Office of Public Works River Bride (Blackpool) Certified Drainage Scheme

Invasive Species Management Plan

246842-06

Issue 01 | 16 October 2020

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1 Introduction

1.1 Scope of document

Invasive plant species have been identified and documented within proposed works areas that are included in the River Bride (Blackpool) Certified Drainage Scheme, herein referred to as the flood relief scheme.

The purpose of this non-native invasive species management plan is to present the strategy that has been adopted from Stage 1 through Stage 3 and will continue during the construction (Stage 4), handover (Stage 5) and operation of the proposed scheme in order to manage and prevent the spread of the invasive plant species.

This outline plan is intended to be a working document and will be updated during both the construction and operational phases. During construction, it will be updated by the Contractor to form the detailed invasive species management plan which will form part of the detailed Construction Environmental Management Plan (CEMP). Following construction, the plan will be updated for the operational phase, taking into account the results of the detailed construction invasive species management plan and operational maintenance requirements etc.

Construction (and potentially operational maintenance works) could disturb stands of invasive plants and/or soils contaminated with invasive plant material. In addition to lands within the proposed works areas, there is an identified risk of invasive plant species being spread onto neighbouring lands and onto public roads and other locations.

Invasive plant species which have been identified in the proposed works areas include Gunnera (Giant Rhubarb) and Japanese Knotweed species. While Gunnera has been identified in the area, Japanese Knotweed is of primary concern for the structural integrity of these proposed flood works and for the designated sites downstream. Therefore, the focus of this report is on the prevention of the spread of Knotweed, however, the same principles are applicable to other invasive species. This report outlines the strategy that will be adopted during the construction and operation of the flood relief scheme in order to prevent the spread of invasive plant species.

The main objective of the invasive species management strategy for the scheme will be to:

- Prevent the spread of invasive plant species during the construction phase;
- Manage the growth of invasive plant species adjacent to flood defences so as to protect the integrity of the structures from the impacts of these species;
- Prevent the spread of invasive plant species during channel maintenance works in the future.

1.2 Description of the proposed development

The Office of Public of Works (OPW) has commissioned Arup in conjunction with JBA Consulting to develop a flood relief scheme for Blackpool in Cork City.

The proposed scheme is largely centred on the channels of the Rivers Bride and Glenamought and will comprise a combination of flood walls, embankments, culverting a section of open channel, bridge replacements and other works. The flood relief works area extends from the vicinity of North Point Business Park to Blackpool Village. The sites along the river are in a built-up urban area adjacent to a number of industrial, retail, and residential centres, as well as roads and parks.

An indicative timeline for the stages of the development is provided in Table 1, these dates may be subject to change.

Timeline	Current programme	
Stage 1	October 2015 – December 2015	
Stage 2 Planning	October 2015 – January 2020	
Stage 3 Finalisation of detailed design and tender – provisional datesPhase 1		October 2020 – July 2021
Stage 4 Construction	July 2021 – June 2023	
Stage 5 Handover	June 2023 – November 2023	

Table 1: Indicative timeline for development

1.3 Description of relevant invasive species

1.3.1 Japanese Knotweed

Japanese Knotweed is an herbaceous perennial plant that can grow to heights of 2-3 m, see Figure 1. In summer it produces dense bushes of purplish bamboo-like stems with large, triangular leaves, and hanging strings of white flowers. In winter the herbaceous material dies back, leaving only its dead canes. Plants expand via rhizomes (underground creeping stems), and as plants mature, they can create a dense network of rhizomes in the surrounding soil. Most are within 1m depth and 2m radius of the above-ground stems, but in extreme circumstances the rhizomes can extend 3m underground and 7m horizontally from the parent plant. As plants mature, the bases of dead stems combine to form a robust, woody 'crown' at the surface.

Japanese Knotweed is spread exclusively by fragmentation of its rhizomes, crowns and stems. The rhizomes and stems are relatively fragile and can easily be broken apart, and new plants can grow from root fragments weighing less than one gram. Although the plant produces large numbers of flowers in the late summer period, its seeds are not viable, because only female Japanese Knotweed plants have been introduced to Ireland.



