

MARINE BIOSECURITY PLANNING

GUIDANCE FOR PRODUCING SITE AND OPERATION-BASED PLANS FOR
PREVENTING THE INTRODUCTION OF NON-NATIVE SPECIES

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Scottish Natural Heritage
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PLEASE NOTE: Further background information on this guidance document can be found in the report entitled “Cook, E.J., Payne, R.D. and Macleod, A. (2014). *Marine Biosecurity Planning – Identification of best practice: A Literature Review*. Report by SRSL Ltd. in conjunction with Robin Payne to the Firth of Clyde Forum and Scottish Natural Heritage Commissioned Report No. 748 - 45 pp.”

SECTION 1 - INTRODUCTION

Aim and Scope

This document is intended to guide the owners and operators of small harbours, visitor moorings, mooring associations, boatyards, marinas and slipways in developing a site-based biosecurity plan for marine species that have been introduced to waters outside their natural range by human action (hereafter referred to as 'non-native species' (NNS)). The guidance also covers the development of a biosecurity plan for a time-limited operation in the inshore environment, such as the repairs to a jetty or a major recreation event. This guidance has not been designed to cover larger facilities such as ports or oil terminals although the principles set out here also apply to these larger sites.

Shellfish and finfish farms have to develop *Biosecurity Measures Plans* to cover disease risk as a condition of their licence. This guide can also be used to expand these plans to include NNS.

Most site biosecurity plans will cover recreational and commercial users of a facility, as well as the role of the site operator. It is recognised that **not all activities can be controlled by the site operator**. The role of this guidance document is to help the site operator encourage good practice, both for staff and users of the facility or event.

You can find a template for completing a simple biosecurity plan at the end of this guidance document (Annex C). Sections 3, 4 and 5 explain how to complete the boxes in the template.

What is Biosecurity?

Biosecurity is a relatively modern term, which has its origins in the control of animal and plant diseases. Biosecurity is now also used in the context of NNS species of plants and animals.

A simple definition of biosecurity in the context of this guide is **'taking action in order to minimise the introduction or spread of non-native species'**.

Movement of vessels, equipment and/or stock can cause both the introduction of a new NNS or the spread of a NNS already established at a site to new locations.

When a NNS threatens native biological diversity, human health or economic activity it is often referred to as an *invasive* non-native species. In the marine environment, very little is known about NNS and their existing or potential impact, making it difficult to differentiate between non-native species which are clearly invasive and species

which may become invasive (effectively all other non-native species). Both are referred to as NNS in this guidance.

In the marine environment, the complete eradication of NNS is rarely possible or affordable and control is usually only effective on a local scale. A precautionary approach, which seeks to reduce the likelihood of introducing a NNS in the first place, is more suitable to this environment.

Biosecurity measures, therefore, typically focus on minimising the introduction and spread, i.e., “prevention” and do not cover the long-term control and management of NNS which are well established and widespread.

Why does marine biosecurity matter?

Once NNS become established, they can threaten the diversity of life in our seas and coasts, as well as impacting on our livelihoods and our sport, leisure and enjoyment of the marine environment.

Shellfish and finfish farming and NNS

In shellfish and finfish farms, many individuals of a single species of mollusc or fish are kept on one site and are vulnerable to disease. Biosecurity plans help to prevent the introduction and spread of diseases and are already obligatory at marine aquaculture sites. The industry is becoming increasingly aware that NNS are also a threat to their stock and that extending their biosecurity planning to cover both disease and NNS makes good sense.

Problem species include the veined rapa whelk (*Rapana venosa*), which predate on oysters and mussels; the slipper limpet (*Crepidula fornicata*), which can significantly increase the harvesting costs for seabed grown mussels and oysters; Japanese wireweed (*Sargassum muticum*), which can overgrow oyster trestles and clog cage netting, a leathery sea squirt (*Styela clava*) and a carpet sea squirt (*Didemnum vexillum*), which can overgrow mussel lines.



Photo: *Didemnum vexillum* on pontoon anchor chains, west coast of Scotland © C. Beveridge SAMS

Increased international trade has caused a dramatic increase in the spread of NNS around the world over the last few decades. It's estimated that the direct cost of NNS to marine industries in Great Britain is approximately **£40 million per year**. These marine industries include aquaculture, shipping, recreational boating, fisheries and power generation.

More than 90 marine NNS have been identified in British and Irish waters (including Republic of Ireland and Northern Ireland), of which seventeen are now established in Scotland. Their arrival is believed to be principally due to shipping, including ballast waters and sediments, fouling of hulls and other associated hard structures, and imported consignments of cultured species. Most marine NNS in Britain originate from parts of the world with a similar latitude to ourselves (e.g., North Pacific, North-west Atlantic).

For a full list of the NNS that can be found on our shores visit the AQUANIS website and carry out a search for your area (www.corpi.ku.lt/databases/index.php/aquanis) OR Alien species in British brackish and marine waters:

- Full paper: http://www.aquaticinvasions.net/2013/AI_2013_1_Minchin_etal.pdf
- List of species: http://www.aquaticinvasions.net/2013/Supplements/AI_2013_Minchin_etal_Supplement.pdf

For further general non-native species information:

- GB Non-Native Species Secretariat – www.nonnativespecies.org

GLOSSARY

- ❖ **Native Species:** Also known as indigenous species, means a species occurring within its natural range (past or present) and dispersal potential, i.e. within the range it occupies naturally or could occupy without direct or indirect introduction or care by humans
- ❖ **Non-Native Species:** Non-native species (also known as alien, non-indigenous, foreign or exotic) means a species or subspecies occurring outside its native range i.e. the range it occupies naturally without the intervention of human activity. This includes any part of the species that might survive and subsequently reproduce.
- ❖ **Invasive Non-Native Species:** An invasive non-native species (INNS) is defined as a 'non-native' species that threatens native biological diversity, human health or economic activity.
- ❖ **Biofouling:** Biological growth which develops on manmade structures in the aquatic environment.
- ❖ **Introduction:** Refers to the movement by human means, indirect or direct, of a species outside its natural range. This movement can be within a country or between countries.
- ❖ **Establishment:** Refers to the process of a non-native species in a new location successfully producing viable offspring with the likelihood of continued survival.
- ❖ **Biosecurity:** Taking action in order to minimise the introduction or spread of non-native species or disease.
- ❖ **Biosecurity Plan:** A written document which details site/ operation activities and actions that will be undertaken to minimise the introduction or spread of a specified threat (i.e., non-native species).
- ❖ **Control Measures:** Refers to actions which are undertaken in order to prevent the introduction or spread of a non-native species.
- ❖ **Precautionary Approach:** If an action, such as a particular operation or site activity has a suspected risk of causing harm to the general public, economy or to the environment (i.e., introduction of an invasive non-native species), based on sound scientific research, then the person(s) in charge must prove that their operation or activity will not cause any harm (i.e., introduce any NNS).

SECTION 2 - WHY DOES MY SITE, OPERATION OR EVENT NEED A MARINE BIOSECURITY PLAN?

All of us depend on a healthy marine environment to prosper, damage to this environment can lead to huge direct financial losses to marine industries. Effective biosecurity planning can help ameliorate these risks of damage and, at the same time, help keep marine operators within the law. There are three major reasons for preparing these plans.

a) We all share a concern for the environment

The value of a healthy marine environment has been widely accepted and understood for some time. What is changing is that we are becoming increasingly aware that the biodiversity of our seas provides us with a wide range of benefits, often called 'ecosystem services', on which our lives and livelihoods depend. Non-native species threaten those marine ecosystems services. The recreational boating and marine industries have been working to reduce that threat (See Annex A).

b) Marine NNS can affect your business

Having a biosecurity plan in place to minimise the introduction or spread of invasive NNS to your harbour, marina, boatyard or slipway makes business sense. A biosecurity plan can help you avoid an unpleasant bill if something does go wrong by showing you are following best practice. It also shows your business' green credentials and how it is responding responsibly to a serious environmental threat.

In Scotland, where an invasive NNS is present and control or eradication of that species is imperative, new legislation also provides powers to government agencies to offer voluntary Species Control Agreements (SCA) and, if that fails, serve Statutory Species Control Orders (SCO). SCOs operate on the 'polluter pays' principle. If government agency staff or their contractors have to carry out the eradication, control or containment work and best practice has not been followed on the site, then the cost of this work can be recovered from the site operator. Similar powers are under consideration for England and Wales.

