

Environmental noise monitoring should be undertaken only by suitably-trained and experienced staff. Where the requirements for noise monitoring occur as a result of a Section 61 consent, then advice from the local authority environmental health officer (EHO) should be sought as to the requirements for noise monitoring, ie where to measure and for how long. The following information is given to help site-based staff ensure monitoring is being properly carried out.

How and where to measure

A suitably qualified acoustic consultant or company employee, should be employed to provide technical advice and define where and when to measure. Advice should be sought from a qualified acoustician with regard to the relevant parameters to measure and the type of assessment required. The choice of appropriate measurement equipment is essential in order to ensure that the correct acoustic parameters are measured and that any such measurements are robust and stand up to scrutiny from other parties. In this respect all equipment should be calibrated in-line with the requirements of any relevant British Standards (eg BS 5228-1:2009+A1:2014) or other guidance documents.



Figure 4.34 Façade noise monitoring equipment (courtesy Arup)

In sensitive areas noise measurement (**Figure 4.34**) may be specified as a contract requirement. It is good practice to employ an acoustician for this activity if there is a likelihood of the site works creating noise disturbance, or nuisance. Where noise monitoring is required it should be carried out in-line with any relevant British Standards (eg BS 5228-1:2009+A1:2014) or other guidance document, the requirements of any site noise and vibration management plan or EMP and ANC (2013).

For long-term and possibly unmanned noise and vibration monitoring, extra care should be taken in locating the measurement equipment to minimise both the risk of damage or theft and the influence of other external noise sources, eg fixed building services plant.

Site management need to remain in contact with the person responsible for taking measurements to ensure that the measuring equipment (**Figure 4.35**) will not be affected, or changes will be managed to maintain valid measurements, by changes to the site as the project progresses.

4.4.3.7 Why is vibration management important?

High vibration levels over a sustained period can cause damage to buildings, while lower vibration levels can cause disturbance, annoyance and stress to residents. By properly informing local residents of the likelihood that vibration will occur, the less likely they are to complain or experience stress.

How to avoid vibration problems

The primary aims in the management of vibration on site are to avoid:

- causing annoyance and concerns
- being (falsely) accused of causing damage
- causing damage to nearby structures.

The following six steps will help in addressing each of these aims:

1 Evaluate the potential for vibration and damage

Transmission of vibration is highly dependent on ground conditions and on features in the ground, such as pipe runs. Prediction methods do exist, but they require specialist expertise to implement and rely on detailed information being available on the site, the ground conditions and the plant.

If it appears that a piling or ground engineering project will generate vibration putting nearby structures at risk, then a detailed study should be undertaken by specialists. In most other situations it should be sufficient for staff to review the operations to take place on site and establish the sensitive areas around the site that may need to be monitored.

2 Monitor conditions before works start

Before starting the construction operations, it is important to survey the condition of identified sensitive locations and structures. The survey should include a detailed record of:

- a Existing cracks and their widths.
- b Level and plumb survey, including damp-proof course measurements of tilting walls or bulges.
- c Other existing damage including loose or broken tiles, pipes, gullies or plaster.

Photographic records and installation of measuring devices are helpful to establish



Figure 4.35 Free-field noise monitoring equipment (courtesy Parsons Brinckerhoff)

alleged or actual damage. In some situations it will be necessary to strengthen vulnerable off-site structures before vibrations start.

Sensitive locations to survey and monitor before and during construction would include:

- a Aquatic habitats nearby.
- b Brittle/ancient underground services including tunnels.
- c Buildings in poor condition.
- d Historic buildings.
- e Hospitals and nursing homes.
- f Housing.
- g Laboratories.
- h Museums.
- i Precision machine workshops.
- j Schools.
- k Sensitive plant or equipment used by local companies.

3 Inform neighbours

Vibration causes anxiety and annoyance to residents mostly because they fear that it will cause damage. It is useful to explain to people that damage only occurs at vibration levels many times greater than those that can normally be felt from construction plant.

Informing neighbours of the potential for vibration allows site-based staff to learn of any particularly sensitive issues that may be time-dependent and that may be resolved by limiting hours of work.

4 Minimise effects during works

The adoption of BPM to minimise noise and vibration should have identified the best low vibration method for the completion of a construction task. If there are further concerns about the vibration impact of a construction method then they should be revisited at this stage.

The following specific BPM measures should be considered:

- a Can the activity be undertaken using a different methodology that results in lower levels of vibration at the nearby sensitive receptor?
- b As high frequency vibration causes less damage than low frequency vibration, can the plant be operated in a mode that generates less low frequency vibration (eg vibratory roller, wacker-plates)?
- c Can the plant be isolated from the transfer medium (ie what it's sitting on)? Can plant be placed on a heavy base, which causes less vibration than plant on a lighter base (eg mount plant on the ground rather than on suspended structures)?

5 Monitor vibration levels during the works

To be effective, monitoring of vibration levels should be carried out by trained staff or by external specialists. However, it may be necessary for site-based staff to discuss with

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Appendices

building occupants where vibration monitoring can be conducted.

When monitoring at properties during operations, the two main rules are:

- a Measure inside rooms when assessing for nuisance, noting that the choice of measurement position and extraneous vibration events such as footfall and the slamming of doors may affect the measurement results.
- b Measure on the structure outside when assessing for damage (doorsteps are a good location).

It should be noted that vibration measurement at premises is often impracticable and it is only possible to measure externally at the site or sensitive premises boundary. In which case a transfer function will have to be derived for the local ground conditions, an allowance made for attenuation between ground and foundation and possible amplification at the higher storeys of sensitive premises.

Do not forget that in sensitive structures continued visual monitoring and measurement of crack widths is the best way to determine whether actual damage is being caused.

6 Monitor conditions after works are completed.

The same evaluation as undertaken for Step 2 should be carried out and results compared to the precondition surveys.

4.4.3.8 Good practice checklists

Noise	
Change the working method to use equipment or modes of operation that produce less noise. For example: - in demolition works use hydraulic shears in place of hydraulic impact breakers - in driving steel sheet piles consider the jacking method (subject to soil conditions, eg cohesive soils), which produce only a fraction of the noise of conventional hammer-driven piling - when breaking out pavements consider other methods than pneumatic breakers and drills, including chemical splitters or falling weight breakers	
Reduce the need for noisy assembly practices, eg fabricate off site	
Keep noisy plant as far away as possible from sensitive receptors	
Adopt working hours to restrict noisy activities to certain less sensitive periods of the day	
Arrange delivery times to suit the area – daytime for residential areas, perhaps night time for commercial inner city areas	
Route construction vehicles to take account of the need to reduce noise and vibration	
Keep haul roads well maintained	
Use mufflers or silencers to reduce noise transmitted along pipes and ducts	

Minimise the drop height into hoppers, lorries or other plant (reducing the drop height by a factor of 10, which reduces noise by about 10 dB)	
Consider using rubber linings on tippers at very sensitive sites	
Liaise with SNCOs to minimise noise disturbance (disruption) to any sensitive wildlife	

Screens	
Where possible, place sources of noise away from sensitive receptors	
Avoid locations where multiple reflections of noise might result in increased receptor noise levels	
Erect the screen close to the source(s) of noise or the receptor	
Build the screen from materials with density of 7 kg/m ² or higher, with panels stiffened to prevent drumming	
For the most effective results build the screen about one metre above the highest sight line	
Seal all gaps and openings, including gaps at the bottom of the screen	
Glaze any public observation openings in perimeter hoardings with Perspex (protected with wire mesh or similar) if sensitive receptors are lower than the height of the hoarding	
Consider placing more screens close to sensitive receptors but not parallel to nearby walls, unless the screens are of the absorbent variety	

Vibration	
Change the working method to use equipment or modes of operation that produce less vibration, for example: - breaking out concrete, where practicable, should be undertaken using equipment that breaks by bending rather than by percussion - where practicable, rotary drills and bursters actuated by hydraulic or electrical power should be used for excavating hard material	
Undertake vibration activities as far away as possible from sensitive receptors	
Adopt working hours to restrict high vibration generating activities to certain periods of the day	
Suitable anti-vibration mountings should be fitted where practicable to rotating and/or impacting equipment	
Keep haul roads well maintained	
Consider using rubber linings on tippers in sensitive sites	

4.4.3.9 Further reading

ANC (2012) *Red Book: Measurement and assessment of groundborne noise and vibration (second edition)*, Association of Noise Consultants, St Albans, UK

www.association-of-noise-consultants.co.uk/publications-guidelines (accessed 7 March 2017)

BS 7385-2:1993 *Evaluation and measurement for vibration in buildings. Guide to damage levels from groundborne vibration*

BS 5228-2: 2009+A1:2014 *Code of practice for noise and vibration control on construction and open sites. Vibration*

BS ISO 4866:2010 *Mechanical vibration and shock. Vibration of fixed structures. Guidelines for the measurement of vibrations and evaluation of their effects on structures*

4.4.3.10 Legislation

Legislation is constantly changing, including amendments and new legislation, and this varies between England, Wales, Scotland and Northern Ireland. If site staff are unsure on any environmental issue, contact the regional environmental regulator for advice.

Legislation	Key requirements	Applicable Nation(s)
Clean Neighbourhoods and Environment Act (Northern Ireland) 2011	Sets out rules on statutory nuisance, including noise, which could lead to the issuing of an abatement notice by the local authority.	Northern Ireland
Environmental Protection Act 1990 (as amended)	Under Section 80 local authorities can serve an abatement notice upon the cause of a statutory nuisance to stop work immediately.	England, Wales, Scotland, Northern Ireland
Control of Pollution Act (CoPA) 1974	A local authority can serve a Section 60 notice if the conditions of the Section 61 consent are breached or if there is no Section 61 in place and excessive noise is being produced.	England, Wales, Scotland
The Noise Emissions in the Environment by Equipment for use Outdoors Regulations 2001 (as amended)	The intention of the legislation is to control and monitor noise of equipment for use outdoors. Construction plant and equipment must carry an appropriate label to indicate that it conforms to the levels given in the Regulations for that type of machinery.	England
Construction Plant and Equipment (Harmonisation of Noise Emission Standards) Regulations 1985 and 1988 (as amended) The Construction Plant and Equipment (Harmonisation of Noise Emission Standards) (Extension to Northern Ireland) Regulations 1992 (as amended)	An EC examination certificate is required before any item of construction plant and equipment may be marketed. Construction plant and equipment must carry an EC mark to indicate that it conforms to the levels given in the Regulations for that type of machinery. Failure to comply with, or contravention of, the Regulations may result in a fine of up to £2000.	England, Wales, Scotland, Northern Ireland
The Pollution Control and Local Government (NI) Order 1978	Complaints can be made against a noise or vibration source under Article 39. Magistrates can then serve an abatement notice upon the cause of a statutory nuisance to stop work immediately.	Northern Ireland

4.5 RESOURCE MANAGEMENT

4.5.1 Energy consumption

4.5.1.1 Introduction

The reduction of energy is closely linked to GHG emissions and climate change. The primary focus has been placed on carbon emissions. Carbon is the most prevalent of all the GHG emissions and it is used as an indicator in the Climate Change Act 2008. The Act has set legally binding targets, from the 1990 baseline, of a 34 per cent reduction in carbon emissions by 2020 and an 80 per cent reduction by 2050. This also includes the establishment of other requirements and commitments. Carbon also features, for example, in the scoring opportunities for BREEAM and CEEQUAL (see [Section 1.4](#)).

These requirements place a responsibility on all industries and individuals to reduce their energy consumption, especially energy generated through the burning of fossil fuels. There are opportunities to reduce energy consumption through design, advance programming, embodied energy and energy management at corporate offices among others.

Optimising material needs to reduce embodied carbon (courtesy Galliford Try plc and Black & Veatch)

4.5

Background

The recondition of the River Irwell flood defence scheme in Salford required the installation of rock armour to support the toe of the embankment. An initial design was submitted and accepted for the use of 62 500 tonnes of rock armour. The project was put out to competitive tender and won by Galliford Try plc and Black & Veatch. These two companies reviewed the project and realised that some segments of the scheme could be reduced or omitted. So they submitted new designs that required only 15 600 tonnes of rock armour and reduced the project embodied carbon by 385 tonnes. The new design was accepted by the Environment Agency and the works proceeded to construction.

Lessons learnt

Implementing the change at the design stage allows significant costs and carbon reduction.

HM Government (2013) outlines a number of key targets for the construction industry to be achieved by 2025. In summary these are:

- 33 per cent reduction in the initial cost of construction and the whole-life cost of built assets
- 50 per cent reduction in the trade gap between total exports and total imports for construction products and materials
- 50 per cent reduction in the overall time, from inception to completion, for new build and refurbished assets
- 50 per cent reduction in GHG emissions in the built environment.

Activities on site can help to reduce the emission of GHGs from the built environment in a number of ways, for example by greater attention to the quality of joints to avoid air leakage reducing the amount of energy needed to heat a dwelling.

The choice of construction products can often be influenced during the construction phase. Comparing similar products in terms of embodied carbon can help to make a more informed choice regarding which substitutions are more significant in terms of the construction project. It is also possible that products with higher embodied impacts can have greater operation benefits. Materials may also be supplied from the local area of the project thereby reducing transport impacts, road congestion and associated safety concerns. Larger projects are more likely to have requirements promoting the use of a local supply chain.

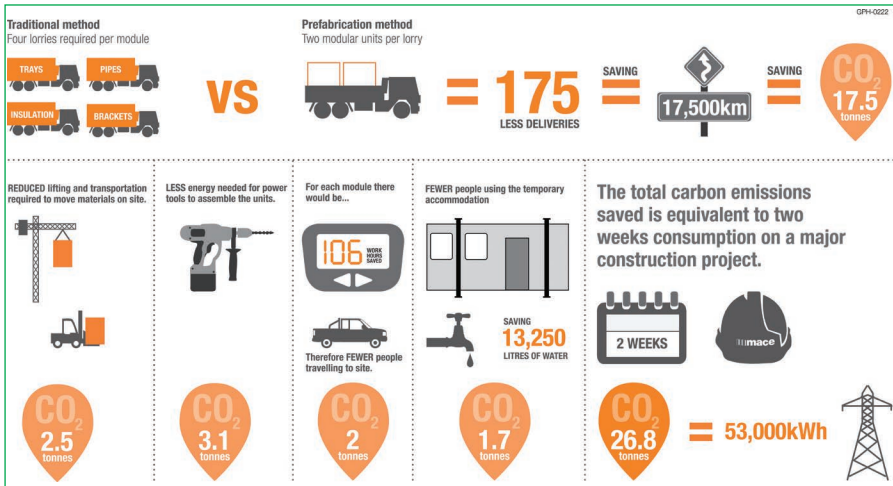


Figure 4.36 Reduction of carbon footprint through pre-fabrication (courtesy Mace)

4.5.1.2 Energy consumption during construction phases

Some construction projects will consume more energy than others during the use phase or operation. However, it is still important to control and minimise energy consumption during the construction phase. Indeed some projects will not use energy in operation making the construction impacts more significant in the life cycle of the project.

Energy consumption during the construction phases can be attributed to a variety of operations. These operations are identified as follows along with the measures that can be taken to reduce the energy consumption.

Construction plant and site vehicles

Construction plant is one of the biggest users of energy on construction sites. Efficient use of this machinery and fuel efficiency are the key for reducing their energy consumption.

Fuel efficiency can be achieved through selecting the right plant for the jobs, for example, avoid using oversized or undersized machines which would be inefficient. Also select plant based on their fuel efficiency credentials. Details of the fuel consumption are available from construction plant suppliers. Ensure that the construction plant owned by the organisation is regularly serviced. This will not only help fuel efficiency, but also the plants lifespan. Construction plant should avoid being left to run 'idle'.

Efficient use can be achieved through advanced operator training in driving plant efficiently and also a good works programme and plant positioning, so as to avoid unnecessary movements.

In terms of site vehicles consideration should be given to using hybrid and/or fully-electric vehicles to minimise emissions and reduce fuel consumption (**Figure 4.37**).



Figure 4.37 Electric site vehicle (courtesy BAM Nuttall)

Site topography

The optimisation of cut and fill for a construction site should be undertaken during design stage, but this can be improved upon during construction. Reducing the movement of vehicles and plant to take material off site could be minimised by reusing material on site or working with another project in the area (if feasible). This activity can reduce energy consumption, but also save on landfill costs and improve the resource efficiency. It would also be recommended to keep records of volumes of excavated materials that have been reused efficiently on site.

Deliveries and logistics

In some cases it is possible to access a site by a number of different roads. There may be restrictions on some due to schools etc but the most efficient route could be promoted by the placement of signage to direct deliveries to site. Transport impacts can also be reduced by car sharing and works mini-buses. National logistics companies can provide telemetry services that help to plan deliveries more effectively and give real time data that can also be helpful in arranging back haul routes for surplus materials and waste removal. The on-site management of delivery vehicles can also lead to reduced energy consumption, ie less time idling waiting for a space to be cleared for the products to be off loaded.

Site accommodation

Temporary offices and associated cabins, for example, canteens and changing rooms, are often poorly insulated, glazed, heated and lit. The use of modern temporary offices and

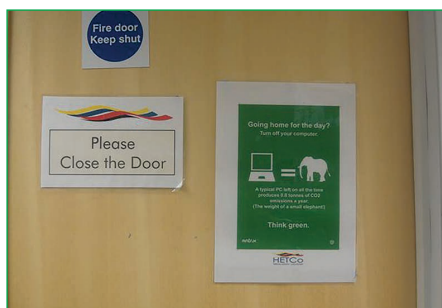


Figure 4.38 Energy signage (courtesy Laing O'Rourke)

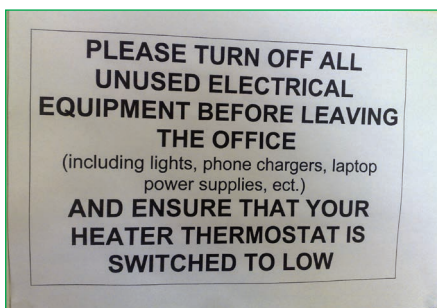


Figure 4.39 Switch-off notice (courtesy BAM Nuttall)

cabins reduce energy consumption through better insulation, glazing, lighting (eg motion sensors), heating and electricity (eg meters and master switch off).

A focus on the occupants of these offices and cabins can also lead to a reduction in consumption from raising awareness (**Figures 4.38** and **4.39**) and encouraging behaviour change through training and 'switch off' schemes.

Utilities

Often site utilities can consume energy. When gaining access to utilities such as water and electricity it is worthwhile checking that the associated mechanical and electrical equipment (pumps etc) are not unnecessarily oversized and therefore consume more energy during construction than is really needed.

Grid connection

It is considered that connection of a site to the national grid is more energy efficient than relying on power from diesel generators. So, where possible the connection should be established as early as practicable.

It may also be possible (depending on the scale of the project) to incorporate low or zero carbon energy for the construction phase. This could be in the form of solar photovoltaic panels and wind turbines, but also alternative lower carbon fuels for mobile plant and delivery vehicles could be considered.

Metrics and reporting

The performance of construction projects is often assessed through schemes such as BREEAM and CEEQUAL (see **Section 1.4**). There is a requirement to demonstrate sustainability performance, which is derived from data recorded at the site level. It is good practice to record energy consumption data for the most significant aspects of the construction as these will not only assist in identifying areas for improvement, but serve as evidence in the latter sustainability assessment of the project.

Most large construction companies report to stakeholders on their sustainability performance through an annual report. Data is often gathered from each project and office to be aggregated up to the corporate level. Site level data is the most valuable as it varies by construction project and one of the greatest areas for improvement for many businesses.

General energy management

The following points should also be considered when on site to reduce energy consumption.

- switch off electrical equipment and lighting when not required
- ensure windows and doors are closed in cold weather and seals are in good condition
- report defective seals, electrical equipment, lighting, heating/cooling
- turn off/turn down heating in unoccupied offices or cabins
- install energy efficient lighting
- avoid unnecessary night time site and accommodation lighting.

Reducing energy consumption will not only reduce the environmental impact of the construction site but also the release of GHGs, reduce waste, improve resource efficiency and help to lower costs.

4.5.1.3 Further reading

KO, J (2010) *Carbon: Reducing the footprint of the construction industry. An action plan to reduce carbon emissions*, Report 006, Strategic Forum for Construction and the Carbon Trust, UK
www.carbonaction2050.com/sites/carbonaction2050.com/files/document-attachment/Reducing%20the%20Footprint%20of%20the%20Construction%20Process.pdf (accessed 7 March 2017)

4.5.1.4 Legislation

Legislation is constantly changing, including amendments and new legislation, and this varies between England, Wales, Scotland and Northern Ireland. If site staff are unsure on any environmental issue, contact the regional environmental regulator for advice.

Legislation	Key requirements	Applicable Nation(s)
Climate Change Act 2008	Sets out a framework for moving the UK to a low-carbon economy, as progress continues towards establishing a post-2012 global emissions agreement. There are no specific legislative requirements on businesses specifically to reduce their carbon footprints, the UK Government has signed up a range of targets to reduce carbon emissions (eg Kyoto Protocol and Climate Change Levy [CCL]).	England, Wales, Scotland, Northern Ireland
The Climate Change Levy (General) Regulations 2001 (as amended) Finance Act 2013	The CCL is an energy tax rather than a carbon tax. It is aimed at industry, including agriculture and the public sector, and applies to all non-household use of coal, gas, electricity and non-transport liquefied petroleum gas (LPG). Climate change agreements can be set for energy-intensive industries to set targets for agreed emission reductions in return for CCL discount.	England, Wales, Scotland, Northern Ireland

4.5.2 Materials

4.5.2.1 Efficient use of materials

Using resources efficiently is important for reducing environmental impact, reducing waste and minimising costs. Increasingly, clients and contractors require monitoring and reporting on resource efficiency. This feeds into corporate reporting on carbon, water, waste and cost. It also helps to ensure materials are being ordered, used, managed and disposed of effectively.

A useful tool for this is a RMP, which is invaluable in identifying where opportunities to maximise efficient use of resources can be identified before works start, and throughout the construction process (**Figure 4.40**).

There are two aspects to environmental good practice in relation to materials:

- 1 Using materials more efficiently.
- 2 Using more sustainable materials.

Efficient use of materials saves cost and waste. It was once common practice that an extra five to 10 per cent of materials was 'over-ordered' to allow for site waste through damage, spills, under-supply and vandalism. These figures can be reduced. The materials resource efficiency checklist (see **Section 4.5.2.7**) can be used to focus on how materials are ordered, delivered, stored and handled on site and to help investigate how to reduce waste.

Choosing more sustainable materials reduces environmental impacts, and can also have social and economic benefits. Clients and designers are now more frequently looking to choose more sustainable materials, particularly in categories that have significant environmental or social impacts. In some product categories, such as timber, product suppliers have developed more sustainable products that have detailed Chain of Custody (CoC) or EU Ecolabel requirements to demonstrate they provide a more sustainable solution. There are many UK-based, local providers of sustainable building materials.



Figure 4.40 Shredded vegetation retained on site as footpath chippings (courtesy BAM Nuttall)

4.5.2.2 Environmental impact

Materials selection and use on site can have several direct and indirect environmental impacts (see [Table 4.3](#)):

Table 4.3 Example of environmental impacts

Material	Direct impacts	Indirect impacts
Timber	- depletion of resources - destruction of habitat - killing of flora and fauna - release of CO₂ from logging.	- use of fossil fuels to cut trees and transport timber - waste produced in further treatment and use on site - emissions (CO₂, NO_x, SO_x etc) in transport - reduction in biodiversity.
Aggregates	- depletion of finite resource - pollution during extraction and processing - visual impact and loss of land.	- emissions (CO₂, NO_x, SO_x etc) in transport - waste generated through use.

These are two simplified examples of how commonly used construction materials can affect the environment. Most materials that are used in construction can have a negative effect on the environment and as a consequence a sustainable approach to the procurement and use of materials on site to reduce them is essential.

Construction assessment schemes such as BREEAM, CEEQUAL, DREAM and LEED consider materials selection to have a significant environmental impact on projects. Inappropriate materials selection during the construction phase is likely to affect the overall scheme award (see [Section 1.4](#)).

It is good practice to consider the link between material selection, use on site, waste management, carbon and water. This is referred to as resource efficiency and is the first step towards effective waste management and ultimately generating minimal waste.

Use of precast concrete to reduce embodied energy (courtesy Barhale Trant Utilities and Carlow Precast)

4.6

Background

Barhale Trant Utilities (BTU) were installing two humus tanks and a deep bed sand filter as part of the upgrade of the wastewater treatment works at Ashford. To reduce potable water consumption and the embodied carbon (29 per cent of onsite pouring emission) of the project, the tanks were to be precast units produced with rainwater.

Lessons learnt

Precast concrete solutions and rainwater use for construction products limit carbon footprint.

4.5.2.3 Material procurement

Important considerations when sourcing materials

Responsible sourcing and management of materials should ensure that the environmental, social and economic impacts associated with those materials are minimised.

All materials contain natural resources, whether this is direct (ie timber) or indirect (ie oil in plastics). Material manufacture may consume large amounts of natural resources such as the fuel used to maintain high temperatures in the manufacture of cement. Some materials contain hazardous chemicals or consume or release hazardous chemicals during their manufacture, application or disposal.

The Alliance for Sustainable Building Products (ASBP) is a cross sector, not for profit organisation, comprising, building product manufacturers and distributors, specifiers, designers, contractors, public interest and sustainability organisations, academics and other building practitioners.



The ASBP champions the increased understanding and use of building products that meet demonstrably high standards of sustainability.

For more information go to: www.asbp.org.uk

Where hazardous materials are being specified, alternatives with a lower environmental impact should be sought where possible.

Responsible sourcing considers the people involved in the abstraction or manufacture of the material or product. It is important to ensure that the human rights of these people are not being infringed through age, discrimination, welfare and working conditions.

When buying material made from natural resources such as timber it is important to ensure it is from a sustainable source. FSC or PEFC certified timber ensures a CoC from tree to site and that the timber is sustainably sourced.

Timber

To maintain the CoC both schemes require seven key pieces of information are displayed on the delivery tickets:

- 1 Supplier identification (name and address of the certified supplier providing the timber or timber products, ie the company name).



Figure 4.41 FSC-approved timber (courtesy Skanska)

- 2 Delivery address – usually the project with the main contractor's name.
- 3 Product identification (ie SW linings, OSB sheets, skirting).
- 4 Dimensional quantity of each product supplied and for BUILD UK member's volume (m³).
- 5 Date of delivery to site/document issue date.
- 6 Formal claim for each certified product (eg FSC 100 per cent, FSC X per cent, X per cent PEFC certified).
- 7 Proof of certification (the CoC number of the supplier, ie BMT-PEFC-1234).

If the timber is handled before it is delivered to a project and this person/company does not hold CoC then they are breaking the chain. In this instance the timber should be delivered to the project from a supplier with chain of custody, or documentary evidence provided to trace the timber back to the source where the chain was broken.

Timber from sustainable sources includes Greenpeace, Friends of the Earth, WWF, UK Forest and Trade Network UK.



FSC retailers: www.fsc-uk.org

UK Government Central Point of Expertise on Timber Procurement:
<https://www.gov.uk/government/groups/central-point-of-expertise-on-timber>

Aggregates and cement replacements

The use of recycled and secondary aggregates helps to reduce the demand for virgin quarried materials and can be a cost-effective alternative. Of the aggregates used in the UK each year, 70 million tonnes come from recycled or secondary sources. A good example is the use of pulverised fuel ash (PFA) or furnace bottom ash (FBA) as cement replacement in concrete. Other examples are detailed in **Table 4.4**.

Table 4.4 Examples of recycled and secondary sources of aggregate and cement replacements

Recycled	Secondary	
	Manufactured	Natural
● recycled aggregate (RA) ● recycled concrete aggregate (RCA) ● recycled asphalt ● recycled asphalt planings (RAP) ● spent rail ballast.	● blast furnace slag ● steel slag ● PFA ● incinerator bottom ash (IBA) ● FBA ● used foundry sand ● spent oil shale ● recycled glass ● recycled plastic ● recycled tyres.	● slate aggregate ● china clay sand ● colliery spoil.

The Aggregates Levy (AGL) is an environmental tax that is levied on the commercial exploitation of rock, sand and gravel when used as aggregate for construction purposes. The purposes of the levy is to maximise the use of recycled aggregate and alternatives to virgin aggregate, and to promote the efficient use of virgin aggregate. The AGL is designed to encourage a shift in demand away from virgin aggregate towards recycled and secondary aggregates that can be produced on site through crushing (Figure 4.42) and screening (Figure 4.43).



Figure 4.42 On site crusher
(courtesy Skanska)



Figure 4.43 Mobile screener
(courtesy Galliford Try plc)

The importation, storage and placement of recycled and secondary aggregates on site requires an environmental permit, licence or exemption from the local environmental regulator at all times unless the aggregate has been produced in accordance with a quality protocol, for example the WRAP Quality Protocol for the production of aggregates from inert waste. The resultant aggregate in this example is classified as a recovered non-waste product.

