NS (*)	NS (*)	NS (***)	NS (*)	L (*)	L (*)	L (*)	Ns (*)	NS (*)	NEv	NEv	M (*)	NS (*)
	Tubificoides benedii	NS (*)	NS (*)	L (**)	L (*)	L (*)	M (*)	NS (*)	L (*)	NS (*)	NS (*)	NS (***)	NS (*)	NS (*)	NS (***)	NS (***)	NS (*)	NS (***)	NS (***)	NS (*)	NS (*)	NS (*)	NS (**)	NEv	NEv	NS (**)
	Scrobicularia plana	NS (*)	NS (**)	M-H (*)	NS (**)	L (**)	M-H (*)	NS-L (*)	M-H (*)	M-H (*)	NS (*)	NS (*)	L (*)	NS (*)	M (*)	M (*)	NS(*)	NS (*)	NS (*)	M (*)	NS (*)	NS (*)	NS (*)	NA	L (*)	NS (*)

Table 8.4 - Codes of sensitivity and confidence applying to species and pressure interactions presented in **Tables 8.2** and **8.3**.

Pressure interaction codes for Table 8.1 and 8.2	
NA	Not Assessed
NEv	No Evidence
NE	Not Exposed
NS	Not Sensitive
L	Low
M	Medium
H	High
VH	Very High
*	Low confidence
**	Medium confidence
***	High Confidence

Table 8.5 - Interactions between current and proposed oyster aquaculture activities and constituent communities of the habitat features of (1140) Mudflats and sandflats not covered by seawater at low tide with a broad conclusion on the interactions.

Licence Status	**Culture Species / Method**	**Qualifying Interest 1140 (722.24 ha)** **Community Type** **Mixed sediment to sandy mud with polychaetes and oligochaetes community complex (722.24ha)**
Licensed	Oyster - Trestles	**Disturbing: No** **Justification:** The spatial overlap with the community type is 0.25%. Published literature (Forde *et al.,* 2015) suggests that activities occurring at trestle culture sites are not disturbing.
Cumulative Impact Licenced and Proposed Activity		**Disturbing: No** **Justification:** The spatial overlap with the community type is 0.25%. Published literature (Forde *et al.,* 2015) suggests that activities occurring at trestle culture sites are not disturbing

9 IN-COMBINATION EFFECTS OF AQUACULTURE, FISHERIES AND OTHER ACTIVITIES

9.1 FISHERIES

9.1.1 Habitats

Putative fishery activities occurring in the marine benthic habitat of the SAC are limited to subtidal oyster cultivation.

9.1.1.1 Subtidal Oyster Cultivation

There are two Oyster Fishery Orders within the North Channel. Within these Orders oysters can be cultivated on the bottom. This is primarily for Native oyster production although at times Pacific oysters are fattened on the bottom. Pacific oysters to be fattened would typically be 1-2 years old prior to being placed on the bottom to be dredged for grading. Native oysters have been traditionally bred in the summer and then harvested and sold oysters in the winter months. The spatting ponds in the North Channel are used in the summer.

The seed for the Native oyster production are hatched on Brick Island (also within Cork Harbour). The ponds are filled with seawater in May / June, and then parent oysters are fished from the North Channel and are placed into the ponds. As they grow, mussel shell is placed into the ponds to catch the larvae. Once the larvae have stuck to the shells, then the mussel shell, with the spat attached are put to sea, in the oyster order areas in the North Channel at the end of the summer. They use the good oyster ground in the middle of the channel, from Brick Island in the west to Brown Island to the east. The spat are completely undisturbed, until they are harvested by boat about 3 years later, when they are harvested for the market, between September and April. Only one boat is used to harvest the oysters by dredging the oysters from the bottom. The beds are used in rotation in the North Channel, so some years' activity would be at the western end of the area, and some years there would be more activity to the east.

In 1987 the native stock were infected with *Bonamia ostrea* which caused large scale mortalities, upwards of 98%, over the next twenty years of spawnings, breeding from survivors the company successfully produced a *Bonamia* resistant native oyster. Production continues and between 2015 and 2016, 20 million seed were produced and laid down in the North Channel.

