

DixonBrosnan
environmental consultants

Invasive Species Management Plan (ISMP)

Former Cork Warehouse Company Site,
Cork City

On Behalf of
Arup

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1. Introduction

The information in this report has been compiled by DixonBrosnan Environmental Consultants, on behalf of the applicant. It provides information on the control of invasive species during construction works.

Invasive plant species have been identified with and in close proximity to the construction works areas for the proposed development site at the former Cork Warehouse Company, Cork City.

Two third-schedule invasive species Japanese Knotweed (*Fallopia japonica*) and Giant Knotweed (*Fallopia sachalinensis*) were recorded within the proposed development site boundary.

One area of Cherry Laurel (*Cerasus laurocerasus*) was also recorded close to the existing entrance within the proposed development site. Buddleia (*Buddleja davidii*), Wild Clematis (*Clematis virginiana*) and Winter Heliotrope (*Petasites pyrenaicus*) have a scattered distribution within the site and in some places are the dominant species. These species are considered high risk (Cherry Laurel) and medium risk (Buddleia, Wild Clematis and Winter Heliotrope) invasive species by the NBDC.

This Invasive Species Management Plan (ISMP) describes the strategy that will be adopted during the construction and operation of the proposed development to manage the knotweed and other invasive species. This ISMP is a working document. Following the appointment of the contractor, and prior to commencing works on site, the ISMP will be further developed by the contractor.

The main objective of the ISMP is to control and prevent the spread of invasive species during the construction phase.

2. Methodology

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

- NRA (2010) Guidelines for the Management of Noxious Weeds and Non- Native Invasive Plant Species on National Roads. National Roads Authority, Dublin.
- IW-AMP-SOP-009 Information and Guidance Document on Japanese knotweed
- 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)
- *Best Practice Management Guidelines for Japanese Knotweed* (Invasive Species Ireland, 2015)
- *Circular Letter NPWS 2/08 Use of Herbicide Spray on Vegetated Road Verges* (National Parks and Wildlife Service 2008)

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.’

The Birds and Natural Habitats Regulations 2011 (SI 477 of 2011), Section 49(2) prohibits the introduction and dispersal of species listed in the Third Schedule, which includes Japanese Knotweed, as follows: “any person who plants, disperses, allows or causes to disperse, spreads or otherwise causes to grow [...] shall be guilty of an offence.”

Japanese Knotweed and Giant Knotweed, which are listed on the Third Schedule, were recorded at the proposed development site (**Figure 1**).