The Environmental Liability (Scotland) Regulations and their equivalent in England and Wales have established a civil law mechanism based on the 'polluter pays' principle. Under the Regulations, certain operators who cause a risk of 'significant' damage or cause 'significant' damage to land, water or biodiversity will have a duty to avert such damage occurring or, where damage does occur, a duty to reinstate the environment.

CARPET SEA SQUIRT, *DIDEMNUM VEXILLUM* ERADICATION IN HOLYHEAD MARINA, NORTH WALES

The carpet sea squirt *Didemnum vexillum* was first recorded in the UK in north Wales and Plymouth, south coast of England in 2008. Surveys in north Wales determined it was confined to the marina structures and was nowhere else in Wales. Eradication started at this site in 2009, using isolation and stagnation methods with a chemical accelerant to speed up the process. Further eradication attempts have been made over the following three winters at a cost of over £800,000.



Photo: The carpet Sea Squirt (front) and native sponge (back) © C. Beveridge, SAMS.

As you can imagine, where eradication and control operations are attempted, these can be disruptive to commercial activity and this, along with a reputational risk could lead to a loss of trade. The discovery of high-risk species could even lead to the temporary closure of a facility. In Scotland, powers exist for government agencies to make Emergency Species Control Orders (ESCO), which apply with immediate effect and have been created to enable rapid action where there is an immediate risk of an invasive NNS being introduced or spread.

c) It keeps you within the law

Recent changes to the law in Scotland (and which are likely to follow throughout the rest of the UK) set a strong context for preparing and implementing marine biosecurity plans. The deliberate release of non-native animals and some plants has been an offence for some time, but now there are new offences of:

- *Causing an animal to be in a place outwith its native range* - which can include the accidental transfer and spread of non-native animals and,
- *Planting or causing any plant species to grow in the wild outwith its native range* and this includes species of seaweeds and plants, such as cord grass, which can grow in the marine environment.

These offences can apply when poor biosecurity allows non-native plants or animals to be introduced or spread within the marine environment through, for example, site operation or construction work. Knowledge of the offence, intention, recklessness or negligence do not have to be proved in these cases, but if all reasonable steps were taken and all due diligence was exercised to avoid committing the offence then this can form the basis of a legal defence. So, in effect, the legal requirement is

for everyone to take all reasonable steps to ensure biosecurity. Biosecurity is a shared responsibility.

***The Code of Practice On Non-Native Species* recommends:**

- Adopting a precautionary approach and not carrying out operations which might lead to the spread of NNS until there is a clear understanding of the situation
- Carrying out risk assessments to understand the risk of spreading a NNS, setting out how to avoid it happening
- Seeking advice and following good practice
- Reporting the presence of NNS

As these are the main elements of a biosecurity plan, then preparing and implementing a biosecurity plan on this basis will help you to keep within the law.

USEFUL LINKS – SCOTLAND

Wildlife and Countryside Act Scotland

<http://www.legislation.gov.uk/asp/2011/6/contents/enacted>

Code of Practice On Non-Native Species

<http://www.scotland.gov.uk/Resource/0039/00398608.pdf>

Environment Liability (Scotland) Regulations 2009

http://www.legislation.gov.uk/ssi/2009/266/pdfs/ssi_20090266_en.pdf

USEFUL LINKS – ENGLAND AND WALES

Guidance on the law on non-native species in England and Wales

<http://archive.defra.gov.uk/wildlife-pets/wildlife/management/non-native/documents/section-14-guidance.pdf>

SECTION 3 - WHAT KIND OF BIOSECURITY PLAN DO I NEED?

Before starting to prepare your biosecurity plan it's helpful to consider two questions:

A 'site' or 'operations' plan – which type will my plan be?

A **site** biosecurity plan covers the long-term on-going activities at a single location such as a boat yard, marina or shellfish farm. A biosecurity plan for an 'operation' is drawn up to cover a time-limited set of activities at one or more locations. This could be the construction of a new bridge the upgrade of a set of slipways or a major sailing regatta using several harbours.

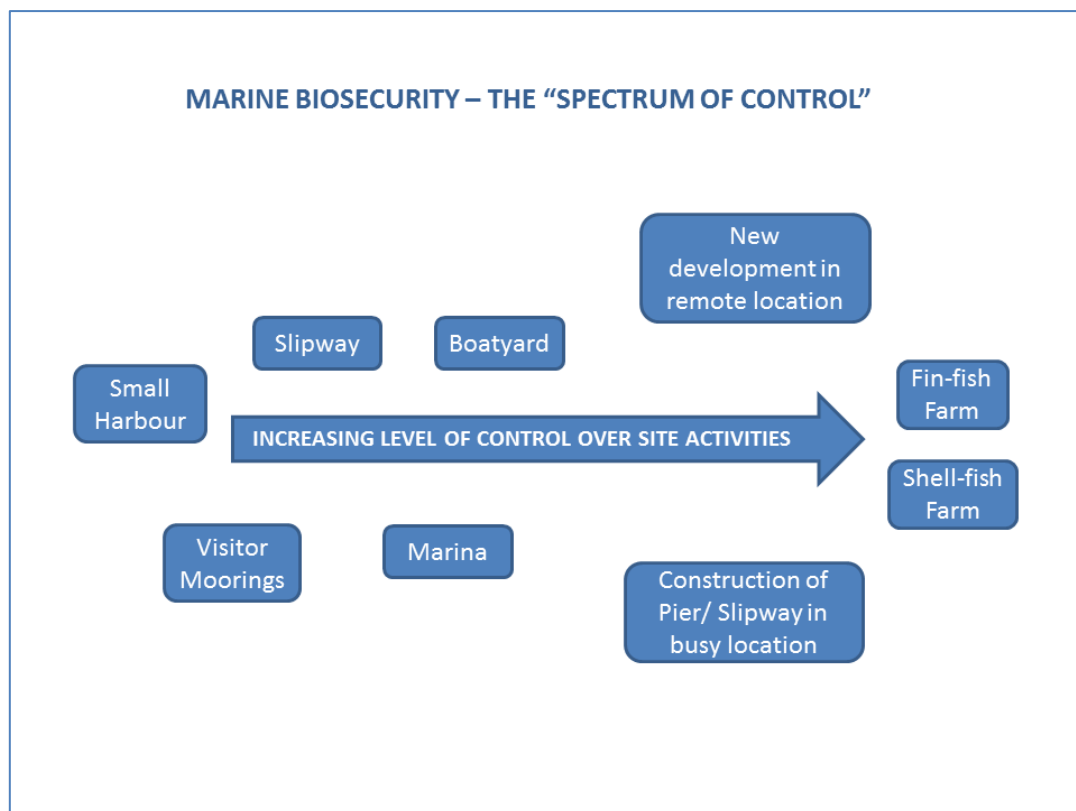
Both plan types are covered by this guidance and the planning process is the same for both. There will be some differences though and it's worth being aware of these when you start. A site plan is likely to be in place for a longer period and have an emphasis on routine activities and biosecurity control measures repeated many times. It will be suited to periodic monitoring and review. An operations plan will have a shorter lifespan and is likely to cover a sequence of activities which may only be carried out once (e.g., movement of a construction barge to build a pier). There is less opportunity here for fine tuning and biosecurity measures are likely to be time-critical.

The plan can only 'make' people do so much, it's voluntary isn't it?

A biosecurity plan is of little use if it has complex control measures and actions which have little chance of being applied in the real world. It must reflect what can, realistically, be implemented and achieved. An important influence on almost every aspect of the plan will be the *degree of control* the plan will have over the activities taking place on the site or as part of the operation. These two examples illustrate either end of the spectrum of control.

Low level of Control	High level of Control
E.g., a small busy harbour. One member of staff only part of the day. 24 hour activity of a variety of vessels, all privately owned arriving and departing as and when they choose.	E.g. repair to a private jetty for a quarry. Planned activity with main contractor and sub-contractors all bound through contract terms to clear biosecurity measures and procedures. All vessels owned and operated by site owner/contractors. No other users of the facility.

