Farming and Water Quality

Guidance Notes - Point Source Pollution

These Guidance Notes provide information on how to identify and cure point source pollution from farms and deliver improved water quality.

They are intended to be used in support of the Farming and Water Quality, Point Source Pollution Checklist.

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Acknowledgement

We wish to thank all the organisations and individuals who contributed to the development of this Training Package, including the Northern Ireland Environment Agency, NI Water, CAFRE and the 44 farmers who participated in the feedback workshops.

Some of the tasks recommended in these Guidance Notes involve a degree of risk. Before undertaking any work, always identify potential hazards and adopt working practices which minimise any risk to those undertaking the work.

Guidance Note 1

How to Trace Farmyard Drainage

Tracing drains is a useful skill for identifying the routes and connections of drainage systems, especially during repairs, renovations, or when diagnosing problems. By following the steps in this Guidance Note, you can effectively trace drains and gain a clear understanding of a site's drainage layout, making maintenance and problem-solving much easier. This should be done before any pollution incident is discovered – do it in good time and record on a simple farmyard map including helpful photographs. Specialist contractors are available should you have difficulties doing this yourself and to clear blockages or carry out CCTV examination of drain conditions.

1. Consult Drain Plans

If available, consult existing drain or site plan. This is the starting point from which you can confirm routes and identify any undocumented alterations or extensions.

2. Gather the Necessary Tools

- Drain rods – For physically probing the drains.
- Dye testing kit – To observe the flow of water and identify outlets.
- Drain plans or site drawings (if available) – To provide an initial layout of the drainage system.

3. Visual Inspection

Start by locating all visible inspection chambers, manholes, and gullies. Remove the covers and inspect for signs of flow, blockages, or unusual odours. This step helps you understand the general layout and access points.

4. Dye Testing

Introduce a non-toxic coloured dye into a drain entry point (such as a gully). Then, observe downstream inspection chambers or outlets to see where the dye emerges. This method is useful for tracing surface water drains and confirming connections. Coloured fluorescent dyes are inexpensive and available from good hardware stores.

Drain tracing using non-toxic fluorescent dye

5. Use of CCTV Drain Cameras

Insert a CCTV drain camera into the pipework via an inspection chamber. The camera will transmit live images, allowing the operator to follow the pipe's route, spot defects, and verify connections between different sections of the drainage system.

6. Electronic Drain Tracing

Attach a small transmitter (**sonde**) to a drain rod or reel and insert it into the pipe. Using a handheld (CAT) receiver above ground, you can trace the sonde's signal to map the path of the drain, even if it runs beneath buildings or hard surfaces. This equipment can be hired from local hire companies.

SONDE sender – attached to drain rods or reel.

CAT Detection Tool

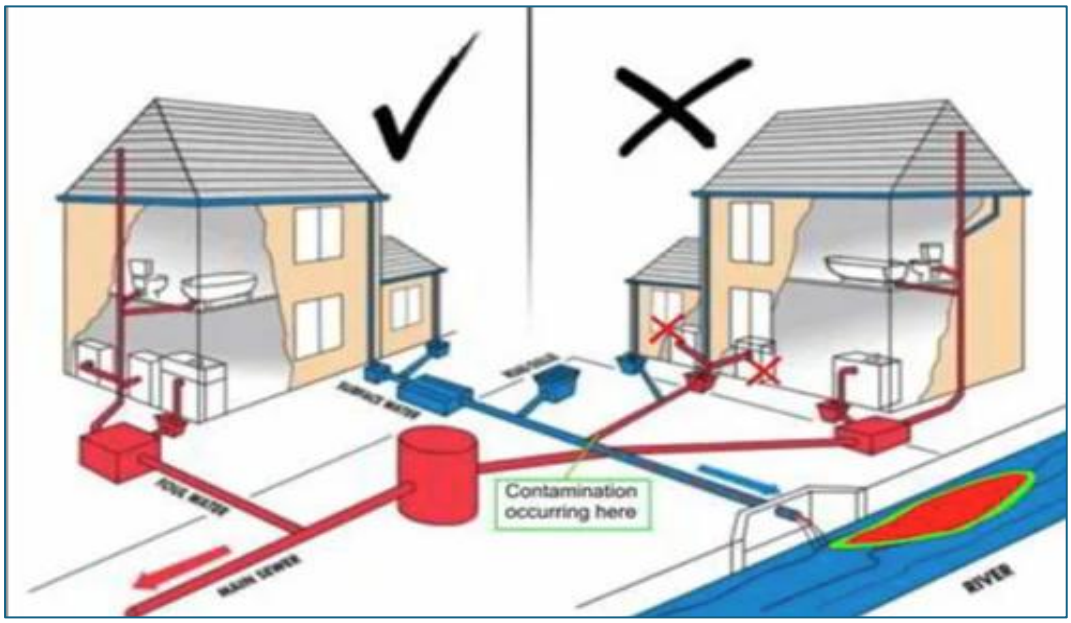
7. Marking and Recording

Mark the traced routes on the ground and on a site plan for future reference. Record your findings, including photographs, videos, and notes about the depth, direction, and condition of the drains.

Safety Considerations

- Always use appropriate personal protective equipment (PPE), such as gloves and masks.
- Be cautious when lifting manhole covers and working around open chambers.
- Ensure proper ventilation if working in confined spaces.
- Do not enter drains or pits without checking for noxious gases and oxygen levels and taking the necessary precautions – including using breathing apparatus where necessary.

NOTE: Misconnections to domestic systems are a significant and worrying cause of pollution. These typically occur when a house is being extended or outside toilet added and the toilet is connected into a storm drain by mistake. In a farm situation dairy washing from the tank room could also inadvertently be connected to the storm (clean) water system or clean rainwater be channelled into the septic tank.



Misconnections cause pollution (Source NI Water)

This is more likely to be a problem for newer houses and those with septic tanks which have separate storm water and sewage systems. In older houses connected to public sewers both storm / rainwater and wastewater are often collected in the one combined system, and all are treated as wastewater.

Guidance Note 2.

Recognising Signs of Pollution of Waterways

Introduction

Recognising the indicators of farm pollution is crucial for early intervention and maintaining water quality. This document outlines the primary signs and evidence of pollution affecting rivers, streams, lakes, and other water bodies.

Pollution will impact on water quality in a variety of ways depending on the pollutant.

The presence of pollution can be detected through –

1. Visual Indicators – these are the most useful for farmers

Algal Blooms: The presence of green, blue-green, or brown mats or scum on the water surface often indicates nutrient runoff, particularly nitrogen and phosphorus, from fertilisers and animal waste from multiple sources.

Bloom due to pollution in watercourse

Sewage Fungus. Despite its fungus-like appearance, sewage fungus is made up of filamentous bacteria, which grows in response to any organic nutrients in the water – not just sewage. The “fungus” thrives in a low dissolved oxygen (DO) environment. This makes sewage fungus a bio-indicator of organic pollution (including farm effluent) and suggests reoccurring pollution incidents which have reduced the oxygen concentration in the water. The fungus grows quickly in the presence of pollution but dies off rapidly in clean water. Silage effluent will cause

substantial growth of sewage fungus. It is grey in colour and often coats vegetation below the water surface. It can form lamb's tails in low oxygen, nutrient rich water.

Tufts of Sewage Fungus – Lamb's Tails

Not to be confused with Iron Bacteria (Iron Ochre) which has a visual impact but is not linked to farm pollution and occurs naturally in iron rich areas, especially around slow moving sheughs and drains. Breaks apart easily unlike sewage fungus or filamentous algae.

Iron Ochre bacteria

Filamentous Algae**.** These are much less obvious than blooms and occur as thread-like slimy hair strands in sheughs and pipes. Occur in nutrient rich water and often form mats which are attached but float on the surface

Cladophora and plant matter

Algae strands in nutrient rich drain

Murky or Cloudy Water: Increased turbidity or muddiness can result from soil erosion and runoff after rainfall, carrying sediments from fields or when clearing drainage ditches. Some turbidity will occur naturally especially in floods, but excessive amounts block out sunlight, smother fish eggs and spawning habitats, carry nutrient or pollutants and cause problems for water treatment in achieving clarity of drinking water. Soil levels can be reduced by sediment traps which reduce the flow and allow the soil particles to settle out. *See Guidance Note 11 for examples.*

Suspended solids causing increased turbidity (muddiness) in watercourse

Foam and Pollution**:** Some foam is produced naturally in rivers after rain, caused by dissolved organic matter trapping air bubbles in turbulent conditions. This foam is often brown in colour. Pollution related foam is often white and smelly. This will occur at

times when there hasn't been recent rain. Can be the result of chemical or detergent spills.

Foam can be due to pollution – but also occurs naturally in turbulent conditions

Oil Spills. When oil, such as heating or diesel oil enters a waterway it forms a dark or rainbow film on the surface of the water drastically reducing the oxygen content making it difficult for the fish and other aquatic life to breathe. It also coats surfaces and taints fish flesh. It persists long after the spill has dissipated. Diesel is particularly toxic to invertebrate life.

Oil films on water surface.

Dead Fish or Aquatic Life: Sudden fish kills or a noticeable decline in aquatic insects and plants may signal toxic contamination, oxygen depletion, or high ammonia levels.

Excessive Plant Growth: Overgrowth of aquatic plants and weeds is often driven by nutrient enrichment.

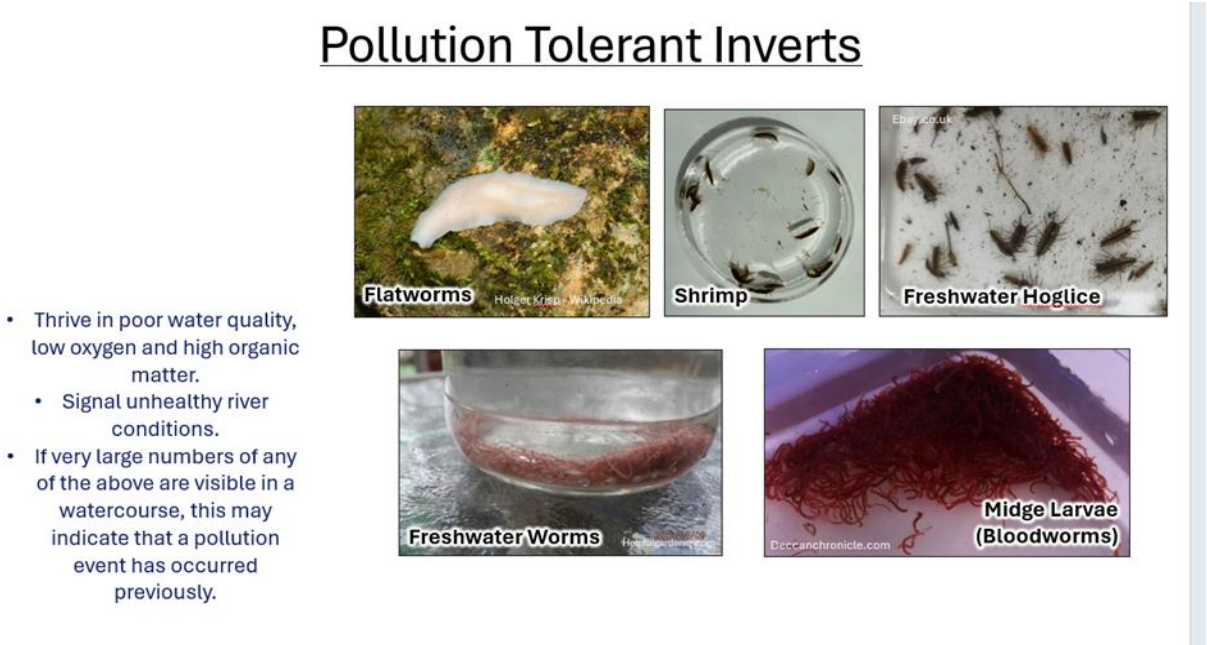
Unusual Odours: Strong smells, such as rotten eggs (hydrogen sulphide) or silage, may suggest organic pollution.

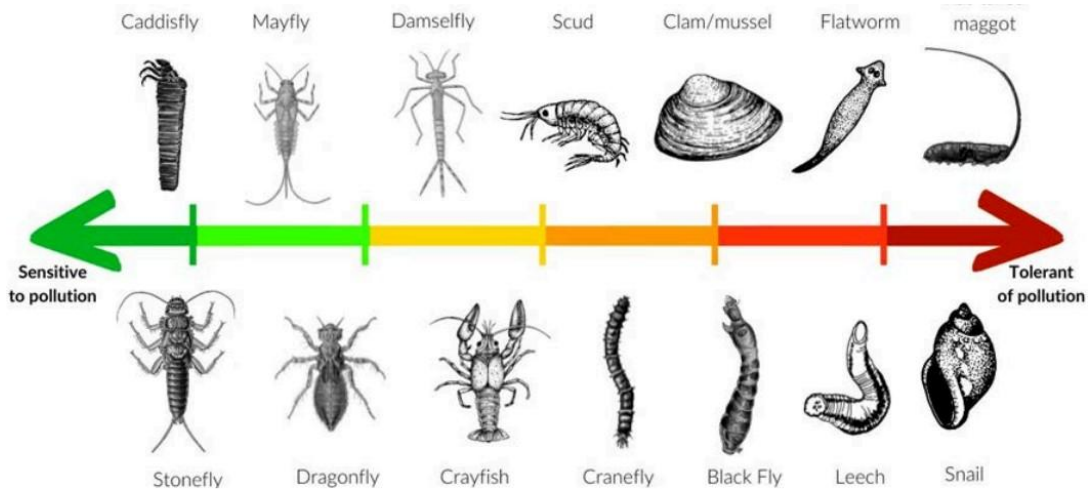
2. Chemical Indicators – these need specialist equipment so are mostly used by scientists and enforcement agencies.

- Elevated Nutrient Levels: Testing may reveal high concentrations of nitrates and phosphates, commonly from fertiliser and manure runoff.
- Low Dissolved Oxygen: Excessive organic matter decomposition or algal blooms can reduce oxygen, stressing aquatic life.
- Ammonia Presence: Ammonia from livestock waste or fertiliser is toxic to fish and a clear sign of agricultural pollution.
- Pesticide Residues: Detection of herbicides, insecticides, or fungicides in water samples points to chemical runoff from crop spraying or sheep dipping.

3. Biological Indicators – requires some specialist expertise

- Changes in Aquatic Species: A decline in sensitive species such as mayflies, stoneflies, and caddisflies, or a dominance of tolerant species like worms and midges, can indicate poor water quality. Good quality waterways will have a range of invertebrate types – the diversity is more important than the number. Requires limited equipment and expertise. *To see how it is done view Teagasc video at https://www.youtube.com/watch?v=gdnn3oOdPx4.*





Relationship between water quality and invertebrate diversity

4. Physical and Structural Indicators

- Bank Erosion: Overgrazing, removal of riparian vegetation, and livestock access to waterways can destabilise banks and increase sediment input.

Positive Indicators need Action!