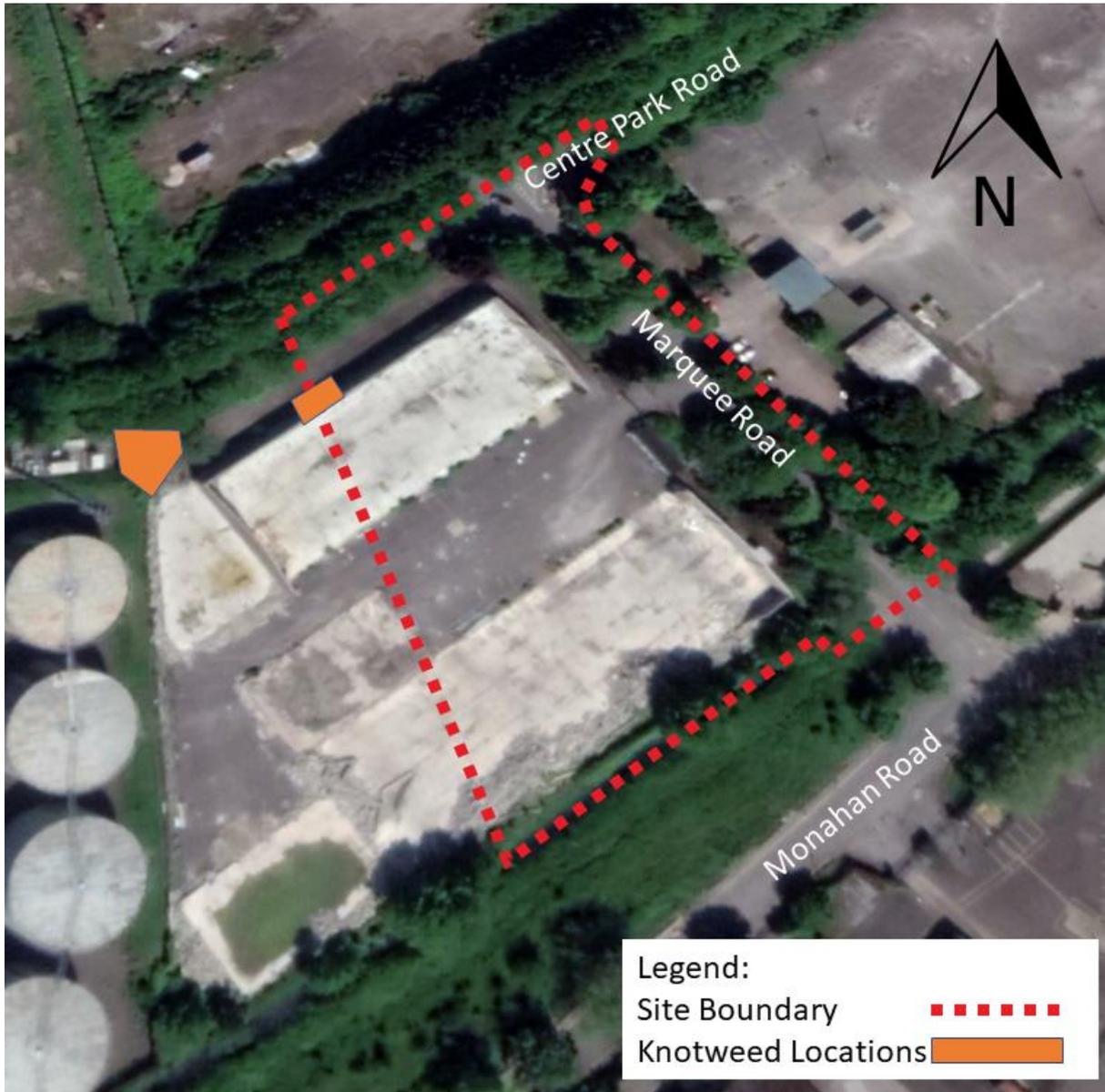


Figure 1. Invasive species within and adjacent to the proposed development site | | Note Buddleia, Wild Clematis and Winter Heliotrope have a scattered distribution and were not mapped.

One area of Cherry Laurel was also recorded close to the existing entrance. Buddleia and Wild Clematis have a scattered distribution within the site and in some places are the dominant species. These species are considered high risk (Cherry Laurel) and medium risk (Buddleia and Wild Clematis) invasive species by the NBDC, but they are not included in the Third Schedule and therefore, its presence at the site does not have the potential to lead to an offence under the Birds and Natural Habitats Regulations 2011 (S.I. 477 of 2011). However, the NBDC notes that under the right ecological conditions this species may have an impact on the conservation goals of a European site or impact on a water body achieving good/high ecological status under the Water Framework Directive (Directive 2000/60/EC).

4. Invasive Species Within the Study Area

A small area of Giant Knotweed was recorded along the northern boundary of the now derelict industrial structure. A much larger area of Japanese Knotweed and Giant Knotweed was recorded in the north west corner of the overall site but west of the proposed development site boundary (**Figure 1**).

The high impact species (NBDC) Cherry Laurel and the medium impact listed species (NBDC) Buddleia, Wild Clematis and Winter Heliotrope were also recorded in a scattered distribution throughout the site.

Japanese Knotweed is a highly invasive, non-native species which was originally introduced as an ornamental plant but has since spread along transport routes and rivers to become a serious problem. From an ecological viewpoint it out-competes native species by forming dense stands which suppresses growth of other species. It grows extremely vigorously and can penetrate through small faults in tarmac and concrete and thus can damage footpaths, roads and flood defence structures. As it can survive in poor quality soils, including spoil, it often thrives in brownfield sites and in urban areas.

Giant Knotweed is a species of *Fallopia* native to northeastern Asia, northern Japan and the far east of Russia it was introduced to Ireland by gardeners and now resides in most counties across Ireland. It is identified by the leaves which are some of the largest in the family, up to 15–40 cm long and 10–28 cm broad. Giant Knotweed is a herbaceous perennial plant. The flowers are small, produced on short, dense panicles up to 10 cm long in late summer or early autumn and grows to 4 meters high. The species is closely related to the Japanese Knotweed and can be distinguished from it by its larger size with a smooth edged, elongated heart-shaped leaf, with a slight wavy, crenate margin.