Typically, sites open to other marine users (e.g., harbours, marinas and slipways) all have to accommodate the activities of a range of vessels and the majority of activities tend to lie at the ‘*low control*’ end of the spectrum whilst planned operations and sites with regulated access (e.g., finfish farms) lie at the ‘*high control*’ end. The figure below gives an overview of the typical levels of control over site activities. However, individuals/ operators have to make an assessment of the level of control on a case by case basis regardless of the activity.



Where direct control of activities isn’t possible (e.g., private boat owners), then there should be aspects within the plan which emphasise the need to influence and encourage best practice where possible.

The degree of control shouldn’t be confused with legal requirement in Scotland to take ‘*all reasonable steps*’. This duty applies to everyone (harbour operator, yacht owner) and only a court can decide what are ‘*reasonable steps*’. A biosecurity plan can’t define anyone’s legal responsibility, neither can it pass this responsibility to someone else, but it is a key step in reducing the risk of introducing NNS, which is the main aim of the new legal framework.

Understanding the level of control that the plan will have over activities gives a good guide to the balance between compulsory procedures and voluntary good practice. It’s unrealistic, for example, to expect a marina manager to have the time to inspect every vessel entering the marina or to enforce biosecurity procedures on private boat owners. By contrast the repair of a slipway in a site designated for its marine life should be planned so that biosecurity is both built-in and fully applied.

So what type of plan do I need, what are the key issues?

Section 3 will guide you through the plan preparation process. The table below sets out the main categories of plan types for a site or operation, the likely key issues and where the emphasis of the plan should be. This is not intended to be prescriptive, but is to be used as a broad guide.

If you operate a shellfish or finfish farm you can use this methodology to develop a biosecurity site plan for NNS. However, we would also suggest that you refer to the statutory biosecurity guidance you already use for your operation for minimising the introduction and spread of disease, as this guidance could be adapted to incorporate NNS.

PLAN TYPE	MAIN VECTORS	LIKELY ISSUES	PLAN EMPHASIS
SITE PLANS			
Marina	Yachts, tenders, inflatables, outboards	Biofouling Floating structures Associated boatyard/marine engineering Vessel cleaning	Biosecurity actions for marina staff Biosecurity facilities for boat owners Promoting good practice Surveillance and monitoring Careful/appropriate disposal of hull scrapings after cleaning.
Harbour	Recreational and commercial vessels, cargoes	Biofouling Diversity of vessel types and activities	Promoting good practice Biosecurity facilities for boat owners Surveillance and monitoring
Boatyard	Recreational and commercial vessels	Cleaning vessels	Surveillance and monitoring Careful/appropriate disposal of hull scrapings after cleaning.
Slipway	Recreational and commercial vessels	Biofouling	Promoting good practice Biosecurity facilities for boat owners Appropriate disposal of hull scrapings
Finfish Farm	Well boats, service vessels, imported stock	Biofouling Links/overlap with pathogen plan Contamination of imported stock	Biosecurity control measures for all staff, visitors and sub-contractors Surveillance and monitoring
Shellfish farm	Harvesting vessels, imported stock	Biofouling Links/ overlap with pathogen plan Contamination of imported stock	Biosecurity control measures for all staff, visitors and sub-contractors Surveillance and monitoring
OPERATION/EVENT PLANS			
Construction/ Development	Slow-moving vessels, barges, service vessels, equipment	Biofouling Construction materials Dredging	Analysis of biosecurity risk and development of control measures and control points (see Annex B) Bio-secure design of new facilities and installations. Biosecurity control measures for all staff, visitors and sub-contractors
Event	Yachts and other recreational vessels, recreation equipment	Biofouling Origin of vessels	Advanced Planning Communicating good practice and event requirements Monitoring compliance

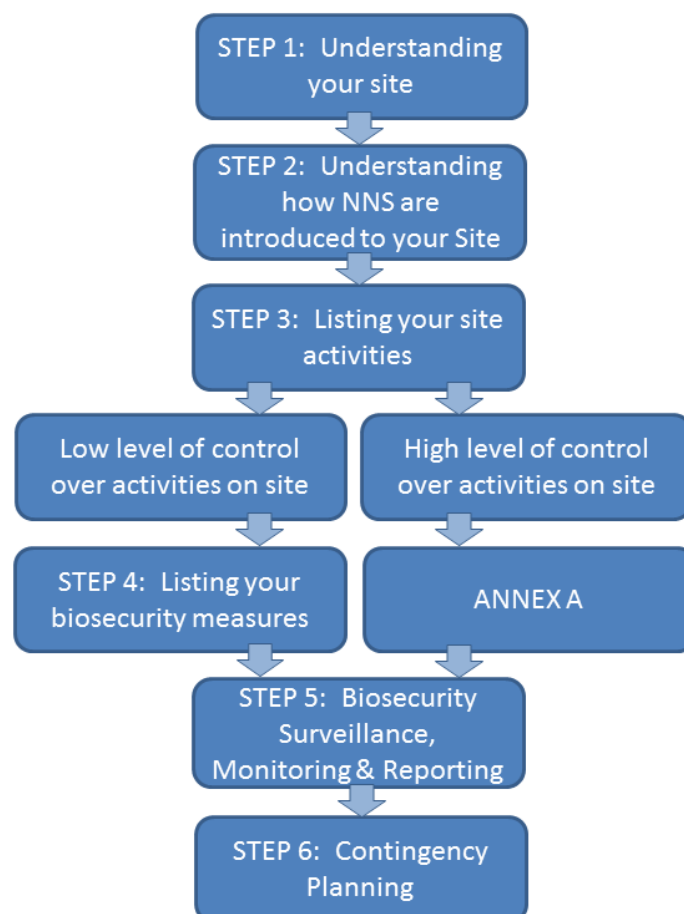
SECTION 4 – WRITING THE PLAN

Introduction

This section will provide you with a step by step guide to preparing a marine biosecurity plan for your site or operation. The main aim of this plan is to prevent the introduction of NNS to your site or to the location where you are about to undertake an activity. It will also help you to prevent the spread of NNS already present on your site to new locations.

The first task is to appoint someone responsible for managing biosecurity on your site or operation. This person will be responsible for producing the biosecurity plan, checking the biosecurity log book, training staff in the control measures, ensuring that all sub-contractors, visitors to the site etc. are aware of the aspects of the plan that apply to them and reporting any 'unusual' sightings to the appropriate contact.

The preparation of the plan is then based on a series of six steps and each of these is covered in more detail in the rest of this section.



STEP 1 - UNDERSTANDING YOUR SITE

As a first step, it's important to think carefully about your site or where your operation/ event will be taking place. To do this you may need to walk the site, ask some questions or dig out some information. It will be well worth the effort, as this knowledge will help you produce a much more effective plan. The following is a guide to the questions you should be asking yourself about your site.

How 'salty' is the water at your site?

The majority of marine animals and algae can't tolerate freshwater for any length of time so the more freshwater you have flowing into your site the less hospitable it will be for an NNS. The risk increases as the water gets more and more salty, with the greatest risk of NNS establishment occurring when the water is fully saline (i.e. without any freshwater input from any river or drainage channels within 1 km of your site) or if it only has occasional freshwater input (i.e., from storm drains)

How many man-made structures are in the water?

The risk of NNS introduction and establishment is also increased by the presence of artificial structures (e.g., concrete slipways, floating pontoons, steel or fibreglass hulls, mooring chains and plastic mooring buoys), as these species typically prefer to settle on man-made structures rather than natural surfaces. Any structure that has been in the water for just a few weeks, particularly in the summer months when NNS typically reproduce, without an anti-fouling coating will be at risk from NNS settlement.

Are NNS already present on your site?

It is highly likely that NNS are already present on your site, either with or without your knowledge, especially if your site is fully saline (i.e. no freshwater input close by). The biosecurity plan should concentrate on reducing the risk of introducing new NNS to your site, but also consider how best to prevent any NNS already present on the site becoming invasive or being moved elsewhere.

If species records, survey reports and other accounts of a NNS on the site already exist then these should be recorded in the biosecurity plan. However, even if you have no evidence of NNS on your site, you should still follow the precautionary principle and **assume that they *might* be present and act as if they *are* present.**

Check the following websites for more information on the 'risk' status and distribution of individual species:

- GB Non-native Species Secretariat website (www.nonnativespecies.org) to see if any species found at your site are classified as high risk. Follow links 'Species information', then 'Risk assessments'
- National Biodiversity Network (www.nbn.org.uk) for distribution data
- AQUANIS – European Database for Non-native Species (<http://www.corpi.ku.it/databases/index.php/aquanis>)

Think through the factors that affect the risk that your site and its location pose in relation to the risk of introducing or spreading NNS.

