

How to reduce the risk of diffuse pollution

In forestry, the risk of diffuse pollution is increased by:

- Poor site planning, management and monitoring.
- Not understanding each other's responsibilities on site.
- Conditions such as high rainfall, heavy machinery and steep ground.

Pollutants can get into drains, ditches and groundwater and can end up in a watercourse many miles away from their source. Just a small amount of pollutant can damage a long stretch of watercourse. They get trapped in sediments and carried along, being released slowly and causing a wide and potentially long-term impact on drinking water supplies, the water environment, fish and wildlife.



Silt pollution in watercourse

Forest works managers and contractors should focus on preventing pollution rather than remediating it, because prevention has less environmental and financial cost.

The five key steps to reduce the risk of diffuse pollution are:

1. Understand the site – topography, soil, water, drainage.
2. Identify the risks to water and what measures are needed to avoid those risks.
3. Monitor conditions and if needed, change measures.
4. Mark out buffer areas and disconnect roadside drains from watercourses before work commences.
5. Know your role and responsibilities.

The advice in this booklet applies to all watercourses and the drains and ditches which connect to them.

Forestry operations near water require buffer areas to be put in place, within which certain operations cannot be undertaken. The width of the buffer depends on the width of the watercourse – see the Keep Your Distance sticker at the back of this booklet.



Appropriate buffers can help reduce pollution risk

In case of a pollution incident

STOP	Stop the activity
THINK	Think what immediate action could be taken
ACT	Act with a remedy

Contact immediately the forest works manager and the SEPA Pollution hotline on 0800 80 70 60.

Pre-commencement

Steps to reduce pollution must be taken before operations begin, and this needs planning and communication.

Before the pre-commencement meeting

Forest works managers must ensure that:

- There are adequate resources for reducing the risk of pollution and dealing with incidents.
- There is a pollution prevention plan which determines how water will be managed on site under different weather conditions, and a contingency plan for pollution incidents.
- Sensitive areas are identified in the operations plan and on site - and they match.
- Only machinery and techniques appropriate for the site and working conditions will be used.
- Relevant licences (e.g. to install a culvert) are in place before operations begin.

At the pre-commencement meeting

Forest works managers should:

- Give out and discuss this booklet and the Keep Your Distance vehicle sticker with all contractors, so that everyone on site understands good practice. This includes contractors who start work after operations are already underway.
- Assign roles and responsibilities clearly, e.g. who is responsible for disconnecting drains from watercourses.
- State who to contact under what circumstances.

Contractors should:

- Make sure they understand the operations plan.
- Be able to identify risks to water that might arise and sensitive areas on site such as buffer areas, wetlands and designated areas.
- Ensure that all machinery is well maintained and regularly inspected.
- Know what action to take in case of a pollution incident.



Biosecurity

Biosecurity measures are crucial to avoid spreading non-native plants and animals. Seek advice from SEPA, SNH, the local Fishery Trust or FCS on where infected sites are.

Invasive non-native species such as American Signal Crayfish (ASC) can damage a large area. Eggs and juveniles can be trapped in mud and transported off-site on machinery, then fall off and spread to other waters. ASC are highly destructive - they eat vegetation, fish eggs and small fish, and burrow 3 m into riverbanks causing bank erosion. Removal can be expensive.



American Signal Crayfish

Locate cleaning areas, especially those used for power-hosing away from drains and waterlogged ground and instead put them in well vegetated areas so dirty water runoff is captured for settlement and natural soakaway.

On all sites:

Do

- Arrive with power-hosed clean equipment and vehicles and disinfected footwear.
- Use clearly marked cleaning stations on site.
- Ensure footwear and vehicles are clean before leaving site – this includes tyres, wheel arches and undersides.

Don't

- Don't clean machinery, equipment or footwear in a watercourse.

On sites where watercourses are known to have invasive plants or animals take these extra measures too:

Do

- Follow all biosecurity measures explained by the forest works manager at the pre-commencement meeting.
- Avoid coming into contact with infectious material, e.g. water with ASC or a parasite outbreak.
- If contact has been made with infectious material, use a power hose to clean and disinfect all footwear, equipment and vehicles before leaving site.

Don't

- Don't touch dead or dying amphibians or crayfish.

