

Environmental good practice for archaeological excavations

Technical guidance booklet

NI EA Northern Ireland
Environment
Agency
www.ni-environment.gov.uk



Cover image - Pot from an archaeological excavation

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INTRODUCTION

This Guidance is designed for use by staff in the Built Heritage Directorate, Northern Ireland Environment Agency (NIEA) and by staff sub contracted by NIEA to carry out archaeological excavations.

NIEA Built Heritage Directorate HQ operates an Environmental Management System (EMS) accredited to the ISO 14001 standard and in this regard would seek that sub contractors comply with the Built Heritage environmental policy Annex 1.

NIEA is committed to minimising the environmental impact of its operations or operations carried out on it behalf. This Good Practice Guide provides practical guidance for site managers and their teams on how to control and minimise environmental impacts.

An excavation site has the potential to cause damage to the surrounding environment in terms of land, water and air pollution, waste production, excessive noise and dust generation.

Additionally plant and animal life may be affected detrimentally. The site team need to take responsibility for minimising these impacts.

A site that demonstrates environmental good practice will:

- Ensure legal compliance
- Reduce damage to the natural environment
- Reduce demand on natural resources
- Reduce disturbance to neighbours

The Guidance gives consideration to six key environmental issues:

1. Water
2. Waste
3. Noise
4. Dust, emissions and odours
5. Ground Contamination
6. Wildlife & Natural features

In the event that an Environmental Statement is available for a site this will include guidance in relation to the areas above.



An archaeological excavation

WATER

It is important to minimise the risk of pollution to watercourses and to ensure that unacceptable wastes are not disposed of to sewer.

It does not take much spillage to cause pollution. For example, suspended solids in water arising from soil or silt at a level of 30-40 mg/l (equivalent to mixing half a teaspoon of soil in a bath) are typical limits set by NIEA as the regulator.

High levels of silt can clog up a fish's gills and eventually kill it. It can also smother invertebrates and sensitive plant life. When deposited on a stream bed, silt may prevent fish spawning and suffocate eggs. Levels as low as 180 mg/l can damage salmon and trout and juvenile fish can be adversely affected by only 15 mg/l. Other pollutants can damage the water environment in other ways, for example, by changing the chemical balance or pH or by removing dissolved oxygen (eg detergents).

In the event of spillage notify and seek advice from NIEA Environmental Protection at helpline FREEPHONE 0800 807060 (24 hours, 7 days a week).

The key action, however is to prevent anything that has the potential to pollute including muddy water entering surface water drains or watercourses.

Avoid spillages

Precautions should be taken to avoid spillages including the use of bunds around areas where chemicals are stored and the use of drip trays around mobile plant equipment. Advance planning can avoid the need for emergency response if things do go wrong. For example sandbags or even sand can be used as a barrier to protect sensitive areas. They are also effective for

Relevant Environmental Legislation

The Water (Northern Ireland) Order 1999

'It is an offence whether knowingly or otherwise to discharge or deposit any poisonous, noxious or polluting matter so that it enters a waterway or water contained in underground strata.'

The Water and Sewage Services (Northern Ireland) Order 2006

'It is an offence to pass any matter into a sewer or sewage treatment works likely to damage the sewer or the works or to interfere with the free flow of their content.'

The Waste and Contaminated Land (Northern Ireland) Order 1997



An archaeological excavation at Armoy

controlling and mopping up spillages. Mats or cushions can be placed over drains to prevent pollution to water supplies. Any sand or soil that becomes contaminated must be disposed of properly. See section 2 on waste.

In the event that a chemical spillage does occur use a spill kit* absorbent granules to mop up the liquid and shovel contaminated sand/earth/granules into sacks. These must be disposed of appropriately as in section 2 on waste. Personnel working on site should be familiar on how to use spill kits which should be stored in marked bags.

Staff working on sites should be familiar with the use of spill kits and who to contact in the event of a spillage.

Water course pollution incidents should be reported to the NIEA pollution hotline – FREEPHONE 0800 807060(24 hours, 7 days a week).

Accidental discharges (large spills) to sewer should be reported to Water Service. The Emergency Helpline number 08457 440088 (24 hours, 7 days a week).