If any of these indicators suggest a potential pollution problem, it is vital that it is traced back up the watercourse to find the drain or pipe where it is coming from and then find the source to stop the pollution at source.

Check the watercourse again at regular intervals to ensure the problem does not reoccur.

CHECK IT – FIND IT – FIX IT – CHECK IT AGAIN

Reporting Urgent Water Pollution Incidents

If you are involved with or become aware of a pollution incident (from any cause) you should call the NIEA Urgent Pollution Incident Number - 0800 807060 which operates 24 hr each day.

Early reporting of pollution will enable prompt action to be taken, and mitigation measures initiated promptly.

If you would like to report a pollution incident that does not require immediate attention you can email NIEA on emergency-pollution@daera-ni.gov.uk

Guidance Note 3.

Calculation of Slurry Store Requirements

Slurry storage requirement for Farm Livestock. (NAP Guidance / Workbook)

Livestock type	Average number of stock housed (A)	Slurry/animal/ week (m^3) (B)	Weeks animals housed (C)	Slurry produced when housed AxBxC m^3
Cattle				
Dairy cow		0.37		
Suckler cow		0.23		
Cattle over 2 years		0.23		
Cattle 1-2 years		0.18		
Calves 6 months – 1 year		0.09		
Calves 0 – 6 months		0.05		
Sheep				
Adult ewe / ram		0.03		
Fattening Lamb		0.01		
Pigs				
Maiden gilt		0.05		
Dry/lactating sows/served gilts		0.08		
Weaner 7 – 18 kg		0.01		
Grower 18 – 35 kg		0.02		
Finisher – dry fed fed 35 – 105kg		0.03		
Finisher – liquid fed 35 – 105 kg		0.05		
Poultry				
1000 laying hens		0.81		
100 ducks		0.81		
Total Storage required (cum)				

Notes:

1. Storage must be sufficient to cover the closed period.
2. Dirty water collected in slurry tanks must be added to the capacity required.
3. Stock outwintered and straw bedded do not need to be included.
4. Further information and guidance are provided in the Nutrient Action Programme 2019-2022 Workbook
5. CAFRE Manure Storage Calculator, accessed through DAERA on-line Services, assists with this calculation
6. When working out the tank capacity required, allowance should also be made for rainwater water collected from parlour and building washings – e.g. allow 0.13cum /cow/week for parlour washings.

Nutrient Action Programme Requirements are minimums of:

→ **26 weeks storage minimum for pig and poultry enterprises**

→ **22 weeks storage minimum for all other enterprises.**

Example of Simple Storage Calculation using this framework.

Livestock Type	**Average Number of stock housed (A)**	**Slurry produced / animal / week m^3 (B)**	**Weeks animals housed (C)**	**Slurry produced A x B x C m^3**
Dairy Cows	100	0.37	25	925
Calves – 6 months to 1 yr	50	0.09	25	112
Parlour Washings	100	0.13	25	325
Rain falling on collecting yard See Guidance Note 4	Yard 15mx10m		25	15x10x25x0.025 = 94
Total Capacity Required				**1,456 m^3**

Guidance Note 4.

Calculation of rainfall entering yards and stores as dirty water or in slurry tanks

Rainfall in Northern Ireland averaged over the winter months = 0.025 m or 25mm per week. (1 inch per week). So, rainfall over an area per week will be – length (m) x breath (m) x 0.025 cum/week.

For example: A roaming yard 15m x 10 m will collect 15x10x0.025 = 3.75 m^3 per week or 82 m^3 / 82,000 litres over a 22-week period.

or if prefer, rainwater values can be calculated from 4.5 gallons per square yard per inch of rain.

For 22-week period, rainfall collected on area of 17yd x 11yd will be 4.5x 22x17yd x 11yd will be 18,500 gallons or 84,100litres.

Significant quantities of rain also enter open slurry tanks and reduce available capacity– see examples below.

Tank Capacity Calculation Examples

Rectangular Store Capacity

Tank	**Description**	**Length (l) m**	**Breadth (b) m**	**Adjusted Depth (d) m. Depth minus freeboard**	**Volume m^3 (l x b x d)**
1	Cattle Lagoon	30	30	3 – 0.75 =2.25m	2,025 m^3
	Rainfall input over 22 weeks	30	30	Area = 900 m^2	30x30X22X0.025 = 495 m^3
	Available capacity if uncovered				**2,025 – 495 = 1,530 m^3**
2					
3					

Circular Tank Capacity

Tank	Description	Radius (rad) (m)	Depth (h) (m) height – freeboard*	Volume m^3 (3.14xradxradx h)
1	Above Ground Store	10m	6 – 0.3 = 5.7m	1,790 m3
	Rainfall input over 22 weeks	10m	Area m^2 3.14 x 10 x 10 = 314 m^2	3.14x10x10x22x0.025 = 173 m^3
	Available capacity if uncovered			*1790 – 173 = 1,617 m^3*
2				
3				

* Freeboard is the term given to the unfilled depth (safety margin) at the top of a slurry tank or compound. Mandatory freeboard allowances are at least 750 mm for earth bank lagoons and 300 mm for all other slurry stores. This is not a legal requirement for facilities completed before 1 December 2003 (unless they have been substantially modified). However, it is considered best management practice to adhere to free- board allowances in all stores.

Note: allow at least 750mm freeboard for lagoons and 300 mm for tanks.

Guidance Note 5

Dirty Water on Farms

Dirty Water: In this context **Dirty Water is defined (DAERA Code of Good Agricultural Practice) as "water which is lightly contaminated by manure, urine, silage effluent or milk and cleaning materials**." It is defined as having a Biochemical Oxygen Demand (BOD) no greater than 2,000 mg/l; no more than 0.5 kgN per m^3 and less than 0.5% DM."

Water with a greater level of contamination and therefore pollution potential must be treated as slurry.

This Guidance Note explores the origins of dirty water on farms, its impacts, and practical approaches to managing and reducing its occurrence.

Possible Sources of Dirty Water on Farms – subject to contamination levels

- Livestock Housing and Yards: Rainwater falling on open yards and running off roofs or adjacent fields onto yards can mix with manure, bedding, feed, and urine, resulting in contaminated runoff. The level of contamination will determine if this is treated as Slurry or Dirty Water.

- Milking Parlours and Dairy Units: Cleaning activities generate washings containing milk residues, detergents, and manure. Can only be treated as dirty water if lightly contaminated since milk is a potent pollutant.

- Silage Clamps: Effluent from open silage clamps contaminates rainwater. If silage is still seeping effluent then contaminated water must be treated as slurry. However, if no silage effluent is evident and area is clean then rain falling on the area may be treated as dirty water

- Equipment Washing: Cleaning machinery and vehicles, especially after fieldwork, can produce water loaded with soil, oil, and agrochemicals. Level of contamination will determine whether it can be treated as dirty water or slurry

The level of contamination will determine if the flow can be treated as Dirty Water or Slurry.

The photographs below, most of which come from DAERA Code of Good Agricultural Practice, will help explain when effluent flows in farmyards are treated as –

(i) Clean water – suitable for discharge direct to waterways; or
(ii) Dirty Water; or
(iii) Slurry.

Runoff from brushed area can be treated as Dirty Water.

Thorough removal of slurry / manure from a yard allows the runoff from that area to be treated as Dirty Water. If left unscraped and unbrushed (area on the right) the level of contamination requires runoff to be treated as slurry,

NOTE: Sweeping brush with collector is an invaluable tool to minimise pollution on any farm.

Runoff from a frequently used collecting yard is treated as slurry.

Runoff from tidy open silo with limited dropped silage can be treated as Dirty Water but if untidy or with any seepage must be treated as slurry

Runoff from these clean yards / silos will be treated as clean water suitable for piping to a ditch or stream.

Runoff from clean yard can go to stream but seepage from this bedded yard must be handled as slurry.

Runoff to drain in foreground must be treated as slurry.

Good Practice in Managing Dirty Water

The priorities must always be to:

a) prevent pollution of waterways;

b) minimise volumes; and

c) catch it and **hold it** for spreading when conditions are suitable.

Implement the following where possible:

1. Keep clean and dirty water separate by collecting clean rainwater from roofs and piping away from contaminated areas.

   Remember Rainfall in Northern Ireland averaged over the winter months = 0.025 m or 25mm per week.(1 inch per week)
   So, rainfall over an area per week will be – length (m) x breath (m) x 0.025 m^3/week.
   For example, a shed 30m x 15 m will collect 11.25 m^3 rainwater each week or 247m^3 (or 247 x 220 = 54,000 gallon) over a 22 week period.

2. Keep gutters, drains, and storage tanks in good repair to prevent leaks and unintended discharges. Stock will damage downspouts so protect them in stock areas.

3. If possible, roof regularly used loafing and collecting areas.

4. Install physical barriers, such as kerbs and ramps to prevent mixing of clean and dirty water flows. Gullys at downspouts should have concrete surrounds to catch all rainwater and prevent its contamination.

5. Reduce hosing volumes by scraping first and / or using pressure washers.

Gully with concrete surround to maintain clean and dirty water separation.

Downpipe direct to drain to avoid contamination. Note damage protection

Where an area is only occasionally or lightly contaminated; collection is impracticable and there is no risk of polluting a waterway, the runoff may be diverted to grass or vegetated areas where the water can be absorbed and the nutrients utilised.

Rainwater Harvesting

If you need to replace gutters and downspouts it may be worth considering a rainwater harvesting system – especially on farms using a lot of water e.g. dairy farms. **One study found that dairy farms spent £31 to £100 per cow a year on water.** Rainwater harvesting (RWH) on a farm involves collecting and storing rainwater from roofs for later use to reduce reliance on mains water and manage runoff. The **water is not potable (of drinking quality) and while it can be used for yard washing and spraying it cannot be used, without treatment, for parlour washing**, so check legislative and quality assurance restrictions.

Diverters

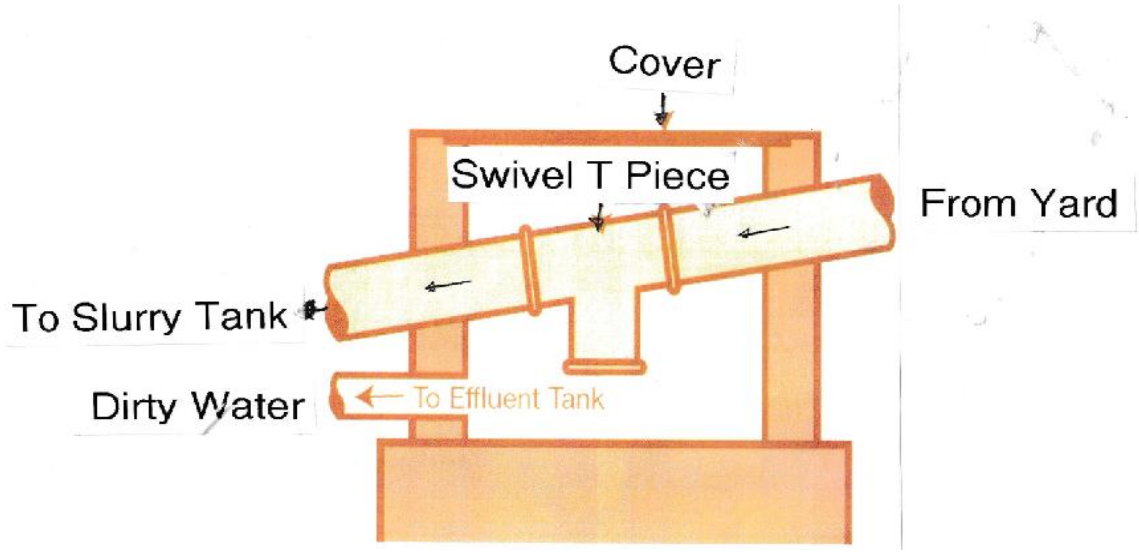
Where an area varies between dirty water and slurry or between slurry and dirty water a diverter can be used to direct the runoff to the appropriate storage tank.

Diverters were widely recommended in the past but there is obviously a risk of pollution and legal action under the Water (NI) Order 1991 should they be left in the wrong position and pollution of a waterway occurs. They are therefore best used where neither position provides a direct flow to a waterway.

Within the NAP Notification Form to be submitted to NIEA for New or Substantially Reconstructed silos or storage systems NIEA request details of any Diverter Systems installed and state –

N.B. Newly constructed, substantially reconstructed or substantially enlarged silos and new middens and yards, diverter systems MUST NOT be connected to a waterway or any pipework which can be connected to a waterway. This would constitute an illegal discharge under Article 7 of the Water (Northern Ireland) Order 1999 and may lead to enforcement action being taken.

In open silo and yard situations, where the area is thoroughly cleaned between use, considerable volumes of clean water will be collected and will require additional storage capacity – *see Guidance Note 4.*



Example of a diverter of effluent from area with runoff of different levels of pollution. Heavily grease or soap the swivel piece when fitting.

It is very important to check the diverter's setting when conditions change.

Manholes

All clean water drainage systems should have a manhole and inspection chamber close to where it leaves the yard to allow the flow to be checked for contamination. This should have access to allow the exit to be closed off should effluent enter the system and be large enough to allow a submersible pump to be dropped in to clear the system.

Small submersible pump with float switch.

These pumps are now relatively cheap and are invaluable to hold in reserve with suitable flexible piping for use in an emergency.

As they run submerged in liquid it is important to have them checked regularly for electrical safety.

Storage and Disposal

Dirty Water may be spread on land throughout the year – closed periods for slurry do not apply - but it must not be applied when the soil is waterlogged, flooded, frozen, snow covered or if heavy rain is forecast within 48 hrs. Run-off to waterways must not occur during or after application.

Application can be by using the same equipment as slurry e.g LESSE equipment or inverted splash plates. Low-rate irrigation systems may be used but not on land sloping towards drains or waterways.

Dirty Water can of course be collected in slurry tanks, but this increases the volume of slurry to be stored and handled. Where possible it should be stored and handled separately.

Tanks for dirty water must obviously be watertight and fitted with a secure cover for safety. The size will depend on the area served and should be big enough to not need emptying between periods when condition allow land spreading to be carried out.

The volume required can be calculated by multiplying the yard area by the average rainfall – (width x length x0.025 cum/week). Remember to allow for parlour washing – 0.13cum/cow/week. – *See Guidance Note 3.*

Constructed Wetlands

These may be used to “treat” Dirty Water in situations where space and conditions allow, but DAERA NIEA must be consulted well in advance of any such installation. A discharge consent will be required. *Constructed Farm Wetlands (CFW) – Design Manual for Scotland and Northern Ireland.*

***Additional Information**.*

Video on dirty water available at Source to Tap (www.sourcetotap.eu) farmers tab on menu.

Rainwater Harvesting: an on-farm guide. Environment Agency. Download form ecosystemsdirect.co.uk or www.environment-agency.gov.uk.

Water Management on Your Farm – Scottish Farm Advisory Service

Guidance Note 6.

Construction and Care of Silos and Slurry Tanks to Minimise Pollution Risk

New Slurry Stores and Silos

Location -Nutrient Action Programme Requirements.

