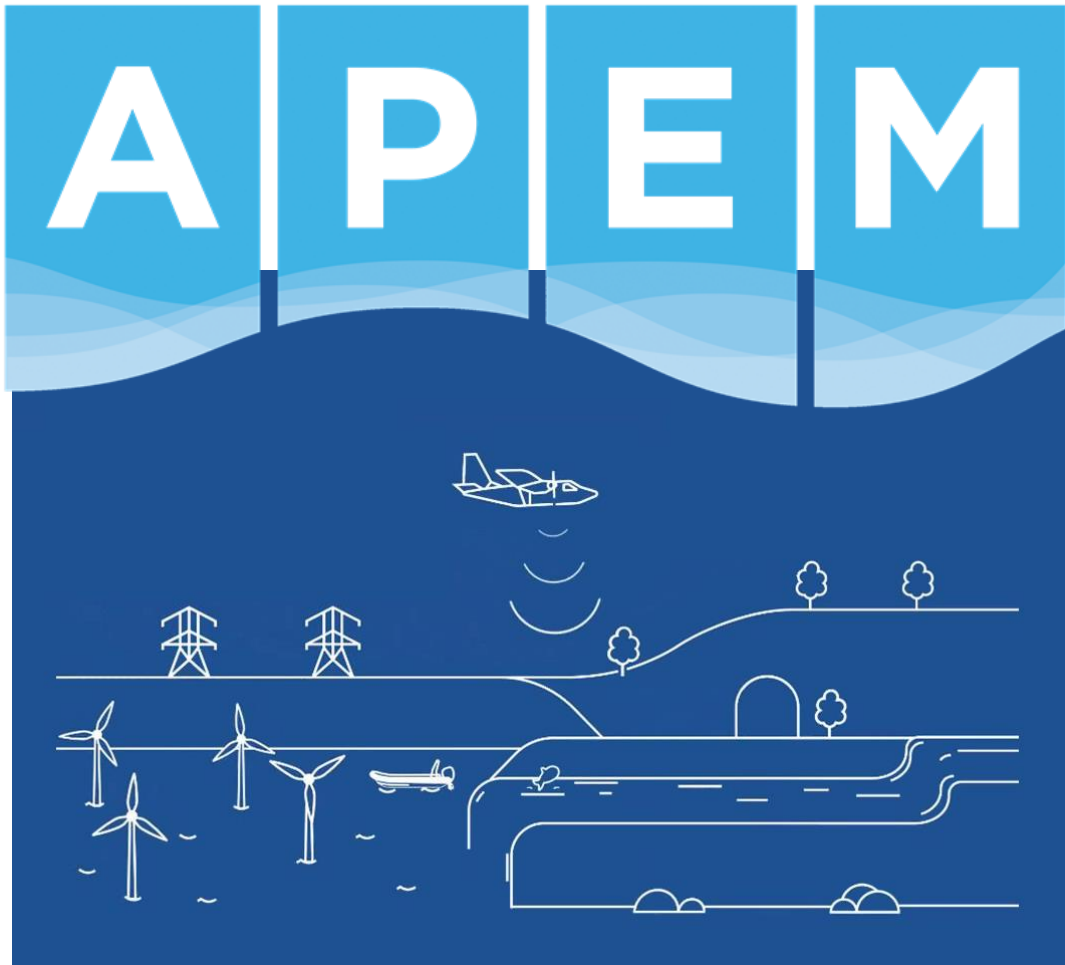




Newport Effluent Pipe Replacement Scheme

Biosecurity Plan

APEM Ref P000009011

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1 Project background

A non-native species (NNS; also known as alien, non-indigenous, foreign or exotic) is 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 (Payne *et al.* 2014, Cook *et al.* 2015).

The number of marine non-native species in the UK and Ireland is increasing each year, with their spread primarily due to shipping (ballast water, biofouling of hulls) and imported consignments of cultured species (Nall *et al.* 2016, Cook *et al.* 2015). Estimates suggest that approximately 10–12 new non-native species are established annually in both the terrestrial and aquatic environments (GB NNSS 2015, Kakkonen *et al.* 2019). It is estimated that there are currently over 100 marine non-native species in the UK (Payne *et al.* 2014, Kakkonen *et al.* 2019).