WRAP have developed the Quality Protocol to help with the use of recycled aggregates in construction. In the context of construction and within clearly defined end uses, quality protocols for PFA, steel slag, IBA, tyre derived rubber materials and tyre bales are being considered. If recycled aggregates are sourced from a supplier, and accompanied by a quality certificate and test certificates, it should have ceased to be waste and does not need to be treated as such, unless it is subsequently discarded as waste.

For information about recycled or secondary aggregates see the Aggregain case studies produced by WRAP: www.ciria.org/REK



On-site crushing and reuse of site-won inert materials (courtesy Kier)

4.7

Background

On-site crushing of inert materials, arising from demolition work, to produce fill for use on site, normally requires both space and large quantities of material for it to be feasible. However, the introduction of mini crushers has now made this operation practicable on small and constrained sites, as was demonstrated on the contract to refurbish Central Square at the University of East Anglia (UEA).

Central Square is the main public circulation area, and was fully renovated in 2009. This necessitated the removal of over 1200 m² of paving slabs. By careful handling, the site team managed to salvage nearly a third of these, handing them over to the UEA Estates Department for use in repairing other areas of existing paving across the campus.

The remaining slabs and concrete bed were crushed on site, over a period of four days, using a mini-crusher. This produced 260 tonnes of clean fill material that, following testing, was later reused in the works. The result was zero waste to landfill and a significant cost saving. Crushing the concrete on site also reduced the number of vehicle movements and the carbon emissions, on what was a very restricted site.

Costs and savings

- total cost of crusher, JCB and attendance: £1600 (£400/per day)
- potential cost of disposal: £1560 (260 tonnes of concrete at £6/t)
- cost of purchasing new material: £3120 (260 tonnes of concrete at £12/t)
- total saving to the project: £3080 (£3120 + £1560 – £1600).

Carbon emissions comparison

- offsite disposal, using a 20t lorry, would require thirteen 40 mile round trips, fuel used, at 8.5 mpg, would be $(40/8.5) \times 13 \times 4.546 = 278$ litres
- crusher, over four days at four litres of fuel per hour, used $4 \times 8 \times 4 = 128$ litres. Fuel saved 150 litres, which is equal to 390 kg of CO₂ (150×2.6 kg CO₂/l)
- for a crusher of this size, as dust suppression equipment was fitted and it was only on site for a short period, no environmental permit was required.

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Appendices

Use of recycled aggregate on the A3 Hindhead Road Tunnel project (courtesy Balfour Beatty)

4.8

Background

The A3 Hindhead Road Tunnel project was an important road improvement scheme to tackle congestion and safety issues, and improve the environment on this busy road. The project comprised a 6.5 km dual two-lane carriageway between Hammer Lane on the Surrey-Hampshire boundary and Boundless Lane near Thursley. Twin bored tunnels take the A3 under a SSSI adjacent to the Devil's Punchbowl.

Material used

Glass sand is a recycled aggregate made from glass bottles and jars, which can be used in the construction industry as a replacement for quarried or marine sand. Glass sand is made by crushing and screening glass waste to a particle size of 6 mm. Glass sand was used on the A3 in the following ways:

- constituent of cement bound material (CBM) used in the construction of the lower road base for the new A3 (up to 40 per cent)
- filter or protective layer lining all the scheme permanent infiltration and attenuation ponds for highways drainage
- filter layer in the scheme permanent soakaways for highways drainage from the new A3
- protective layer underlying the green roof for the tunnel service buildings.

Rationale for use

The potential for using glass sand on the A3 project was identified early in the construction phase and the majority was supplied by Viridor. The Highways Agency specification allowed for use of up to 40 per cent glass in the road base. The choice of recycled glass sand was made easier because there are no quarries near to the A3 project (30 mile radius) that can provide sand of a suitable quality. Neither was the Hythe sands excavated during earthworks work for the A3 earthworks fit for this purpose. The particle size of the glass sand makes it suitable for use as a filter and protective layer.

Economic and environmental benefits

- reduced the demand for sand or other primary aggregates that have to be quarried or dredged from estuaries
- reuse of glass reduces the volume of waste taken to landfill
- glass sand is an inert material and does not present a pollution risk
- reduced waste materials by producing CBM on-site
- cost savings of £191 235 compared to quarried sand
- on-site manufacture of CBM reduced potential delays from off-site production and delivery
- supply of the glass sand represents a cost saving to Viridor who would have to landfill the glass sand if they could not find an alternative use for the material
- use of recycled glass sand is economical, environmentally friendly, and its use is technically feasible and provides suitable quality and performance
- close liaison between the contractor, designer and client allowed for appropriate and effective use of recycled glass sand on the A3 project.

Plasterboard and gypsum

New plasterboard should be stored flat, undercover and away from traffic and moisture to prevent damage to the boards resulting in it becoming waste. It is unlikely that waste plasterboard generated during demolition or refit can be recycled due to contamination and this should be segregated from general waste to reduce disposal costs.

To reduce disposal costs construction projects should recycle plasterboard/gypsum waste where possible by arranging a take back scheme with the supplier. If a take back scheme is not possible then it should be separated for recovery and recycling with a certified waste contractor.

Plasterboard and gypsum waste that cannot be recovered or recycled should be sent to landfill. There are currently relatively few landfills that can accept such waste, so this disposal route is likely to lead to higher costs.

Non-hazardous gypsum-based and other high sulphate bearing materials should be deposited in landfills for non-hazardous waste in cells where no biodegradable waste is accepted. Any gypsum based materials classified as hazardous waste must be disposed of in a hazardous landfill.

Polyvinyl chloride (PVC)

The construction industry is one of the largest consumers of PVC, using it extensively in applications such as piping, cladding, wiring, flooring, windows and many others. It is estimated that the industry consumes in the region of 500 000 tonnes per annum. The issues surrounding PVC are contentious because of the many substances used during PVC manufacture and their release during accidental fire or incineration. Alternatives to PVC should be specified where possible.

Formaldehyde

Formaldehyde is most commonly used as a bonding material for composite boards such as medium density fibreboard (MDF) and plywood. Also, it is used in soft furnishings and carpets, providing a degree of fire retardation. Exposure to even low levels of formaldehyde through inhalation can cause irritation to the eyes, nose, throat, mucous membranes and skin. Unsealed chipboard, plywood, fire retardants and some furnishings have been found to yield measurable quantities of formaldehyde. In addition, when boards such as MDF are cut, a fine dust is created that can be respired leading to possible exposure to released formaldehyde. Formaldehyde-free and low formaldehyde containing boards and products are increasingly available in the UK and should be specified where possible.

Packaging

Packaging plays an important role in materials and product protection and ease of handling on site – too little increases product waste, too much increases packaging waste. Early engagement with the materials supplier will maximise opportunities to reduce the amount

of waste material and packaging. Reductions can be found from the adoption of JIT deliveries and use of appropriately packaged goods for the site requirements.

Opportunities to reduce waste also exist through material and packaging recycling and take back schemes. Good segregation of used packaging materials will maximise these opportunities. Most suppliers will be subject to the legislative requirements and should be able to offer alternatives if excess package becomes waste on site.

4.5.2.4 Material assessment

When procuring materials, consideration needs to be given to client and legal requirements. Traditionally these have been referred to as:

- **preferred** – with reduced environmental or social impact (eg FSC timber)
- **advisory** – not banned, but those which clients would prefer not to be used (eg PVC)
- **prohibited** – banned by law (eg asbestos).

Following the update to BRE (1996) greater emphasis is being placed on Ecopoint scoring from A+ to E of main building elements, such as roof, floor or wall systems, rather than addressing materials in isolation. It is becoming increasingly common for specification lists to state an acceptable BRE Ecopoint band such as 'B' for a roofing system component, rather than to specify the avoidance of PVC. Where this is the case, liaison with the material manufacturer and reference to the BRE guide is necessary.

Increasingly a life cycle analysis (LCA) (or cradle to grave) approach is being taken to demonstrate the environmental impact or sustainability of products and materials. In Europe, the European Committee for Standardization (CEN) are undertaking several projects to standardise the environmental declarations of products.

The environmental impacts of materials selection are considered significant within the CEEQUAL and BREEAM assessment methodologies (see **Section 1.4**) and responsible sourcing of materials contributes to the overall score.

BRE Green Guide to Specification:
www.bre.co.uk/greenguide



4.5.2.5 Material logistic planning

The use of logistics as a complementary approach to construction management is becoming more popular. Logistics are now a key feature of pre-construction planning, not only on large complex schemes, but also in the planning and delivery of mainstream housing and fit-out contracts. Material logistics planning not only encourages resource efficiency and reduces damage to materials, but also helps construction projects achieve programme certainty and cost predictability.

A materials logistics plan (MLP) sets out the following:

- types and quantities of materials to be used
- supply routes
- handling, storage, security arrangements
- use or installation
- reuse and disposal of any leftover materials.

WRAP documents are available from:
www.ciria.org/REK



- Resource management plan
- Building Information Modelling and resource efficiency
- Materials logistics plan.

A MLP can work alongside a RMP or a SWMP to ensure integrated, efficient management of the materials you buy and use on site.

4.5.2.6 Management of materials on site

Storing materials

The correct storage of materials is necessary to ensure they are:

- located at least 10 m away from sensitive receptors, eg watercourses, including drainage and transport routes, or more if there is no vegetated buffer zone
- unlikely to pollute: all potentially polluting materials should be stored in a designated area, on an impermeable base, bunded and away from potential vehicle collision
- not at risk of theft, vandalism or accidental damage
- not spoiled through exposure to the elements
- not subject to double handling – the more times materials are moved the more likely it is that damage will occur
- easily accessible
- on level ground to prevent damage from falling or toppling.

For guidance on effective storage of materials on site see the materials storage checklist in **Section 4.5.2.7**.

Managing materials

Different materials need to be managed in different ways according to their potential environmental impacts. For example, oil storage legislation require that oil containers are strong enough and that they are unlikely to burst or leak during ordinary use, containers must be within a drip tray, bund or other secondary containment system and must be located away from any watercourses (see **Section 4.7.3**) (in Scotland, this is only containers with a capacity over 200 litres).

The legislation does not apply in Wales, but consideration should be given to meeting such requirements, as they are designed to prevent contamination of the water environment that would be an offence under other legislation. Use the checklists provided in [Section 4.5.2.7](#) to ensure good practice with oil fuel storage and management.

Many materials that are potentially hazardous such as adhesives, solvents, paints and curing agents are regulated under the COSHH. Details of how these materials have to be stored, used and disposed of are stipulated in the COSHH datasheets, which should be followed. Copies of the datasheets and an inventory of all COSHH materials held on site should be



maintained. As a minimum all COSHH materials should be kept in a secure bunded COSHH store located away from drains and watercourses ([Figure 4.44](#)).

For all other materials, consider the appropriate means to handle products/materials to prevent them being damaged and becoming waste. For instance, store on pallets in designated areas and protected from the elements (eg wind and rain).

Figure 4.44 COSHH store sign (courtesy Laing O'Rourke)

Stockpiling

For any stockpile ([Figure 4.45](#)) that will be used on site for a long period, it is worth considering profiling and vegetating it to improve its stability and aesthetics (see [Section 4.5.2.7](#)), so as not to generate a nuisance from dust. Ensure control measures are in place to deal with silt runoff during wet conditions and dust during dry periods. Soil stockpiles or areas of exposed soil should be managed to prevent silty runoff from entering watercourses, drains, public highways and areas of the site where materials are stored. This can be done through bunding, vegetation, silt fencing and through the use of cut-off trenches, berms, bunds and covering (eg with hessian or jute matting).



Figure 4.45 Landscaped stockpile of spoil (courtesy Galliford Try plc)

Materials such as uncontaminated spoil arising from site set-up, sands and gravel excavations can be used to create a temporary bund or acoustic barrier while works are in progress and minimise silty runoff. Where the bund or barrier is situated needs careful consideration as does the need to comply with environmental permitting requirements.

Consideration should be given to the need for an environmental permit, licence or waste management exemption.



Reuse of natural stone and other on-site recycling initiatives (courtesy Galliford Try plc)



Background

Construction of 120 m of natural stone clad reinforced concrete flood defence wall near to a small village hamlet. The site was located in a conservation area, which meant the wall had to be remade using existing stone on site or locally sourced-stone. An existing stone shed had to be dismantled and rebuilt as part of the works.

Material used

As part of the reconstruction of the wall about 300 m² of Natural York Stone walling was removed, cleaned, stored and reconstructed in exactly the same position and size without any damage being caused. This meant that no new materials had to be ordered or off site recycling undertaken. In addition the supporting wood beam from the stone shed was preserved and reused in the new structure.

Surplus excavated material was used to reinforce the existing flood bund. Undamaged pallets used to deliver bricks and other materials were registered with a pallet collection scheme and collected every month.

4.5.2.7 Good practice checklists

Materials procurement	
Substitute hazardous materials with non-hazardous alternatives	
Replace virgin materials (eg aggregates) with recycled products	
Order products with recycled content	
Source ethically-produced materials	
Order sustainably sourced materials, such as FSC timber or PEFC timber or procure products certified to the framework of BES 6001	
Consider the environmental impact of the material life cycle	
Consider transport distances of materials, ie are products sourced locally	

Resource efficiency	
Where appropriate reuse materials (eg aggregates) generated through on-site activity (eg temporary works or demolition/deconstruction)	
Make sure that when intending to reuse materials won on-site that they are suitable for the intended use and do not contain contaminants that could potentially cause pollution or harm to sensitive receptors	
If uncertain about the suitability of site won materials to be reused consult a specialist for advice	
Only order the required amount	
Order materials cut to size to reduce off-cuts	
Establish JIT systems, so that materials are not stored on site unnecessarily, reducing potential damage	
When deliveries arrive on site: ● ensure they are off-loaded in a designated area of site ● check goods to ensure that they are the correct specification and quantity ● do not accept delivery of damaged goods	
When handling materials, avoid damage or spillage through incorrect or repetitive handling	

Materials storage	
Identify mechanisms that allow for beneficial reuse and avoid materials becoming waste by using them on the next project	
Store all containers of potential polluting materials, such as oils and paints, in a bunded area	
Designate responsibility for hazardous materials storage, restrict and manage access	
Clearly mark storage area(s)	
Store materials in suitable containers that are labelled appropriately with fitted lids, taps and tops in good condition	
Put control measures in place and/or locate spill kits near to bulk stores and ensure they are accessible and fully stocked	
Store material so as to guard against breakage, vandalism or theft	
Protect stores against flood damage or inundation	
Store waste in a designated area away from the materials storage	

Managing stockpiles	
Store topsoil for reuse in piles less than two metres high to prevent damage to the soil structure	
Segregate different grades of soil	
Position spoil and temporary stockpiles a minimum of 10 m away from watercourses and drainage systems	
Minimise movements of materials in stockpiles to reduce degradation of the soil structure	
Silty water formed by erosion of the stockpile should be managed correctly	
Direct surface water away from the stockpiles to prevent erosion at the bottom	
Place silt screens around spoil heaps to trap silt from any surface water runoff	
Vegetate long-term stockpiles to prevent dust in dry weather conditions, and reduce erosion of the stockpile to form silty runoff. Ensure adequate weed control	

Refuelling protocol	
Designate a bunded refuelling area, away from site drains on an impermeable surface	
Avoid using remote fill points. Where these are unavoidable install suitable oil separators to the surface drainage system	
Avoid refuelling close to watercourses	
When refuelling keep materials such as absorbent pads or booms readily available in case of spillage	
All refuelling should be supervised. Do not leave valves open unattended (note that auto-close valves may be a legal requirement)	
Keep an emergency spill kit at each refuelling point. If mobile refuelling is carried out, ensure each bowser carries a spill kit	
Bowsers should have an automatic cut out and should be locked when not in use	
Ensure that site staff carrying out refuelling are aware of the protocol and know what actions to take in an emergency	

Storing, fuels and chemicals	
Securely store all containers that contain potential pollutants (eg fuels, oils and chemicals) according to oil storage legislation	
Label containers clearly, so that appropriate remedial action can be taken in the event of a spillage	
All bulk fuel storage should be integrally bunded or kept within a bunded area	

Storing, fuels and chemicals	
Regularly check taps and hoses for leakage and signs of damage	
Avoid storing drums tightly against each other. Store drums so that they can all be inspected for leaks	
Prevent damage from vandalism. Ensure that all valves and trigger guns are vandal and tamper proof	
Display a notice that demands valves and trigger guns are to be locked when not in use	
Store tanks or drums in a secure bunded container or compound that is locked when not in use	
Fuel, oil and chemicals must be stored on an impermeable base (this may be part of a bund). Ideally, such materials should be stored away from areas of groundwater contamination risk. This should be identified in the contract but may be worth discussing with the environmental agencies	
Provide separate fill pipes for each tank unless the tanks are interconnected by a balance pipe of greater flow capacity than the fill pipe	
Mark fill pipes with the product type and a tank number where there is more than one tank	
Before moving a drum, check the bung is secure	

Bunding tanks	
To avoid accidental spillage, bund tanks with a minimum capacity of 110 per cent of the volume of the largest tank or 25 per cent of the total storage capacity, whichever is the greater	
Do not allow bunded areas to fill with rainwater or slops (ideally, provide a cover). Empty and dispose of any water collected in an appropriate way	
Site tanks away from vehicle movements and mark them clearly, so that people know they are a potential risk	
Do not put tanks where there is a direct link to surface drains, watercourses or sewers. Avoid placing tanks on unpaved ground, to reduce the risk of groundwater and soil contamination. Protect tanks from vandalism	
The bund should be impermeable to the substance that is being stored in the tank	
Position air vent pipes, so that they can be seen easily and directed so that any discharge (eg in the event of the tank being overfilled) is directed down into the bund	
Fill points must be inside the bund	
Fit any pumps sited outside the bund with a non-return/check valve installed in the feed line	

4.5.2.8 Further reading

WRAP (2004) *Quality protocol for the production of aggregates from inert waste*, The Waste and Resources Action Programme, Oxon, UK

www.wrap.org.uk/content/quality-protocols (accessed 7 March 2017)

WRAP (2013) *Aggregates from inert waste. End of waste criteria for the production of aggregates from inert waste*, The Waste and Resources Action Programme, Oxon, UK

www.mineralproducts.org/documents/aggregates_quality_protocol.pdf (accessed 7 March 2017)

BS 8903:2010 *Principles and framework for procuring sustainably. Guide*

4.5.2.9 Legislation

Legislation is constantly changing, including amendments and new legislation, and this varies between England, Wales, Scotland and Northern Ireland. If site staff are unsure on any environmental issue, contact the regional environmental regulator for advice.

Legislation	Key requirements	Applicable Nation(s)
Timber and Timber Products (Placing on the Market) Regulations 2013	This counters the trade in illegally harvested timber and timber products through three key obligations: - it prohibits the placing on the EU market for the first time of illegally harvested timber and products derived from such timber - it requires EU traders who place timber products on the EU market for the first time to exercise 'due diligence' - it requires operators to keep records of their suppliers and customers for five years.	England, Wales, Scotland, Northern Ireland
The Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) Enforcement Regulations 2008 (as amended)	If chemicals are used on site that are not common check with the supplier to see if they comply with the REACH regulations. Safety data sheets should be provided with each chemical kept on site: these will be provided by the supplier. All safety data sheets should be kept with the appropriate chemical. The recommended risk assessments should be checked for feasibility on the site for storage and use. If the risk assessment is not adequate for use on site a new risk assessment should be carried out and documented.	England, Wales, Scotland, Northern Ireland
Water Environment (Oil Storage) (Scotland) Regulations 2006	Where oil is stored in any portable container with a storage capacity of less than 200 litres, the container must be of sufficient strength and structural integrity to ensure that it is unlikely to burst or leak in its ordinary use. Where the container has a storage capacity of 200 litres or more, the Regulations require provision of a secondary containment (a bund or drip-tray) to ensure that any leaking or spilt oil cannot enter the water environment.	Scotland

Legislation	Key requirements	Applicable Nation(s)
Control of Substances Hazardous to Health Regulations 2002 (as amended) Control of Substances Hazardous to Health Regulations (Northern Ireland) 2003 (as amended)	The organisation: - shall ensure that the exposure of its employees to substances hazardous to health is either prevented or, where this is not reasonably practicable, adequately controlled - providing any control measure, personal protective equipment (PPE) or facility pursuant to these Regulations shall take all reasonable steps to ensure that it is properly used or applied as specified - providing any control measure shall ensure that it is maintained in an efficient state, in efficient working order and in good repair. PPE should be in a clean condition - shall ensure that employees who are or are liable to be exposed to a hazardous substance are under suitable health surveillance - shall prepare procedures, provide information and establish warning systems to deal with an emergency in the workplace related to the presence of a substance hazardous to health.	England, Wales, Scotland, Northern Ireland
The Aggregates Levy (General) Regulations 2002 (as amended)	A tax placed on sand, gravel and rock extracted from the ground or dredged from the sea to encourage an increase in the use of recycled materials.	England, Wales, Scotland, Northern Ireland
Control of Pollution (Oil Storage) (England) Regulations 2001 Control of Pollution (Oil Storage) (Northern Ireland) Regulations 2010 (as amended)	Imposes general requirements for preventing pollution of controlled waters from oil storage, particularly fixed tanks, drums or mobile bowsters. The legislation applies to the storage of 200 litres or more of oil of any kind, including petrol, but excluding the storage of waste oil. Restrictions also govern the use of pumps. It details requirements for oil stored in tanks, drums, mobile bowsters or underground that must be identified and implemented, and makes contravention a criminal offence.	England, Northern Ireland

4.5.3 Waste

4.5.3.1 Introduction

In England and Wales the construction and demolition industry is responsible for generating up to 77.4 million tonnes of construction, demolition and excavation waste per year and approximately 19.8 million tonnes of this total is sent to landfill (Defra, 2012. Note these figures are as of 2010). The total amount of waste generated equates to about one-third of all waste produced in a year in England and Wales, and makes up around half of all controlled waste in Scotland. The industry is the third largest producer of hazardous waste.

Waste not only significantly affects the environment, but handling waste inefficiently will cost time, money and effort. For example, by not segregating waste initially, inert material may have to be disposed of as non-hazardous or hazardous waste, depending on the waste it is mixed with, which is more expensive and stops the reuse of the waste. Often people think that waste costs are related only to its disposal. In fact, the true cost of waste is eight to 10 times the disposal cost and includes:

- purchase price of materials that are being wasted
- cost of storage, transport and disposal of excess materials/waste
- cost of the time spent managing and handling the waste
- loss of income from not reusing waste materials.

4.5.3.2 Waste impacts

The environmental impacts of waste are many and wide ranging, but can be divided into two main categories:

1 Direct impacts

- emissions** – any processing of waste before disposal (on or off site) requires energy, so contributes to emissions to atmosphere
- energy emissions from transport** – each load of waste removed from site is responsible for transport emissions to the atmosphere
- landfill emissions** – as waste undergoes chemical, physical and biological change in landfill it releases emissions to the atmosphere, such as CO₂ and methane, that then affects air quality and contributes to emissions into the atmosphere of GHGs
- land use** – disposal to landfill requires the use and contamination of land that takes away a commodity that could be used for more beneficial purposes, or simply left for ecological value.

2 Indirect impacts

- impacts of raw material use and energy consumption in production of product, material, packaging etc before becoming a waste
- recycling uses energy, produces emission pollutions and generates waste
- landfill as contaminated land requires extensive clean up or remediation before it can be reused
- energy use and emissions as a consequence of transport, processing and disposal of waste following transfer of waste to new holder.

The effects of waste at regional and national levels are wide ranging and collectively there is a major impact on the environment. Waste is considered as one of the most important environmental issues to manage properly.



Figure 4.46 Site recycling (courtesy SEPA)

There are two principles of sustainably managing waste:

- 1 **Resource efficiency** – reducing the generation of waste in the first place.
- 2 **Effective waste management** – diverting remaining waste from landfill into reuse, recycle and recovery (see [Section 4.5.3.6](#)).

These principles are acted upon through several mechanisms in the UK construction industry, from European Directives through to national legislation.

Legislation as it applies to a construction site can be summarised as having two principle aims in the industry:

- 1 To ensure the disposal of waste is regulated (and traceable).
- 2 To ensure that the cost of waste disposal is borne by the waste producer, in-line with the polluter pays principle (PPP).

To meet the wider aims eliminating waste and diverting waste from landfill there are many strategies in place that are highlighted in [Section 4.5.3.4](#).

4.5.3.3 Definition of different types of waste

The European Waste Catalogue (EWC) can be used to identify waste and assigns a six digit code to it that helps to determine how waste can be disposed. These six digit codes are required to be written on waste transfer evidence (see [Case study 4.15](#)). For the purposes of landfill disposal, wastes can be divided into the following:

- **inert waste** includes rocks, ceramics, concrete, masonry and brick rubble
- **non-hazardous waste** is non-contaminated biodegradable materials, including paper, cardboard, plastic, metal, timber, topsoil and food
- **hazardous/special (Scotland) waste** is contaminated and harmful materials and deemed to be dangerous to life and/or damaging to the environment. Hazardous wastes may be corrosive, explosive, oxidising, carcinogenic or flammable. Examples include asbestos, acids, alkaline solutions, oily sludges, waste oils and wood preservatives.

The terms active and inactive may also be used along with hazardous, non-hazardous and inert category classifications, defined as:



Inactive: non-biodegradable, eg inert waste and does not undergo significant physical or chemical reactions or cause environmental pollution or harm to human health or endanger the quality of any surface water or groundwater.

Active: biodegradable, eg wood, plastics, food, topsoil, which break down and undergo significant physical and chemical reactions. They may cause environmental pollution or harm to human health or endanger the quality of any surface water or groundwater.

4.5.3.4 Waste management initiatives

Circular economy

The Ellen MacArthur Foundation set out the principles of a circular economy in two business-focused annual reports (started in 2012). These reports suggest that a step-change is needed in how resources are sourced and managed. They advocate a systems approach, where the whole business cycle uses and reuses resources more efficiently, eliminating waste and instead using all by-products. The Circular Economy 100 is a global group of leading businesses, including contractors and clients, who collaborate to encourage the transition to a circular economy.

Ellen MacArthur Foundation:
www.ellenmacarthurfoundation.org

Circular Economy 100:
www.ellenmacarthurfoundation.org/business/ce100



Resource efficiency

Resource efficiency is the next step on from waste reduction, and is becoming widely accepted as the driving concept in waste and resource management. Encouraged by government, and organisations such as WRAP and BRE, resource efficiency focuses on making the most of resources to gain maximum cost benefit and minimise environmental impact.

National strategies/local authorities

Each of the UK regions and some local authorities have developed and published their own strategies for waste management by setting targets and developing process to reduce the amount of waste produced.

Community schemes

There are a number of local community schemes that promote waste management. The aim of these schemes is to collate information on the local community waste schemes available.

Others aim to provide waste management solutions, usually run by social enterprises, for local businesses and/or works. An example is the Community Wood Recycling project providing options for wood and timber recycling and also locations for purchasing recycled timber products.

Waste treatment on site (courtesy Amey, Costain)

4.10

Background

At the Bidston Moss Viaduct site a bailing machine was used to create plastic bales from shrink wrap and polythene previously used for containment. The baler took five skips worth of plastic to produce one bale weighing one tonne and paid back its £10 000 cost in three months. It was estimated to save the project twice the cost and the project team had the baler as an asset at the end of the project. More importantly, 452 vehicle movements were eliminated reducing the impact on the environment and local community. All the plastic bales were then collected and recycled.

Lessons learnt

This is a good example of the use of innovative technologies to reduce construction waste and impact.

4.5.3.5 Waste management on site

To effectively manage waste on site, a standard approach should be adopted as follows:

- 1 Planning.
- 2 Managing.
- 3 Monitoring.
- 4 Reporting.

These collectively combine good practice techniques and legislation and is reflected in this section of the guide.

Figure 4.47 outlines the activities to apply waste management on site. The following section explains this process in more detail.

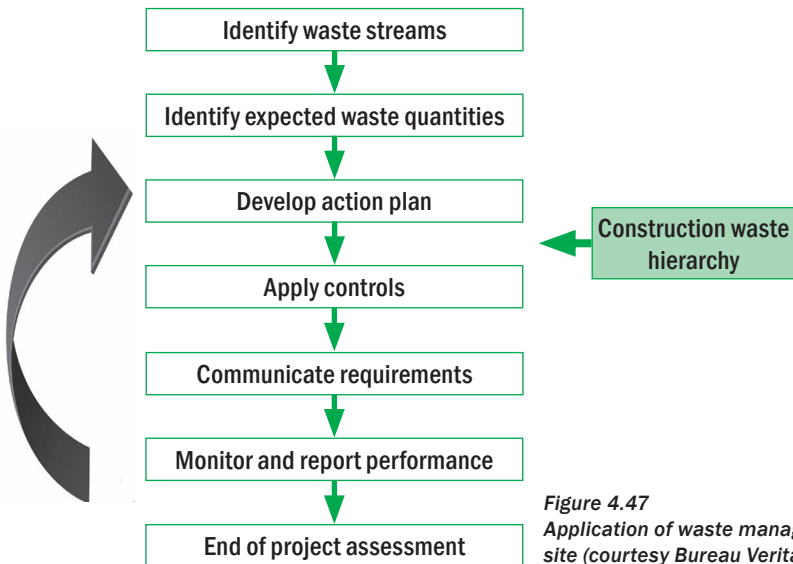


Figure 4.47
Application of waste management on site (courtesy Bureau Veritas)

Planning

A RMP or a SWMP is useful tool for managing waste on site. A SWMP in particular may be required under the planning permission, by the client or main contractor, or to obtain BREEAM points. SWMP are generally considered good practice.