**Emergency spill kits can be obtained from various suppliers and they contain equipment to contain and absorb spills including, for example, oil absorbent granules, absorbent mats, polythene sheeting, polythene sacks.*

WASTE

Problems often arise with waste because there is confusion as to what waste actually is. Legally waste is defined as 'any substance or object which the holder discards, intends to discard, or is required to discard'. Note that excavation spoil falls under this definition. There are different types of waste which should be handled according to type and include:

Inactive waste: this covers materials which do not undergo significant physical, chemical or biological reactions or cause environmental pollution when deposited at a landfill site under normal conditions – uncontaminated soils and rock, masonry and brick rubble;

Active wastes: these are those which are not inactive and would include acids, pesticides, wood preservative, oily sludges, batteries, waste oils, asbestos, timber, plastics, alkaline solutions and bitumen. Some active waste may be hazardous in nature;

Hazardous wastes: these are deemed to be dangerous to life; they may be corrosive, reactive, explosive, oxidising, carcinogenic or flammable. Some of the more common hazardous wastes include acids, alkaline solutions, oily sludges, waste oils and wood preservatives. The criteria to be used to determine whether a waste is hazardous waste are described in the Hazardous Waste Regulations (Northern Ireland) 2005 (advice and guidance can be obtained from the Hazardous Waste section of NIEA, phone contact 02890 569710).

Note hazardous waste movements must be accompanied by a consignment note. Check the NIEA website www.ni-environment.gov.uk for guidance or use the phone contact above.



Human remains uncovered at an archaeological excavation

Relevant Environmental Legislation

Waste and Contaminated Land (Northern Ireland) Order 1997

Controlled Waste (Duty of Care) Regulations (NI) 2002
'Duty of care places a duty on anyone, who in any way, has a responsibility for controlled waste to ensure that it is managed properly and recovered or disposed of safely.'

Hazardous Waste Regulations (Northern Ireland) 2005

Sites must comply with legislation concerning the storage, handling, transport and disposal of waste (Duty of Care – A Code of Practice August 2004).

Guidance available at www.ni-environment.gov.uk.
General Waste advice - NIEA phone no. (028) 9056 9359

Waste should not only be considered in terms of disposal. The true cost of waste may be summarised as follows:

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

To manage waste effectively the focus should be on:

- The amount of material wasted
- The way in which waste is handled and stored
- The potential for reuse
- Method of disposal

The following should be considered in the storage and handling of waste, with regard to segregation:

- Segregation assists in the identification of waste produced and to where reduction may be focused
- Reduction in costs of disposal (for example, segregation reduces the contamination of inactive waste by active waste, reducing landfill tax payments)
- Segregation maximises the potential for reusing and recycling material

Waste storage on site – a checklist:

- Segregate waste as it is generated
- Mark containers with intended contents
- Ensure containers are fit for purpose
- Minimise the risk of spillages, leaks or waste being blown away
- Provide covers and bunds.

If you sub-let the transfer of waste to a contractor, remember the Duty of Care, check:

- That you have a copy of the waste carrier's licence
- That the carrier is authorised to carry the type of waste collected
- That a transfer note is completed with an accurate description of the waste
- That you keep copies of all transfer notes for waste transported (2 years)



Human remains uncovered at an archaeological excavation



Use of machinery at an archeological excavation

NOISE

Noise is often explained as being sound that is unwanted by the listener. Sound above 90 dB is considered hazardous to hearing, under continuous exposure. As a rule of thumb if you are having to make yourself heard over background noise, then the background noise is likely to be about 75-80 dB. Communication starts to become difficult at around 50 dB.

Excessive noise is obviously a health and safety issue, but it may also be an annoyance to neighbours and a disturbance to wildlife and natural heritage.

