Cleator Moor Innovation Quarter

INVASIVE NON-NATIVE SPECIES MANAGEMENT PLAN

784-B029668 - Rev 2

Copeland Borough Council

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Prepared on Behalf Tetra Tech Group Limited.

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EXECUTIVE SUMMARY

Contents	Summary
Site Location	The 'site' is located in Cleator Moor, Cumbria and is centred at Ordnance Survey National Grid Reference NY 01570 15529. The site is approximately 34.9 hectares in size and lies on the north side of Leconfield Street.
Proposals	The Leconfield site has been used as an industrial estate since 1980s and over the last 10 years, the site has declined significantly. Therefore, it is proposed to be re-developed to create an Innovation Quarter in West Cumbria.

Scope of this Survey(s)	• Identify all areas of invasive species on-site at the time of survey and in the immediate surroundings of the site to a maximum of 50 metres, where possible;
	• Consider the source of these invasive plant species;
	• Consider vectors on and off the site that could allow these species to spread; and
	• Provide species-specific, preliminary advice on:
	  ○ The legal implications of the presence of any invasive species on site; and
	  ○ Potential eradication/management options available.

Results	Japanese knotweed was identified along the southwest boundary of Site A and in three separate locations to the east, west and southern border of Site C. Montbretia was identified in eight stands to the west and southwest of Site A and in the grassland northwest of Site A. Himalayan balsam was present in extensive strands at two places along the northwest border in the mixed woodland area. Two species of cotoneaster were recorded on site, hollyberry cotoneaster and wall cotoneaster. Single stands were identified in the grasslands surrounding the buildings centre north as well as to the west and in the woodland located to the south (Site A).
Recommendations	It is illegal to facilitate the spread invasive and non-native species or otherwise cause them to grow in the wild. Good practice procedures to reduce the risk of spreading include: • A minimum 3m around invasive species, using high visibility tape/netting (or similar) to demarcate the boundary and prevent any disturbance of plants or potentially contaminated soils prior to works; • The use of a suitable, non-permeable membrane and heavy duty boarding where vehicular/personnel access is necessary around areas with surface growth;

	• The implementation of a wheel-wash or foot bath and tools/boots cleaning system, where necessary; and measures to prevent the transfer of potentially contaminated materials and soils. There are five methods of Japanese knotweed control, all of which could be utilised on the site alone or in combination. 1) chemical control, 2) excavation and landfill, 3) excavation and burial, 4) root barrier techniques, 5) excavation and bund. Two methods of montbretia control, all of which could be utilised on the site, either alone or in combination. 1) mechanical control, 2) chemical control. Four methods of Himalayan balsam control, all of which could be utilised on site alone or in combination. 1) hand pulling, 2) cutting/strimming, 3) herbicidal control, 4) excavation. Three methods of cotoneaster species control, all of which could be utilised on the site alone or in combination. 1) mechanical and landfill, 2) mechanical and burned on site, 3) chemical control. Further consultation with a specialist contractor is recommended to confirm and implement suitable future eradication methods. Appropriate methods should be used to ensure waste is legally disposed of and monitoring of the infested area should be undertaken until at least two years with no re-growth of invasive species.

GLOSSARY

CBDC	Cumbria Biodiversity Data Centre
CMIQ	Cleator Moor Innovation Quarter
LERC	Local Ecological Records Centre
W&CA	Wildlife & Countryside Act 1981 (as amended)

INTRODUCTION

1.1 BACKGROUND

Tetra Tech was commissioned by Copeland Borough Council in May 2021 to undertake an Invasive Non-Native Species survey of the site known as Cleator Moor Innovation Quarter (CMIQ), and to produce a management plan based on the findings of the survey.

This report has been prepared by Lucy Bennison Assistant Ecologist and the conditions pertinent to it are provided in Appendix A.

1.2 SITE LOCATION

The 'site' is located in Cleator Moor and is centred at Ordnance Survey National Grid Reference NY 01570 15529 – see Figure 1 for site location plan. The Main Leconfield Site (Site A) comprised the Industrial Estate (which is 17.6ha in size) which lies on the north side of Leconfield Street. Additionally, two expansion areas are present; these comprise Expansion Site B (Site B) to the north-east and Expansion Site C (Site C) to the south-east of the main site. At the time of survey there was no access to Site B or the allotments located in Site C, therefore Site B and the allotments of Site C were not included within the remit of this survey.

Site A predominantly comprised several industrial / commercial buildings with associated hard standing, roads and amenity grassland. These were surrounded by pockets of habitats that included broadleaved and mixed woodland, plantation / screen planting, scattered trees, scrub, semi-improved neutral grassland, marshy grassland, swamp and tall ruderal vegetation.

Site C is comprised of broadleaved plantation woodland along the cycle route, grassland and scrub habitats, as well as allotments and areas of hardstanding.

1.3 DEVELOPMENT PROPOSALS

Outline planning permission is sought for light industrial-led mixed-use development on the existing Leconfield Industrial Estate and adjacent land parcels to the north and east at Cleator Moor. Quantum, use, scale and access are sought for approval with all other matters reserved. The description of the proposed development is as follows:

"Provision of 44,350 sqm (GEA) floorspace for light industrial, general industrial and storage & distribution (Class E(g),B2, B8), Hotel (Class C1) and Student Accommodation (Sui Generis) with ancillary food/beverage (Class E(b)), education and community facility uses (Class F1(a & e)) with internal accesses, parking, service yards, attenuation basins, electricity substations and associated infrastructure, earthworks and landscaping."

1.4 PURPOSE OF THE REPORT

The objectives of this assessment are to:

- Identify all areas of invasive species on-site at the time of survey and in the immediate surroundings of the site.
- Consider the source of these invasive plant species;
- Consider vectors on and off the site that could allow these species to spread; and
- Provide species-specific, preliminary advice on:
    - The legal implications of the presence of any invasive species on site; and
    - Potential eradication/management options available.

Please note: This report shall indicate potential management options only. It does not seek to recommend any specific treatment strategy to be adopted or imply what treatment option(s) would be most successful. A specialist contractor will need to be employed to design a treatment strategy for the site with reference to the project plans, timescales and other constraints.