Site waste management planning should have the involvement of all parts of the project team, including the client, contractors, designers and workers, not based on site. It is useful to identify one site-based employee from the main/principal contractor to be responsible for the development and implementation of the SWMP or processes. This individual should have sufficient knowledge and experience of the project processes and enough influence within the project team to ensure that the site waste management planning is effective.

Before work begins it is necessary to plan for waste management. This should include ways of minimising waste arisings, materials and waste storage, and logistics such as take-back schemes. Many product suppliers offer these schemes to take back packaging and/or left over product reducing unnecessary waste on site.

Client and designers role in planning for waste management

The client should be involved in the planning stage. However, the most beneficial waste reduction opportunities should be identified by members of the design team, which may include engineers, architects and quantity surveyors. This is often referred to as 'designing out waste', and should contribute to the projects resource efficiency.

Engaging the client and designers will help ensure that waste reduction decisions and actions are achievable and agreed by all who are involved in the project delivery. Many of the most effective methods to reduce waste are achieved through design and specifications on projects. It is good practice for the client and principal contractor to sign a joint declaration of commitment to the SWMP.

Earthworks planning

For earthworks it is worth considering the CL:AIRE CoP (2011). This document sets out an auditable good practice methodology that can be applied for assessing whether or not materials are classified as waste and for determining when treated waste can cease to be waste for a particular use. This will help to identify whether or not an environmental permit may be required. The CL:AIRE cluster guide (2012) sets out the 'cluster methodology' designed to offer an alternative way of developing and remediating multiple sites that are located relatively close by.

Segregation of recycling

Segregation of various recycling streams is often advisable where space allows and these include plastics, metals, glass, paper and card. Space for collection, segregation, storage and possibly treatment of waste (eg individual and/or communal bin stores, composting facilities, waste treatment facilities) should be allocated within the planning application site layout.

Managing waste

Identify waste streams

Undertake a review of the project plans, programme, design etc to identify each type of waste that is expected to be produced, including identifying those that are inert (inactive), non-hazardous (active) and hazardous. If using a SWMP, record the expected wastes in it.

WRAP Net Waste Tool:
<http://nwtool.wrap.org.uk>



For each type of waste identified, estimate the quantities expected to be generated and associated cost of traditional disposal. This estimation should be based on previous experience, or industry averages. WRAP's Net Waste Tool can be used to forecast arisings as well as assess recycled content.

By identifying potential waste streams (types and quantities) that could arise during a construction project, there is a greater likelihood that these can be effectively managed and diverted from landfill.

For each waste stream identified consideration needs to be given as to how the waste will be disposed of, eg timber off-cuts, general waste skip, landfill.

The information gathered on waste streams and disposal routes is used to estimate the expected costs for waste disposal. This is the cost expected to pay for wastes identified if no improvements are made to the disposal options, eg material x skip hire x transfer fees x disposal cost x no. of skips = £xxx.

Develop waste action plan

Using the principles of the waste hierarchy (**Figure 4.50**) a plan should be developed for each waste stream identified. Opportunities for each stage of the hierarchy should be considered and the most suitable (practical, financial, technical) option selected. This plan should demonstrate both reductions in overall waste expected to be generated and the reductions in waste to be sent to landfill.

To develop suitable actions it is important that the client and architect and/or designers are involved in the process. In some contracts this may require subcontractors input. Examples include:

- developing standardised sizes or pre-cut materials to reduce off cuts (eg timber)
- negotiating take-back schemes with suppliers
- identifying opportunities to reuse materials between trades
- providing storage areas for materials to be reused on site
- specifying/negotiating reduction in the amount of packaging used by suppliers, or packaging return schemes
- specifying pre-cast units (eg concrete panels rather than on-site pours).

Each waste stream in the action plan should have a corresponding action (some may require more than one action) to reduce waste. These can be used to monitor progress in reducing waste.

Waste management should start with resource efficiency by using the raw materials procured more wisely. To manage wastes effectively, focus on ways to prevent materials becoming waste.



It is good practice to record the waste action plan within the SWMP document for the site. The SWMP should include details of disposal methods for waste on the project, for instance waste carriers and waste disposal facilities (as included within SWMP templates developed by WRAP). At the time of planning it is important to take into account the availability of facilities in the area of the site.

At this stage ensure to obtain copies of environmental permits/licenses for each of the waste streams identified.

WRAP SWMP templates:
<http://tinyurl.com/mdgbpps>



Storing and treating waste

During construction if waste material is to be stored on site before collection and treatment or treated on site (eg crushing or reusing) then, depending on the national environmental regulator, an environmental permit, license, Pollution Prevention and Control (PPC) permit or exemption could be required, resulting in extra costs to the project. For example, using baling equipment to reduce the volume of waste may require an exemption. If there is an exemption in place, it must comply with the conditions set out in it.

Waste management during contaminated land remediation (courtesy Galliford Try plc)

One of the largest tyre dumps in Europe was remediated using tyre stabilisation and capping techniques. The first stage involved re-profiling the remaining tyres into a regular shape and covering them. The second stage involved the construction of a specifically designed cover, which comprised a layer of geogrid membrane, a layer of inert waste shale from a local source and completed with a layer of local limestone.



Details of materials reused on the project to reduce the amount of waste generated included:

- use of 19 000 tonnes of waste shale and limestone dust in the engineering cap, which would have gone to landfill. This material was acquired through the procurement system and resulted in a landfill tax saving of £455 000, more than the actual project value
- concrete slabs that were already present on site were used as temporary security fencing/ road blocks during the scheme and then made into a permanent fence on project completion
- mature trees taken down to make way for the engineering cap were made into log sections and stored on site. On completion of the cap they were then redistributed around the site in log piles to provide new habitat for hibernating mammals, reptiles and ground nesting birds
- limestone blocks already *in situ* were used for habitat provision. These latter two initiatives were not part of the original design, but provided added value to the scheme by encouraging new habitat to flourish on the site, which had previously been an eyesore and a drain on local resources.

Obtain guidance from the environmental regulator before undertaking any storing or treating of waste on site.

Once the waste has been suitably treated on site in accordance with the waste permit, licence or exemption and it fulfils the WRAP Quality Protocol, it may no longer be classed as a waste and can be used for its defined purpose on site.



Figure 4.48 Segregated skips (courtesy BAM Nuttall)

Apply controls

Having defined the site waste management arrangements (such as a SWMP) and action plan, apply controls on site to ensure that the plans are achieved, which starts with defining facilities.

Define facilities on site

Ensure that sufficient space is allocated on site for the waste expected. This should include the transfer of waste from remote locations to a central waste area. Clearly mark these areas on site plans for communication purposes. When waste is being stored on site it is important that the storage areas have clear signage to ensure different wastes are stored in the correct place.

Before stockpiling wastes on site for reuse or recycling, identify where the material is going to be used. If there is no space on site to segregate wastes for reuse or recycling, consider off-site recycling by using a waste management contractor that has the necessary facilities. Consider the use of reused and recycled materials on site. To find sources of such materials talk to local demolition contractors and local authority recycling officers.

The storage provided should be:

- on a hard standing area away from drains and watercourses
- clearly marked, eg use waste aware signs
- enclosed/secured to prevent waste escaping, eg blown by wind or from unauthorised access
- segregated by type where possible
- engineered to contain that waste type, ie to prevent escape, including leaking of liquids.

In addition:

- hazardous wastes must not be mixed
- hazardous wastes must be stored in suitable containment.

Dedicated hazardous waste storage area (courtesy Parsons Brinckerhoff)

4.12

Issue

At the Hutton Substation in Cumbria, hazardous waste storage was not on an impermeable base, was difficult to access, located outside and uncovered causing build-up of rainwater in bunds.

Lessons learnt

A dedicated hazardous waste storage area was set up within a waterproof shelter on a concrete base. Oil drums were provided with an appropriate drum spill pallet. Access was such that plant could be used to move drums/containers, removing the requirement for manual handling. All hazardous waste was clearly labelled with consistent signage that included the EWC codes. Where possible, such an area for hazardous waste should be included in the planning stages of a project and put in place at site mobilisation.



Figure 4.49 Dedicated hazardous waste storage area (courtesy J Murphy and Sons Ltd)

If it is intended to use a material recovery facility (MRF) to sort and recycle waste, it will be necessary to discuss the on-site facility requirements with the contractor to ensure that the best results are achieved. This will include establishing exactly what can be placed in a general waste skip without contaminating the waste and preventing it being recovered and recycled.

Communicate

As each site will have different requirements for waste management, it is important that these requirements are communicated to relevant parties (ie site-based staff and subcontractors).

All site-based staff should be made aware of the waste management requirements at induction as a minimum. It is good practice for the principal contractor to make the SWMP available to all contractors carrying out work on their behalf, and that these contractors know where the SWMP is held.

Site induction

Ensure that the site specific requirements for waste (including relevant action plans) are included in the site induction, and provided to all who work on site. This does not need to be the full details of the plan, but just those areas relevant to their activities.

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Appendices

Monitoring and reporting performance

Updating the site waste management planning

It is considered good practice to update the waste management records or SWMP each time waste is removed from site or at least on a monthly basis, with the waste transfer evidence/consignment note information. Following this procedure provides a useful check that the transfer notes are being completed correctly and ensures records are up-to-date at all times.

A thorough review of the waste management records or SWMP should be carried out monthly, to assess performance against the waste action plan and targets. The review should include calculating the costs of waste treatment and disposal.

The site manager should allocate responsibility to a nominated person to carry out waste audits/inspections at regular intervals to look at:

- quantities of each type of waste generated, reasons why and its cost implications
- how wastes are being handled and stored
- recommendations for improving waste management.

Carrying out audits will provide valuable information to help set targets for improvement and will show how well waste management initiatives from the action plan are working on site.

MRF monitoring

Where possible, it is good practice to ensure that exact recovery and recycling data from MRF's is obtained rather than average statistics, which will not accurately reflect the sites performance.

End of project assessment

At the completion of the project, it is good practice for the person responsible for waste management on site to undertake a full review of the plan and document expected performance, ie action plan, against the actual performance achieved. This review should include a comparison of the expected waste management costs versus actual waste costs.

This review will provide valuable information internally that can be used on future projects to define site waste management planning and assist in development of SWMP for other projects, and compare performance.

4.5.3.6 Waste hierarchy

Legislation states that waste management priorities and practical actions on site must follow the principles of the waste hierarchy (**Figure 4.50**). A declaration that this has been applied to the waste should be included on the relevant duty of care documentation (see **Section 4.5.3.8**).

Orkney Islands School Investment Programme (courtesy Galliford Try plc)

4.13

Background

Galliford Try plc was appointed by Orkney Island Council for the School Investment Programme. Four projects were let under the same contract, which facilitated integrated waste management between the sites. As the projects were on the Orkney Islands there were limited disposal options for construction, demolition and excavation (CD&E) waste so the site teams, the waste champion and the environmental advisor worked together to identify and evaluate opportunity to prevent, reuse and recycle waste materials. This focus led to a SWMP that comprised:

- reuse and recovery – demolition waste materials were used in another phase or site
- local expertise – a local stonemason advised on stone suitable for reuse
- material optimisation, eg optimising design to reduce cuts and waste
- waste-efficient procurement – materials were not over ordered and delivered on site on an 'as needed' basis to prevent accumulation
- recycling – when reuse was not possible, waste was sent to local recycling centres
- energy from waste – materials that could not be reused or recycled were sent when possible, to an energy recovery plant.

Take-back schemes were established with suppliers for undelivered materials and a construction materials exchange tool was developed to exchange unused materials with other companies.

Lessons learnt

This is a good example of a comprehensive SWMP. Logistic constraints were input to push waste management further and find new solutions and strategies to reduce the import of materials and divert waste from landfill.

4.5.3.7 Waste disposal

Any waste disposed of to landfill sites is subject to landfill tax. Landfill tax is regulated by HMRC and is designed to encourage businesses to produce less waste and to use alternative forms of waste management/disposal. It is a levy charged by weight and there are two rates for inert (inactive) and non-hazardous (active) waste. Inert (inactive) waste is charged at a substantially lower rate than non-hazardous (active) waste. If these waste types are mixed together the higher rate of tax will be charged on the whole load, so segregating waste saves money.

Waste arising from the following activities is exempt, subject to meeting certain conditions:

- some dredging activities
- quarrying and mining
- reclamation of contaminated land.

The cost of landfill tax for non-hazardous (active) wastes is £80 per tonne at April 2014. The rate will not fall below £80 per tonne between 2014/2015 to 2019/2020. Inert (inactive) wastes are charged at a lower cost for £2.50 per tonne.

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Appendices

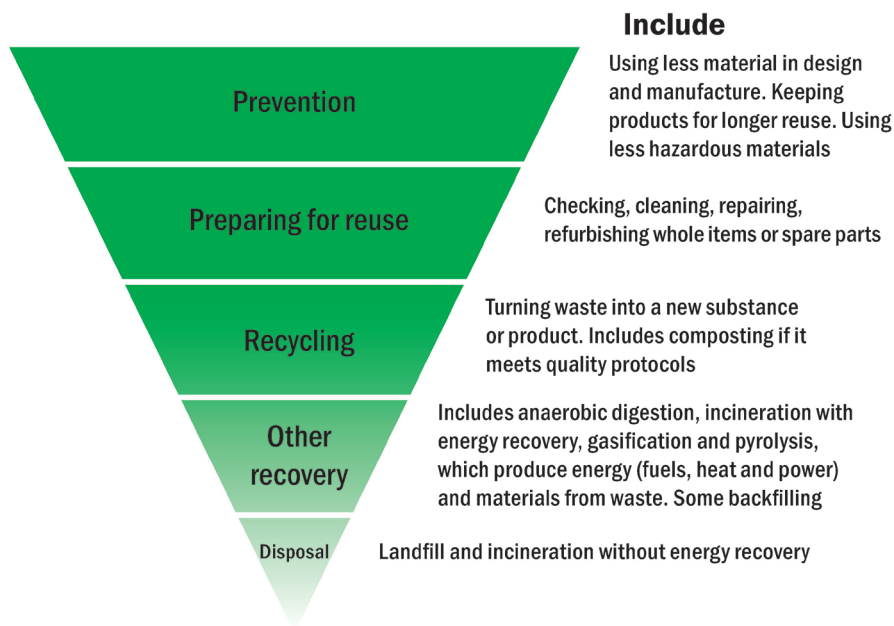


Figure 4.50 Waste hierarchy

4.5.3.8 Duty of care

There is a duty of care to ensure that waste is dealt with appropriately. The person on site with responsibility for waste management must be able to describe both the waste kept on site and the waste transported off site.

Disposal of waste from site must only be carried out by a registered waste carrier who should be able to provide a colour copy of their waste carriers' certificate. Details of the certificate can be checked with the environmental regulator. If an organisation carries its own waste, legislation requires it to register as a waste carrier. Waste should only be accepted at a site that is either permitted/licensed or exempt as appropriate.

Green taxes, reliefs and schemes for businesses:
www.gov.uk/green-taxes-and-reliefs/landfill-tax



Using a SWMP and carefully recording waste movements to and from site can help assure that the duty of care requirements are met.

Environmental permitting/licensing

In England and Wales, legislation requires 'waste operations' to hold an environmental permit or have an exemption. Waste operations mean any recovery (including storage pending recycling/reclamation etc) or disposal of waste that requires an environmental permit, unless the waste operation is specifically exempt or excluded under the legislation.

In Northern Ireland and Scotland waste operations will be authorised by a waste management licence, an exemption from waste management licensing or a PPC permit, depending on the nature of the waste management activity.

For all countries in the UK, it is important to identify whether an environmental permit or licence is required for operations carried out on or off site.

A recycling company was ordered to pay a record £200 000 penalty for dumping tonnes of construction and demolition waste at the former Woodend Colliery in Armadale, West Lothian, without a licence.



Waste transfer evidence/notes (inert and non-hazardous waste)

All inert and non-hazardous waste leaving the site must be accompanied by waste transfer evidence (England and Wales) or a note (WTN) (Scotland and Northern Ireland), which needs to include the following information for controlled waste:

- description of the waste
- List of Wastes (LoW) or EWC code
- how it is contained
- quantity of waste
- the place, date and time of transfer
- the name and address of both parties (ie carrier and holder/producer) – site and either transfer or end disposal as applicable
- details of the permit, licence or exemption of the person receiving the waste
- declaration that the waste hierarchy has been applied (England, Wales and Northern Ireland only)
- Standard Industrial Classification (SIC) code (2007)
- signatures of both parties (transferor and transferee).

Copies of waste transfer evidence needs to be kept by the waste producer, the waste carrier, waste broker (if applicable) and the waste disposer. These records need to be kept for a minimum of two years.

The transfer note records the transfer of waste between two parties. It does not record the full journey of the waste and there is no requirement to write the site of final disposal or recovery unless that is where the transfer takes place. However, companies are required to take action that is reasonable to confirm their waste has been managed legally once it leaves their site. Many companies choose to follow waste from their site to confirm it has been taken to an exemption, permitted or licensed waste management facility for treatment or disposal.

An electronic alternative to the existing paper-based system of waste transfer evidence and notes is also available. The electronic duty of care (EDOC) programme is a national,

internet-based system to monitor the collection, transportation and disposal of waste materials. It is designed to, make it easier for businesses and regulators to collect, collate and extract good quality waste transfer data.

Completing and checking waste transfer evidence (courtesy Laing O'Rourke)



Waste must be transported in accordance with the Waste (England and Wales) (Amendment) Regulations 2014. All construction and demolition waste must be transported by a waste carrier that is registered with the environmental regulator and waste transfer evidence must be completed for every load of waste removed. The Regulations also state that copies of all waste transfer evidence should be kept for at least two years.

In most cases, waste transfer evidence will be completed and provided by the waste contractor. However, it is the responsibility of the producer/holder of the waste to ensure that the information on these documents is accurate and correct before it is signed. If an organisation needs to complete its own waste transfer evidence or Hazardous Waste Consignment Note (HWCN), contact the procurement department to order waste documentation pads. Templates are available if needed. Also note that three copies of each document may be required (for the producer, carrier and disposer).

Waste transfer evidence must contain the following information:

- a description of the waste including the EWC Code
- description of how the waste is contained, eg 7 yd skip, 200 ltr drums, loose
- quantity of the waste (the weight or volume)
- address and postcode from which the waste is being removed
- address and postcode to which the waste is being taken
- permit number or exemption reference for the site to which the waste is being taken
- SIC code
- waste carrier's vehicle registration number
- waste carrier registration number
- application of the waste hierarchy declaration ("I confirm that I have fulfilled my duty to apply the waste hierarchy as required by Regulation 12 of the Waste Regulations 2014")
- date and time of collection
- transferor's signature
- driver's signature (as the transferee).

Annual waste transfer evidence

Annual waste transfer evidence (also known as a season ticket) can be used for repeat transfers. This is a single evidence document or note that can cover multiple transfers over a period of up to 12 months. Using a season ticket can be agreed if all of the following conditions remain the same:

- the waste producer, the waste carrier and the waste destination
- the description and type of waste being transferred
- the site where the waste comes from.

If any of these conditions change, a new evidence document or note will be required. Contact the waste contractor for more information if an annual waste transfer evidence for waste on the site can be used.

Consignment notes – hazardous/special waste

All hazardous/special waste leaving the site must be accompanied by a consignment note that travels with the waste to its final treatment or disposal option. Information that must be recorded on the consignment note includes:

- waste producer
- waste carrier
- premises code
- description of waste
- LoW/EWC code
- quantity (kg)
- chemical/biological components of waste and their concentrations
- physical form
- hazardous code(s)
- container type, number and size
- declaration that the waste hierarchy has been applied (England, Wales and Northern Ireland only)
- SIC code (2007) (England, Wales and Northern Ireland only).

Electronic Duty of Care (EDOC):
www.edoconline.co.uk



A company and one of its directors pleaded guilty after an Environment Agency investigation revealed a disused railway cutting was being illegally filled with waste from a construction project at the company's site at East Grinstead. The company was fined £15 000 and ordered to pay costs of £2315, while its director was fined £2000.



Copies of the consignment note need to be kept by the producer for at least three years.

In England and Wales the consignee (the person whom waste is transferred to for recovery or disposal) issues records to the site (consignor) of the waste disposed, including copies of consignment note and information on waste received, disposed, or recovery of

waste (known as quarterly returns). These returns must be retained by the holder at the registered site, or registered office after the site closes.

To move hazardous waste in Northern Ireland pre-notification is required and a uniquely coded consignment note must be obtained from the NIEA. There is a small fee and the note is required even if transporting directly to England, Wales or Scotland. Notification is required before movement can proceed.

The consignment note is uniquely coded. In Scotland, all special waste movements are required to be pre-notified to SEPA via a special waste consignment note.

Completing and checking HWCNs (courtesy Laing O'Rourke)

4.15

Hazardous waste must be transported in accordance with Hazardous Waste (England and Wales) Regulations 2005 as amended. All hazardous waste must be transported by a waste carrier that is registered with the environmental regulator and a HWCN must be completed for every load of hazardous waste removed and retained for at least three years after the deposit of the waste.

It is the consignor's responsibility to complete Parts A, B and D of the HWCN. If the waste contractor completes Parts A and B, the information provided must be checked to ensure that it is accurate. The carrier will complete Part C upon inspecting the waste. It is the consignee's responsibility to complete Part E and return a copy of this to the consignor within three months of receiving the waste. This provides confirmation that the waste has been received by the consignee and also how it has been treated or disposed of.

Note: the consignee is also required to submit hazardous waste returns to the Environment Agency every quarter.

If hazardous waste is being stored on site, even for a short period of time, then:

- ensure that it is stored safely and securely to prevent pollution
- ensure that it is packaged and labelled correctly
- keep different types of hazardous waste separate
- keep hazardous and non-hazardous waste separate
- keep liquid hazardous waste in a dedicated area, with a bund or barrier to contain spills and leaks
- regularly check storage areas for leaks, deteriorating containers or other potential risks
- display written instructions for storing and disposing of each type of hazardous waste
- maintain an inventory of the hazardous wastes kept on the premises, and where they are stored – this will help the emergency services to deal with any incident effectively and safely.

Wastes requiring specialist services

Certain wastes require specialists to remove and dispose of them when they are found on site, for example asbestos and sharps (see the following sections). Removal of asbestos or sharps must be carried out under a specific method statement (MS) that has been reviewed and approved by the contractor.

Asbestos

Asbestos is a hazardous material that in the past was extensively used in various applications including:

- insulation of pipes and boilers
- fire protection in panels, wall partitions, ceiling panels and around structural steel work
- roof and wall cladding
- gutters, rainwater pipes and water tanks
- reinforced plastics and sealants
- bound in concrete.

During renovation or demolition the asbestos may be disturbed through drilling, cutting or sanding. Such disturbance releases potentially harmful fibres into the atmosphere that could cause serious health problems. If asbestos is found or suspected, stop work immediately and contact a specialist contractor to remove it. Specialist licences for transport and disposal are required for asbestos wastes.

One example of an on-site activity requiring careful management is that of road sweeper arisings generated by keeping site access routes clean. These arisings could contain fuel residues, road salt and other substances that may harm the environment. As part of the sites duty of care they are required to be discharged at an authorised facility. If they are not this could result in prosecution. Where, due to logistical issues or overnight working, this is not possible, the environmental regulator should be contacted to discuss viable alternatives.



Sharps

This is the collective name for needles, syringes and other objects that can cause potential harm if the skin is pierced. If these are found on site do not touch any items and call a specialist contractor to remove them. A registered waste carrier is sufficient to transport sharps waste, with an appropriate PPC or waste management licence in place to allow disposal.

4.5.3.9 Registering premises producing hazardous waste

In England and Wales, there is a legal requirement that the Environment Agency must be notified of premises where more than 500 kg of hazardous waste will be produced in a year. Such sites must be registered with the Environment Agency. Once a site is registered it will be assigned a unique six digit code that needs to be put on all consignment notes. Registration of premises is only applicable in England and Wales and does not apply to premises producing hazardous waste in Northern Ireland or Scotland.

Premises are exempt from the need to register if no more than 500 kg of hazardous waste is produced in a year. However, even where premises are exempt, collections of hazardous waste must still be made by a registered (or exempt) waste carrier, accompanied by a consignment note using a specific exemption code, and transferred to a facility that holds a suitable environmental permit.

Environment Agency hazardous waste producer registration:
<https://www.gov.uk/hazardous-waste-producer-registration>



To apply by post or by telephone contact:
03708 502 858

4.5.3.10 Disposal of hazardous waste

Assessing waste as hazardous or non-hazardous is a multi-stage process. The flowcharts and supporting text in Environment Agency *et al* (2013) can be used to support this five step process, which includes:

Step 1: determining whether the waste is a 'Directive waste' or is required to be included as a potential hazardous waste based on domestic legislative provisions. Directive wastes are

wastes included in the scope of the WFD. In general, nearly all household, commercial and industrial waste is ‘directive waste’ and as such might be hazardous waste.

Step 2: determine how the waste is coded and classified on the LoW, ie determine if the waste is a ‘mirror’ or ‘absolute’ entry on the LoW. If it is an ‘absolute’ entry then the waste must be treated as hazardous. If the waste is a ‘mirror’ entry, further classification works (Steps 3 to 5) need to be undertaken to determine whether the waste is hazardous or not. Wastes that do not possess an ‘absolute’ or ‘mirror’ entry are classed as non-hazardous or inert wastes.

Step 3 to 5: determine whether hazardous entries are hazardous with regards to the substances in the waste including the determination of:

- dangerous substances in the waste and what their risk phrases are
- hazardous properties H1 to H15 that the waste possess.

Final classification of the waste at Steps 3 to 5 will be dependent on the concentration of substances possessing risk and or hazard phrases. Due to the concentration levels of these substances the waste maybe deemed hazardous waste (see Environment Agency, 2013).

Many types of hazardous waste can be recycled (eg oil and solvents). Identifying potential recycling and reuse opportunities early will enable hazardous waste to be better managed both in terms of cost control and environmental impact.

The information provided in this section is a brief summary to the EA (2013) guide that should be consulted in full when classifying waste. Specialist waste contractors can also help companies through this process.



Hazardous wastes can be accepted only at a particular hazardous waste landfill if they meet the relevant waste acceptance criteria (WAC) for that class of landfill and the waste acceptance procedures (WAP) are followed.

A waste carrier and waste recycling company were fined £6000 and £5250 respectively and ordered to pay £5500 costs for dumping construction waste containing asbestos on land near Doncaster, Yorkshire. The landowner was fined £3000 with £5500 costs.



Hazardous waste can also be disposed of via incineration. These plants operate under strict environmental permits so it is important to find out what hazardous waste the plant can accept.

4.5.3.11 Good practice checklists

Planning – SWMP	
Develop a SWMP	
Identify a responsible person for developing, implementing and monitoring SWMP	

Planning – SWMP	
Identify and record waste stream (types, quantities)	
Identify and record waste hierarchy options and associated costs	
Review expected waste and disposal options with client, designers and/or architect. Agree actions to reduce expected wastes using the waste hierarchy	
Update SWMP with cost estimates for waste expected	
Define facilities on site for requirements of SWMP	
Ensure sufficient space is allocated on site to meet waste management requirements	
Make a joint commitment to the waste management/SWMP with the client	
Obtain signage for skips and update signs to reflect the site, eg company name, contact details, waste transfer evidence	
Include SWMP requirements into induction material for communication	

Storing waste on site	
Segregate waste. Make this easy for site-based staff to do, by providing several waste containers in a designated impermeable waste storage area and briefing staff on their requirements	
Mark waste containers clearly with their intended contents	
Use containers suitable for their contents. Check that containers are not corroded or worn out	
Use covered skips to prevent spread of wind-blown wastes	
Store away from drains and impact	

Storage of hazardous waste	
Check that the premises are registered as a producer of hazardous waste, if more than 500 kg is likely to be generated (England and Wales only)	
Ensure hazardous wastes are stored in suitable labelled containers away from sensitive receptors and away from the risk of damage by site traffic	
Hazardous waste must not be mixed with non-hazardous waste	
Do not mix different types of hazardous waste together	
Do not store wastes longer than is necessary to complete documentation to arrange their disposal	

Handling and removing waste (on a confined site)	
If removing waste from upper levels on buildings, transport using roller bins	
Store these bins in an area close to lifts	
Arrange for daily collection of bins	
Lower bins to ground floor only shortly before collection lorry arrives.	