Private drinking water supplies

Forestry operations can disturb and contaminate private water supplies because the equipment used to treat this water can be easily overloaded or damaged. Operations can also reduce the amount of water flowing to a supply, so extra precautions are needed on land that is near to, or drains to, a private water supply.

Do

- Keep a 5 m buffer along either side of a pipe.
- Avoid crossing pipes. If this is absolutely unavoidable, use a log bridge or steel plates.
- If a pipeline is disturbed or broken, repair as soon as possible and inform the local Environmental Health Department.
- On harvesting sites clear all brash from the buffer area upslope of a spring abstraction point.
- On restock sites keep a minimum 10m buffer for chemical use.
- Use durable, inert materials for water-bound roads and tracks.



Supply drawn from a well or borehole



Supply drawn from a spring

- Maintain site roads and access routes.
- Monitor all work, to make sure buffer areas and other measures to prevent pollution are being effective.
- Respond quickly if circumstances change and report all incidents to the forest works manager.

Don't

- Don't handle or store chemicals and oil on land that drains to the water supply.
- Don't allow sediment and debris to block intakes.
- Don't use machinery inside the buffer unless absolutely necessary, and only then with additional water protection measures in place.
- Don't put brash heaps or extraction routes within buffer areas, or put brash in streams.
- Don't ford across a watercourse.
- Don't excavate tracks, drains or borrow pits if the nearby source is a shallow spring flow.



Forwarder track next to private water supply

Public drinking water supplies

Precautions are needed in source water catchments - the areas from which public drinking water is drawn – because these sources provide drinking water for 97% of the Scottish public. Scottish Water can provide on-site toolbox talks for operations near public water assets.

Do

- Store and handle fuel, oil and hazardous material outside the source water catchment.
- If this is not possible, keep a 50m buffer around all watercourses, boreholes and springs. Outside the 50m buffer, store and handle fuel, oil and hazardous material in dedicated areas.
- Keep a spill kit in all vehicles and plant.
- Manage sediment and debris so that it doesn't block intakes or reduce storage capacity.
- Clearly mark the location of assets such as pipes, and protect all pipework used for the supply.
- If crossing a pipeline is unavoidable, use log bridges or steel plates.
- Use inert, durable materials for water-bound roads and tracks.
- Regularly maintain site roads and access routes.



Dedicated area for chemicals

Don't

- Don't direct water into an adjacent catchment - deal with it directly instead.

Ground Preparation

Ground preparation creates soil disturbance, so sediment run-off must be minimised.

Disturbing soil during wet weather is particularly risky because of the likely increase in run-off, so avoid working in these conditions.

Do

- Use the Keep Your Distance buffer widths as a minimum.
- Understand where sensitive areas are on site.
- Within buffer areas, limit cultivation to manual screefing, inverted mounding and hinge mounding.
- Use silt traps and vegetated areas to reduce sediment run-off.
- Block drains which connect directly to a watercourse, e.g. with logs.
- Minimise water crossings; use pipes and log bridges if this can't be avoided.

Don't

- Don't connect drains to watercourses.
- Don't lay a drain at a gradient steeper than 2 degrees.
- Don't operate machinery or equipment in water.
- Don't cultivate waterlogged ground.



Appropriate buffers can help reduce pollution risk



Choosing appropriate technique can help reduce pollution risk

Silt Traps / Sumps

A silt trap or sump acts as a sediment trap for dirty water run-off. They are quick and easy to install before operations begin. They should be made large enough to cope with heavy rainfall events, and more can be installed if weather conditions deteriorate or the working area increases.