According to the Convention on Biological Diversity, ‘invasive’ NNS (INNS) are one of the greatest threats to biodiversity as they can rapidly colonise a wide range of habitats and exclude native flora and fauna. It is important to understand, that the majority of NNS are not ‘invasive’, i.e. they are not defined as INNS which is a NNS that has the ability to spread causing damage to the environment, the economy and our health (GB NNSS 2019).

A new effluent pipe and sea outfall at Newport, South Wales is proposed to be constructed in the Severn Estuary within the Severn Lower Water Framework Directive (WFD) transitional water body (ID: GB530905415401). This Biosecurity Plan (referred to as the ‘Plan’ herein) has been produced because a WFD assessment to support a Band 3 marine licence application for the works identified a risk of introducing or spreading INNS. The Plan assesses the potential risks of introduction of INNS during the construction phase of the project and identifies measures to reduce these risks. Due to the nature of the operation, it is considered that the operational phase of the project does not pose an additional INNS risk, so only the construction phase activities have been assessed. This plan will be part of the Construction Environmental Management Plan (CEMP) for the project.

The main aim of the plan is to minimise the risk of introduction and establishment of NNS at the Project location during the construction phase and to help prevent the spread of NNS already present at the site to new locations.

1.1 Relevant Policy and Legislation

National and international policy/legislation set out requirements for compliance with the implementation of biosecurity¹ measures and the control of NNS. In the UK at present the primary drivers include the following:

¹ The term biosecurity, in relation to INNS, is defined by Cook *et al.* 2015 as “taking action in order to minimise the introduction, spread and establishment of invasive non-native species”

- **EC Marine Strategy Framework Directive (2008/56/EC)** - requires 'Good Environmental Status' (GES) of marine waters by 2020. Requires that Non-Native species introduction is at levels that do not adversely alter ecosystems.
- **EU Water Framework Directive (2000) (2000/60/EC)** – to achieve 'Good Ecological Status' by 2020, no deterioration in ecological status is permitted.
- **The Wildlife and Countryside Act: Section 14 (1981)** – it is illegal to allow any animal which is not ordinarily resident in Great Britain, or that is listed on Schedule 9 to the Act, to escape into the wild, or to release it into the wild. It is also illegal to plant or otherwise cause to grow in the wild any plant listed on Schedule 9 of the Act.
- **The EU invasive alien species regulation** - came into force in January 2015. The list of species to which the regulation applies is still being developed; however, a requirement of the legislation is to have in place pathways action plans to control the introduction and spread of listed species. Pathways action plans for marine species may include future requirements for biosecurity plans.

2 Methodology

This plan has been prepared following guidance in Cook *et al.* (2015) which indicates there are two types of biosecurity plans which are 'Site' and 'Operations' plans:

- A 'Site' Biosecurity Plan covers the long-term, on-going activities at a single location such as a marina (e.g., vessel activity or routine dredging activities).
- The 'Operations' Biosecurity Plan is for a particular activity or set of activities which are time-limited (e.g., construction of marine infrastructure or one-off activities) (Cook *et al.* 2015).

This assessment has been conducted following this guidance taking into account the operation type of plan to cover the particular activities involved with the construction of the new effluent pipe and outfall. As this is a planned activity by a contractor or sub-contractor and the vessels are owned or will be contracted in, there is a high level of control.

The preparation of this plan involved the following aspects:

- Defining the construction works to be undertaken – methods, frequency, size of operation, location etc.
- Site description – including environmental information (water flow, salinity etc.).
- Review of NNS recorded in the vicinity of the Project site.
- Assigning a risk level for each activity (High, Medium, Low).
- Proposing biosecurity control measures for the medium and high-risk tasks associated with the construction works along with instructions for staff and contractors.
- Proposing a contingency plan, e.g., rapid response and containment measures if there is any evidence of high-risk incidents or if new NNS are detected.

3 Marine Biosecurity Plan

3.1 Description of construction activities

A full description of the activities and methods associated with the proposed works is provided in Kaymac Marine & Civil Engineering Ltd (referred to as Kaymac herein) (2022). A summary of key aspects of relevance to this assessment is provided below.

The proposed works involve the placement of the new effluent pipe adjacent to the existing pipe and outfall. The works will be contained within a footprint of approximately 1,360 m by 25 m (0.034 km²) and will involve activities in the intertidal zone and landward of the sea defence wall.

The primary activities within each stage will include:

Stage 1

- Works landward of the sea defence;
 - Establishment of site compound; and
 - Land-based works (excavation, cutting out section of existing pipe, installation of chamber).
- Works within the upper intertidal;
 - Cutting out section of existing pipe; and
 - Slip lining of new pipe through the existing pipe.