Duty of care	
Check that a copy of the waste carrier's certificate/environmental permit is available on site and that it is still valid. The waste carrier's certificate/environmental permit should be accepted only if it has been endorsed by the appropriate environmental regulator	
The waste carrier must be certified to carry waste	
The transfer notes should be completed in full and contain an accurate description of the waste, full LoW code, signed by the producer and carrier before waste leaves the site, include SIC code and waste hierarchy declaration	
Keep copies of all waste transfer evidence for waste sent off site for two years for inert and non-hazardous	
Hazardous waste movements must be documented using consignment notes and copies kept for three years	
Carry out spot checks to ensure compliance with the duty of care including: ● following the waste carrier to ensure the waste arrives at the agreed disposal site ● carrying out periodic assessment and/or audits on the waste carrier ● visiting the waste carrier's premises ● visiting/assessing agreed disposal site to confirm it is licensed/permited to accept the waste	

Monitoring and reporting waste	
Update SWMP each time waste is removed from site (using transfer and consignment note records)	
Undertake monthly review of performance against action plan including targets and update records	
Report performance internally against action plan and identify opportunities for future improvement	
Complete performance assessment at end of project, including expected against actual waste generated, disposal, cost of disposal and any savings achieved	

4.5.3.12 Further reading

DOENI (2013) *Towards resource management. The Northern Ireland Waste Management Strategy 2006–2020*, Department of the Environment Northern Ireland

www.daera-ni.gov.uk/articles/waste-management-strategy (accessed 24 March 2017)

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<http://webarchive.nationalarchives.gov.uk/20130402151656/http://archive.defra.gov.uk/environment/waste/strategy/strategy07/documents/waste07-strategy.pdf> (accessed 7 March 2017)

DEFRA (2008) *Non-statutory guidance for site waste management plans*, Department for the Environment, Food and Rural Affairs, London

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www.ciria.org

SCOTTISH GOVERNMENT (2010) *Scotland's zero waste plan*, Scottish Government, Edinburgh (ISBN: 978-0-75598-306-3)

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<http://gov.wales/docs/desh/publications/100621wastetowardszeroen.pdf> (accessed 7 March 2017)

4.5.3.13 Legislation

Legislation is constantly changing, including amendments and new legislation, and this varies between England, Wales, Scotland and Northern Ireland. If site staff are unsure on any environmental issue, contact the regional environmental regulator for advice.

Legislation	Key requirements	Applicable Nation(s)
The Environmental Protection (Duty of Care) (Scotland) Regulations 2014 SSI 4	Requires a transfer note to be signed by the transferor and transferee of waste, specifies information to be included and requires copies to be kept for two years. Includes the use of SIC codes. Enables the use of electronic waste transfer evidence. These Regulations revoke the Environmental Protection (Duty of Care) Regulations 1991.	Scotland
Waste Regulations (England and Wales) 2011 (as amended)	Persons concerned with controlled waste are under a duty of care to: - prevent any other person committing the offence of depositing, treating or keeping of controlled waste without an environmental permit or in a manner likely to cause harm to health or the environment - prevent the escape of waste - ensure that waste is transferred to an licensed person or to a person licensed to transport waste - ensure the waste is accompanied by a written description of the waste. From 1 January 2015, an establishment or undertaking that collects waste paper, metal, plastic or glass must take all such measures to ensure separate collection of the waste are available to the establishment or undertaking in that capacity.	England, Wales
Waste (England and Wales) (amendment) Regulations 2014	Clarifies that the transfer of controlled waste may be recorded on alternative documentation, such as invoices, instead of waste transfer evidence and to make other amendments relevant to the registration of waste carriers, brokers and dealers.	England, Wales
Waste (Scotland) Regulations 2012	To provide for the separate collection of dry recyclable waste (ie paper, card, plastic, metal and glass) and food waste, and for the treatment of such wastes and of controlled waste generally from 2014. Operators of a landfill shall not accept separately collected waste from 1 January 2014, or biodegradable municipal waste from 1 January 2021.	Scotland
The Pollution Prevention and Control (Scotland) Regulations 2012 The Pollution Prevention and Control (Northern Ireland) Regulations 2003	Regulates PPC facilities in Scotland and Northern Ireland.	Scotland, Northern Ireland
Producer Responsibility Obligations (Packaging Waste) Regulations 2007 (as amended) Producer Responsibility Obligations (Packaging Waste) Regulations (Northern Ireland) 2007 (as amended)	Apply to all businesses involved in the packaging chain, who handle more than 50 tonnes of packaging material in a year and who have an annual turnover of £2m or more. Also applies mainly to suppliers in the construction industry.	England, Wales, Scotland, Northern Ireland
Waste Electrical and Electronic Equipment (WEEE) Regulations 2006 (as amended)	The WEEE Regulations implement provisions of the European Parliament and Council Directive 2002/96/EC. The Directive aims to prevent WEEE arising, to encourage reuse, recycling and recovery and to improve the environmental performance of all operators involved in the life cycle of electrical and electronic equipment, especially those dealing with WEEE. The Directive sets requirements relating to criteria for the collection, treatment, recycling and recovery of WEEE.	England, Wales, Scotland, Northern Ireland

Legislation	Key requirements	Applicable Nation(s)
List of Wastes (England) Regulations 2005 (as amended) List of Wastes (Wales) Regulations 2005 List of Wastes Regulations (Northern Ireland) 2005 (as amended) The Landfill (Scotland) Amendment Regulations 2003	The appropriate six digit EWC code must accompany waste as a means of classification.	England, Wales, Northern Ireland, Scotland
Hazardous Waste (England and Wales) Regulations 2005 as amended Hazardous Waste (Northern Ireland) Regulations 2005 as amended	No co-disposal or mixing of hazardous waste with other hazardous wastes or non-hazardous waste. Environment Agency/NIEA must be notified of all premises where hazardous wastes are produced above threshold of 500 kg per year. HWCNs must be held for a minimum period of three years Quarterly waste reporting by waste consignee.	England, Wales, Northern Ireland
Waste Management Licensing Regulations (Northern Ireland) 2003 (as amended)	Prohibits the deposit, treatment or storage of controlled waste unless in accordance with a waste management licence. Covers applications for waste management licences, which authorise the deposit, disposal and treatment of controlled waste. Includes conditions on the use of certain mobile plant.	Northern Ireland
The Landfill (England and Wales) Regulations 2002 (as amended) The Landfill (Scotland) Regulations 2003 (as amended) The Landfill (Northern Ireland) Regulations 2003 (as amended)	Regulates landfill sites in England, Wales, Scotland and Northern Ireland.	England, Wales, Scotland, Northern Ireland
The Special Waste (Scotland) Regulations 1996 (as amended)	Defines special wastes and sets out the requirements for disposal of special waste.	Scotland
The Waste Management Licensing Regulations 1994	Prohibits the deposit, treatment or storage of controlled waste unless in accordance with a waste management licence. Relates to persons involved in the collection, storage, treatment and disposal of controlled wastes. The Regulations dictate the licensing of persons or businesses involved in the management of waste and relate directly to the licensing of a site or activity to carry out the management, processing and disposal of wastes.	Scotland
Controlled Waste (Registration of Carriers and Seizure of Vehicles) Regulations 1991	Details the system for seizing vehicles used in the commission of waste offences. Establishes a registration system for carriers of controlled waste and provides for the seizure of vehicles used in waste offences.	England, Wales, Scotland and Northern Ireland

4.5.4 Water consumption

4.5.4.1 Water efficiency

Water is integral to the economy. It is needed for energy production, industrial processes, to grow food and also for construction. In the coming years, the combined effects of climate change and a growing population are likely to put increasing pressure on water supplies and compromise its security.

In simple terms, water efficiency is about completing a task with the minimum amount of water possible. Although, around 70 per cent of the Earth's surface is water covered, about 97 per cent of this is saline and only 2.5 per cent is fresh water. Also, due to the movement of water in the water cycle, much of this becomes locked up as groundwater or in ice caps, meaning that less than one per cent of the water on the planet is readily available for human consumption. So, it is good practice on site to consider water use needs and to aim to reduce these where possible.

4.5.4.2 Water use and waste

It is important to remember that a licence is required from the environmental regulator to be able to attract water for use on a construction site (see [Section 4.7.6](#)).

So at the early stages of a project it is important to consider the following:

- where water is used
- how much is being used
- where could water potentially be wasted
- what behaviours and/or technologies can be introduced to reduce water use on site.

Many of the key processes and activities for water use on a construction site include:

- site cabins and temporary accommodation
- wet trades
- ground works
- dust suppression
- hydro-demolition
- cleaning
- commissioning/testing of equipment/services.

A small number of contractors have measured water consumption on construction sites for a number of years and the lowest estimate of water use on site for five large companies was 112 m³ per £million contractors output (Waylen *et al*, 2011). Measuring water consumption is the first step towards reducing water use on site. This measuring can help to establish

a baseline level and then methods for reducing water use can be implemented.

Once the 'where' and 'how' of water use has been identified, the next priority is to eliminate water waste. However, without this knowledge, it is not possible to determine where water is used and where it has been is wasted. The processes and activities linked to where the majority of water is wasted include:

- dust suppression
- hydro-demolition
- vehicle washdown
- concrete washout
- cleaning
- specialist and high pressure cleaning
- commissioning/testing of equipment/services.

To effectively manage water use on site, four steps should be taken:

- 1 Evaluate the potential challenges and risks of minimising water use on site.
- 2 Identify the control and management methods, ie how will it be ensured that water is used efficiently.
- 3 Adopt an emergency response plan, for example if any issues arise such as leaks or spills.
- 4 Ensure compliance and monitor consumption, ie ensure compliance with all relevant legislation and that water use is monitored and recorded.

Strategic Forum for Construction:
water toolbox talk:
www.greenconstructionboard.org/otherdocs/SCTG09-WaterActionPlanFinalCopy.pdf

WRAP Water efficiency in construction:
www.ciria.org/REK

Waterwise: www.waterwise.org.uk



Use of non-potable water (courtesy Willmott Dixon)

Background

Building a swimming pool demands water in both construction and commissioning, especially because of the leak test. During the construction of Gosport Leisure Centre, the storm drainage was not installed due to the nature of the envelope when heavy rainfalls caused saturation of the ground surrounding the facility.

The team calculated that half of the roof's runoff could be used by diverting rainwater pipes directly into the two pools as part of their construction leak testing. 435 m³ of water was then harvested in the pools and used to identify leaks as well as for site activities, washdown and tool cleaning.

Lessons learnt

This is an example of managing exceptional waterfall and runoff in an effective way.



4.5.4.3 Water reduction

Reducing the use of water on construction sites is a major challenge and will only be successful if these challenges can be overcome:

- **Value for money:** water is a relatively cheap resource and so it is unlikely that the introduction of expensive processes on temporary construction sites will be viable.
- **Work environment:** any technology needs to be robust and able to stand up to the demands of construction sites.
- **Habit:** behavioural change is not a process that happens overnight and so technological innovation or technology that actively influences a behaviour change is likely to be more successful than purely behavioural interventions. A mix of approaches is more likely to be successful than considering either behaviour or technology in isolation.



Figure 4.51 Greywater capture with solar powered pumps (courtesy BAM Nuttall)

A combination of technological and behavioural change to reduce water consumption can include installation of water efficient fittings (such as dual flush toilets), installing rainwater harvesting systems (Figure 4.51), reporting and fixing leaks and/or drips and installing triggers on hoses. Alternatively, use the water hierarchy to evaluate the options (Figure 4.52).

4.5.4.4 Water footprinting

Water footprinting is about measuring the total volume of freshwater used to produce goods/products/services and looks at both the direct and indirect water use of a producer or consumer.

Direct water

Direct water use is the organisations use of water, such as for drinking, in cooking and for flushing of toilets.

Indirect water

Indirect use of water is water that is used through the production of products that are then bought or used by the consumer. For example, the amount of water that is required to produce an A4 paper notepad for a person's use would contribute towards that individuals indirect water use.

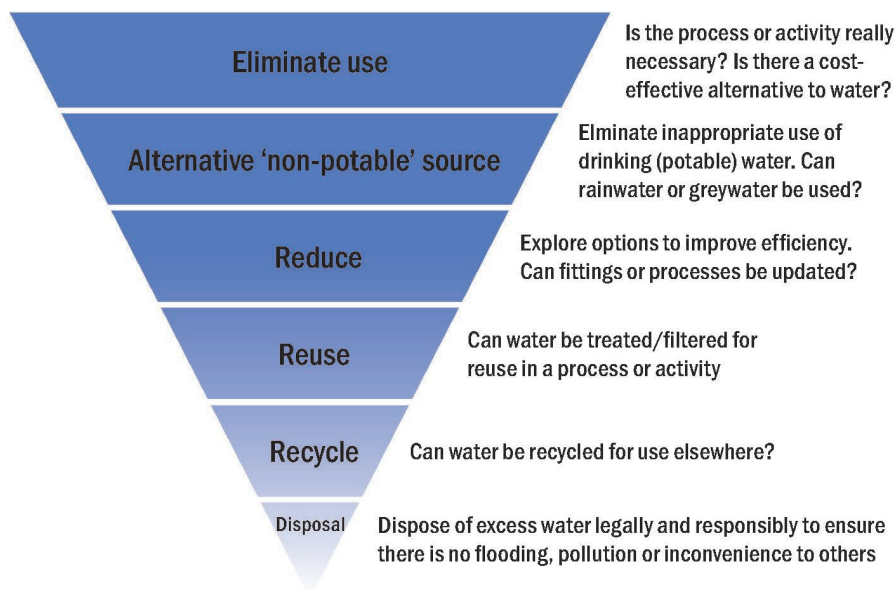


Figure 4.52 Water hierarchy (courtesy Green Construction Board)

Water footprinting is a form of LCA in that it requires water use across all stages of production to be considered, including the concept of embodied water, and the amount of water used in the extraction, processing, manufacture and transportation of a product.

Imported goods, products or services from abroad contribute towards the water footprint of the country of origin and not the country that the goods, products or services have been imported to. Many countries tend to externalise their water footprint in this way with particularly water intensive products. This puts pressure on water resources in many exporting regions where often mechanisms for wise water governance are not well developed.

Many organisations have traditionally focused upon water use in their operations, ie accounting for abstractions and/or discharges, whereas there should be a focus across the whole of the supply chain.

Water footprinting is quite an advanced topic, and while some footprint studies have been conducted on food and drink products, it is an emerging area in the construction sector.

However, general water efficiency steps can be taken to reduce a projects operational footprint such as by saving water where possible and ensuring that the project does not contribute to any water pollution.

Reducing the water footprint of the supply chain can be done through agreements set to certain standards being put in place. Alternatively, other suppliers could be used, but

quite often, looking to improve the water footprint through the supply chain may be a considerable task as it may mean refocusing the business model in order to better control supply chains.

Efforts to increase an organisations transparency could include:

- setting of targets
- labelling products to contain information about the amount of water used in production
- gaining certification through environmental labelling
- informing stakeholders through corporate responsibility reports or other publications.

These are general steps towards improving water efficiency and observing lower water footprints.

The Water Footprint Network

The network is a learning community that aims to connect different groups interested in sustainability, equitability and efficiency of water use.

Water Footprint Network website
WFA tool:
www.waterfootprint.org



The network make data, methods and tools freely available and incorporates perspectives from a broad range of stakeholders from different social, cultural, economic and environmental backgrounds.

Many organisations and industries are now asking for and providing information about the carbon footprint of a product so that labels on packaging and in information brochures have become commonplace. It is forecasted that over the next few years water footprinting will soon be viewed in the same light.

The network provides tools such as a personal water footprint calculator, a water footprint manual (Hoekstra *et al.*, 2011) and information about how to calculate a corporate water footprint, water footprints by country and a host of other useful information.

ISO 14046:2014

This Standard covers the principles, requirements and guidelines for carrying out a water footprint and will be used to conduct and report a water footprint assessment.

The water footprint standard is set out to follow the principles of the LCA standards (ISO 14040:2006 and ISO 14044:2006).

It aims to make the conducting of water footprints more mainstream as it is currently a technique in its infancy. To date most product water footprints have been conducted on food

and drink products, but now a much broader range of industries are required to conduct water footprints if management of water resources is to become more efficient.

4.5.4.5 Further reading

ISO 14044:2006 *Environmental management. Life cycle assessment. Requirements and guidelines*

ISO 14040:2006 *Environmental management. Life cycle assessment. Principles and framework*

4.5.4.6 Legislation

Legislation is constantly changing, including amendments and new legislation, and this varies between England, Wales, Scotland and Northern Ireland. If site staff are unsure on any environmental issue, contact the regional environmental regulator for advice.

Legislation	Key requirements	Applicable Nation(s)
Water Resources (Abstraction and Impounding) Regulations 2006 (as amended) Water Environment (Controlled Activities) (Scotland) Regulation 2011 Water Abstraction and Impoundment (licensing) Regulations (Northern Ireland) 2006 (as amended)	Makes provision for the licensing of abstraction and impounding of water, including setting limits on the amount of water used.	England, Wales, Scotland, Northern Ireland

4.6 TRAFFIC, TRAVEL MANAGEMENT AND VEHICLE USE

4.6.1 Why is management of traffic and vehicle use important?

There are many good reasons to manage traffic coming to site, on site and when leaving it. Traffic on roads around the site can cause nuisance through noise, exhaust emissions, dust, congestion and mud.

On-site traffic generates emissions, dust, noise and carries risks of damaging materials and causing pollution incidents (eg vehicles damaging oil containers causing ground pollution). Site traffic also forms part of a site's carbon footprint and natural resource use (eg fuel), which can be effectively reduced through good planning.

A good TMP covers all forms of transport, eg road vehicles, pedestrians, bicycles and disabled access.

Emissions

There are two further issues to consider for transport to and from, and on site:

- the effect on local and national air quality
- carbon dioxide emissions.

From a site management perspective these should offer further encouragement for reducing vehicle movements associated with the site.

Also, clients, especially in the public sector, are increasingly requiring the production of carbon footprints for projects, leading to reduction targets.

4.6.2 Traffic management plan

A TMP should enable site-based staff to manage all these risks efficiently and effectively. It should be clearly written and presented, and well communicated to everyone on site including subcontractors, suppliers and site visitors. It is good practice to regularly review the TMP and to make sure that changes to the plan are appropriately communicated.

The TMP should include both off-site (ie travel to/from site, deliveries) and on-site (ie plant/car movements) traffic management requirements.

For details on what information should be included in a site TMP refer to the checklist at the end of this section.

On-site traffic

Plan to reduce nuisance, potential impacts to materials, and polluting substances by:

- planning on-site roads as one-way systems
- including turning circles
- controlling access to and from the site
- adopting and enforcing speed limits
- preparing roads to prevent dust
- ensuring roads avoid fuel and material storage areas
- ensuring delivery and waste removal vehicles are sheeted to prevent dust or material being blown into the air
- minimising drop heights when tipping materials or loading vehicles
- pointing exhausts upwards to disperse pollution and avoid blowing dust up
- communicating to drivers the need to comply with site rules and to maintain vehicles, and the consequences if these requirements are not applied. Also providing training for drivers if necessary

- ensure vehicles enter washing facilities before leaving the site.

Travel Plans offers free help with developing a travel plan:
www.travelplans.org.uk



Off-site traffic

Plan the timing of deliveries to avoid vehicles waiting and minimise engine idling. Where several deliveries are likely to take place over a short period, designate queuing areas away from sensitive receptor areas, in liaison with the local authority if on public roads. In urban areas it may be best to allocate a waiting area some distance from the site and then call in deliveries when access to the site is clear.

Site worker traffic

Site-based staff should not be permitted to park vehicles around the site boundary as this will cause a nuisance to local residents and disruption to deliveries. Arrange designated parking areas when there is appropriate space to do so on larger projects. On more confined sites this may not be possible, so workers should be encouraged to vehicle share, or arrangements should be made for a minibus to collect them from local train or bus stations. Local employees should be encouraged to walk or cycle (ensure that facilities such as secure areas to store bikes during the working day and showers are made available).



Figure 4.53 Vehicle leaving site (courtesy Skanska)

4.6.3 Reducing nuisance and congestion around site

It is a good idea to plan traffic movements around a site in consultation with local authorities and the police. It may even be a planning or legal requirement or form part of an agreement with a local authority. This will help to identify both important times to avoid deliveries (eg during school runs) and appropriate delivery routes.

The use of public roads for site access may be restricted. Such restrictions may include:

- weight and width controls
- parking controls
- low-headroom access routes
- accessibility.

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Appendices

Where possible, arrange site access so that all vehicles enter and exit in a forward direction.

RMPs can help reduce the number of deliveries needed and make sure that they arrive at the right time of day. Details of site access routes and delivery times can be included with orders placed with suppliers on a clear map with written instructions.

Encouraging site staff to car-share or use public transport, and/or providing communal transport can further reduce traffic to and from site. Using alternative site transport, such as bicycles, will help reduce dust, emissions and site hazards.

Mud and debris from roads should be cleared regularly and it may be appropriate to install wheel and vehicle washing facilities.



Figure 4.54 Signage for vehicle routes (courtesy Lend Lease)

Sustainable TMP (courtesy Jacobs Engineering UK Ltd, and Alun Griffiths (Contractors) Ltd)

4.17

Background

Due to the rural nature and location of the A470 site, the transport of site-based staff and materials was a major consideration. It was not possible to transport materials by rail as there was no railhead and it was not practicable to form one. Transport of site-based staff was also difficult by rail due to a limited timetable and difficult connections. The team developed a sustainable TMP that comprised:

- local material suppliers
- a central main compound and localised compounds and laydown areas at major structures
- minibus service to transport site staff from the central compound
- on-site accommodation to prevent commuting
- minimum impact on the existing highways network
- a traffic liaison group to optimise traffic management of the scheme.

Lessons learnt

This is a good example of a comprehensive TMP, developed to limit the impact on the existing transport network and to optimise the traffic management of the scheme.

4.6.4 Good practice checklists

Traffic management plan	
Identify sensitive areas (eg schools and homes)	
Plan on-site routes, one-way systems and turning circles	
Use speed limits	
Prepare on-site roads to prevent dust	
Be aware of road restrictions either through road works, narrow roads and bridges with height and/or weight restrictions	
Choose suitable materials for use on access roads – to avoid transferring mud and dust	
Take into account other developments whose activities could affect the project	
Identify suitable locations for parking facilities for private cars and plant	
Ensure there are designated walkways on and around site	
Ensure there are designated vehicular routes on site with speed restrictions	
Locate site entrance and exit so they are not off minor roads	
Gain permission for road closure from the highways division of local authority in smaller scale projects (Highways Agency for larger projects)	
Ensure road closures are carried out by a competent person	
Develop a map showing delivery drivers' routes to site from trunk roads	
Schedule site deliveries outside times of peak traffic volume	
Have designated workers on site to receive deliveries, direct vehicles on and off site, and act as banksmen	
Project vehicles should have badges on their windscreens displaying contact details for the project if they are found to be parked inappropriately	
Offer alternative modes of transport for workers to get to site, eg use of minibuses, car sharing or bicycles	
Identify alternative delivery streams, eg canals and railway if feasible	
Monitor vehicle movements to reduce the likelihood of queuing or causing congestion in and around the local area	
Minimise the need for reversing vehicles (eg one-way systems) and potential nuisance issues from reversing alarms	

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Appendices

Parking	
Designate an area on site for site-based staff parking	
Prevent delivery vehicles from queuing outside the site boundary	
Make delivery drivers aware of traffic restrictions on and around the site	

Plant and vehicles	
Use a wheel wash for vehicles leaving the site to prevent mud being spread on surrounding roads	
Prohibit vehicle washing outside of any designated area on site	
Use mechanical road sweepers and surface flushing apparatus to clean hard standing and remove any mud or debris deposited by site vehicles on roads, footpaths, gullies or drains near to the site	
Ensure that exhausts do not discharge directly at the ground	
Use retractable sheeted covers to protect wind-blown material	
Ensure all plant and vehicles are in good working order	
Minimise loading and drop heights	
Reverse sirens – consider lorries with 'white noise/broad band' reversing alarms to minimise the effects of noise on local residents	
Should emergency maintenance need to be carried out on site, ensure it is in a designated area away from sensitive receptors and that a spill kit is close to hand	

Delivery schedule	
All deliveries to site should keep to their allocated time slot. Failure to do so could mean they are turned away	
No deliveries should be accepted on site without contractor staff to unload them or direct the vehicle	
No materials or rubbish are to be left in the unloading area	
Washout should occur only in designated areas	
All vehicle delivery drivers should wear PPE once inside the delivery area	
Ensure contractors are aware that incorrectly loaded vehicles will not be offloaded	

Site rules for drivers	
Access to and from the site will be only via the main entrance gates	
On leaving the site, vehicles are to follow the directions previously given	
All engines to be switched off while waiting to unload	
No parking in residential streets surrounding the site	
All drivers should be asked to proceed with caution particularly at peak school times in the vicinity of local schools	
Drivers should adhere to the site speed limit	
All vehicles entering the site should stop and report to the gateman who will direct them to the required place of loading/unloading	
Avoid the need to reverse where possible, otherwise a competent banksman should be present	
Drivers are asked to park in the designated area and wear appropriate PPE (safety helmet, boots and hi-vis jackets) while away from their vehicles	
All loaded vehicles leaving site should be sheeted – this should be done using a mechanism before entering the wheel wash	
All vehicles should pass through the wheel wash facility and be inspected by the gateman to ensure they are clean before leaving site	
All loaded vehicles leaving site should take the correct documentation with them. Ensure relevant copies of documentation, together with a copy of the weighbridge ticket, are handed to the gateman on return to site	

4.6.5 Legislation

Legislation is constantly changing, including amendments and new legislation, and this varies between England, Wales, Scotland and Northern Ireland. If site staff are unsure on any environmental issue, contact the regional environmental regulator for advice.

Legislation	Key requirements	Applicable Nation(s)
New Roads and Street Works Act 1991	The local authority has a duty to ensure all traffic management and reinstatements are carried out effectively and efficiently to keep disruption to the highway user to a minimum. The council has some powers regarding the timing of street works and the restriction of such works within 12 months of the completion of substantial road works.	England, Wales, Scotland
Roads (Scotland) Act 1984	Ensures, as far as is reasonably practicable, that the highway is kept in a clear and unobstructed condition for the highway user. Anyone contravening the Act is advised accordingly that any obstruction must be removed. Occasionally action may result in legal proceedings against the person contravening the Act.	Scotland

Highways Act 1980	Ensures, as far as is reasonably practicable, that the highway is kept in a clear and unobstructed condition for the highway user. Anyone contravening the Highways Act is advised accordingly that any obstruction must be removed. Action may on occasion result in legal proceedings against the person contravening the Act.	England, Wales
The Street Works (Northern Ireland) Order 1995 (as amended)	A street works licence is required by any person or organisation who wishes to place or retain apparatus in a street, and inspect, maintain, adjust, repair, alter or renew the apparatus, change its position or remove it after, unless the person or organisation has a statutory right to do so. Any person who carries out such works without a street works licence or a statutory right is committing an offence and liable on summary conviction to a fine.	Northern Ireland

4.7 WATER

4.7.1 Why is water management important?

Waters, including rivers, streams, ditches, ponds, lakes/lochs/loughs, groundwater and coastal waters (up to three nautical miles offshore) have legal protection from harm and pollution. Pollution can result from any of the following entering a body of surface or groundwater:

- poisonous, noxious or polluting matter
- waste matter (including silt, cement, concrete, oil, petroleum spirit, chemicals, solvents, sewage and other polluting matter)
- other harmful activities detrimentally affecting the status of a water body.

The status of a water body can be affected not only by chemical pollution, but also by activities directly or indirectly affecting ecology, including changes in physico-chemical parameters such as temperature and turbidity or physical modifications to the hydrology of a water body. For example, activities such as engineering works on inland waters may harm the integrity of the waters or their habitats, such as riverbanks.

It is vital to manage sites properly to protect the water environment and water supplies. If waters are polluted or otherwise harmed, or if unacceptable wastes are discharged to sewer systems, the management, company, subcontractors and clients could end up in court. Also, they may be liable for damages to industries or other third parties using water downstream.

4.7.2 Water pollution

Water regulation applies the PPP, which recognises that the polluter should be financially responsible for costs associated with pollution that arise in terms of human health or harm to the environment. Where there is an imminent threat to the water environment or where damage has already been done, the regulator may require the polluter to implement a number of preventative or remedial measures in response. Failure to comply with the

conditions of permits or prevention and remedial obligations may result in a large fine and/or imprisonment.

A site does not need to be next to a river or other water body to cause a problem. Any pollutants getting into subsoil, surface water drain, dry or wet ditch/channel or groundwater can end up in a river even if it is miles away. Often these pollutants can be tracked back to their source.

Even a small amount of material can be a pollutant and one of the most common sources of contamination from construction sites is silt. For example, the normal limits set by the environmental regulator for suspended solids are typically 30–40 mg/l (50 mg/l in Northern Ireland). However, limits can vary dependant on the local circumstances and sensitivities. This is about the equivalent of mixing half a tablespoon of soil in a bath full of water. Another common pollutant from sites is oil. Again, pollution does not necessarily involve large quantities. For example, five litres of oil can cover an area of water equivalent to four football pitches.

High levels of silt can clog the gills of fish and ultimately lead to their death. Also, it can smother invertebrates and sensitive plant life, which are also a food source for fish. When deposited on the bed, silt may prevent fish from spawning successfully and suffocate eggs. Silt levels as low as 15 mg/l can harm juvenile fish.

During the upgrading of the M74(M) in south-west Scotland, discharges from the construction site into top quality salmonid rivers contained suspended solids concentrations as high as 46 800 mg/l. These high concentrations, derived from silt, resulted in the contractors being fined £40 000 for the offence.