Figure 1: Japanese Knotweed (photo taken from All About Trees Initial Invasive Species Survey Report, 2016)

As a result of its highly invasive characteristics and vigorous growth, Japanese Knotweed is recognised as a significant constraint on construction sites. It can easily be spread by the movement of earth, gravel or rocks, or by snagging on construction vehicles. Its rhizomes extend underground away from the main stem of the plant, so even works several metres from the plants can fragment and spread the rhizomes. New seedlings are very vigorous, and can break through some built surfaces (e.g. tarmac, permeable paving) or exploit gaps between concrete surfaces.

The standard approach to kill Japanese Knotweed is to treat it with a systemic herbicide, applied either as a spray to the foliage, or injected into the stem. Although leaves and stems can easily be killed by any herbicide, the key to successful eradication is to kill the rhizomes. Systemic herbicides are the most effective option in this regard, because they are carried through the vascular system of the plant and can infiltrate significant proportions of the rhizome. However, it is rarely possible to kill the entire rhizome network of mature plants with a single treatment, so it is usually necessary to carry out multiple years of treatment in order to successfully kill all of the rhizomes. Herbicide treatment typically takes 1-2 years for immature plants, 2-3 years for semi-mature plants, and 3-5 years for mature plants.

1.3.2 Gunnera (Giant Rhubarb)

Gunnera is an herbaceous perennial plant with very large leaves of up to 1.5 m diameter. It has a robust central core (referred to as a crown), from which large rhizomes spread into the surrounding soil. The leaves grow from the crown, and are deciduous, growing in spring each year, and dying back in the winter.

Spikes of flowers grow from the crown in summer months, and when fertilised, produce up to 250,000 seeds per plant, which are dispersed by birds and small mammals.

Figure 2: Small Gunnera (photo taken from the Japanese Knotweed Ireland monitoring photos, 2019)



Gunnera is spread primarily by fragmentation of crowns and rhizomes. As with Japanese Knotweed, it can easily be spread by the movement of earth, gravel or rocks, or by snagging on construction vehicles. Gunnera rhizomes are not as extensive as those of Japanese Knotweed, but can still spread several metres from the plants.

In some parts of Ireland, Gunnera plants can spread by seed, and these are the locations in which the plant is most problematic. Although it has been planted throughout Ireland, it is only invasive in a narrow band along the western coast of Ireland, notably in Galway, Mayo, Kerry and Donegal. This is because its seedlings are intolerant of frost, which is very rare along the western coastline due to the oceanic influence, but occurs regularly in winter and spring months further inland, including within Cork City. The crowns and rhizomes of mature plants can survive such conditions, and plants can survive for many decades but the seedlings of these plants will not survive, so they are not invasive in these locations.

The typical approach to kill Gunnera is to treat it with systemic herbicide, usually applied as a spray to the foliage. Systemic herbicides will usually penetrate the crown and rhizomes, but it may not be possible to kill all of the rhizomes with a single treatment, particularly for very mature plants. Infiltration can be improved by drilling small holes in the rhizome and filling them with herbicide.

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Nonetheless, multiple years of treatment are usually required in order to kill all rhizomes. As an alternative, Gunnera plants can be removed manually and destroyed (by burning, mulching, deep burial, etc), thus eradicating them within a single year. However, Gunnera fragments are restricted materials and cannot be disposed of as standard green waste: it may be sent off-site for incineration or deep-burial at a licensed facility (either within Ireland or overseas), or can be chipped or mulched and buried in-situ.

2 Methodology

This report applies the most relevant and current guidance in relation to the treatment and management of non-native invasive plant species in construction projects. The following literature was referred to in preparation of this report.