In 2002 the Food Safety Authority required that the active fishery within the Oyster Fishery Order at the eastern end of the North Channel be closed down until such time as the water could be pronounced safe for direct sales of oysters. This continues until today. Oysters are still held for shellfish testing purposes.

The Fishery Order overlaps with 9.62% of habitat 1140 and 9.62% of the constituent marine community types 'Mixed sediment to sandy mud with polychaetes and oligochaetes community complex' (see **Table 9.1**).

The activity of relaying seed oysters onto subtidal habitats constitutes a disturbance by virtue of the fact that the activity may lead to a shift in community composition.

Monoculture - Bottom culture

The relaying of oysters on the seabed may alters the infaunal community in terms of number of individuals and number of species present. If the density of oysters is high, the habitat may be dominated by single species and thus may lead to the transformation of an infaunal dominated community to an epifaunal dominated community.

Cork Harbour has an estimated residence time of 21 days (Dabrowski, 2011). A long residence time (21 days or greater) has been identified as one of the risk factors that would contribute to the successful reproduction of the non-native Pacific oyster, of *Crassostrea gigas* in an embayment (Kochmann et al 2013). This risk if further exacerbated if the oysters are uncontained on the seafloor where removal of all stock is not possible in the event of successful spawning or an epizootic.

Sensitivities to dredging

Mixed sediment communities, as identified above, have high level of resistance and resilience to the pressure resulting from an oyster dredge (ABPMer 2013f). In addition, the low frequency of dredging (once every 3 years) will contribute to this resilience (ABPMer 2013f).

9.1.1 Conclusion

Based on the level of overlap (less than the 15% threshold) and the resilience of the community types (and associated species) with oyster bottom culture and dredging, significant disturbance **could be discounted** for the following constituent habitat of Qualifying Interests (1140) Mudflats and sandflats not covered by seawater at low tide: Mixed sediment to sandy mud with polychaetes and oligochaetes community complex. In addition, as oyster trestles are considered non-disturbing they will have no in-combination effect with other activities.

Consequently, in-combination effects of fisheries with intertidal trestle aquaculture activities on designated habitats (and constituent community types) can be discounted.

Bottom culture of *C. gigas* presents a risk of successful reproduction of this species individually and in-combination with intertidal culture of oysters.

Table 9.1- Spatial extent (ha) of subtidal oyster aquaculture areas overlapping with the Qualifying Interest of Mudflats and sandflats not covered by seawater at low tide [1140] in the Great Island Channel SAC (Site Code 001058). Spatial extent of licenced areas presented according to Qualifying Interest and license status.

Licence Status	Culture Species	Qualifying Interest 1140 (722.24 ha)	Constituent Habitat Mixed sediment to sandy mud with polychaetes and oligochaetes community complex (722.24ha)
		% Overlap (Overlap ha)	% Overlap (Overlap ha)
Licenced	Fishery Order	9.62% (69.49ha)	9.62% (69.49ha)
Total		**9.62% (69.49ha)**	**9.62% (69.49ha)**