Stage 2

- Works within the intertidal;
 - Excavation of trench;
 - Pipe laying and installation of diffuser; and
 - Laying of concrete mattresses and backfilling.

The primary plant required for the works are:

- Landing craft;
- Floating barge;
- 2 x support vessels;
- 2 x small dory support vessels;
- 15 tonne excavator; and
- Dumper

The excavation of the trench works will largely be undertaken on the flood tide by an excavator mounted on the floating barge, which will be maintained in position by the vessels' spud legs. Approximately 900 m of the trench will be excavated in this way with the remainder of the trench in the upper intertidal excavated in the dry.

A site compound will be established at Associated British Ports, Newport (Newport ABP) in the River Usk approximately 2.5 nm from the project site. The pipe sections will be delivered and made ready for installation at this location before being transported to site using the landing craft.

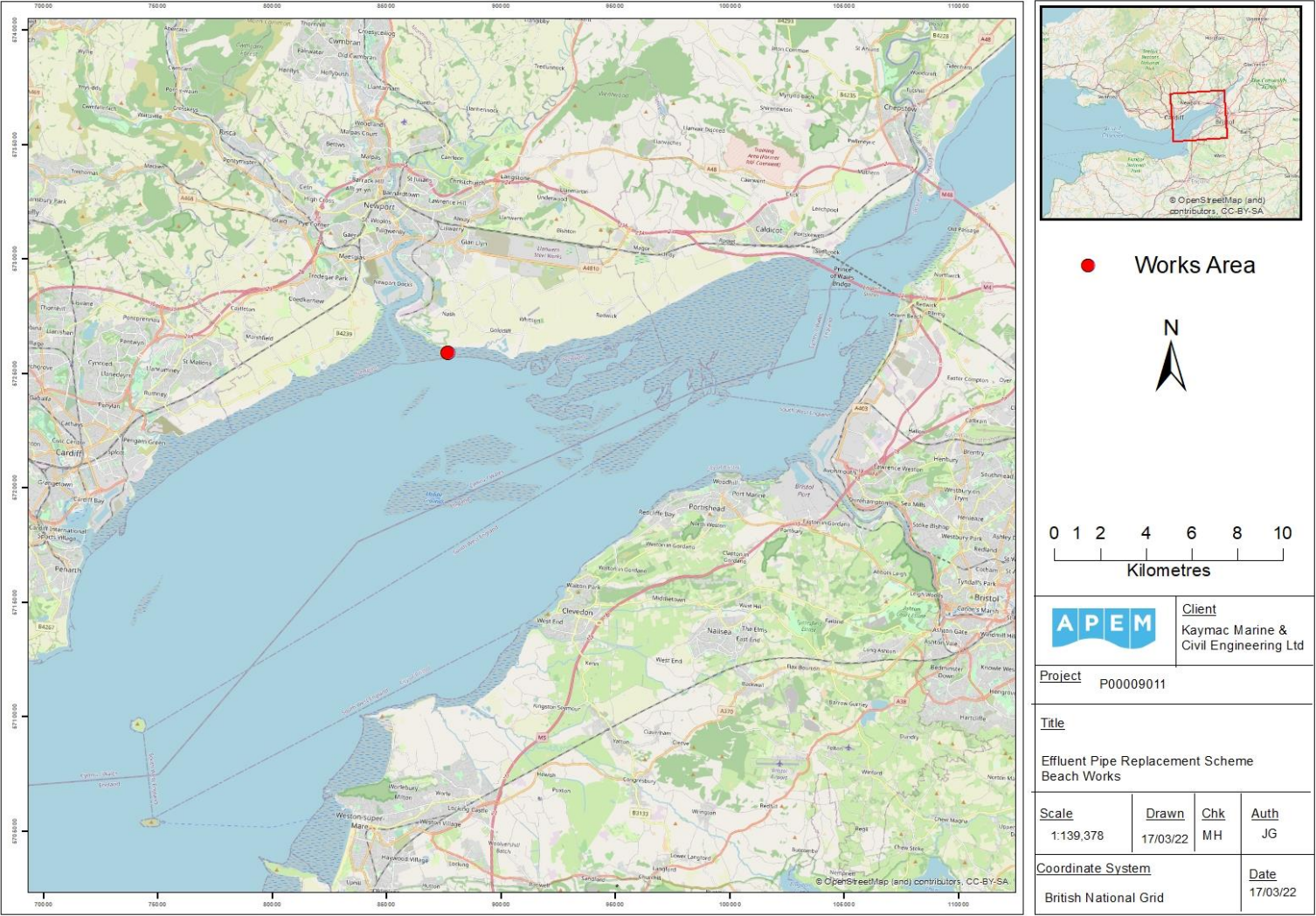


Figure 1: Location of the proposed works within the Severn Estuary



3.1.1 Construction vessels

The main risk of introducing or spreading NNS during the works comes from the use of the marine vessels during construction. The following proposed vessels and their roles are detailed **Error! Reference source not found.** below (Table **Error! Use the Home tab to apply 0 to the text that you want to appear here.1**). Because the two tugboats that will deliver the pipe sections from the manufacturer are coming from Norway, these vessels should be given the most consideration regarding biosecurity.

Table Error! Use the Home tab to apply 0 to the text that you want to appear here.1. Proposed vessels to be used during construction.

Proposed vessel	Home port	Role
MTS Terramare 1 – landing craft	Penzance, Cornwall	Delivery of plant, equipment and pipe sections from Newport ABP to project site
Doreen Dorward – floating barge	Poole, Dorset	Excavation of trench. Based at Newport ABP for duration of works
Heather D – fishing boat	Swansea Marina	General support
Sea Venture – work boat	Swansea Marina	General support
2 x tugboats	Norway	Deliver pipe sections from Norway to Newport ABP
2 x Kaymac owned dory	Kept out of water at Kaymac facilities	General support

3.1.2 Infrastructure in the intertidal zone