- NRA Guidelines on The Management of Noxious Weeds and Non-Native Invasive Plant Species on National Roads (2010)
- Managing Japanese Knotweed on development sites The Knotweed Code of Practice produced by the Environmental Agency (2013)1
- Managing Invasive Non-native Plants in or near Freshwater, Environment Agency (2010)
- Best Practice Management Guidelines Japanese Knotweed *Fallopia japonica*, Invasive Species Ireland (2015)

¹This document was officially withdrawn by the UK Environment Agency as a guidance document in July 2016 but contains relevant, practical advice and is included here for that reason.

3 Legislation

The control of invasive species in Ireland comes under the Wildlife (Amendment) Act 2000 where it states that:

'Any person who— [...] plants or otherwise causes to grow in a wild state in any place in the State any species of flora, or the flowers, roots, seeds or spores of flora, ['refers only to exotic species thereof'][...] otherwise than under and in accordance with a licence granted in that behalf by the Minister shall be guilty of an offence.'

Under the European legislation, the Birds and Natural Habitats Regulations 2011 (SI 477 of 2011), Section 49(2) prohibit the introduction and dispersal of species listed in the Third Schedule (including Japanese Knotweed) whereby "any person who plants, disperses, allows or causes to disperse, spreads or otherwise causes to grow [....] shall be guilty of an offence."

In addition, under Regulation 50 a person shall be guilty of an offence "*if he or she* […] *offers or exposes for sale, transportation, distribution, introduction or release* [any restricted non-native plant species], *anything from which* [the plants] *can be reproduced or propagated, or a vector material listed in the Third Schedule,* [which includes] *soil or spoil taken from places infested with Japanese Knotweed*". Soil that is contaminated with Japanese Knotweed is also considered a restricted material under the *Waste Management Act 1996* (as amended) and associated regulations.

The implementation of the management measures set out in this plan have been informed by the above legislation.

4 Non-native invasive species in the study area

Non-native invasive species have been identified in a number of areas of the proposed construction works. Invasive plant species which have been identified include Japanese Knotweed and Gunnera. Although these non-native invasive species are present throughout the study area, for the purposes of this scheme, a non-native invasive species management plan will only be put in place within the footprint of the construction works.

Several surveys have been carried out in the study area in the last five years. There was a previous invasive species survey completed in May 2015. Subsequently, All About Trees (AAT) carried out a complete survey in July 2016 covering a number of locations adjoining the River Bride and Glenamought River and up to 3m from the top of the bank in the Blackpool area, North of Cork City. The results of the survey indicated much more Japanese Knotweed than was initially noted in the area. The report recommended that all stands identified in the re-survey and all previously unrecorded Knotweed stands in the zone of influence be treated. Herbicide application was completed in August and September 2016.

AAT completed a follow up survey in August 2017. The herbicide treatment in 2016 was very effective and reduced the extent and density of Japanese Knotweed by almost 50%. The small amount of Gunnera found was noted not to be a priority for treatment and may be left in place until the commencement of construction works. They could be removed prior to site clearance works if required, and do not need to be treated beforehand.

In June 2018, Japanese Knotweed Ireland (JKI) completed another survey of the area to determine the extent of regrowth. Additionally, new locations were identified to be included in the next treatment programme. The treatment was completed from July through September 2018. There was evidence of cutting from an unknown party in some areas, signage in those areas warn against disturbing the Japanese Knotweed.

JKI completed another monitoring survey and report in June 2019 and by August 2019, herbicide treatment was again completed on recommended locations. It was noted at the time that there were areas with limited or no regrowth.

In May 2020, JKI identified two new areas of Japanese Knotweed. Another treatment of the study area took place in September 2020, results of this treatment are pending.

Table 2 provides an overview of annual works completed and general notes on the treatment progression.

Year	Works completed by Works completed		Notes
2015		Survey	N/A
2016	All About Trees	Survey and herbicide treatment	Area treated: 2,637 m ²

Table 2: Summary of works completed in the study area

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Year	Works completed by	Works completed	Notes	
2017	All About Trees	Survey and herbicide treatment	Extent and density reduced by 50%	
			Regrowth treated: 1,327 m ²	
2018	Japanese Knotweed Ireland	Survey and herbicide treatment	Evidence of cutting, regrowth treated	
2019	Japanese Knotweed Ireland	Survey and herbicide treatment	Areas noted with limited or no regrowth	
2020	Japanese Knotweed Ireland	Survey, treatment completed in September 2020	New areas of growth added to treatment programme. Treatment report pending.	