DOES YOUR SITE...

- HAVE A FRESHWATER SUPPLY FROM A LOCAL RIVER
- HAVE A BREAKWATER OR WALLS AROUND MOST OF THE SITE
- HAVE STRUCTURES THAT HAVE AN ANTI-FOULING COATING OR REMOVED FROM THE WATER AND AIR DRIED ON A REGULAR BASIS (~ EVERY 6 - 12 MONTHS)

= LOW RISK

- HAVE FULLY SALINE WATER (I.E. MINIMAL FRESHWATER INFLOW)
- HAVE STRUCTURES WITHOUT ANTI-FOULING COATING AND/OR SUBMERGED FOR LONGER THAN 6 MONTHS AT A TIME
- HAVE FIXED STRUCTURES THAT CAN ONLY BE CLEANED *IN SITU*

= SIGNIFICANT RISK



LOW RISK: A marina in the Firth of Clyde was constructed by breaching a small section of the outer wall of a quarry, so that seawater could flood the site. A river discharges freshwater into the marina and, together with the enclosed nature of the site, this means that the salinity of the water is kept at a low level, preventing the survival and establishment of marine NNS.

Photo © E. Cook, SAMS

LOW RISK: In the Isle of Man, the main marina is built at the seaward end of the River Douglas, with the freshwater providing a natural barrier to the survival and establishment of marine NNS.

Photo © E. Cook, SAMS



SIGNIFICANT RISK: Steel pontoons covered in marine bio-fouling from a fully saline site. Bio-fouling accumulates on these structures which are not easy to remove from the water to clean or recoat with anti-fouling paint.

Photo © C. Maggs, Queen's University, Belfast.

STEP 2 - UNDERSTANDING HOW NON-NATIVE SPECIES CAN BE INTRODUCED TO YOUR SITE

In addition to thinking about your site, the structures on site and any NNS already present it's also essential to consider how NNS can be introduced to your site. What are the movements of vessels and equipment into and around your site?

To assess which activities are likely to present a greater risk of introducing NNS consider the following questions whilst completing this section of your biosecurity plan.

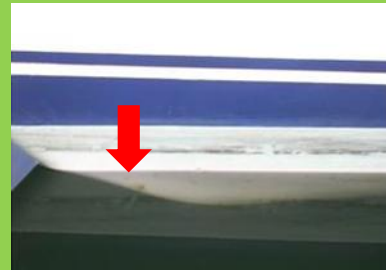
	HIGH	MED	LOW
1. Has the vessel/ equipment just arrived from the local area?			
2. Has the vessel/ equipment had an anti-fouling coating applied to submerged structures within the last 12 months (or time recommended by manufacturer)?			
3. Are all the visible submerged surfaces free of bio-fouling (a green 'slime' is OK)?			
4. Do the visible submerged surfaces have more than a green 'slime' coating?			
5. Does the vessel/ equipment have noticeable clumps of algae and/ or animals clinging to the visible parts of the hull/ rudder/ propeller?			
6. Has the vessel/ equipment just arrived from another country, region or water body with similar environmental conditions (e.g., seawater temperature)?			
7. Has the vessel/ equipment just arrived from a water body known to have NNS present?			
8. Does the vessel/ equipment spend long periods of time stationary at sites in between anti-fouling treatments?			
9. Is the vessel 'slow moving', such as a construction barge or drilling rig?			

Remember, the greatest risk of introducing a NNS is when a vessel (particularly slow moving barges for example), equipment or stock arrives at your site from another country, region or water body, with similar environmental conditions (e.g., temperature, salinity) to your own site and is covered in biofouling (i.e., anything more than a thin, green 'slime' coating for vessel hulls) or contains additional algae and animals (otherwise known as 'hitch-hikers') within other parts of its structure or amongst the stock.

There is also a greater risk of introducing NNS when a vessel with fouling on the hull, for example, has just arrived from a site that is known to contain NNS. However, just because NNS haven't been reported at a particular site, does not mean that they are not present there. It may just mean that this site hasn't been surveyed yet for NNS.

LOW RISK: A recreational vessel showing no signs of bio-fouling on the hull on either just on or below the water line (see arrow) would be considered as low risk for the introduction of NNS.

Photo © E. Cook, SAMS



SIGNIFICANT RISK: Work vessels/ barges that move from site to site, and have to hold position for long periods of time or spend extended periods of time in port, may be more vulnerable to having NNS settling on their hull and, therefore, more likely to introduce NNS to a site.

Photo © A. Macleod, SAMS

SIGNIFICANT RISK: Repairs were planned for a small pier at Beaumaris on the Isle of Anglesey. The pier lies within the Menai Strait Special Area of Conservation (SAC). As part of the work a construction barge needed to be brought to the site from a distant location. Further investigation revealed that the barge hadn't been cleaned for some time and was heavily biofouled. To ensure biosecurity and meet the requirements of the consultation on undertaking work within the SAC the barge was taken away for specialist cleaning.



Photo: © www.capita.co.uk

STEP 3 – IDENTIFYING ACTIVITIES WHICH RISK INTRODUCING NON-NATIVE SPECIES

The next step in preparing your biosecurity plan is to think about the main activities which take place at your site or as part of the operation/ event, particularly those that could lead to the introduction or release of marine NNS to the wider environment.

Some activities will clearly carry almost no risk at all, such as those that take place in areas which are never in contact with sea water, and so do not need to be covered by the plan. Always err on the side of caution though and consider all the activities, which take place in or around the water and include both vessels and structures.

At this stage you need to make a choice and follow one of the two approaches described below. The in-depth approach is recommended and can be used effectively for all plans but there is simpler and quicker alternative.

A **simple approach** is to list all the activities which take place on your site or which make up your operation/ event that you think may carry a significant risk of introducing or releasing NNS and then take that list on to the next step to develop control measure.

A more **in-depth approach** to looking at site activities is described in Annex B. This technique helps you better understand the risk of introducing or spreading NNS associated with each activity. It also guides you in the development of biosecurity control measures as well as where and when to apply them. This approach will take a little more time than just providing a *list of significant risk activities*, but it will enable you to more rigorously assess where preventative actions can be incorporated into the plan. ***Remember this approach is not a legal requirement, but it could provide evidence that you have taken ‘reasonable steps’ to avoid the introduction of NNS.***

Simple Approach	In-depth Approach
Suited to small sites and simple operations. Sites/ operations where there is a limited level control of over activities e.g. ‘self-service visitor moorings’, small harbour or marina without full time attendant.	Large, complex sites with many activities. Important for understanding the risks of introducing or spreading NNS in operations/ events. Suited to sites and operations where there is a high level of control over all the activities.
If you chose this approach then follow the guide below.	If you chose this approach then first read the guide below and then look at the instructions and example in Annex B.

A simple guide to activities which carry a risk of introducing or releasing NNS

This table lists some of the most common activities that may take place on your site or may be part of your operation/ event, which carry a significant risk of introducing NNS. Use it as a starting point when drawing up your list of activities, but remember that every site and operation is different, so it's more than likely that there will be other activities which you will have to add that will be specific to your site or operation.

When drawing up your list, think carefully about the information that you've gathered together for STEPS 1 and 2 about your site/operation and the vessels movements associated with it. Use this information to help you identify activities which carry a significant risk. Move on to Step 4 once you have completed your list.