As part of the scheme new infrastructure including pipe sections, concrete mattresses, and the outfall will be installed in the intertidal zone. This will be new and unused material, therefore, will not be fouled by any substance. The pipe and concrete mattresses will be buried in an excavated trench and covered with the excavated material. The only part of the new infrastructure that will remain exposed above bed level is the diffuser at the end of the pipe.

3.2 Plan period

3.2.1 Construction phases

Works will be completed in two stages, Stage 1 being completed between the end of July 2022 through the end of September 2022 and Stage 2 being completed from the end of April 2022 through the end of September 2023.

3.2.2 Biosecurity Manager

A Biosecurity Manager will be designated by the Site Manager and will be responsible for the construction phase ensuring appropriate management measures are in place and implemented.

3.3 Site description

The proposed Newport Effluent Pipe Replacement Scheme development is located in the Bristol Channel along the South Wales coast. The Bristol Channel is a tidally influenced estuary and receives substantial freshwater input from the River Severn which flows into the Channel between England and South Wales. It has one of the highest tidal ranges in the world at 15 m. Full flushing of the estuary takes approximately 200 days (Mantoura and Woodward, 1983). The estuary is characterised as a temperate system (approximately 6 -20°C). It is a mixed sediment system containing a wide range of particle sizes, from gravel and sand, to silt and clay (Manning *et al.* 2010). Salinity varies from fully fresh to brackish (mixed freshwater and marine) to fully marine (35 ppt) depending on the location in the estuary, stage of the tidal cycle and amount of rainfall. The Project Site is close to the mouth of the River Usk, which may influence the salinity in this area. The estuary is hyper-tidal and, consequently, highly turbid along most of its length.

The Bristol Channel is a busy water body with various large industrial, commercial and recreational assets along both the English and Welsh coasts. Major ports in the area include Portishead, Portbury, Avonmouth and Bristol on the English side and Swansea, Port Talbot, Barry, Cardiff and Newport on the Welsh side. These ports support a wide range of types of vessels including vehicle carriers, general cargo ships, asphalt tankers, bulk carriers, container ships, work vessels, oil/chemical tankers, dredgers, passenger vessels, sailing vessels and other leisure watercraft. The Project Site is located adjacent to Newport Dock between Nash and Goldcliff, South Wales, and is near the mouth of the River Usk, which is a freshwater contributor to the estuary (Figure 1).