→ Underground stores must be situated at least 10 m from any waterway.

→ Above ground stores must be situated at least 50 m from any waterway.

With some specific exceptions, above ground stores constructed since 1 January 2022 must be inside a building or fitted with a cover to minimise emissions of odour or ammonia.

Statutory Permissions

If building or enlarging a slurry store or silo, planning permission may be required, and you should consult your local planning office for advice.

NIEA must be informed of any new or enlarged slurry store or silo. The application form needs to be signed by a chartered engineer confirming the standard of construction. Further information and a copy of the notification form is available from DAERA at www.darea-ni.gov.uk/publications/nutrient-action-programme-nap-notification-form.

In the case of older structures NIEA may require improvements where they consider that there is a risk of pollution and issue a notice of improvement to this effect.

Construction Standards

Making silage in field clamps without a constructed and impermeable base and an effluent collection system is prohibited.

The Nutrient Action Plan has assumed the same standards as the Control of Pollution (Silage, Slurry and Agricultural Fuel Oil) Regulations (NI) 2003 and require that all new or substantially enlarged stores and silos must be constructed to ensure a lifespan of at least 20 years. This effectively means that they must withstand their design loads

and contain the silage or slurry without being at risk of causing pollution for at least 20 years.

Slurry tanks, reception pits, effluent tanks and pipes/channels must be designed and constructed so as to be impermeable and to withstand corrosion and support loadings as specified in British Standard BS 5502-50:1993+A2:2010. Above ground tanks must also be able to resist corrosion for the required 20 years.

Where the walls are designed to be impermeable (weeping wall stores) the base must extend beyond the walls and have impermeable channels to collect any seepage and direct it to an effluent tank.

The banks and floors of earth bank lagoons must be lined with an impermeable liner or certified by a qualified engineer to provide suitable impermeability without a liner.

 **Like other open tanks they must be enclosed by stock and childproof fencing and have secure access points.**

Any outlet pipes on slurry tanks must have two valves in series, each capable of shutting off the flow. These must both be kept locked when not in use. The only exception is where they drain into a lower tank which is of equal or greater capacity than the first.

Care must be taken to ensure that tanks do not overflow and **a freeboard (distance between slurry surface and top of the lowest retaining wall) should be maintained of at least – 750mm for lagoons and 300mm for other stores**.

Middens and Washing Areas

Runoff from these areas is classed as slurry and must be collected and stored with other slurry or in dedicated tanks. Roofing middens will reduce the volume of slurry produced.

Silos

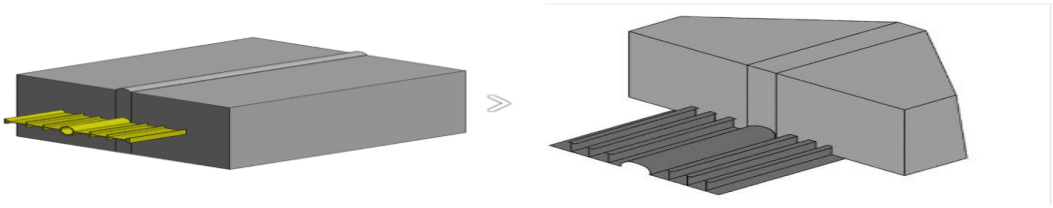
Unless constructed of earth banks, walls of new (completed after 1 December 2003) silos must be as resistant to corrosion as possible and capable of withstanding loading calculated using the methodology contained in the current British Standards BS 5502-22:2003+A1:2013. The load capabilities of the walls must be displayed on the walls and must not be exceeded.

Where the silo has earth bank walls or is cut into a hillside the walls must be lined with an impermeable membrane. This must be carried over the edge of the concrete floor slab to prevent any seepage into the earth banks.

The base of the silo, other than earth bank silos, must be impermeable (concrete or asphalt), extend beyond the walls and constructed to carry the anticipated load.

Like all materials, concrete expands and contracts with temperature. During the curing process heat is generated so it will contract significantly as it cures and cools. For this reason, joints are required in large structures to accommodate this thermal movement. There may also be some movement between walls and floors.

Continuous waterstops and/or sealants must be used at these construction joints to prevent effluent leakage at the joint. Waterstops can be difficult to place and hold in position while concrete is poured so sealing construction joints is popular.



Internal Waterstop *External Waterstop*

Concrete cures quite slowly to reach maximum strength and resistance to chemical attack, so always aim to complete the building work **at least a month before the silo is to be filled**. Ready-mix concrete is supplied in different grades depending on the strength and durability required. Tell your supplier the application and take their expert advice on the grade supplied. Typical grade for silos and effluent tanks is at least C32/40 which will have a 40N strength and minimum cement content of 350kg/m$^{3.}$

Lay the silo floor with a slope of approx. 1 in 60 from back to front to facilitate drainage.

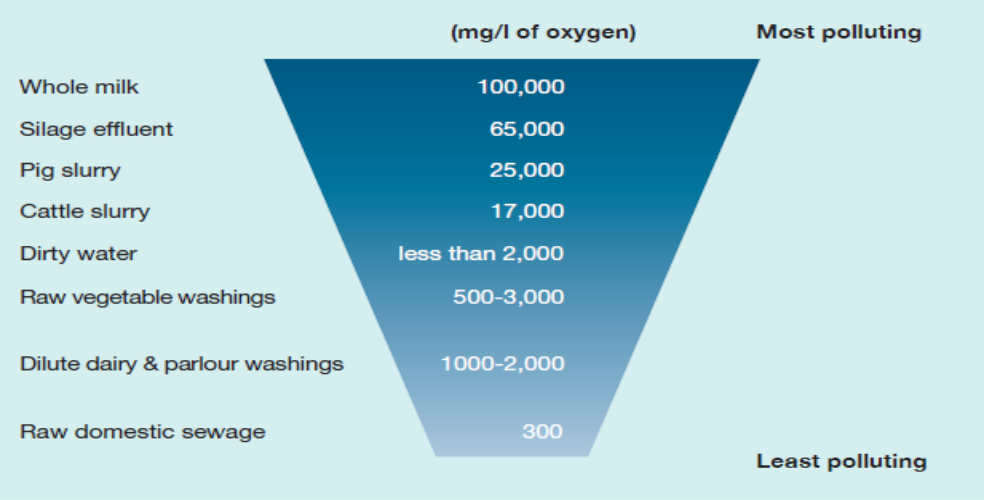
Provide internal drains to help reduce the pressure on the silo walls.

Profiled floor and drain to reduce internal pressure and 1,000-gauge polythene and drainage pipe protecting the floor/wall joint and reducing the possibility of effluent leaks.

Note: In practice this will be easier to manage if the vertical section is about 200mm up the wall and 300mm onto the floor. The sheet can be held in place with tape or adhesive or by placing grass on it when starting to fill the silo. This sheet and drainage

pipe not only reduces the chance of effluent leaks but also reduces the pressure load on the wall structure.

Silage effluent is highly polluting so must be collected through drainage channels at the silo front. It is good practice to also have kerbs or channels around the sides to collect any leakage.



Serious Pollution potential of silage effluent and slurry.

Effluent collection drains at the front of an open silo.

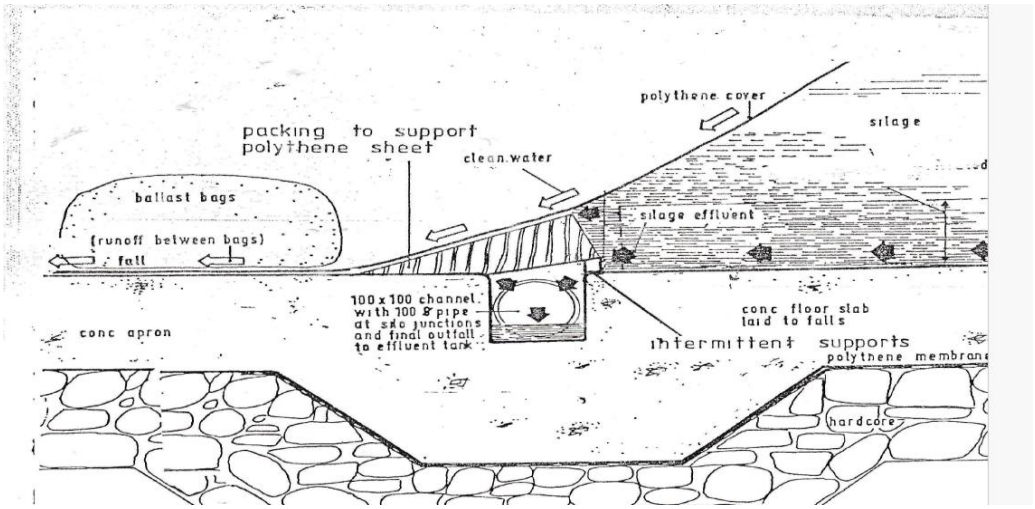


Diagram illustrating a) increased depth of floor slab in silo to accommodate the drainage channel and b) sheeting extended over the channel to stop clean rainwater entering the effluent channel.

The volume of silage effluent produced will depend on the moisture content of the ensiled grass. Direct cut grass at 18% dry matter will produce about 150 litres effluent per tonne but if wilted to 25% DM this reduces to 25 Litres per tonne. Flow starts within a few hours and tails off after 10 days or so.

Obviously with seasonal weather variation it is best to cater for a wet year and whatever the season it is essential to regularly monitor the flow, ensure collection channels are kept clear and be prepared to empty the tank and prevent overflows.

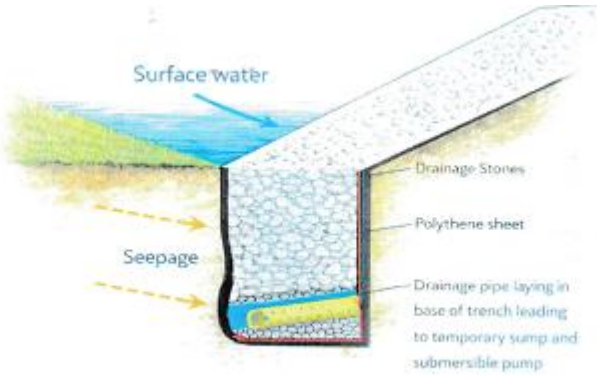
Effluent may be collected and stored in adjacent slurry tanks or in specifically constructed effluent tanks. These tanks must meet the same design criteria as slurry tanks and must **not** be fitted with an overflow pipe or bypass to a storm drain or waterway.

For silos with a capacity of less than 1,500m^3(approx. 1,000 tonne) allow a minimum tank capacity of 3m^3 per 150m^3 (or part thereof) of silo capacity.
For example, for a silo 20m x 10m x 3m (600m^3) allow a tank capacity of 12m^3. During periods of peak effluent flow, a tank of this size will need to be emptied daily.

Silos with a capacity of 1,500m^3 or more, should have an effluent tank able to hold at least 30m^3 plus an additional 1m^3 for every 150m^3 (or part thereof) of silo capacity in excess of 1,500m^3.

Remember that while silage remains in the silo any effluent and contaminated water must be collected and stored as slurry. This contaminated liquid can be pumped to a slurry tank in another area of the farmyard. Small submersible pumps have proved to be a very simple and cheap way of doing this. Indeed, they are useful to have in reserve for emergencies.

If the worst happens and effluent escapes the collection system, they have been successfully used to save the day by collecting effluent from a French Drain and pumping it back into the intended collection systems.



Emergency French Drain to contain escaping effluent or dirty water

Note: To prevent tearing of the plastic sheet washed gravel should be used rather than crushed stone.

It is important to regularly check waterways close to the farmyard during silage making to ensure that no silage effluent is escaping. This should be routine throughout the year but is especially important during silage making and the following month.

Field Clamps of Silage

Making silage in field clamps without a constructed and impermeable base and an effluent collection system is prohibited.

Storing Baled Silage

Silage bales must be stored or opened at least 10m from any waterway. When stored on hard standing an effective effluent collection system must be provided - as for other silage. Wilting ensiled grass to 25% DM should be the aim as this reduces the volume of effluent produced.

Silage bales stored too close to waterway

The plastic wrap should all be removed and stored securely with other plastic waste for collection by an authorised contractor.

Waste materials can be a hazard to wildlife and cause pollution so should be collected and stored to prevent wind blow and contamination of waterways prior to disposal.

Storing farm plastic for collection by authorised contractor.

Repairing Existing Silos

It is important to thoroughly wash and check all silos and yards each year when not in use and **in plenty of time to carry out repairs and allow time for the cement to cure before the silo is filled**.

Several types of defects may be evident –

Spalling of the concrete surface due to frost expansion or chemical attach from acidic effluent. This damage is unlikely to result in leaks as is generally only surface deep. If deeper or cracks are evident then the concrete slab will be weakened and will need to be replaced.

Surface spalling

One solution for damaged silo floors is to resurface with a 40 – 50 mm layer of Hot Rolled Asphalt . This has to be laid by specialist contractors. It requires a solid compacted sub-floor but can be laid on top of an existing concrete floor providing this is stable and sound. In some cases, the old floor is planed to remove loose material and lower the level. The asphalt normally used will have 40% stone content with a maximum stone size of 14mm.

The Asphalt is manufactured using sand, crushed rock, limestone filler and bitumen binder which provides an uninterrupted impervious layer. As a bitumen product it will soften in very warm weather so requires careful operation of loaders and grabs.

Where a new concrete slab is being laid this should be laid on top of 1000 gauge polythene sheet and include a reinforcing mesh to reduce cracking and the number of construction joints.- typically every 15m. A 200 mm wide waterstop should be included at every joint. All joints should be sealed after curing is complete, including the joint between wall and the new slab.

For both new asphalt and concrete floors the base of the silo wall must first be made sound to enable a secure and durable seal between wall and floor.

Loss of sealing in existing expansion/construction joints:

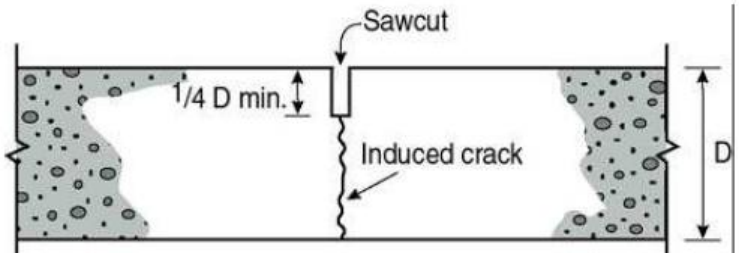
These construction joints are included in large slabs to accommodate expansion and shrinkage of slabs during the curing process and as the temperature changes. Single slabs are typically restricted to 6mx12m.

A 30m slab will be 10 – 12 mm (1/2 inch)) shorter on a frosty morning than in a hot summers' day.

These construction joints are now frequently made by sawing tracks in the concrete as it cures – typically 6 – 18 hours after laying. This will form a full depth crack and prevents random cracking but to contain effluent the joint needs to be sealed.