Consideration should be given to actions outlined in the duty of care checklist below:

- Liaise with nature conservation bodies to minimize noise disturbance (disruption) to any sensitive wildlife
- Liaison with the Local Authority to check on any special conditions set for an area in relation to noise generation
- If noisy plant equipment has to be used, keep it away from public areas
- Adopt working hours to restrict noisy activities to certain times of the day
- If plant equipment is used, ensure it conforms to the relevant standards and directives on emissions.
- Use noise control equipment such as mufflers or jackets on plant if it is used
- Keep doors or hoods tightly closed on plant equipment such as compressors
- Plant equipment should be operated and maintained as intended, to ensure noise is reduced
- Shut down plant equipment when not in use

Screening may be an option to reduce noise. To be effective, artificial screening should be of a thickness of least 7kg/m^2 which equates to 12 mm of plywood.

A checklist for design and placement of screens should include:

- Where possible place sources of noise away from sensitive areas
- Erect the screen close to the source of noise
- Almost any solidly built screen is better than none
- Build the screen from stout materials with stiffened panels to stop drumming
- For the most effective results build the screen about 1m above the highest sight line
- Seal any gaps and openings including those at the bottom of the screen

Community liaison is a key step to increasing tolerance and understanding of noise. It may be helpful to inform the local community and residents about what you're doing on a site, increasing their acceptance of higher noise levels. Good relations will undoubtedly reduce the potential for complaints.



Exposed features at an archeological excavation

Relevant Environmental Legislation

Articles 40, 41 and 43- Pollution Control and Local Government (NI) Order 1978

Noise Emission in the Environment by Equipment for Use Outdoors Regulations 2001



A well ventilated area will prevent dust related health problems during an excavation

DUST, EMISSIONS AND ODOURS

Dust

Dust, emissions and odours arising from a site have the potential to annoy neighbours, cause health problems (outside the scope of this guidance) and impact on the local ecology.

Dust is generally considered to be any airborne solid matter up to about 2mm in size. Some dust such as limestone dust is chemically active. Dust can affect plant and fruit growth and can damage river ecology, if blown onto watercourses.

Dust, emissions and odour generation should be minimized by the adoption of good working practice. The following checklist provides some actions worthy of consideration:

- Seal temporary or completed earthworks as soon as possible
- Keep earthworks damp
- Ensure that if plant equipment is used, the exhausts do not discharge directly at the ground
- Stockpiled material should be located out of the wind to minimize the potential for dust generation
- Stockpiled material should be kept to a minimum practicable height
- Minimise the storage time of materials on site

'Damping down'

An effective way of suppressing dust is the application of a fine spray of water to sand, spoil etc. Over a period of time chemical additives or binders may be necessary, when repeated water application may itself become environmentally unacceptable.

A number of proprietary methods are available including:

- Magnesium chloride – 95% effective on sand or gravel
- Polymer bonding agents applied as a water additive

Over application should be avoided, which may cause pollution. Advice should be sought from NIEA before using additives.

Dust screening may be appropriate in the event that dust generation is unavoidable, but they can be expensive if designed to withstand high winds.

Emissions and odours

Processes involving the use of fuels and the heating and drying of materials commonly emit fumes, odours or smoke. It is important to prevent emissions and odours as far as possible to protect workers, because they annoy the public and affect the environment. The preventative measures listed in the checklist below will help reduce emissions and odours:

- Ensure vehicles and plant are well maintained and serviced
- Secure waste and other materials (like fuels and chemicals) on site appropriately (lowering the risk of a site fire, for example due to vandalism)
- Use covered containers for organic waste and remove frequently
- Remove organic waste (like vegetation) before it begins to decompose
- Position site toilets away from public areas

Relevant Environmental Legislation

The Clean Air (Northern Ireland) Order 1981



Human remains uncovered at an archaeological excavation

GROUND CONTAMINATION

This section gives advice on how to deal with contamination (both expected and unexpected) and how to avoid causing or spreading the contamination.

Ground contamination may give rise to problems such as:

- Adverse Health and Safety impacts on staff
- Cause delay to the programme of work
- Pollution of groundwater and surface water courses
- Pollution of surrounding land

There are two key requirements in managing ground contamination

- Do not cause it or spread it
- Deal with it appropriately

Causes of problems

Ground contamination is often present as a result of previous uses of the site such as industrial land use or waste disposal.

Existing contamination may be exacerbated by excavating contaminated ground, for example, where impermeable ground is penetrated and therefore creates a pathway to an aquifer below.