Pollutants can damage the water environment in various ways, as shown in **Table 4.5**.

Table 4.5 Common water pollutants and their effects on the aquatic environment

Common pollutants of water	Adverse effect on aquatic environment
Silt	Reduces water quality, clogs fish gills, covers aquatic plants
Bentonite (very fine silt)	Reduces water quality, clogs fish gills, covers aquatic plants
Cement or concrete wash water (highly alkaline)	Changes the chemical balance, is toxic to fish and other wildlife
Detergent	Removes dissolved oxygen, can be toxic to fish and other wildlife
Hydrocarbons, eg oil, diesel	Suffocates aquatic life, damaging other wildlife (eg birds), and to water supplies including industrial abstractions
Sewage	Reduces water quality, is toxic to fish and other wildlife, and damages water supplies

Pollutants that disperse quickly are difficult to control and treat. They are easily transported in waters and the effects are likely to be significant. Some pollutants can smother the surface of watercourses (or standing waters such as lakes or lochs) depleting oxygen and leading to fish deaths or harm to other wildlife or third party interests. Notify and consult for advice the environmental regulator immediately from if spillages occur.

A contractor was found liable for causing oil pollution of the Grand Union Canal after a tap was removed from an oil storage tank. Despite the contractor blaming vandals the Magistrates agreed with the Environment Agency that the site had poor security and the company was fined £7000 and had to pay costs of more than £11 000.



4.7.3 Water pollution prevention

All sites have the potential to pollute watercourses, so a standard approach should be adopted at the earliest stage of the project. Survey the site through a combination of desktop reviews of plans, site drawings, contract documents and reviews of local authority information, and by site walkover for a physical check. Then use the source–pathway–receptor model to identify the site risk as shown in **Table 4.6** (see also **Section 3.2.4**).

Table 4.6 *Example source–pathway–receptor model*

Source	Pathway	Receptor
Earthworks – silt pollution from vehicle movements	Wash off from roads into surface water drains	Watercourse and aquatic life
Oil storage – leaking on unmade ground	Soil – infiltration	Groundwater

A contractor and client were ordered to pay £21 000 for poor planning and inadequate pollution prevention measures resulting in water offences being committed at a construction development site at Castlewood Grange near South Normanton. Runoff containing debris from the construction process unlawfully entered a nearby Brook, causing a downstream increase in the concentration of suspended solids. The enforcement officers found that the non-existence of a settlement lagoon to treat runoff from the site or a balancing pond were the immediate causes of the polluting incidents.



After undertaking this process the scale and significance of the problem can be assessed and the most suitable control measures for the site can be defined. If following the approach set out in **Table 4.6**, new columns should be added for recording controls and monitoring requirements.

Controls should be applied in a hierarchical manner for each pollution item identified, ie try applying control measures at source, if not possible at pathway, and if not possible at receptor.

When assessing the site for pollution potential, pay particular attention to sources of diffuse pollution. Diffuse pollution is the release of (potential) pollutants from a range of activities that individually may have no effect on the water environment, but at the scale

of a catchment can have a significant impact (ie on water quality and wildlife). So, while an individual instance of silt pollution from a site may not have a significant effect, many instances across the site into the same water catchment could be significant.

Pollution prevention control measures

Preventing and managing runoff and silty water

Surface water runoff may cause water management or pollution problems. For example, more than 25 tonnes of sediment can be eroded per hectare off site in a year. Removing the potential for runoff on site should be a high priority. Consider the following:

- 1 Can the proposal be altered to minimise land clearing and land shaping (ie phased stripping)?
- 2 Can the proposal be altered to allow permanent stabilisation of disturbed areas as soon as land shaping is complete?
- 3 Can undisturbed areas be used as sediment buffer zones either during construction or on a long-term basis as appropriate?
- 4 Can site entry points be located so as to minimise soil contamination of vehicles, and is it possible to allow the early establishment of all-weather parking areas?
- 5 Is it possible to locate imported material and soil stockpiles in areas that minimise on-site traffic movement?
- 6 Is it possible to carry out early or phased landscaping to minimise the length of time soils/ground is exposed?
- 7 Can the works be sequenced to make best use of existing buffer zones and stabilised areas?
- 8 Can the development be staged so that most of the ground disturbance occurs outside periods of high saturation?

If runoff is still likely to occur, surface water will need to be managed (**Figure 4.55**) so that it does not run into excavations, over disturbed ground, directly into surface water drains/ditches or watercourses, or onto haul roads. Steps should be taken to ensure that the water collection system is adequate to allow for the controlled release of storm flows. Ensure hard standing areas and surface roads are kept clean from mud and oil build-up, and keep stockpiles covered (**Figure 4.56**).

Periods of heavy rain can dramatically increase surface water runoff, giving very high pollutant loads. Some areas of the UK



Figure 4.55 Concrete canvases (courtesy Skanska)



Figure 4.56 *Drainage installation and silt management (courtesy BAM Nuttall)*

are subject to considerably higher rainfall than others, eg west coasts. This factor should be taken into account when considering the management of runoff. Another important factor is soil types on site. Clay soils are much more difficult to remove from site runoff once mobilised than sandy soils. So, construction activities in high rainfall areas with clay soils have the potential to cause more serious environmental harm to waters than projects in low rainfall areas with sandy soils. Issues relating to the

potential of pollution from runoff should be fully considered on every site.

Silt fences (**Figure 4.57**) work by preventing runoff flowing over ground. However, it is important not to rely on silt fences to remove sediment from concentrated flows, such as pipe discharges or in flow watercourses. Adequate scour protection (eg rock mattresses, geofabrics) should be provided at points of concentrated discharge to spread flows and reduce velocities, minimising damage and mobilisation of sediment.

Fences cause a physical barrier, capturing the water and enabling it to seep into the ground where it is naturally filtered as it flows downhill. If correctly installed, silt fences can prevent erosion and stop silt laden runoff entering watercourses. Correct installation and maintenance of silt fences is vital. The silt fence should be shaped and installed so that it will catch runoff, without the water flowing underneath or around the edge. Also, the required shape of the silt fence will depend on the gradient of the slope. It is important that the bottom of the geotextile is dug into the ground so that water does not simply flow under the barrier.

Grips, sumps, straw bales and sediment traps can be installed to capture silt. Each of these should be regularly maintained to ensure that they remain effective (ie do not become blocked) and not increase the likelihood of an incident occurring.



Figure 4.57 *Silt fence (courtesy Galliford Try plc)*

Further actions to prevent silty water runoff, include:

- reduce overland flow, eg use of lined (scour protected) cut-off channels to collect and channel water and use of check dams within these
- maintain vegetative buffer zones (10 m min from waterways)
- use of clean aggregate for haul roads
- locate stockpiles a minimum of 10 metres away from waterways
- vegetate stockpiles or cover with geotextiles and use silt fencing
- keep stockpiles on slopes not subject to failure and consider gradient and height accordingly.

Drainage

Identify all drainage on site and use colour coding and symbols to distinguish them, for example blue for surface water, red for foul water and a red 'C' for combined drainage systems. Using the yellow fish symbol beside drains in accordance with the Environment Agency (2012) yellow fish campaign, can also be incorporated to remind people that any waste entering them may go directly to the nearest stream, river, lake, canal, beach or bathing water causing pollution and killing wildlife. This ensures that all those working on the site are aware of the type of drain in the event of a pollution incident.

Depending on the types of drains, where they are on site and potential sources of pollution, control measures can be applied such as placing interceptors in drains to catch oils or placing bunding or silt traps around drains to prevent silt runoff.

Managing effluent from vehicles and boot washing

Where vehicle washing is carried out on site the following measures should be carried out:

- cleaning in a designated bunded area without drains and recycle/treat the water. Disposal of water to sewer may be allowed with the agreement of the sewerage undertaker
- discharge waste water to the foul sewer (with the consent of the sewerage provider)
- collect water in a sealed tank for removal from site by a licensed waste disposal contractor
- use none hazardous and non-solvent based cleaning products where possible
- do not use detergents with oil interceptors as they affect their function.

Vehicle wheels may need to be washed on site to avoid mud on public roads. A specific wheel washing facility (**Figure 3.7**) should be used, with either a discharge to the foul sewer or, if contaminated, collection by tanker. Where a site is not contaminated, water recycling wheel washing systems are available where only the collected silt needs to be removed.

Facilities should be provided for site staff to wash their boots to remove mud (**Figure 4.60**).

Use of dirt boxes and sedimats to reduce silty runoff on a site with underlying clay ground (courtesy Parsons Brinkerhoff)

4.18

Issue

The project involved constructing a substantial extension to the Hutton Substation in Cumbria, which included culverting a beck and re-profiling a hillside.

The earthworks, which included movements of up to 100 wagons a day, were carried out during a period of prolonged heavy rainfall that resulted in a number of instances of heavily silt-laden runoff reaching the beck. As the underlying ground on site was clay, this did not settle out.

Lessons learnt

The Environment Agency was engaged very early in the project and was consulted regarding measures that could be implemented on site. This proactive engagement and full transparency with the Environment Agency created trust and good working relationships throughout the project. A system of dirt boxes (Figure 4.58), silt fencing and sedimats were used across the site to try and remove as much silt and colour from the water, which discharged to the beck at the bottom of the site.



Figure 4.58 Dirt box, silt sock and sedimats

A dirt box is a filtration system that uses a 100 micron filtration bag attached to the inlet to remove larger sediment particles and a 40 micron filtration sock or 'silt sock' attached to the outlet to remove finer sediment particles from water.

Additionally, sedimats were used to further filter the water that discharged through the silt socks, along slopes to prevent runoff picking up silt, and within the beck. They proved particularly useful in reducing runoff from exposed ground. Sedimats consist of biodegradable matting whereby sediments within the water flow settle through the upper layer of jute mesh and into a layer of wood wool. A lower layer of hessian prevents the sediment from escaping.

Silt fencing (Figure 4.59) was installed in areas where silty water was likely to runoff the site either into land drains or directly into the beck. As site works progressed, new areas that would benefit from the installation of silt fencing were identified. Similarly, redundant silt fencing was removed where there was no longer a risk.

When carrying out mass earthworks and land re-profiling, ensure landscaping is carried out as soon as possible. Complete landscaping as soon as formation levels are complete in one area before moving onto the next. Ensure landscaping is pre-planned and incorporated into the programme in order to minimise the length of time that large areas of bare ground are exposed.



Figure 4.59 Silt fencing

This is vital on contaminated sites. Similarly the water should be captured and treated.

Do not allow water containing detergents to enter either surface water drains or other surface water or groundwater bodies.

In exceptional circumstances, discharge to a surface water body may be accepted with the consent of the environmental regulator in the form of an environmental permit. However, this would typically require pre-treatment (for example, silt settlement and oil separation through an interceptor) and it may be difficult to control quality.



Figure 4.60 On-site boot wash facility (courtesy Galliford Try plc)

If tools and equipment need to be washed, ensure that this is undertaken well away from any waters or surface water drains on a designated collection area to avoid infiltration of potential pollutants into soils.

Boot washers supplied with rainwater (courtesy Lend Lease)

Background

During winter months construction teams can wash their boots up to four times a day. For a typical £50m construction project, this means about 300 000 litres of mains water consumption per year. To save this volume of water Land Lease is now using boots washers supplied with rainwater that is collected by a harvesting system designed to supply the 70 per cent of the peak demand.

Lessons learnt

Water consumption can be reduced through simple cost-effective strategies.

4.19

Managing concrete washout

The washout from a concrete mixing plant and/or from cleaning ready-mix concrete lorries, is contaminated with cement and so is highly alkaline. Do not allow it to enter any surface water drains or other surface water or groundwater bodies.

The preferred option is to wash out the container and chute back at batching plant or in a designated concrete washout area. Where this is not appropriate or possible the following options should be considered for concrete washout areas:

- where possible located away from watercourses and on an impermeable surface

- easily accessible for concrete wagons and situated as close as possible to pours
- stored in secured lined pit (Figure 4.61) or container

The hardened residual concrete should be disposed of using the waste hierarchy (see Section 4.5.3.6). The options presented in Section 4.7.6 should be considered for any remaining washout water.



Figure 4.61 Lined washout pit (courtesy BAM Nuttall)

Avoiding spillages

There are many precautions that can be taken to avoid spillages including:

- use of secondary containment, eg bunds around oil storage tanks, double skinned fuel bowers, drum pallets (for inside/under cover use) that may be a legal requirement
- use of drip trays/plant nappies under mobile plant (Figure 4.62)
- supervising all deliveries and refuelling activities
- designate a refuelling area on an impermeable base, away from surface water, away from vehicle movements and appropriately signed
- provide secure containment for fuel oil and chemicals, appropriately bunded and consider signing in and out procedures
- provide and identify trained site-based staff to supervise and carry out refuelling training.

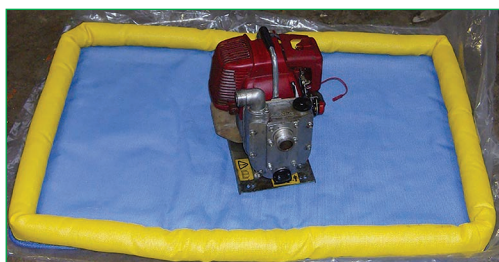


Figure 4.62 Plant nappy (courtesy BAM Nuttall)

Forward or risk planning can ensure a speedy emergency response if things do go wrong. For example, sandbags can be used as a barrier to protect sensitive areas, or to block off drains during refuelling. Also, they are effective for controlling and mopping up some types of spillages. Ensure adequate supply of appropriate spill materials, eg granules, pads, socks and booms. Ensure site-based staff are trained in spill procedures (Figure 4.63).

Monitoring

Undertaking the chemical analysis of water samples for trace quantities of particular

pollutants is a specialised task. However, the appearance of a sample can indicate potential problems, for example:

- unusual levels of turbidity, colour or dissolved solids
- odour
- presence of oil film.

The use of pH testing kits, eg pH meters and test strips, can be used to indicate the presence of specific pollutants on site. For instance, high pH rinse waters from cement batching plants or grouting works can be toxic to aquatic life and may cause a severe pollution incident. This can be identified easily through the use of pH papers that show a colour change in response to differing acidity or alkalinity.



Figure 4.63 Boom demonstration (courtesy SEPA)

Regular visual checks should be undertaken to check for

- changes in water colour
- changes in water transparency
- oil sheen to the surface of the water
- scum or foam build-up on the surface
- signs of dead plants or animals
- the condition of control measures such as silt fencing.

Monitoring will have to be carried out if conditions are specified in trade effluent consents and discharge permits. This may include monitoring specified limits for flow rate, suspended solids, chemical or biological oxygen demand, or chemical constituents.

4.7.4 Dealing with water pollution – considering the options

To establish the best approach for each site, review the following prioritised options. Those at the top of the list are likely to be least expensive and should minimise the risk of accidental pollution.

Preferred options include:

- 1 Pump to grassland/field or other soakaway.
- 2 Pump to sewer.
- 3 Pump to settlement tank, lagoon, constructed pond and/or wetlands.
- 4 Pass through a filtration system.
- 5 Use flocculants in conjunction with settlement tank/ponds.
- 6 Pump into a tanker and dispose of off-site.

Least expensive



Most expensive

The preferred options will depend on several factors, including:

- the quantities of water involved
- whether areas are available for storage and treatment
- the level of any charges to be levied by the sewerage provider
- the degree of contamination of the water
- sensitivity, quality and flow of the receiving watercourse
- the characteristics of the sediment
- other users of the receiving water
- ground water table level
- slope gradient
- whether permission/consent can be obtained
- underlying geology (eg clay).

So when making an assessment on the suitability and feasibility for each option, the following information and data should be taken into account:

- size of the construction site
- annual rainfall data
- soil types
- site topography
- surface water flow paths during the various stages of construction
- sensitivity of the waters in, around or connected to the site.

Obtain the approval of the environmental regulator and/or the landowner before doing anything.



Grasslands/fields or other soakaway

This option is only suitable for water that is unpolluted aside from its silt content and should be conducted well away from excavations to avoid recirculation through the ground. It may be necessary to allow water temperatures to rise by storing in a lagoon before discharge onto crops. Typical infiltration rates are given in **Table 4.7** for various soils.

Pumping to land is the ideal option from excavations, but it needs to be vegetated and

adequate space management provided to prevent overland flow. When pumping to grassland it is essential to prevent water logging of ground as this will only result in excessive overland flow and suspended solid loading. This needs to be managed according to prevailing ground conditions, slope and weather. Any discharge to land from pumping needs to be at surface water level and not the base of the excavation as this increases the suspended solid loading.

Table 4.7 Typical infiltration rates for different soil types (from Bettess, 1996)

Soil type	Infiltration co-efficient (m/h)
Gravel	10–1000
Sand	0.1–100
Loamy sand	0.01–1
Sandy loam	0.05–0.5
Loam	0.001–0.1
Silt loam	0.0005–0.05
Chalk	0.001–100
Cut-off point for most infiltration drainage systems	0.001
Sandy clay loam	0.001–0.01
Silty clay loam	0.00005–0.0005
Clay	<0.0001
Till	0.00001–0.01
Rock	0.00001–0.1

To get an accurate infiltration rate carry out appropriate measurements, eg using the BRE soakaway test (BRE, 2003).

Sewer

Discharge to the sewer will require consent from the sewage provider. This is unlikely to be allowed in Northern Ireland.

Settlement tanks/lagoons/ponds/wetlands

A settlement lagoon (pond or tank) (Figure 4.64) works by reducing energy and retaining water in an undisturbed state long enough for suspended solids to settle out. The clean water then either flows out at the discharge point or is pumped out. Usually it is necessary to retain the water in the settlement tank for two to three hours at maximum flow rate (Table 4.8). However, finer particulate matter (eg fine sand) may require a longer retention

time and possibly larger lagoons. An idea of the required retention time can be obtained by leaving a sample of the contaminated water to stand in a clear glass bottle. Compare this sample to a prepared sample of a concentration equal to the consented/permited discharge.

As a general rule, when the contaminated water sample looks as clear as the sample representing the consented discharge, it may be discharged. Settlement tanks should only be used with low flow and they are not effective with large volumes.

Settlement lagoons (Figure 4.64) are unlikely to be appropriate for water from sites underlain by clay that does not readily settle out.

Inspection and maintenance of settlement tanks/lagoons and ponds should be conducted on a regular basis. This will help to mitigate the impact of heavy rain on the settlements. The inspection should also cover amphibian checks and areas fenced where appropriate to prevent access (see Section 4.1.5).



Figure 4.64 Settlement lagoon (courtesy Galliford Try plc)

Where sufficient land is available it may be possible to create a wetland around the pond to allow further treatment of the runoff. Where sustainable drainage systems (SuDS) are to be used for surface water management for the final development, it may be possible to construct such features at the start of the project with the aim of their use during construction (see Section 4.7.7).

Table 4.8 Typical dimensions of a settlement tank/lagoon for a three-hour settling time

Pump diameter	Discharge rate (as per discharge permit)	Length	Width
6 in pump	3000 l/min	60 m	20 m
	6000 l/min	80 m	27 m
4 in pump	1000 l/min	30 m	10 m
	2500 l/min	50 m	17 m

Note: assuming one metre deep ponds, where the length = three times the width

Filtration

Discharges with fairly coarse particles (but no other pollutants) and relatively small flows may be treated easily and cheaply by passing them through steel tanks or even skips.

These are filled with a suitable filter, such as fine single size aggregates (5 mm to 10 mm), geotextiles, straw bales or straw bales wrapped in geotextiles. Filtration socks can be added for further treatment. If this solution is used there should be careful control of the discharge quality and a mechanism to close down the flow. Discharge should then be to land (with landowners permission), to sewer (with water company permission), or to surface waters (with the environmental regulator's permission). Proprietary systems may also be used.

Consider installing a spare settlement tank/lagoon on site, so that it can be used as an emergency overflow (eg fire water runoff) or when the main tank is being cleaned or in periods of heavy rainfall.



Flocculation

If no alternative treatment is available (whether due to the material characteristics, lack of space or lack of suitable discharge locations), the use of settlement tanks together with flocculants (and/or coagulants) can be an effective solution, particularly to aid the settlement of fine silts. This approach can be expensive and needs specialist advice on the design of the system, the size and dosing rates etc and careful supervision to avoid failures of the system.

Flocculants commonly used include aluminium sulphate and ferric sulphate. If applied incorrectly they can cause pollution and are toxic to fish. Discharges of substances including flocculants/coagulants, to land (with landowners permission and specialist advice), to sewer (with water company permission), or to surface waters (with the environmental regulator's permission) can be made following close supervision and monitoring.

4.7.5 Emergency preparedness and response

All site-based staff should be aware of the appropriate action in the event of an emergency, such as the spillage of potentially polluting substances. A spill response plan/procedure should be developed for the site (see [Section 3.4](#)). For details on appropriate fuel storage preparedness measures see [Section 4.5.2.6](#). Any environmental damage to surface water or groundwater must be reported to the environmental regulator unless it can be remedied immediately. Also, steps need to be taken to limit the damage caused by any such incidents.

4.7.6 Water abstraction and discharge

If there is a need to abstract water or to discharge to either surface water (eg river, stream, estuary) or groundwater, the environmental regulator should be contacted to confirm whether a PLC will be required (the terminology varies between regions).

Abstracting water

Some construction activities, for example concrete batching or dust suppression, require water to be abstracted from surface water or groundwater.

Abstraction needs to be licensed/permitted because water is a resource and over abstraction, or impeding flows can lead to:

- shortages in water supply
- increased pollution due to the reduced dilution of pollutants
- damage to habitats
- changes to the water regime (eg groundwater draw down) or reduction of levels in water bodies (eg ponds).

Each application is considered for its potential impacts based on national and regional considerations. Contact the environmental regulator for information. The following abstraction limits apply per day:

- **Scotland:** more than 10 m³, register with SEPA. More than 50 m³, licence from SEPA.
- **England:** more than 20 m³, licence from the Environment Agency.
- **Northern Ireland:** between 10 m³ and 20 m³, notify NIEA. More than 20 m³, licence from NIEA.
- **Wales:** more than 20 m³, licence from NRW.

Discharging water

Discharges should only be made to drains following formal legal approval by way of a PLC from the environmental regulator:

- foul water sewer – effluent discharge consent required from the sewerage provider
- waters from surface water drains or any other temporary/permanent outfalls installed to serve the site – discharge consent/permit from the relevant environmental regulator
- discharge to land with the landowner's permission and possibly the environmental regulator.

A consortium of developers was fined in excess of £26 000 for failing to comply with the terms of their discharge consent and allowing polluted water carrying 10 times the allowable level of ammonia and four times the permissible solids concentration to enter a stream close to their housing development. The investigating officers found that a lack of maintenance of the sewage treatment works (and particularly de-sludging) was a major contributor to the incident and the resulting penalties.



A developer was fined and ordered to pay in excess of £10 000 for polluting a County Durham stream by discharging extremely polluted water from their site without a discharge consent. The company failed to heed instructions from Northumbrian Water Limited to stop discharging despite being ordered to do so.



If the discharge of water is necessary, discharge to foul sewer should be considered in preference to surface water drains.

Discharge PLCs can be obtained from the environmental regulator, but can take up to four months to obtain, or even longer if there are representations made by third parties/the

public. It is important to plan ahead to avoid delays. Even with a PLC, allowable pollution limits will be low.

Water used on site may be contaminated with pollutants that cannot be discharged to the sewer. In these circumstances it will have to be pumped into a tanker or IBC for disposal to an appropriately licensed disposal facility, adding extra costs to the project. **Figure 4.65** outlines the steps to follow when disposing of water on site.

4.7.7 Sustainable drainage systems (SuDS)

Traditional drainage systems could lead to an increased risk of flooding through surface water runoff, to contamination of water bodies with pollutants, or to the diversion of water away from natural groundwater systems. Often, the inclusion of SuDS in a development is a stated policy aim of the environmental regulators for final developments, but also SuDS can be considered for use during the construction phases of projects.

susdrain

An exciting community offering a range of resources for those involved in delivering sustainable drainage systems (SuDS). With the need for SuDS greater than ever before, susdrain provides up to date guidance, information, case studies, videos and discussion forums to help underpin planning, design, approval, construction and maintenance of SuDS.

For more information got to: www.susdrain.org



4.7.8 Working over or near to water

PLCs may be required from the environmental regulator and/or local authority for any works over or near to water. Contact the environmental regulator before starting any works in, on or over water to establish requirements. Particular care should be taken to avoid the increased risk of water pollution (**Figure 4.66**). In addition to the measures described in **Section 4.7.5**, good practice includes:

- ensuring the comprehensive risk assessments to be undertaken, include water-related risks, and that the risk management plans are implemented
- where relevant, construct working platform to act as a bund
- identifying measures to prevent water reaching a watercourse (eg sandbags, silt fencing)
- availability and, if necessary, use of primary and secondary booms to contain pollutants in the event of substances entering the water erecting dust screens on bridges
- consideration of surface water, groundwater and flood water flows and pathways
- no refuelling within at least 20 m of a watercourse. These activities should be undertaken as far away from the area as possible, on impermeable ground and supervised.

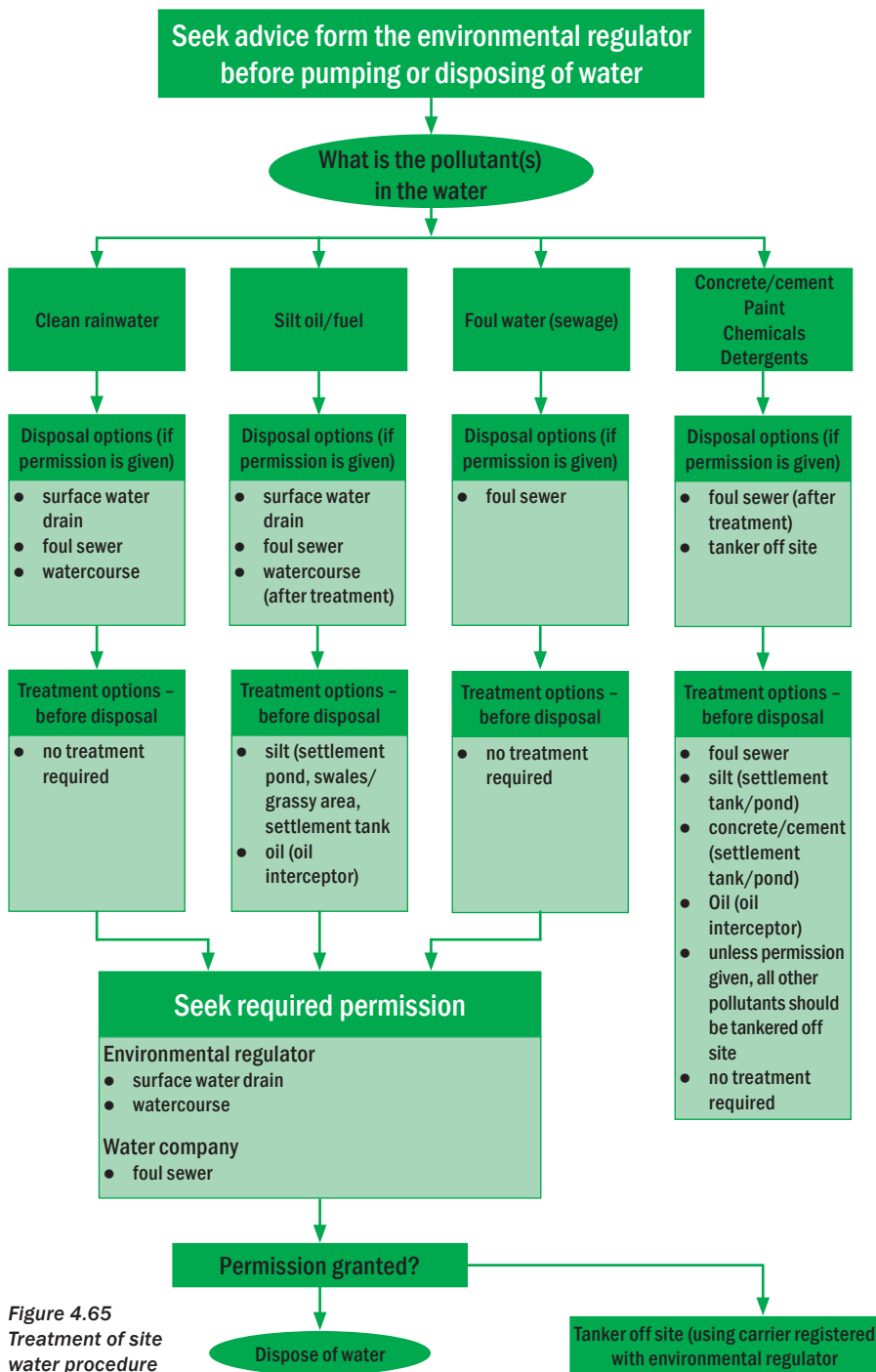


Figure 4.65
Treatment of site
water procedure

Temporary works

In England and Wales, the Environment Agency and NRW and/or local authority need at least seven days' notice of any intention to temporarily or permanently divert the flow of a watercourse, to carry out works over or within a river channel or to begin operations in a river channel.