Cherry Laurel is a dense thicket forming invasive ever-green shrub of gardens, parks and woodlands from South West Asia. The leaves are thick and laurel-like and are poisonous with cyanide. The white flowers are produced on upright spikes and are succeeded in autumn by blackish cherry-like fruits that should not be eaten. Cherry Laurel are extremely invasive plant species, particularly in the more humid western parts of Ireland, forming dense impenetrable thickets. It is unpalatable and likely toxic to mammals and probably invertebrates due to the presence of 'free' phenols and cyanide in Cherry Laurel. Cherry Laurel is avoided by grazing animals, thus giving it a significant advantage over native species. The deep shadow cast by the Cherry Laurel suppresses regeneration of native species and supports little wildlife.

Wild Clematis, also known as Travellers Joy, is a member of the Ranunculaceae family. It is a vigorous, deciduous climber with characteristic feathery seed heads in the late summer from which it derives its common name. In Ireland it is found in hedgerows, roadsides, riverbanks and along forest edges. The vine can form dense thickets blanketing trees and shrubs, ultimately depriving them of light. It can break limbs or cause their collapse from its sheer weight and mass. It also prevents regeneration of native vegetation by blocking light and physically oppressing young plants.

Buddleia (also known as the butterfly bush) is a member of the Buddlejaceae family. It is very fast growing and can reach 2m in its first year, producing flowers and setting seed. Buddleia is a native of China but is common as a garden plant owing to its profusion of flowers which tend to attract a considerable diversity of butterflies (hence its other common name). It is frequently found in waste ground in urban environments, though has a widespread distribution

throughout the country. It colonises bare ground very rapidly and can quickly form mono-typic stands. As *Buddleia* tolerates very poor soils, it is capable of growing on walls, rock outcrops or sub-soils, conditions which are frequent on new road schemes. In particular it poses a threat where such features are being left to re-colonize naturally as in rock cuttings, eskers, etc. In other countries it has established itself as a problem plant along watercourses where due to its shallow root system, it is frequently washed away resulting in erosion of the river banks and downstream blockages.

5. Japanese and Giant Knotweed Management Plan

This purpose of this plan is to:

- Identify the extent of the infestation on the site
- Ensure further growth and spread of the plant on the site does not occur
- Ensure the plant is not spread to other sites either adjacent to the infested site or through transportation of contaminated soil to another site
- Identify the best method for managing and controlling Japanese Knotweed, Giant Knotweed and other invasive species on the site with regard to the proposed site works and construction methods
- Communicate the plan to all site operatives to ensure success of the plan
- Document and record the treatment and management methods carried out on site for future reference, for future site owners and site users and to avoid litigation.

The contractor will employ a suitably qualified ecologist to update the plan prior to the commencement of construction. The updated plan will contain the following:

- Site background including proposed works
- Extent of the Japanese Knotweed and Giant Knotweed infestation
- Specific control plan to be put in place
- Site hygiene protocols
- Responsible individuals
- Follow up requirements
- Any other relevant information

5.1 Management Options for Japanese Knotweed

There are a number of suitable management options to control and prevent the spread of Japanese Knotweed and Giant Knotweed. The methodology outlined in this document will be updated, if required, based on an up to date survey of the contaminated area. The proposed management plan will be agreed with Cork City Council prior to the works being carried out. It should be noted that:

- Where any infested material (soil containing Knotweed species) is to be taken off site, a licence to transport the material will be required from National Parks and Wildlife Service (NPWS).
- A landfill, which is licensed to accept such material, will be identified to dispose of the excavated material. The landfill site operator will be informed of what the material contains.
- Where herbicide treatment will be used, consideration will be given to the proximity of the herbicide treatment to watercourses and other vegetation.

For all management plans, site hygiene protocols will be implemented. These protocols will apply to sites which are infested with Knotweed and those where Knotweed is not growing to prevent contaminated material being brought to site. Site hygiene protocols are outlined in **Section 5.3** below.

5.2 Pre-Construction Survey

Since invasive species spread quickly, prior to the commencement of treatment, a pre-construction survey will be undertaken to identify the extent of invasive species at that time. The survey will be undertaken by a suitably qualified ecologist. This information will be utilised to update the ISMP.