A summary is given in Table 3 that indicates the required treatment for each specific site ID in the study area. Appendix A provides the 2016 mapping indicating the location of the Site ID numbers within the study area.

Site ID	2016 AAT Glyphosate	2017 AAT Glyphosate	2018 JKI Foliar Spray RoundUp Biactive	2019 JKI Foliar Spray RoundUp Biactive	2020 JKI Pending
G01	-	New area			
J1					
J2			Not required	Not required	
J3		Not required	Not required	Not required	
J4			Not required	Not required	
J5			001, 002, 003, 004, 005, 006,	001, 002, 003, 004, 005, 006, 101, 102	201, 202 New areas
J6 ABCDEF	ABCDEF	ABCDE	ABCDE	ABCDE	
J7					
J8			Not required	Not required	
J9					
J10		Not required	Not required	Not required	
J11		Not required	Not required	Not required	
J12			Not required	Not required	
J13					
J14					
J15			Not required	Not required	
J16		Not required	Not required	Not required	
J17					
J18					
J19					

Table 3: Summary of treated areas (hatched box indicates treatment occurred)

Site ID	2016 AAT Glyphosate	2017 AAT Glyphosate	2018 JKI Foliar Spray RoundUp Biactive	2019 JKI Foliar Spray RoundUp Biactive	2020 JKI Pending
J20			Not required	Not required	
J21					
J22					
J23					
J24					
J25			Not required	Not required	
J26					
J27					
J28			Not required	Not required	
J29					
J30			Not required	Not required	
J31 ABCDE	ABCDE	ABCDE	AC	AC	
J32	-	New area	Not required	Not required	
J33	-	New area	Not required	Not required	
J34	-	New area	Not required	Not required	

The latest mapping of the study area and treatment report from 2019 are provided in Appendix B and Appendix C for reference.

5 Management options

5.1 General measures to avoid spreading invasive species during construction or soil movement

The species noted above are highly invasive, can easily spread to new areas, and are particularly effective at colonising disturbed ground (e.g. construction sites). Japanese Knotweed spreads by the re-growth of cut fragments or root material, so if broken up during site clearance or other earthworks they can readily re-grow in new areas to which soil is moved.

The unintentional spread of invasive species during construction works is a significant issue, and if not managed in the correct manner, species like Japanese Knotweed could be spread to uninfested areas, which would increase the future cost and effort required to control the species, and could pose further public health and safety risks (Knotweed species can cause damage to buildings and infrastructure).

The most common ways that these species can be spread are:

- Site and vegetation clearance, mowing, hedge-cutting or other landscaping activities
- Spread of seeds or plant fragments during the movement or transport of soil
- Spread of seeds or plant fragments through the local surface water and drainage network
- Contamination of vehicles or equipment with seeds or plant fragments which are then transported to other areas
- Importation of soil from off-site sources contaminated with invasive species plant material

As mowing, cutting, and hand pulling easily spread Japanese Knotweed, these are not viable management options and should not be carried out as part of this management plan.

Depending on the timescale for the construction of the proposed scheme it may be possible to eradicate some species prior to the onset of construction on the site via an advance treatment contract (refer to Section 5.2 below); this would be preferable. In addition, hygiene measures will need to be put in place to ensure that the further spread of invasive species is avoided. Refer to the Section 5.4 below on-site hygiene below for further details on same.

5.2 Advance treatment

As mentioned previously, advance chemical treatment works on the Knotweed species have commenced. At least two rounds of treatment have been carried out so far and the survey completed in May 2020 showed that the advance treatment has been effective in substantially reducing the extent of the Japanese Knotweed infestation. The specific treatment method is decided on a site by site basis.

Details on the advance treatment (such as treatment locations, treatment methodologies etc) will be made available to the main Contractor before the construction works commence.

