Bodenham Lake Island Re-Profiling Method of Work and Environmental Risk Assessment

Prepared for

Herefordshire Wildlife Trust

Prepared by

Leela O'Dea **MSc CEnv C.WEM MCIWEM** **Technical Director & Environmental Consultant**	**Signed & dated**  **10/09/16**

Document Reference: FE160904.1

frog environmental Ltd
Registered Number 9738715 VAT number GB 223170352
Banc y Berllan, Llansadwrn, Llanwrda, Carmarthenshire, SA19 8NA
0845 057 4040 www.frogenvironmental.co.uk info@frogenvironmental.co.uk

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1 INTRODUCTION

1.1 BACKGROUND

This report provides an environmentally sensitive method of work to enable re-profiling of several islands on Bodenham Lake.

The aim of the re-profiling work is to increase the area of reedbed, open gravel and wet grassland within the lake to improve habitat for a wide range of wildlife including otter, invertebrates and birds.

The new island habitats will be visible from the new and existing bird hides and provide exceptional opportunities for visitors to interact with the lake, and view wildlife.

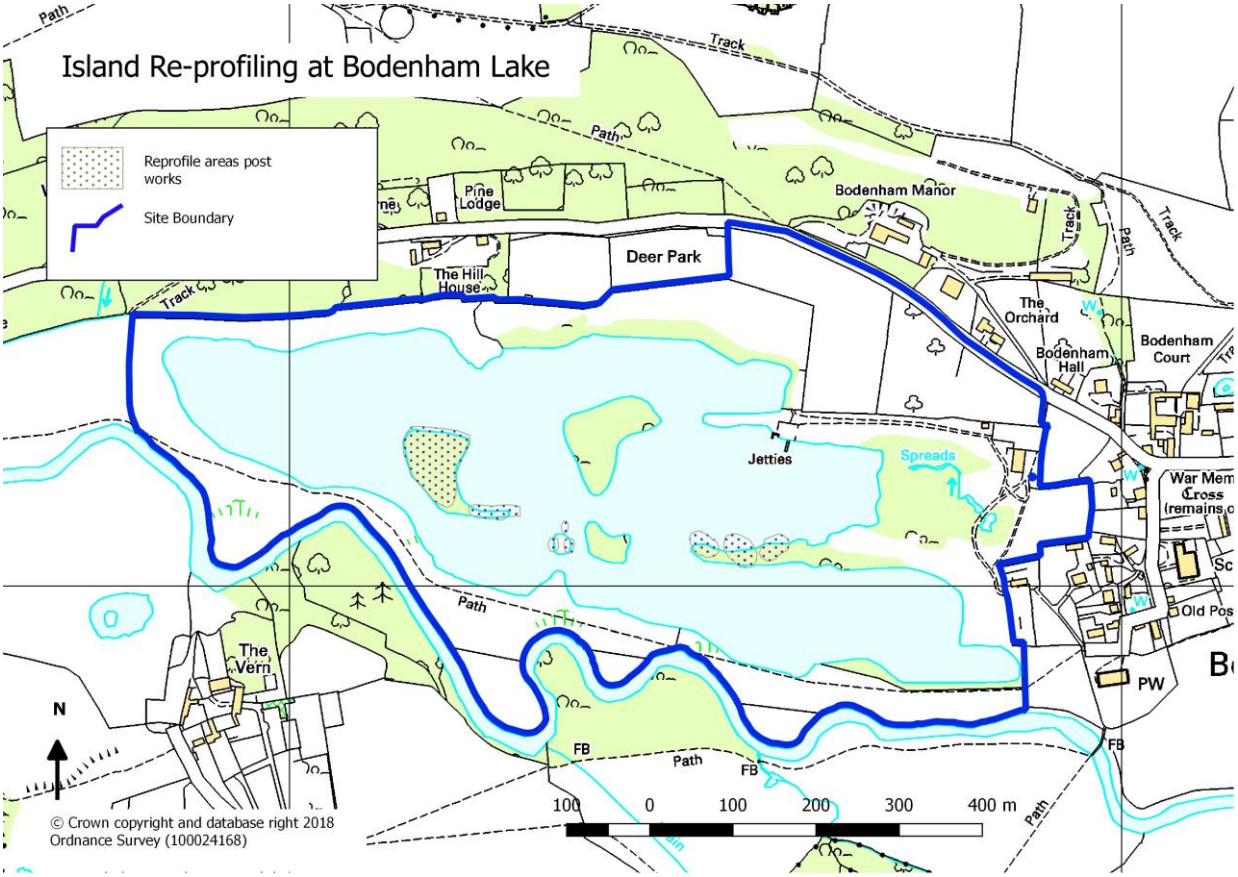

Figure 1: Bodenham Lake island reprofiling overview

The requirement of this report is to undertake an assessment of the existing ecological reports and nature conservation designations to best determine environmental risk and define a method of work that will be least detrimental to the existing flora and fauna as well as offer protection to adjacent habitats whilst adhering to all environmental legislation.

1.2 THE SITE

- Location: Bodenham Lake Nature Reserve, Bodenham, Hereford, HR1 3JT
- Name: Bodenham Lake
- Designations: River Lugg Site of Special Scientific Interest (SSSI) Site Ref 15 PGL and River Wye Special Area Conservation (SAC) SAC EU Code UK0012642
- Map Reference: Ordnance Survey Explorer Map 202 Leominster & Bromyard
- Grid Reference: SO 51911 51179 (Site Centre)
- Area: 44.5 Hectare site with 18.5 Hectare open water
- Area of work: 0.9 Hectare of open water along south and southwest bank

Bodenham lake is an old quarry situated within the flood plain of the River Lugg, a Site of Special Scientific Interest (SSSI) since 1995 and Special Area of Conservation (SAC) since 2005 (Appendix A and B). The lake represents the largest open water in Herefordshire, situated within a 44.5 hectare nature reserve of varied habitat including riverside meadow, scrub, wet woodland and veteran orchard.

The current condition of the River Lugg SSSI as assessed by Natural England in 2010 is Unfavourable Recovering. The habitat encompasses a largely unmodified lowland river channel with abundant growth of crowfoot species and other aquatic macrophytes. The primary features of interest include white-clawed crayfish (*Austropotamobius pallipes*), Otter (*Lutra lutra*), Salmon (*Salmo salar*), Bullhead (*Cottus gobio*) and Twaite Shed (*Alosa fallax*). A number of other fish species including eel (*Anguilla anguilla*), stone loach (*Noemacheilus barbatulus*) and brown trout (*Salmo trutta)* are also present alongside a rich invertebrate flora including pea mussel (*Pisidium tenuilineatum)* and Odonata. Birdlife includes kingfisher (*Alcedo atthis)*, sandmartin (*Riparia riparia*) and common sandpiper (*Actitis hypoleucos)*.

2 ENVIRONMENTAL RISK APPRAISAL

There will be no degradation to the River Lugg SSSI or River Wye SAC as a result of the proposed work providing the following method of work is followed. Appendix C contains the full environmental risk assessment that has been completed following the template of the flood risk permit application.

Appendix D lists the relevant environmental legislation to be considered and applied.

Natural England must be notified of the operations in advance and any necessary assent obtained.

3 METHOD OF WORK

The chosen contractors are responsible for producing their own detailed Risk Assessment and Method Statements (RAMS) for each specific operation. However, they must ensure that they incorporate all the points outlined in the method of work to ensure adequate environmental protection.

3.1 SCOPE OF WORKS

The works specific to the Bodenham Lake project comprises:

- Site mobilisation including the creation of a site compound
- Creating a safe access route using track mats and undertaking tree management where required
- Scrub and tree coppicing on the islands in advance of re-profiling
- Re-profiling of three islands to remove any steep banks and create an extended marginal platform for reed growth and expose a gravel substrate
- Reinstatement works, including any repairs to the access routes
- Demobilisation

3.2 TIMING

The re-profiling operation should be undertaken in the months of September to October 2019. This is essential to minimise environmental risk with respect avoiding the breeding season for nesting birds, amphibians and fish as well as limiting the risk of low dissolved oxygen occurrences.

3.3 KEY PERSONNEL

All key persons must be identified alongside their role and responsibility and contact details. A nominated person will have environmental responsibilities that include but are not limited to:

- Ensure consents are obtained before works commence. Keep copies of the consent including any conditions on site and confirm those conditions have been transposed into the method of work.
- Ensure all persons working on site undertake the appropriate training through the site induction and relevant tool box talks. As a minimum topics will include:
    - Review of environmental risk assessment and method statement
    - Non-conformance, complaints and incident reporting
    - Spill control and spill kits
    - Waste management
    - Water pollution prevention
    - Storage of oils and fuel
- Identify the need for further, specific training.
- Weekly site checks (in the compound, the access route and the work area) of the waste storage facilities to ensure the vessels are intact and labeled, the waste is sorted correctly, no litter is present and the vessels are not overfull.
- Arrange for collection of waste.

- Ensure all waste transfer documentation is completed and copies/records maintained on site, including the waste carrier's licenses.
- Supervise refueling of tanks.
- Check that all oil and fuel is stored appropriately
- Check weekly the drip trays and bunds
- Liaise with statutory authorities and client as required and ensure records of communication (including verbal) are kept. Ensure statutory authorities are always accompanied on site.
- Maintain a record of any complaints, incidents or non-conformances; ensure that any action arising is completed by the assigned person and on time. Liaise with client and environmental support to notify statutory agencies if necessary
- Support environmental and safety monitoring/auditing spot checks.

3.4 SAFETY

All tasks are to be covered by a risk assessment. A point of work risk assessment should happen at the start of each day or new activity/operation and any changes to working methods are to be reassessed, documented and outcome actioned before work continues.

3.4.1 Site inductions and method statement briefings

Prior to commencement of work all site personnel involved in the operation will have received a site induction and a briefing on the method statement. A record of all operatives that undertake the induction must be kept.

Toolbox talks will be given to cover the changing aspects of the works e.g. wet weather work and working near to water as well as specific environmental talks.