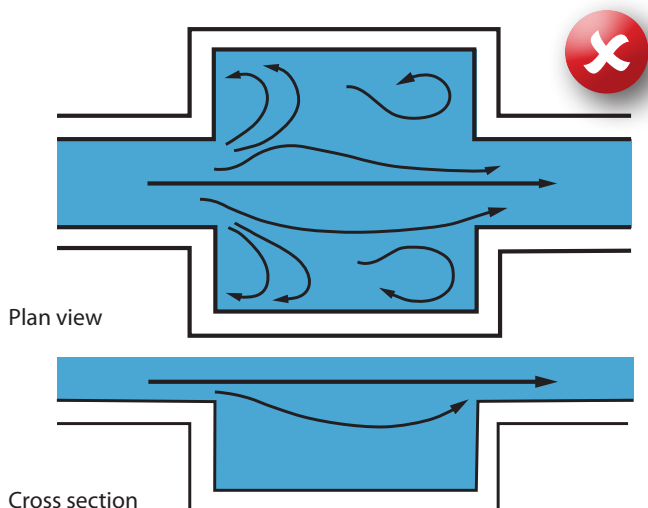


Silt trap / sump with sloping (not flat) bottom

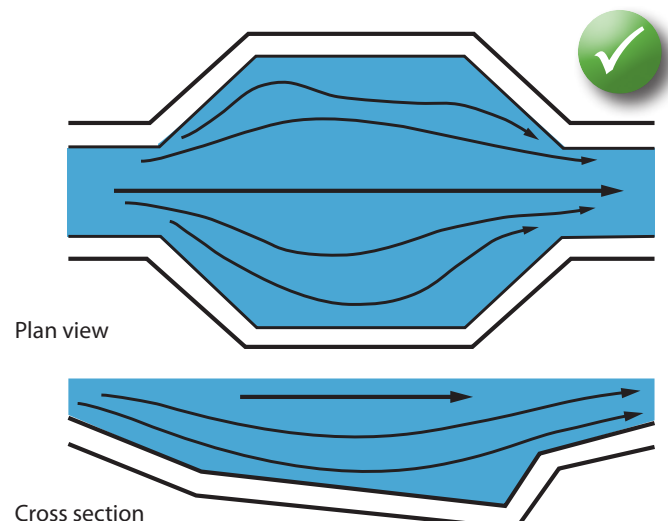
A well-constructed silt trap/sump will catch most large sediment. Trapped sediment can be removed at regular intervals; the remainder can be dealt with by the surrounding vegetation acting as a natural filter. Direct its outlet onto a well-vegetated grassy area to allow this to happen.

To remain effective they must be regularly monitored and maintained – use this booklet's Turbidity Ready-Reckoner to help with this.

Poor design, the silt passes through



Good design with gradual changes of cross section



If bedrock prevents sufficient depth, then a series of multiple shallow silt traps/sumps can be created, or logs can be inserted into the channel to create silt trap/sump sides above the bedrock.



Forwarder Track Settlement sumps in series

Fertilisers

Good fertiliser management means targeting relevant areas and avoiding nutrient run-off, which can cause excessive weed growth and poor oxygen levels in watercourses, in turn affecting fish and insects. Fertiliser run-off can also compromise drinking water quality.

Do

- Apply only the amount of fertiliser required by the crop.
- Observe the Keep Your Distance buffers as a minimum:

Minimum working distances from watercourses		
Width up to 1 m	Width 1-2 m	Width > 2m
5m	10m	20m
No storage or application of fertiliser	No storage or application of fertiliser	No storage or application of fertiliser

- Keep equipment in a good state of repair.
- Inform SEPA if you intend to undertake aerial applications.

Don't

- Don't store fertiliser on land that is waterlogged.
- Don't store fertiliser within 10m of a watercourse (regardless of its width) or within 50m of a spring, well or borehole.
- Don't use organic fertiliser within buffer areas.
- Don't use in wet weather or if rain is forecast.
- Don't use on ground that is waterlogged, frozen or covered with snow.

Pesticides

Good pesticide management is essential to avoid contamination from storing, mixing, handling and spraying them.

Do

- Keep pesticide use to a minimum.
- Observe the Keep Your Distance buffers as a minimum:

Minimum working distances from watercourses		
Width up to 1m	Width 1-2m	Width > 2m
5m	10m	20m
No preparation, application, storage or cleaning of sprayers	No preparation, application, storage or cleaning of sprayers	No preparation, application, storage or cleaning of sprayers

- Ensure users have a certificate of competence, or work under the supervision of someone who has.
- Comply with dosage and manufacturer's label at all times.
- Ensure sprayers are correctly calibrated and kept in good condition; fix any leaks or drips before use.
- Clearly mark mixing and handling areas on site.
- Ensure the secure storage and removal from site of pesticides, packaging and containers, gather up and remove tree bags from the work site as soon as they are empty.

Don't

- Don't store or apply pesticides within 50m of a spring, well or borehole.
- Don't apply on frozen or waterlogged ground, or in wet or windy conditions.
- Don't fill sprayers directly from a watercourse.
- Don't wash any equipment or PPE in a watercourse.
- Don't soak any pesticide-treated planting stock in a water course or place planting bags within/near roads or forest drains.