Designated sites located within 15 km of the project include the Severn Estuary / Môr Hafren SAC (UK0013030), the Severn Estuary / Môr Hafren SPA (UK9015022), the Severn Estuary RAMSAR Site and the River Usk SAC (UK0013007). These sites are composed of tidal rivers, estuaries, mud flats, sand flats, lagoons, salt marshes, salt pastures, salt steppes, shingle and rocky shore habitats and support breeding, feeding, wintering and the migration of rare and vulnerable species of birds

3.4 Current and horizon NNS

Due to its close proximity to northern Europe and Ireland, as well as its history of supporting commercial shipping and leisure watercraft activities, the Bristol Channel is known to support many species not native to the area. A list of NNS recorded as established in the Bristol Channel that the Biosecurity Manager should be aware of as being potentially present in the construction area is provided in Table 2. The Biosecurity Manager should also be aware of horizon species (i.e. species not yet present but that are highly likely to arrive and become established in the area), and protocols should be in place should any of these species be observed on-site or on construction equipment (i.e. contingency planning, see Section 5 in this report). A list of horizon species is provided in Table 3.

Table 2. NNS known to be present in the Bristol Channel. (Source: NBN 2021, supplemented by Wood *et al.* 2015; Holmes and Callaway 2021).

Major taxonomic group	Scientific name	Common name
Crustacean	<i>Amphibalanus improvisus</i>	bay barnacle
	<i>Austrominius modestus</i>	Darwin's barnacle
	<i>Brachynotus sexdentatus</i>	grapoid crab
	<i>Caprella mutica</i>	skeleton shrimp
	<i>Eriocheir sinensis</i>	Chinese mitten crab
	<i>Monocorophium sextonae</i>	corophiid amphipod
Bivalve	<i>Magallana gigas</i>	Pacific oyster
	<i>Mya arenaria</i>	sand gaper
	<i>Mytilopsis leucophaeata</i>	false mussel
Bryozoan	<i>Bugulina stolonifera</i>	bushy bryozoan
Gastropoda	<i>Crepidula fornicata</i>	American slipper limpet
Ascidian	<i>Aplidium cf. glabrum</i>	colonial sea squirt
	<i>Didemnum vexillum</i>	carpet sea squirt
	<i>Styela clava</i>	leathery sea squirt
Cnidarian	<i>Diadumene lineata</i>	orange striped anemone

Major taxonomic group	Scientific name	Common name
Polychaeta	<i>Ficopomatus enigmaticus</i>	Australian tube worm
	<i>Goniadella gracilis</i>	polychaete
	<i>Hypania invalida</i>	polychaete
Macroalgae	<i>Antithamnionella spirographidis</i>	red macroalgae
	<i>Sargassum muticum</i>	wireweed
	<i>Undaria pinnatifida</i>	wakame
Angiospermae	<i>Spartina anglica</i>	common cordgrass

Table 3. Horizon species identified by Roy *et al.* (2014) as highly likely to arrive and establish in UK waters.

Scientific name	Common name	Introduced to	Native range
<i>Hemigrapsus sanguineus</i>	Asian shore crab	Europe (northern & southern)	Pacific
<i>Hemigrapsus takanoi</i>	brush-clawed shore crab	Europe (northern & southern)	Pacific
<i>Homarus americanus</i>	American lobster	Europe (northern & southern, incl Norway)	North America
<i>Mnemiopsis leidyi</i>	American comb jelly	Europe (northern & southern, incl Norway)	North & South America
<i>Rapana venosa</i>	veined rapa whelk	Europe & England (North Sea)	Pacific
<i>Celtodoryx ciocalyptoides</i>	sponge	Europe (northern, incl. Norway)	Pacific
<i>Ocenebra inornata</i>	Japanese sting winkle	Europe (northern)	Pacific

It is considered that the primary risk of introduction and therefore spread of NNS/INNS is associated with vessel movement between similar biogeographic regions with potential transfer of species adapted to growth and survival in similar water temperatures (e.g. in general the likelihood of colonisation is greater for a species being transported from temperate waters to temperate waters, as opposed to being transported from tropical waters to temperate waters). Challinor *et al.* (2014) developed a risk matrix to indicate the potential risk of the spread of NNS from one biogeographical region to another (**Error! Reference source not found.**).

The construction works will involve the use of tugboats arriving from Norway. The south coast of Norway has a matching climate to that of the UK (e.g., cold temperate; Peel *et al.*, 2007), and as such the likelihood of new arrivals is high according to the risk matrix of Challinor *et al.* (2014), (Table 4).

Table 4. Likelihood of colonisation of NNS, according to the matching biogeographical region (from Challinor *et al.* 2014).