3.4.2 PPE

All persons on site will be required to wear hard hat, safety boot, gloves and high visibility top as a minimum safety requirement. Any person working on the waters edge including the excavator operator will wear life jackets. Clothing will be suitable for the weather conditions such as weatherproof clothing.

3.4.3 Working in and around water specific risk

Working with contaminated wet material can increase the risk of contracting leptospirosis (Weil 's disease). Site staff will be made aware of the symptoms at the induction and how to minimise the risk of contracting the disease.

Waterproof gloves/or glove liners to be worn.

Weather and water levels to be monitored by the contracting supervisor and reviewed if they deteriorate, before works continue.

3.5 WELFARE AND SITE ACCESS

All works will comply with Construction Design Management (CDM) regulations. The site accommodation will consist of an office suitable for holding daily meetings with staff and the client, canteen unit, drying room and toilet block with waste tank. This welfare will be positioned on the existing hard standing to the south of the main car park Bodenham Lake Nature Reserve, Bodenham, Hereford, HR1 3JT as shown on the map.

All units will be delivered on HIAB and lifted into place by the hire company. The site manager will check the Hire Company's Risk Assessment and lifting equipment certification.

All services including wastewater, potable water and electric for the welfare and office units will need to be bought on and off site, this will remain the responsibility of the contractor.

A hybrid generator such as a firefly, with the ability to operate silently i.e. battery powered in the hours of darkness must be specified to avoid unnecessary disturbance on site.

Ensure all generators, pumps and compressors are CE marked and marked with the sound power level.

No shouting or loud radios on site.

Delivery of plant and equipment will be to the compound at Bodenham Lake Nature Reserve, Bodenham, Hereford, HR1 3JT (point A on figure 2). All deliveries must be pre- arranged with the site manager, met and escorted into the site. The gates will be kept locked when not in use and all vehicles reversing will be supervised by a banksman. Within the reserve all delivery vehicles will obey the site speed limit of 10mph to the area of site they need to deliver to / collect from. All plant will be locked / secured when not in use.

Appropriate access routes will be agreed with all parties at the pre-commencement meeting. Herefordshire Wildlife Trust will walk the route with the contractor in advance of moving machinery to identify any mature or veteran trees on the route and ensure that all areas of land are sufficiently dry.

Track mats installed in any areas that are waterlogged, especially important if these are close to trees which are not being removed as part of the works, to prevent compaction.

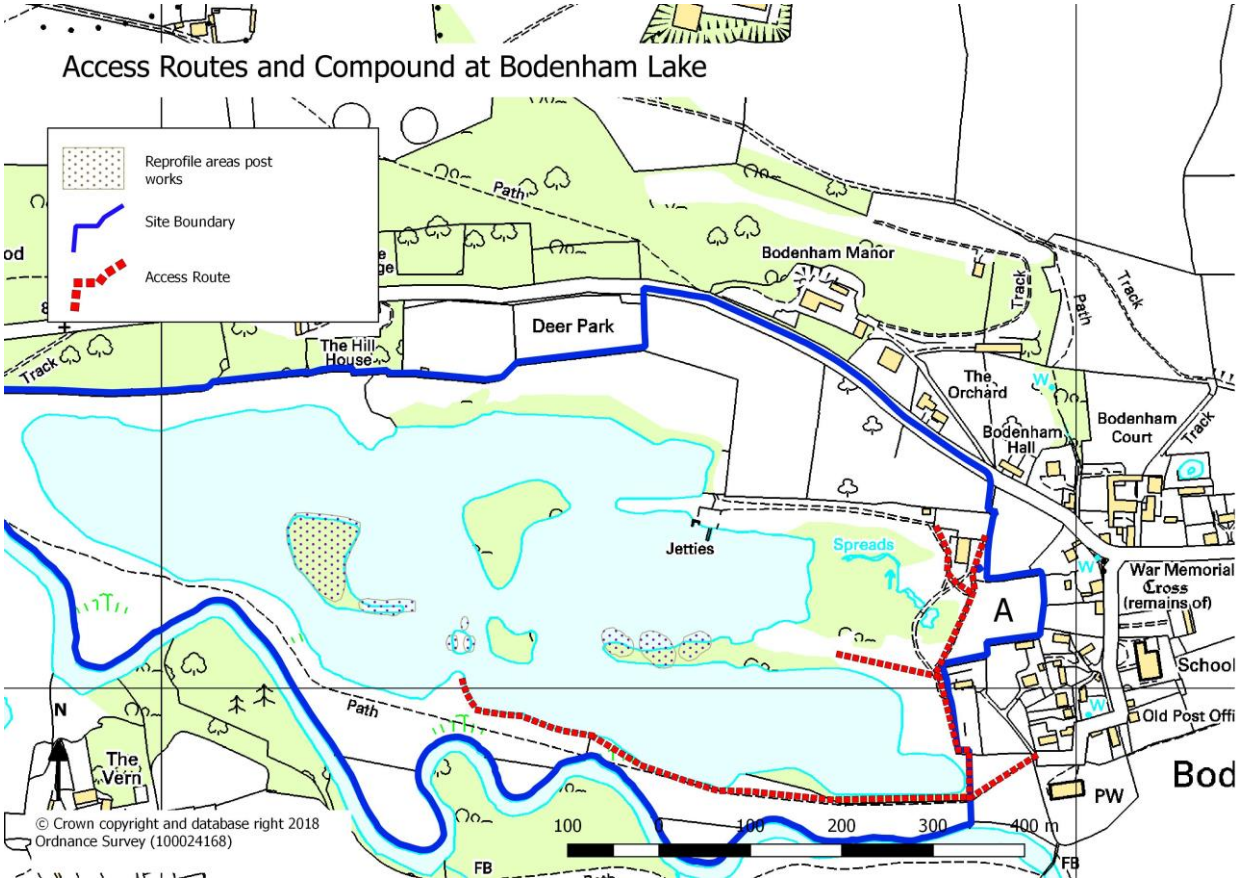

Figure 2: Access route to site compound (A) and work locations

3.6 FUEL MANAGEMENT

Use biodegradable oils (e.g. Panolin) where practicable although be aware that these still cause pollution should they be spilt.

All fuel will be stored in a secure, double-bunded bowser located in the main site compound, at least 10m away from surface waters and 50m away from boreholes or wells. It has been confirmed that the compound is greater than 50m away from boreholes or wells (figure 3). Fuels must not be stored at the work area.

Ensure all primary fuel containers are stored in a secondary container that is bunded, impermeable and has a capacity to hold more than either 25% of the total volume of all the primary containers it holds or 110% of the volume of the largest container; whichever is greater.

Ensure all pipes, funnels, draw pipes, gauges are enclosed within the secondary container. Ensure all primary containers are clearly labeled and strong enough not to burst or leak under normal circumstances. Ensure all oils are securely locked away when not in use.

Check all fueling hoses / valves before use for signs of damage.

Refueling to be carried out by competent staff at the compound, except for bankside machines. NEVER leave a fueling operation unattended. Ensure gauges (if used) have automatic stops.

Bankside based refueling, only the minimum fuel required will be carried in sealed jerry cans. These are to be stored upright and on a bund or drip tray when not in use.

Use a funnel and drip dray when refueling with a jerry can to reduce possible spillage. Use appropriate absorbents to mop up any oil collected in drip trays.

Any oil holding machinery/pumps will be sat over a drip tray/plant nappy.

Daily maintenance of machines by the operator will be carried out on site; this will check hydraulic hoses and other oil-bearing parts, records of their finding will be kept in the site file. Spent grease cartridges and oil containers will be collected/stored at the compound and disposed of as hazardous waste.

If a spill occurs immediately stop work, contain the spill and prevent further spillage.

Report all spills to the environmental rep on site so that they may escalate the cleanup and notification.

Spill kits, oil booms and soft drip trays are kept on all machinery, at the site compound and a specific 120ltr kit on the bowser.

Adler and Allen or other emergency spill response company must be contacted to offer emergency spill response. Ensure lists of emergency numbers are easily accessible to all staff in the case of spills and general environmental emergencies.

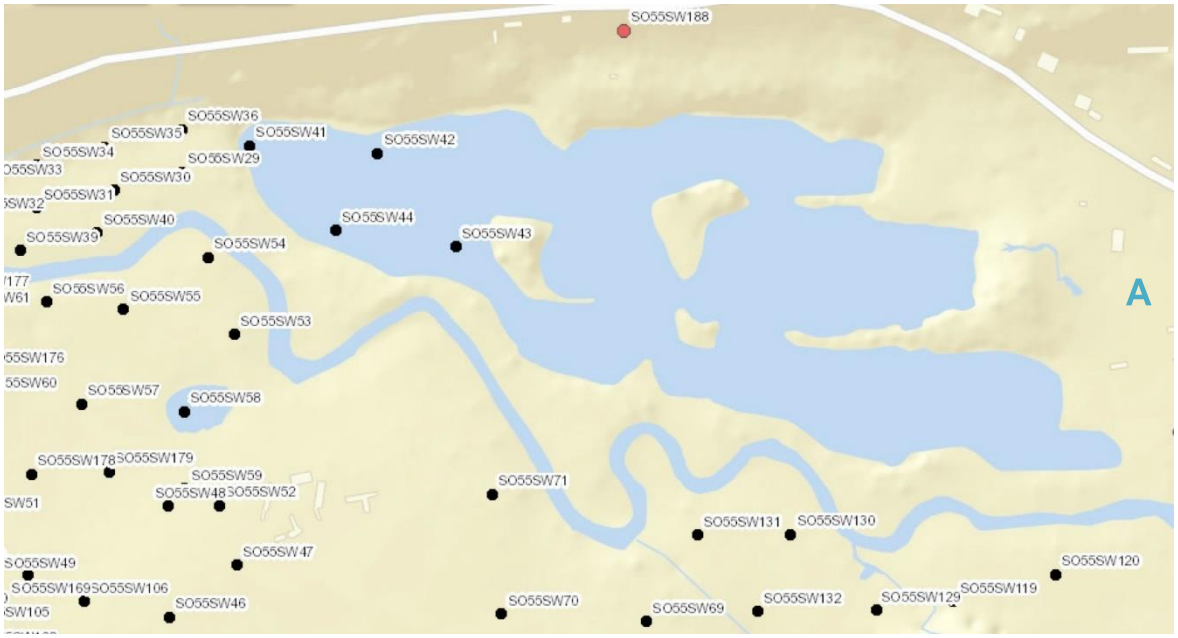

Figure 3: Bodenham Lake Borehole and Well Data (A is main compound)

3.7 GENERAL WASTE

Ensure the waste hierarchy is followed (in order): reduce, re-use, recycle/compost, energy recovery and disposal. All waste collection facilities will be located at the main site compound.