5.3 Site Hygiene at Contaminated Areas

Construction equipment, vehicles and footwear may provide a vector for the spread of invasive species. Maintaining site hygiene at all times in an area affected by invasive species is essential to prevent further spread.

The following site hygiene measures will be implemented for the contaminated area:

- Understand the potential extent of the rhizome (root) system underground – up to seven metres horizontally and three metres vertically.
- Where possible, the contaminated area will be avoided and fenced off, or the extent of the rhizomes clearly marked.
- If possible, the use of machinery with tracks will be avoid contaminated areas. Movement of machinery between contaminated and non-contaminated areas must be controlled and adequate power washing measures implemented.
- Areas where contaminated soil is to be stockpiled on site will be clearly identified and marked out.

- Designated entry and exit points will be identified for personnel on foot and for small mobile equipment. A delineated access track, to be maintained free of knotweed species, will be established through the site to minimise the spread of Knotweed species by permitted vehicles accessing the site.
- Vehicles, including footwear and tools, leaving the site will be inspected for any plant material and washed down (using a pressure washer) in a dedicated vehicular wheel wash down facility, which will drain into a contained area within the site. Particular care is required with tracked machines.
- Vehicles used in the transport of contaminated material will be visually checked and washed down into a contained area before being used for any other work, either in the same area or on a different site.
- Only vehicles required for essential works including site investigation works will be brought on site and the number of visits minimised as much as practicable.
- Material gathered in the dedicated wash down contained areas will be appropriately disposed of off-site.
- For any subsoil or topsoil entering the site, the supplier will be required to provide an assurance that it is free of knotweed.
- All site personnel will be made aware of measures to be taken and will be informed of the requirements of the ISMP.
- Site hygiene signage, in relation to the management of invasive species, will be erected.

6. Japanese and Giant Knotweed Treatment Options

In addition to the possible advance treatment works and pre-construction survey, areas identified as requiring specific invasive species 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.

Those involved in the application of herbicides/pesticides will be competent to do so and, consequently, will have sufficient training, experience and knowledge in the area of herbicides/pesticides application.

All staff involved in the application of herbicides/pesticides will 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.

It is likely that chemical treatment, as described in **Section 6.1** will be the most suitable method for the identified invasive species.

6.1 Chemical Treatment

The control of knotweed will require the use of herbicides, 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, it is essential that a competent and qualified person carries out the herbicide treatment. A qualified and experienced contractor will be employed to carry out all treatment work.

The contractor will follow the detailed recommendations of the following documents 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)
- *Best Practice Management Guidelines for Japanese Knotweed* (Invasive Species Ireland, 2015)
- *Circular Letter NPWS 2/08 Use of Herbicide Spray on Vegetated Road Verges* (National Parks and Wildlife Service 2008)

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 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.

If herbicide is applied as the treatment option, it may need to be reapplied for up to five years after the first application to ensure the plant control measures have been effective.

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

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 included in the updated ISMP.

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. Foliar treatment 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 can be cut, removed and burned on/off site in accordance with the relevant legislation.

The stem injection method is sometimes used for 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 by injection is 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 *Use of Herbicide Spray on Vegetated Road Verges* from the National Parks and Wildlife Service dealing with the application on to non-target areas.

6.2 Excavation and Chemical Treatment On-Site

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 relatively short timeframe. Generally, digging up the rhizomes and re-cultivating 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. Storage of cut material should not take place within flood risk zone of a river. The cut material should not be placed in a green waste recycling bin. Once dried out, the material should be burned on site in accordance with the relevant legislation. 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, allowing for a more successful treatment. An excavator can be used to scrape the surface crowns and rhizomes into a pile and then to cultivate the ground to stimulate rhizomes to produce a 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.

6.3 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 manufacturer's guarantee is required that the membrane will stay intact for at least 50 years. An accurate map and record of the location of the burial site, to prevent any future accidental disturbance, is required, and future owners must be informed of its position. If soil containing 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 marked with warning signs, and the stockpile should be regularly treated with herbicide to prevent any regrowth or re-infestation.

As a precaution, the stockpiled material should be laid on a root barrier membrane and covered to avoid contaminating the site further. The contractor must also comply with all waste legislation.

6.4 Excavation and root barrier membrane

Excavated material containing knotweed can also be buried on site within a root barrier membrane cell. The procedure is similar to that described in **Section 6.3** above.