The seals in these construction joints can deteriorate and need to be replaced with suitable flexible sealers. Sealers may be polyurethane or two pack on top of hydrophilic backer rod which prevent loss in deep joints.

It is very important to use the correct sealer. Seek advice from specialists through your builders' merchants or supplier of precast slabs. Avoid overfilling which exposes the seal to mechanical damage.



Sawed Construction Joint showing full depth crack.

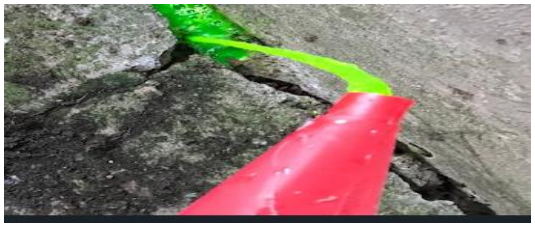
Sealing Construction Joint

Wandering Cracks in floors

These have developed after construction and unless sealed will leak effluent and get worse with time.

It is important to start the repair by power washing the cracks and then using a concrete saw or grinder with diamond blade to cut away any loose concrete and form a track to hold the sealant. Clean away dust with a leaf blower or vacuum. Narrow cracks can then be filled with polyurethane or other gun applied proprietary sealer. Hot poured rubberised bitumen can also be used. Some sealers may require a primer to be brushed on first and then the sealer sticks to the tacky primer. Deep cracks will need to be filled with sand or a backing strip. In all cases follow the manufacturers instruction carefully.

If there is any doubt about whether a crack is full depth and a potential source of leaks this can be checked simply with a watering can. If water seeps away, then there is a potential pollution problem requiring attention.



Checking for leaking cracks using a watering can

Wider cracks are best filled with an **SBR (Styrene Butadiene Rubber)** mix. Again, prepare the crack by power washing, cutting away loose concrete and blowing/sucking away the dust to leave a “clean” joint.

The SBR liquid is widely available from building suppliers and provides much better adhesion and flexibility than pure mortar mixes. After preparation of the crack a bonding or slurry coat is applied to the surfaces. This bonding coat is made by mixing cement with the SBR – two parts cement and one-part SBR to produce a brushable slurry consistency. This is then brushed onto the crack sides followed by the SBR repair mix (e.g. 150kg sharp sand, 50 kg cement and upto 10 litres SBR to produce a stiff mortar mix). It is important that the repair mix is applied and finished before the slurry coat dries – “wet on wet “application.

Small holes in a floor can be repaired using the same technique provided the subbase is sound and secure. Fill the hole with concrete and then top off with the SBR mix which is bonded to the hole edges using the SBR slurry mix. However, when multiple cracks lead to actual structural failure the concrete will need to be replaced or covered with a new floor of concrete or Asphalt.

Cracks causing leaks between walls and floors.

Despite reinforcing steel at these joints, cracks can develop between silo walls and floors over time, due to overloading and hydraulic pressure. This route for effluent escape can be corrected using the same SBR / cement technique. In this case after preparation and applying a bonding coat, a narrow fillet of SBR Repair Mix is laid along the joint.

Whatever technique is used it is very important to follow the manufacturers instruction and measure out the constituents carefully.

Silo Wall Movement

Silo walls are generally designed to withstand loading to the wall height. Due to the leverage effect overfilling will seriously overload the wall – a 20% overfill can cause 60% overload at the base of the wall.

Wall movement leads to effluent escape at the wall base

As well as avoiding overfilling, inclusion of the drainage pipe at the wall base is important as it helps reduce hydraulic pressure loading on the wall.

Repairing cracked floor using SBR mix.-

Locate crack in floor

Clean with power washer

Remove loose edges with grinder fitted with diamond cutting disc

Blow clear of debris

Mix slurry paste with SBR

Paint slurry paste on crack edges

Apply repair mix before slurry dries

Fill floor cracks or add fillet between floor and wall

Guidance Note 7.

Guidance on protection of water quality when using pesticides in agriculture

Very comprehensive guidance on the use of pesticides in agriculture is provided in the Code of Practice for using Plant Protection Products available on the DAERA website at https://www.daera-ni.gov.uk/publications/code-practice-using-plant-protection-products.

The three key principles in the application of pesticides which govern the whole process are –

1. Only use pesticides when necessary**.** While pesticides are often essential to control pests, diseases and weeds, they are both expensive and can pose a threat to the environment, including water quality, so should only be used as the last resort.

   The *Integrated Pest Management (IPM) approach* should be used **–** this relies on monitoring pest populations e.g. weed and disease levels and using chemicals only when really necessary. The goal is to prevent pests from causing significant economic damage while encouraging natural control and minimising the negative impact of agriculture – including pollution of water.

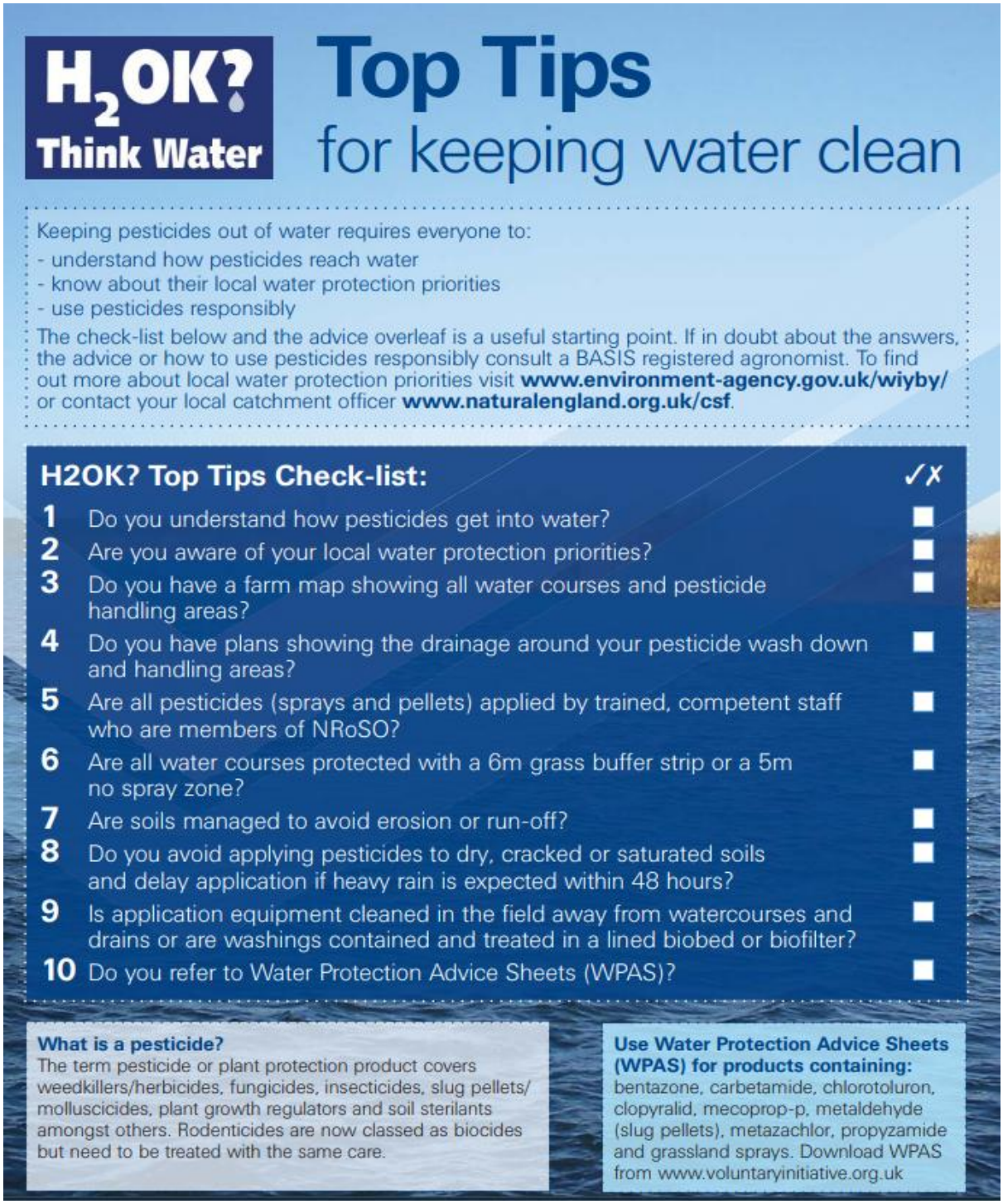
2. Select the best pesticide for the job. Obtain professional advice from a BASIS trained agronomist to avoid wasting money and causing unnecessary pollution by using the best possible chemical for the pest/disease involved.

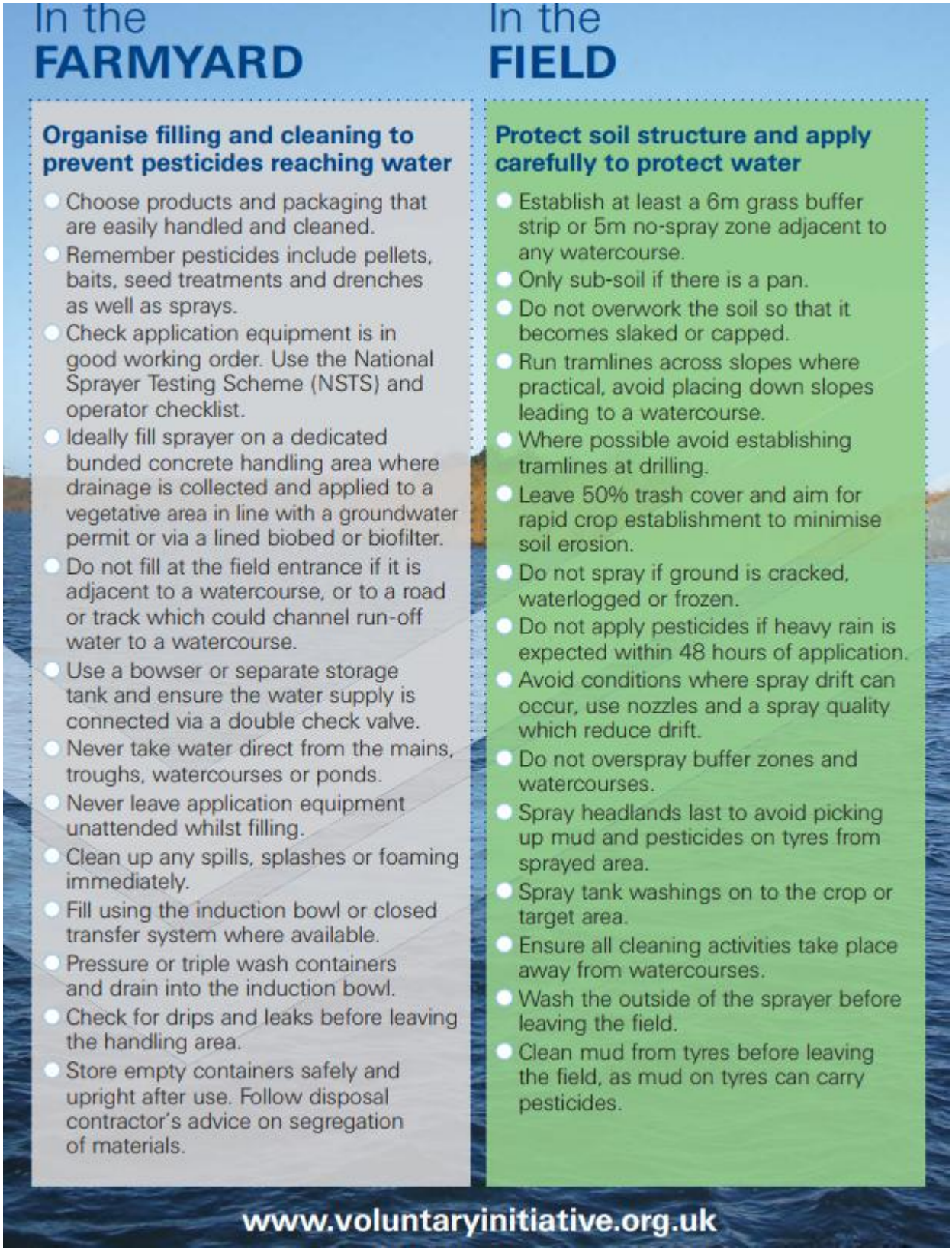
3. Maximise effectiveness by careful application in line with the manufacturers label guidance.

Care is especially important in the filling area where runoff drains lead to waterways. Up to 70% of pesticide chemicals reaching water can come from handling areas

For example the pesticide on one foil can-seal contains enough pesticide to increase residues above the 0.1µg/l standard in 30km (18 miles) of 1 m wide stream. (Ref Voluntary Initiative)

To minimise the risk to water, observe the following guidance, as provided by the Voluntary Initiative organisation –





Operators must ensure that the application equipment (sprayer) is tested regularly as required by the Plant Protection Products (Sustainable Use) Regulations 2012. These requirements apply whether the user is a farmer or contractor.

Equipment Type	Initial Test Due	Re-test Frequency
Boom sprayers over 3 metres, air assisted broadcast sprayers, and sprayers on trains/aircraft	Before the machine is 5 years old	Every **3 years**
Boom sprayers 3 metres and under, weed wipers, micro-granular applicators, slug pellet applicators, and other specialist equipment	Before the machine is 5 years old	Every **6 years**
Handheld, knapsack, and pedestrian equipment	No formal test required	Must be inspected regularly by a competent person, with records kept

NSTS or National Sprayer Test Scheme is the only officially recognised provider for certification of pesticide application equipment in the UK.

All sprayer operators and users of rodenticides etc must have been trained and hold the Certificate of Competence relevant to the pesticide and its method of application- e.g. Boom Sprayer / Knapsack Sprayer.

The most common Certificates of Competence for farm applications are –

PA1. Foundation Unit – Principles of Safe Handling and Application of Pesticides. This is mandatory for all operators.

Some common application-specific certificates.

PA2. Boom Sprayers – mounted, trailed and self-propelled.

PA6. Handheld applicators (Knapsack Sprayers)

PA2F – Weed wipers.

There are other Tests / Certificates relating to specific applications e.g. orchard sprayers and seed treatment.

Competent and qualified sprayer operators can be identified through the **National Register of Sprayer Operators (NROSO)**. Members must hold the required Certificate of Competence and undertake continual professional development and training each year.

Water Catchment Partnership Risk Analysis

The Water Catchment Partnership is a working partnership established with representatives from Ulster Farmers Union, Northern Ireland Water, Northern Ireland Environment Agency, Department of Agriculture, Environment and Rural Affairs (DAERA), CAFRE (College of Agriculture, Food and Rural Enterprise) and the Voluntary Initiative.

The aim of the partnership is to deliver one message from all organisations to effectively tackle the problem of pesticides in the water environment: particularly in drinking water.

The Partnership has identified 10 key areas of risk –

In the Yard.