Only use licensed waste carriers and permitted receiving sites. Obtain all relevant waste carrier registration certificates, waste management licenses/exemption certificates and associated regulator validity checks

Complete a Waste Transfer Note (WTN) for each waste stream. Keep copies of all WTN and record European Waste Codes (EWC) on all waste transfer paperwork.

Ensure all waste streams are pre-treated by physical separation into different containment vessels to ensure ease of recycling. Each container/skip must be clearly labeled with the waste content and EWC. A responsible person must check the waste daily to ensure appropriate segregation and volume.

Use suitable storage facilities for each waste type e.g. skips that do not have any damage so as to leak and covers waste to prevent water ingress. Do Not accept damaged skips.

Locate skips/waste vessels in the site compound away from sensitive receptors

Hazardous materials must be collected and stored separately such as used oil adsorbents, these may be transported to the main compound in a double skin thick plastic bag but then transferred into a sealed container. A specialist contractor should be used to remove hazardous waste and a consignment note that includes an accurate EWC must be kept for the disposal of these wastes. Register as a hazardous waste producer if you hold or produce greater than 500kg.

Banned wastes will not be disposed to landfill these include: tyres and liquids, instead alternative disposal route will be sought and appropriate paperwork completed and maintained in the site records.

Timber from the coppicing of willow and alder will be produced at the island re-profiling sites. This timber will be stacked on site in a location agreed by Herefordshire Wildlife Trust to ensure that it can be used to create habitat for reptiles, amphibians, and for artificial otter holts. This will mitigate potential disturbance from the earth moving operation. Some willow timber will be retained for future use as revetments, any remaining timber will either be chipped and removed off site or burnt.

3.8 MOBILISATION

The excavators (13 ton long reach- bio oils and 2.5 ton) will be delivered by a low loader to the drop off point and then tracked into position. Depending on water depth at the time of the works, a floating pontoon will be used to transport a lighter weight excavator to the western island.

A Rigid Inflatable Boat (RIB) will be delivered by a trailer to the drop off point and then launched into the water at the sailing club.

Any vegetation management to facilitate the access will be agreed with all parties in advance. Track mats or other ground protection measures will be implemented as necessary and tree roots avoided. Any additional work areas/compounds should be agreed with all parties appropriately secured and closed to the public for the duration of the work. These will be required to reduce environmental risk in tracking the machinery back and forth to the main site compound.

Should flood risk increase then all machinery must be removed to the main site compound away from the river.

3.9 TREE MANAGEMENT AND SCRUB CLEARANCE

Willow and Alder trees and shrubs on the islands will be coppiced. These trees are not suitable for roosting bats, as they have grown post lake creation and are therefore too young to have suitable crevices from decay and loose bark.

If necessary to ensure the safe access of machinery onto site, a suitably qualified and experienced arboriculturalist will be engaged to selectively prune or crown lift trees.

The arborist must have a bat licence or work with a suitably qualified member of Herefordshire Wildlife Trust to check each tree prior to management for potential bat roosts.

If a bat is discovered during the tree management work then operations must stop immediately and the site made safe. Advice should be sought from Herefordshire Wildlife Trust bat expert and work should proceed following specific instruction.

BS3998:2010 recommendations for tree work should be followed and appropriate cutting techniques used to protect the trees health and vigour.

Timber will be stacked on site in a location agreed by Herefordshire Wildlife Trust to ensure that it can be used as a habitat gain and to mitigate potential disturbance from the earth moving operation.

3.10 RE-PROFILING

The operation will take place so as to minimise spreading the invasive plant Australian Stonecrop (*Crassula helmsii*) on site.

The excavator should remain on top of the bank at all times to ensure that the tracks do not become contaminated with Crassula helmsii. If the machine does have to track into the margin then the biosecurity process must be adhered to. The excavator bucket must be cleaned out thoroughly at each work site before moving to the next.

A silt curtain will be placed beyond the re-profiling works to prevent the dispersion of turbid water within the lake. The silt curtain will be installed from the water using a powered RIB. The RIB will be handled by a trained person and driven in a manner that does not create wash.

The long reach excavator will be positioned on the bank. The operator will be given the instruction to profile the steep bank edges, cutting into the uppermost bank to create a more gradual slope to the waterline. The material from the bank will be redistributed a to create shallow water and new platforms on which plants may establish.

The newly created margins islands will vary in height to create a diversity of habitats.

No additional material will be bought onto site. No earth bunds or storage piles will be created at any point of the work, even if they are for latter redistribution.

If Otter (*Lutra lutra*) are encountered during the work, stop immediately and allow them to pass the works area safely. Do not approach the Otter. Report any sightings to Herefordshire Wildlife Trust.

If crayfish are encountered during the work then confirmation of the species must be sought immediately from environmental support of Herefordshire Wildlife Trust and advice taken to determine the how best to manage the animal.

Do not track the excavators towards the river or beyond the extent of the working areas.

If during rain events it is observed that silt is being carried in the overland flow towards the river identify areas where this is happening and using a natural silt wattle block the route of water. This will encourage the water to slow and deposit sediment, whilst the natural wood fill will help trap the fines.

3.10.1 Oxygen monitoring

There will be low oxygen levels in the immediate area of the re-profiling operation however as the reservoir is a large body of water fish will migrate away from the disturbance. Staff will however be alert for any fish in distress and work will stop whilst advice is sought.

Most lakes by their nature are slow flowing or have no flow and as such dissolved oxygen (DO) levels have been known to decrease to critically low concentrations of <2 mg l^{-1} from silt disturbance activities. These critically low levels have been known to cause distressed fish, fish mortalities and may also give rise to noxious smells. This is undesirable both aesthetically and environmentally as it has the propensity to endanger waterway biodiversity.

It will be important to establish the baseline DO in advance of implementing water based activities. This will establish a DO threshold appropriate for the lake similar to those in table 1.

Staff must be training in the use of the DO meter; an optical meter offers the simplest use on site. They measure in both percentage saturation (% sat) and concentration in milligrams per litre (mg l^{-1}). Calibration is conducted in % sat, but readings will be taken in mg l^{-1} to make it easier to interpret the results against the limits set under the Freshwater Fisheries Directive (FFD).

- DO meters should be calibrated in the field before use.
- Readings should be taken once the meter has stabilised (this may take up to five minutes). If the meter fails to stabilise, then check the membrane, replace as necessary and then recalibrate.
- When taking a reading, the probe needs a flow of water. If the watercourse is fairly still, the probe should be moved gently back and forth in the water.

DO monitoring will be required daily at a frequency of 4 x day (Before work, Mid-morning, Early afternoon and Before leaving site) for the duration of the water based activities. The DO measurements should be taken just below the water's surface and at a depth of 50cm. The location should be 10-20m away from the re-profiling operation and on the far side of the silt curtain. Readings should be taken in mg l^{-1} and recorded along with temperature readings. The records must be kept and shared with the client.

An emergency diffuser type aeration kit must be available at all times if the fish show distress or DO is between 3-2mg l^{-1}. An appropriate location for a fish refuge should be agreed with all parties in advance of work.

DO meter reading		**What the reading means**	**Action**
% Sat	**mg l^{-1}**		
Below 45	Below 4	Poor standard, salmonid fish at risk, cyprinid fish unlikely to be harmed in short term, but may limit populations in longer term. Below 2 mg l^{-1} all fish at risk and unpleasant smells likely and possible phosphorus release from sediments.	Monitor and consider aeration and/or fish rescue if DO levels fail to recover or continue to fall. If fish are in distress, dredging should be temporarily halted
45 – 69	4 – 6.9	Moderate to good standard suitable for cyprinid fish (coarse fish).	No action required unless salmonid fishery

70 – 149	7 – 11	High standard for salmonid fish (trout, salmon, etc.).	No action required.
Over 150	Over 11	Only possible in daytime and may indicate super-saturation because of nutrient enrichment and/or excessive plant and/or algae growth. Levels will fall at night time, possibly or 4 mg l^{-1}.	Check minimum reading at dawn and in longer term assess nutrient enrichment and ecosystem damage.

Table 1: Dissolved oxygen thresholds and action

3.11 BIOSECURITY

A complete Biosecurity process would need to be provided by the contractor. All operatives should receive training and have detailed procedures to follow with respect to cleaning machinery and PPE. An example can be found in Appendix E.

3.12 DEMOBILISATION

On leaving site ensure that all protection measures have been removed including
tape/fencing and track mats.

Make good any ground disturbance and seed with a native mix agreed by Herefordshire Wildlife Trust.

4 REFERENCES

Cowling, S., David, L. & Warner, E. (2016) Otter Survey, Bodenham Lake Report.
Herefordshire wildlife Trust

Cowling, S. (2016) An assessment of the ecological impact of re-profiling Bodenham Lake. Herefordshire Wildlife Trust Ltd.

Website accessed 9th September 2016
http://jncc.defra.gov.uk/protectedsites/sacselection/sac.asp?eucode=UK0012642

Website accessed 9th September 2016 http://www.bgs.ac.uk/data/boreholescans/home.html

APPENDIX A

River Lugg Site of Special Scientific Interest Designation

COUNTY: HEREFORD AND WORCESTER/POWYS SITE NAME: RIVER LUGG/AFON LLUGWY

SITE REF: 15 PGL

Status: Site of Special Scientific Interest (SSSI) notified under Section 28 of the Wildlife and Countryside Act 1981 as amended

Local Planning Authorities: HEREFORD AND WORCESTER COUNTY COUNCIL, Leominster District Council, Hereford City Council, South Herefordshire District Council, Powys County Council, Radnorshire District Council

National Grid References: SO 173751–SO 565372

Length (approximate)		Area (approximate)	
English Length:	74.17 (km.)	English Area:	210.05 (ha.)
Welsh Length:	26.90 (km.)	Welsh Area:	26.90 (ha.)
Total Length:	101.07 (km.)	Total Area:	236.95 (ha.)

