A Northland farmer’s guide to managing farm dairy effluent

A good practice guide for land application systems
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Introduction

About this booklet

The Northland Regional Council (NRC) requires all dairy farms to comply with the rules for animal effluent disposal which are outlined in the Regional Water and Soil Plan for Northland.

This guide outlines some options for land application systems in Northland. It explains how transitioning from discharge to land management effluent systems brings tangible benefits:

- It reduces fertiliser bills
- It allows you to control when and where you irrigate valuable nutrients
- If managed properly, can help to protect the environment now and in the future.

The variances throughout the region, including extreme weather events and challenging topography, mean that each farming system is unique.

Land is one of farmers’ greatest assets, and managing it productively and sustainably will add further value to the farm. It’s part of future-proofing New Zealand’s unique landscape and waterways to ensure we can continue to farm in a productive and sustainable way.

The Sustainable Dairying: Water Accord outlines good management practices expected of all dairy farmers in New Zealand. It positions the sector to cope with a future that will focus on managing water within limits, recognising that expectations of performance will evolve over time.

Most Northland dairy farmers take pride in keeping their waterways healthy and want to protect this valuable resource.

In brief

- Effluent is a major contaminant, which can cause degradation of our streams, harbours and estuaries
- Investment by Northland farmers is improving the status of our waterways; but we must continue to focus on FDE management.
- Land application is the preferred method of managing dairy effluent disposal.
- When planning a land application system, it is important to understand the factors that influence the type of system that is best suited to your farm. In particular, an understanding of soil types is vital to this planning phase to ensure that you have sufficient storage.
- Storage facility volumes can be estimated using two storage calculators, the Northland Regional Council Effluent Storage Calculator or the Dairy Effluent Storage Calculator; both are accepted, but it is important to have an understanding of Council expectations when using the Dairy Effluent Storage Calculator.
- The easiest way to estimate water use at the dairy shed is to install a water meter, now a requirement under the Sustainable Dairying: Water Accord. For a list of installers and suppliers of water meters visit: irrigationaccreditation.co.nz/watermeasurement/
- Effluent needs to be contained and/or reticulated from all off-pasture infrastructure including high traffic areas, silage pads and stand-off facilities.
• The type of irrigators suited to Northland vary. Most important is the maintenance and upkeep of this equipment. Set up maintenance rosters with staff and pump suppliers to ensure equipment is working efficiently.

• Staff buy-in and training in effluent systems is vital. Ensure all staff are trained in your individual farm system and that they understand what to do when something goes wrong.

**Responsible dairy effluent management**

Dairy effluent, is a valuable resource that can increase pasture production and reduce fertiliser costs. It contains organic matter, nutrients including nitrogen (N), phosphorus (P), potassium (K), and also bacteria (such as faecal coliforms, E. coli and campylobacter). However, if not managed well, effluent can be a major contaminant which causes degradation of our streams, rivers, harbours and estuaries.

DairyNZ, through the Sustainable Dairying: Water Accord is assisting and encouraging dairy farmers to adopt good management practices to reduce the impact of dairy farms on the environment. One aspect of the Accord, is the expectation that dairy farmers will manage Nitrogen (N) and Phosphorus (P) loss from farming systems, acknowledge the need to manage within nutrient loss limits, and pursue continuous improvement in nutrient loss efficiency.

Discharging farm dairy effluent in some regions can have the following effects on waterways:

- Increased nutrient loadings (especially nitrogen and phosphorus), which can result in algal blooms and nuisance weed growth
- Increased ammonia concentrations, which can be toxic to fish species
- Microbial contamination rendering the water unsuitable for human consumption, contact recreation, or stock drinking
- Increased suspended solids which reduce light penetration and can smother aquatic creatures
- Polluted groundwater can be caused by poor effluent management.