This method will require burying the material at a depth of at least two metres. The contaminated material must be placed in a contained cell formed by a root barrier membrane before being backfilled with topsoil, or other, suitable fill material. The manufacturer's guarantee is required that the membrane will stay intact for at least 50 years. The method for stockpiling prior to burial would be as described as above. The contractor must also comply with all waste legislation.

6.5 Excavation and bund method

Where there is not sufficient depth on a site excavated material can be 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 manufacturer's guarantee is required that the membrane will stay intact for at least 50 years. This method of treatment can also be used where knotweed material needs to be moved from a location and there is another 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 marked by warning signs 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.

The appointed contractor must comply with waste legislation if this method is to be considered.

6.6 Excavation and removal from site

Where the above treatment options are not possible because the site is too small to contain excavated material, or too shallow for burial, or where there is a lack of space or where the

infestation simply cannot be avoided by the construction works, removal of excavated material may be the only option. 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. Where there are small amounts of Knotweed material to be removed it is possible to double bag the material and send to a licenced waste facility for disposal. Where the amount of material is larger in volume, it will be necessary to haul it from site to a suitably licenced waste facility.

Invasive species material, particularly roots, flower heads or seeds, must be disposed of at licensed waste facilities appropriately buried, or incinerated in compliance with the relevant legislation. Disposal must be carried out in accordance with the relevant waste management legislation. 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. If the material has been treated with a persistent herbicide, the excavated material must be classified as hazardous waste and must be disposed of to a hazardous waste facility. Advice would need to be sought from a suitably qualified waste expert regarding the classification of the waste and the suitability of different disposal measures.

The movement of invasive plant material requires a licence from the NPWS under Section 49 of the European Communities (Birds and Natural Habitats) Regulations, 2011 (as amended).

7. Preferred Treatment Option, Advance Chemical Treatment and Continued Chemical Treatment of Regrowth

The knotweed within the proposed development boundary is located within an area zoned as Flood Zone A and Flood Zone B. During construction works and implementation of the ISMP there is the potential for flooding to impact on the area currently contaminated with knotweed species. Therefore there is the potential for fragments of knotweed to be spread from the works area and inadvertently distributed off-site.

Having assessed the available management options and constraints associated with this particular site, it has been concluded that *in-situ* chemical treatment prior to construction, careful management of the works and continued in-situ chemical treatment post construction is the preferred option. This is primarily due to the following significant constraints.

The risk of fragments of knotweed being spread outside of its current distribution is high as high flood levels could result in fragments of knotweed, which are dislodged during site works, being carried downstream along the River Lee and thus impacts on off-site receptors could occur.

Given that flooding could impact on existing stands of knotweed, large scale foliar spraying is not recommended and therefore only stem injection and spot treatment is practical as a first treatment method. For the re-growth material within the site or juvenile plants, a foliar spray application using a cowled knapsack sprayer will allow for efficient treatment when stems are too small and fragile to use stem injection.

Therefore, the following methodology is proposed:

1. Contractors will commence chemical treatment of the knotweed species in this area, in order to avoid the continued spread of the species. The preferred method for initial

treatment is stem injection and spot treatment. This will be carried out under the supervision of a qualified ecologist who will ensure that the correct methodology and appropriate site hygiene methods are utilised. This ISMP will be updated by the supervising ecologist if required. Early treatment will effectively reduce the length of time that chemical treatment will be required. It is noted that knotweed can persist for long periods and the sooner treatment commences, the more rapidly this species will be eradicated from the works area.

2. Prior to the commencement of site works, the extent of contamination will be determined by site investigations including trial pits. This information will be used to determine the area of contamination taking into account that the roots of knotweed can extend 7m from the parent plant. If it is determined by visual inspections/trial hole investigation that viable plants remain within the work area the spreading of this viable Knotweed plant material outside the current area of contamination is not permitted.
3. Following the above, the identified area of contamination will be clearly fenced and all works in relation to knotweed will be carried out only within this fenced area.
4. Where possible, contaminated soil will remain on-site and be treated. The transport of any material that must be removed off site for disposal, as part of the construction works, will require a licence from the NPWS.
5. Any excavations that are carried out as part of the project, must be contained within this area and the spread of any fragments of viable plant material or contaminated soil outside of this area must be effectively prevented. All hygiene protocols as listed in this ISMP must be effectively implemented.
6. Any contaminated material including material from the wash down area must be contained within the identified and fenced contaminated area or removed to a suitably licenced facility offsite in line with standard hygiene measures.
7. Once works within the contaminated area is complete a follow-up programme of works will commence to treat any regrowth of knotweed. This will consist of stem injection and spot treatment and it will continue until the supervising ecologist can certify that Knotweed has been effectively eradicated.
8. The application of herbicide (injection/spot treatment) must take into account the risk of flooding which must be assessed immediately prior to the use of herbicides. Treatment will not be carried out when heavy rain is forecast or in the winter period when there is a higher risk of flooding and adverse weather. It is noted that site hygiene is of particular importance in areas prone to flooding.