Ordnance Survey Sheets:
1:50,000: 148, 149
1:10,000: SO 17 NE, SE, SO 26 NE, NW, SO 27 SW, SO 36 NW, NE, SE, SW, SO 46 NW, SW, SE, SO 45 NE, SO 53 NE, SO 54 NW, SE, SW, SO 55 NW, SW

Date Notified (Under 1981 Act): 2 February 1995

Other Information:
This is a new site.
The site interest includes the following species covered by Council Directive 92/43/EEC on the conservation of natural habitats and of wild flora and fauna:

- Atlantic Stream Crayfish *Austropotamobius pallipes* – Annex II
- Common Otter *Lutra lutra* – Annex II and IV
- Atlantic Salmon *Salmo salar* – Annex IV
- Bullhead *Cottus gobio* – Annex IV
- Twaite Shad *Alosa fallax* – Annex II

Atlantic Stream Crayfish and Common Otter are also listed in Schedule 5 of the Wildlife and Countryside Act 1981 as amended.
The site overlaps with the River Lugg Meanders SSSI selected under the Geological Conservation Review.

Flora
The headwaters on Pool Hill are characterised by a range of aquatic and semi-aquatic bryophytes including the golden-brown moss *Cratoneuron commutatum* in stony flushes and *Cinclidotus fontinaloides* on streamside rocks.

There are a few higher plants present, especially in the peaty pools near to the river's source where intermediate water-starwort *Callitriche hamulata*, water-purslane *Lythrum portula* and round-leaved crowfoot *Ranunculus omiophyllus* can be found. The large pool at the source supports the nationally scarce pillwort *Pilularia globulifera*.

The river banks and surrounds in the headwaters support a range of semi-natural vegetation including heather moorland, dry calcareous grassland, base-rich flushes typically with small sedges and brown mosses and damp pasture. The latter is characterised by purple moor-grass *Molinia caerulea*, quaking grass *Briza media*, sharp-flowered rush *Juncus acutiflorus*, devil's-bit scabious *Succisa pratensis*, Marsh valerian *Valeriana dioica* and rusty willow *Salix cinerea* subsp *oleifolia* scrub with a rich ground flora that includes water avens *Geum rivale*.

In the upper Lugg there is little vegetation where the flow is greatest and the bed is unstable. Characteristic plants include encrusting and filamentous algae, the liverworts *Pellia epiphylla* and *Solenostoma triste* and the moss *Rhynchostegium riparioides*. The species diversity for such small, shaded, sandstone streams is typically poor with lower plants constituting over one-third of plant species present. The only truly aquatic higher plants of this community are branched bur-reed *Sparganium erectum*, which grows in silt at the channel edge, and brook water-crowfoot *Ranunculus penicillatus* subsp *pseudofluitans* on riffles.

Most of the middle and lower reaches have species-rich, calcareous, lowland river communities due to the downstream influence of the drainage from the Silurian mudstones, siltstones and limestones. In the middle reaches from Leominster to the Vern Railway bridge the transitional nature of the river is shown by the lowland species, typical of a clay bedded channel, growing alongside water crowfoots and a variety of bryophytes requiring coarser substrates. Below the confluence with the Arrow, the dominant higher plant of the upper river – brook water-crowfoot – gradually gives way to extensive beds of river water-crowfoot *Ranunculus fluitans*, a species largely confined to rivers with a large flow volume. There is an increasingly eutrophic influence downstream with spiked water-milfoil *Myriophyllum spicatum*, horned pondweed *Zannichellia palustris* and the green algae *Cladophora glomerata* and *Enteromorpha* frequent. Marginal vegetation is sparse with only branched bur-reed and reed canary-grass *Phalaris arundinacea* commonly present.

In the lower reaches of the Lugg the vegetation assemblages are increasingly characteristic of southern clay rivers but retain the influence of coarse substrates. Upstream of weirs and where the flow is sluggish, several species occur which are typical of slow moving, soft bottomed rivers, for example yellow water-lily *Nuphar lutea*, unbranched bur-reed *Sparganium emersum* and common club-rush *Scirpus lacustris* The nutrient-rich nature of the lowermost reaches is shown by the appearance of fennel pondweed *Potamogeton pectinatus*, perfoliate pondweed *P. perfoliatus* and arrowhead *Sagittaria sagittifolia*. Along the river's edge, great yellow-cress *Rorippa amphibia* and flowering rush *Butomus umbellatus* occur, at or near to their western limit of distribution.

Parts of the site within Wales at Pool Hill and within England at Presteigne are managed by the Radnorshire Wildlife Trust as the Beacon Hill and Withybeds nature reserves, respectively.

The Welsh section of the river lies within the Radnor Environmentally Sensitive Area (ESA).

Description and Reasons for Notification:
From its upland source in Powys in mid-Wales to its confluence with the Wye below Hereford in England, the River Lugg is considered to be one of the best British mainland examples of both a clay river and a river displaying a transition from nutrient-poor to naturally nutrient-rich water chemistry. Despite being canalised in some small sections of its 101 km length and running through an intensively farmed catchment in its middle and lower reaches, it is a largely unpolluted natural river and supports river plant communities and otter populations of special interest.

The Lugg rises at 500 m on Pool Hill in Powys and descends rapidly to flow through a more gentle landscape and eventually onto a broad alluvial floodplain joining the River Wye. It runs for most of its length through pasture with some areas of arable. Only around its source and at the Lugg Meadow SSSI does adjoining semi-natural vegetation constitute significant land cover. The river is tree lined for most of its length, alder *Alnus glutinosa* and willows *Salix* spp. being the main species. The SSSI boundary incorporates short stretches of adjacent wet woodland and includes all fringing tree lines. The channel itself is quite active, especially in the upper and middle reaches, with migrating meanders which deposit shingle banks and cut vertical bank faces up to 3 m high. Through its long history

of use the river also has several mill leats and flood flow channels, the most notable of the latter being the Kenwater through Leominster. These stretches complement the biological interest found in the main channel and have been included in the site, even though they have extensive bank protection or canalised sections.

Geology and Topography

Near to its source the infant river drains an upland area based on Silurian mudstones and siltstones, where the bedrock geology is the dominant influence on channel form. Numerous peaty flushes and small springs on the valley sides feed the headwaters and combine to cut a steep-sided and rock-bottomed section, descending over 200 m in the first 3 km. The Lugg's upper catchment is underlain by these same Silurian rocks and the river adopts a typically high-energy erosive character.

From the border with England, the underlying rocks are predominantly non-calcareous and are principally Old Red Sandstone of Devonian age on the valley sides, with some limestone outcropping at the Aymestry Gorge. Changes in bedrock and river gradient are reflected in the channel substrate. Along the stretch from the border to Leominster the average flow is quite fast, with a well developed pool and riffle system and a river bed predominantly of cobbles, pebbles and gravels. From Kingsland and particularly below the confluence with the River Arrow, the river meanders across an alluvial plain. These lower reaches are characterised by deeper water and slower flows and the river is clay bedded with silt deposits.

Such variations in geology , flow and substrate have given rise to an interesting downstream variation in river plant communities, ranging from naturally species-poor communities of upland channels prone to spate, to those representative of mature lowland rivers. These types combine in the Lugg's lower reaches to produce a plant assemblage of unusual occurrence in England.

The high naturalness and diversity of the aquatic communities is demonstrated by the occurrence of the pollution intolerant red algae, *Lemanea fluviatilis* and *Hildenbrandia rivularis* along the entire course of the Lugg and the presence of a total of 121 river plant species.

Mammals

Field signs of common otter *Lutra lutra* are numerous and widespread along the length of the river and indicate a healthy population. It is one of the few rivers in central England that retained a strong population during the widespread decline of the 1980s. The Lugg, therefore, is considered a core refuge area for otters and has played a key role in the species recolonisation of the River Wye catchment.

Invertebrates

Extensive populations of the native atlantic stream crayfish *Austropotomobius pallipes* are present, a species which is in decline across Europe. Limited sampling to date has identified a variety of rare and scarce invertebrates from the lower Lugg, including the nationally rare pea mussel *Pisidium tenuilineatum*, a species requiring unpolluted conditions. The nationally scarce species present include two aquatic beetles *Riolus cupreus* and *R. subviolaceus* which live on stones in flowing water, and the alderfly *Sialis nigripes*, a species with an aquatic larva living in silts in large river systems. A range of mayflies *Ephemeroptera* including species with localised distributions are also recorded. The common hawker *Aeshna juncea* is common along the headwaters of the river.

The change in river bed substrate and flow rate can be mapped by the distribution of two damselflies, the banded demoiselle *Calopteryx splendens* and the beautiful demoiselle *C. virgo*. The latter is present above and around Leominster but is replaced by the banded demoiselle down to the confluence with the Wye.

Fisheries

Though not of special interest, the fish community has many natural characteristics and contributes to the nature conservation value of the river. The Lugg upstream of Leominster is predominantly a brown trout *Salmo trutta* fishery with some grayling *Thymallus thymallus* present. Few coarse fish are found above Aymestry which marks the upper limit of atlantic salmon *Salmo salar* migration. Coarse fish including chub *Leuciscus cephalus*, roach *Rutilus rutilus*, pike *Esox lucius*, twaite shad *Alosa fallax*, eels *Anguilla anguilla* and barbel *Barbus barbus* become more plentiful downstream of Leominster. Stoneloach *Noemacheilus barbatulus*, minnows *Phoxinus phoxinus* and bullheads *Cottus gobio* are present throughout the river.

Breeding Birds

The River Lugg provides good habitat for a range of typical river birds. Dipper *Cinclus cinclus* is found on the upper reaches, with kingfisher *Alcedo atthis* occurring more on the middle and lower stretches. Grey wagtail *Motacilla cinerea* occur throughout. Several pairs of mute swan *Cygnus olor* and common sandpiper *Actitis hypoleucos* also breed on the river, as do mallards *Anas platyrhynchos* which are plentiful. Some active cutting faces of the meanders hold colonies of sand martins *Riparia riparia*.