New ground contamination or spreading of existing contamination may result from:

- Stockpiling contaminated ground on clean ground in the course of excavation
- Stockpiling materials containing contaminants that are liable to leach out
- Spillages of contaminants such as oil onto the ground
- Dewatering that draws in contaminated groundwater from adjacent sites
- Discharge of contaminated dewatering water into a nearby watercourse

Problem Avoidance

Preliminary investigations of the site history can help predict potential problems through the examination of published maps, plans and photographs, existing site records and enquiries.

A preliminary investigation could include:

- Knowing the history of the site (details of owners, occupiers and users)
- Processes used (including their locations, raw materials, products, waste residues and methods of disposal)
- The presence of waste disposal tips, abandoned pits and quarries with or without standing water
- Information on geology and hydrogeology (including the presence of groundwater and surface water)

Relevant Environmental Legislation

Waste and Contamination Land (Northern Ireland) Order 1997

Appropriate actions if contamination is encountered

Visual signs of contamination can include:

- Discoloured soil
- Fibrous texture to the soil (eg asbestos)
- Chemical/oil containers are uncovered
- Evidence of previous soil workings
- Evidence of underground structures and tanks
- Existence of waste pits
- Made ground (ground previously moved/disturbed/excavated)
- Topsoil adjacent to roads can be contaminated by traffic emissions

When contamination is suspected:

- Stop work
- Seal off area
- Report the discovery to the site manager
- The site manager should seek advice from the local authority in the first instance via their Environment and Health Department

WILDLIFE AND NATURAL FEATURES

These terms should be taken to mean all living things such as trees, flowering plants, insects, birds and mammals and the habitats in which they live, as well as the rocks and landforms that shape the landscape. Climate, geology or soil structure and land management all influence the creation of habitats and the presence of species in particular locations. It is important to look, not just at individual living things, but also at larger animal populations, plant communities, their habitats, the rocks and landforms and the natural processes that affect them.

Excavations should be carried out in a manner to ensure that activities cause the least damage to the surrounding natural environment. Unexpected ecological finds arising during site work should be dealt with in the correct manner, for example not damaging or disturbing protected species.

Note that damaging or disturbing protected species or a protected habitat could result in prosecution under a range of legislation.

Main Causes of Problems

There are three ways in which ecological issues have to be considered on site.

- Where species or areas of the site have been identified for particular protection;
- Where protected species are discovered on the site when work has begun;
- Minimisation of general damage to ecology on site.



A rath covered with trees



A merlin on it's nest

Relevant Environmental Legislation

The Nature Conservation and Amenity lands (Northern Ireland) Order 1995

The Conservation (Natural habitats etc) Regulations (Northern Ireland) 2005

The Environment (Northern Ireland) Order 2002

The Wildlife (Northern Ireland) Order 1985

Giving consideration to wildlife and natural features

It is important to take a responsible attitude to the natural environment as a whole and to be aware of activities that can affect the surrounding ecology such as:

- Changes to water quality
- Destruction of places inhabited by plants and animals
- Interruptions to the movements of wildlife
- Habitat fragmentation
- Vegetation damage through trampling (people or vehicles)
- Dust
- High noise disturbing adjacent ecology
- Changes in lighting
- Damage, removal or burial of important rock formations or landforms

Avoidance of problems

If designated ecological sites or protected species have been identified and guidance issued before excavation commences then the advice given in that guidance should be followed.

Project managers should check site designations before commencing work. If no advice is given the project manager should seek advice from NIEA. This advice, for example may include fencing off any sensitive habitats and restricting the movement of workers to these areas. NIEA may advise the commissioning of surveys for various protected species. Such actions will minimize any damage caused. For many categories of wildlife, for example nesting birds and roosting bats, the timing of work will be important so correct scheduling will avoid problems.

Diligence on the site

- Staff working on a site are not expected to be ecological experts. However they should be reasonably aware of problems and seek advice if necessary
- Check for nesting birds, as it is an offence to interfere with them. If found do not disturb them or cut down the tree or shrubs that contain the nest.
- Check whether any trees on site are covered by preservation orders (Local Authority)

Protect trees on site

Damage to trees may be caused either through direct physical injury to the branches, trunk or roots or by changing the soil character around the roots. This can arise by various actions including compaction, raising soil levels, impervious covering around the tree roots, raising the water table, hazardous spillages and soil stripping.