8. Management of Other Non-native Species During Construction Phase

As noted in **Section 3** of this report, there is no statutory obligation to remove Cherry Laurel, Buddleia, Wild Clematis or Winter Heliotrope. However, should it be concluded that these species at the proposed development site should be removed, the following treatment methods are recommended.

8.1 Cherry Laurel

The management and eradication of Cherry Laurel is challenging. Understanding the ecology of the species and carefully planning clearance work will ensure success. Clearance can be expensive and time consuming, and should be well planned before any action is taken.

Three main issues must be considered when planning management/control. These are:

Cherry Laurel regrows vigorously when cut. As a result, some method of stump killing or removal is always necessary. Any untreated cut stump will regrow and in most cases flower within 3-4 years.

It is important to consider populations in the wider environment around the site. If Cherry Laurel is growing on adjacent land, or upstream, then recolonisation of recently cleared sites is possible. Discussion with neighbouring land owners on the issues involved and your intended actions, may help encourage them to remove or not plant Cherry Laurel as ornamental or hedging species.

Treatment programmes can be divided into 3 main stages: initial removal, control of stems and roots, and follow up. The following treatment options have been widely tested and measured for effectiveness across Ireland. In almost all cases, failures can be accredited to poor application of a particular technique and/or logistical difficulties, rather than the control method itself. Care should be taken when embarking on a control programme and resources should be identified and allocated for repeated treatments.

Cut and remove stems by hand or chainsaw, cutting as close to the ground as possible to remove above ground growth. Chip or remove the cut material from the area to allow for effective follow-up work and prevent regrowth. Chipped material can provide good weed barrier around ornamental garden areas. Flailing has also been effectively used in Ireland to treat young or immature growth. Although not suitable on all sites and locations, especially steeply sloping or wet sites, it is very effective as it breaks up woody stems upon contact.

The removal of above ground growth will not prevent regrowth as Cherry Laurel will regrow from cut stems and stumps. There are four recommended methods to achieve successful management after the initial cut and removal:

1. Digging the stumps out. The effectiveness of this technique is increased by removing all viable roots. This can be done manually or with a tractor and plough. To avoid regrowth, stumps should be turned upside down and soil should be brushed off roots.
2. Direct stump treatment by painting or spot spraying freshly cut low stumps with a herbicide immediately after been cut. Glyphosate (20% solution), triclopyr (8% solution) or ammonium sulphate (40% solution) are known to be effective during suitable weather conditions i.e. dry weather. The herbicide concentrations used and timings of applications vary according to which chemical is used. Use of a vegetable dye is recommended to mark treated stumps and all stumps should be targeted. A handheld applicator will help avoid spray drift onto surrounding non-target species. Always read the label and follow the manufacturers guidelines when using herbicides. Remember that using

3. A variation on the stump treatment method is stem injection, using a 'drill and drop' methodology, whereby, if the main stem is cut and is large enough for a hole to be drilled into it, the hole can be used to facilitate the targeted application of glyphosate (25% solution).

4. Stump regrowth and seedlings can be effectively killed by spraying regrowth with a suitable herbicide, usually glyphosate. Best practice spraying protocols should be carefully followed. General broadcast spraying is not as effective as stump spot treatment and has the potential to impact on surrounding non-target species. Cherry Laurel leaves are thick and waxy. For herbicide treatment to be effective each individual leaf needs to be thoroughly wetted with herbicide to kill the plant.

8.2 Wild Clematis

Wild Clematis is straightforward to control using a mixture of mechanical removal and herbicide treatment.

Wild Clematis is easily spread by fragmentation. This plant recovers quickly from physical damage with the ability to re-sprout, and prolific seed production with wind dispersal. Site hygiene measures outlined in **Section 5.3** should be implemented where relevant.