Views About Management

ENGLISH NATURE

A statement of English Nature's views about the management of River Lugg Site of Special Scientific Interest (SSSI).

This statement represents English Nature's views about the management of the SSSI for nature conservation. This statement sets out, in principle, our views on how the site's special conservation interest can be conserved and enhanced. English Nature has a duty to notify the owners and occupiers of the SSSI of its views about the management of the land.

Not all of the management principles will be equally appropriate to all parts of the SSSI. Also, there may be other management activities, additional to our current views, which can be beneficial to the conservation and enhancement of the features of interest.

The management views set out below do not constitute consent for any operation. English Nature's written consent is still required before carrying out any operation likely to damage the features of special interest (see your SSSI notification papers for a list of these operations). English Nature welcomes consultation with owners, occupiers and users of the SSSI to ensure that the management of this site conserves and enhances the features of interest, and to ensure that all necessary prior consents are obtained.

Please note that if you own land on both sides of the England/Wales border you will also receive a similar document from Countryside Council for Wales in due course.

Management Principles

Rivers vary widely in character, from dynamic, boulder-strewn, upland streams, to more tranquil, spring-fed, chalk rivers in the lowlands. Each river naturally provides a diversity of habitats for plants and animals (including invertebrates, many species of fish, otter, water vole and breeding and wintering birds). Some of these habitats are directly connected with the physical form of the channel and its banks; others are created by the vegetation which the river's form supports. The river substrate and its water chemistry vary naturally, depending upon the geology of the river catchment.

Despite their varied character, there are some common principles on conservation and management that apply to all rivers.

The physical features of the river (its natural structure and form) should be maintained as far as possible in their natural state. This will support a natural flow regime that will help conserve the geomorphological features of interest. It will also ensure the provision of resting pools for fish like salmon and trout, and conserve the quality of the riverbed habitat for salmon, shad and lamprey spawning.

Wherever possible, the creation of artificial barriers to the passage of migratory fish and other animals, such as otters, should be avoided. Natural barriers to the movement of fish (such as waterfalls, or large log jams) should be left alone. Where artificial modifications have occurred - such as weirs and impoundments, embankment, straightening and dredging – the restoration of natural channel profiles and dynamics is desirable where appropriate. Any new infrastructure, such as road and rail bridges should be carefully designed to avoid the constriction of the river or blockage of its floodplain. Opportunities should be taken to create additional riparian areas where flooding is acceptable, in order to reconnect the river with its floodplain.

Management should maintain the natural flow regime of the river, including *natural* erosion and sedimentation processes, in order to meet the requirements of the full range of flora and fauna it supports. Abstraction levels should be managed to protect the characteristic flow regime of the river, including seasonal base flows and flushing flows. Compensation flows are generally not an acceptable alternative to reducing abstraction, and river transfers may also have an undesirable effect on river ecology.

Bank-side vegetation should be allowed to develop, allowing characteristic plants to flourish as well as benefiting those animals that spend part of their life-cycle out of the water. A mix of trees, bushes, marginal fen vegetation and grass is desirable and can be encouraged by careful management. For example, grass swards are best managed by cutting once or twice a year or lightly grazing with stock at low densities. If it is not possible to reduce stocking densities on bank-side habitats, it may be necessary to consider fencing the bank-side habitat to avoid artificially exacerbated bank-side erosion caused by excessive livestock trampling. The riverside tree stock should be managed, and where pollarding or coppicing have been practiced in the past these practices should be re-instated. It is better to carry out management in small runs on alternate sides of the river rather than in single clear-fell blocks, and the coppice stools should always be protected from grazing animals.

Associated habitats, such as oxbow lakes, areas of marshland, vernal pools and wet woodland, can all be very important for invertebrates and should be considered integral with the river system.

The characteristic aquatic plant communities associated with in-channel vegetation should be allowed to flourish. Any cutting of vegetation should aim to leave at least 50% of the channel vegetated, comprising an active marginal fringe and a mosaic of submerged and floating beds that are allowed to flower and set seed.

Of particular importance for invertebrates are lightly vegetated gravel bars and shoals, as well as sand bars and spits and the eroding river banks and cliffs. The nature of these features is such that they tend to shift and move over time and management should aim to ensure that a similar proportion of exposed sediment is maintained within any given stretch of the river. The invertebrate communities associated with these exposed riverine sediments are sensitive to excessive shade, livestock trampling over and feeding on the shoals, and vehicle compaction and digging activity, and management should aim to keep most areas of exposed sediment free from these impacts. Where appropriate, any log jams and flood debris piles (wrack) within the river channel should be left *in situ* or, if unavoidable, moved within channel to less

"damaging" locations. As well as providing a valuable habitat for many rare water beetle and cranefly species, they can also promote the deposition of river silts behind the debris (thus countering some bank erosion) and can generally increase in-channel structure, for the benefit of invertebrates.

Any exploitation of fish populations or other native animals or plants should be at a sustainable level, without manipulation of the river's natural capacity to support them or augmentation by excessive stocking. Where stocking is carried out it should not be done in areas which have not previously been subject to stocking, to ensure that the genetic integrity of natural populations of species such as brown trout are not compromised.

In common with other freshwater systems, rivers are susceptible to the introduction of invasive species such as non-native plants and animals, for example, mink and signal crayfish. The introduction of non-native plants and animals, including fish, should be avoided. Invasive species such as Japanese knotweed and Himalayan balsam should also be controlled. Attention should be paid to diseased alder trees and any trees showing signs of infection are often best managed to reduce the stress on the tree.

The maintenance of good water and sediment quality are essential to maintaining a healthy river system. River management should minimise pollution both from point and diffuse sources, and will include discharges of domestic and industrial effluent, run-off from agriculture, forestry and urban land, and accidental pollution from industry and agriculture. Siltation of the river bed can smother and infill coarse gravels, adversely affecting fish spawning success and behaviour, and the establishment of submerged plants such as water crowfoot. It can also seriously impact invertebrates such as caddisflies living in and on the riverbed.

Riparian areas and the wider catchment need to be managed sensitively to avoid excessive run-off of soil particles and nutrients into the river. Ploughing should not be allowed to destabilise river banks and an unploughed strip of at least 2m should be left adjacent to the riverbank and tributary ditches and streams. Nutrient enrichment and organic pollution result in the decline of plant, invertebrate and fish communities. Effluents entering the river, either directly or indirectly, should be treated to reduce the levels of phosphorus contained within them to concentrations that will not lead to a proliferation of algae or the disappearance of characteristic plants and animals. Organic pollution should also be controlled to avoid de-oxygenation of the water or any toxic effects on aquatic animals and plants.

Operations likely to damage the special interest

Site name: River Lugg, SSSI

OLD1006616

Ref. No.	Type of Operation
1	Cultivation of permanent pasture, woodland, non-rotational set-aside and any other natural or semi-natural vegetation, excluding cultivation as part of established arable rotations with leys and the reseeding of short term grass leys.
2	The introduction of grazing to previously ungrazed headlands, bankside vegetation and riverside woodlands and changes in grazing practice such as changes in type of stock or cessation of grazing for more than one season.
3	Stock feeding.
4	The introduction of mowing and/or changes in the mowing and cutting regime such as a change from hay making to the cutting of silage and cessation of mowing.
5	Application of manure, fertilisers and lime to any areas, excluding existing arable cultivations, ley and other agriculturally improved pastures.
6	Application of pesticides, including herbicides, to any areas excluding existing arable cultivations, leys and the spot treatment of noxious weeds.
7	Dumping, spreading or discharge of any materials.
8	Burning.
9	The release into the site of any wild, feral or domestic animal*, plant or seed.
10	The killing or removal of any wild animal*, excluding pest control, and existing freshwater fishing (see 16a).
11	The destruction, displacement, removal or cutting of any plant or plant remains, including tree, shrub, herb, hedge, dead or decaying wood, moss, lichen and turf, other than cropping of existing arable land, cutting of hay and silage and traditional hedge management.
12	Tree and woodland management+.
13a	Drainage (including moor-gripping and the use of mole, tile, tunnel or other artificial drains).
13b	Modification of the structure of watercourses (eg rivers, streams, springs, ditches, drains, meanders, backwater channels and mill leats), including their banks and beds, as by re-alignment, damming, installation of weirs and sluices, re-grading, shoal removal, excavation, dredging and the creation of new stock watering points.
13c	Management of aquatic and bank vegetation for drainage purposes.
14	The changing of water levels and tables and water utilisation (including irrigation, storage and abstraction from existing water bodies and through boreholes).
15	Infilling of ditches, drains, ponds, pools, marshes, meanders, backwater channels or mill leats.
16a	The introduction of or changes in freshwater fishery practice and/or management, including changes in sporting fishing and angling.
20	Extraction of minerals, including peat, river shingle, sand and gravel, topsoil, subsoil and spoil.
21	Construction, removal or destruction of roads, tracks, walls, fences, hardstands, banks (including bank protection works), ditches or other earthworks, and permanent structures within the river channel including weirs, croys and fishing platforms, or the laying, maintenance or removal of pipelines and cables, above or below ground.
22	Storage of materials.

APPENDIX B

River Wye Special Area of Conservation Designation

JNCC
Joint Nature Conservation Committee

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River Wye/ Afon Gwy

Site details

Country	England/Wales
Unitary Authority	Fynwy/ Monmouthshire; Gloucestershire; Herefordshire; Powys
Centroid*	SO109369
Latitude	52.02333333
Longitude	-3.299722222
SAC EU code	UK0012642
Status	Designated Special Area of Conservation (SAC)
Area (ha)	2147.64

* This is the approximate central point of the SAC. In the case of large, linear or composite sites, this may not represent the location where a feature occurs within the SAC.