- **Storage** – a small leak of concentrated pesticide can cause a serious incident.
- **Sprayer Maintenance** – a leaking pipe or loose connection wastes product and increases the threat to water quality
- **Filling** – washings from even a single cap can raise chemical levels for many miles downstream
- **Washing** – especially dangerous on concrete yards (washings need to be trapped for safe disposal)
- **Disposal** – empty containers need to be thoroughly washed into the sprayer and disposed of by a waste contractor or by taking them to a licensed waste-disposal or waste-recovery site.

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Small Pesticide Storage Cabinet with leakproof sump

In the Field.

- **Cracked soils -** allow chemical to pass down the soil profile and into drains.
- **Runoff and soil erosion** – removes chemicals in solution and attached to soil particles.
- **Tramlines** – should run across slopes to avoid runoff carrying chemicals into waterways.
- **Timing** – rainfall within 48 hrs of application can wash pesticides into drains and waterways.
- **Drift** – poses threat to plant life and waterways. Use the correct pressure and low drift nozzles. Don't spray in windy conditions.

Operators should always work to minimise these risks by –

1. **Seeking and taking BASIS qualified professional advice** -- using the correct pesticide reduces the quantities applied by being more effective.
2. **Storing and handling with care** – Follow the instructions on the label; avoid spills on concrete surfaces; and always park sprayers under a roof or on bunded filling areas.
3. **Managing soil to avoid water runoff** into watercourses – don't overwork soil; don't spray if soil is cracked or waterlogged; leave some surface vegetation and encourage rapid crop establishment; avoid tracking and poaching at gateways.
4. **Handle and dispose of pesticides and containers to prevent point source pollution** - Choose products which minimise the risk of spills and splashes and make container cleaning easy.

   Review your filling area – identify and protect any farmyard drains that could pose a risk to water; Handle and mix on an impermeable surface e.g. concrete, where washings are collected and drained to a lined Biobed.

   Avoid using filling points beside a watercourse or any area, e.g. road or track which may channel run-off to a watercourse. **Water should never be sucked directly from a watercourse or direct connections made to a mains water supply.**

   Check the sprayer is in good working order. Use the **National Sprayer Testing Scheme (NSTS)** and operator checklist. Check for drips and leaks before leaving the mixing area.

Never leave the sprayer unattended whilst filling; Fill using the induction bowl or closed transfer system where available.

Triple wash containers with water and drain into the induction bowl. **Rinse seals and lids over the induction bowl or sprayer tank.**

Store cleaned empty containers safely and upright after use. Follow disposal contractor's advice on segregating clean packaging material.

5. **Field Applications.-**

Only use pesticides approved for use on the crop being sprayed using the intended application method (sprayer / applicator)

Establish and respect buffer strips beside watercourses. **A minimum no-spray zone of 5m from watercourses is required but this will be extended for certain pesticides – check the manufactures instruction / product labels before use**.

Don't spray when soil is frozen or waterlogged or there is a risk of drift. Spray headlands last.

Clean the sprayer, well away from watercourses**.**

Spray tank washings onto the crop.

Wash the outside of the sprayer before leaving the field

Clean tyres before leaving he field.

Videos

*A short video of **pesticide storage** can be found on the farmers section of the Source to Tap website (www.sourcetotap.eu.).*

*A 5 minute Teagasc video on **spraying for rush control** will be found by searching* "teagasc- spraying for rush control"

Comprehensive practical guidance on the storage and use of pesticides is provided on the Voluntary Initiative website www.voluntaryinitiative.org.uk.

Dealing with surplus spray and washings.

Surplus spray should be avoided, if possible, by accurate calibration and only mixing enough to spray the area required. If there is still some left this should be sprayed over an equivalent crop area.

For small areas and spray volumes.

Splashes and drips must be collected in a drip tray or portable bund and returned to the sprayer tank.
Wash down the sprayer in the field after use.

For larger areas and volumes.

A specific area for filling sprayers should be provided. This should be -

- At least 10m away from any watercourse or vulnerable site.
- At least 50m away from any borehole spring or well.
- More than 250m from any borehole used to supply water for domestic use or food production.
- Away from existing farmyard flash flood routes, rainwater outlets and gutter outfalls and downslope of farmyard drains
- Surrounded by a bund (an 8- 12cm concrete lip) to keep the handling area water within the area.

The filling area should preferably be roofed as it will reduce the volume of liquid to be stored and handled. Runoff from the area needs to be collected and stored separately for collection by a licensed waste disposal contractor or processed through a Biofilter or Biobed.
A **biobed** is a specially lined excavated pit designed to reduce the levels of pesticides within wastewater.

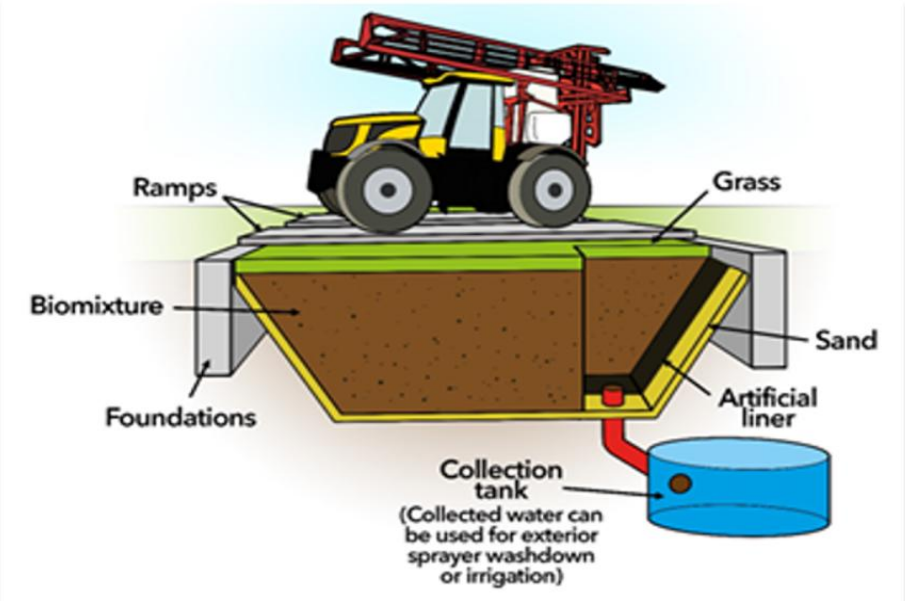

Diagram of a Biobed – for processing larger volumes of water lightly contaminated with pesticide. (Ref Farming and Water Scotland.org.)

A **biofilter** is a similar to a biobed and is better suited to smaller farms. Instead of a pit it is constructed with intermediate bulk containers (IBCs). In both cases the dilute pesticide is passed through a mixture of straw, soil and peat-free compost which research has shown to be very effective at retaining and degrading pesticide residues. Before installing either you should consult NIEA to check and obtain any necessary approvals and get guidance on the disposal /uses of the “treated” liquid.

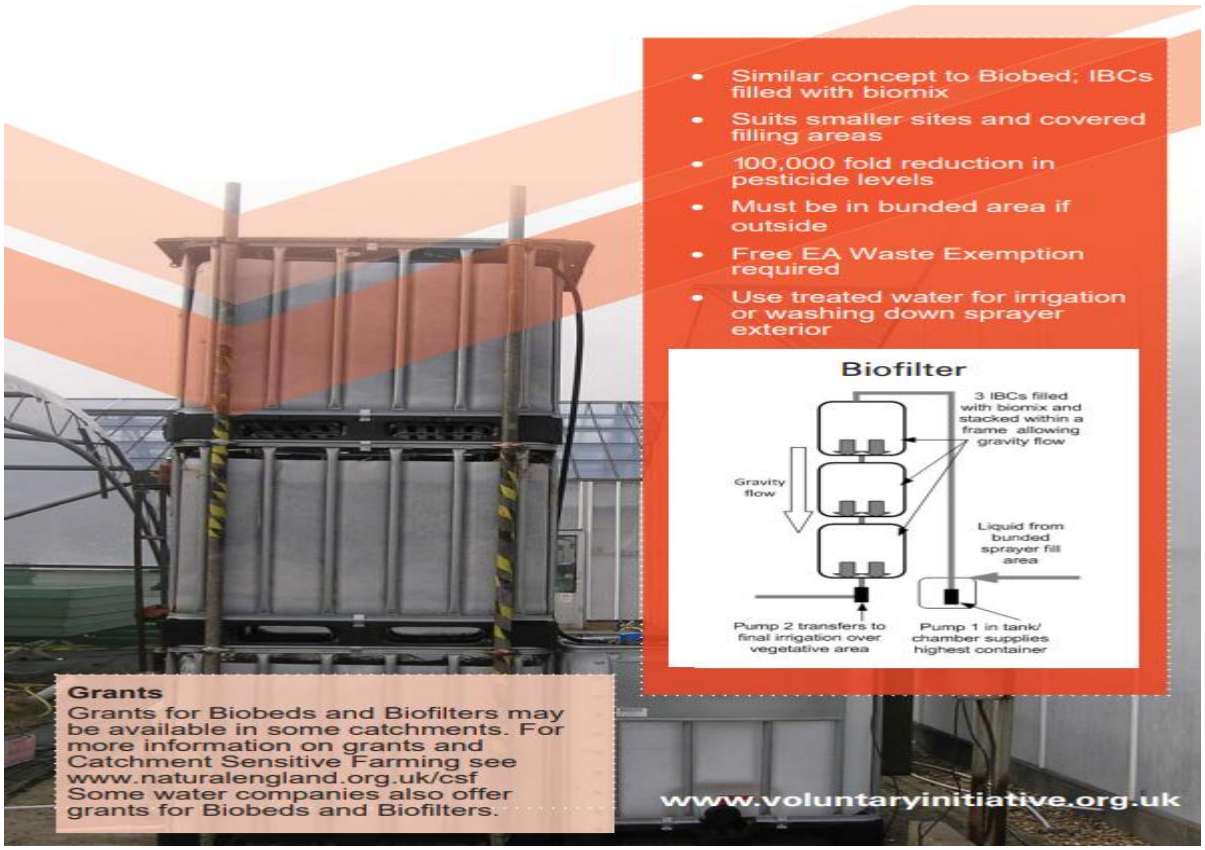

Diagram of simple Biofilter using adapted IBC containers. (Ref Voluntary Initiative)

The biofilter works by filtering the contaminated water though a composted mix of soil, peat substitute and straw where microorganisms, like bacteria, consume the pollutants as a food source, breaking them down into harmless byproducts like carbon dioxide and water.

Further information on Biofilter design and use is available from CAFRE or on the Voluntary Initiative and Catchment Sensitive Farming websites. www.voluntaryinitiave.org.uk. and www.farmingandwaterscotland.org.

If you are involved with or become aware of a pollution incident

(including a major pesticide spill or store fire) you should call the NIEA

Urgent Pollution Incident Number -

0800 807060 which operates 24 hr each day.

Weed Wipers, MCPA and Water Quality.

NI Water frequently detects high levels of MCPA in rivers and lakes and at abstraction points for some of the drinking water sources in Northern Ireland. This MCPA has to be removed in the water treatment process to meet stringent drinking water standards. However, this is an expensive and slow process as all the contaminated water must be diverted and passed through a carbon filter. MCPA is a selective herbicide specifically designed to kill weeds without harming crops and is a common active ingredient in both agricultural and domestic herbicide products. MCPA is widely used for controlling the growth of weeds like the Common Soft Rush, but it does not bind to soil particles so is prone to leaching. Once in a waterway it can take 3 – 4 weeks to break down without treatment.

Weed Wiping has been shown to provide an effective method of rush control which is much less likely to contaminate water supplies.

Weed Wiper pulled by Quad Bike used for rush control.

Weed wiping typically involves applying glyphosate directly to the rushes using a fabric covered roller soaked in pesticide. The application is highly targeted and avoids damage to surrounding grass and clover. To be effective, the rushes must be grazed tightly or mowed in advance so that they are actively growing and stand taller than the grass. These rushes (or other weeds) are then wiped with glyphosate. This method uses less herbicide, reduces spray drift, and is more environmentally friendly than boom spraying with MCPA, as glyphosate breaks down faster in the environment.
Weed wiping requires operators to hold a specific Certificate of Competence (PA2F) for this purpose.

A short (10 minute) video on methods of rush control will be found on the Source to Tap website and accessed through the "Farmers" tab.

Records Required when using pesticides – including rodenticides.

Records of the use of pesticides must be completed and kept for at least 3 years.

Examples of records for rodenticides and plant protection products are provided on the flowing pages.

A record should also be kept of the **pesticide products in the store**. These should include –

- The date the pesticide was taken into the store, or removed from the store;
- Name of the pesticide and Ministerial Approved Pesticide Product (MAPP) number (from product label);
- Amount taken in, or taken out.
- The amount of the pesticide remaining in stock.
- Signature of the person putting the pesticide into/out of the store, along with any relevant comments.

This up-to-date stock list should be kept in duplicate with another copy kept in a separate location, e.g. the farm office

Disposal of Pesticide Containers.

Clean pesticide containers correctly at the time of use. This ensures that any potential source of pesticide exposure to people, animals and the environment is kept to an absolute minimum. It is also economical and efficient to add the washings to the spray tank as this ensures that all the chemical is used and minimises waste disposal costs.

Take the time to clean containers properly. It is easier and quicker to clean the containers "on the job" rather than leaving material to dry which then needs to be cleaned later.

Rigid Containers should be triple rinsed – Fill with 10-20% water , replace cap, shake vigorously, remove cap and add washings to the sprayer tank, repeat twice. **Check container is visibly clean** and if not repeat until clean. Drain thoroughly, replace cap and retain in secure area for disposal. Correctly cleaned containers do not need to be treated as hazardous waste.

Farm waste regulations mean that burial and burning of waste such as pesticide containers on farm is now illegal.

Recycling Contractors may accept clean containers. These may also be accepted at licensed disposal sites – otherwise use a Licensed Waste Disposal Contractor. Check with the contractor if seals need to be removed - if not leave them partially attached to the container or put them back in the container. In all cases they must be visibly clean.

NOTE:
New recording requirements were introduced from January 2026 [under Regulation (EU) 2023/564] . These relate to the content and method of recording pesticide use by professionals in the agriculture, horticulture, forestry and amenity industries.

These requirements include -

- Prompt recording of use.
- Additional record of :
    - Product authorisation number (MAPP)
    - EPPO codes for crops/land uses
    - BBCH codes for crop growth stages
- Contractors must provide the farmer with a copy of all relevant pesticide application records without delay.
- The person who carries out the spraying must keep the records in the specified format and, if requested to do so, submit these to the Department.

From 1 January 2027 all records will have to be held electronically/digitally. Additional guidance and a downloadable excel template will be provided by DAERA.

If records are initially created on paper, they must be converted into the prescribed electronic format by 31 January of the year following the year of use.

Pesticide (Plant Protection Products) Record of Use.(See note on page 46 re the introduction of additional requirements and mandatory electronic format from January 2027.

Name …… Address…….