**FIND OUT MORE**

*A farmer’s guide to managing farm dairy effluent: A good practice guide for land application systems* order or download from dairynz.co.nz
**ENTRY/EXIT RACES**
Effluent on entry/exit races where cows stop/mill about must be contained and/or reticulated to avoid the risk of water contamination. Rainfall on these must be included in pond size calculations.

**BRIDGES & CROSSINGS**
Effluent must be contained and/or reticulated to avoid the risk of water contamination.

**UNDERPASSES**
Effluent from underpasses needs to be contained and disposed of in accordance with regional rules.

**IRRIGATOR TYPE**
The most suitable type of irrigator is dependent on individual farm characteristics.

**MILKING PLATFORM/YARD AREA**
Due to their ability to capture rain, stormwater diversion systems need to be used when yards are clean. If not, storage facilities need to be sized accordingly.
STORAGE FACILITIES
Whether it’s a tank or a pond, storage needs to be sized correctly. Calculations should be made by an expert.

SOLIDS SEPARATION
Managing solids can help to get better performance from storage facilities and irrigators by reducing wear and tear on pumps and irrigators. However, these areas are ‘catchments’ and storage facilities need to be sized to include them.

STAND-OFF PADS
As with feed pads, any stand-off facilities need to be on sealed surfaces and the effluent needs to be contained and/or reticulated into storage. Roofs decrease effluent volume by lessening rainfall to pad surfaces, but can be expensive.

SILAGE PITS
Contaminated runoff must be contained and disposed of to avoid the risk of water contamination.

FEED PADS
Effluent from feed pads needs to be contained and/or reticulated and should be included in pond size calculations along with any rain that falls on them.
Selecting my system
Where do I start?

An effluent system needs to be designed so it is fit for purpose. Every farm is different and the system needs to reflect this. In Northland where factors like climate, topography and soils vary so widely, this is particularly important.

There are six main variables that have the most importance when designing an effluent system. These are:

- Storage requirements
- Soil type
- Dairy shed water use
- Storm/rainwater diversions
- Irrigator performance
- Managing nutrient loadings

Storage requirements

The best way to deal with effluent is to store it in a pond/tank and irrigate it strategically when soil moisture levels are suitable for irrigating. This reduces the risk of surface runoff or direct drainage and maximises nutrients’ uptake useful for plant growth.

A full pond has NO storage capacity.

How much do I need?

The amount of storage required on Northland dairy farms can be calculated in two ways:

1. The Northland Regional Council Effluent Storage Calculator is used by a regional council staff member who will assess the volume of effluent generated from all areas of your dairy operation. This calculation is specific to your practices, local rainfall and the existing storage capacity.

2. The Dairy Effluent Storage Calculator is a national tool developed by Massey University and Horizons Regional Council that estimates the amount of effluent storage needed on dairy farms around the country. When using this tool in Northland, it is important to understand that the Northland Regional Council looks at May to October as a period when, in some seasons, effluent cannot be discharged to land without non-compliance and contamination of water. It is necessary to block out this period when estimating storage requirements.
**New ponds**

DairyNZ promotes the use of a trained professional to design your pond. It recommends the use of companies that have undergone training by attending the NZ Water & Environment Training Academy (NZWETA) Pond Design and Construction course. A list of attendees can be found on www.infratrain.co.nz

The Institute of Professional Engineers (IPENZ) Practice Note 21: Farm Dairy Effluent Pond Design and Construction, documents good practice methods for designing and installing effluent storage facilities.

Some of the pond design and construction principles you should be aware of are:

- Pond placement can have a big impact on the overall cost (i.e. pumping costs, earth works etc). Minimum distances also apply as to where effluent can be stored in proximity to the dairy. When investigating a site, variables such as existing water tables, soil profiles, and nearby waterways need to be taken into consideration.

- Where high water tables are present, an above ground tank for effluent storage should be considered. Be sure to use an engineer with experience in installing these types of storage facilities. This can also be a cost-effective option for smaller herds.

- One of the major issues with pond construction lies in the type of liner that is used to seal the pond from leakage. The table below looks at pros and cons for clay and synthetic liners.