Broad Category	Example Activities
Construction and/ or maintenance of slipways/ jetties/ coastal defence structures etc.	<ul style="list-style-type: none"> • Use of construction barge and slow moving vessels • Using vessels from locations outside local water body • Importation of materials • Removal of old structures/ equipment • Disposal/ re-use of old structures/equipment
Shore-based boat repairs and/ or over-winter storage	<ul style="list-style-type: none"> • Moving and haul out of vessels from locations outside local water body • Provision of temporary mooring for boats awaiting haul out • Cleaning of hull and associated structures • Disposal of damaged structures and biofouling removed during cleaning process
Provision of berthing and facilities for recreational vessels	<ul style="list-style-type: none"> • Operating swinging moorings for visiting and resident boats • Operating pontoon berths for visiting and resident boats • Maintaining moorings and pontoon berths • Removal of old structures/ equipment • Disposal of biofouling removed during maintenance of berthing facilities
Provision of berthing and facilities for commercial vessels	<ul style="list-style-type: none"> • Operating dockside berths for visiting vessels • Maintaining pilings, ladders, pontoon berths • Disposal of biofouling removed during maintenance of facilities
Culture of shellfish	<ul style="list-style-type: none"> • Maintenance of culture infrastructure (e.g., long-lines, anchor chains, buoys) • Use of slow moving vessels (e.g., harvesting barge) • Importation of stock • Maintenance of equipment and vessels • Disposal of biofouling and waste water during cleaning process for stock and equipment
Culture of finfish	<ul style="list-style-type: none"> • Maintenance of culture infrastructure (e.g., cages, netting, buoys, anchor chains) • Use of vessels that remain in position for long periods of time (e.g., feed barge) • Importation of smolts via slow moving vessels from locations outside local water body • Maintenance of equipment and vessels • Disposal of biofouling during cleaning process for equipment

STEP 4 – BIOSECURITY CONTROL MEASURES

Now that you have a list of activities which carry a risk of introducing NNS you can develop measures to control that risk.

It's important that these measures are:

- Effective
- Simple
- Realistic and can be applied in the real world given the staff resource, amount of planning time etc.
- Can be easily translated into instructions for staff or recommendations for private vessels that are out of your control

There is little point in developing a control measure which, however thorough and imaginatively designed, is simply too complex and unwieldy to only ever be used occasionally. Better to have a simple and easy action or method which will be used by many.

At all times, think about how much control you have over the site and its activities (as discussed in Section 3) when implementing biosecurity measures and design your measures with this in mind. Control measures which apply to private boat owners will only be taken up if they are simple and make sense to the boat owner. By contrast, a sub-contractor working on a new development can have a control measure written into the method statement for their contract and that measure is then obligatory.

Control measures help you to meet with the legal requirement to take 'reasonable steps' to prevent the introduction of NNS. Generally, you will be expected to cover the additional costs, if any, that carrying out control measures may incur. Some funding may be available if your site, or the NNS concerned, is covered by a specific initiative or project.

To make the control measures effective think about:

- **Who** will carry out the action
- **What** will they be doing to reduce the risk of introducing NNS
- **Where** will the control measure be applied
- **When** will the control measure be applied, at what stage in a process

NOTE: If you have followed the planning method set out in Annex B, to define the activities on your site, continue to use this method as it will now help you develop control measures and how to apply them.

Marine biosecurity is constantly developing as more is understood about NNS and the activities which lead to their introduction. At the same time technologies, such as anti-fouling paints, vessel cleaning facilities and tracking of vessel movements are developing, too. The focus of this guidance is therefore on how to develop and implement control measures rather than the measures themselves. The measures will change over time as the technology develops and will reflect a change in culture as biosecurity is more widely adopted.

KEY SOURCES OF ADVICE

- **GB NNSS Website**
 - Biosecurity in the field (including biosecurity for boat users, submerged structures and event biosecurity support pack) <http://www.nonnativespecies.org/index.cfm?pageid=174>
- **Firth of Clyde Biosecurity Plan**
 - Invasive non-native species – A biosecurity plan for the Firth of Clyde
<http://clydeforum.com/index.php/projects/invasive-species>
- **Invasive Species Ireland**
 - Aquaculture Code of Good Practice <http://invasivespeciesireland.com/cops/aquaculture/>
 - Marina Operators Code of Good Practice <http://invasivespeciesireland.com/cops/marina-operators/>
 - Water Users Code of Good Practice <http://invasivespeciesireland.com/cops/water-users/>
- **Green Blue**
 - Antifoul and Invasive Species
www.thegreenblue.org.uk/boat_users/antifoul_and_invasive_species.aspx
 - The Green Guide to Boat Washdown
www.thegreenblue.org.uk/leaflets_resources/resources_for_clubs_and_marina.aspx
- **Cefas Biosecurity Measures Guidance**
 - Shellfish biosecurity measures plan
<http://www.defra.gov.uk/aahm/files/Book-Shellfish-BMP.pdf>
 - Finfish biosecurity measures plan
<http://www.defra.gov.uk/aahm/files/Book-Finfish-BMP.pdf>
- **Oil and Gas Industry Guidelines for Prevention and Management of Alien Species**
<http://www.ogp.org.uk/pubs/436.pdf>
- **IMO Biofouling Guidelines to Minimise Transfer of Invasive Aquatic Species**
[http://www.imo.org/blast/blastDataHelper.asp?data_id=30766&filename=207\(62\).pdf](http://www.imo.org/blast/blastDataHelper.asp?data_id=30766&filename=207(62).pdf)

The table below gives examples of some of the biosecurity measures which could be appropriate for the activities described. It should be used as a guide.

Activity type	Example biosecurity measures
Preventing biofouling	<ul style="list-style-type: none"> • Use the right type of anti-fouling for your site and vessel usage – take advice from manufacturer or chandlery where possible • Replace anti-fouling coating at regular intervals as specified by the manufacturer's instructions or if damage occurs to any surface in the meantime • Consider applying anti-fouling to surfaces not typically coated (e.g., mooring buoys, pontoon floats), if fouling is particularly intense • Use any freshwater inflows to best advantage to reduce fouling on equipment and vessels
Removing biofouling	<ul style="list-style-type: none"> • Avoid biofouling scrapings entering the water by collecting in tarpaulin • Provide wash down facilities which collect biofouling material during the wash down
Operation of facilities for berthing vessels	<ul style="list-style-type: none"> • Gather biosecurity information from visiting vessels at the earliest opportunity; including port of origin and when anti-fouling was last applied to hull • Direct all visiting vessels, which are from distant ports to berths closest to the freshwater inflow, if available • Carry out rapid visual hull inspection on 'high risk' vessels • Provide biosecurity information to allow boat owners to 'self-assess' their risk • Ask boat owners not to dispose of any water contained on the vessel (e.g., ballast tanks, bilge water, anchor lockers) into the water at your site • Provide 'quarantine' facilities, if possible, for vessels with obvious biofouling on hulls (e.g., berth nearest to any freshwater inflow to site)
Operation of public slipway/ visitor moorings	<ul style="list-style-type: none"> • Mount permanent and weather proof biosecurity guidance notices on wall post adjacent to slipway/ padlocked barrier to slipway or access point for moorings • Print biosecurity information on reverse side of licence/season ticket for slipway or receipt for moorings • Make adhering to biosecurity guidance a condition of annual licence
Monitoring and surveillance	<ul style="list-style-type: none"> • All relevant staff to receive a copy of the site/ operation biosecurity plan summary and instructions sheet • All relevant staff to received training in NNS identification • All staff encouraged to report any 'suspect' marine plant or animal to the biosecurity manager
Importing shellfish or finfish stock	<ul style="list-style-type: none"> • Gather biosecurity information from vessels transporting stock including when anti-fouling was last applied to hull • Carry out rapid visual inspection of vessels, on entering site and direct all vessels with visible biofouling to quarantine site or nearest haul out and wash down facilities • Gather biosecurity information on stock itself, particularly if NNS exist in area of origin • Carry out rapid visual check of stock prior to release at site for any 'hitch-hikers'
Repair and maintenance of jetties/slipways	<ul style="list-style-type: none"> • Gather biosecurity information on all vessels, including barges and other slow-moving vessels which will be used during the project; including anti-fouling maintenance history, sites/ regions visited since last anti-fouling applied • Carry out rapid visual inspection of vessels and check biofouling log book (if available), on entering site and direct all vessels with visible biofouling to quarantine site or nearest haul out and wash down facilities

STEP 5 - SURVEILLANCE, MONITORING AND REPORTING

The early detection of a NNS on a site is important as this will increase the likelihood of successful containment and the potential for full eradication.

Anyone who works on a site or visits it regularly has a sense of what's normal for that particular place and can usually spot if something is amiss. The key for any biosecurity plan is to encourage all staff and other site users (e.g. boat owners) to feel that they're able to report any unusual sightings. This may turn out to be a native plant or animal, but it shouldn't be treated as a false alarm or time wasted, every bit of understanding of a site and the species found on it helps.