Obtain approval from the environmental regulator for all temporary works that involve construction, erection, re-erection or modification during works that:

- may interfere with the bed or banks or flood channel of any watercourse
- is within eight metres of the bank of any main river
- is within 16 metres of any tidal defence.

In Scotland, SEPA needs to be notified in advance of similar works and depending on the scale of the activity a licence may be required. If the works do require a PLC this can take up to four months to issue and even longer if representations are made by third parties.

If SuDS are to be used as part of the final development for surface water disposal or management, it may be possible to install ponds and wetlands at the initial phase of construction, allowing site drainage to be managed accordingly. Perhaps following a clean out, the ponds and wetlands can remain on site to serve the development once built.



In south-west Scotland and in Cumbria, ponds were used for the treatment of runoff from the construction of the M74 and the M6. Once construction was completed, the ponds were slightly modified and in some cases wetlands were included. The facilities installed for treating runoff from the construction site were retained as a permanent SuDS feature for treating highway drainage.



Figure 4.66 Encapsulation of blasting works (courtesy BAM Nuttall)

In Northern Ireland the NIEA, Rivers Agency and the Department of Culture, Arts and Leisure (DCAL) Inland Fisheries need to be consulted before any river works are started.

Further information can be found in Environment Agency, SEPA, EHSNI (2007) (see [Appendix A3](#)).

4.7.9 Good practice checklists

Know the site	
Identify potential pollution pathways and receptors on site	
Define suitable controls to prevent pollution entering pathways and reaching receptors	
Identify temporary drainage patterns on site where cut-off channels and site drainage towards settlement features should be	
Check the annual rainfall data, soil types, site topography and flow paths during the various planned stages of construction	
Identify site drainage as surface, combined or foul water and suitably colour code and mark on the site plan	
Protect/cover drains	
Ensure the correct connections are being made with either foul sewers, surface water drains or combined systems	
Identify all water bodies, gain appropriate consents and put measures in place to fulfil the requirements of the consent	

Managing runoff and silty water	
Minimise, where possible, the amount of exposed earth	
Maintain a filter (or buffer strip) strip to protect surface water (minimum of 10 m)	
Regularly check waters for signs of pollution (if applicable)	
Look for any visible signs of discolouration in waters (if applicable) at or near the site	
Silty or discoloured water should not be discharged from the site	
Surface water runoff should not directly enter waters or drains	
Monitor any water treatment methods to ensure their effectiveness	
Inspect scour protection, cut-off channels and settlement features	
If a settlement tank is used, ensure that water is not moving too fast and/or overflowing (other than at the discharge point)	
If necessary, erect silt fences along the downslope or side slope of disturbed areas	
If straw bales, geotextiles or silt curtains are used, ensure they are securely fixed and maintained	
Seed, roll or cover stockpiles as soon as possible	

Managing effluent from washout facilities	
Wash out concrete lorries in a suitably contained designated area that is impermeable and/or lined	
Ensure designated washout area is at least 10 m away from drains and waters	
Protect surface water and groundwater from washout	
Put a plan/procedure in place to dispose of washout cost effectively	

Avoiding spillages	
Store fuel, oil and chemicals away from drains and water bodies, and in secondary containment in accordance with the appropriate pollution prevention regulations	
Store solvents, chemicals or paints in accordance with their COSHH datasheets and oil storage regulations	
Use drip trays/plant nappies for equipment	
Implement procedures for storage, use, delivery, inspection and monitoring of polluting substances	

Monitoring	
Establish a regular monitoring procedure for water discharged from the site and keep records (turbidity/flow rate) in accordance with the PLCs/good practice limits	
Undertake daily visual inspection of watercourses on and near to a site for signs of pollution	
Check outfalls and pipework daily to ensure they are clean and clear of litter	
Monitor and investigate any complaints, incidents and near-miss occurrences	
Monitor bunds and machinery for leaks	
Ensure PPE is in good order	

Dealing with water in excavations	
Measures should be put in place to prevent water from entering excavations	
Inform the environmental regulator before undertaking any excavation below the water table, including any site dewatering	
Control water in excavations using stone-filled edge drains leading to sumps	

Dealing with water in excavations	
Install cut-off ditches, walls or well point dewatering to manage groundwater flow into excavations	
Obtain a discharge PLC for the disposal of water from excavations where required and monitor	
Ensure water dewatering is disposed of appropriately (ie through a settlement tank, to sewer, to ground or offsite depending on water quality)	

Settlement tank/lagoon/ponds/wetlands	
Ensure the size of the tank/lagoon is adequate for the settlement time required and the rate at which water flows or is pumped into it	
Install a long, narrow, shallow settlement lagoon to ensure maximum retention time of all water in the lagoon	
Obtain a PLC to pump clean water from the surface of settlement lagoons into waters or a designated discharge point	
Clean the entry chamber periodically to prevent a build-up of silt	
Regularly inspect/monitor the outflow quality in accordance with the PLC	

Emergency preparedness and response	
Ensure site-based staff know who to contact in the event of a spillage, what to do and from where to get equipment	
Ensure appropriate spill kits are available (eg oil only, chemical or general use) and adequately stocked	
Adopt and test an emergency response plan/procedure	
Report environmental damage that cannot be rectified immediately to the environmental regulator and take appropriate steps to remedy the damage caused	
Nominate a spill contractor to deal with major incidents	

Abstracting water	
Ensure the site has a PLC to abstract water	
Ensure the site complies with the abstraction PLC	

Discharging water	
Check appropriate PLC for disposal of all water are in place, and site staff are aware of the quantity and quality of water that can be discharged	
Check for any visible sign or smell of pollution in waters at, or near the site	
Ensure water is treated effectively before disposal	
If a settlement tank (or lagoon) is being used, check it is working properly	
Supervise and regularly monitor the discharge to ensure compliance with PLCs and general good practice	

Working over or near to water	
Avoid storing fuel in containers near water	
Re-fuelling in designated areas only at least 10 m from watercourses	
Ensure that no site works are within 10 m of the edge of waters or ensure a PLC is obtained	
Check that the banks or bed of waters outside the area of the works are not being affected by discharges or vehicle movements	
Spray, dust or other airborne materials should be prevented from entering waters	
Approaches to the watercourse should be kept free from the build-up of mud	
If using a cofferdam to retain water, it needs to be in good condition and working effectively	
Regularly check waters downstream of the works to see if these are silted or discoloured or if there is an oily sheen visible on the water	
Ensure spill kits are adequately stocked	
Site-based staff should be aware of the location of spill kits and know how to use these properly	
Mitigation measures should be put in place in the event of an emergency (eg booms across river). Contact the environmental regulator immediately	
Monitor compliance against any PLCs that may be in place	
Store all fuel oil and chemicals at least 10 m from any water body	
Test emergency procedures regularly	

Pontoons and barges	
All fuel tanks to be secure and safe on the vessel so that there is no chance of collision damage or accidental spillage overboard	
Contaminated bilge water should be pumped to suitable facilities ashore or absorbents used	

4.7.10 Further reading

BETTES, R (1996) *Infiltration drainage – manual of good practice*, R156, CIRIA, London (ISBN: 978-0-86017-457-8)

www.ciria.org

DEFRA (2004) *Groundwater protection code: solvent use and storage*, PB 9849, Department for the Environment, Food and Rural Affairs, London

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4.7.11 Legislation

Legislation is constantly changing, including amendments and new legislation, and this varies between England, Wales, Scotland and Northern Ireland. If site staff are unsure on any environmental issue contact the regional environmental regulator for advice.

Legislation	Key requirements	Applicable nation(s)
Water Resources Act 1991	It is an offence to cause or knowingly permit any poisonous, noxious or polluting matter or any solid waste matter to enter any controlled waters (including lakes, streams, ponds, rivers and canals).	England, Wales
Water Industry Act 1991 Sewerage (Scotland) Act 1968 Water and Sewerage Services (Northern Ireland) Order 2006	Consent is required from the local sewerage provider before discharging water to any foul water sewer.	England, Wales, Scotland, Northern Ireland
Salmon and Freshwater Fisheries Act 1975 (Modified by Water Resources Act 1991 and Marine and Coastal Access Act 2009)	Covering: ● damage to habitat, spawning grounds or spawning fish ● illegal removal of fish/fishing ● making and maintaining fish passes ● damage and obstruction of fish passes.	England
Water Environment (Controlled Activities) (Scotland) Regulation 2011	In addition to the provisions for licensing of abstraction and impounding water, these Regulations amend the rules governing a number of activities that affect the water environment, including works close to or in watercourses, certain agricultural activities and the storage and use of pesticides.	Scotland
Environmental Permitting Regulations (England and Wales) 2010 as amended	An environmental permit will be required for discharging to water to any controlled water or surface water drain. It will also describe any abstraction limits placed upon a site.	England, Wales
The Environmental Damage (Prevention and Remediation) Regulations 2009 Environmental Damage (Prevention and Remediation) (Wales) Regulations 2009 Environmental Liability (Scotland) Regulations 2009 (as amended) Environmental Liability (Prevention and Remediation) Regulations (Northern Ireland) 2009 (as amended)	If a business carries out an activity that causes environmental damage it will have to remedy the damage. If there is a risk of damage from any business activities, the damage must be prevented. Overall, the Regulations are likely to be used only for the most serious cases of damage. Under the Regulations, environmental damage is: ● damage to surface water or groundwater such that its classification is affected ● contamination of land where there is a significant risk to human health ● damage to EU protected natural habitats and species or damage to SSSIs/ASSIs.	England, Wales, Scotland, Northern Ireland

Legislation	Key requirements	Applicable nation(s)
Water Resources (Abstraction and Impounding) Regulations 2006 (as amended) Water Environment (Controlled Activities) (Scotland) Regulation 2011 Water Abstraction and Impoundment (licensing) Regulations (Northern Ireland) 2006 (as amended)	Makes provision for the licensing of abstraction and impounding of water.	England, Wales, Scotland, Northern Ireland
Water Environment (Oil Storage) (Scotland) Regulations 2006	Where oil is stored in any portable container with a storage capacity of less than 200 litres, the container must be of sufficient strength and structural integrity to ensure that it is unlikely to burst or leak in its ordinary use Where the container has a storage capacity of 200 litres or more, the Regulations require provision of a secondary containment (a bund or drip-tray) to ensure that any leaking or spilt oil cannot enter the water environment	Scotland
Control of Pollution (Oil Storage) (England) Regulations 2001 Control of Pollution (Oil Storage) (Northern Ireland) Regulations 2010 (as amended)	Imposes general requirements for preventing pollution of controlled waters from oil storage, particularly fixed tanks, drums or mobile bowsters. The legislation applies to the storage of 200 litres or more of oil of any kind, including petrol, but excluding the storage of waste oil. Restrictions also govern the use of pumps. It details requirements for oil stored in tanks, drums, mobile bowsters or underground that must be identified and implemented, and makes contravention a criminal offence.	England, Northern Ireland

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Acts

Clean Air Act 1993 (c.11)

Climate Change Act 2008 (c.27)

Control of Pollution Act 1974 (c.40)

Disused Burial Grounds (Amendment) Act 1981 (c.18)

Equality Act 2010 (c.15)

Nature Conservation (Scotland) Act 2004 (asp 6)

Protection of Badgers Act 1992 (c.51)

Town and Country Planning (Scotland) Act 1997 (c.8)

Weeds Act 1959 (c.54)

Wild Mammals (Protection) Act 1996 (c.3)

Wildlife and Countryside Act 1981 (c.69)

Wildlife and Natural Environment (Scotland) Act 2011 (asp 6)

Directives

Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives (the Waste Framework Directive)

Regulations

Conservation of Habitats and Species Regulations 2010 (No.490)

Conservation (Natural Habitats etc) (Amendment) Regulations (Northern Ireland) 2007 (No.345)

Environmental Damage (Prevention and Remediation) Regulations 2009 (No.153)

Environmental Damage (Prevention and Remediation) (Wales) Regulations 2009 (No.995 W81)

Environmental Liability (Scotland) Regulations 2009 (No.266)

The Environmental Liability (Prevention and Remediation) Regulations (Northern Ireland) 2009

Hedgerow Regulations 1997 (No.1160)

Town and Country planning (Environmental Impact Assessment) Regulations 2011

Town and Country Planning (Tree preservation order and Trees in Conservation Areas) (Scotland) Regulations (2010) (No.434)

Town and Country Planning (Tree Preservation) (England) Regulations 2012 (No.605)

British standards

BS 1192:2007 *Collaborative production of architectural, engineering and construction information*

BS 5228-1:2009+A1:2014 *Code of practice for noise and vibration control on construction and open sites. Noise*

BS 5837:2012 *Trees in relation to design, demolition and construction. Recommendations*

BS 8555:2003 *Environmental management systems. Phased implementation. Guide*

BS 42020:2013 *Biodiversity. Code of practice for planning and development*

BES 6001 *Responsible sourcing of construction products*

International Standards

BS ISO 14046:2014 *Environmental management. Water footprint. Principles, requirements and guidelines*

BS EN ISO 14001:2015 *Environmental management systems. Requirements with guidance for use*

Orders

The Wildlife (Northern Ireland) Order 1985 (No.171 NI 2)

Noxious Weeds (Northern Ireland) Order 1977 (No.52 NI 1)

A1 UK environmental regulators, nature conservation and heritage bodies

Environmental regulators

Organisation	Responsibilities
UK environmental regulators	Pollution/environmental incident hotline
Contact details T: 0800 80 70 60	
Department of Environment Food and Rural Affairs (Defra)	Policy-maker for all aspects of the environment, rural matters, farming and food production at national level
Contact details T: 03459 33 55 77 / W: www.gov.uk/defra	
Environment Agency	Discharges to land and controlled water, waste, effluent discharges, abstraction licences some nature conservation functions, contaminated land, enforcing environmental legislation
Contact details T: 03708 506 506 / W: www.gov.uk/environment-agency	
Natural Resources Wales (NRW)	Discharges to land and controlled water, waste, effluent discharges, abstraction licences, contaminated land, flood control, fisheries, sustainable development, forestry and forestry regulation, nuclear regulation, enforcing environmental legislation, wildlife conservation authority, designation of sites, sustaining natural beauty, access and recreation, land management of estate.
Contact details T: 0300 065 3000 / W: www.naturalresourceswales.gov.uk	
Scottish Environment Protection Agency (SEPA)	Licensing discharges to the water environment, water abstractions, impoundments and river engineering activities, emissions to air and waste deposits to land. Duties with regards to sustainable development (climate change)
Contact details T: 01786 457 700 / W: www.sepa.org.uk	
Northern Ireland Environment Agency (NIEA)	Discharges to land and controlled water, waste, nature conservation functions, contaminated land and the built heritage
Contact details T: 0300 200 7856 / W: www.daera-ni.gov.uk/northern-ireland-environment-agency	
Local authority	Noise, air quality, traffic, the planning process and contaminated land. Some powers under waste legislation to stop and search waste carriers and confiscate vehicles
Contact details W: www.gov.uk/find-your-local-council	

Statutory Nature Conservation Organisations (SNCOs)

Organisation	Responsibilities
Natural England	Designated ecological sites, geological and geomorphological sites, and protected species
Contact details T: 0300 060 3900 / W: www.gov.uk/natural-england	
Natural Resources Wales (NRW)	Discharges to land and controlled water, waste, effluent discharges, abstraction licences some nature conservation functions, contaminated land, enforcing environmental legislation, wildlife conservation authority, sustaining natural beauty.
Contact details T: 0300 065 3000 / W: www.naturalresourceswales.gov.uk	
Scottish Natural Heritage (SNH)	Designated ecological sites, geological and geomorphological sites, and protected species
Contact details T: 01463 725 000 / W: www.snh.gov.uk	
Northern Ireland Environment Agency (NIEA)	Discharges to land and controlled water, waste, nature conservation functions, contaminated land and the built heritage
Contact details T: 0300 200 7856 / W: www.daera-ni.gov.uk/northern-ireland-environment-agency	

Heritage bodies

Organisation	Responsibilities
Historic England	Responsible for protecting historic buildings, landscapes and archaeological sites
Contact details T: 020 7973 3700 / W: www.historicengland.org.uk	
Cadw	Designate archaeological and heritage sites in Wales
Contact details T: 01443 336 000 / W: www.cadw.wales.gov.uk	
Historic Environment Scotland	Safeguarding the nation's built heritage
Contact details T: 0131 668 8600 / W: www.historicenvironment.scot	
Northern Ireland Environment Agency (NIEA)	Responsible for recording, protecting, conserving and promoting built heritage
Contact details T: 0300 200 7856 / W: www.daera-ni.gov.uk/northern-ireland-environment-agency	

A2 Useful contacts

Organisation	Responsibilities
Chartered Institute of Environmental Health (CIEH)	Maintains and promotes improvements in public and environmental health
Contact details T: 0207 928 6006 / W: www.cieh.org	
CIRIA	CIRIA is the construction industry research and information association. As a neutral, independent, not-for-profit body, we link organisations with common interests and facilitate a range of collaborative activities that help improve the industry.
Contact details T: 0207 549 3300 / W: www.ciria.org	
Green Construction Board	Government and industry initiative working to achieve a low carbon economy. Through a series of Working Groups provides a variety of resources to achieve this.
Contact details W: www.greenconstructionboard.org	
Health & Safety Executive (HSE)	Advice on health and safety issues
Contact details T: 0300 003 1747 / W: www.hse.gov.uk	
National Trust	Responsible for protecting historic buildings, landscapes and archaeological sites
Contact details T: 0844 800 1895 / W: www.nationaltrust.org.uk	
National Trust for Scotland	Responsible for protecting historic buildings, landscapes and archaeological sites
Contact details T: 0844 493 2100 / W: www.nts.org.uk	
NetRegs	Website run by NIEA and SEPA detailing industry sector legislation
Contact details T: 01786 457 700 (SEPA) / W: www.netregs.org.uk	
Resource Efficient Scotland	Scottish Government programme designed to help the public and private sector reduce costs by implementing resource efficiencies in energy, water, raw materials and waste management.
Contact details T: 0808 808 2268 / W: www.resourceefficientscotland.com	
WRAP	Providing expertise, research and practical advice on resource efficiency to government and industry. Some of the resources developed by WRAP as part of the Built Environment Programme have been transferred to CIRIA: www.ciria.org/REK
Contact details T: 0808 100 2040 / W: www.wrap.org.uk	
Zero Waste Scotland	Funded by the Scottish Government to support delivery of its zero waste plan
Contact details T: 01786 433 930 / W: www.zerowastescotland.org.uk	

A3 Regulatory Pollution Prevention Guidance Notes

The Environment Agency, SEPA and the NIEA have produced a range of UK-wide PPGs. Each PPG is targeted at a particular industrial sector or activity and aims to provide advice on legal responsibilities and good environmental practice. Copies of the PPGs can be downloaded from:

- NetRegs: www.netregs.org.uk

Relevant PPGs and the section of this guide where they are relevant

PPG	Title	Section(s)
1	General guide to the prevention of pollution	4.7
2	Above ground oil storage tanks	4.4.3 4.7
3	Use and design of oil separators in surface water drainage systems	4.7
4	Disposal of sewage where no mains drainage is available	4.7
5	Works and maintenance in or near water	4.7 4.4.1
6	Working at construction and demolition sites	2, 3, 4
7	Refuelling facilities	4.7
13	Vehicle washing and cleaning	4.5.1 4.7
26	Drums and intermediate bulk containers	4.5.1
27	Installation, decommissioning and removal of underground storage tanks	4.5.1

Relevant Welsh Government Technical Advisory Notes (TAN) and the section of this guide where they are relevant:

TAN	Title	Section(s)
5	Nature Conservation and Planning	4.1
10	Tree preservation orders	4.1
11	Noise	4.4.3
15	Development and flood risk	4.7
21	Waste	4.5.3

For more information go to: <http://gov.wales/topics/planning/policy/tans/?lang=en>

Relevant Scottish Government Planning Advice Notes (PAN) and the section of this guide where they are relevant

PAN	Title	Section(s)
50	Controlling the environmental effects of surface mineral workings	4.4.1
51	Planning, environmental protection and regulation	4.1
60	Planning for natural heritage	4.2

Copies accessible from: www.gov.scot/Topics/Built-Environment/planning/publications/pans



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AECOM Ltd
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Buro Happold Engineers Ltd
BWB Consulting Ltd
CH2M
Dynasafe BACTEC Ltd
Environment Agency
Farrow Walsh Consulting Ltd
Galliford Try Plc
Gatwick Airport Ltd
Geotechnical Consulting Group
Golder Associates (Europe) Ltd
High Speed Two (HS2)
Highways England
HR Wallingford Ltd
Imperial College London
Institution of Civil Engineers
London Underground Ltd
Loughborough University
Maccaferri Ltd
Marshalls Plc
Ministry of Justice

Morgan Sindall Construction and
Infrastructure Ltd
Mott MacDonald Group Ltd
Mouchel
MWH
National Grid UK Ltd
Network Rail
Northumbrian Water Ltd
Rail Safety and Standards Board
Royal HaskoningDHV Ltd
RSK Group Plc
Scottish Water
Sellafeld Ltd
Sir Robert McAlpine Ltd
SLR Consulting Ltd
Southern Water Services Ltd
Tarmac
Temple Group Ltd
Thames Water Utilities Ltd
TOPCON (Great Britain) Ltd
UK Green Building Council
United Utilities Plc
University College London
University of Reading
University of Sheffield
University of Southampton
WYG Group (Nottingham Office)

February 2017



CANARY WHARF
CONTRACTORS



This guide was first published in 1999 and the latest edition reflects changes in legislation, developments in practice and emergence of new topics that the industry needs to consider. These include Building Information Modelling (BIM), sustainable procurement, Fairness, Inclusion and Respect (FIR), water footprinting, resource efficiency and the circular economy all of which will influence site practice in the short, medium and long-term.

Environmental impacts arise on all construction projects, irrespective of the location, size or nature of the development, and have the potential to affect the surrounding communities, as well as the natural and built environment. Impacts can take many forms, such as noise or pollution, and can affect surrounding flora and fauna.

This guide is a user-friendly reference tool and training aid that provides practical advice about managing construction on site to minimise environmental impacts. It is relevant to all concerned within the construction process.

Robust project planning and a collaborative approach enables environmental issues to be positively managed.

The whole project team and construction supply chain have responsibilities for good environmental management.



C741



Appendix – Biosecurity and management of invasive non-native species for construction sites and Controlled Activities.

Biosecurity and management of invasive non-native species for construction sites and Controlled Activities

1.0 Introduction

Non-Native Species (NNS) are any animal or plant introduced (deliberately or accidentally) by human activity to an area in which they do not naturally occur. Some animals and plants may have been transported here a long time ago and be considered “naturalised”, but these are still considered non-native species. Others are native to some parts of the UK but not to other parts (for example native to the mainland but not all islands).

Invasive Non-Native Species (INNS), sometimes referred to as ‘invasive alien species’, are those non-native species that have the ability to spread rapidly and become dominant in an area or ecosystem, causing adverse ecological, environmental and economic impacts. INNS can also affect our health.

Examples of the negative effects caused by invasive non-native species include; economic cost, structural damage, environmental degradation, aesthetic degradation, biodiversity loss, loss of land function, access restrictions and increased risk to human and animal health and safety. Costs incurred because of invasive non-native species can include repairs to damaged structures and environment, delays to works, loss in value of a landholding or other asset, potential for prosecution because of damage caused by invasive species or infringement of legislation. There is also a risk of loss of reputation through mismanagement of invasive species, especially where the interest of sensitive local groups (such as a fisheries trust) could be affected.

1.1 Legislation and responsible authorities for non-native species in Scotland

In Scotland the main legislation relating to the control of non-native species is the Wildlife and Countryside Act 1981. Under this legislation it is the landowner or land manager’s responsibility to prevent the planting or otherwise causing to grow in the wild of any non-native plant, or releasing of any non-native animal or spread of any non-native species out-with its native range.

Any criminal act relating to this legislation (eg illegal spread of NNS) should be reported to Police Scotland who are the prosecuting authority, by dialling ‘101’.

The bodies with responsibilities for non-native species issues in Scotland are detailed in the Scottish Government’s [Code of Practice on non-native species](#):

Relevant Body	Habitat
Scottish Natural Heritage	Dry land, river banks and wetlands
Forestry Commission Scotland	Woodland, trees & woody shrubs
Scottish Environment Protection Agency	Standing and running freshwater
Marine Scotland	Marine environments

All general non-native species enquiries and reports should be directed to SEARS, or alternatively to the Habitat Lead:

SEARS (Scottish Environment and Rural Services)

24/7 customer service 08452 30 20 50 or info@sears.scotland.gov.uk

SNH: non_native_species@snh.gov.uk

FCS: fcsscotland@forestry.gsi.gov.uk

Marine Scotland: marinescotland@gov.scot

SEPA: www.sepa.org.uk/about_us/contacting_sepa/by_email.aspx

1.2 Key considerations

Managing land inhabited by a non-native species, in a timely and appropriate way, **can help avoid**:

- Excessive development costs
- Physical damage to buildings and hard surface
- Harm to the environment.
- Reputational damage
- Compensation claims
- Prosecution

Identifying a non-native species on a site early lets developers assess and cost options for managing, disposal, or destruction.

Making sure staff can identify non-native species which are present on site can reduce waste costs and improve how you manage the site. A clerk of works can oversee the management of non-native species and is a good way of ensuring that contractors treat them in an appropriate manner.

1.3 Your legal responsibilities when dealing with non-native species

Under the Wildlife and Countryside Act 1981 it is an offence to plant or otherwise cause to grow in the wild any non-native plant, or release any non-native animal. If you have invasive non-native species on your premises you have a responsibility to prevent them from spreading into the wild.

If you are undertaking control of any non-native plants on land that you own or occupy, you must comply with specific legal responsibilities relating to:

- Spraying herbicides
- Burning invasive plants
- Burial of soil containing invasive plant material
- Disposing of invasive plants and contaminated soil off site.

Full details are available via [Netregs](#).

When dealing with any non-native species, demonstrating that you have exercised due diligence, adopting best practice and taking reasonable steps to comply with the legislation is prudent. This involves:

- **Adopting a precautionary approach.** Don't release or plant until you have a clear understanding of the situation.
- **Carrying out risk assessments.** Due diligence is likely to include assessing the risk of an offence happening, establishing what to do to avoid it happening and acting according to best practice to prevent it happening.
- **Identification of non-native species, mitigation advice and following good management practices.** Photographs of many INNS species, advice on mitigation methods and 'good practice' guidance for many key species can be found at the GB Non-Native Species Secretariat website: www.nonnativespecies.org. You should seek early advice from an expert or habitat lead, if you are unsure about any issues relating to either the identification/management or release/planting of any non-native plant or animal.

1.4 Avoiding the introduction, movement and spread of non-native species on and off your construction site

a) Pre-construction considerations:

- Ensure detailed checks and risk assessments are carried out for non-native species within initial site feasibility assessments and surveys.
- Where any non-native species is present, ensure you understand the risks and implications of managing it, as well as your legal requirements. Seek advice early.
- Where a non-native species is identified as a risk of being introduced, spread within, or moved off site, ensure mitigation measures are considered at the early planning stage, and ensure enough time is given to implement them.
- Consider phasing the development to allow time to deal with the presence and/or risk of spread of non-native species.
- Ensure non-native species and locations (mapped) are incorporated within all relevant site method statements, including the site Ecological Protection Plan and Species Protection Plans, where appropriate.
- Where a species requires long-term management (e.g. [Japanese knotweed](#)), ensure a site management plan is put together that addresses all issues associated with it
- Nominate a designated Clerk of Works to manage the issue of non-native species on your site from an early stage.

b) Biosecurity considerations on-site:

If your site does not currently have any non-native species, it is also important to consider potential pathways of introductions onto your site from elsewhere and for mitigation procedures to be put in place to prevent this.

You should brief all contractors fully, and ensure all staff are aware of what the species looks like (www.nonnativespecies.org) and the issues associated with it. This could be done through 'tool-box' talks or within site introductions. Everybody working on site must understand the role and authority of the Clerk of works managing the issue of the non-native species.



An example of a foot bath & biosecurity station (Copyright Galloway Fisheries Trust)

You should record any areas that are contaminated/infested with non-native species within your management plan, isolate them with fencing and put up restricted access signs.

c) Equipment / machinery

To maintain good site hygiene when dealing with any non-native species:

- A fence that can be clearly seen should mark out the area of issue. Signs should be erected to warn people working there that the area is infested / contaminated.
- Where contaminated soil, materials or water are located, signage should be erected to indicate them.
- Personnel working on or between sites should ensure their clothing and footwear are cleaned where appropriate to prevent spread
- Tracked vehicles should not be used within the area of infestation.
- All vehicles leaving the infested area and / or transporting infested soil/materials must be thoroughly pressure-washed in a designated wash-down area before being used for other work.
- Where cross-contamination is possible (i.e. from one site to another), consider designating vehicles or machinery to specific sites where possible to prevent spread.
- Material / water left after vehicles have been pressure-washed must be contained, collected and disposed of appropriately.
- All chemicals used for the control of non-native species should be stored and used in a responsible manner.
- All wash facilities including waste water from washing vehicles, equipment or personnel should be managed in a responsible way so as not to not cause harm to the environment.