Date	Operator	Site of operation (Field Name or number)	Crop treated	Reason for treatment	Product Used	Application rate – active ingredient and water	No of tanks	Weather conditions	Start and finish times	Other Information. e.g. stock removal or withdrawal

Baiting Record

This plan is to be completed by the person responsible for vermin control and kept up to date.

Identify the location on a sketch or farm map or list in the table with a clear description of the location.

Location number	**Bait Used.** ***Not required if using trap***	**Date**	**Person**	**Inspection**	**Replenishment**

Guidance Note 8

Storage of Fuel Oil on Farms

Oils such as heating, fuel and lubricating oils, when polluting a waterway, form a surface film which reduces the oxygen content of the water and can kill fish and plants. Diesel fuel, in particular, is very toxic to invertebrates.

Where a Diesel fuel spill enters a watercourse, water will be unfit to drink or use for irrigation. Fish will be tainted and inedible and the effect lasts long after the initial spill.

Storage Requirements.

For these reasons storage tanks should be sited to prevent spillage and leaks reaching waterways and those over 1250 litres must comply with the Control of Pollution (Silage, Slurry and Agricultural Fuel Oil) Regulations 2003 or SSAFO Regulations.

This applies to Farm Fuel Oil storage installed after 2003 and with a capacity over 1,250 litres, and imposes specific requirements aimed at minimising the risk of pollution should a tank, piping or taps fail.

Basic requirements include:

- Designed, constructed and maintained to have life of at least 20 years.
- A secondary tank or bund capable of “catching” and retaining 110% of the tank capacity; and
- Any tap which discharges to the open attached to the tank shall be within the bund and shut and locked when not in use; and
- Flexible Hose fitted to tank must close automatically after use and be held within bund when not in use ; and
- Situated no less than 10 m from a waterway, including drains, which the fuel oil could enter.

New installations must be notified to NIEA at least 28 days before brought into use

Bunded fuel tank installations can be constructed on-farm but are difficult to manage as unless under a roof or indoors the bund will fill with water and need draining. For this reason self-contained pumped double skinned tanks which meet the SSAFO requirements are increasingly popular.

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Typical Farm Fuel Oil (Diesel) Storage Tank, with pump, which meets the SSAFO Requirements.

Note: The SSAFO requirements do not apply to fuel tanks used to store oil used for heating a domestic dwelling. These are covered by separate legal requirements.

Waste Oil must be stored securely prior to disposal using a licensed contractor or disposal facility (Local Authority Site) .

A **notification form** to advice NIEA of a new agricultural fuel oil storage facility which exceeds the 1250 litre capacity limit, will be found on the DAERA website or using this link.

https://www.daera-ni.gov.uk/sites/default/files/publications/daera/nap-notification-form-2019.pdf.

Guidance Note 9.

Safeguarding water when using Sheep Dips

Sheep dipping and spraying plays an important part in ensuring good animal welfare and performance. The chemicals used are highly effective in controlling parasites that colonise sheep skins and fleeces. However, if not used correctly even very small quantities can have devastating consequences for water quality and the aquatic environment. There have been instances where the aquatic life in many miles of watercourse has been killed as a result of the entry of tiny amounts of dip.

Groundwater, as accessed through boreholes and wells, can also be at risk and so certain legislative requirements govern the handling and disposal of these chemicals are in place. e.g Cross compliance codes and Groundwater Regulations (NI) 2009 as amended. **In particular the disposal of sheep dip must be authorised by NIEA and carried out in line with this authorisation.**

Treatments containing Organophosphates (OPs) and Synthetic Pyrethroids (SPs) are extremely toxic even at low concentrations. The newer SP based dips are 100 times more toxic to wildlife than OP based dips.

These chemicals are also toxic to humans and good quality Personal Protective Equipment (PPE) , as specified by the product supplier, must be used at all times. Comprehensive advice on personal safety when sheep dipping is provided in the Health and Safety Executive Information sheet – *"Advice for farmers and others involved in dipping sheep"*

The purchaser of any sheep dip product must hold a Certificate of Competence in the Safe Use of Sheep Dips. Those carrying out the dipping must have this certificate or be operating under the control of someone who has.

Sheep dipping or spraying can be carried out by mobile operators /contractors. Farmers should ensure that the contractor holds the relevant Certificate of Competence and that both parties have a clear understanding of their individual responsibilities. The Sustainable Control of Parasites in Sheep organisation (SCOPS) has developed a useful Mobile Sheep Dipping Code of Practice for Farmers, Mobile Dipping Contractors and Prescribers. This is available to download at www.scops.org.uk.

Comprehensive Codes of Practice are available for sheep dipping e.g. Shep Dipping Code of Practice for Scottish Farmers, Crofters and Contractors. However, the following are the key elements relating to protecting water quality.

Dos

- Adopt standards of flock management which minimize the extent of ectoparasite infection on your farm.
- Choose the pesticide with care to ensure it is effective and approved in Northern Ireland for the treatment required. Some are approved for dipping but not spray application. If in doubt seek Veterinary guidance. Follow the label instructions on dilution and use, to ensure the treatment is as effective as possible.
- Alternatives such as injectable or pour-on products reduce the risk of water contamination and may provide the control required.
- Site permanent sheep dips and locate mobile dips –
    - At least 10m from waterways including drains, ditches and streams.
    - At least 50 m and preferable more from any spring, borehole or well.
    - On level impervious surfaces which prevent runoff to waterways or roadways. Runoff should be able to be collected.
    - If mobile dip is used in a field, then this should be flat or gently sloping with well-established grass cover. In this situation the distance to a drinking supply should be extended to 500m.
- Ensure dipping baths and pens are leakproof and that the bath does not have an open drain hole – found on some older dipping baths.
- Fit splashboards to help protect the operator and reduce pollution.
- Plan the dipping operation in advance. Identify and minimise any risk of pollution and have plans to deal with any leaks or overflows.

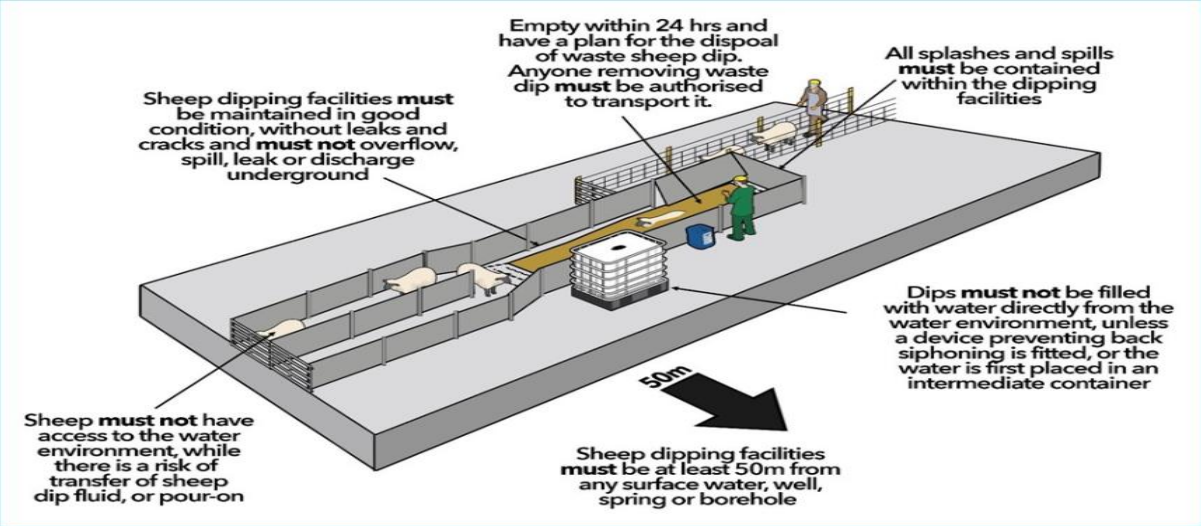


Diagram illustrating features of a good sheep dipping installation. Farming and Water Scotland

- Fill bath with water first before adding dip chemical (avoids overflow when filling dipper). Check bath level regularly and top up with water and pesticide as necessary but do not overfill. Thoroughly wash and rinse containers into the dip bath.

- Always wear the correct PPE (protective clothing and masks) and have spares available to ensue no dipping liquid gets onto your skin. Clean this thoroughly after use – washing into the dip bath.
- Hold the sheep in drip pens for at least 10 minutes and ensure that surplus dip flows back into the dip bath.
- Keep freshly dipped sheep off waterlogged ground and away from contact with water in rivers, streams etc for several days after dipping. While the risk of contamination diminishes considerably after 2 days best practice suggest avoiding contact with waterways for at least 2 weeks.

Don't

- Allow dip to enter a watercourse – this causes serious pollution and could result in legal action.
- Use dips not approved for use in NI.
- **Delay contacting NIEA if a pollution incident occurs – NIEA 24 hr pollution hotline is 0800 807060**.
- Dispose of unused sheep dip other than according the NIEA Authorisation
- Leave sheep dips unattended or uncovered.
- Store sheep dip for re-use or delay emptying, unless weather conditions prevent safe disposal. Empty the dip as soon as possible
- Allow the dip bath to overflow.
- Dispose of sheep dip without following conditions in NIEA Authorisation .
- Forget to complete and keep records of the date and location of the sheep dipping and the type of dip (pesticide) used.

Disposal of Used Sheep Dip

NIEA Authorisation is generally required for most farms to dispose of waste sheep dip (including cosmetic dips and shampoo) and tank washings from PPEs (unless sprayed onto the target crop). The authorisation will include conditions such as the area to be used for disposal and the method of disposal.
The Application Form can be downloaded from the DAERA website at https://www.daera-ni.gov.uk/publications/groundwater-authorisation-application-form.

Additional information.

CatchmentCARE and Teagasc Sheep Dip Demonstration. This short (10 minute) video covers important elements of dipping using a mobile Dip Trailer.

Teagasc – Best Practice for sheep dipping Short video based on newly constructed sheep dipping unit. Also covers waste dip disposal in Ireland.

Note: In Northern Ireland sheep dip disposal will need to comply with an NIEA Authorisation.

Guidance Note 10.

Livestock Exclusion at Watercourses

Where stock have access to rivers or streams, they can adversely affect water quality by –

- Defecating in the water which both adds nutrients and disease organisms; and
- Tramping in the banks which adds soil to the water which increases turbidity and carries nutrients, especially phosphorous. Soil can also cover gravel spawning grounds on the riverbed. This turbidity or discolouration of the water requires additional treatment in the water treatment works.

By excluding stock from rivers, you also reduce the risk of injury, lameness and transfer of livestock diseases from farms upstream.

Fencing must be at least 2 m back from the bank edge and of a standard which excludes the stock from the river – e.g. 4 strands barbed wire and at least 1.2 m high for cattle.

Where grant aid is being sought all posts should be treated with preservatives by the manufacturer and have a guaranteed 15-year life. Strainers and struts should be used to withstand expected loads. Livestock must not graze the banks behind the fence but it may be mown except between 1 March and 31 August.

Sheep fencing can be a problem on land liable to flooding by collecting debris which in flood flows will overload the fence and posts. If sheep fencing must be used, then use 2 strands of barbed wire at the top with sheep netting below and overall height of

1.2m. Due to the high loads imposed in floods, sheep fences will last longer on smaller streams and on high banks where floods do not reach.

Debris on Sheep Fencing in flooded meadow

Where livestock are excluded from waterways, alternative livestock drinking facilities obviously need to be provided. The options available are:

- **Pasture Pumps.** Cattle operated pumps can lift water from the adjacent river or stream.
- **Solar Powered drinking troughs**. These use a solar powered pump to lift water from a river or stream into a drinking trough. Unlike pasture pumps these can be used for sheep.
- **Mains supplied drinking troughs**. These require that mains supply is within a reasonable distance.

Pasture Pump and Solar Powered Drinking trough replacements for river access.

A short (3 minute) video on Livestock Fencing and Alternative Watering Facilities will be found in the Farmers section of the Source to Tap website (www.sourcetotap.eu.

Minimising Surface Runoff from Agricultural Land

Surface runoff occurs when rainfall on land exceeds the infiltration rate and the excess water flows along the surface carrying with it dissolved nutrients and soil particles. This water will also carry other products such as pesticides and plant material. Such runoff will be identified as a brown plume in a stream or river.

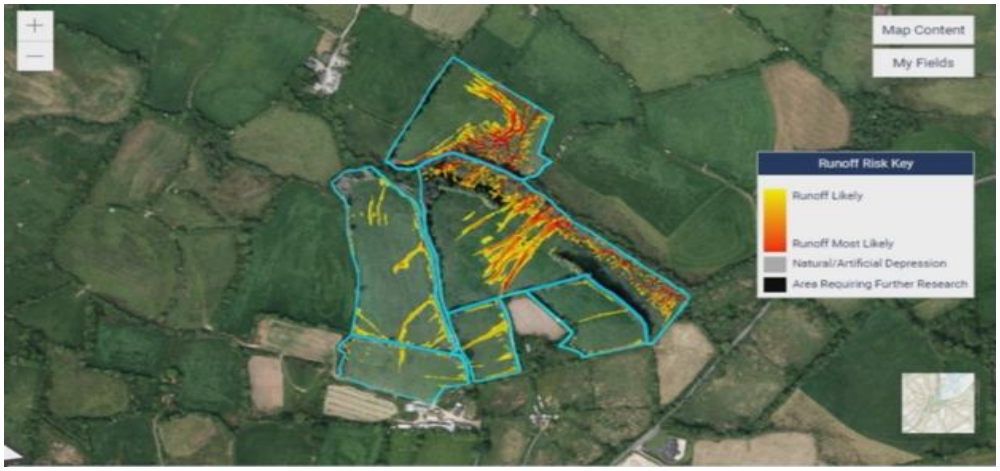
With an increase in extreme weather events predicted, due to climate change, runoff and soil erosion is expected to be an increasing problem.

Ther are many reasons why this runoff should be reduced –

- The topsoil in which we grow our crops has taken centuries to develop but is being lost at an alarming rate.
- The soil particles washed into streams and rivers can physically impede flow, cover the gravel beds used by fish when spawning and increase the cost of drinking water treatment .
- The runoff water can also contain nutrients such as nitrogen and phosphorous, which cause enrichment and eutrophication of rivers and lakes.
- Slurry or fertiliser, if spread under wet conditions or followed by heavy rain, can be a particular pollution risk on steep slopes.
- If the crop or grassland has recently been sprayed with pesticides the water will contain some residues which contaminate the water and must, at considerable expense, be removed at water treatment works.

How can this runoff be minimised?

1. Identify high risk areas.



The Lidar Runoff Risk Maps included with the farm Soil Nutrient Health Scheme results, provide useful indications of high-risk areas and should be the starting point for considering decisions on action to minimise runoff. High risk areas are identified in red.

To access these maps the farmer or agent needs to log onto DAERA on-line services through the Government Gateway, click on the “Soil Nutrient Health Scheme” button, followed by the “Download Results PDF button ” and then scroll down to the “Runoff Risk Map”. This can be viewed on screen or printed off in the usual way.