Recipient region	Donor region			
	Arctic & Antarctic [e.g. Arctic Coast]	Cold-temperate [e.g. North Sea]	Warm-temperate [e.g. Mediterranean Sea]	Tropics [e.g. Caribbean]
Arctic & Antarctic [e.g. Arctic Coast]	High	Medium	Low	Low
Cold-temperate [e.g. North Sea]	Medium	High	Medium	Low
Warm-temperate [e.g. Mediterranean Sea]	Low	Medium	High	Medium
Tropics [e.g. Caribbean]	Low	Low	Medium	High

4 Risk assessment

To assess the risk of introduction and spread of NNS, activities that may carry a significant risk of introducing or spreading NNS have been considered and associated control measures have been provided below. Due to the nature of the operation, it is considered that the operational phase of the project does not pose an additional NNS risk, so only the construction phase activities have been assessed.

4.1 Construction

4.1.1 Risk of introducing or spreading non-native species

The construction works in the estuary have been broken down into three main activities, although they will likely be occurring simultaneously. The activities are listed below:

- Vessel arrival;
- Construction works (including the introduction of materials/structures to the intertidal zone); and
- Vessel departure.

For each of these activities the biosecurity risks have been identified and the level of risk has been assessed using the Marine Biosecurity Planning guidelines (Cook *et al.* 2015) and professional judgement (Table 5). The greatest risk of introducing a NNS is when a vessel (particularly slow-moving), equipment or stock arrives at the site from another country, region or water body with similar environmental conditions to the worksite (e.g. in terms of temperature) and is covered in biofouling or contains additional algae and animals within the equipment/stock. For any plant or materials coming into contact with the water column in the dock, the measures indicated in relation to the assessment of the levels of biofouling of plant/materials should be applied.

As a precautionary approach, the overall activity risk has been categorised at the highest risk level of any of the component tasks.

4.1.2 Biosecurity Control Measures

Biosecurity control measures have been proposed for the activities assessed to be Medium and High risk in Table 5 **Error! Reference source not found.**. These control measures (provided in Table 6) will be listed in a biosecurity log and the date when each control measure is carried out will be recorded in the log. The location of the logbook must be known by all personnel at site. This process will allow the identification of any breaches in control measures. If such a breach occurs, it will be recorded in the biosecurity log and the contingency plan will be triggered as outlined in Sections Contingency Plan5 and 6.

Table 5. Construction Phase: Risk assessment of introduction and spread of NNS during construction works for the Newport Effluent Pipe Replacement Scheme. Risk categories were assigned using guidelines in Cook *et al* 2015.

Activity	Biosecurity risk	Risk factor assessment	Task risk (High/ Medium /Low)	Overall activity risk (High/Medium/Low)
CONSTRUCTION				
Arrival of vessels				
Arrival of vessels; supply vessels; support craft	Introduction of new NNS	Vessel with no notable biofouling (just green slime (see Appendix 1) ²	Low	High
		Vessel with notable biofouling (more than green slime (see Appendix 1)	High	
		Vessel will remain stationary for prolonged periods of time	Medium	
Arrival of vessels from cold temperate waters	Introduction of new NNS	Vessel will remain at the project site water body / Newport ABP for more than 8-12 hours	High	High

² When indicating levels of biofouling it is assumed inspection of vessels or materials will be undertaken visually, within dry dock (prior to deployment to site) or via inspection camera (still and video), as appropriate.

Activity	Biosecurity risk	Risk factor assessment	Task risk (High/ Medium /Low)	Overall activity risk (High/Medium/Low)
Exchange of ballast water of vessels on site / at Newport ABP	Introduction of new NNS	It is not known at this stage if any of the vessels would use ballast water. If any exchange of ballast water is required this would be undertaken in the open ocean and follow stringent protocols/standards (International Maritime Organisation regulations)	Medium	Medium
Introduction of new materials to the marine environment (flotsam)	Introduction of new NNS	Contaminated flotsam falling overboard	Low	Low
Construction activities				
Installation of pipe, concrete mattresses and outfall	New infrastructure could provide surface for colonisation by NNS.	The pipe and concrete mattresses will be buried in a back-filled trench so will not provide new surface for colonisation by NNS. The only section of new infrastructure that could provide new surface area for colonisation is the diffuser at the end of the pipe. This represents a very small area of new infrastructure available for potential colonisation.	Low	Low
	Spreading of NNS via fragmentation or dispersal of NNS into the water column due to physical disturbance.	Prop wash from vessel or sediment disturbance could mobilise or displace NNS if present in sediments	Low	