Location of River Wye/ Afon Gwy SAC/SCI/cSAC

General site character

Tidal rivers, Estuaries, Mud flats, Sand flats, Lagoons (including saltwork basins) (9.5%)
Salt marshes, Salt pastures, Salt steppes (1.5%)
Inland water bodies (Standing water, Running water) (52.5%)
Bogs, Marshes, Water fringed vegetation, Fens (3.1%)
Heath, Scrub, Maquis and Garrigue, Phygrana (1%)
Dry grassland, Steppes (5.3%)
Humid grassland, Mesophile grassland (2.4%)
Improved grassland (10.4%)
Broad-leaved deciduous woodland (12.3%)
Inland rocks, Screes, Sands, Permanent Snow and ice (0.2%)
Other land (including Towns, Villages, Roads, Waste places, Mines, Industrial sites) (1.8%)

Boundary map and associated biodiversity information on the NBN Gateway.

Natura 2000 standard data form for this site as submitted to Europe (PDF, < 100kb).

Note:

When undertaking an appropriate assessment of impacts at a site, **all** features of European importance (both primary and non-primary) need to be considered.

Annex I habitats that are a primary reason for selection of this site

3260 **Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation**

The Wye, on the border of England and Wales, is a large river representative of sub-type 2. It has a geologically mixed catchment, including shales and sandstones, and there is a clear transition between the upland reaches, with characteristic bryophyte-dominated vegetation, and the lower reaches, with extensive *Ranunculus* beds. There is a varied water-crowfoot *Ranunculus* flora; stream water-crowfoot *R. penicillatus* ssp. *pseudofluitans* is abundant, with other *Ranunculus* species – including the uncommon river water-crowfoot *R. fluitans* – found locally. Other species characteristic of sub-type 2 include flowering-rush *Butomus umbellatus*, lesser water-parsnip *Berula erecta* and curled pondweed *Potamogeton crispus*. There is an exceptional range of aquatic flora in the catchment including river jelly-lichen *Collema dichotum*. The river channel is largely unmodified and includes some excellent gorges, as well as significant areas of associated woodland.

Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site

7140 **Transition mires and quaking bogs**

Annex II species that are a primary reason for selection of this site

1092 **White-clawed (or Atlantic stream) crayfish** **Austropotamobius pallipes**

The Welsh River Wye system is the best site known in Wales for **white-clawed crayfish *Austropotamobius pallipes***. The tributaries are the main haven for the species, particularly at the confluences of the main river and the Edw, Dulas Brook, Sgithwen and Clettwr Brook.

1095 **Sea lamprey** **Petromyzon marinus**

The Wye is an extensive river system crossing the border between England and Wales and the **sea lamprey *Petromyzon marinus*** population is found in the main stem below Llyswen. The site provides exceptionally good quality habitat for sea lamprey and supports a healthy population.

1096 **Brook lamprey** **Lampetra planeri**

The Wye is an extensive river system spanning the border between England and Wales and the **brook lamprey *Lampetra planeri*** population is widely distributed in its catchment. The river provides exceptionally good quality habitat for brook lamprey and supports a healthy population.

1099 **River lamprey** **Lampetra fluviatilis**

The Wye is an extensive river system crossing the border between England and Wales, and the **river lamprey *Lampetra**

fluviatilis population is widely distributed in the catchment. The Wye provides exceptionally good quality habitat for river lamprey and supports a healthy population.

1103 Twaite shad Alosa fallax

Twaite shad *Alosa fallax* have long been abundant in the Wye, an extensive river system spanning the border between England and Wales. Twaite shad often spawn at or just above the tidal limit, but in the Wye they migrate over 100 km upstream, the highest spawning site being at Builth Wells. Data held by the Environment Agency indicate that, of the three selected rivers, the largest spawning areas for this species occur on the Wye. The river has relatively good water quality, adequate flows through an unobstructed main channel and a wide range of aquatic habitats conducive to supporting this fish species. In particular, there are a number of deep pools essential for congregation before spawning.

1106 Atlantic salmon Salmo salar

Historically, the Wye is the most famous and productive river in Wales for **Atlantic salmon *Salmo salar***, with high-quality spawning grounds and juvenile habitat in both the main channel and tributaries; water quality in the system is generally favourable. It is also one of the most diverse river systems in the UK, with a transition from hard geology, high gradients, rapid flow fluctuations and low nutrient-content in its upper reaches, to a more nutrient-rich river with lower gradient, more stable flow and softer geology in the lowlands. The effect of river engineering work on migration and spawning has been limited, although there is a localised influence from the Elan Valley reservoirs, through inundation of spawning and nursery habitat and fluctuations in flow and water levels in the upper Wye. The most important tributaries for spawning are included in the SAC. Although in the past non-native salmon may have been released to the system, the impact of this is likely to have been minimal. The Wye salmon population is particularly notable for the very high proportion (around 75%) of multi sea winter (MSW) fish, a stock component which has declined sharply in recent years throughout the UK. This pattern has also occurred in the Wye, with a consequent marked decline in the population since the 1980s. However, the Wye salmon population is still of considerable importance in UK terms.

1163 Bullhead Cottus gobio

The Wye represents **bullhead *Cottus gobio*** in an extensive river system crossing the border between England and Wales. The Wye is one of the most diverse river systems in the UK, with a range of nutrient conditions and aquatic habitats and generally good water quality for fish species. The diversity of habitat types in the Wye means that it is likely to represent most of the habitat conditions in which bullhead occurs in Britain, highlighting the conservation importance of this river.

1355 Otter Lutra lutra

The Wye holds the densest and most well-established **otter *Lutra lutra*** population in Wales, representative of otters occurring in lowland freshwater habitats in the borders of Wales. The river has bank-side vegetation cover, abundant food supply, clean water and undisturbed areas of dense scrub suitable for breeding, making it particularly favourable as otter habitat. The population remained even during the lowest point of the UK decline, confirming that the site is particularly favourable for this species and the population likely to be highly stable.

Annex II species present as a qualifying feature, but not a primary reason for site selection

1102 Allis shad Alosa alosa

APPENDIX C

Environmental Risk Assessment

Environmental Risk Assessment	Island Re-profiling
Location:	Bodenham Lake Nature Reserve, Bodenham, Hereford, HR1 3JT
Location of environmentally sensitive sites (km / m):	River Lugg SSSI and River Wye SAC within 100m of the work area
Risk assessment carried out by:	Leela O'Dea, Senior Ecologist at Frog Environmental
Date:	9th September 2016

Data and information				**Judgement**			**Method of Work**		
Receptor	**Source**	**Harm**	**Pathway**	**Probability of exposure**	**Consequence**	**Magnitude of risk**	**Justification for magnitude**	**Risk management**	**Residual risk**
What is at risk? What do I wish to protect?	**What is the agent or process with potential to cause harm?**	**What are the harmful consequences if things go wrong?**	**How might the receptor come into contact with the source?**	**How likely is this contact?**	**How severe will the consequences be if this occurs?**	**What is the overall magnitude e of the risk?**	**On what did I base my judgement?**	**How can I best manage the risk to reduce the magnitude?**	**What is the magnitude of the risk after management? (This residual risk will be controlled by Compliance Assessment).**
Local population	Increased flood risk	Impact on local population and businesses, damage to property	Out of channel flow	Medium	Medium	**Medium**	Working close to a structure may cause damage or increase flood risk.	No work or movement of vehicles will take place within 30m from the bank top of the River Lugg and any associated flood risk management structures on the river.	Low

Local population	Increased flood risk	Impact on local population and businesses, damage to property	Out of channel flow	Medium	Medium	**Medium**	Reduces risk of impact on the channel	No work or movement of vehicles will take place within 30m from the bank top of the River Lugg and any associated flood risk management structures on the river.	Low
Local population	Increased flood risk	Impact on local population and businesses, damage to property	Out of channel flow	Medium	Medium	**Medium**	Waste needs to be removed from site so that flood storage is not reduced.	The island re-profiling work will not alter the flood plain capacity as there will be no change in the volume. The material will be redistributed to create a sloped profile with extended island margin. At no point during the work will materials be stored in a bund for later redistribution so as to ensure the flood plain remains uncompromised. All other waste materials generated will be removed from site daily to the main compound and from there disposed of accordingly.	Low
Historic environment	Physical damage to designated sites	Damage to designated sites	During construction works	Medium	Medium	**Medium**	Construction works that dig into the ground can cause damage to Scheduled Monuments	There are no Scheduled Monuments or structures subject to any conservation listing on site.	Low

Habitat and species	Damage to designated sites	Damage to designated sites or features of interest	Change in habitat	Medium	Medium	**Medium**	The activity can cause disturbance to features of interest	There will be a 30m exclusion from the bank top of the River Lugg to prevent any materials from entering the river and causing potential harm to the aquatic ecosystem. An Otter survey carried out showed that the otter actively use the river corridor and the lake. Should an otter be seen during the day all work will cease until it has passed safely through the site. Work will be restricted to daylight hours when otters are at their least active and the generator at the main compound will be on silent mode should energy be required in the hours of darkness. Vegetation removed from site will be used to create holt to provide further sanctuary and resting places for otter away from the work area. Crayfish were not recorded in the lake during a recent survey. However as signal crayfish are present in the River they could access the Lake across land, or be present in low numbers. As a precaution a biosecurity process will be followed to ensure that no animals or diseases are transferred between sites. If a crayfish is encountered then the site operatives will seek confirmation of identification and advice as to how to manage the animal.	Low