ZEBRA MUSSELS AND THE FORTH AND CLYDE CANAL

In October 2012, a crane operator lifting a boat out of the Forth and Clyde Canal spotted some unusual mussels clinging to the underside of the boat. The boat was taken away to a nearby yard, but the crane operator still phoned the canal manager to report the incident. This allowed a rapid investigation and the identification of the mussels as zebra mussels, a highly invasive non-native species. Surveys of the site quickly confirmed that no other vessels or parts of the canal lock were infested.

Photo: Zebra mussel © GB NNSS



Monitoring the visible signs of biofouling on any vessels, shellfish stock or equipment that enter a site should be encouraged. In New Zealand, a ranking scheme was recommended where vessel with *Rank 3 or above* were subject to further biosecurity measures.

Rank	Description	Visual estimate of biofouling cover
0	No visible fouling. Hull entirely clean, no biofilm ^a on visible submerged parts of the hull.	Nil
1	Slime fouling only. Submerged hull areas partially or entirely covered in biofilm, but absence of any plants or animals.	Nil
2	Light fouling. Hull covered in biofilm and 1–2 very small patches of one type of plant or animal.	1–5 % of visible submerged surfaces
3	Considerable fouling. Presence of biofilm, and fouling still patchy, but clearly visible and comprised of either one or more types of plant and/or animal.	6–15 % of visible submerged surfaces
4	Extensive fouling. Presence of biofilm and abundant fouling assemblages consisting of more than one type of plant or animal.	16–40 % of visible submerged surfaces
5	Very heavy fouling. Many different types of plant and/ or animal covering most of visible hull surfaces.	41–100 % of visible submerged surfaces

^aBiofilm: Thin layer of bacteria, microalgae, detritus and other particulates.

Staff training in biosecurity actions is also vital. This can be basic, but still highly effective. At the very simplest level staff running a site need clear and concise instructions which tell them the procedure to follow (the what to do, where and when) if things go wrong or if they spot anything they think is out of the ordinary or of potential concern. Ideally training should establish an appreciation of why biosecurity matters. Training should be a process of continuous learning rather than a one-off event.

Part of the training, may include some basic identification skills of NNS that may exist in your area. Scottish training courses are run annually and there are guides available to use (see box below). It is important to realise though, that there are always going to be NNS which are introduced to your site/ operation, and which are not covered in the guides or found in your local area.

LINKS TO NNS TRAINING AND IDENTIFICATION GUIDES

- Annual Marine Identification Workshop on Non-Native Species based at Scottish Association for Marine Science, Oban
<http://www.sams.ac.uk/education/short-courses/marine-invasive-species-identification-workshop>
- GB Non Native Species Secretariat – Identification Guides & Images
<http://www.nonnativespecies.org/index.cfm?sectionid=47>
- Firth of Clyde Forum Marine Invasive Non-Native Species Identification Guide <http://clydeforum.com/attachments/article/64/DangleBookLowRes30-7-12.pdf>
- Marine Aliens Project – Identification Guide
http://www.marlin.ac.uk/marine_allies/latest_news.php

Records of species sightings of unidentified plants and animals of concern need to be reported as soon as possible, especially in the case of high alert species. It may be necessary to send samples of the suspect plants or animals to specialists.

It can be a legal responsibility to report the presence of a non-native species in Scotland (Wildlife and Countryside Act Sect 14B), including marine species. This is intended to cover high alert and high risk species. The species covered by this responsibility will change over time, although no marine species are currently listed under this power, the websites below will list them if this power is used.

GUIDANCE ON REPORTING NON-NATIVE SPECIES

- Clyde Forum
<http://clydeforum.com/>
- GB Non-native Species Secretariat
<http://www.nonnativespecies.org/index.cfm?sectionid=81>
- Scottish Natural Heritage
<http://www.snh.gov.uk/protecting-scotlands-nature/safeguarding-biodiversity/nonnative-species/id-and-report/>

CONTACT DETAILS FOR ALL NON-NATIVE SPECIES ENQUIRIES AND REPORTS

SEARS (Scottish Environment and Rural Services)

08452 30 20 50

(24/7 customer service number)

Email: info@sears.scotland.gsi.uk

Add actions to your biosecurity plan:

- Setting out who is responsible for surveillance and monitoring of the site
- Actions to encourage any owners of vessels who use the site to be vigilant and report any sightings of concern

STEP 6 - CONTINGENCY PLAN

No system is perfect or fool proof; however good a plan you make, things can and do go wrong. This section explains how to build instructions and procedures into your biosecurity plan including what to do if your biosecurity measures for NNS fail.

The contingency plan doesn't need to be a complex document which anticipates every problem. It's best kept simple, and above all, accessible to everyone who might need to use it. It could be distilled down to a single page of advice and instructions, a set of logical actions which get under way immediately and can be pinned up in a site office or laminated to carry around on site.

Think through the most likely biosecurity alerts that might take place on your site or during your event/ operations. Look back at your list of site activities, and biosecurity and control measures. Consider what would happen if these failed. Alerts may include:

- The discovery of an unknown species on the site which you suspect may not be native.
- A vessel which had been wrongly assessed as low risk, originally came from a distant port, has been berthed on the site for some time and has heavy biofouling which was difficult to see on the day of arrival.
- A high alert species is reported from a nearby site, where vessels from your site frequently travel to and from.
- Unexpected bad weather overnight has forced a construction barge en route to a construction site to seek shelter in your harbour and it is covered with biofouling.

Anticipate the events that will take place as these scenarios unfold and set these out as a series of stages. Then work through the actions that will be needed at each stage and, crucially, who will carry out these actions. Actions are likely to include:

- The rapid identification of 'suspect' species
- Quick and simple survey to determine the extent and distribution of a newly discovered species
- Informing the relevant authorities, other water-users and vessel operators (see page 23 – "Step 5")
- Seeking advice and information on the species and its management.
- Marking areas to be avoided
- Containment measures to help prevent a high-alert NNS spreading such as sealing off part of a construction site from further work.
- Monitoring, especially if a species is considered to be low risk
- Precautionary restrictions on vessel movements

- Precautionary requirements for vessel cleaning
- Actions to be followed if a particular high alert species is discovered

Example of Contingency Plan Actions for the discovery of a high alert non-native species

Action	Responsibility
Stage One – Suspected arrival of high alert species	
Collect sample, place in plastic bag and contact SEARS for advice on where to send sample.	E.g., harbour master, marina berthing manager, Ecological Clerk of Works (ECOW)
Inform harbour users and place marker buoys around area	Harbour master/staff
Stage Two – Presence of high alert species confirmed	
Initiate immediate containment measures, including restricted vessel movements	E.g., marina berthing manager
Carry out wider survey of vessels and structures using underwater camera	Harbour staff, Marine Scotland Inspectors
Stage Three – Eradication/long-term control measures in place	

Ensure that any special equipment needed such as marker buoys, signs, underwater camera on a pole etc. is listed along with its storage location.

THE SLIPPER LIMPET, AN EXAMPLE OF A RAPID RESPONSE TO A BIOSECURITY ALERT



In 2006, a successful rapid response and eradication of the non-native slipper limpet (*Crepidula fornicata*) was undertaken in the Menai and Conwy Bay Special Area of Conservation, North Wales. The slipper limpets were 'hitch-hikers' in a consignment of seed mussels from a site in the English Channel. By the time it was discovered that the mussel seed was contaminated it had been laid on the seabed in the Menai Strait as part of the growing method used there. The rapid response included the removal of the contaminated mussels by dredgers, followed by smothering of the area with a dense layer of mussels sourced from an unaffected area. Subsequent monitoring surveys have since found no sign of live limpets.

It's important to respond to alerts and biosecurity breaches as quickly as possible. The sooner a problem is acted upon the greater the potential for minimising the risk

of it spreading. Once you are sure that you have a major problem on your hands then act swiftly and mount a *rapid response* to the problem. Each table of the type above is a mini rapid response plan. Consider what might become a barrier to a quick and effective action and plan to avoid these barriers. Barriers are frequently caused by lack of clarity about who should do what and when as well as a lack of information about what to do. Managing communication and information is vital.

A good way to discover any flaws in your plan or barriers to action which you hadn't anticipated is to test it with a biosecurity alert exercise. Develop a scenario for your site or operation where biosecurity has failed. Bring as wide a group of staff, vessel owners, sub-contractors, environment agency staff and others as you feel it justifies and test what you would all do in the event of the scenario being a reality. It can be very revealing.