Activity	Biosecurity risk	Risk factor assessment	Task risk (High/ Medium /Low)	Overall activity risk (High/Medium/Low)
Departure of vessels				
Departure to cold temperate waters	Spread of NNS from the project site on vessels	Vessel has been in port at Newport ABP or at the project site for more than 8-12 hours	High	High
Exchange of ballast water after departure from project site / Newport ABP	Spread of NNS from the project site in ballast water	It is not known at this stage if any of the vessels would use ballast water. If any exchange of ballast is required this would be undertaken in the open ocean and follow stringent protocols/standards (International Maritime Organisation regulations)	Low	Low

Table 6. Construction Phase: Biosecurity control measures proposed for Newport Effluent Pipe Replacement Scheme construction.

Activity and biosecurity risk	Risk	Control measure	Where	When
CONSTRUCTION				
Arrival of vessels				
Arrival of vessels	Commercial vessels with regular movement between unknown ports, biofouling removal regime is unknown	Vessels are expected to remain within the Severn Estuary during the Construction phase, as opposed to arriving at site, leaving to enter another water body, and then returning to site.	Within the Severn Estuary	Duration that the vessel is within the Severn Estuary
		Biosecurity assessments to be undertaken for all vessels (IMO guidelines, see Section 7)	Vessels home port if possible	Prior to arrival at Newport ABP / project site
		Request anti-fouling treatment record (if applicable) and bio-fouling removal record from all vessel operators	Vessels home port	Prior to arrival at Newport ABP
		Apply the biofouling rapid visual inspection criteria indicated in Cook <i>et al.</i> 2015 (see Appendix 1) on vessel arrival. If the level of biofouling is ranked at level 3 or higher the vessel should be refused entry until biofouling is removed. Removal must be in a controlled manner with all removed material contained and not released to the marine environment An alternative to physical removal is to air dry biofouled areas for at least 48-72 hr to eradicate NNS (where air drying is possible) and/or use of appropriate chemicals to accelerate eradication of organisms	Newport ABP / project site	On arrival at Newport ABP / project site

Activity and biosecurity risk	Risk	Control measure	Where	When
Exchange of ballast water of vessels on site / at Newport ABP during construction	Introduction or spread of NNS through release of ballast waters	It is not known at this stage if any of the vessels would use ballast water. If ballast water exchange is required any exchange would be undertaken in the open ocean and follow stringent protocols/standards (International Maritime Organisation regulations)	Open ocean	Before arrival
Departure of vessels				
Departure of vessels	Spread of NNS from the project site to the vessels home water body	Apply the biofouling rapid visual inspection criteria indicated in Cook <i>et al.</i> 2015 (see Appendix 1 of this document) prior to vessel departure. If vessel is ranked at level 3 or higher the vessel should be refused entry until biofouling is removed. Removal must be in a controlled manner with all removed material contained and not released to the marine environment An alternative to physical removal is to air dry biofouled areas for at least 48-72 hr to eradicate NNS (where air drying is possible) and/or use of appropriate chemicals to accelerate eradication of organisms	Newport ABP / project site	Before vessel returns to home water body.
Additional measures				

Activity and biosecurity risk	Risk	Control measure	Where	When
All	All	Training will be given to key staff at the Project site in the identification of key INNS from the region and using the visual inspection scheme (see Appendix 1 of this document). These reference materials should be printed off and placed in the Biosecurity Plan folder along with this plan Staff are encouraged to report any unusual sightings or suspected INNS to the Biosecurity Manager	Newport ABP / project site	Ongoing during construction

5 Contingency Plan

In the event of any control measures being breached or the detection of a new NNS all necessary steps should be taken to control the spread and dispersal of the NNS. Contingency plans for specific scenarios are provided in Table 7. A sighting of any new NNS, but particularly a new species novel to the UK, needs to be reported to the GB NNSS immediately. Subsequently, the GB NNSS will be able to provide advice on how to proceed with containment measures.

Table 7. Newport Effluent Pipe Replacement Scheme Contingency Plan.