Note: LiDAR stands for Light Detection and Ranging. It is a remote sensing method that uses a pulsed laser to measure distances and create 3D models of the Earth's surface and objects

2. Practical action to minimise surface runoff.

This should be determined before starting work by a risk analysis which takes into account the following guidance**.**

a) Observe restrictions in Nutrient Action Programme (NAP) Guidance.

i) Do not spread fertiliser or organic manures during closed periods:

Fertiliser Type	**Closed period starts**	**Closed period ends**
All types of chemical fertiliser*	Midnight 15 September	Midnight 31 January
Slurry, poultry litter and other organic manures – e.g. sewage sludge, anaerobic digestate, mushroom compost etc.	Midnight 15 October	Midnight 31 January
Farmyard manure	Midnight 31 October	Midnight 31 January
Dirty water	No closed restriction period but land condition restrictions apply – section iii) below.	

**Exceptions apply for crops with a demonstrated need and for the application of potassium fertiliser to grassland.*

ii) Observe application rate restrictions in NAP Guidance.

Maximum rates which can be applied are .
- Slurries 50 m^3 per ha (4,500 gallons per acre)
- Solid organic manures 50 tonnes per ha (20 tonnes per acre)

From midnight 30 September until midnight 15 October and during February the maximum slurry application rate is reduced to 30 m^3 per ha (2,700 gallons per acre)

These are maximum amounts and the rate used will vary depending on the outcome of a Risk Assessment to ensure that the quantity of organic manure applied does not cause run-off of the manure into a waterway.

iii) Never apply fertilisers or manures (including dirty water) when:

- Soil is waterlogged.
- Land is flooded or likely to flood.
- Ground is frozen hard or snow covered.
- Heavy rain is forecast in next 48 hrs.
- There is a significant risk of runoff to a watercourse**.**

iv) Take care to observe buffer zone restrictions contained in the NAP Guidance

Note The recommended distances should be increased when land slopes towards a waterway or other factors increase the risk of runoff to a waterway.

Fertiliser application: usually to no less than 2 m from a waterway.

Organic Manures: usually to no less than;

- 20 m of lakes (30 m from 15 October to end February)
- 10m (15 m from 15 October to end February) of other waterways including drains back-filled with stone to the surface**.**

Distance may be reduced to 3 m where the land slope is less than 10% towards a waterway and the manure is spread with LESSE such as dribble bars and trailing shoe spreaders.

Exceptions also apply for small fields (under 1 ha) and where field is narrow (no more than 50m wide)

- 50 m of borehole, spring or well.
- 250 m of borehole used for a public water supply.
- 15 m of exposed limestone feature.

NOTE: When applying pesticides the designated no-spray strip adjacent to waterways must be observed – 5m minimum but check the manufacturer's instructions on the product label.

b) Avoid soil compaction.

Soil compaction occurs when external pressure from a vehicle or animal squeezes the soil particles together and decreases the pore space between the particles. This decreases infiltration and increases surface runoff as well as increasing the soil bulk density and the difficulty of root penetration; hence impacting on grass/crop production. The aim should always be to avoid it through good soil management.

Compaction is less likely in soils which are managed to give good soil structure with macropores and cracks which allow water infiltration and drainage. Higher organic matter and liming are important to provide good structure.

As soil becomes wetter it loses load bearing capacity and so compaction occurs to a greater depth.

In Northern Ireland, soil compaction is mainly caused as a consequence of traffic, treading by animals, cultivation operations and damage or poor soil structure.

The potential for wheeled vehicle compaction in any given situation is governed by the following factors:

- *Total Axle Weight* – Higher axle weights cause increased compaction and to a greater depth.
- *Tyre width, diameter and type*. The larger the footprint (width and diameter) of the tyre on the soil surface the less likelihood of deep compaction. The arrival of IF (Increased Flexion) and VF (Very High Flexion) tyres now allow reduced tyre pressures and compaction for a given axle load.
- *Inflation Pressure* is linked to tyre size and type and affects the footprint of the tyre on the soil surface. High inflation pressures mean less flex in the tyre sidewall and the potential for deeper compaction.
- *Wheel slip* has been shown to produce significant compaction down to 5 cm. Higher number of vehicle passes increases the degree of compaction.

Compaction by livestock

At low to medium soil moisture contents animals cause compaction at or near the soil surface. At high soil moisture contents, trampling results in poaching (penetration of the soil surface by the hoof). As the hoof penetrates the soil, the structure of the soil is damaged and soil at the base of the hoofprint is compacted. Animal-induced compaction does not generally extend beyond 10 cm, although with a combination of heavy stock and poor conditions compaction can be deeper.

c) Correct any compaction

Overcoming compaction can be expensive and disruptive so should only be carried out when necessary. The need for action is best assessed by digging a hole to about 300 mm (1 spade) deep and checking for compacted layers.

Sward slitting or spiking on grassland allows rainwater to filter into the soil – thus reducing nutrient and soil runoff. It is more generally used to overcome shallow compaction caused by livestock.

Typical equipment for spiking or sward lifting to alleviate shallow compaction.

For deeper compaction subsoiling will be necessary but this is expensive and requires more power. It should only be carried out when necessary and the subsoil is brittle – not too dry or wet. This creates “heave” to make fissures in the soil and creating paths for drainage and root development. To be effective the soil moisture content is critically important.

Subsoiler as used to correct deeper soil compaction

d) Reduce runoff from arable crops

Where at all possible the crop should be sown so that drills and tramlines do not go up and down the steepest areas of the field.

Runoff from tramlines can be a cause of both soil erosion and water contamination - up to 80% of pesticide runoff from fields has been found to come from compacted tramlines.

Tramline runoff can be reduced by using a single tine – “tramline tickler” - to break up the compacted surface and improve infiltration. Where the crop is being grown on steeper ground (above 8 degrees or 1 in 7 is considered to be a high risk) then consider additional measures such as arranging a barrier to flow of roughly cultivated ground between the slope and the vulnerable waterway. This is possible on rented land where a more permanent arrangement such as planting a riparian buffer strip is not feasible.

Where the problem is expected to persist over a number of years and in emergency situations, drains can be partially blocked with a “check dam” or sediment traps can be constructed to slow the flow and allow the sediment to settle out while the water flows on down the waterway.

Bales of straw placed in a ditch can be used as a temporary check dam e.g. when drainage work is in progress.

Hay bale sediment trap.
Photo Source: Aqualinc

Temporary sediment trap when drain clearing.

Sediment trap for runoff from land area.

e) Use of cover crops.

Cover crops are often called by different names. **Green manures** are grown with the intention of ploughing them in after a period of growth, to increase the amount of organic matter in the soil and improve soil fertility. When cover crops are grown to capture nutrients from the soil to prevent them being lost by leaching, they are called **catch crops**.

Cover crops prevent soil erosion by creating a protective surface layer that absorbs the impact of raindrops and slows down water runoff. Their root systems also bind soil particles together, improve soil structure, and increase water infiltration.

Even soil cover of 30% can reduce runoff by 50% and soil erosion by 80%.

The following species tend to perform well:

- Those with high root density, such as oats (influencing soil aggregate stability)
- Those with high root thickness, such as radish and chicory (influencing drainage pores)
- Those that provide good ground cover, such as oats and brassica mixes
- Those that establish rapidly in the autumn, such as mustards

Maize fields can be a significant source of soil erosion. They must be actively managed to reduce the risk of soil, nutrient and agrochemical loss during winter. Cover crops over-sown into maize crops can reduce overwinter losses.

The overall aim is to limit periods of bare soil cover and so early planting and harvest to allow prompt replanting of the subsequent crop help reduce surface runoff and soil erosion.

3. Buffer Strips and Riparian Buffer Zones.

Buffer strips and Zones are strips of vegetation, like grass, trees, or shrubs, planted around or within fields to protect against soil erosion, nutrient runoff, and pollutants. They also serve to improve water quality, provide habitats for wildlife, and protect existing landscape features like streams, ponds, or archaeological sites. These strips slow down water runoff, allowing more water to soak into the ground and trapping sediments, nutrients, and other farm inputs before they reach a watercourse.

Types of buffer strips and zones.

a. In-field buffer strips: These are established within a field, for example, along boundaries or to protect specific features within the field.

The width of these buffer strips specified in some legislation and the Nutrient Action Programme, depend on the activity and the nature of the waterway.

On long slopes Buffer Strips may be included in the midst of the crop itself to interrupt the path of the runoff and collect nutrient and soil runoff.

The width of buffer strip crops can vary from 2 meters to 30 meters or more, depending on the intended purpose, such as water quality protection or wildlife habitat. Minimum required widths are often 2-7 meters for regulatory purposes, while wider, voluntary buffers are recommended for enhanced benefits like nutrient reduction on steep slopes; with 10 meters or more often suggested for wildlife .

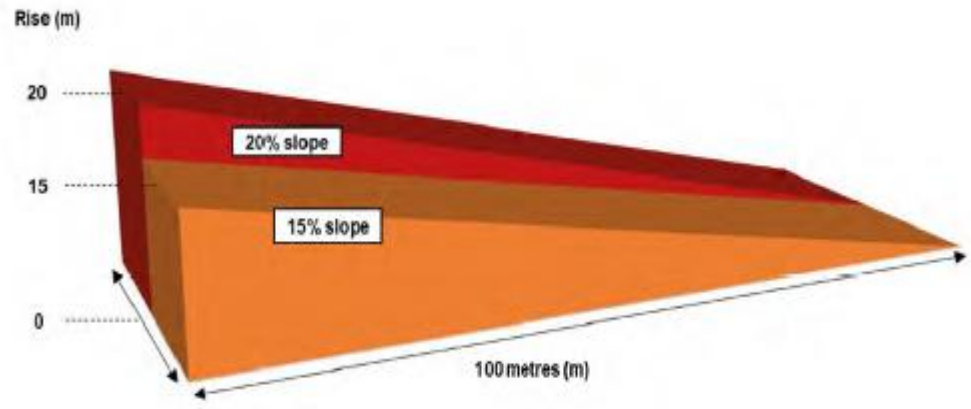
Some examples where buffer strips in fields are imposed to protect water quality, include –

All types of chemical fertiliser should not be applied within 5 m of any waterway.

Organic manures, including dirty water must not be applied within –

- 20m of lakes,
- 50m of a borehole, spring or well,

- 250m of borehole used as public water supply.
- 15 m of exposed limestone limestone feature.
- 10 m of a waterway other than lakes; this is reduced to 3 m where the slope towards the waterway is less than 10% and LESSE spreader is being used. Exceptions are provided for fields under 1 ha or 50m wide.



Measuring Slopes. A 10% slope will have a rise of 10 m in 100m.

b. Riparian Buffer Zones These are located next to watercourses, such as rivers or streams, and are crucial for preventing runoff from entering the waterway.

These zones are vegetated strips along watercourses that act as a barrier to protect against pollution from farm runoff, improve water quality, and support biodiversity. These strips “break the pathway”, help filter nutrients, sediment, and pesticides, prevent soil poaching, and provide habitat for wildlife.

Example of a 2 m wide ungrazed riparian buffer strip

Vegetation in the buffer zone increases the roughness of the land surface, which slows runoff as well as increasing the interception and absorption of rainfall. Planting trees as part of a riparian buffer strip will also help to stabilise riverbanks, prevent erosion and reduce the amount of silt entering the river. They are not fertilised nor treated with pesticides unless spot sprayed to control invasive species such as Giant Hogweed.

Careful siting in peak flow areas is essential and in general the wider the Buffer Zone the more likely it is to prevent runoff reaching the waterbody. For small streams a zone width of 5 m may suffice although on steeply sloping ground the width needs to be increased to 6 meters or more adjacent to late harvested crops such a maize or potatoes. In high-risk areas cross slope ridges within the riparian zone help reduce runoff. i.e. “magic margins”.

Riparian Zones of 2m and 7 m have been supported under the Farming with Nature Scheme.

Ridges in buffer zone to impede flow – sometimes called “magic margins”. (Reference: FAS Scotland)

Better Buffer Strips are explained diagrammatically in Teagasc Video on Better Buffer Strips – SMARTER BufferZ.

Lost Production Area

Buffer strips and Riparian Zones consume significant areas of otherwise productive land and so may make cultivation of adjacent land non-viable for crops.

With so much arable production in Northern Ireland being on land with short term rental agreements riparian buffer zones will not be possible without the constructive engagement of the landlord.

Riparian Zones along “designated watercourses” must be 7 m wide (between fence and watercourse bank) to allow access by the equipment used to maintain the waterway.

Financial Support for Buffer Zones

Several organisations provide grant aid to help defray the cost of establishing and maintaining Riparian Buffer Zones and other actions linked to water quality. **The availability of this support depends on the availability of funding, so it is important to check on the situation and apply when the schemes are open.**

When available, the **Farming with Nature Transition Scheme** provides support for the establishment of both 2 m and 7 wide riparian buffer strips, retention of winter stubble and multi-species winter cover crops.

In certain designated catchments support is provided through the **Rivers Trust Water Friendly Farming Scheme**. This is linked to the preparation of a whole-farm Water Friendly Environment Plan (WFEP) and again is subject to the availability of funding. Rivers Trust Advisers are available within the designated high-risk catchments to prepare the WFEP and help with the specification of funded projects

Other organisations such as NI Water have provided support through their **Farming For Water** Scheme – again within defined river catchments.

4. Upland and extensively managed land also impact on water quality

Degraded peatlands can cause erosion, releasing dissolved organic carbon and sediment into watercourses, which makes treatment more difficult.

Forestry operations, if not managed properly, can increase runoff and sedimentation.

Overgrazing damages vegetation cover, leading to bare soil, compaction, and erosion. Under-grazing can allow vegetation to grow unchecked, creating wildfire risks.

Wildfires are particularly damaging—they destroy habitats and release carbon and ash into rivers, degrading water quality.

Good Practice in Uplands to protect water quality

Control Grazing Pressure

1. Avoid overgrazing by sheep or cattle, which leads to bare soil and runoff.
2. Rotational grazing or reduced stocking densities help maintain vegetation cover.
3. Healthy vegetation slows water flow and traps sediment before it reaches rivers.

Restore Peatlands and Wetlands

1. Peat bogs act as natural filters, storing carbon and improving water quality.

2. Blocking drainage ditches re-wets peat, reducing erosion and dissolved organic carbon.
3. Wetlands capture nutrients and sediment, protecting downstream reservoirs.