Remember, you will not have to deal with the introduction of a high alert NNS alone. Government agency staff as well as a range of voluntary organisations will share your interest in mounting a *rapid response* and will be able to guide you and provide advice on covering the costs of the control/ eradication programme.

SOURCES OF INFORMATION

- GB NNSS Website – Species Alert Page (see Asian Hornet Rapid Response Plan) <http://www.nonnativespecies.org/alerts/index.cfm>
- A Marine Biosecurity Incursion Exercise from new Zealand <http://www.marinebiosecurity.co.nz/downloads/2253243/Incursion+exercise+brief.pdf>

SECTION 5 – MONITORING AND REVIEW

Monitoring the Implementation of the Plan

Once the biosecurity plan has been agreed, it is important that a clear recording system (i.e., a logbook) is put in place for the results of any checks or actions taken and formal steps are put in place to ensure the biosecurity manager is quickly informed of any potential introduction of NNS.

EXAMPLES OF INFORMATION TO BE RECORDED IN LOGBOOK:

- Routine inspections of equipment and vessels for NNS and biosecurity measures taken if NNS found at site or on equipment.
- Application of antifouling or cleaning of equipment or vessels at site.
- Inspection of any high 'risk' vessels; including any details of when biosecurity manager has been informed of a potential 'high risk' vessels and the additional biosecurity measures that have been undertaken.
- Awareness raising events.

All records entered in the logbook should be given a date and signed by the biosecurity manager.

Plan review

Site Plans: A plan is, physically, a paper document or electronic file but it only has life and purpose if it is implemented and can adapt to changes. Changes can take place throughout the year, activities can be modified and re-designed, new activities can start up. Regular review, for example once a year, will ensure that the plan stays fresh and relevant. If new activities that carry a significant risk of introducing or spreading NNS are commenced then control measures should be identified before the activity starts and need not wait for the annual review.

Operation Plans: Biosecurity plans for operations can cover activities which are novel and untested taking place in new locations and are likely to need more frequent review than site plans. The complexity of the operation and the number of activities which risk spreading NNS will influence just how frequently the plan or key parts of the plan such as the control measures are reviewed.

SECTION 6 - MARINE BIOSECURITY PLAN TEMPLATE

Site Name or Description of Operation:

Site/Operation Location(s):

Plan period:

Biosecurity Manager:

Site features affecting biosecurity:

Salinity	
Submerged structures	
Non-native species known to be present	

Vessel types using the site/involved in the operation:

Vessel type	Risk factors; Pathway, speed, biofouling control	Risk: High/Medium/Low

Site Activities which have a significant risk of introducing or spreading non-native species:

Activity Description
1.
2.
3.
4.
5.
6.

Biosecurity Control Measures – Instructions for staff/contractors/site users:

Who	What	Where	When

Site surveillance and reporting procedure:

--

Contingency Plan:

Action	Responsibility	Location of Equipment

Location of biosecurity logbook:

--

Plan Review Date:

ANNEX A: NEW DEVELOPMENTS IN THE MARINE ENVIRONMENT – BUILDING IN BIOSECURITY FROM THE START

Incorporating biosecurity measures into future coastal developments (e.g., ports, marinas, offshore energy generation) should be considered at the very start of any design process. With the recent announcement by the [Convention of Biological Diversity \(CBD\) Aichi Target 9](#), that biosecurity may become mandatory, building in biosecurity design features at the development stage would make more sense than having to make modifications to facilities in order to comply with biosecurity regulations in the future.

Key features likely to improve biosecurity include; high freshwater input, lock gates and novel pontoon designs. In addition, facilities which reduce the time and cost of vessel hull maintenance would encourage better practices amongst vessel owners.

Novel Design Features

Siting new developments in areas of high freshwater input would help reduce the likelihood of marine NNS surviving and becoming established at a particular site. This could be achieved by locating new developments in rivers or by river mouths, or in urban settings, by re-routing storm drains.

Incorporating lock gates into new port and marina designs would also allow these facilities to be rapidly quarantined and treated if an invasive NNS was reported. For example, the £4.2 million project at Bury Marina in Wales, has added lock gates to the marina to prevent it from drying out at low tide. These gates, however, could also act as a barrier to prevent the release of a NNS during an eradication programme and for freshwater to be used as a treatment option, if available.

The majority of bio-fouling occurs on novel, man-made structures, especially pontoons and pontoon floats and vessel hulls. Therefore, including design features and facilities, which reduce biofouling on these structures should be considered when planning new developments. A design concept in the test phase is rotating pontoon floats (see photo). Automated rotation of rolling pontoon floats would allow surfaces to be exposed above the water line where they can be air dried in sections for prolonged periods, killing many fouling organisms both native and NNS. Another design feature still in



Rotating pontoon floats under trial in North Wales. Photo © Rohan Holt. NRW

the conceptual phase is locking pontoons, which could be 'locked' at the top of high tide, exposing the underside of the pontoon surface when the tide drops. This would allow either air drying or chemical treatment of surfaces to eliminate biofouling species. Other surfaces, prone to biofouling, including pilings and other underwater structures would need to be engineered for easy removal of biofouling. However, these concepts are still in the initial phases of design, and investment is needed to see if these design features would be feasible on a commercial scale.

It is important that new developments also provide facilities that enable hull fouling to be removed from vessels efficiently and cost effectively, whilst containing any waste and preventing its return to the marine environment. This is especially important in the case of quarantining vessels, which should not be seen as a deterrent to visiting a harbour or marina. Recreational boaters' concerns over cost and time implications of cleaning boats may be addressed using various technologies both in existence and under development.

There are currently boat hoists such as the 'Sealift2' which are able to lift and clean between 10 and 15 boats per day. New designs under development include a wet-dock quarantine facility, which a vessel could enter, have its hull treated with chemicals, and then depart without leaving the water. Both systems incorporate facilities to contain the waste water and any chemicals for appropriate disposal on land.



Floatation system used to store vessels out of the water whilst not in use. Photo © E. Cook, SAMS

In addition, facilities which keep boats out of the water until they are needed would benefit boat owners by reducing hull fouling (see photo). Although this is not practical with large vessels, systems, such as Sunstream boat lifts for power boats and the 'DrySail™ System' by VersaDock for keel boats are currently used to dry dock individual boats quickly and efficiently. Although the floats and other underwater parts of these systems may get fouled, they can be routinely cleaned and will prevent the NNS from being transported to another site on the vessel hull.

LINKS TO FURTHER INFORMATION

Cook, E.J., Payne, R. and Macleod, A. (2014). Marine Biosecurity Planning – Identification of best practice. Report by SRS Ltd. in conjunction with Robin Payne to the Firth of Clyde Forum and Scottish Natural Heritage. Ref. 00954. 41 pp.

The Carpet Sea squirt (*Didemnum vexillum*) eradication programme (Slides 17 – 19) - <http://invasivespeciesireland.com/wp-content/uploads/2013/03/Rohan-Holt.pdf>

ANNEX B: LOOKING AT ACTIVITIES AND TASKS IN MORE DETAIL

Introduction

This annex sets out a method for looking at the activities on your site or which make up your event/operation in more detail by breaking them down into their constituent tasks. The method allows you to develop the biosecurity control measures that should be applied to the tasks to reduce the likelihood of introducing NNS and to determine when (i.e. during which tasks) the control measures should be applied.

Risk Assessment and Marine NNS

A widely used technique for assessing the risk of an activity leading to the introduction of a NNS or leading to the spread of a NNS is to categorise risk as high, medium or low based on the formula:

Risk = likelihood of an activity causing the introduction of a NNS **multiplied by the severity** of the impact caused by that species

This approach isn't well suited to the marine environment, as the information that it requires is often unavailable. We don't know enough about what affects the chances of many species being transported, establishing in a new location and becoming invasive. An alternative, more precautionary approach is described below.

The comprehensive technique from which this simple version has been developed from is called **Hazard Analysis and Critical Control Point (HACCP)**, which is quite a mouthful, either as a full name or as an acronym!