Tress may be protected by:

- Temporary fencing off
- Digging in close proximity, if necessary, should only be carried out by hand
- Large roots should not be cut (>25mm)
- Cut small roots with a hand saw (Not a spade, for example)
- Wrap damp sacking around exposed roots prior to back filling
- When back filling with soil compact it lightly
- Do not store spoil, chemicals etc within the protected area

Working near water

- Place a protective bund around ponds to prevent pollution of water
- Dewatering can affect the ecology of wetlands around the site, the monitoring of water levels may be appropriate



Brown long-eared bat



Common newt



Common lizard



Badger

Key animals

- **Bats** – are a schedule 5 protected species if disturbed seek advice on appropriate measures to take if, for example the animals need to be moved, advice can be gained from the NIEA Wildlife Officer, telephone 02890 569602
- **Amphibians** - Smooth Newts are Schedule 5 species and therefore protected at all times
- **Reptiles** – Common Lizards are Schedule 5 species as per amphibians
- **Badgers** – If their presence in the area is suspected the NIEA Wildlife Officer should be contacted. No excavation should be conducted within 25m of the nearest sett entrance. If excavation outside this buffer zone still causes sett disturbance, then the work should cease and the NIEA Wildlife Officer contacted immediately.

Designated sites

It is important to be aware of designated sites in Northern Ireland and ensure NIEA is consulted should the need arise to carry out work on such a site. Designated sites include:

- Areas of Special Scientific Interest (ASSI)
- Special Protection Areas (SPA)
- Special areas of Conservation (SAC)
- Nature Reserves (NR)
- Marine Nature Reserves (MNR)
- RAMSAR sites (wetland protection)
- Areas of outstanding beauty (AONB)

All the sites are described on the NIEA website. Prior agreement is required from NIEA before carrying out any work on an Area of Special Scientific Interest (ASSI). It is an offence to carry out work on an ASSI without the permission of NIEA.

ANNEX 1

ENVIRONMENTAL POLICY

Staff in Waterman House, part of the Northern Ireland Environment Agency (NIEA), are responsible for the promotion, preservation and conservation of the built heritage of Northern Ireland. This is carried out through the Built Heritage Directorate of the NIEA.

Staff in Waterman House recognise that good environmental stewardship goes hand in hand with the protection of our built heritage, and understand that our activities may have a significant impact on the environment. As such we believe that practical concern for the environment is an integral and fundamental part of our activities and is of importance to the community that we serve. We also acknowledge that, as a prominent part of the NIEA, we can influence the behaviour of our subcontractors, the public sector and the community at large.

We are committed to promoting continual improvement of our environmental performance and to the prevention of pollution through the design and operation of all our activities. We endeavour to achieve this through the development and implementation of an environmental management system, in accordance with the requirements of the International Environmental Management Standard EN ISO 14001:2004. This is the mechanism through which we set, review and implement timetabled environmental objectives and targets.

We seek to comply with relevant environmental legislation, regulations and public sector policies concerning our activities whilst operating efficiently, cost effectively and with minimum disruption to the environment. We undertake close liaison with relevant authorities and agencies in order to meet our environmental aims.



This policy has been defined by the senior management of Waterman House, is reviewed for continuing suitability at regular intervals, and has been communicated, understood and implemented throughout Waterman House.

This Environmental Policy is displayed in Waterman House and is also available to the public on request.

ANNEX 2

1. Environmental Good Practice on Site CIRIA (CIRIA C502 ISBN 00880175022)
2. Guidance for Public Sector and large organisations on Waste prevention and Management (www.ni-environment.co.uk)
3. Noise minimisation at 'Works sites' - A code of practice (BS 5228)
4. Guide to key N.I. Environmental Legislation (www.netregs.gov.uk)



Pots from an archaeological excavation

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Our aim is to protect, conserve and promote the natural environment and built heritage for the benefit of present and future generations.



An Agency within the Department of the

Environment

www.doeni.gov.uk



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