<table>
<thead>
<tr>
<th>Options</th>
<th>Pros</th>
<th>Cons</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Compacted clay</strong></td>
<td>• May have suitable clay on site</td>
<td>• Requires soils to be laboratory tested and meet specific criteria</td>
</tr>
<tr>
<td></td>
<td>• Requires technical expertise to compact clay correctly to achieve sealing requirement</td>
<td>• Cracking can appear when ponds are empty, risk of leaking</td>
</tr>
<tr>
<td></td>
<td>• Warranties may be more difficult to obtain</td>
<td>• Potentially high cost if clay is imported from off-site</td>
</tr>
<tr>
<td></td>
<td>• May require periodoc re-lining after cleaning</td>
<td>• Not favoured by all councils; you need to check</td>
</tr>
<tr>
<td></td>
<td>• Not suitable for peat soils.</td>
<td></td>
</tr>
<tr>
<td><strong>Synthetic liners</strong></td>
<td>• Good range of liners available</td>
<td>• Some variation in quality of synthetics on market, need to assess them and shop around</td>
</tr>
<tr>
<td></td>
<td>• Good warranties available</td>
<td>• May be more expensive than compacted clay.</td>
</tr>
<tr>
<td></td>
<td>• Installation allows for gas and ground water dissipation.</td>
<td></td>
</tr>
</tbody>
</table>
**Treatment ponds**

The main purpose of treatment ponds is to reduce the concentration of nutrients, suspended solids and bacteria in effluent. To achieve this, the effluent must remain in the treatment system (anaerobic first pond and aerobic second pond) for at least 90 days. This enables the settling out of solids and the breakdown of organic material by micro-organisms living in the ponds.

In two-pond systems, effluent enters the first (anaerobic) pond where solids settle and are broken down by bacteria which thrive in the absence of oxygen. This reduces the concentration of nutrients flowing into the second (aerobic) pond. Ponds which are well-designed, constructed and managed can work well in Northland if managed correctly due to high ambient temperatures.

**Note:** You must have a resource consent to discharge treated effluent to any waterway.

**The most common reasons for poor performance of pond systems are:**

- Undersized ponds
- Excessive use of water at the dairy
- Failure to control stormwater
- Inadequate management.

**Embankments**

- Damage by animals or machinery and erosion by weather can result in pond failure
- Routinely check pond embankments
- Do not graze heavy stock on pond embankments
- Fence ponds to exclude stock as well as protect staff and children.

**Removing Solids**

When removing solids from the first settlement pond, it is important to ensure that the liner/base of the pond is not damaged and that removed solids are spread straight away.

The nutrient rich solids can be spread on the farm by a spreader or spreading contractor. Solids can be beneficial to cropping/maize paddocks where nutrients broken down into soils can be taken up by growing plants.

It is important with treatment ponds to routinely:

- Check pipe work, including T-piece
- Clean the gravel trap
- Control weeds on the surface of ponds (small vegetation can be left on the embankments to prevent cracking and erosion)
- Check pond embankments for cracks, erosion or signs of leakage
- Desludge the anaerobic pond
- Check visual quality of pond discharge.
Leaking ponds

Storage ponds may show signs of leaking. A good way to diagnose a leaking pond is to visually assess it using the following checklist.

Your pond is likely to leak if:

• The walls of have visible cracks or fissures where liquid can escape
• There are lush patches of long, green grass present all year round (even during summer dry periods)
• Planted trees around the walls of your pond have roots protruding into the pond walls or base
• Soil tests near the pond itself show heightened levels of nutrients, in particular Nitrogen and Phosphorus
• Nearby drains or waterways show an increase in effluent related nutrients or bacteria
• The pond remains at a constant level no matter how large the effluent input during the year
• A ‘drop-test’ or similar test undertaken by a professional, shows a decrease in pond volume during periods where irrigation is not occurring (with adjustments for evaporation and rainfall).