5.3 Pre-construction survey

As species may have spread, or their distribution may have changed, between the survey completed in May 2020 and the commencement of the main construction works, the implementation of this Invasive Species Management Plan will require a pre-construction re-survey by a suitably qualified person within the proposed scheme boundary and any additional areas where construction works are required (e.g. temporary construction compounds, haul routes etc.). In accordance with the TII guidance this survey will produce accurate 1:5,000 scale mapping for the precise location of invasive species.

The pre-construction surveys will be undertaken by suitable experts with competence in identifying the species concerned having regard to any seasonal constraint.

5.4 Site hygiene

Maintaining site hygiene at all times in an area where invasive non-native species are present is essential to prevent further spread. It is also necessary on sites where invasive non-native species are not present but where there is risk of contaminated material being brought to site, for example, site machinery being used on multiple sites, construction staff travelling between infested and not infested sites. Preventative measures must be taken. Construction equipment, vehicles and footwear may provide a vector for the spread of invasive non-native species.

The following site hygiene measures shall be taken for each site where applicable:

- In relation to Knotweed plant species, understand the possible extent of the rhizome (root) system underground up to 7m horizontally and 3 meters vertically.
- Fence off the infested areas prior to and during construction works where possible in order to avoid spreading seeds or plant fragments around or off the construction site. In relation to Knotweed plant species, allow for a 10m buffer around the area.
- Clearly identify and mark out infested areas. Erect signs to inform Contractors of the risk.
- Avoid, if possible, using machinery with tracks in infested areas.
- Clearly identify and mark out areas where contaminated soil is to be stockpiled on site and cannot be within 50m of any watercourse or within a flood zone.
- Create designated entry and exit points for operators on foot and for small mobile equipment.

A delineated access track to be maintained free of non-native invasive species to be established through the site to avoid the spread of Japanese Knotweed by permitted vehicles accessing the site.

- Installation of a dedicated footwear and vehicular wheel wash down facility into a contained area within each works site.
- Vehicles leaving the site to be inspected for any plant material and washed down into a contained area.
- Vehicles used in the transport of contaminated material will need to be visually checked and washed down into a contained area before being used for any other work, either on the same site or at a different site.
- Transportation of contaminated material will need to be in covered trailers and haul routes should be prepared in advance using root barrier membrane and hardcore as required.
- Material gathered in dedicated wash down contained areas will need to be appropriately treated along with other contaminated soil on site. Refer to sections below in relation to treatment methods.
- If soil is imported to the site for landscaping, infilling or embankments, the Contractor shall gain documentation from suppliers that it is free from invasive species.
- Ensure all site users are aware of measures to be taken and alert them to the presence of the Invasive Species Management Plan.
- Erection of adequate site hygiene signage in relation to the management of non-native invasive material.

5.5 **Treatment methods**

In addition to the advance treatment works and pre-construction survey, when the works areas become available to the Contractor for fencing and commencement of site clearance, areas identified as requiring specific treatment will be demarcated and the designated control measures implemented at the earliest possible stage to reduce the risk of spread along the proposed scheme or beyond the land take.

There are a number of management options that may be implemented to control and prevent the spread of invasive species. These are presented in the sections below. It is also noted that it may not be possible to completely eradicate the invasive species before or during the construction phase. For example, where structures are proposed at sites that contain Japanese Knotweed, root barrier membranes may require to be installed to protect the structures from the plant. The design of these membranes will form part of the detailed design stage.

It should be noted that those involved in the application of herbicides/pesticides must be competent to do so and, consequently, must have sufficient training, experience and knowledge in the area of herbicides/pesticides application.

It is important that all staff involved in the application of herbicides/pesticides have received appropriate training, which may include achieving competency certification in the safe use of herbicides/pesticides through a National Proficiency Tests Council registered assessment centre or achieving an appropriate FETAC award in this area.

Given the constraints of the physical site boundaries and flooding risks in the area, it is likely that chemical treatment, as described in Section 5.5.1, will be the most suitable method for the identified invasive species.