See [Netregs](#) for further information.

d) Use and movement of soil and water

The introduction of a non-native species both onto and off a site is most likely to happen in the following ways:

Contaminated topsoil

If soil has been treated for and is free from Japanese knotweed it can be re-used on site without the need for a waste management license or an exemption. If taken off site, this material must be disposed of in a licensed landfill. Developers reuse treated soils at their own risk and they should be re-used in a restricted area, rather than spread across the site, but this should be recorded in an ongoing management plan and inspected/treated accordingly.

You should always consider the source of topsoil brought onto any site, which can easily introduce a non-native species along with it, particularly Japanese knotweed.

Section N.6.4.5 of BS 3882:1994, the British Standard for topsoil clearly states that it is critical that material should be free from Japanese knotweed propagules, rhizome and vegetative fragments.

Use of water and/or crossing of water

If using water on your site for construction purposes or to wash vehicles or equipment, you should ensure that the source of that water will not inadvertently act as a vector for the transportation of non-native species to/from your site or elsewhere.

If you abstract or store any surface or ground water on your site for any reason you must gain appropriate authorisation from SEPA. Disposal of contaminated wash water, including all silt and other solids (e.g. plant fragments), must also be dealt with in a responsible manner to avoid pollution and to prevent the spread of any non-native species that may be present. For further information see [Netregs](#) (Pollution Prevention Guidance 5 - Works and maintenance in or near water, and Invasive Plants pages), and/or seek advice from SEPA.

Contamination of vehicles or machinery

Where non-native species are known to be within or close to your site, you should take care not to facilitate the transportation of plant seeds or fragments, animals or eggs on machinery, vehicles or by foot, from one site/river catchment to another. This may require the need for an exclusion zone and/or the use of designated machinery/ equipment on key sites to prevent movement from one site or river catchment to another.

You should inspect vehicles before moving them from site to site or off site, and provide wash facilities suitable for the machinery you have, if needed, e.g. a drive through bath or footbaths. You should pay particular attention to caterpillar tracks and where trucks and dumpers are stowed.



An example of a temporary drive-through bath

1.5 Further guidance

[Net Regs \(Construction and Building Industries INNS guidance in Northern Ireland and Scotland\)](#)

CIRIA Manual C679 'Invasive species management for infrastructure managers and the construction industry' (Available for purchase).

[Wildlife and Countryside Act 1981 & Code of Practice on Non-Native Species, Wildlife and Natural Environment \(Scotland\) Act 2011](#)

[The Knotweed Code of Practice – managing Japanese Knotweed on development sites \(EA\)](#) (Environment Agency document - England & Wales only)

[The Non-native Species Secretariat \(NNSS\)](#)

[The Economic Cost of Invasive Non-Native Species on Great Britain 2010](#)

[Forestry Commission Scotland – Tree pests and diseases](#)

CASE-STUDY: CLYDE WINDFARM, EAST AYRSHIRE

Introduction

The Clyde Windfarm was constructed spanning two river catchments; the River Clyde in South Lanarkshire and the River Annan whose headwaters are in Dumfriesshire.

As part of early investigative work it was noted that the Clyde river catchment was inhabited by a very invasive non-native species; the North American signal crayfish, which can cause significant adverse impacts within our freshwaters, and can spread between waters either by the movement of individual animals and/or the movement of their eggs.

The status of signal crayfish within the river Annan catchment, however, was unknown, but it was flagged early on that the construction of the wind farm must not inadvertently spread them from the River Clyde to the River Annan, if they were not already present. The two river catchments were, however, hydraulically linked which could offer easy access for crayfish.

Pre-site surveys

The windfarm construction company commissioned the Annan District Salmon Fishery Board (ADSFB) to undertake a report to confirm/establish the status of signal crayfish on the Annan headwaters which were closest to the Clyde and close to the construction site (i.e. if present or not), and electrofishing, kick-sampling and trapping were carried out on four of the most vulnerable burns most likely to see accessed by signal crayfish. Results showed that although difficult to confirm with 100% certainty, it was highly unlikely that there were any crayfish in this part of the Annan.

Recommendations were made by ADSFB to undertake further surveys to prevent natural spread of signal crayfish, but also to prevent cross-contamination by civil engineering work for the windfarm (by people and machinery) across the river catchments.

Mitigation policies and procedures

The windfarm company adopted the following policies and procedures in order to mitigate risk of the spread of signal crayfish:

- Catchment boundaries were clearly marked.
- Separate plant was used for forestry felling operations in one catchment or another, or plant washed down if moved between catchments;
- A drive through wheel wash was set up at key sites to prevent potential spread between sites.

Appendix – SEPA/NIEA Guidance note – GPP5 Guidance for Pollution Prevention – Works and Maintenance in or near water

Guidance for Pollution Prevention

Works and maintenance in or near water: GPP 5

Version 1.2 February 2018

This guidance has been produced by Natural Resources Wales (NRW), the Northern Ireland Environment Agency (NIEA) and the Scottish Environment Protection Agency (SEPA).

For Northern Ireland, Scotland and Wales, this document provides guidance on environmental legislation. These guidelines are not endorsed by the Environment Agency as regulatory guidance in England. For guidance on environmental regulations in England go to www.gov.uk

To find the relevant regulations visit www.legislation.gov.uk

Guidance for Pollution Prevention (GPP) documents are based on relevant legislation and reflect current good practice. Following this guidance will help you manage the environmental responsibilities to prevent pollution and comply with the law.

If you cause pollution or allow it to occur, you will be committing a criminal offence. Following these guidelines will help you reduce the likelihood of a pollution incident. If one does occur contact the environmental regulator immediately on the relevant incident hotline number: In Northern Ireland and Scotland call **0800 80 70 60**, in Wales call **0300 065 3000**.

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Acknowledgements

We wish to acknowledge the assistance provided by the following organisations in the development of this guidance:

Construction Industry Research and Information Association (CIRIA)

NetRegs

Health and Safety Executive (HSE)

Welsh Government

Dŵr Cymru Welsh Water

Section 1: Introduction

1.1 Who is this guidance for?

This guidance is for anyone carrying out works or activities in or near the water environment. Such activities have the potential to cause pollution, transfer non-native species and can impact on the bed and banks of a watercourse.

Potential environmental risks when working in or near water include:

- Silt – **section 2**
- Cement and concrete – **section 3**
- Chemicals and solvents – **section 4**
- Bridge cleaning debris – **section 5**
- Herbicides – **section 6**
- Invasive Non-Native Species – **section 7**
- Waste materials (including hazardous waste or special waste in Scotland) – **section 8**

1.2 Legal requirements

Formal approval may be required when carrying out such works or activities. It can take up to four months to process an application for formal approval, it is therefore important you contact the environmental regulator early on in the project.

There are laws that protect land, water, air, wildlife and people from pollution. If you cause pollution you will be committing an offence. Penalties include fines, imprisonment, Fixed Penalty Notices, stop-work notices or equivalent and having to pay clean-up costs, along with damage to your reputation.

Only clean uncontaminated water can be discharged without formal approval.

The Legal requirements are different throughout the United Kingdom (UK) (England, Northern Ireland, Scotland and Wales). If you are located in **Scotland** or **Northern Ireland** you can find information on your legal environmental obligations by visiting the NetRegs website (see website list). In **Scotland**, also read references 2 and 3. In **Wales** guidance on regulations can be found on the Natural Resources Wales (NRW) and Welsh Government website (see website list).

1.3 Which type(s) of formal approval may I need?

In this document we refer to 'formal approval', which covers the authorisation(s) you may need from the environmental regulator. They may be called a consent, licence or permit. You may be committing an offence if you carry out your works or activities without all the relevant formal approvals in place. See Appendix A for the main ones applicable in your area.

You are responsible for ensuring that you understand and comply with all applicable legislation wherever your site is located. If you have any concerns, or require clarification, contact the environmental regulator before taking action. Ignorance is no defence under law, so you need to understand which laws apply to you and your activities.

1.4 Scoping your project

Allowing time to plan and prepare before work starts on site can significantly reduce the risk of a pollution incident. Once you have identified potential sources of pollution, you can put in place measures to avoid or reduce the risk of causing pollution.

Planning ahead will:

- help make the job run smoothly
- improve risk management, reducing risk of pollution incidents and enforcement action
- help identify efficiencies and potential cost savings
- improve relationships with clients, local regulators and neighbours and reduce likelihood of complaints
- reduce damage and clean-up costs if an incident does happen
- help you win and maintain contracts
- protect and enhance your reputation

Plan to protect the Environment



Figure 1: Plan to protect the Environment (courtesy NetRegs 2016)

You can get information on local surface and groundwater water sensitivity from the environmental regulator before you start any work. In addition to preventing pollution of surface waters and groundwater you should take precautions to prevent blocking of channels and culverts, and erosion of the riverbank or bed. This information should form part of the environmental aspects and impact assessment and Site Environmental Management Plan (SEMP).

1.5 Pollution Prevention

It is important to understand how activities could affect the environment and cause pollution. Think about what pollution linkages there are (see Figure 2.).

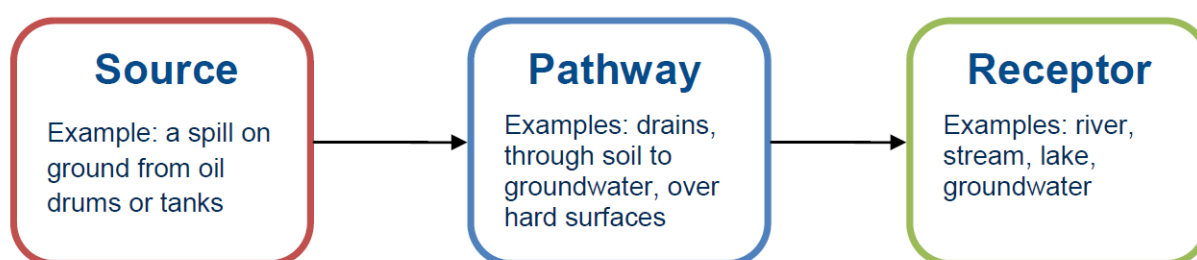


Figure 2: Example of a pollution linkage using the source > pathway > receptor model.

NOTE: Groundwater is both a pathway and a receptor.

The site and activities will only cause a risk to the environment or people if you have all three parts of the pollutant linkage present i.e. a source, a pathway and a receptor. You should put in place measures to prevent or minimise or mitigate the effects of any risks and thereby break the pollutant linkages between these three. By doing this, you can identify how to prevent or reduce the likelihood of pollution and reduce the impact of any risks that may occur. It is important that you fully understand the local drainage network as pollution is often caused by mistaking a surface water drain for a foul/combined sewer. Contact your local water company for advice on this.

Surface water drains go directly to a watercourse and therefore should only carry clean uncontaminated rainwater

If you cause pollution you will be responsible for the clean-up cost. This can be expensive and time consuming particularly if groundwater has become contaminated. There may be additional costs associated with recovering the cost for the environmental regulator's response (in line with the Polluter Pays Principle), you may receive fines through the criminal courts or civil claims and you may experience a reputational cost i.e loss of future work.

Following this Guidance for Pollution Prevention will help you reduce the likelihood of an incident. However, if one does occur contact the environmental regulator immediately on the relevant Incident Hotline number - see section 9. A rapid response to incidents will help to minimise the environmental impact and could reduce the overall costs – For more information refer to section 9.

1.6 Emergency works

Even if the works you are carrying out are required as a result of an emergency, this Guidance for Pollution Prevention should be followed as closely as possible. An emergency can be defined as an occurrence, which presents a risk of serious flooding, serious detrimental impact on drainage, or serious harm to the environment or people.

Contact should be made with the environmental regulator as soon as practicable to discuss whether further approval is required. If works are carried out without the knowledge of the environmental regulator, enforcement action may be considered whether it is an emergency or not.

Section 2: Silt

Good soil use and management is crucial to preventing silt pollution which is a major cause of environmental incidents. It can harm water quality, damage and kill aquatic life by smothering and suffocation and can cause flooding by blocking culverts and channels. See websites listed under Reference 19 for relevant soil guidance and good practice.

2.1 Activities that can cause silt pollution

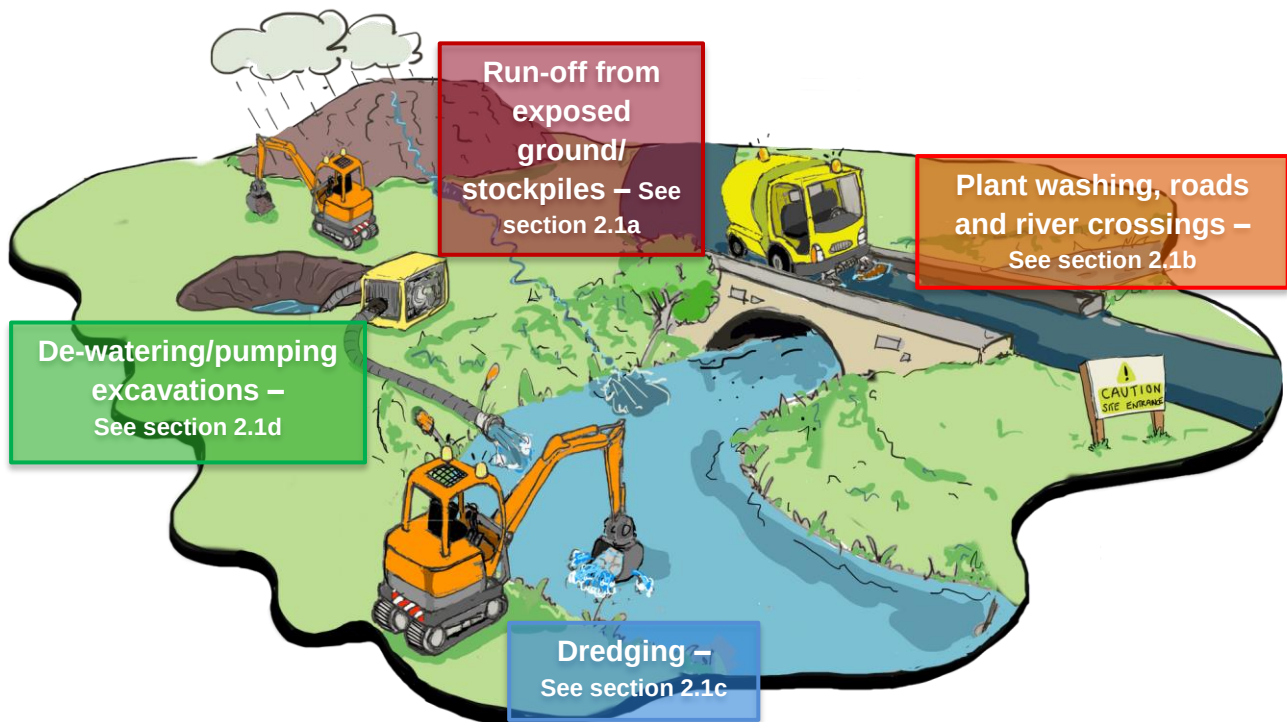


Figure 3: Activities that can cause silt pollution (courtesy NetRegs 2016)

2.1a Exposed ground and stockpiles

Soil stripping and vegetation removal at the start of a project can increase the volume of contaminated surface water run-off. It can also reduce the area of vegetated land available for disposal of silty water.

You should plan ahead for intense and also prolonged wet weather and consider all relevant pollution mitigation measures including:

- minimising the amount of time stripped ground and soil stockpiles are exposed
- only removing vegetation from the area that needs to be exposed in the near future
- seeding or covering stockpiles
- using geotextile silt fencing at the toe of the slope, to reduce the movement of silt; this should be installed before soil stripping has begun and vehicles start tracking over the site
- collect run-off in lagoons and allow suspended solids to settle before disposal – see section 2.2b
- divert clean water away from the area of construction work in order to minimise the volume of contaminated water

2.1b On-site working

The movement and maintenance of plant on site can generate silt and oil contaminated water, or introduce non-native species from other sites. Sources of silt (e.g. plant and wheel washing, site roads, river crossings) carry a high risk of causing pollution.

Plant and wheel washing

To reduce the pollution risk, make sure that you consider all relevant measures, including:

- plant and wheel washing is carried out in a designated area of hard standing at least 10 metres from any watercourse or surface water drain, rock outcrop (hard rock at surface) or karstic sinkhole
- run-off is collected in an impermeable sump - recycle and reuse water where possible
- settled solids are removed regularly and appropriately disposed of
- if permission can be granted from your local water and sewerage provider, it may be possible to discharge contaminated water to the public foul/combined sewer – see section 2.2e
- discharge of treated water to the environment with formal approval from the environmental regulator – see section 2.2
- contaminated water tankered off site for authorised disposal – see section 2.2f
- biodegradable oils should be used for vehicles and plant where possible, please be aware that they should still be prevented from entering the water environment

Site roads and river crossings

Run off from site roads and river crossings can contain high levels of silt. Road drains typically drain to the local water environment so are a pathway for pollution. To reduce the pollution risk make sure that you consider all relevant measures, including:

- brushing or scraping roads to reduce dust and mud deposits, appropriately disposing of material collected
- putting small dams or silt fencing in artificial roadside ditches to retain silt
- using existing permanent bridges or pipe crossings for crossing the river
- if necessary building temporary bridges (constructed in the dry) - do not ford rivers
- working from the bank where possible (taking steps to stabilise the bank during and after works), avoiding working in the river
- divert run-off to settlement lagoons - see section 2.2b

In **Scotland** please refer to the SEPA river crossings guidance, reference 4.

2.1c Disturbance of the river bed / working in the river channel

Always try to avoid working in the channel. When you have considered all other options and it is still necessary (e.g. dredging operations, river diversion works) contact your environmental regulator as early as possible during the scoping stages to discuss appropriate pollution control measures. Permission for this type of work may take up to four months to obtain - see section 1.

The risk of silt pollution causing an incident will depend on many factors including:

- the time of year e.g. fish spawning season
- likelihood of silt being disturbed and the method/effectiveness of silt containment
- what the river bed is made of, e.g. silt or gravel
- the conditions in which the work is carried out, e.g. working in the dry, weather

Silt pollution caused by working in the water environment can be minimised or prevented by keeping water out of the working area using appropriate isolation techniques, such as coffer dams and by-pass channels. There may be a need for fish rescue prior to in-channel works, stream diversion or coffer dam work. Fish passage **MUST** be maintained during in-channel works.

In **Northern Ireland** all river works should be conducted 'in the dry' (*i.e. isolated from waterway*) in a manner to prevent the release or escape of suspended solids or pollutants to the environment following regulator engagement to agree a method of works.

In **Wales** in-channel works during the spawning season (17 October to 15 May) are generally **NOT** permitted. You will need to contact the local NRW Fisheries Team to find out what the specific embargo periods are when working in the channel is not allowed in your area.

In **Scotland** please refer to the SEPA Silt Control Guidance: Preventing Pollution While Dredging – Reference 5

2.1d Disposal of water from excavations, dewatering and pumping

Problems with disposal of water from these activities may be minimised or avoided by:

- preventing water from entering excavations, by using cut-off ditches
- considering the impact on groundwater if you use well point dewatering or cut off walls (in Scotland, please refer to the CAR Practical Guide: GBR 15, Reference 1)
- using pump sumps in excavations
- raising inlet hoses above the bed to ensure that they do not disturb silt on the bed
- discharging clean water onto a hard surface e.g. concrete slabs/gravel, to avoid causing impact from ground/bank erosion
- using appropriate pump rates; to avoid disturbance of bed or bank the maximum rate should be set after consideration of the flow of the river, the location of the discharge and the risk of erosion
- protecting the pump inlet to avoid drawing in aquatic life and other debris
- minimising disturbance of standing water

In **Wales** please refer to the dewatering guidance – Reference 6.

2.2 Disposal of contaminated water

Where run off water is contaminated with silt or other pollutants such as oil this water must not be pumped or allowed to flow (directly or indirectly) into the water environment without treatment.

Discharges to the water environment may require formal approval from the environmental regulator – see section 1. If you require formal approval, it may limit the volume, amount of silt and the presence of any oil in the discharge, and may have conditions for additional substances.

In **Scotland** all surface water discharges from new developments require authorisation and to be treated by a Sustainable Drainage System or equivalent - see section 2.2a.

It is essential to minimise the volume of clean water that becomes contaminated, by diverting clean water away from working areas

Discharges to public foul/combined sewers will require consent from the water and sewerage provider. In **Wales** see Reference 7 for details on the water and sewerage providers in your area. If the water and sewerage provider is unable to approve, it will be necessary to tanker the contaminated water off site for authorised disposal (section 2.2f).

The choice of method for the treatment and disposal of contaminated water will depend on:

- the volume of water
- the area of land available for storage, treatment or discharge
- the amount and type of silt
- the presence of other substances in the water
- the conditions of any consent or authorisation.

Contaminated water treatment and disposal options

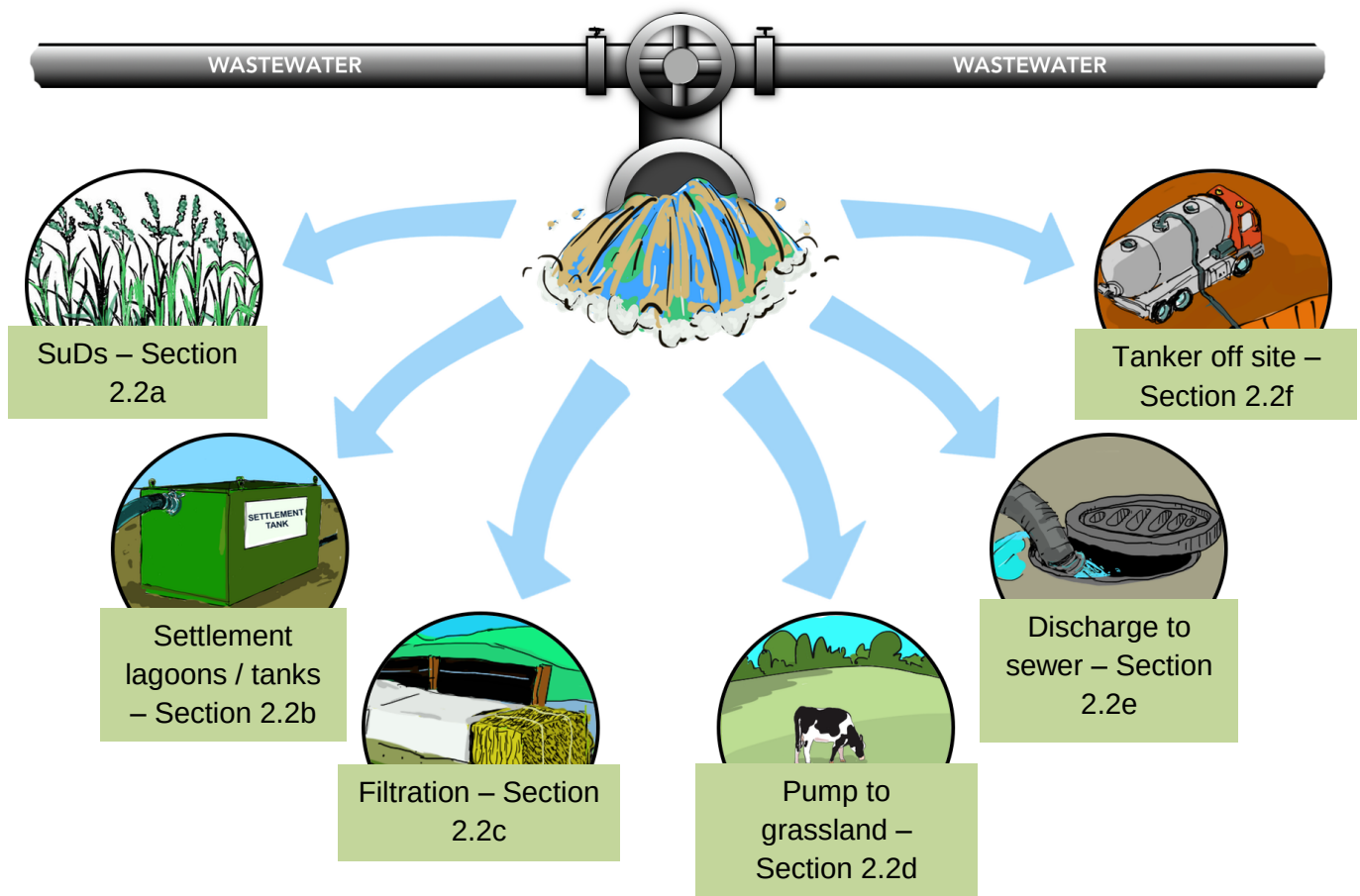


Figure 4. Contaminated water treatment and disposal options (courtesy NetRegs, 2016)

2.2a Sustainable Drainage Systems (SuDS)

Sustainable drainage is the practice of controlling and managing surface water runoff as close to its origin as practicable by slowing and reducing flows, allowing adequate settlement and biological action to take place before water is discharged to the water environment. The most effective SuDS use a series of drainage components to imitate natural drainage rather than traditional end-of-pipe drainage solutions. Well designed, easy to maintain SuDS will deliver a range of important benefits. They can:

- reduce flood risk from development within a catchment by slowing down runoff reaching the water environment
- minimise diffuse pollution arising from surface water runoff
- minimise the risk of pollution to groundwater
- minimise environmental damage, such as bank erosion and damage to habitats
- maintain or restore the natural flow regime of the receiving watercourse
- maintain recharge to groundwater
- achieve environmental enhancements, improvement to wildlife habitats, amenity and landscape quality
- help meet conditions set in license or consents.

Examples of source control SuDS:

- **Permeable/porous surface pavements** – water permeates in to the soil or sub-surface reservoir which can then be allowed to discharge slowly rather than immediately running off. This will minimise the volume of water that you might need to treat and can also recharge groundwater. Permeable/porous pavements need to be protected during installation from blocking by excessive silt-contaminated water.
- **Infiltration trenches** – a shallow excavated trench backfilled with stone to make an underground reservoir. Run off is diverted into the trench and then filters in to the subsoil. The closer to the source the more effective this method will be.
- **Infiltration basins** – a shallow surface impoundment where water is stored until it gradually infiltrates into the soil of the basin floor. The performance of the basin depends largely on the permeability of the soil and the depth of the water table
- **Filter drains or French drains** - these are similar to infiltration trenches but also allow movement of run off slowly towards a watercourse allowing time for filtration, storage and some loss of water due to evaporation / infiltration.
- **Swales** – grassed wide shallow depressions which lead water overland from a drained surface into a storage or discharge system. They provide temporary storage for run off reducing high flows. Solids are retained and oily residues and organic matter broken down in the top layer of the soil and vegetation.
- **Filter strips** – vegetated sections of land designed to accept run off as an overland sheet flow. To be effective they should be 5 – 15 metres wide and are best employed on the upstream end of a drainage system. They are most effective at removing excess solids and pollutants before discharging to downstream system.

Other SuDS can be considered including ponds, retention basins (dry ponds) and wetlands.

At the planning stage of your project consider how your drainage can be managed by using SuDS. This will ensure that SuDS infrastructure is properly maintained and functions effectively for its design life. It is advisable to begin discussions at an early stage to help ensure that sufficient land is made available to implement SuDS. Pre-application discussions between the developer, local planning authority, water and sewerage provider and other relevant bodies will help to identify the most cost effective way to integrate SuDS within the emerging scheme design.

For phased developments, the design should indicate how SuDS features will be managed, protected and commissioned, especially where their use may change through the construction programme.

Pollution removal by these methods is achieved by sedimentation, adsorption, absorption, filtration and microbial action. CIRIA have more detailed information on SuDS which can be found on the CIRIA website (see website list) or in References 8 and 9

In **Scotland**, discharges of water run-off from construction sites are required to be treated by either a Sustainable Drainage System (SuDS) or an equivalent which is equipped to avoid pollution. However, equivalent systems are not permissible for treatment of runoff water from completed developments - see CAR Practical Guide: GBR 10 in Reference 1.

Businesses in **Scotland** and **Northern Ireland** can find more information on SuDS on the guidance pages on the NetRegs website (see website list). Businesses in **Wales** can find more information at the SuDS Wales website (see website list).

2.2b Settlement lagoons or tanks

To be effective a settlement lagoon or tank should retain contaminated water long enough for silt to settle out. The length of time will depend on the type of silt, with finer clay solids taking longer to settle. If you use flocculants to aid settlement you **MUST** discuss this option with your environmental regulator before use. Flocculants can themselves be polluting and/or toxic and need careful use and monitoring to be effective. The checklist below gives guidance on lagoon/tank operation.

Table 2.1 gives guidance on the volume of lagoon or tank needed for a three-hour settlement at a defined rate of inlet discharge. NOTE: This may not be suitable for the settlement of fine clay solids.

Typical dimension of a settlement lagoon / tank for a three hour settling time			
Pump Diameter	Discharge rate in to the lagoon	Length	Width
6 inch pump	3000 l/ min	60m	20m
	6000 l/ min	80m	27m
4 inch pump	1000 l/ min	30m	10m
	2500 l/ min	50m	17m
Assuming a tank / lagoon depth of 1 m , where length = three times the width			

Table 2.1: Settlement pond dimensions - the size of the tank/lagoon is determined by the rate of introduction of water.