Fuel and Oil

Small, unintentional losses of fuel and oil during storage and handling can have serious consequences, especially to drinking water. This can be very costly to remediate.

Do

- Plan how fuel and oil will be stored, transported and handled so that spillage is prevented.
- Store in a sufficiently strong, lockable, bunded tank or container.
- Carry spill kits on all machinery, with an additional larger spill kit at the fuel storage/service area.
- Use funnels when pouring from cans.
- Put waste or recovered oil in an oil-tight container and dispose of it at a licensed site.
- Put fuel bowzers on a stable site.
- Ensure machinery is well maintained and regularly inspected.



*Fuel store on level ground
away from drains*

Don't

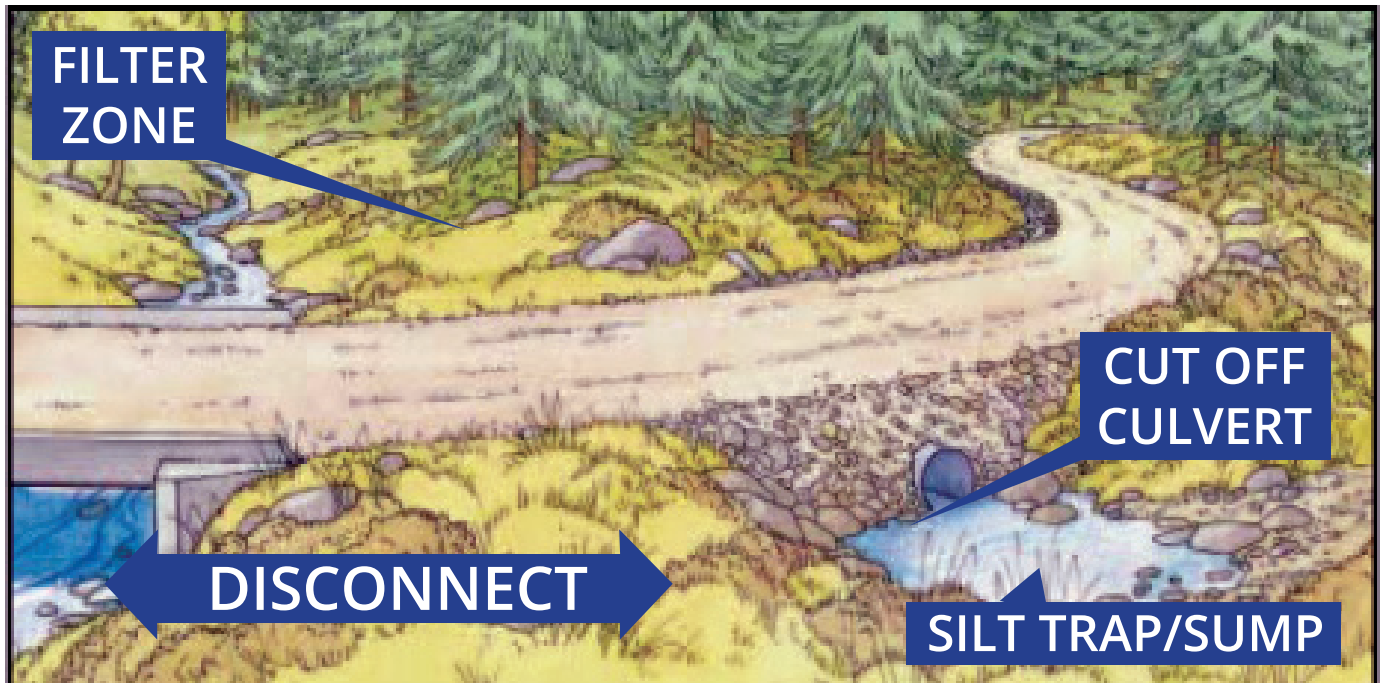
- Don't store or handle fuel or oil within 10 m of a watercourse.
- Don't wash machinery within 10 m of a watercourse or allow machinery washings into the water.
- Don't operate machinery which is leaking fuel or oil.



Oil in watercourse

Constructing forest roads

A road which is constructed badly and used by heavy vehicles can generate a lot of sediment run-off. This will pollute water if the roadside drains connect to a watercourse.



Do

- Ensure the operations plan for constructing or upgrading a road shows the location of road lines, watercourses and drains, buffer areas, and drinking water supplies and sources.