As mature plants occur within the proposed works area, the preferred method of treatment is cutting back to a basal stump or grubbing out followed by chemical treatment. Herbicide applications will take into account sensitive receptors such as watercourses and locally important habitats such as woodland and must only be applied in line with manufacturers recommendations.

A number of chemicals have been used effectively against Wild Clematis, including glyphosate, though control invariably takes more than one year (New Zealand Department of Conservation 2005). Control should be undertaken during active growth. For mature plants, the vines should be cut back to ground level or waist height in winter or spring and the subsequent re-growth can be then foliar sprayed. This method will avoid impacting on the host plant the vine may be covering.

For larger specimens, the plant can be cut at the base with a straight horizontal cut. Herbicide is then applied immediately to the wound with a paint brush, eye dropper or small squeeze bottle. On larger stems it is only necessary to wipe herbicide around the outer rim of the cut. The plants should be left in situ until they are dead. Where plants are not killed in a single application, wait until re-growth before re-spraying.

8.3 Buddleia

Buddleia

Buddleia is straightforward to control using a mixture of mechanical removal and herbicide treatment. Buddleia is a plant that favours disturbed sites, physical grubbing of plants can provide ideal conditions for the germination of seeds. Therefore, care needs to be taken to ensure re-vegetation of controlled areas is undertaken swiftly. The branches of Buddleia are capable of rooting as cuttings, so care should also be taken to ensure material is disposed of in a manner to avoid this risk.

Buddleia Physical Control

Management methods such as digging it out are applicable only to minor infestations at the initial stage of invasion. Hand-picking of young plants is feasible but should be undertaken with care to avoid soil disturbance which can give rise to a flush of new seedling. Grubbing of mature stands as a sole attempt at control is not recommended for the same reason. After uprooting, it is essential to plant the ground in order to prevent a flush of new seedling growth.

When it is cut, *Buddleia* grows back from the stump very vigorously. Mowing of young plants does not provide control as they re-sprout with vigour. Where removal of mature plants is not feasible in the short term, the flower heads should be cut off in June before seed set.

Buddleia Chemical Control

Recommended practice for the application of herbicides requires cutting back of plants to a basal stump during active growth (late spring to early summer) which is then treated (brushed on) immediately with a systemic weed killer mix (Starr *et al*, 2003). Foliar application of triclopyr or glyphosate may be adequate for limited infestations of younger plants but should be followed up at 6 monthly intervals. Where herbicide treatment will be used, consideration will be given to the proximity of the herbicide treatment to watercourses and other vegetation.

9. Conclusion

Japanese Knotweed and Giant Knotweed are high risk invasive plant species and will be treated in accordance with this ISMP.

The primary concern is the presence of knotweed species along the drainage network onsite which flows into the Atlantic Pond and River Lee.

Herbicide treatment of knotweed via stem injection and spot treatment will commence as soon as practically possible under the supervision of a qualified ecologist. Site investigations will be carried out prior to the commencement of works to determine if Knotweed species are still present and the degree of contamination.

This information will be utilised to determine the extent of the contaminated area and will be utilised to update this ISMP. Detailed fencing and hygiene protocols will ensure that viable plant material will not be spread outside of its current distribution area. Following completion of works, monitoring and treatment protocols will be implemented to ensure any regrowth is effectively treated.

Cherry Laurel, Wild Clematis, *Buddleia* and Winter Heliotrope are considered a lower risk species. Should it be concluded that these species at the proposed development site should be removed they will be treated via cutting back to a basal stump or grubbing out followed by chemical treatment. Treatment will continue until the supervising ecologist certifies that this species has been effectively removed from the works area.

References

Cornwall Nature Reserves, 2008. Invasive Species. [Online]. Available at: <http://www.cornwallnr.org.uk/inspec.htm>

Invasive Species Ireland (2015) Best Practice Management Guidelines for Japanese Knotweed

IW-AMP-SOP-009 Information and Guidance Document on Japanese knotweed

National Parks and Wildlife Service (2008) Circular Letter NPWS 2/08 Use of Herbicide Spray on Vegetated Road Verges

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

NRA, 2010 Chapter 7 and Appendix 3 of the TII Publication: *The Management of Noxious Weeds and Non-Native Invasive Plant Species on National Roads*