Settlement lagoon/tank – good practice checklist

- maintain a constant pumped inlet rate
- minimise the inlet flow as much as possible by using energy dissipaters or rip rap
- position inlet pipe work vertically to dissipate energy
- provide lined inlet chamber to reduce velocity of flow
- line the inlet chamber and outlet weir with materials like geotextiles, brickwork, polythene or timber
- have a long outlet weir to minimise disturbance
- provide two or three lagoons in series or parallel to increase silt retention, preferably with a bypass facility to allow maintenance, when necessary
- de-silt inlet chamber regularly
- monitor discharge quality frequently.

See Reference 10 for more detail.

2.2c Filtration

If you do not have the space for lagoons and the water is contaminated with coarse silt only (not fine clay silts), you may be able to use tanks filled with filter material. Single sized aggregates 5–10 mm, geotextiles or straw bales wrapped in geotextiles can be used as a filter. You must monitor the inlet pump rate and discharge quality carefully, to ensure only clean, uncontaminated water is discharged. Discharge should then be to foul sewer (with the water and sewerage company's permission), land (with the environmental regulator's and landowner's permission), or to surface water drains (with the environmental regulator's permission).

2.2d Pump to grassland

This method of disposal is only suitable for water contaminated with silt only and you must have permission from your environmental regulator and landowner. The discharge rate must match the rate of infiltration into the soil, which will vary with the soil type (see Table 2.2), weather, amount of vegetation cover and the gradient. Discharges should be well away from excavations to avoid re-circulation through the ground and must be monitored to prevent scouring, waterlogging, overland flow and sediment mobilisation issues.

Soil type	Infiltration co-efficient (m/h)
Gravel	10-1000
Sand	0.1-100
Loamy sand	0.01-1
Sandy loam	0.05-0.5
Loam	0.001-0.1
Silt loam	0.0005-0.05
Chalk	0.001-100
Cut off point for most infiltration drainage systems	0.001
Sandy clay loam	0.001-0.01
Silty clay loam	0.00005-0.0005
Clay	<0.0001
Till	0.00001-0.01
Rock	0.00001-0.1

Table 2.2: Typical infiltration rates for different soil types (Bettess, 1996)

2.2e Discharge to sewer

Discharges to foul sewer will require the permission of the local water and sewerage provider. You must approach your local water and sewerage provider (In **Wales**, see reference 7) as early as possible in your project. You may require formal approval, which may limit the volume and content of the discharge. If the water and sewerage provider is unable to approve, it will be necessary to tanker the contaminated water off site for authorised disposal (see section 2.2f).

2.2f Tanker off site

If no other disposal routes are available then contaminated water can be collected by tanker for authorised disposal off-site. This may be a costly option and must be discussed with your environmental regulator at the scoping stage of your project. You must comply with your Duty of Care obligations and obtain Waste Transfer Notes for any waste leaving site.

Section 3: Concrete, cement and grout

Concrete, cement and grouts are very alkaline and corrosive and can cause serious pollution to water. Concrete, cement and grout mixing and washing areas should:

- be sited on an impermeable designated area
- be sited at least 10 metres from any watercourse or surface water drain, rock outcrop (hard rock at surface) or karstic sinkhole to minimise the risk of run off entering the water environment
- have settlement and re-circulation systems for water reuse, to minimise the risk of pollution and reduce water usage
- have a contained area for washing out and cleaning of concrete batching plant or ready mix lorries; see section 2.1b above
- collect wash waters that cannot be reused and, where necessary, discharge to the foul sewer (you must have permission from the local water and sewerage provider for this), or contain wash water for authorised disposal off site (see section 8. Waste Management).

Wash waters from concrete and cement works should never be discharged into the water environment as this could have serious impact on the water quality and ecology.



Cement silo inspection (courtesy of SEPA)

Section 4: Oil and chemicals

Oil storage regulations differ between countries, however in general the regulations apply to businesses in:

- **Wales**, who store more than 200 litres of any kind of oil (except uncut bitumen) in oil storage containers. The regulations also apply to oil storage at domestic properties installed since 15 March 2016;
- **Scotland**, who store any volume of any kind of oil (excluding uncut bitumen). More prescriptive requirements apply to industrial, commercial and institutional sites storing over 200 litres of oil. The regulations also apply to domestic premises storing more than 2,500 litres of oil;
- **Northern Ireland**, who store more than 200 litres of any kind of oil (excluding uncut bitumen) in oil storage containers including drums and IBCs. The regulations also apply to domestic premises storing more than 3,500 litres of oil;
- **England**, who store more than 200 litres of oil in oil storage containers.

Detailed guidelines concerning above ground oil storage can be found in our guidance GPP2, see Reference 11.

4.1 Biodegradable oils

If possible use biodegradable lubricant and biodegradable hydraulic oil in plant when working in or near watercourses. Biodegradable oils are less toxic than most of the synthetic oil but should still be stored and used to the same standards as other oils and prevented from entering the water environment.

4.2 Trade materials

Sealants, coatings, adhesives and glazings can be toxic to plants and animals if released into the environment. Select, store and use these materials carefully to save resources and protect the environment. You must not use sealant and glazing compounds containing asbestos. You should:

- use water based or low solvent products
- avoid products containing lead as a drying agent and those containing hazardous solvents (toluene or chlorinated hydrocarbons)
- provide safe and secure storage.

For guidance on general storage in **Northern Ireland** and **Scotland** visit NetRegs (see website list).

You must make sure you are familiar with the labelling on the products you use and fully understand any hazardous properties they hold.

Section 5: Bridge maintenance and structures over water

Work to maintain bridges or other structures over or next to watercourses has a high risk of causing pollution. The maintenance work itself may require formal approval from the environmental regulator and you should contact them at an early stage in your project to agree the most appropriate method of working and to agree an Environmental Management Plan.

5.1 Pollutant containment

Dust, debris and contaminated water are the most common pollutants produced by structure maintenance. You should choose a containment system designed to reduce the risk of pollution from your work. The system should take account of the sensitivity of the environment which will influence the type of containment you will need.

Methods of containment include:

- air or water impermeable walls
- rigid or flexible framing lined as necessary
- fully sealed joints
- airlocks or re-sealable entryways
- negative air pressure (achieved by forced or natural air flow)
- exhaust air filtration.

In sealed containment areas you should provide filtered ventilation to prevent the build-up of dust and minimise the possibility of contaminated air escaping. Use physical cleaning instead of liquid chemicals such as caustic and acid solutions. Contain contaminated water from surface washings and agree the disposal method with the environmental regulator as part of the Environmental Management Plan before you start work. In some circumstances you may be able to use a barge with a wastewater containment facility for working over water, or dispose to foul sewer with prior permission of the local water and sewerage provider.

The containment facility must be designed so that the structure does not obstruct the river flow beneath it to such an extent that it increases the risk of flooding.

5.2 Paint removal

Paint removal methods include:

- abrasive blast cleaning
- blasting in a closed circuit
- preparation by various types of wet abrasive blasting or water jetting
- chemical stripping
- hand or power tool cleaning.

Abrasive blasting produces the greatest level of dust and debris. The use of vacuum attachments on power tools can reduce dust generation. Water cleaning methods produce less debris, but generate run-off, which needs to be contained and treated.

Sample existing coatings for hazardous materials (e.g. lead) before starting to remove them. This can help determine the level of containment you will need. The level of containment needed depends on:

- the amount of paint to be removed
- the type and concentration of the hazardous materials
- the sensitivity of the surrounding environment.

5.3 Surface cleaning

You should avoid using grit blasting with slag-derived grit as they can contain significant levels of heavy metals such as copper. These can be toxic if they get into the water environment. Reduce the potential for contamination by using garnet, low silica abrasive or recycled glass media with vacuum attachments.

5.4 Painting

The advice for painting is similar for paint removal although the volume of waste and size of operations will be less. Remove dust and debris by sweeping or vacuum cleaning before painting. Paints can be applied on-site using brush, conventional spray or airless spray. Consider using electrostatic spray units to reduce the loss of product by over-spraying.

Carefully consider the type of paint you use. Although water based solvent-free paints have lower environmental impact they may require more frequent application. Solvent-based paints could have a higher environmental impact but will last longer and require less maintenance. The decision to use water or solvent-based paints should be based on the environmental sensitivity of the surrounding environment and ease of access to the structure. All waste paints should be disposed of at an appropriately authorised waste facility. Washings from paint brushes and containers must not enter surface water drains (e.g. roof gullies, road drains) as these may drain to the local water environment.



Bridge maintenance (courtesy of SEPA)

Section 6: Pesticide use

Pesticides are used for controlling pests (these include: insecticides; molluscicides; and acaricides), weeds (herbicides) and diseases (fungicides). They are all required to have information on the product labels to explain how and where they can be used.

You should always consider alternative ways of controlling pests and weeds in or near water. If you decide to use a pesticide in or near water, you will need approval from the environmental regulator before use. In **Scotland**, the treatment of invasive non-native species (INNS) within 1m of a surface water is now permitted, providing you follow the rules within the General Binding Rule (GBR) 23g, see Reference 1. Safe and correct application of pesticide is required to protect the environment and water supplies. Only pesticides approved for use in or near water may be used, and only by competent persons holding a Health and Safety Executive (HSE) recognised specified certificate for pesticide use (or under the direct supervision of a certificate holder). The sprayer/operator must comply with the herbicide product label and meet all of its conditions.

You should contact the environmental regulator if you are considering aerial spraying.

You must also carry out a Control of Substances Hazardous to Health (COSHH) assessment for any activities that involve pesticides.

You must make sure that your pesticide application equipment is tested at least once by 26 November 2016 unless it is less than 5 years old on that date and at regular intervals thereafter. Knapsacks and handheld sprayers are exempt from the requirement to pass inspection. All equipment must be calibrated on a regular basis.

Equipment which is less than 5 years old on 26 November 2016 must be tested before it becomes 5 years old.

After the 26 November 2016, ongoing testing intervals vary depending on the type of applicator. The following types of equipment must be inspected at intervals of no more than 5 years between 2016 and 2020 and at intervals of no more than 3 years after 2020:

- boom sprayers greater than 3m
- sprayers attached to trains or aircraft
- air assisted broadcast sprayers.

Equipment that represents a very low scale of use, including those not used for spraying pesticides, will be subject to a maximum inspection interval of 6 years. This equipment type must be inspected once by 26 November 2016 (unless it is less than 5 years old on that date) and at intervals of no more than 6 years thereafter. A complete list of these equipment types is maintained within the National Action Plan for the Sustainable Use of Pesticides, see Reference 12.

Further information is also available from the 'Using Pesticides' guidance pages and the 'Code of Practice for using Plant Protection Products' on the HSE website (see website list).

Section 7: Invasive Non-Native Species (INNS)

An invasive non-native species is any non-native animal or plant that has the ability to spread causing damage to the environment, the economy, our health and the way we live.

Common examples include:



Japanese Knotweed



Himalayan Balsam



Giant Hogweed



Asian Clam



Floating Pennywort

Common INNS (images courtesy of GBNNSS)

The regulations differ between countries, however in general:

- In **England, Wales** and **Northern Ireland** it is an offence to plant or cause to grow in the wild certain listed invasive non-native species.
- In **Scotland**, it is an offence to plant or cause **any** non-native plant species to grow in the wild.

You should take the necessary steps to eliminate the risk of transferring water and soil potentially containing plant or animal diseases, or invasive non-native species, to or from the development site. If plant material is removed from site, it can only be transported by registered waste carriers and disposed of at appropriately authorised waste sites. The environmental regulator has a public register which holds this information. In **Scotland** and **Northern Ireland** you can visit the 'Find my nearest waste site' pages on the NetRegs website (see website list) in **Wales** see Reference 13.

Any pumps and associated pipework used should be:

- emptied, thoroughly cleaned using a disinfectant approved for aquatic use, rinse thoroughly without allowing the cleaning water to enter the main drainage system (and preferably dried) before it is taken to a site and again before being removed from it.
- positioned to avoid placing the inlet pipe amongst water plants
- positioned with the inlet just below the water's surface, rather than on the bed of the water body.

To help minimise the risk of spreading INNS, any equipment or plant needs to be cleaned and dried before it is taken to a site and again before being removed from it.

In **Wales** further INNS information, including leaflets on different species is available through the Welsh Government INNS website pages (see website list).

In **Northern Ireland**, wildlife crime is reported to the Police Service Northern Ireland (see Reference 14). All sightings of INNS should be submitted through the CEDaR online submissions portal (see website list).



Use the GB Non Native Species Secretariat website (See website list) which has the latest INNS good practice information including:

- ***a short e-learning training module to provide a basic understanding of INNS, the risks and what to do***
- ***more specific biosecurity advice***
- ***and further Be Plantwise and Check, Clean, Dry information.***

You should also make yourself familiar with the GB NNSS advice on:

- ***high priority alert species***
- ***how to report any suspected INNS sightings***

Section 8: Waste management

Legal waste storage and disposal are essential for effective pollution prevention.

Under the Duty of Care legislation (see Reference 15) you have a legal duty to make sure any waste you produce does not escape from your control. Waste must be transferred to an authorised, registered or exempt waste carrier or waste manager. It must be accompanied by a full description of the waste and a Waste Transfer Note and be disposed of lawfully. You should check on the proposed destination and ensure the site is authorised to receive the waste.

In **Scotland** and **Wales** you must separate dry recyclable materials such as paper, card, glass, metals and plastics. These must be collected separately from other wastes and managed in such a manner as to allow high quality recycling. In **Wales** see Reference 16

Some types of waste, called 'hazardous wastes' or in Scotland, 'special wastes', such as oily wastes, acids, solvents and solvent-based products are very harmful to human health or to the environment. When dealing with hazardous/special wastes:

- you must store, handle and dispose of these differently to non-hazardous wastes
- you must not mix different types of hazardous or special wastes together
- if you mix hazardous or special wastes with non-hazardous wastes then you must consider everything as hazardous or special waste
- the movement of hazardous/special wastes must be accompanied by a consignment note. Everyone involved in the transfer of the waste, including your environmental regulator, must keep copies of the consignment notes for proof of legal disposal.

In **Wales** any premises that produces less than 500kg of hazardous waste in a 12 month period is exempt from registering. However hazardous waste moved from an exempt premises must still be covered by a Hazardous Waste Consignment Note. The unique consignment note code will show that the waste has come from an exempt premises. NRW have published advice that lists certain types of premises that do not need to register (see Reference 13). These exceptions only apply in certain circumstances. You should read the advice to ensure that it applies to your premises and activity. See Reference 17 for information on how to register as a hazardous waste premises.

Consider the security of your premises too - any waste dumped on your property becomes your responsibility to remove which will cost you money.

If you are located in **Scotland** or **Northern Ireland** you can find out how these waste regulations affect your site. Check the guidance by Environmental Topic section of the NetRegs website (see website list) for information on waste legislation and how you can comply.

If you are located in **Wales** you can find out how waste regulations affect you by visiting the NRW website, (see website list).

To help maximise reuse and recycling and also minimise disposal of waste, it's useful to draw up a Project Waste Management Plan or a Resource Management Plan taking into account the waste hierarchy of prevention, preparing for re-use, recycling and other recovery and disposal.

Project Waste Management Plan checklist

- Carry out a waste minimisation audit to identify where you can reduce the volume of waste you produce
- Reuse materials or use products that can be reused many times
- Substitute materials for less hazardous ones – e.g. biodegradable lubricants and water based paints
- Recycle waste where possible
- Segregate different wastes for recycling, hazardous waste and general waste and label them. Do not mix or dilute hazardous wastes - In **Scotland**, you must separate dry recyclable materials such as paper, card, glass, metals and plastics. These must be collected separately from other wastes and managed in such a manner as to allow high quality recycling
- Store waste in suitable containers of sufficient capacity to avoid loss, overflow or spillage
- Store waste in designated areas, isolated completely from surface water drains, outside the floodplain and areas which discharge directly to the water environment
- Cover or enclose skips unless they are stored undercover or within a building
- Take waste off your site frequently; do not allow large quantities to accumulate.

Section 9: Incident response

Incident Hotline Numbers:

In **Scotland, Northern Ireland and England** call:

0800 80 70 60

(24 hour service)

In **Wales** call:

0300 065 3000

(Press 1 for 24 hour service)

You should immediately report any environmental incidents by calling the Incident Hotline for your country.

Incidents can include spillages (e.g. from oils and chemicals), contaminated surface water run-off, flooding, riverbed disturbance, damage to underground services, damage to habitats and poor waste disposal and storage. If in doubt, report it.

You should produce an Incident Response Plan as part of the environmental impact management of your work. Include the following:

- site risks
- list of key external and internal contacts (include your environmental regulator, Local Authority, Fire Service)
- reporting procedures
- site plan including drainage and location of storage/refuelling areas
- list of stored materials
- details of local environmental sensitivities e.g. abstractors, high amenity areas and fish farms
- location of spill equipment
- procedures for spill containment and remediation

Train your staff and contractors in the use of spill equipment and how to manage and dispose of waste materials legally.

If you are using oils and chemicals in close proximity to the water environment, store a suitable spill kit or absorbent materials nearby. Provide appropriate temporary storage for any oils and chemicals. Contain all spillages using absorbents such as sand, soil or commercially available booms or pads and notify the environmental regulator immediately, using the Incident Hotline numbers above.

Appendix A: Types of formal approval

	Water discharge	Working close to water	Designated sites and protected species	Other
Northern Ireland	If you want to discharge any of the following: trade or sewage effluent; or other poisonous, noxious or polluting substance into a waterway or water contained in any underground strata you must have approval from the Northern Ireland Environment Agency (NIEA), see website list	You must have consent from the Rivers Agency before you place structures in any waterway that could affect its drainage. Contact your local Rivers Agency office for further information, see website list	Authorisation may be required for works within designated sites such as Sites of Special Scientific Interest – contact NIEA to check. European Protected Species of animals, their breeding sites and resting places, are protected against disturbance and harm. Check the NIEA website for more information and details on how to apply for a licence.	Planning permission – contact your Local Planning Authority. Trade Effluent Consent for discharging to public foul/combined sewer – contact your water and sewerage company to apply/discuss. If you plan to use herbicides to control weeds you may need authorisation from NIEA - see NIEA website. Other approvals may be needed depending on the site's specific environmental sensitivities – contact NIEA to check.
Scotland	Depending on the activity being carried out you may require authorisation from SEPA under the Controlled Activity Regulations (CAR). The level of authorisation required is dependent on the effect that the activity will have on the water environment. The levels of authorisation are as follows: - General Binding Rules (GBRs) provide statutory controls over certain low risk activities - Registration is intended to cover low risk activities which cumulatively pose a risk to the water environment		Scottish Natural Heritage (SNH) is the conservation body for Scotland. Permission will be required for works on designated sites such as Sites of Scientific Interest (SSSI) or Special Area of Conservation (SAC). Contact SNH for further	Planning permission – contact your Local Planning Authority. Trade Effluent Consent for discharging to public foul/combined sewer – contact your water and sewerage company to apply/discuss.

	A licence is needed if site-specific controls are required, particularly if constraints upon the activity are to be imposed Please contact SEPA to discuss, see website list. Also read reference 1 for more details.		details, see website list. European Protected Species of animals, their breeding sites and resting places, are protected against disturbance and harm. Contact SNH for details on licencing.	If you plan to use herbicides to control weeds you may need authorisation from SEPA - see SEPA website. Other approvals may be needed depending on the site's specific environmental sensitivities – contact SEPA to check.
Wales	An Environmental Permit for Water Discharge may be required if you carry out a water discharge. Discharges of clean, uncontaminated water from e.g. excavations, do not need approval providing the discharge is temporary (less than 3 consecutive months) and the advice in this GPP is followed. Contact NRW to apply/discuss.	A Flood Risk Activity Permit may be required if works are being proposed in, over, under or adjacent to a Main River. Please check NRW's website for more information. If the watercourse is classed as an Ordinary Watercourse you will need to contact the relevant Local Authority to discuss whether a consent is required. See Reference 18 to find out whether your works are near a Main River or Ordinary Watercourse.	Assent or Consent may be required for works within designated sites, such as Sites of Special Scientific Interest – contact NRW to check. European Protected Species of animals, their breeding sites and resting places, are protected against disturbance and harm. Check the NRW website for more information and details on how to apply for a licence.	Planning permission – contact your Local Planning Authority. Trade Effluent Consent for discharging to public foul/combined sewer – contact your water and sewerage company to apply/discuss. If you plan to use herbicides to control weeds you may need to apply for an agreement – see NRW website. Other approvals may be needed depending on the site's specific environmental sensitivities – contact NRW to check.

Appendix B: Examples of site specific environmental hazards and sensitivities

Environmental Sensitivities
Downstream water abstractors and users e.g. fish farms.
NOTE: In Northern Ireland, if the waterway or downstream of the works is of a fisheries interest it will have an impact on the level and frequency of engagement with the regulator.
High amenity areas
Designated bathing waters
Fish, especially in fish spawning season
Surface water drains
Designated sites e.g. Sites of Special Scientific Interest (SSSIs)
Protected species e.g. Otters

Environmental Hazards
Silt laden water
Foul sewerage pipes
Oil or chemical pipelines
Mains water supply pipelines
High voltage fluid filled cables

Glossary

Aerial spraying	Involves spraying crops or plants with plant protection products from an aircraft.
Aquatic life	Animal or plant that lives or grows in water.
Biosecurity	Measures that are taken to stop the spread or introduction of harmful organisms to human, animal or plant life.
By-pass channels	A channel created to divert water from the main channel.
Catchment	The area drained by a river or body of water.
Clean, uncontaminated water	Water which is free from any contamination, for example uncontaminated could include rainwater directly from roofs. Even if the water looks clear it may still be contaminated with e.g. chemicals, so it is essential the sources of runoff are considered carefully when checking whether water is contaminated or not.
Coffer dams	A watertight enclosure pumped dry to permit construction work below the water line.
Combined drains/sewers	Sewers or drains that collect both foul sewage and surface water run-off and carries it safely to a sewage treatment facility. Either owned privately or by the local water and sewerage provider.
Containment	The action of keeping something harmful under control or within limits
Culverts	A covered channel or pipe designed to prevent the obstruction of a watercourse or drainage path by an artificial construction e.g. a road crossing, highway embankment etc.
Cut-off walls	A wall of impervious material built to reduce seepage.
De-silt	Removal of silt.
Dewatering	Removing groundwater or surface water from a construction site.
Discharge	Release of water into the water environment or drainage/sewer systems.
Dredging	The removal or redistribution of any sand, silt, ballast, clay, gravel or other materials from or off the bed of a watercourse. Generally results in channel deepening and/or widening.
Duty of Care	A legal obligation to take reasonable care and avoid causing damage.

Environmental Management Plan	A document describing potential environmental impacts and activities of a project/site and ways to manage and mitigate these.
Flocculants	A substance which promotes the clumping of particles/sediments.
Ford rivers	Crossing a body of water at a shallow point on foot or in a vehicle
Formal approval	In this document refers to the authorisation(s) you may need from the environmental regulator. They may be called a consent, licence or permit.
Groundwater	All water which is below the surface of the ground in the saturation zone and in direct contact with the ground or subsoil.
Habitat	Specific area or environment in which a particular type of plant or animal, or group of plants or animals, live
Hazardous material	Hazardous materials are those with toxic properties that damage the environment and / or affect human health
Hazardous waste	Waste that is harmful to human health or the environment. For specific legal definitions including special waste in Scotland.
Herbicide	Commonly known as weed killers. It is substance used to control/destroy unwanted plants.
Impermeable	A surface or material that liquid cannot pass through.
Impervious	A surface that cannot be penetrated.
Karstic sinkhole	A depression in the ground that has no natural external surface drainage
Lagoon	An artificial pool for the treatment or storage of water.
Organism	An individual living thing.
Overland flow	Also known as run-off. Water flow over the ground surface to the drainage system or direct to watercourse. This occurs if the ground is impermeable, is saturated or if rainfall is particularly intense.
Pesticide	A substance used to control/destroy insects or other harmful organisms to cultivated plants or to animals.
Polluter Pays Principle	Principle in law that ensures that the party responsible for pollution should pay for damage caused to the environment.

Remediation	The act of remedying, reversing or stopping environmental damage.
Rock outcrop	A rock formation that appears above the surface of the surrounding land.
Run-off	Also known as overland flow. Water flow over the ground surface to the drainage system or direct to watercourse. This occurs if the ground is impermeable, is saturated or if rainfall is particularly intense.
Scour	Erosion of the channel banks and bed due to excessive velocity of the flow.
Secondary containment	This is another container in which a primary container is located. It is impermeable to the product being stored and water, and designed to catch spills, leaks or overflows from the container (including its pipework and equipment) in everyday use, accidents and emergencies. Secondary containment is essential to prevent pollution. Bunds and drip trays are examples of secondary containment.
Sediment mobilisation	The transport or movement by water of insoluble particulate matter.
Soil stripping	Removal of the surface layer of the soil.
SuDS	Sustainable drainage systems are a sequence of management practices and control structures designed to drain surface water in a more sustainable way than conventional techniques.
Surface waters	Water bodies including rivers, lakes, lochs, loughs, reservoirs, ponds, streams, canals, ditches (including those that are temporarily dry), estuaries and coastal waters up to three miles offshore. Northern Ireland legislation defines these as 'waterways'.
Suspended solids	Small solid particles which remain in suspension in water.
Toe (slope/bank)	The lowest point on the bank/slope of any body of inland surface water where the bank meets the bed of the body of inland surface water.
Trade Effluent	Trade effluent is any liquid waste (effluent) discharged from premises being used for a business, trade or industry.

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14. Watch out for wildlife crime. Available at www.wildlifecrimesni.org
15. Duty of Care Code of Practice guidance. Available at www.gov.uk/government/uploads/system/uploads/attachment_data/file/506917/waste-duty-care-code-practice-2016.pdf

16. Welsh Government Guidance on the Separate Collection of Waste Paper, Metal, Plastic and Glass Available at
http://gov.wales/topics/environmentcountryside/epg/waste_recycling/publication/guidance-on-the-separate-collection-of-waste-paper-metal-plastic-and-glass/?lang=en
17. Register a premises as a hazardous waste producer at:
<http://naturalresources.wales/permits-and-permissions/waste/register-as-a-producer-of-hazardous-waste/?lang=en>
18. How to find out if a watercourse is a Main River or and Ordinary Watercourse.
Available at: <https://www.naturalresources.wales/flooding/managing-flood-risk/flood-risk-map-guidance/main-rivers/?lang=en>
19. Section 2 (silt pollution) guidance:
 - a. Construction code of practice for the sustainable use of soils on construction sites. Available at www.gov.uk/government/publications/code-of-practice-for-the-sustainable-use-of-soils-on-construction-sites
 - b. Protecting our Water, Soil and Air A Code of Good Agricultural Practice for farmers, growers and land managers (CoGAP). Available at www.gov.uk/government/uploads/system/uploads/attachment_data/file/268691/pb13558-cogap-131223.pdf
 - c. UK Forestry Standard (UKFS) Guidelines on Forests and Soil. Available at <http://www.forestry.gov.uk/ukfs/soil>
 - d. UKFS Guidelines on Forests and Water. Available at www.forestry.gov.uk/ukfs/water

Website List

NetRegs - Guidance on environmental regulations for businesses in Scotland and Northern Ireland

www.netregs.org.uk

Scottish Environment Protection Agency (SEPA) website

www.sepa.org.uk

Natural Resource Wales

www.naturalresources.wales

Welsh Government

www.gov.wales

Department of Agriculture, Environment and Rural Affairs Northern Ireland

www.daera-ni.gov.uk

Sustainable Drainage System guidance for Wales

www.sudswales.com

Health and Safety Executive (HSE) - Using Storing and Disposing of Plant Protection Products

www.hse.gov.uk/pesticides/topics/using-pesticides.htm

GB Non-Native Species Secretariat

www.nonnativespecies.org

CEDaR Online Recording for INNS.

www2.habitats.org.uk/records/ISI

Scottish Natural Heritage (SNH)

www.snh.gov.uk

Chemicals Regulation Directorate (HSE)

www.hse.gov.uk/crd

Further information

For information about environmental compliance, or to report inconsistencies or inaccuracies in this guidance, visit www.netregs.org.uk.

You can view guidance on environmental regulations online at www.netregs.org.uk (for businesses in Scotland and Northern Ireland) and at <http://naturalresources.wales> (for businesses in Wales).

This guidance is issued by the Scottish Environment Protection Agency (SEPA), Northern Ireland Environment Agency (NIEA) and Natural Resources Wales (NRW).

This document is available at www.netregs.org.uk/environmental-topics/pollution-prevention-guidelines-ppgs-and-replacement-series/.

First published January 2017

Useful contacts

Incident/Pollution hotline: Northern Ireland, Scotland and England

0800 80 70 60 (24-hour service)

Emergency hotline - Wales

0300 065 3000 (press 1 – 24-hour service)

Floodline – Wales, Scotland and England

0845 988 1188

Flooding incident line - Northern Ireland

0300 200 0100

Natural Resources Wales

Scottish Environment Protection Agency

Northern Ireland Environment Agency

www.naturalresourceswales.gov.uk

www.sepa.org.uk

www.daera-ni.gov.uk

Head Office (Ty Cambria)
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Head Office
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9am–5pm)

Tel: 03000 99 66 99

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