5.5.1 Chemical treatment

The control of some species will require the use of herbicides (if not buried), which can pose a risk to human health, to non-target plants or to wildlife. In order to ensure the safety of herbicide applicators and of other public users of the site, a qualified and experienced Contractor will be employed to carry out all work. It is advised that the Contractor refer to the following documents, which provides detailed recommendations for the control of invasive species and noxious weeds:

- Chapter 7 and Appendix 3 of the TII Publication: The Management of Noxious Weeds and Non-Native Invasive Plant Species on National Roads (NRA, 2010)
- Invasive Species Ireland Best Practice Management Guidelines for Japanese Knotweed (2015)
- The Knotweed Code of Practice: Managing Japanese Knotweed on development sites (UK Environment Agency, 2013)

These documents include measures to aid the identification of relevant species, with details for the timing, chemicals and methodology for chemical control, and for measures to avoid environmental damage during the use of herbicides.

Chemical treatment involves the application of an herbicide to invasive species plant such as Japanese Knotweed stands without any excavation or removal of the plant material. The preferred types of herbicides to be used in the treatment of Knotweed are Glyphosate and 2,4-D Amine. Generally, if herbicide is applied as the treatment option, it will need to be reapplied for up to five years after the first application to ensure the plant control measures have been effective, or monitored for a minimum of two years during which no regrowth is recorded.

Glyphosate is non-persistent and can be used near water but it is not selective (i.e. it is a broad spectrum chemical - will impact all plant species) whereas 2,4-D Amine, can be persistent for up to one month, can also be used near water but is more selective on certain plants. The selection of chemical will depend on the site conditions, proximity to water, surrounding habitats etc.

The most effective time to apply Glyphosate is from July to September (or before cold weather causes leaves to discolour and fall). The majority of herbicides are not effective during the winter dormant stage because they require living foliage to take up the active ingredient. It is essential that a competent and qualified person carries out the herbicide treatment.

Reapplication rates will depend on site specific considerations including the extent of the infestation, its location, and the time of year treatment commences. Details of the proposed chemical treatment plan will be required in the site-specific invasive species management plan.

Foliar treatment (spraying) is usually applied with a sprayer such as a knapsack sprayer or a larger spray system. It is important to use a treatment dye to identify clearly all areas treated. It is an efficient way to treat large monocultures of invasive plants, or to spot-treat individual plants that are difficult to remove mechanically such as Japanese Knotweed.

In the case of Knotweed, depending on weather and temperatures in the days following the initial treatment, and to ensure optimal uptake of herbicide into the rhizome system, a second similar treatment will be required usually within ten days, before the internal vascular system is no longer capable of translocating the herbicide to the root system. While the upper surface of the leaves will be easier to treat, it is also important to treat the leaf under surface as Knotweed possesses many stomata openings on the leaf under surface. Dead stems should be cut, removed and burned on/off site in accordance with the Waste Management Acts 1996 as amended and the Waste Management (Prohibition of Waste disposal by burning) Regulations 2009 (SI 286).

The stem injection method is sometimes used for Japanese Knotweed control. This treatment requires a higher concentration of the active ingredient than is used in foliar applications. It involves the use of a specialist herbicide injection tool whereby the injection tool injects the herbicide directly into each of the canes approximately 20-30cms from the base of each cane (between the 1st and 2nd nodule).

Subsequently approximately 10 mL of herbicide mix is injected into each cane at a ratio of 5:1 through the use of a specialist stem injection tool. The application of glyphosate based products, are most effective when applied in the early Autumn (mid to late Sept). Regrowth will occur in subsequent years, albeit much less vigorously, which will require follow up treatment at the appropriate time of year. Spot treatment will be required each year until no regrowth is observed.

In order to ensure that the use of herbicides does not contravene legislation, the Contractor must comply with Circular Letter NPWS 2/08 dealing with the application on to non-target areas from the National Parks and Wildlife Service.