Good practice - culvert

- Avoid working in wet weather as far as possible.
- Use durable material to reduce the risk of road deterioration and run-off.
- Disconnect roadside drains that connect to a watercourse, e.g. block them with logs. Ensure they discharge onto vegetation at regular intervals instead.

- Retain the vegetation that grows in roadside ditches because it is a natural filter for pollutants.
- Ensure culverts are positioned below the bed level of the watercourse, and are maintained.

Don't

- Don't build a road within a buffer area.
- Don't allow large volumes of surface water to build up in roadside drains.
- Don't use multiple pipe culverts (used to be known as "Irish pipe bridges") as crossing points – they prevent fish migration and can increase flood risk.



Water making its way across a road

Using and maintaining forest roads

Forest works managers should ensure that forest roads and associated drainage are maintained throughout all operations. Overloaded trailers and inappropriate vehicle configuration can damage and deteriorate forest roads, which can increase the amount of sediments and pollutants entering a watercourse.



*Good quality forest road
– no chained vehicles, just
lorries travelling on it*

Do

- Consider lorry configuration, paying particular attention to tyre pressure and the impact on road surfaces. See the Road Haulage of Roundtimber Code of Practice.
- Report road defects and roadside pollution to the works manager.
- Check vehicles regularly to address fuel or oil leaks.



Deteriorating forest road

Don't

- Don't damage the forest road network by overloading vehicles or using chained tyres.

Quarries and borrow pits

Good quarry management means understanding how water moves around the site, and managing operations in relation to it. Quarry run-off may or may not have a colour but it will contain pollutants that can seriously damage water quality.

Silt traps/sumps and vegetated strips should be made large enough to cope with heavy rainfall, and monitored and maintained so that they remain efficient and effective. Quarries should be included in pollution prevention and contingency plans.

Do

- Keep clean and dirty quarry water separate.
- Use silt traps and vegetated strips to collect and treat the run-off from quarry vehicles.
- Keep a fuel spill kit for machinery spillages.

Don't

- Don't allow quarry run-off to enter ditches or drains which connect directly into a watercourse.
- Don't position any static plant or equipment within 10 m of watercourses unless on a drip tray or within a bund.
- Don't allow large volumes of clean water to enter the quarry.
- Don't allow the quarry entrance to deteriorate.



Runoff treatment sump overflow to vegetation



Polluted Quarry runoff

Harvesting and Extraction

It is crucial to install preventative measures to reduce soil disturbance and water run-off, such as brash mats, silt traps, disconnected drains and buffer areas before starting work. Observe the buffer widths on the Keep Your Distance sticker, and regularly check watercourses, particularly drainage outlets, for discolouration using the Turbidity Ready-Reckoner in this booklet.

Harvesting operations on older sites may be unable to comply with current rules, so on these sites take extra care to reduce the risk of pollution.

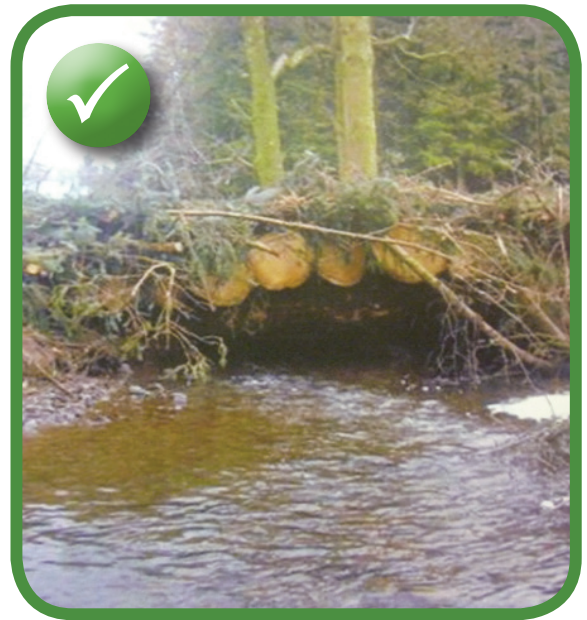
Do

- Provide and maintain appropriate areas for stacking, loading and turning vehicles.
- Follow the operations plan, paying particular attention to where the main extraction routes are.
- Fell away from watercourses; remove brash and tops from the water and buffer area.
- Stack from in-wood where possible.
- Maintain brash mats, patching holes before they become waterlogged.
- Use brash or cut-offs to deflect water from the extraction routes onto the forest floor.