Manage Forestry and Woodland

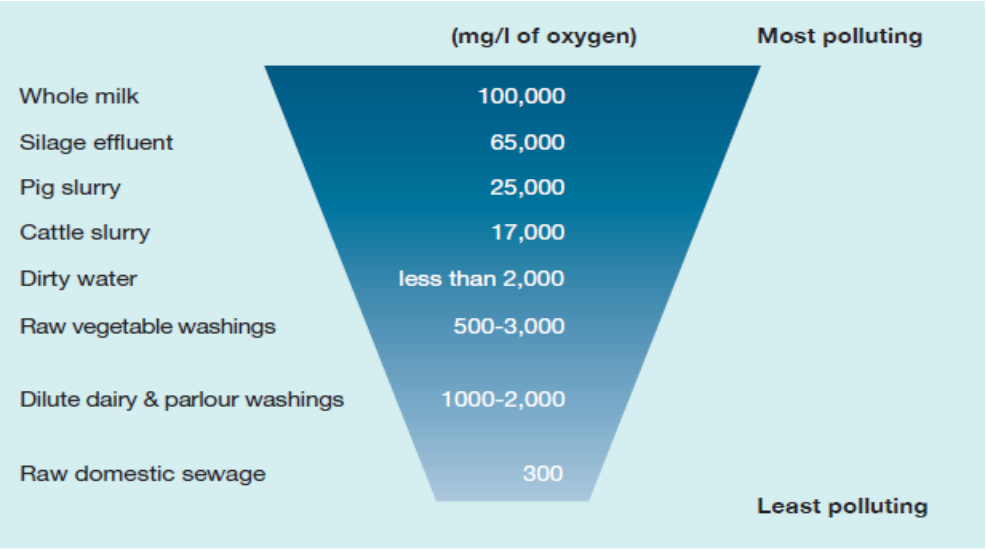
1. Plant native trees along upland streams to stabilise banks and reduce sedimentation.
2. Avoid clear-felling near watercourses; use buffer zones to protect rivers.

Woodland cover improves infiltration and reduces ‘flashy’ river flows.

Guidance Note. 12

Domestic Sewage and Wastewater Treatment Systems

Although domestic sewage is not as polluting as most farm effluent, the sheer number of discharges make it a potential contributor to nutrient levels in waterways. There are at least 106,000 septic tanks in Northern Ireland, in addition to over 1000 wastewater treatment plants operated by NI Water.



Septic Tanks in Northern Ireland (2009) (Briefing Note NI Assembly 103/09)

Consented Domestic Septic Tanks	104,512
Consented trade/commercial Septic Tanks	2,300
Total consented tanks	*106,842*

Phosphate is present naturally in most foods in varying amounts. Foods naturally high in phosphorous include cheese, milk, chocolate , oily fish and nuts. Phosphate is also added to food to keep it fresh for longer. About 40% of the phosphorous in sewage comes from human food. Other sources include food additives and laundry/dishwasher detergents.

In addition to the nutrient enrichment from human food and excrement, sewage, if not adequately treated, can be a cause of serious public health diseases such as *E. coli*, salmonella, dysentery, typhoid, hepatitis and norovirus.

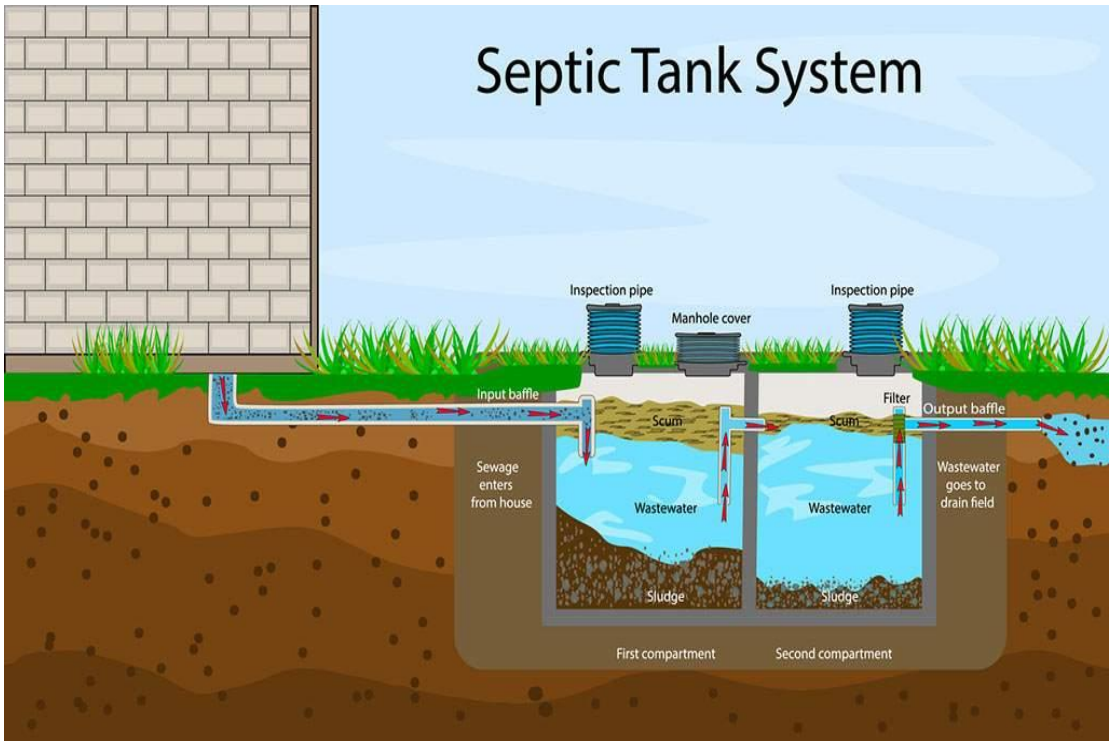
Wastewater from domestic properties must therefore be treated before discharge to drainage fields or waterways. There are two types of system in use – Septic Tanks and Domestic Wastewater Treatment Plants or Packaged Sewage Treatment Plants (PSTPs) .

In all cases permission to discharge after treatment must be obtained from NIEA

Septic Tanks

A septic tank separates and treats wastewater using anaerobic bacteria, which digest solids in the absence of oxygen, to form sludge at the bottom and scum (fats and oils) at the top, while the liquid fraction flows to a soakaway system for further treatment.

The soakaway or drain field consists of an area of closed loop multiple porous pipes and gravel. This permits aerobic bacteria to consume the potential pollutants and filters the effluent into the soil to complete the treatment process.



Most tanks have two compartments or a central baffle to enhance the treatment process. They may be constructed of concrete, but tanks are now increasingly made from fibreglass or plastic.

The foul water leaving the septic tank must be further processed in the soakaway or drainage field. In this “field” the liquid soaks away but more importantly it is digested by aerobic bacteria. It is therefore important that the field is not waterlogged as the process then becomes anaerobic and is typified by a black slime which blocks the

soakaway and reduces the porosity of the soil. The treatment then fails and the risk of waterway pollution is high.

Soakaways only work if the soil can absorb the liquid leaving the septic tank, so soil percolation tests are now required for new septic tank approvals. The area required is considerable (at least 100m^2) and must be at least 15 m from any building and not close to trees. When a drainage field fails, repair in unlikely and so a new field will have to be constructed, or the septic tank replaced by a Packaged Sewage Treatment Plant (PSTP) which can discharge direct into waterways. Soil soaking capacity test will be required when applying for discharge though a septic tank.

Signs of a failed drainage fields include –

- Effluent surfacing in the drainage field area.
- Strong odour coming from the septic tank or drains.
- Pollution of nearby streams as evidence by the smell and presence of slimy fungal growth.
- Back-up of sewage to inspection chambers.
- Slow flushing or back-up to toilets and baths/sinks/washing machines.

Septic tanks are designed to hold about 1 years of sludge and MUST be "desludged" at regular intervals – preferable every year. NI Water provides one free de-sludge service per household each year, so long as vehicular access is possible.

To book a free de-sludge service from NI Water visit their self-service portal or phone 03457 440088

NOTE: The tank is not emptied (typically 4,500 m^3 [990 gallons] is removed) as it is important to leave some sludge so the bacterial process can continue. For the same reason, only detergents marked as suitable for septic tanks should be used.

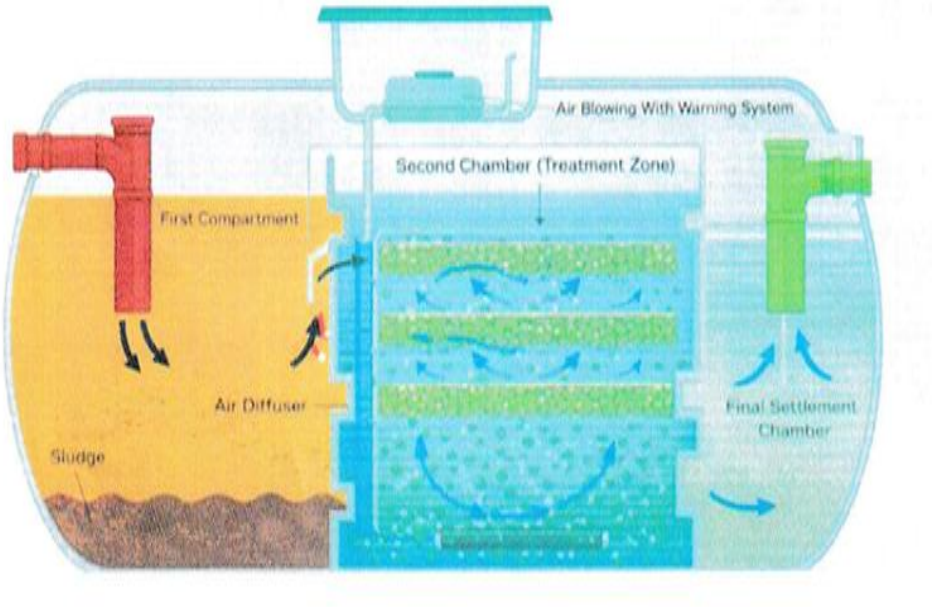
Septic tanks are generally reliable, and so maintenance can be overlooked leading to pollution entering adjacent waterways. Annual Surveys are conducted by the Environmental Protection Agency (EPA) in Ireland. This survey found in 2023 that around 45% did not meet acceptable standards – mostly due to poor maintenance.

Packaged Sewage Treatment Plants (PSTPs)

Packaged Sewage Treatment Plants (PSTPs) are a more recent development, and these units treat the sewage using a three-stage process:

→ **Sedimentation** to remove solid waste which is held as sludge.
→ **Aeration** using compressed air to stimulate useful aerobic bacteria.
→ **Settlement** – final cleaning prior to discharge

These units treat the sewage sufficiently for the waste to be discharged into a drain or stream. The process is encouraged by pumping air through the effluent to aerate the liquid and encourage the helpful aerobic bacteria. They are therefore more expensive to purchase and run than septic tanks and require an electrical supply but do not require an expensive drainage field.



Example of modern Packaged Sewage Treatment Plant

Care of Domestic Sewage Treatment Facilities

- **Stormwater** from clean yards and roofs must be kept separate and NOT directed into septic tanks or PSTPs because it can overwhelm the system, cause the contents to be flushed out, impair the drainage fields for septic tanks and lead to pollution. Stormwater and domestic sewage must be kept separate; gutters and rainwater downpipes should connect to a separate surface water drain.

- **Do not drive over or build on drainage fields** as these need free draining aerobic conditions to operate effectively.

- Use only household cleaning products **suitable for septic tanks** and **use a sink strainer** to prevent food solids entering the sewage treatment system
- **Carry out regular inspections, maintenance and desludging** – see earlier section re service provided by NI Water.

- As for all sewage systems, **only flush the 3 Ps down toilets** (Pees, Poo and Paper) Bin other materials e.g. wet wipes. **Do not pour fats, oils or greases down the sink** as these cause costly blockages (fatbergs)

Source: NI Water

Installation Cost Comparisons (2025)

- **Septic Tank:** The initial cost of the tank itself is significantly lower than a PSTP, however, a full installation with a soakaway (drainage field) will add very considerably to the cost.

- **Sewage Treatment Plant:** These have a higher initial capital cost due to their more complex mechanical components. An electricity supply to the unit is also required

Ongoing Running Costs

	Septic Tank	PSTP
Electricity	No power supply required for the treatment process.	Requires a continuous electricity supply to run an air pump and other components, adding a small but ongoing cost (usually a few hundred pounds annually).
Emptying/Desludging	Needs emptying more regularly, typically at least once a year.	Emptied less often, usually every 12 to 60 months, depending on the system type.
Servicing/Maintenance	No regular servicing is generally required under current regulations.	Requires regular servicing (about once a year) to ensure mechanical parts are functioning effectively, adding to the cost.
Major Repairs	Potential major repair costs (e.g., soakaway replacement) can be high if the system fails due to improper use or maintenance.	Mechanical components are more prone to wear and tear and can be costly to repair if they break down.

Packaged Sewage Treatment Plants are ideal where there is not sufficient space or inadequate soils to install a soakaway (drainage field), since they can discharge straight into waterways (subject to NIEA Authorisation.)

They are highly efficient at reducing BOD levels – typically 96% efficient but less efficient at removal of nutrients e.g. nitrogen and phosphate.

Municipal Waste Water Treatment Works (WwTW)

Provided they are regularly maintained, Septic Tanks and PSTPs provide simple and effective sewage treatment. Wastewater Treatment Works which treat municipal sewage use a much more complex and sophisticated treatment process to process the vast volumes involved.

In Northern Ireland these WwTWs are operated by a Government owned company - NI Water. These WwTWs, and their equivalents operated by some commercial businesses, have specified treatment requirements and Discharge Consents which depend both on the size of the plant (measured in Population Equivalents PE) and the waterway into which they discharge e.g. inland waterways with high nutrient load risk and proximity to designated areas such as ASSIs. There are just over 1020

Wastewater Treatment Works in NI. Routine monitoring of discharges is carried out by NIEA (Northern Ireland Environment Agency).

Historically the public sewage system collected all water from domestic and commercial properties (rainwater as well as sewage) so the system becomes overloaded in periods of heavy rain and to prevent backflow to gulleys and properties, 2,500 Combined Storm Overflows (CSOs) operate which can discharge a dilute mix of storm water and sewage into rivers and inshore waterways. With such high rainfall incidents expected to increase due to climate change, NI Water are installing remote monitoring systems on these CSO systems.

Wastewater in large municipal Wastewater Treatment Works is typically treated using a multistage process**.**

1. *Physically remove large objects* including items that should never have been put down the drain in the first place, such as wet wipes, nappies, sanitary items and cotton buds.

2. To separate human waste from the water the sewage is put into large *settlement tanks,* which causes the solids to sink to the bottom of the tank. This is called settled solids *or sludge.* In a circular tank, large arms or scrapers slowly move around the tank and push the sludge towards the centre where it is then pumped away for further treatment.

3. *Sludge is recycled as fertiliser on farms or incinerated*

4. Once the wastewater is clean, it is *returned to rivers or the sea.* The quality of the cleaned wastewater is strictly regulated, and operators thoroughly test it. If the river / inshore waterway to which the discharge is returned is particularly sensitive the cleaned water can be further treated e.g. slowly filtered through a bed of sand.

Phosphorus can be removed from wastewater through **chemical precipitation**, which adds salts like iron or aluminium to form solid precipitates that are then removed, or **enhanced biological phosphorus removal (EBPR),** which uses specific microorganisms that accumulate and store phosphorus before it is removed with the sludge.

***Further information*.**

NI Water video "Wastewater Treatment Process" describes treatment process at Belfast's Duncrue treatment works.