Similar chemical treatment can be used for Gunnera during active growth late in the growing season between late August to early September.

5.5.2 Excavation and chemical treatment

This option employs both physical and chemical methods of treatment. This method is employed in situations where treatment of invasive species, in particular Knotweed, is required to be completed in a shorter timeframe. The Environment Agency suggest that by digging up the rhizomes and recultivating it stimulates plant growth and will result in more successful herbicide application and management.

In summary this management method requires cutting and killing of the surface plant. The cut material must be left on top of plastic sheeting until dried out and subsequently monitored for any sign of regrowth (this is not recommended for a river bank habitat where there is the possibility of flooding occurring). They should not be placed in a green waste recycling bin. Once dried out, the material should be burned on site in accordance with the Waste Management Acts 1996 as amended and the Waste Management (Prohibition of Waste disposal by burning) Regulations 2009 (SI 286). The surface of the affected area should be raked with tines to remove crowns and surface material, and in order to break up the rhizomes, bringing them to the surface, which will stimulate leaf production. This will make the plant more vulnerable to herbicide treatment. The more rhizomes that are brought to the surface, the more growth will occur and allowing for a more successful treatment. An excavator can be used to scrape the surface crowns and rhizomes into a pile and then cultivate the ground to stimulate rhizomes to produce higher density of stems for treatment. Reapplication of herbicide may be required for up to five years after initially application, subject to the site specific management plan.

As the site for the proposed scheme is at risk of flooding, the excavation and chemical treatment is not deemed suitable for this project unless the Contractor can identify a suitable area that is not at risk of flooding and within the confines of the site boundary.

5.5.3 Excavation and burial

Excavated material containing Knotweed can also be buried on site. This will require burying the material at a depth of at least five metres. The contaminated material must be covered with a root barrier membrane before being backfilled with topsoil or other suitable fill material. The membrane must stay intact for at least 50 years. A manufacturer's guarantee is required. An accurate map and record of the location of the burial site to prevent any future accidental disturbance is required, and future owners shall be informed of its position. If soil containing Japanese Knotweed is stockpiled, the material must be stored in a manner that will not harm health or the environment. The stockpile should be on an area of the site that will remain undisturbed. The area should be clearly fenced and signed, and should be regularly treated with herbicide to prevent any regrowth or reinfestation.

As a precaution, the stockpiled material should be laid on a root barrier membrane and covered to avoid contaminating the site further.

As the site for the proposed scheme is at risk of flooding, the excavation and burial treatment is not deemed suitable for this project unless the Contractor can identify a suitable area that is not at risk of flooding and within the confines of the site boundary.

5.5.4 Excavation and root barrier cell method

Excavated material containing Knotweed can also be buried on site within a root barrier membrane cell. Similar procedure to above.

This will require burying the material at a depth of at least two metres. The contaminated material must be within a contained cell consisting of a root barrier membrane before being backfilled with topsoil or other suitable fill material. The membrane must stay intact for at least 50 years. A manufacturer's guarantee is required. Stockpiling method as above.

Due to concerns over future land use, this method is not deemed suitable for this project.

5.5.5 Excavation and bund method

Where there is not sufficient depth on a site for deep burial the Environmental Agency Guidelines set out another option whereby such excavated material is placed in a structured bund. The bund will comprise a raised area above ground level or a shallow excavation, no more than 0.5m deep, and lined with a root barrier membrane. The membrane must stay intact for at least 50 years and a manufacturer's guarantee is required. This method of treatment can also be used where Knotweed material needs to be moved from a location and there is another ideal area of the site available to contain it.

The aim of this method is to concentrate the rhizome material into the upper surface of the bund, where it will grow and be controlled by herbicide. If the rhizome is buried deep, it will become dormant when inside the bund and regrow when the apparently clean soil is used for landscaping on the site. The bund location needs to be clearly signed and protected from potential accidental damage. Reapplication of herbicide may be required for up to five years after the initial application, subject to the site-specific management plan.

This method is not deemed suitable for the proposed scheme, as a suitable bund location could not be identified within the site boundary.