Habitat and species	Disturbance of habitat both directly through physical intervention and indirectly through noise/light	Disturbance of overwintering birds on the lake	Change to habitat and operation of machinery on site	Medium	Medium	**Medium**	The activity can cause disturbance to over wintering bird populations	Work will all take place between September and October, prior to deep winter as there are fewer overwintering birds on site, again reducing potential disturbance. Work will be restricted to daylight hours and the generator at the main compound will be on silent mode should energy be required in the hours of darkness. The excavator bucket will be used to 'push' the earth into the lake, this motion will reduce any sudden, loud banging noise, as the motion will generate a more constant vibration thus limiting disturbance to wildfowl and overwintering birds.	Low
Habitat and species	Disturbance of habitat both directly through physical intervention and indirectly through noise/light	Disturbance of nesting birds and roosting bats	Damage to habitat and operation of machinery on site	Medium	Medium	**Medium**	The activity can cause damage to habitat used by birds and bats for nesting and roosting	Work will all take place between September and October, outside the bird nesting season. If they are required, the arborist must have a bat licence or work with a suitably qualified member of Herefordshire Wildlife Trust to check each tree prior to management for potential bat roosts. If a bat is discovered during the tree management work then operations must stop immediately and the site made safe. Advice should be sought from a bat expert and work should proceed following specific instruction.	Low
Habitat and species	Reduction in variability of bed and bank; engineered channel. Disconnection with riparian zone.	Direct loss of or damage to habitat / species; indirect changes to ability of river to form and sustain habitat.	Change in river depth and width variation; Change in structure of riparian zone	Medium	Medium	**Medium**	The activity can cause increased sedimentation and other damage, which may be large enough to adversely affect a conservation site or species.	A silt curtain will be installed in the lake to prevent sediment dispersion. Natural silt wattles will be used to stop sediment from being moved in overland flow towards the River Lugg, these will be applied based on the direct need observed on site. They will slow the water allowing silt to drop out and the wood fill will trap further sediments.	Low

Habitat and species	Spread of non- native invasive species and plant and animal diseases	Loss of or damage to habitat or species	Spread of species in the catchment caused by non-native species being disturbed and spread downstream or transported by machinery and equipment to another site	Medium	Medium	**Medium**	Use of biosecurity measures and good site management will reduce the spread of non-native invasive species	*Crassula helmsii* has been identified as being present in the lake. The method of work includes a plan of biosecurity and site management measures to prevent the spread of invasive non- native species, plant and animal diseases. The machinery is not to enter the water or marginal edge to avoid contaminating the tracks and the bucket will be cleaned at each site.	Low
Habitat and species	Damage to mature and veteran trees	Direct loss of or damage to habitat / species	Access routes	Medium	Medium	**Medium**	The tracking of vehicles close to trees can cause compaction and harm the health and vitality	Tree management will take place along the access route to remove specific branches and crown lift where absolutely necessary to facilitate safe passage of vehicles without unintended damage to branches. This work will be undertaken by a qualified and experienced arborist following BS3998: 2010 best practice guidelines for the recommendation of tree management. Machinery will be tracked to reduce compaction and damage to the soil surface. Trees on the islands will be coppiced to facilitate access, this is part of the wider conservation management plan for the lakes and the remaining debris will be used on site for habitat.	Low

Water quality	Increased risk of pollution caused by working near surface water	Pollution of aquatic ecosystem	Direct run-off from site	Medium	Medium	**Medium**	Will reduce risk due to limited mobilisation of sediment or pollutants.	A rigid method of works to manage fuel and oil on site will be detailed. This will include training personnel in the most appropriate storage, handling of fuels/oils as well as reviewing the emergency spill procedure. Use biodegradable oils (e.g. Panolin) where practicable and implement best practice in fuel storage and refueling operations. All machinery will be checked for damage on a daily basis. Contaminated waste materials will be segregated and stored appropriately prior to disposal off site and spill kits as well as an emergency spill response company will be on hand to offer immediate response.	Low
Water quality	Increased siltation caused by working in the river, direct disturbance whilst undertaking construction works or footprint of the finished works.	Increase in sediment load.	Direct run-off from site, or in-channel flow from works within bank.	Medium	Medium	**Medium**	Will reduce risk due to limited mobilisation of sediment or pollutants.	Natural silt wattles will be used to stop sediment from being moved in overland flow towards the River Lugg, these will be applied based on the direct need observed on site. They will slow the water allowing silt to drop out and the wood fill will trap further sediments.	Low
Ground water	Increased risk of ground water pollution caused by working on unmade ground	Pollution of ground water sources	Direct run-off from site	Medium	Medium	**Medium**	Borehole activity in the area is high and therefore direct pathway to ground water created	All fuel will be stored in a secure, double-bunded bowser located in the main site compound, at least 10m away from surface waters and 50m away from boreholes or wells. It has been confirmed that the site compound is greater than 50m away from boreholes or wells. Fuels must not be stored at the work area (figure 3 of method of work).	Low

WFD biological quality elements	Changes in flow, water quality or to habitat	Deterioration of ecological status through loss or harm to biology	Changes in: quantity and dynamics of water flow; connection to groundwater bodies; river connectivity; river depth and width variation; structure and substrate of river bed; and structure of riparian zone.	Medium	Medium	**Medium**	Limiting the size of the activity reduces the impact on receptors	There will be no deterioration of the River Lugg WFD as the methods outlined above will ensure that there is no work carried out directly in the river causing any physical modification and that any silt which may escape the flood plain is suitably controlled at source. There is no reason to believe that the water quality will be altered and method of work has been put forward to appropriately manage potentially polluting materials (fuels/oils) on site so as they do not escape into surface or ground water. The ecology of the river, mainly designated for aquatic species will be protected by these steps and further biosecurity measures. Other features of interest have been noted and specific measures to ensure that the wider river corridor habitat is protected during the work and enhanced as a long term aim.	Low

APPENDIX D

Relevant Environmental Legislation

Subject	Legislation
Protected sites (SSSI)	Part 2 of the Wildlife and Countryside Act (WCA) 1981 (as amended) section 28 to 33 contains measures for the protection and management of Sites of Special Scientific Interest (SSSIs). Duties of the land owner include but are not limited to ensuring that any operation is carried out with the written consent of Natural England and in a way that does not cause damage to the site.
Bats	All bat species, their roosts/resting places in Britain are protected under the Wildlife and Countryside Act (WCA) 1981 (as amended) through their inclusion on Schedule 5. The offences prohibit certain intentional or reckless acts, which harm the species or their roosts/resting places. Bats are also included on Annex IV of Council Directive 92/43/EEC of 21st May 1992 on the Conservation of Natural Habitats and of Wild Fauna and Flora (known as the Habitats Directive). As a result of the United Kingdom implementing this Directive, all British bats are now protected under the Conservation of Habitats and Species Regulations 2010. Therefore, domestic legislation makes it an offence to kill, injure, capture or disturb bats, or obstruct access to roosts/resting places. If bats are affected by development a European Protected Species licence will be required to make lawful actions, which are prohibited by regulation and mitigate any detrimental effects.

Reptiles	Smooth snake and sand lizard receive full protection under Schedule 2 of The Conservation (Natural Habitats & c.) Regulations 1994 (as amended). Regulation 39 prohibits:
	• Deliberate killing, injuring or taking of species listed on Schedule 2.
	• Deliberate disturbance of any Schedule 2 species as
	  ○ to impair their ability
	  ○ to survive, breed, or reproduce, or to rear or nurture young;
	  ○ in the case of animals of a hibernating or migratory species, to hibernate or migrate.
	  ○ to affect significantly the local distribution or abundance of a species.
	• Deliberately taking or destroying of eggs of a Schedule 2 species
	• Damage or destruction or a breeding site or resting place
	• Keeping, transporting, selling, exchanging or offering for sale whether live or dead or any part thereof.
	
	Smooth snake, sand lizard, adder, grass snake, slow worm and common lizard are also listed on Schedule 5 of The Wildlife and Countryside Act 1981 (as amended). Under this act they are additionally protected from:
	• Intentional or reckless disturbance
	• Intentional or reckless obstruction of access to a place of shelter or protection
	• Selling, offering or exposing for sale, possession or transporting for purpose of sale

	If any reptiles are affected by development a Protected Species licence will be required to make lawful actions, which are prohibited by regulation and mitigate any detrimental effects.

Great Crested Newt	The Great Crested Newt (GCN) *Triturus cristatus* receives full protection under Schedule 2 of The Conservation (Natural Habitats & c) Regulations 1994 (as amended). Regulation 39 prohibits:
	• Deliberate killing, injuring or taking of species listed on Schedule 2.
	• Deliberate disturbance of any Schedule 2 species as
	  ○ to impair their ability
	  ○ to survive, breed, or reproduce, or to rear or nurture young;
	  ○ in the case of animals of a hibernating or migratory species, to hibernate or migrate.
	  ○ to affect significantly the local distribution or abundance of a species.
	• Deliberately taking or destroying of eggs of a Schedule 2 species
	• Damage or destruction or a breeding site or resting place
	• Keeping, transporting, selling, exchanging or offering for sale whether live or dead or any part thereof.
	
	The GCN is also listed on Schedule 5 of The Wildlife and Countryside Act 1981 (as amended). Under this act they are additionally protected from:
	• Intentional or reckless disturbance
	• Intentional or reckless obstruction of access to a place of shelter or protection
	• Selling, offering or exposing for sale, possession or transporting for purpose of sale
	
	If GCN are affected by development a Protected Species licence will be required to make lawful actions, which are prohibited by regulation and mitigate any detrimental effects.