LEGISLATION

The Wildlife & Countryside Act 1981 (as amended) is the principal mechanism for the legislative protection of wildlife in the UK. Since it was first introduced, the W&CA has been amended several times.

Part 14 of the W&CA makes it unlawful to plant or otherwise cause to grow in the wild any plant which is listed in Part II of Schedule 9. Part 14 of the W&CA states that '*if any person plants or otherwise causes to grow in the wild, plants which are included in Part II of Schedule 9, he shall be guilty of an offence* '. The W&CA also states that persons must take all reasonable steps and must exercise due diligence to avoid committing an offence. It is not an offence to have plants listed under Schedule 9 on your land. It is an offence to cause the spread of these plants to new areas.

The relevant species listed on Schedule 9 of the W&CA are Hollyberry cotoneaster *Cotoneaster bullatus*, Wall cotoneaster *Cotoneaster horizontalis*, Montbretia *Crocosmia x crocosmiiflora,* Indian (Himalayan) balsam *Impatiens glandulifera* and Japanese knotweed *Reynoutria japonica*. Table 1 lists all plant species on Schedule 9.

Table 1: Plant Species Listed on Schedule 9 of the W&CA

Invasive Species Listed in Relevant Legislation			
Australian swamp stonecrop or New Zealand pygmyweed	*Crassula helmsii*	Japanese rose	*Rosa rugosa*
Californian red seaweed	*Pikea californica*	Japanese seaweed	*Sargassum muticum*
Curly waterweed	*Lagarosiphon major*	Laver seaweeds (except native species)	*Porphyra* spp
Duck potato	*Sagittaria latifolia*	Parrot's-feather	*Myriophyllum aquaticum*
Entire-leaved cotoneaster	*Cotoneaster integrifolius*	Perfoliate alexanders	*Smyrnium perfoliatum*
False Virginia creeper	*Parthenocissus inserta*	Pontic rhododendron	*Rhododendron ponticum*
Fanwort or Carolina water-shield	*Cabomba caroliniana*	Purple dewplant	*Disphyma crassifolium*
Few-flowered garlic	*Allium paradoxum*	Red algae	*Grateloupia luxurians*
Floating pennywort	*Hydrocotyle ranunculoides*	Rhododendron	*Rhododendron ponticum* × *Rhododendron maximum*
Floating water primrose	*Ludwigia peploides*	Small-leaved cotoneaster	*Cotoneaster microphyllus*
Giant hogweed	*Heracleum mantegazzianum*	Three-cornered garlic	*Allium triquetrum*
Giant kelp	*Macrocystis* spp.	Variegated yellow archangel	*Lamiastrum galeobdolon* subsp. *argentatum*
Giant knotweed	*Reynoutira (Fallopia) sachalinensis*	Virginia creeper	*Parthenocissus quinquefolia*
Giant rhubarb	*Gunnera tinctoria*	Wakame	*Undaria pinnatifida*
Giant salvinia	*Salvinia molesta*	Wall cotoneaster	*Cotoneaster horizontalis*
Green seafingers	*Codium fragile*	Water fern	*Azolla filiculoides*
Himalayan cotoneaster	*Cotoneaster simonsii*	Water hyacinth	*Eichhornia crassipes*

Hollyberry cotoneaster	*Cotoneaster bullatus*	Water lettuce	*Pistia stratiotes*
Hooked asparagus seaweed	*Asparagopsis armata*	Water primrose	*Ludwigia grandiflora*
Hottentot fig	*Carpobrotus edulis*	Water primrose	*Ludwigia uruguayensis*
Hybrid knotweed	*Reynoutira (Fallopia) japonica × sachalinensis*	Waterweeds	*Elodea* spp.
Indian (Himalayan) balsam	*Impatiens glandulifera*	Yellow azalea	*Rhododendron luteum*
Japanese knotweed	*Reynoutria japonica*		

The Environmental Protection Act 1990 classifies soil and other waste containing viable propagules of invasive non-native plant species as controlled waste. This waste must be disposed of in accordance with the duty of care outlined in section 34 of the Act (Environmental Protection 'Duty of Care' Regulations 1991).

Any invasive species that have already been treated by certain toxic herbicides classified as hazardous will also fall under the Hazardous Waste Regulations 2005. These provisions mean that if these species occur on a site proposed for development or other work which may disturb the ground, control of these species is likely to be required. In normal circumstances it is important to eradicate invasive species in advance of commencement of development works to prevent spread these plants.

METHODOLOGY

3.1 DESK STUDY

3.1.1 Previous Reports

An extended Phase 1 habitat survey was completed for the site in November 2019:

- WYG (2020). Leconfield Industrial Estate Ecological Appraisal

An update Phase 1 Habitat Survey was undertaken in 2021:

- Tetra Tech (2021). Copeland Site CM084 (HA08) Leconfield Extension Site Inspection Report

Other relevant reports included:

- Elliott Environmental Surveyors (2014), Preliminary Environmental Risk Assessment for Leconfield Industrial Estate Cleator Moor Cumbria

The above reports were reviewed as part of this assessment.

3.1.2 Local Ecological Records Centre

Information was requested from the Cumbria Biodiversity Data Centre (CBDC) for information on any invasive species records within 2 km of the site.

3.2 FIELD SURVEYS

A field survey was completed by Tetra Tech Assistant Ecologist Elizabeth Wilcox on 28th June 2021. Sites A and C (excluding area of allotments to the south), and where possible a 50m surrounding buffer (hereafter referred to as the 'survey area'), was thoroughly searched for evidence of any invasive species listed in relevant legislation or considered to be invasive/non-native locally. Where present larger stands were mapped onto field maps of the site. Individual plants and/or smaller stands were mapped using a smartphone-based mobile GIS application.

During incidental ecological surveys of the site, additional areas of invasive species were noted and have been referenced in this report.