Effective brash matting

- When working on sites with little or no brash, use alternatives such as logs to deflect dirty water onto plateaus or flushes, digging out settlement ponds, or bringing in brash from adjacent coupes.
- Minimise water crossings; if a crossing is unavoidable use pipes and log bridges (and remove them when work is completed).
- Work sensitive areas only in drier conditions.
- Use band tracks only where necessary.



Good practice log bridge

Don't

- Don't operate machines in watercourses.
- Don't run extraction routes where run-off is likely to enter a watercourse.
- Don't track machines within sensitive areas (e.g. buffer areas, wetlands or designated areas), or for long distances on forest roads.
- Don't work sensitive areas during heavy rain.
- Don't stack timber in roadside drains or buffer areas.
- Don't let brash fall into buffer areas or streams.

Waste

By law, all waste must be stored and disposed of properly. Litter such as tree guards, planting bags, marker tape and warning signs must be collected and disposed of at appropriate locations. There are 'take back' and recycling schemes for items that have not yet disintegrated.

Do

- Include waste disposal in the operations plan.
- Know the health, safety and environmental risks of products used, and manage them accordingly.
- Put waste collection points in accessible places; monitor and empty them regularly.
- Get advice when dealing with hazardous waste.
- Ensure everyone disposes of waste responsibly.

Don't

- Don't discard any material into watercourses, ditches or drains.
- Don't puncture, bury or burn empty containers.
- Don't leave any material on site after operations are finished - planting bags, tubes, containers, packaging, fencing, signs, markers, etc.



Abandoned caravan on forest site

Turbidity Ready-Reckoner

The turbidity ready-reckoner can be used quickly and easily on site to monitor dirty water levels. The turbidity of a water sample is a good indicator of the amount of sediment coming from site drainage, so measuring it will test how clean the water is.

The ready-reckoner can be used, for example, to trace the source of pollution after noticing a discoloured watercourse or when inspecting silt traps/sumps and site drains to ensure they are working effectively.

Method

Take a sample bottle and fill it from the silt trap / sump exit point, taking care not to dredge the bottom of the channel or drain as this will give an inaccurate reading. Place the sample bottle against the ready reckoner's white background and compare the colour of the sample against the chart.

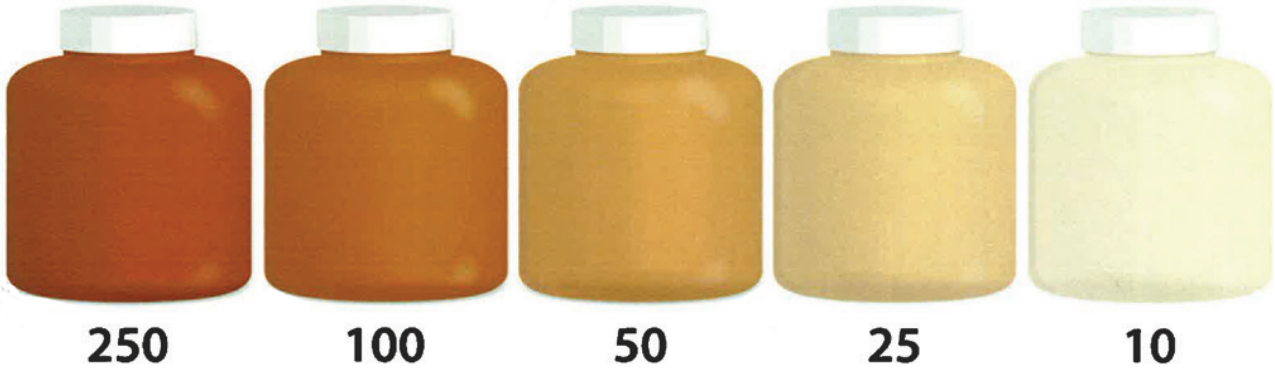


Collecting a water sample

A record of the turbidity measurement taken at each site visit should be recorded in a notebook. Turbidity is measured in National Turbidity Units (NTU).

Turbidity (NTU)

Water Samples:



0-50	OKAY
50-100	Inspect, investigate cause and take action as required
100+	Take action immediately, sort out the problem. May generate public complaint