Breeding Birds	All wild birds are protected under Section 1 of the Wildlife and Countryside Act 1981 (as amended) by Schedule 12 of the Countryside and Rights of Way Act 2000. Subsection 1(1) makes it an offence to kill, injure, or take any wild bird; take, damage or destroy the nest of any such bird whilst it is in use or being built, or take or destroy an egg(s) of any such wild bird. The legislation covers all species of wild birds including common and pest or opportunistic species.
Fish	Salmon and freshwater fisheries act 1975 as amended 2015 – obstruction to passage of fish, disturbs spawn or spawning fish, catch, move or introduce fish without regulatory consent, poisonous matter or polluting effluent The Animal Welfare Act 2006 stipulates that you must not cause unnecessary suffering by taking reasonable steps to meet the welfare need of the animal including the provision of a suitable environment, diet, ability to exhibit normal behavioural patterns and protection from pain suffering injury and disease that also prohibits the administration of a substance that may be poisonous or injurious.
Invasive Species	The Wildlife and Countryside Act 1981 (WCA) is the principal legislation dealing with non-native species. The WCA has been

	amended in relation to England and Wales by various pieces of legislation, including the Wildlife and Countryside Act 1981 (Variation to Schedule 9) (England and Wales) Order 2010, the Natural Environment and Rural Communities Act 2006 and the Countryside and Rights of Way Act 2000. Section 14(1) of the WCA makes it illegal to release or allow to escape into the wild any animal which is not ordinarily resident in Great Britain and is not a regular visitor to Great Britain in a wild state, or is listed in Schedule 9 to the Act. It is also illegal to plant or otherwise cause to grow in the wild any plant listed in Schedule 9 to the Act. The Schedule 9 list of animal and plant species has been amended by the Wildlife and Countryside Act 1981 (Variation of Schedule 9)(England and Wales) Order 2010. The Prohibition of Keeping or Release of Live Fish (Specified Species) Order 1998, made under the Import of Live Fish (England and Wales) Act 1980, prohibits the unlicensed keeping or release of 47 species of non-native live fish. This applies even if the fish were captured from the wild. The Prohibition of Keeping of Live Fish (Crayfish) Order 1996 is a further Order made under the Import of Live Fish (England and Wales) Act 1980. This Order aims to prevent the spread of non-native crayfish, and prohibits the unlicensed keeping of all non-native crayfish species in England and Wales (there is an exception to the prohibition in respect of crayfish of the species named "signal crayfish". The Environmental Protection Act 1990 has limited provisions for non-native species, but is included here due to the potential classification of soil and other waste containing viable propagules of invasive non-native plant species as controlled waste. This has been applied to Japanese Knotweed *Fallopia japonica,* with the result that waste containing this species must be disposed of in accordance with the duty of care set out in section 34 of the Act. The Environment Agency/NRW has issued guidance, which will be of use in complying with the duty of care. The Weeds Act 1959 provides for the control of five specified weeds. These are non aquatic species, though ragwort, (Senecio jacobaea), can grow in riparian areas. This legislation is directed at clearing weeds that threaten agricultural production.
Environmental Protection	The Environment Act 1995 established the Environment Agency, now Natural Resources Wales to make provision or further provision with respect to: • contaminated land and abandoned mines; • National Parks; • the control of pollution; • the conservation of natural resources; • the conservation or enhancement of the environment; • imposing obligations on certain persons in respect of certain products or materials; • waste • fisheries The Environmental Protection Act 1990 improves the control of pollution arising from certain industrial and other processes; to re-enact the provisions of the Control of Pollution Act 1974

	relating to waste on land with modifications as respects the functions of the regulatory and other authorities concerned in the collection and disposal of waste and to make further provision in relation to such waste; to make provision for the abolition of the Nature Conservancy Council and for the creation of councils to replace it and discharge the functions of that Council and, as respects Wales, of the Countryside Commission; to make further provision for the control of the importation, exportation, use, supply or storage of prescribed substances and articles and the importation or exportation of prescribed descriptions of waste; to confer powers to obtain information about potentially hazardous substances; to amend the law relating to the control of hazardous substances on, over or under land; to amend section 107(6) of the Water Act 1989 and sections 31(7)(a), 31A(2)(c)(i) and 32(7)(a) of the Control of Pollution Act 1974.
Water Framework Directive	In October 2000 the Directive 2000/60/EC of the European Parliament established a framework for Community action in the field of water policy (Water Framework Directive or WFD). This was transposed into national law in the UK occurred through the following regulations: The Water Environment (Water Framework Directive) (England and Wales) Regulations 2003. The purpose of the Directive is to establish a framework for the protection of inland surface waters (rivers and lakes), transitional waters (estuaries), coastal waters and groundwater. It will ensure that all aquatic ecosystems and, with regard to their water needs, terrestrial ecosystems and wetlands meet 'good status' by 2015.
Waste	Entered into force on 12 December 2008. The Waste Framework Directive provides the legislative framework for the collection, transport, recovery and disposal of waste, and includes a common definition of waste. Environmental Permitting (England and Wales) Regulations 2010. The Waste (England and Wales) Regulations 2011 The Hazardous Waste (England and Wales) Regulations 2005 The Controlled Waste (England and Wales) Regulations 2012

*This list is not exhaustive and it is the responsibility of the final contractor to ensure compliance with current legislative requirements

Table 1: Relevant Environmental Legislation

APPENDIX E

Biosecurity Process

Disinfection Procedure

Equipment

When disinfecting equipment the following will be required:

Virkon S bucket, brush, knapsack sprayer, disinfectant, facemask if using aerosol applicator, disposable or washing up gloves (to wear while disinfecting), bin bags for waste and water.

Note when making up Virkon S solutions, potable water is the ideal however pond/river water can be used so long as it contains little or no organic matter as this reduces disinfectant effectiveness.

Procedure

Clean all equipment/clothing: brushing off mud, plant and animal matter. Attention must be paid to the seams of clothing and footwear, the wheels, arches and exhausts of vehicles, water intake and propellers as well as any other crevices in waterborne craft. Any pockets of pooled water should be emptied.

Hose or pressure wash equipment down on site preferably on a hard standing area. Washings should be left in the water body where the equipment was used. You must ensure that the wash can't enter a watercourse directly from the hard standing and that all surface water drains are protected. If facilities are not available for washing then equipment should be contained in a sealed unit/bag until a suitable location can be found away from surface water drains and at least 10m away from any other watercourse.

Rinsing with pond/river water will suffice.

Disinfect using the following methods

Clothing and fabrics can be washed on a 40^{o}C cycle with detergent.

All equipment should be soaked in Virkon S* (10 mg/ml, as per suppliers instructions) or sprayed for 1 minute. Finally rinse with clean water and allow to thoroughly dry for at least 48 hours before next use.

Dispose of disinfectant solution directly into mains drainage and flush with clean water.

If mains drainage is not available further dilute unused disinfectant and poor it onto unmade ground at least 10m away from the nearest water body.

Do not dispose of disinfectant if the drainage is connected to a septic tank, cesspit or sewage treatment plant as it could cause them to fail. Do not dispose of disinfectant into a surface water drain as this directly connected to the local river, canal or stream. Do not dispose of disinfectant directly into a water body as it can cause significant harm to aquatic organisms.

*Always read the MSDS and COSHH assessment provided by the manufacturer and follow their instructions on storage, use and disposal.

Used gloves and containers can be disposed of in the general waste.

Boat Users Biosecurity Procedure

This procedure should be adopted when removing or transferring any structure or hard surface that has been submerged, including boats, engines, cages, pontoons, walkways, jetties, buoys, pumps, chains, ropes and anchors. The range and amount of biofouling species will be mainly determined by the period of time the structure has been submerged.

CHECK BEFORE USE

All equipment that has been transferred to the site should be inspected prior to deployment. Any evidence of biofouling must be thoroughly removed away from the water environment. Washings must not be allowed to enter the water environment.

If you identify an invasive non-native species on a structure that has been transported to your site you should inform the site manager who must notify the site owner from which the structure was last deployed.

CHECK CLEAN DRY

Structures should be removed from the water before cleaning.

CHECK

Check all parts of the equipment where access is difficult such as water intake, propeller, trampolines and covers as well as crevices. These areas are more likely to retain encrustations, moisture and viable biofouling species.

CLEAN

Heavy encrustations and holdfasts should be removed with scrapers away from the watercourse, prior to pressure washing.

Waste scrapings should be collected and bagged as they may contaminate the environment. This waste must be disposed of at a licensed landfill site.

Pressure wash equipment down on site, using pond/river water will suffice. Attention must be paid to areas that retain water, remain damp or are hard to inspect.

Washings should be left in the water body where the equipment was used.

Ideally, cleaning should be supervised or checked by a second member of staff.

Disinfect the equipment following the disinfection procedure.

DRY

Any pockets of pooled water should be emptied.

Thorough drying is essential, as this will kill aquatic organisms.

STORE

All equipment should be stored in a well-ventilated and preferably sunlit location for the maximum duration prior to transfer. The location must not drain into a surface water drain or water body. Engines should be returned to its vertical (down) position to drain.

Biosecurity Tool Box Talk

Biosecurity means taking measures to ensure that good practices are in place to minimise the risk of importing and spreading non-native species, pests and infectious disease. As non-native species could be transmitted in any water or material, a good biosecurity routine is essential, even if invasive non-native species are not apparent.

Biosecurity means taking steps to make sure that good hygiene practices are in place to reduce and minimise the risk of spreading invasive non-native species. A good biosecurity routine is always essential, even if invasive non-native species are not always apparent.

Salix's biosecurity plan goes beyond current requirements in law. However, it is important to remember that it is an offence to "release or allow to escape into the wild any plant or animal which is not ordinarily resident in Great Britain".

Biosecurity Basics

Avoid accessing water and minimise the contact time in which equipment is exposed to the water.

Wear appropriate protective clothing, which can be either disposed of or adequately cleaned and disinfected.

Avoid contact with amphibians, crayfish or crabs. Do not move them without prior identification and advice from an ecologist.

Check all equipment/clothing: brushing off mud, plant and animal matter. Attention must be paid to the seams of clothing and footwear, the wheels, arches and exhausts of vehicles, water intake and propellers as well as any other crevices in waterborne craft. It is especially important to remove any biofouling from the hull or other submerged area of craft. Any pockets of pooled water should be emptied.

Clean. Equipment should be hosed down or pressure-washed on site. If facilities are not available equipment should be carefully contained, e.g. in plastic bags, until they can be found. Washings should be left at the water body where the equipment was used, or contained and not allowed to enter any other watercourse or drainage system (i.e. do not put them down the drain or sink).

Clean equipment should be dipped or sprayed with a disinfectant solution (e.g. Virkon) to kill diseases, but note this is unlikely to kill non-native species.

Dry clothing and equipment, which should be thoroughly, dry for 48 hours before it is used elsewhere. Some non-native species can survive for as many as 15 days in damp conditions and up to 2 days in dry conditions.

Specific biosecurity risks on site should be addressed in the method statement, it is therefore important to be able to identify non-native invasive plants and animals (refer to identification guide). Additional measures may include fencing off or treating plants such as Japanese knotweed and giant hogweed or disposal of contaminated soils. These risks and measures should be communicated to all operatives on site.

Biosecurity Supplementary Guidance:

Non-native Species Identification Guide
Disinfection Procedure
A Boat Users Biosecurity Procedure