3.3 LIMITATIONS

The optimal period to undertake a survey for invasive flora is April to September inclusive; during which time, the key invasive species noted in Section 2.0 are most likely to visible and identifiable. The survey was completed in early June 2021 which is inside the optimal survey window and therefore is not considered to be a limitation to the accurate assessment of the presence and distribution of invasive species across the site.

Where possible, a 50m buffer from the site boundary was included within the survey area. It should be noted that, due to land access restrictions, it was not possible to survey the entire CMIQ site. Site B and the allotments located in Site C of the proposed site plan were not surveyed due to access restrictions. It is possible that some invasive species present within the site may have been missed and therefore there is the risk that if species were missed, these may encroach into the site in the future. It is recommended that prior to clearance these areas of site are thoroughly searched to determine presence/ likely absence of invasive and non-native species.

Please note, site activities, such as site preparation, construction work, vehicular and pedestrian movements, as well as vectors within the wider landscape, such as the presence of active roads, railways, watercourses and footpaths, may act to spread invasive plant species (e.g. via dispersal of viable seeds and rhizomes etc.).

The details of this report will remain valid for a period of **two years** from the date of the survey, after which the validity of this assessment should be reviewed to determine whether further updates are necessary. Note that the preliminary advice within this report should be reviewed (and reassessed if necessary) should there be/are any changes to the red line boundary or development proposals which this report was based on.

RESULTS

4.1 OVERVIEW

Five plant species listed on Schedule 9 of the W&CA were recorded within the survey area during the survey:

- Japanese knotweed *Reynoutria* (*Fallopia) japonica*;
- Montbretia *Crocosmia x crocosmiiflora;*
- Himalayan balsam *Impatiens glandulifera;*
- Hollyberry cotoneaster *Cotoneaster bullatus*; and
- Wall cotoneaster *Cotoneaster horizontalis.*

The locations of these species are shown in Figure 2 and further detail is provided under the headings below.

4.2 JAPANESE KNOTWEED

The LERC returned 10 records of Japanese Knotweed within 2 km of the site boundary. The closest was located 1 km southwest of the site.

The Phase 1 habitat report recorded the presence of Japanese knotweed along the southwest boundary of Site A in the broad-leaved woodland area (see Figure 2). Three additional stands of Japanese knotweed were identified at the same location during the INNS survey (Target Note 1, Appendix B). The stands were noted as present on the bank with the potential to spread further into the woodland. During incidental ecological surveys three isolated patches of Japanese knotweed were recorded within the boundary of Site C in the east, west and southern border of the site. An area of bare ground was also noted during surveys where possible herbicidal spray control had been implemented on the southwest border of Site A. All locations are shown in Figure 2.

4.3 MONTBRETIA

The LERC returned no records of Montbretia within 2 km of the site boundary.

Eight areas of montbretia were noted during the INNS survey and incidental ecological surveys (Target note 2, Appendix B). Four of these were found to the southwest of Site A, close to the border in the woodland area and found spread amongst other flora. There are several stands located in this area and spreading down the slope. Several plants were recorded surrounding the building located to the west of Site A. Another individual recording of montbretia was located in the grassland northwest of Site A. See Figure 2.

4.4 HIMALAYAN BLASAM

The LERC returned one record of Himalayan Balsam within 2 km of the site boundary, located 2 km southeast.

Two areas of Himalayan balsam were noted during incidental ecological surveys of the site (Target note 3, Appendix B). The two records were found at separate points along the northwest border in the mixed woodland area and were noted as extensive stands. See Figure 2.

4.5 COTONEASTER SPP.

The LERC returned no records of Cotoneaster species within 2 km of the site boundary.

Two invasive species of cotoneaster were recorded on site, hollyberry cotoneaster and wall cotoneaster (Target notes 4 and 5, Appendix B).

During the Phase 1 habitat survey (Tetra Tech, 2021) cotoneaster species were noted as single stands amongst the grassland surrounding buildings to the north of Site A. During additional ecological surveys a single strand of cotoneaster species was also identified to the west of Site A near a building. During the INNS survey one further recording of cotoneaster species was identified in single stands located centre south in the woodland (Site A). See Figure 2 for details.

MANAGEMENT OF INVASIVE NON-NATIVE SPECIES

5.1 RECOMENDED WORKING PRACTICES TO PREVENT FURTHER SPREAD

All invasive species on site should be clearly marked to limit the potential for accidental spread during day-to-day operation of the site, including any investigative surveys that may be required to support the development proposals (e.g. ground investigations):

- High visibility tape or netting should be erected around all Japanese knotweed stands, wherever possible to 7m from the outer edge of the stand in all directions.
- Where practicable, other INNS should be marked in the same way as Japanese knotweed, where possible with an exclusion zone of 3m from the outer edge of the stand/plant. However, it might be more practical to mark the exclusion zones with high visibility line paint, due to the number of plants present.

All operatives and consultants working on the site should be provided with a toolbox talk provided by an invasive species contractor, which highlights the locations of invasive non-native species on the site and describes the strategy used for marking them.

The following general guidelines should be followed during any works on site to further limit the potential for spread:

- Do not use vehicles within the delineated buffer zones, as Japanese knotweed rhizome fragments and/or soil contaminated with cotoneaster seeds can become lodged within tracks or tyre tread. Plastic sheeting and boarding can be put down if vehicles or personnel need to access or track over affected areas. However, any boards or sheeting must either be cleaned and/or disposed of afterwards; and
- Limit access to treatment areas to treatment operatives only. Wash-down areas should be provided to clean boots and tools as soon as contractors leave this area. This will stop rhizome/seed-infested soil being moved across the site and outside it on operative's boots or tools.

To enable the development to take place, all invasive species must be eradicated from the site prior to the main ground works taking place as there is a high risk that plant propagules may be spread or incorrectly disposed of during this phase of works.