5.5.6 Excavation and removal from site

Where the above treatment options are not possible (site is too small to contain excavated material, too shallow for burial, or where there is lack of space or where the infestation simply cannot be avoided by the construction works) removal of excavated material may be the only option. Where there are small amounts of Knotweed material to be removed it is possible to double bag the material and send to a fully licenced waste facility for disposal (i.e. landfill). Where the amount of material is larger in volume it will be necessary to haul from site to a suitably licenced waste facility. It should also be noted that in the process of excavated material will need to be classified as hazardous waste and there will need to be disposed of to a hazardous waste facility.

If any invasive species plant material is collected (e.g. by hand-pulling or mowing), it is important that its disposal will not lead to a risk of further spread. The movement of invasive plant material requires a licence from the National Parks and Wildlife Service (NPWS) under Section 49 of the European Communities (Birds and Natural Habitats) Regulations, 2011 (as amended).

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Invasive species (particularly roots, flower heads or seeds) will be disposed of at licensed waste facilities or composting sites, appropriately buried, or incinerated having regard to relevant legislation. For example Section 32 of the Waste Management Act, 1996 to 2008; Section 4 of the Air Pollution Act, 1987; relevant local authority byelaws and any other relevant legislation). All disposals will be carried out in accordance with the relevant Waste Management legislation (as per guidance from NRA, 2010). It should be noted that some invasive species plant material or soil containing residual herbicides may be classified as either 'hazardous waste' or 'non-hazardous waste' under the terms of the Waste Management Acts, and both categories may require special disposal procedures or permissions. Advice will be sought from a suitably qualified waste expert regarding the classification of waste and the suitability of different disposal measures. As noted above, additional specific measures for the management of Japanese Knotweed cuttings or contaminated soil can be found in the UK Environment Agency document The Knotweed Code of Practice: Managing Japanese Knotweed on development sites (UK Environment Agency, 2013).

6 Management during the operational phase

6.1 **Protecting flood defence structures**

As part of the operation phase there will need to be on-going treatment of nonnative invasive species. A management plan for the operational phase will need to be formulated by the Contractor in consultation with the relevant bodies i.e. NPWS, IFI, OPW, and Cork County Council.

Site hygiene protocols will need to be implemented.

6.2 Channel maintenance works

During channel maintenance works, a management plan will need to be put in place to prevent the spread of non-native invasive species downstream during those works.

Site hygiene protocols will need to be implemented.

As discussed above, the management plan for the operational phase will need to be formulated in consultation with the NPWS, IFI, OPW, and Cork County Council.

7 Conclusion

The presence of non-native invasive species along the works areas of the proposed scheme requires the need for an Invasive Species Management Plan to be finalised prior to construction commencing. This Plan shall be written by a qualified ecologist.

Given the nature of the species and the rate of growth, each proposed works site will need to be re-surveyed prior to works. Site hygiene will be particularly important on sites where invasive species are present but also 'clean' sites. Incoming vehicles, and equipment (including footwear worn by all site visitors) will need to be cleaned and inspected before coming on site and upon leaving, to prevent the further spread of the plant.

Where possible material will remain on site and be reused. Any material that must be removed off site to landfill or other suitable facility will require a licence from the National Parks and Wildlife Service.

The Plan must be clearly communicated to all site staff and must be adhered to if it is to be implemented successfully.

An updated treatment report and mapping will be received from JKI detailing the completed programme from September 2020.

8 References

NRA Guidelines on The Management of Noxious Weeds and Non-Native Invasive Plant Species on National Roads (2010)

Managing Japanese Knotweed on development sites - The Knotweed Code of Practice produced by the Environmental Agency (2013)

Managing Invasive Non-native Plants in or near Freshwater, Environment Agency (2010)

Best Practice Management Guidelines Japanese Knotweed *Fallopia japonica*, Invasive Species Ireland (2015).

Appendix A

All About Trees Mapping 2016













Japanese knotweed - mature plants

Japanese knotweed - single stems

Core survey area