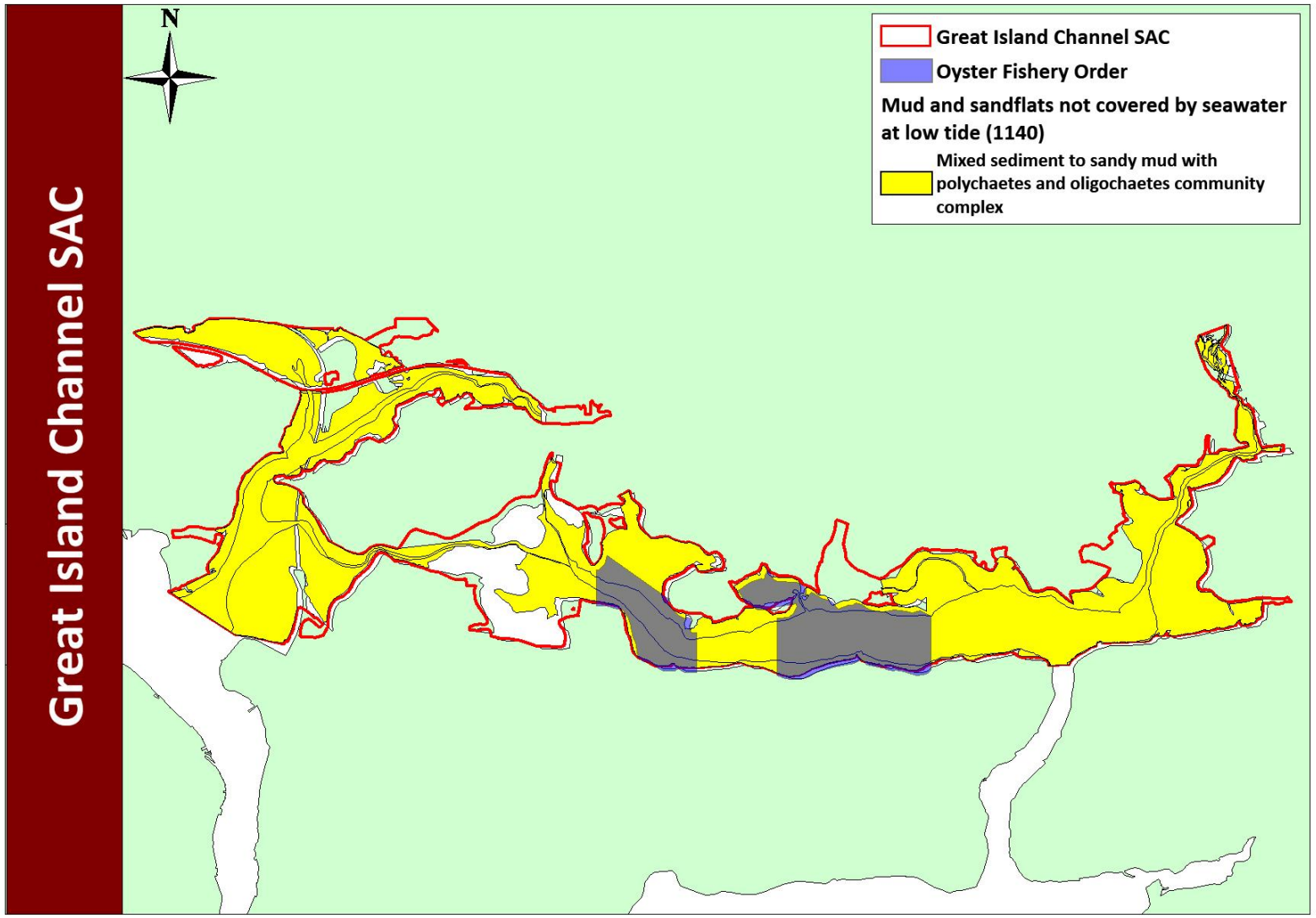

Figure 9.1 – Fisheries relative to principal benthic communities recorded within the marine Annex I Qualifying Interest of (1140) Mud and sandflats not covered by seawater at low tide of the Great Island Channel SAC (NPWS 2014a).

9.2 POLLUTION PRESSURES

There are a number of activities which are terrestrial in origin that might result in impacts on the conservation features of the Great Island Channel SAC. Primary among these are point source discharges from domestic sewage outfalls distributed along the coastline and municipal urban waste water treatment plants. The pressure derived from these point sources may impact upon levels of dissolved nutrients, suspended solids and some elemental components e.g. aluminium in the case of water treatment facilities.

9.2.1 Conclusion

Pressures resulting from aquaculture activities are primarily localised compaction of sediment along access routes. It was, therefore, concluded that given the pressure resulting from point discharge location such as the urban waste-water treatment and/or combined sewer outfalls would likely impact on physico-chemical parameters in the water column, any in-combination effects with aquaculture activities are considered to be **minimal or negligible**.

10 SAC AQUACULTURE CONCLUDING STATEMENT

10.1 ASSESSMENT REPORT CONCLUDING STATEMENT

Current and proposed aquaculture activities occurring in the Great Island Channel SAC focuses on the cultivation of oysters (using bags & trestles) and the subtidal bottom cultivation of Native oysters. Based upon this and the information provided in the aquaculture profiling report (**Section 5**), the likely interaction between these culture methodologies and conservation features (habitats and species) of the SAC were considered.