ERRADICATION OPTIONS

6.1 GENERAL BIOSECURITY MEASURES

Whichever method is chosen as a method of eradication, measures for continued prevention of spread and a monitoring programme to check for further growth **must be implemented.** Good on-site biosecurity practices **during** eradication should include:

- Designated haulage routes must be established and, if spoil containing Japanese knotweed fragments is being moved around the site, ideally lined with root barrier membrane and covered with a thick layer of sand and protective layer of hardcore. The level of protection should be dependent upon the ground that is being traversed – i.e. an un-surfaced track will require greater protection than an existing road.
- An appropriate number of vehicle wash down areas, lined in the same manner as the haulage route, should be established in a designated area that can contain the spread of any invasive plant material.
- Vehicles and other equipment must be thoroughly cleaned before being used in uncontaminated areas. Cleaning must be undertaken in a designated wash down area (or more than one if necessary to prevent spread across the site).
- All material resulting from vehicle wash-down must be collected and disposed of at a landfill site which is licences to receive Japanese knotweed waste.
- Detailed records of all control measures should be kept and passed on to all future site owners/managers.

6.2 JAPANESE KNOTWEED

The stands of Japanese knotweed are located adjacent to public footpaths and access areas however are not in direct impact zones. Due to the urban nature of Sites A and C with close proximity to areas of public access it is considered that the risk of spread of Japanese knotweed through uncontrolled disturbing activities such as the use of motocross bikes or four-wheel drive vehicles is moderate.

Table 2 outlines management options which could be implemented to control Japanese knotweed at the site and to allow the proposed redevelopment to be undertaken in accordance with legislation (Environment Agency, 2013). It is common to select a range of different techniques within the same site to fully eradicate the plant. In the case of this site, five options are considered which are detailed below. Other methods may be applicable for this site; therefore, it is highly recommended that a specialist contractor be employed to develop a bespoke treatment strategy for the site.

Table 2: Summary of Management Options for Japanese Knotweed

Option	Method	Detail
Option 1	**Chemical Control**	Spraying /stem injection/weed wiping with herbicide *in situ*. Often the cheapest and most environmentally friendly method; however, also the slowest method as **this may take several growing seasons** before the Japanese knotweed is successfully eradicated and the rhizomes show no further sign of life.
Option 2	**Excavation & Landfill**	Excavation of all spoil up to 7m laterally and 5m beneath each knotweed stand and transportation to a licensed off site landfill. This is a good option if the practicality of chemical control is limited by a short development timeframe. However, **this**

		option can be very expensive due if high volume of spoil that needs to be disposed of. Excavation may require soil sampling, the results of which need to be presented to the licensed landfill operator prior to acceptance.
Option 3	**Excavation & Burial**	Excavation of all spoil affected by knotweed (as above) and burial 5m below the final ground level on site and capping - dependant on final site levels. Requires a suitable on-site location that will not be disturbed in the future.
Option 4	**Root Barrier techniques**	A root barrier is a membrane which prevents Japanese knotweed roots penetrating. Any new construction over areas presently infested with Japanese knotweed should ideally be protected by a root barrier membrane to prevent future damage to foundations.
Option 5	**Excavation & Bund**	Creation of an on-site waste management area (e.g. a bunded compound), to which all affected spoil is transported (following excavation, as above) and subsequently treated with herbicide. This option allows immediate removal of knotweed contamination with treatment taking place on site, but outside the development area. This option requires suitable areas for storing the knotweed that will not be disturbed in the medium term.

The sections below outline several methods of Japanese knotweed control all of which could be utilised on the site, either alone or in combination. It is recommended that any new construction over areas presently contaminated with Japanese knotweed, should ideally be protected by a root barrier membrane to prevent future damage to foundations. This applies to all areas treated with several applications of herbicide and subsequently removed to a sealed 'cell'. This precaution is recommended because Japanese knotweed rhizomes remain potentially viable for over 20 years and a small fragment may produce a new plant.

6.2.1 Option 1 – Chemical Control

Chemical treatment of Japanese knotweed on-site is often a preferable method of eradication as it reduces the risk of further spread by transportation and is often the least expensive management technique. Herbicides can either be sprayed using a knapsack sprayer or injected directly into the stem. Injecting is more accurate, specifically targeting individual Japanese knotweed stems, and lessening the potential impact on surrounding vegetation through spray drift. Stem injection has the disadvantage of being labour-intensive and time-consuming. Use of particular herbicides alongside watercourses is regulated and operatives employed to eradicate the Japanese knotweed must hold a spraying licence. Chemical control *in-situ* is a long-term approach, usually requiring between 2 and 5 years of bi-annual treatments before the site can be deemed clear of Japanese knotweed by a qualified Ecological Clerk of Works.

Application of glyphosate, a non-persistent herbicide, is advised particularly if the land is to be landscaped afterwards, or removal of Japanese knotweed infested soil may be required at a later date. Spraying of herbicides should not take place when wind conditions could cause spread further than the intended. The best time to apply glyphosate would be late June/July when the growth is at its peak, and spraying can continue until October.

Spraying can be more effective if the old, dried and treated stems are removed and burnt on site before new growth appears, and the top layer of soil disturbed and rhizomes broken up to promote vigorous growth of new shoots, which will then be treated more effectively by the herbicide. Using

equipment to break up rhizomes can increase the risk that rhizome material may be transported elsewhere on, or off site; therefore, all equipment needs to be carefully cleaned before leaving the contaminated area. In addition, burning of the dried material would involve notifying the Environment Agency at least a week in advance (Environment Agency, 2007). Generally, it is best to apply repeated applications of herbicide to weaken the plant in situ before moving any plant material to other parts of the site, as this reduces the risk of spread to unaffected areas.

6.2.2 Option 2 – Excavation & Landfill

The method involves digging up of all plant and contaminated spoil. This requires an excavation extending at least 7m laterally from the outside edge of the stand/plant stems to a depth of 5m below the ground surface due to the potential for rhizome infestation. To minimise the amount of waste generated, a Clerk of Works experienced in identifying Japanese knotweed rhizomes can be employed to inspect the excavations. As outlined in Section 0, the resultant waste is classified as 'controlled waste' and would have to be transported to a licensed waste disposal with the carrier taking appropriate precautions to reduce the risk of spillage during transportation.