Issue	Action	Responsibility	Equipment
Fragmentation or dispersal of conspicuous INNS into the water column – most likely source is during cleaning/removal of biofouling	Remove INNS from the water column and dispose to landfill.	The Biosecurity Manager should inform Project staff to inform them of any observed fragmentation/dispersal into the water column.	Hand nets
Vessel biofouling is ranked at class 3 or above in the visual inspection (Appendix 1).	The vessel is not allowed entry to the Project site / Newport ABP. Remove vessel from water at home port or appropriate designated alternative port, clean and antifoul (if appropriate). Biofouling removal must be in a controlled manner with all removed material contained and not released to the marine environment.	Biosecurity Manager / Project staff to carry out visual inspection of all vessels prior to entry to the Project site / Newport ABP.	Laminated copy of visual inspection table to be readily available.
Vessel leaves site without visual biofouling inspection (i.e. where this represents a breach of protocol)	Recommended visual inspection at next port of call to minimise risk of spread of INNS to other areas.	Vessel owner	N/A
New records of INNS at Project site during construction or identified by project team in wider area.	The GB Non-native Species Secretariat should also be informed so they can update species distribution and abundance databases for NNS. Relevant details are located on their website: http://www.nonnativespecies.org	Workforce to inform the Biosecurity Manager.	N A

6 Monitoring, site surveillance and reporting procedure

The Marine Biosecurity Planning guidelines (Cook *et al.* 2015) require the use of a biosecurity logbook to record training, surveillance, control measures carried out and any other activities of concern regarding the biosecurity of the operation. Formal steps should be put in place to quickly inform the Biosecurity Manager of any potential introduction of NNS.

Information to be recorded in the logbook includes:

- Any routine inspections of vessels, construction equipment, materials and structures in the water column;
- Inspections of 'high risk' vessels;
- Details of when the Biosecurity Manager was informed if any NNS were found;
- Any biosecurity measures that were taken if NNS were found;
- Which organisations were notified when NNS were found (e.g. GB NNSS (non-native species secretariat));
- The application of any antifouling or cleaning of vessels, equipment and materials/structures undertaken on site;
- Any events undertaken to raise NNS/INNS awareness.

All logbook entries should be dated and signed by the Biosecurity Manager.

A table template indicating the key information required in the Biosecurity Plan to be completed on site is provided in Section 6 of Cook *et al.* (2015).

7 Key sources of advice

The following sources provide additional information relating to NNS and the control of the spread of NNS.

- Guidance on Marine Biosecurity planning
 - England and Wales (Cooke *et al.* 2015) - www.nonnativespecies.org/downloadDocument.cfm?id=1401
- 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>
- National Biodiversity Network
 - Distribution maps and information about species: NBN Atlas www.nbnatlas.org
- European Commission
 - EC Alien Species Information http://ec.europa.eu/environment/nature/invasivealien/index_en.htm
- Royal Yachting Association (RYA)
 - www.rya.org.uk/go/alienspecies
- The Green Blue
 - Antifoul and Invasive Species <https://www.thegreenblue.org.uk/Boat-Users>
- IMO (International Maritime Organization) Guidelines For The Control And Management Of Ships' Biofouling To Minimise The 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)
 -
- IMO Guidance For Minimizing The Transfer Of Invasive Aquatic Species As Biofouling (Hull Fouling) For Recreational Craft
 - <https://www.imo.org/en/OurWork/Environment/Pages/Biofouling.aspx>
- DEFRA – <http://jncc.defra.gov.uk/page-5150>
- DASSH - The Archive for Marine Species and Habitats Data www.dassh.ac.uk/

8 Glossary

Biofouling: Biological growth which develops on manmade structures in the aquatic environment.

Biosecurity: Taking action in order to minimise the introduction or spread of invasive 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. invasive non-native species).

Control Measures: Refers to actions which are undertaken in order to prevent the introduction or spread of an invasive non-native species.

Establishment: Refers to the process of a non-native species in a new location successfully producing viable offspring with the likelihood of continued survival.

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.

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 intervention 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.

Prop Wash: An aviation and nautical term used to define a mass of air or water pushed aft or fore by the propeller of an aircraft or propeller-driven watercraft. This term is synonymous with any water disturbance created by a vessel's propulsion systems.

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Appendix 1

Criteria for visual assessment of the extent of biofouling (Cook *et al.* 2015).

Rank	Description	Visual estimate of biofouling cover
0	No visible fouling. Hull entirely clean, no biofilm on visible submerged parts of the hull.	Nil
1	Slime fouling only. Submerged hull areas partially or entirely covered in biofilm, but the absence of any plants or animals.	Nil
2	Light fouling. Hull covered in biofilm and one to two 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