10.1.1 Habitats

An initial screening exercise resulted in the following habitat features being excluded from further consideration by virtue of the fact that no spatial overlap of the culture activities was expected to occur; Atlantic salt meadows (*Glauco-Puccinellietellia maritimae*) (1330).

A full assessment was carried out on the likely interactions between existing and proposed culture operations and the feature Annex 1 habitats of 1140 Mudflats and Sandflats not covered by seawater at low tide.

The likely effects of the aquaculture activities (species, structures, access routes) were considered in light of the sensitivity of constituent habitats and species of the Annex 1 habitat 1140 Mudflats and Sandflats not covered by seawater at low tide. The Annex I 1140 constituent community considered was limited to 'Mixed sediment to sandy mud with polychaetes and oligochaetes community complex'.

Based upon the scale of spatial overlap of current and proposed intertidal oyster aquaculture activities (including access route activity) and the relatively high tolerance levels of the habitats and associated species, the general conclusion is that current and proposed intertidal culture activities are non-disturbing to the Qualifying Interests and their constituent community types.

The subtidal relaying and dredging of Native oysters, either individually or in-combination with aquaculture activities, are considered non-disturbing to the Qualifying Interest and its constituent community types.

10.1.2 Other considerations

Based upon experience elsewhere, the introduction of '½ grown' or 'wild' oyster stock into aquaculture plots (both within and proximate to the SAC) from outside of Ireland does pose a clear risk of establishment of non-native species in the SAC. In order to mitigate the risk of introduction of alien species into the SAC as a result of aquaculture activities all movement of stock in and out of the Great Island Channel SAC should adhere to relevant legislation and follow best practice guidelines.

Furthermore, the culture on non-sterile Pacific oysters (in contained systems and subtidally un-contained on the seafloor) in the SAC presents as risk of successful reproduction and recruitment of this species within the SAC. It is recommended that triploid *C. gigas* oysters be used in a contained fashion only in licenced aquaculture areas.

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An Roinn Talmhaíochta,
Bia agus Mara
Department of Agriculture,
Food and the Marine

16th March 2021

Ref: T05/546A, T05/546B and T05/546C

Mr. Killian Tighe
8 Orilia Tce,
Cobh
Co. Cork

FISHERIES (AMENDMENT) ACT, 1997 (NO.23)
NOTICE OF MINISTERIAL DECISION TO REFUSE TO GRANT THREE AQUACULTURE LICENCES AND FORESHORE LICENCES

Dear Sir

I wish to inform you that the Minister for Agriculture, Food and the Marine has refused the granting to you of an Aquaculture Licence and accompanying Foreshore Licence, for the cultivation of oysters on bags and trestles at Sites no. T05/546,T05/546B and T05/546C (see attached information note). I enclose an extract from the copy of the public notice of the decision which **the Department** has arranged to have published in the "Irish Examiner".

Any person aggrieved by the decision may, in accordance with Section 41 of the Fisheries (Amendment) Act 1997, appeal against it in writing to the Aquaculture Licences Appeals Board. This appeal must be lodged within one month beginning on the date of the publication of the decision.

In addition, a person may question the validity of the Foreshore Licence determination by way of an application for judicial review, under Order 84 of the Rules of the Superior Court (SI No. 15 of 1986). Practical information on the review mechanism can be obtained from the Citizens Information Board at: http://www.citizensinformation.ie/

Yours sincerely

pp Rebecca Hand

Bernie McDonald
Aquaculture and Foreshore Management Division
Email: Bernie.McDonald@agriculture.gov.ie

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An Roinn Talmhaíochta,
Bia agus Mara
Department of Agriculture,
Food and the Marine

S.12 (3) OF THE FISHERIES (AMENDMENT) ACT, 1997(NO.23)
INFORMATION NOTE TO APPLICANT FOR THE PURPOSE OF REGULATION 18 OF THE AQUACULTURE (LICENCE APPLICATION) REGULATIONS 1998

REFERENCE NO:	**T05/546A, T05/546B, and T05/546C**
APPLICANT:	**Killian Tighe**
AQUACULTURE TO WHICH DECISION RELATES:	Cultivation of Oysters on bags and Trestles at Sites T05/546A, T05/546b and t05/546C on areas of the foreshore in Cork Harbour.
NATURE OF DECISION:	Refusal of Aquaculture Licences
DATE OF DECISION:	**12th March 2021**