Soil

The Northland Regional Council treats most soil in land application areas as high risk due to:

• the variability in contours and soil types
• the proliferation of both permanently and intermittently flowing streams; and
• the extreme rain events that occur across the region.

Northlands main concern with effluent systems is deciding when to irrigate effluent to land. Care needs to be taken to establish which effluent system is best for your farm and that this system is well managed.

Soils vary across farms so when choosing areas for land application, paddocks which have a lower-risk of ponding and overland flow should be identified and utilised.

Soil Texture

Soil classification, when it comes to FDE application, is based on the principles of preferential flow paths and ability for soils to hold moisture. Soils vary widely when looking at their ability to become saturated and this determines when effluent/nutrients can be applied to land.
Soil texture is defined by the size of the particle that is comprised of. Texture affects the infiltration rate (speed) of water moving down through the soil and also the way soil particles hold onto water in the soil (water holding capacity), this affects how applied effluent moves in the soil.

**Soil Drainage**

The way that soil drains dictates the rate at which effluent can be applied across paddocks. The structure of soil relates directly to the way that liquid is drained through the soil profile. Determining soil drainage will help to better explain the reasons that effluent needs to be stored when soils are at their wettest.

<table>
<thead>
<tr>
<th>Matrix flow</th>
<th>Preferential flow</th>
<th>Surface runoff</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Uniform movement down through the soil.</td>
<td>• Water fast tracks through soil through cracks and channels.</td>
<td>• Very little infiltration, water moves across the surface or ponds.</td>
</tr>
<tr>
<td>• High infiltration rates</td>
<td>• Poor natural drainage</td>
<td>Influenced by:</td>
</tr>
<tr>
<td>• Well drained soil profile</td>
<td>• Mole and pipe drainage</td>
<td>• Length of slope and steepness</td>
</tr>
<tr>
<td>• High porosity</td>
<td>• Heavy or coarse soils</td>
<td>• Soil moisture content</td>
</tr>
<tr>
<td>• Fine soil structure</td>
<td></td>
<td>• Soil infiltration</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Ground cover and land-use</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Soil compaction</td>
</tr>
</tbody>
</table>

![Diagram of soil texture and drainage types](image)
Dairy shed water-use

Why is it important?

The advantages of keeping dairy shed water volumes down are:

- Cost savings in pumping
- Maximising contingency storage in ponds.

The easiest and most accurate way is to install a water meter to get an actual reading of the amount of water being used per milking. If you are still in the process of organising/installing a meter, there are other less accurate ways of measuring water use. Such as:

- Using the worksheet in this section to estimate the amount of water being used daily (some average volumes required)

or

- Using the industry average of about 70l/cow/day.

The amount of wash down water used in the shed varies considerably and will directly impact the volume of storage required.

How can I minimise total effluent volumes?

Reduce the amount the cows actually leave in the yards by:

- Minimising cow stress
- Keeping milking time to a minimum
- Ensuring cow flow in and out of the shed is efficient
- Sizing shed correctly, sometimes two herds with plenty of room are better than one herd squeezed into the yard.

Minimise water into the effluent system:

- Control clean stormwater with diversions
- Divert milk cooling water away from yards/ponds. Instead look at ways to reuse e.g. wash downs
- Minimise washdown volumes and total washdown time
- Use water-efficient yard cleaning backing gates
- Do not leave hoses running unnecessarily and repair any leaks promptly
- Recycle green water into flood wash or backing gate systems (NZCP1 Food Safety rules permitting)
- Train staff on effective and efficient water-use
- Meter the amount of water being used in the dairy shed
- Permanently divert roof water away from the yard and ponds.

On average the quantity of effluent and wash water generated at the farm dairy is about 70 litres per cow per day, but it can range from 20 to 150 litres per day. This can be reduced with good cow handling practices and water efficient washdown systems and techniques.
Metering water use in the farm dairy is the best and most accurate way to track water consumption over time. In the absence of meters, you can use this form to record all your water uses, then do the calculation to estimate total use.