Removal of contaminated material off site can allow works to progress without the significant delays that can be incurred through chemical control. This approach can be expensive, however, often requiring a large volume of spoil to be transported. Further costs are incurred because the spoil can only be disposed of to a landfill licenced to accept Japanese knotweed contaminated waste (Environmental Protection Act 1990). This method may also require soil sampling, the results of which will need to be presented to the landfill prior to acceptance. If this method is used, all vehicles, machinery and operatives must follow designated haulage routes and be washed-down each time they leave a contaminated area. All material resulting from vehicle wash-downs must also be disposed of at an appropriately licensed landfill.

6.2.3 Option 3 – Excavation & Burial

If the site is large enough to accept the quantity of material excavated, contaminated material can be excavated and buried in another area of the site, preferably after several applications of herbicide, to ensure that there is no regrowth from the already weakened rhizomes and crown material. Again, all vehicles, machinery and operatives must follow designated haulage routes and be washed-down each time they leave a contaminated area. Contaminated material must be buried at least 5m below the final site level and the location of the buried material must be accurately geo-referenced and recorded in site documentation. A root impermeable membrane should be laid over the treated contaminated material before covering this to a depth of 5m with uncontaminated material or topsoil.

6.2.4 Option 4 – Root Barrier Techniques

A root barrier is a membrane which is impenetrable by Japanese knotweed roots. It may be used as above to ensure that there is no regrowth from buried contaminated soil and also to protect foundations, concrete and other structures from root penetration and damage. As the Japanese knotweed rhizomes may remain dormant for at least 20 years, it is important that any structures built over areas of buried contaminated material or previously contaminated land are protected from potential future damage in this way.

It may be possible to make use of a root barrier method whereby all Japanese knotweed contaminated material can be disposed within a void completely lined with sealed root barrier membrane and buried to a depth of at least 2m, to protect from burrowing animals. The area used for this 'cell' formation should be recorded and marked on the site deeds. It is essential to ensure that there will be no requirement to disturb the cell in the future, for example to provide services to the site. Therefore, the land selected for disposal would need to be an area outside the main construction area.

There could potentially be a future problem with underground spread from Japanese knotweed adjacent to the site if these stands aren't controlled. To prevent this, root barriers may be inserted

around the affected boundaries of the site, to a depth of 3m, to prevent lateral spread of Japanese knotweed rhizomes.

Any new construction over areas presently contaminated with Japanese knotweed, should ideally be protected by a root barrier membrane to prevent future damage to foundations. This applies to all areas treated with several applications of herbicide and subsequently removed to a sealed 'cell'. This precaution is recommended because Japanese knotweed rhizomes remain potentially viable for over 20 years and a small fragment may produce a new plant.

6.2.5 Option 5 – Excavation & Bund

Where burial is not an option, this method of treatment allows the contaminated material to be excavated, transported to another area of the site and placed as a shallow bund area typically 0.5m deep for later chemical treatment. The material can be placed within an excavation or raised above ground level. Whichever method is chosen, a root barrier membrane should be used to contain the material. The aim of the bund is to concentrate the rhizome into the upper surface, where it will grow and be controlled by the herbicide, the bund should be no deeper that 1m, preferably no deeper than 0.5m. If the rhizome is buried deep, then it will become dormant inside the bund and regrow when the apparent clean soil us used for landscaping. As before, all vehicles, machinery and operatives must follow designated haulage routes and be washed-down each time they leave a contaminated area.

(Property Care Association, 2014)

6.3 MONTBRETIA

The most effective time to remove Montbretia is just before full flowering occurs in summer. There are two main control measures (Table 3):

Table 3. Summary of Management Options for Montbretia

Option	Method	Detail
Option 1	**Mechanical Control**	Small patches of land dug out by hand/machine. Excavated material should then be removed from site to licensed landfill or buried to a depth pf at least 1m. Mechanical control can be caried out at any time of year but may require follow-up treatments over 2-3 years.
Option 2	**Chemical Control**	Larger infestations can be treated with herbicide when the plants are actively growing. Herbicides must not be used if important native plant species are present or if there is risk of water contamination. Follow-up treatment may be required to deal with re-growth.

6.3.1 Mechanical Control

Small patches can be dug out by hand or with a machine to a depth of 0.3m and 0.3m beyond the patch edge, taking care to remove all the plant material and contaminated soil as any remaining corms will regrow.

Excavated material should be removed from site to licensed landfill as controlled waste, or dealt with on-site in waste management areas or buried to a depth of at least 1m in a sealed membrane. Small pieces of plant material may be spread unintentionally on shoes, equipment and machinery so these must be cleaned before leaving site to prevent further spread.

With care, mechanical removal can be done any time of year as the dead brown leaves and flowering stems are present and recognisable throughout winter.

Mechanical control may require follow-up treatments over 2-3 years to deal with any re-growth by corms or rhizomes.

6.3.2 Chemical Control

Larger infestations can be effectively treated with herbicide at the full leaf stage whilst the plants are actively growing, ensuring all leaves are wetted (e.g. glyphosate (10ml/L) + metsulfuron-methyl 600g/kg (4g/10L) + penetrant).

Follow information on the product labels to explain how and where herbicides should be used. Herbicides should not be used if important native plant populations are present, or where there is a risk of water contamination (usually within 5m of a waterbody).

Chemical control may also require follow-up treatments to deal with any re-growth as it is hard to treat large areas thoroughly.

6.4 HIMALAYAN BALSAM

Cotoneaster species are most likely spread around and off site by natural vectors such as birds eating the berries and dispersing the seeds in their droppings; fly tipped rubbish may also be a vector for cotoneaster species.
Table 4 outlines management options which could be implemented to control invasive Himalayan Balsam at the site.