REASONS FOR REFUSAL:

- The Visual Impact Assessment carried out in respect of sites T05/546A and T05/546C found that the landscape and visual impacts of the application are of substantial impact significance and refusal was recommended.
- The potential for Site T05/546B to significantly negatively impact on a public amenity, namely Corkbeg Strand.
- The concerns expressed by Fáilte Ireland regarding the effect on the surrounding environment and visual amenities of the area, on other marine users, on leisure activities particularly due to accessibility issues, and its proximity to Spike Island, a national monument and tourist attraction

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An Roinn Talmhaíochta,
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Department of Agriculture,
Food and the Marine

Copy of Public Notice to be inserted in 'The Irish Examiner' by the Department

FISHERIES (AMENDMENT) ACT, 1997 (NO. 23) AND FORESHORE ACT, 1933 (NO. 12)
NOTICE OF DECISIONS TO REFUSE AQUACULTURE AND FORESHORE LICENCES

The Minister for Agriculture, Food and the Marine has decided to **grant/refuse Foreshore Licences** to the applicants listed in the Table below:

File Reference	Applicant	Minister's Decision	Species, Location, No. of Sites and Site Reference
T05/546A	Killian Tighe, 8 Orilia Terrace., Cobh, Co. Cork	Refuse	Pacific Oysters – Trestle & Bag, – 1 site: T05/546A
T05/546B	Killian Tighe, 8 Orilia Terrace., Cobh, Co. Cork	Refuse	Pacific Oysters – Trestle & Bag, – 1 site: T05/546B
T05/546C	Killian Tighe, 8 Orilia Terrace., Cobh, Co. Cork	Refuse	Pacific Oysters – Trestle & Bag, – 1 site: T05/546C
[redacted]			

The reasons for these decisions are elaborated on the Department's website at:

https://www.agriculture.gov.ie/seafood/aquaculturefore shoremanagement/aquaculturelicensing/aquaculturelicencedecisions/cork

An appeal against an Aquaculture Licence decision may be made in writing, within one month of the date of its publication, to THE AQUACULTURE LICENCES APPEALS BOARD, Kilminchy Court, Portlaoise, Co. Laois, by completing the Notice of Appeal Application Form available from the Board, phone 057 86 31912, e-mail info@alab.ie or website at http://www.alab.ie/

A person may question the validity of a Foreshore Licence determination by way of an application for judicial review, under Order 84 of the Rules of the Superior Court (SI No. 15

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of 1986). Practical information on the review mechanism can be obtained from the Citizens Information Board at: http://www.citizensinformation.ie/

To be inserted in Iris Oifigiuil

FORESHORE ACT, 1933 NOTICE OF DECISIONS TO GRANT/REFUSE FORESHORE LICENCES

The Minister for Agriculture, Food and the Marine has decided to **grant/refuse Foreshore Licences** to the applicants listed in the Table below:

File Reference	Applicant	Minister's Decision	Species, Location, No. of Sites and Site Reference
T05/546A	Killian Tighe, 8 Orilia Terrace., Cobh, Co. Cork	Refuse	Pacific Oysters – Trestle & Bag, – 1 site: T05/546A
T05/546B	Killian Tighe, 8 Orilia Terrace., Cobh, Co. Cork	Refuse	Pacific Oysters – Trestle & Bag, – 1 site: T05/546B
T05/546C	Killian Tighe, 8 Orilia Terrace., Cobh, Co. Cork	Refuse	Pacific Oysters – Trestle & Bag, – 1 site: T05/546C
[redacted]			

A person may question the validity of a Foreshore Licence determination by way of an application for judicial review, under Order 84 of the Rules of the Superior Court (SI No. 15 of 1986). Practical information on the review mechanism can be obtained from the Citizens Information Board at: http://www.citizensinformation.ie/

The documentation upon which the Minister determined the applications may be inspected free of charge at the Department's Offices in Clonakilty, Co. Cork, by contacting the Aquaculture and Foreshore Management Division on 023 8859500.

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