HACCP and its use for non-native species planning in Great Britain and Ireland

In 2011 the United States Fish and Wildlife Service published "**HACCP -Hazard Analysis & Critical Control Point - Planning to Prevent the Spread of Invasive Species**" a training manual for dealing with aquatic nuisance species. The full 86 page manual, which can be downloaded from:

<http://www.habitat.noaa.gov/pdf/HACCP%20Training%20Manual.pdf>

HACCP has already been adapted for non-native species in Ireland and by the salmon farming industry for controlling sea lice infestations.

http://invasivespeciesireland.com/wp-content/uploads/2010/07/Aquaculture_CoP.pdf

HACCP was originally devised by the food industry to keep contamination out of food processing and so is well suited to being adapted to keeping NNS from being introduced through marine activities. At the heart of HACCP is the precautionary principle. Because the potential impact of a non-native species can be very hard to predict the process assumes that if there is a significant risk of the introduction of a NNS there is a significant risk of negative impacts. If there is any reasonable risk of an activity leading to the introduction of NNS then control measures must be applied.

A version of the HACCP technique is set out below and has been adapted for use as a tool when developing simple biosecurity plans. The full HACCP process should be considered for complex sites, operations and new developments.

A simple HACCP-based technique for defining site activities and developing control measures for marine biosecurity

This shortened version of the technique considers all marine NNS together as a single threat. This saves time when compared to the standard version of the method which investigates the potential for individual species or groups of species to be introduced. The longer method is more thorough but requires a higher level of knowledge of marine species. A worked example of how the technique works is set out at the end.

Step One - List Site Activities

Think about the main activities that take place at your site or as part of the operation/event (see page 20). List **any** activities which have a reasonable risk of leading to the introduction on a NNS. How many activities to split what happens on a day to day basis on a site or the various parts of an operation/event into is your choice but between one and three activities is most likely.

Step Two - Describe Activities

Write a brief description of your activity based on “who, what, when, where, why and how”.

Step 3 - Split Activities into Tasks

Split each activity into ‘tasks’ (a maximum of 10 tasks is usually sufficient). Each task then needs to be briefly described in the sequence that it takes place.

<i>Task 1</i>	<i>Title:</i>
	<i>Description:</i>

<i>Task 2</i>	<i>Title:</i>
	<i>Description:</i>

Task 3	Title:
	Description:

Step 4 - Establish Critical Control Points and Control Measures

Using the table below list the tasks and then consider for each task:

Risk – is there a significant risk or the task leading to the introduction of NNS. Significant here means any risk above low on a “low, moderate, high, severe” scale.

Justify – set out your reasoning on significance of the risk.

Critical Control Point (CCP) – is this the most effective point to apply control measures. If the risk is significant, then subsequent tasks may be the best place to apply control measures. There must be at least one CCP but there may be several more.

Control Measure – if a control measure is necessary for this task then describe it here.

Who – specify who will carry out the control measure.

Task	Risk <i>Is there a significant risk of this task introducing NNS (Yes or No)</i>	Justification <i>Explain your answer in column 2. If the answer is yes, then describe the risk</i>	Critical Control Point <i>Could control measures be applied at this stage</i>	Control Measure <i>What control measures can be applied to this task</i>	Who <i>Who will carry out the control measure</i>
Task 1					
Task 2					

Step 5 – Develop an Action Plan

Take the control measures you developed in Stage 3 and build those into a simple **action plan which sets out who will carry out the control measure, what they will do and when**. This can be in the form of the table below or simply as a list of instructions.

Activity		
When (which task does the control measure apply to)	How (describe the activity including any materials needed)	Who (who will carry out the control measure)
Control measure 1		
Control measure 2		

AN EXAMPLE OF THE SIMPLIFIED 'HACCP TYPE' APPROACH

Scenario

You are a marina manager on the west coast of Scotland. A marina on the east coast is closing and you have bought some of their pontoons, which you intend to re-use on your site to expand capacity. The pontoons appear to only have a light covering of biofouling.

Activity

Collection, transport, repair and installation of second-hand pontoons

Activity Description

Who: Marina staff, crane operator, articulated lorry operator, boatyard staff

What: Collection of pontoons from east coast marina, transport to west coast, check and repair at boatyard adjacent to marina, installation in new marina site

When: Operation must be completed in 4 weeks for start of new season

Where: Three locations (east coast marina, west coast boatyard, west coast marina)

Why: Pontoons, although second-hand and although of variable age, are mostly in very good condition

How: The purchase is on a 'buyer collects' basis, so marina staff will travel to the purchase site and work with a local crane operator to load pontoons onto the transport contractor's lorry. The pontoons then driven overland and delivered to boatyard adjacent to destination marina to be checked and repaired. A boatyard crane will then place pontoons in the water and marina staff will tow them to their new location and secure them in place.

Tasks

Task 1	<i>Title: Collection from purchase site</i>
	<i>Description: Pontoons released from moorings and lifted by crane to an articulated lorry. Pontoons secured on lorry.</i>
Task 2	<i>Title: Transport overland</i>
	<i>Description: Lorry drives by road network to boatyard</i>
Task 3	<i>Title: Delivery to boatyard</i>
	<i>Description: Pontoons delivered to boatyard and craned onto hard-standing</i>
Task 4	<i>Title: Boatyard checks and repairs</i>
	<i>Description: Pontoons cleaned, checked and repaired.</i>
Task 5	<i>Title: Installation in marina</i>
	<i>Description: Pontoons craned into the water and towed to new location in the marina and installed.</i>

Critical Control Points and Control Measures

Task	Risk <i>Is there a significant risk of this task introducing NNS (Yes or No)?</i>	Justification <i>Explain your answer in column 2. If the answer is yes, then describe the risk</i>	Critical Control Point <i>Are control measures most effectively applied at this stage?</i>	Control Measure <i>What control measures can be applied to this task?</i>	Who <i>Who will carry out the control measure?</i>
1. Collection from purchase site	Yes	Although this task is unlikely to introduce NNS to a new area the overall activity does carry this risk and collection is the best time to see biofouling organisms before they dry, carry out as much cleaning as possible at the site of origin and check if any pontoon sections are retaining sea water.	Yes	If biofouling is present; photograph and collect samples of any suspect organisms; ensure that pontoon sections are cleaned as thoroughly as possible prior to leaving purchase site. Following cleaning carry out rapid visual surface inspection. Check if any pontoon floatation sections are waterlogged and mark these and ask for these to be emptied.	Marina Staff
2. Transport overland	No	Transport is by mainland road network and does not pass close to any seawater.	No	None	
3. Delivery to boatyard	Yes	There is a risk that ant remaining biofouling could have been dislodged and remain on the lorry. NNS could also be dislodged during unloading.	Yes	Lorry must be cleaned before it leaves the boatyard and any material sent to landfill. Pontoons must be unloaded to a hard-standing well away from the water.	Lorry driver Boatyard Staff
4. Boatyard checks and repairs	Yes	Cleaning the pontoons to remove biofouling poses a significant risk. Waterlogged pontoons will retain seawater from the collection site.	Yes	Clean any remaining biofouling from all accessible areas of the pontoons well away from water where drainage is directed to a soak-away. All biofouling material to landfill. Waterlogged pontoons not to be re-used. All area of pontoons must be allowed to fully dry. Carry out through visual checks to ensure this has taken place.	Boatyard Staff Marina staff
5. Installation in marina	No	The three critical control measures, if carried out correctly, will have reduced the risk to below the significance level	No	None	

Biosecurity action plan and instructions

1) At East Coast Marina

Marina staff:

- To clean the pontoons as thoroughly as possible with mobile equipment. Take brushes, scrapers and portable pressure washer (preferably one which generates hot water). Cleaning should take place well away from water and where drainage is directed to a soak-away. All biofouling material must go to landfill. All areas of pontoons must be allowed to fully drain after cleaning prior to transportation to West Coast Marina.
- To carry out rapid visual surface inspection of pontoons following cleaning to ensure all possible removal of biofouling. If you are able to recognise any suspect organisms and to collect samples and photographs, then send them for identification – see p26 of manual for reporting instructions. Check if any pontoon floatation sections are waterlogged and make sure these are drained and air dried.

2) At Boatyard next to West Coast Marina

Lorry Driver and Boatyard Staff

- To make sure that any deposited biofouling from the pontoon is cleaned off the lorry before it leaves the boatyard. Any material must be sent to landfill.

Boatyard Staff

- To make sure that pontoons are unloaded to a hard-standing that is well away from the water.
- To check and clean all accessible areas of the pontoons for biofouling.

Marina Staff

- To carry out visual checks to ensure the pontoons have been thoroughly cleaned prior to placing them in the water.