Table 4. Summary of Management Options for Himalayan Balsam

Option	Method	Detail
Option 1	**Hand Pulling**	Himalayan Balsam can be easily hand pulled due to its very shallow roots. This method is useful for small infestations and in areas of high ecological value. Hand pulling should be carried out in May/June when plants are easily identifiable. Repeat treatments are likely required for 2-3 years.
Option 2	**Cutting/Strimming**	Plant stems should be cut below the first node prior to setting seed to prevent vigorous regrowth. If carried out for two consecutive years control should be achieved.
Option 3	**Herbicidal Control**	Where infestations of large densities are present Himalayan Balsam can be treated through herbicidal control. Herbicide should be applied during periods of active growth prior to flowering. The initial application should ideally be carried out in May/June with subsequent treatments/monitoring likely being required in July/August and September/October. Herbicide application will not kill seeds in the seed bank and monitoring, with follow-up control, must be repeated annually over 2-3 years to eradicate new plants growing in subsequent years, though numbers decrease dramatically each year.
Option 4	**Excavation**	Where immediate removal is required excavation is the most appropriate solution. Following excavation, if possible, contaminated soil should be retained onsite, e.g. stockpiled elsewhere on the site and regrowth treated using one of the previous methods stated above. Soil containing Himalayan Balsam seeds can also be buried at a depth of at least one meter. Burial at this depth is sufficient to prevent regrowth. Where offsite disposal in

		unavoidable, efforts to minimise the amount of waste generated that contains invasive plants, or their seeds and rhizomes are recommended. The Environment Agency will accept the removal of soil as controlled waste

6.4.1 Hand Pulling

Himalayan Balsam can be easily hand pulled as the species has very shallow roots growing to a depth of 10-15cm. This method is particularly useful for smaller infestations and in high ecological value areas where the use of herbicides, or indiscriminate cutting, should be avoided. While hand pulling is time consuming, as other species can be easily avoided, the re-establishment of native vegetation should be facilitated by using this approach.

A gentle tug is usually enough to remove the entire root system. Multiple plants can be pulled simultaneously. Gloves should be worn to avoid injury, including stings from nettles which are often found growing beside Himalayan Balsam.

Hand pulling should ideally commence in May/June when plants can be easily found/identified and they will not have set seed. However, it can be carried out sooner (although identification can be tricky) and there will typically be more plants, as numbers reduce with time due to competition.

Repeat treatments will likely be required for 2-3 years.

Pulled plants should not be placed on soil or in damp areas as they can readily re-root. The plants can be allowed to dry out or composted. Once dried, the remains can be left on site as they reduce to small amounts, if fully desiccated and seedless, disposed of as inert waste, or burnt.

(Property Care Association, 2015)

6.4.2 Cutting/Strimming

As with hand pulling, if the species is cut back prior to setting seed for two consecutive years control should be achieved. In order to prevent vigorous regrowth, plant stems should be cut below the first node, which is often very close to ground level. Cutting below the first node will be much easier once the plants have reached approximately 50cm in height in about May.

Compared to hand pulling, cutting/strimming will likely cause more collateral damage to other, potentially desirable, plant species.

Repeat treatments will likely be required. Plant remains should be dealt with as above.

(Property Care Association, 2015)

6.4.3 Herbicidal control

Where *in situ* physical removal is not feasible, potentially due to stand density/size or location/inaccessibility, the species can be successfully treated with herbicide.

Several herbicides have been shown to be effective at killing Himalayan Balsam and often just one application is sufficient. Nevertheless, re-application in the same season should be planned for, as new growth from seed is likely.

Herbicide application should be carried out during periods of active growth, before flowering but late enough to ensure that germinating seedlings have grown up sufficiently to be adequately covered by the herbicide (50+ cm would be suitable). The initial application should ideally be carried out in May/June with subsequent treatments/monitoring likely being required in July/August and September/October, as above.

Herbicide application could be used as a follow up to hand pulling, e.g. later in the year to deal with any missed plants or regrowth from seed bank.

Due to Himalayan Balsam's preference for habitats near water, this limits herbicide selection to products approved for use near water, e.g. glyphosate based herbicides and certain formulations of 2,4-D Amine.

The herbicide can be applied as a spot treatment to individual plants, using hand- held equipment, or as an overall spray using machine-mounted spray booms. In the latter instance, total weed control of all vegetation will occur, increasing the requirement for revegetation.

Where accessibility is problematic, e.g. river banks, a long lance sprayer is useful. Weed-wiping reduces the risk of damaging surrounding vegetation but is only feasible for relatively small infestations.

Herbicide application will not kill seeds in the seed bank and monitoring, with follow-up control, must be repeated annually over 2-3 years to eradicate new plants growing in subsequent years, though the numbers decrease significantly from one year to the next.

(Property Care Association, 2015)

6.4.4 Excavation

Where immediate eradication is required, for example in a location that is shortly to be developed, the most appropriate solution is likely to be excavation.

Following excavation, if possible, contaminated soil should be retained onsite, e.g. stockpiled elsewhere on the site and regrowth treated as above. This stockpile area should be cordoned off from the rest of the site with appropriate signage put in place. Once control is achieved, the soil will be suitable for use as backfill or in landscaping.

If material is stockpiled, it is very important to monitor and carryout control prior to plants setting seed, or new areas of the site can be infested. Stockpiles should be at least 10 meters from the property boundary.

Arising can also be buried. As per Defra (2013) guidance, soil containing Himalayan Balsam seeds should be buried at a depth of at least one meter. Burial at this depth is sufficient to prevent regrowth. Prior to the burial of invasive plant waste the appropriate authority (e.g., the Environment Agency in England) must be contacted and approval granted. Himalayan balsam seeds do not contain sufficient energy reserves to allow them to germinate and grow up through hard substrates; as such, burial immediately beneath hard standing (e.g. poured concrete) is appropriate.

Where offsite disposal in unavoidable, efforts to minimise the amount of waste generated that contains invasive plants, or their seeds and rhizomes are recommended (Defra, 2013). The Environment Agency will accept the removal of soil as controlled waste from Himalayan balsam infested areas less than the stated limits (6 metres from visible plants and down to 500 mm) if the methodology can be adequately justified. Any contaminated waste that is taken offsite must be taken by a licensed waste carrier and must go to a suitably authorised landfill site (as per the Environmental Protection Act,1990).

An experienced Ecological Clerk of Works should supervise excavation and disposal ensuring that the work is undertaken under controlled conditions and that appropriate health and safety measures are implemented.