<table>
<thead>
<tr>
<th>Measure...</th>
<th>Record...</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A. Milk cooling</strong></td>
<td><strong>Water use</strong> $A = \frac{\text{flow}}{\text{min}} \times \text{minutes milking time} = \text{litres}$$</td>
</tr>
<tr>
<td>Measure exit flow during milking: Time how long it takes to fill a 200 litre drum and use it to gauge the flow rate (in litres/min). Determine total milking time for the day.</td>
<td></td>
</tr>
</tbody>
</table>

| **B. Plant/vat wash** | **$B = \text{litres}$$ |
| Wash tubs and hot water cylinders use set amounts of water. Refer to washing routine instructions supplied by the detergent companies |

| **C. Yard wash down** | **$C = \text{litres}$$ |
| To do a bulk tank calculation, follow these steps. |
| • Turn off any automatic tank refilling from source water during measurement (milking). |
| • Turn off stock water tap during measurement period if it draws off this tank. |
| • Turn off connections to other tanks. |
| **Measure amount of water drawn off during the whole milking time** (Remove the lid and use a stick to measure the difference in cm between ‘start’ and ‘finish’ water levels.) Divide this by 10 cm (for 25,000 L tank) or 9 cm (for 30,000 L tank) to approximate water volume in m³. Multiply by 1,000 to convert to litres. This amount is the “change”. |
| For **single tanks**: $C = \text{“change”} - B$ |
| For **multiple tanks** (tank for yard wash down): If there is more water in the tank at finish due to refill from milk cooler greater than use, then $C = A - \text{“change”}$. If less water in the tank, $C = A + \text{“change”}$. If you run out of water for yard wash, refill the tank to provide the water needed to finish. Measure the flow rate x amount of time to refill and call this volume “E”. In this case, $C = A + \text{“change”} + E$. |

| **D. Other water uses** | **Note:** For tanks other than 25,000 or 30,000 litres, divide 1,000 by 3.14 x r² (i.e. radius of the tank squared) to determine the “volume/height” per cubic meter. |
| These uses of water are captured under C (bulk tank calculation) above. If you are interested in quantifying this water consumption, use appropriate procedures (measure water flow rate, etc.). |
| This can include skirt and cluster wash in rotaries, for example, and use of dairy shed water outside of milking activities. |

| **Calculate...** | **Note:** For estimating purposes, D (other water uses) is included in the C calculation above. |
| If you use milk cooling water for yard wash |
| $B + C$ | $\text{Water use per milking} = \frac{B + C}{1,000} = \text{litres} = \text{m}^3$ |
| If you do **not** use milk cooling water for yard wash |
| $A + B + C$ | $\text{Water use per milking} = \frac{A + B + C}{1,000} = \text{litres} = \text{m}^3$ |

| Total water use for twice-a-day milking |
| $\frac{m^3}{\text{milking}} \times 2 = \text{m}^3$ |
**Storm/rainwater diversions**

Diverting as much clean stormwater as possible away from the effluent system helps to reduce the amount of storage required. Water from roofs should be permanently diverted (or collected) for washdown use. Diversions should be used to redirect rainfall from the yard whenever it is clean. Diversions can also be installed on silage pads, feed pads and other infrastructure and redirected after seasonal use.

Good management of diversion systems is vital as untreated effluent can discharge to water if it is not captured. Diversions must be switched over to effluent mode when the yard and/or pad is in use.

**Adding stormwater to storage ponds fills them up quickly and decreases storage capacity**

- Divert catchment water from the ponds
- Install guttering and downpipes on buildings
- Divert stormwater from the yard whenever it’s clean.

**Feed pads**

- Divert stormwater after seasonal use when the pad is cleaned.

**Stand-off pads**

- Effluent from stand-off pads must be collected and reticulated to an effluent storage facility. Pads must be contained with appropriate drainage.