(Property Care Association, 2015)

6.5 COTONEASTER

Table 5 outlines management options which could be implemented to control invasive cotoneaster species at the site and to allow remediation and redevelopment/construction work to be undertaken in accordance with legislation are outlined below.

The following options outline some possible methods of eradicating invasive cotoneaster species from the site. A combination of different techniques may be required within the same site to fully eradicate the plant (Bond, 2003). In the case of this site, three options are considered which are detailed below. Other control methods may be applicable; therefore, it is highly recommended that a specialist contractor be employed to develop a bespoke treatment strategy.

Table 5 Summary of Management Options for Cotoneaster Species

Option	Method	Detail
Option 1	**Mechanical & Landfill**	Excavation of mature bushes and hand pulling seedlings, young plants and individual plants and transportation to a licensed off-site landfill. This can be a relatively expensive method of disposal as plants and rootstocks can only be disposed of at an appropriately licenced landfill site. If removal of rootstocks is not complete, they can re-sprout.
Option 2	**Mechanical & Burned on Site**	Excavation of mature bushes and hand pulling seedlings, young plants and individual plants and burning the arisings on site. This a cheaper method of disposal than landfill, as the material is disposed of on site. If removal of rootstocks is not complete, they can re-sprout.
Option 3	**Chemical Control**	Chemical control of stumps after hand-removal of foliage. Application using a weed wipe or hand-held spray until cut stumps are saturated and completely covered. Once chemical has had sufficient time to reached the root, rootstocks can be more easily dug up and the material burned on site.

As the development is likely to require extensive groundworks, it is recommended that the main method of control is Option 2 *Mechanical and Burned on site*. This will allow the development to proceed without the significant delays that might be encountered if just chemical control is used. As the site is relatively large, burning of the rootstocks is considered a viable option and would avoid the additional cost of landfill. Option 3 *Chemical Control* could be used in combination with Option 2, to control the invasive cotoneaster species.

6.5.1 Option 1 – Mechanical and Landfill

Mature bushes will need to be removed by excavator or, if impractical, hand digging. Seedlings and young plants can be mechanically controlled by hand pulling. Manually removing individual shrubs can help prevent the spread of cotoneaster species, however if removal is incomplete, the rootstocks can regrow. Cut material and excavated rootstocks must be removed to a licensed landfill as controlled waste (Environmental Protection Act, 1990). Cotoneaster spreads mainly by seed therefore, vehicles should be excluded from the immediate vicinity of the bush and a 3m buffer.

The relatively low contamination risk posed by cotoneaster means that even a relatively small excavator could carry out removal of the plants from outside the buffer, without picking up spoil contaminated with cotoneaster seeds on the tracks. The buckets of any machines that have been used to excavate cotoneaster would have to be cleaned before tracking over uncontaminated areas of the site. Should a machine be required to track over areas contaminated with cotoneaster seed, then it

would need to be washed-down each time they leave a contaminated area. All material resulting from vehicle wash-downs must also be disposed of at an appropriately licensed landfill.

All vehicles, machinery and operatives must also follow designated haulage routes when moving around the site, to minimise the risk of spread of cotoneaster.

6.5.2 Option 2 – Mechanical and Burned on Site

A less expensive alternative to removing the waste off site would be to dispose of the waste on site, following excavation as above. This would be best achieved by burning all contaminated material. Burning of the material would involve notifying the Environment Agency (Environment Agency, 2007) at least a week in advance.

6.5.3 Option 3 – Chemical Control

The root system of invasive cotoneaster species can grow rapidly and penetrate extensively into deep crevices and as such the roots systems can be difficult to eradicate. Chemically treating the remaining stumps after cutting may be the most effective method of eradication on rocky sites. The stumps should be treated with herbicide, using a wiping type of herbicide applicator or hand-held spray until they are saturated and completely covered. Larger stumps should be roughed up to expose the bark and be painted / injected with non-residual herbicide. It is considered likely that the herbicide used would be either glyphosate or 2,4-D Amine as these are non-residual herbicides which will allow for subsequent replanting of the site. Stumps and plants sprayed with herbicide should not be cut / dug up until the chemical has had sufficient time to enter the plants circulatory system and reached the crown and roots. Once dug up, the material can then be burned on site.

6.5.4 Long Term Measures

Invasive cotoneaster species are present on site in multiple strands (Figure 2). The possibility of invasive cotoneasters being present in close proximity to the site in addition to on site represents a threat to the long-term success of any treatment programme, due to the risk of re-infestation. Cotoneaster is generally bird-spread and could therefore be transferred to any new areas of landscaping on site, post development. It is recommended that, as the affected land lies within Copeland Brough Council's ownership, it is also included within a management and eradication strategy for cotoneaster. There is also the possibility that further cotoneaster plants are present in areas not surveyed due a lack of access. It is recommended that these areas are thoroughly searched and a co-ordinated approach be taken by all affected landowners (see Section 2.3).

6.5.5 General Biosecurity Measures

Whichever method is chosen as a method of eradication, measures for continued prevention of spread and a monitoring programme to check for further growth **must be implemented.** Good on-site biosecurity practices during eradication should include the same measures set out in Section 6.2 for Japanese knotweed.

Standard procedures to prevent the further spread of non-native, invasive species have been provided. It is advised that permission is sought to fully survey the site surrounding 50m buffer to identify and further presence of invasive and non-native species. Should any presence be recorded species should be incorporated into the development of a management plan.

Whichever method is chosen as a method of eradication, measures for continued prevention of spread and a monitoring programme to check for further growth **must be implemented.** Good on-site biosecurity practices during eradication should be included.

Once an outline construction programme has been drafted a more detailed Invasive Species Management Plan will need to be drawn up taking into account which areas of the site need to be accessed initially and hence are high priority in terms of invasive species eradication. Prior to this it is

important that the areas within the site boundary located in Sites B and C that could not be accessed during the initial survey are fully surveyed to inform the Invasive Species Management Plan once access is available. It is highly recommended that a suitably experienced invasive species contractor is commissioned to provide into the management plan and undertake the subsequent control works. In addition, if possible a coordinated approach of control on invasive species on adjoining landowner's land can be discussed and implemented to prevent re-invasion. If excavation of invasive species is chosen as an option, a suitable experienced Ecological Clerk of Works should be in place to review contractor method statements and oversee the works ensuring all of the control measures set out in the management plan are implemented.

Following treatment, a monitoring programme should be implemented that continues for at least the first year after construction works are complete to ensure no re-growth has occurred. Regrowth should be measured in relation to the invasive species map (Figure 2). All works should be conducted under suitable method statements and detailed records kept of all activities relating to areas where invasive species have been recorded and treated.

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Please note that the legislation which is relevant to this report is not included in the list above, but details are included in Appendix A below.

FIGURES

Figure 1 – Site Location Plan

Figure 2 – Invasive Species Plan

Site Location Plan
CLEATOR MOOR INNOVATION QUARTER

Copeland Borough Council

Legend

Site boundary

Expansion B

Main Site

Expansion C

Notes:

Drawn by: CL
Checked by: GP
Office: Southampton

Figure No. 1
Revision No. A

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Scale 1:5,000 @A3

21 October 2021

NGR: 301752E 515602N

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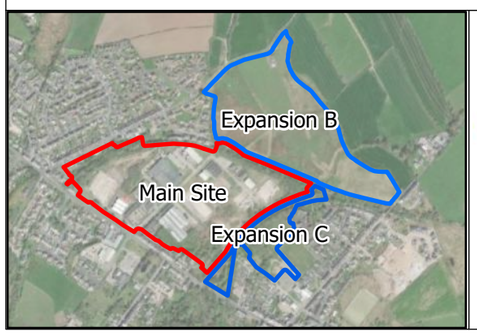

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Invasive Species Plan
CLEATOR MOOR INNOVATION QUARTER

Copeland Borough Council

Expansion B

Main Site

Expansion C

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Legend

Site boundary

INNS survey records

- Cotoneaster
- Hollyberry cotoneaster Cotoneaster bullatus
- Japanese knotweed Reynoutria japonica
- Montbretia Crocosmia x crocosmiiflora

Phase 1 survey records

- Cotoneaster
- Japanese knotweed Reynoutria japonica

Incidentals

- Cotoneaster Cotoneaster horizontalis
- Himalayan balsam Impatiens glandulifera
- Japanese knotweed Reynoutria japonica
- Montbretia Crocosmia x crocosmiiflora

Notes:

Drawn by: CL
Checked by: LB
Office: Southampton

Figure No. 2
Revision No. A

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Scale 1:2,000 @A3

21 October 2021

NGR: 301606E 515467N

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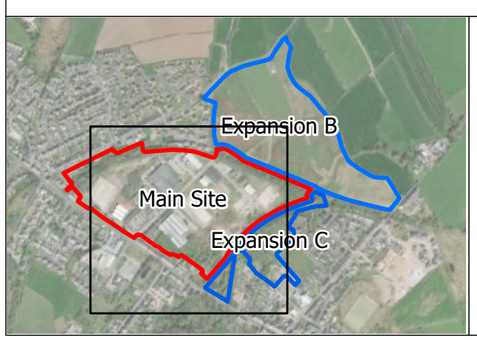

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APPENDIX A – REPORT CONDITIONS

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The report refers, within the limitations stated, to the environment of the site in the context of the surrounding area at the time of the inspections'. Environmental conditions can vary and no warranty is given as to the possibility of changes in the environment of the site and surrounding area at differing times. No investigative method can eliminate the possibility of obtaining partially imprecise, incomplete or not fully representative information. Any monitoring or survey work undertaken as part of the commission will have been subject to limitations, including for example timescale, seasonal and weather-related conditions. Actual environmental conditions are typically more complex and variable than the investigative, predictive and modelling approaches indicate in practice, and the output of such approaches cannot be relied upon as a comprehensive or accurate indicator of future conditions. The "shelf life" of the Report will be determined by a number of factors including; its original purpose, the Client's instructions, passage of time, advances in technology and techniques, changes in legislation etc. and therefore may require future re-assessment.

The whole of the report must be read as other sections of the report may contain information which puts into context the findings in any executive summary.

The performance of environmental protection measures and of buildings and other structures in relation to acoustics, vibration, noise mitigation and other environmental issues is influenced to a large extent by the degree to which the relevant environmental considerations are incorporated into the final design and specifications and the quality of workmanship and compliance with the specifications on site during construction. Tetra Tech accept no liability for issues with performance arising from such factors.

APPENDIX B – TARGET NOTES

Target Note	Description	Photograph
1	Japanese Knotweed Reynoutria japonica Identified on the bund near the fence and spreading down the bank including behind the sycamore tree. Grid reference NY 01536 15370 Also identified on the edge of track with potential to spread into woodland. Grid reference NY 01527 15379 A bare area was identified where Japanese knotweed has been sprayed treated. Some regeneration found, with small plants spread to the bare ground opposite the initial area. Grid reference NY 01522 15381	
2	Montbretia Crocosmia x crocosmiiflora Montbretia had spread within other flora of at least 8 plants. Grid reference NY 01542 15369 Several stands spreading down the slope into woodland area. Grid reference NY 01541 15364 One stand currently not flowering. Grid reference NY 01565 15369 Identified within the woodland. Grid reference NY 01541 15376 Several plants located near building to the west of Site A. Grid reference NY 01360 15601 Several plants located on a pile of soil to the west of Site A. Grid reference: NY 01385 15586 Several plants on mound of refugia to the west of Site A. Grid reference: NY 01415 15580	

3	Himalayan Balsam Impatiens glandulifera Extensive stand located at grid reference NY 01474 15678 Additional strand located at grid reference NY 01435 15665	
4	Cotoneaster Hollyberry *Cotoneaster bullatus* Multiple strands identified located at, grid references: NY 01630 15585, NY 01712 15594. Additional strand identified on the edge of the building located to the west of Site A, grid reference: NY 01412 15578	

5	*Cotoneaster horizontalis* Multiple strands identified located at grid references: NY 01724 15566, NY 01736 15553, NY 01743 15510