**A Northland dairy farm water-use example**

The example below looks at the impact that freshwater inputs can have on the total storage of effluent ponds in Northland. Through efficient management, Farm 1 shows a saving of almost 2000m³ in effluent/water volumes.

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**Smart water use makes a big difference**

This graph illustrates how water management can impact on your effluent volumes.

Both farms milk 300 cows, but Farm 2’s effluent volume is nearly double that of Farm 1. Key reasons are that Farm 2:

- Has no guttering on its roof
- Uses more wash-down water per cow per day (80 l/cow/day instead of 50 l/cow/day)
- No stormwater diversion at the yard
- Requires a larger pond than Farm 1 so it collects more rainfall

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A water-use example from Northland showing the impact various parts of the farm dairy have on total effluent pond volumes
**Stormwater diversion**

Stormwater must be diverted prior to the gravel trap or only when the gravel trap is clean. The best systems are close to the dairy and have a highly visible reminder for staff. Examples include flags or an ear tag on the vacuum pump switch, which staff have to move before starting the milking plant; or some other way of ensuring milking does not start while yard water is diverted away from sump/pond. Here are some examples:

- **Divert clean water**
  ONLY after cleaning

- **Simple stormwater diversion system**

- **In-shed system, with simple way to change from effluent mode to stormwater mode.**
Off-Paddock infrastructure

Off-pasture areas

Effluent can be generated across many different areas of a dairy farm. In all cases, it is important that the effluent is captured and disposed of correctly. The illustration below shows examples of the areas where effluent needs to be contained and/or reticulated.

- Underpasses
- Sand traps and sumps
- Feed bunkers
- Silage stacks
- Feed and stand off pads
- Wintering pads, barns and calf facilities
- Yard entry and exit points
- Ponds and storage facilities
- Bridges and culverts
- De-watering pads and solids storage bunkers
Regional Rules for effluent disposal from feed/stand-off pads, wintering barns, herd homes etc. are the same as those for effluent from the dairy.

When considering the construction of a feed/stand-off facility it is important to consider all the options and to design the effluent disposal system at the same time.

The use of off-pasture systems is increasing throughout New Zealand including Northland. The volume of effluent captured from these facilities can be quite high and must be managed efficiently.

- All solids need to be stored on or in a sealed and drained area
- All liquids need to be stored in a correctly sized storage facility
- The amount of rain likely to fall on these areas needs to be taken into consideration when building a storage facility to allow for the increase in liquid volume into the pond/tank.
- If using green-water to wash down these facilities, you must meet the NZCP1 Food Safety rules and regulations.

**Stand-off pads and feed pads**

Stand-off areas and feed pads should include an effluent management system providing:

- Sealed storage areas for any solid effluent scraped off the area (e.g. sawdust, manure)
- Sufficient capacity in your storage and application system for additional liquid effluent
- Sealing, bunding and collection of liquid effluent from the pad so that it cannot drain into groundwater or surface water. Sealing means that the pad does not leak and is usually achieved with fit-for-purpose synthetic liners such as concrete, rubber or plastic. Drains underneath soft surfaces should have a sealed layer below them and should direct effluent to a storage system. The use of stand-off areas or ‘sacrifice paddocks’ should be avoided.

Different surface materials (such as concrete, limestone, wood chip, bark or sawdust), require different management. Some wood-based products are highly absorbent and can be scraped and composted or spread to land. But you may still be asked to demonstrate that you have an appropriate seal and collection system beneath the pad to ensure that no effluent is reaching groundwater.
Roofed/covered stand-off pads and feed pads

Design and infrastructure of a pad directly impacts the volume of effluent generated. In recent years there has been a move away from open, to covered pads and in some cases they are further weather-proofed with side curtains.

Covering pads greatly decreases effluent volumes by eliminating rain/storm water from the system. Dry scraping effluent from well-ventilated covered pads further reduces these volumes.

Advantages of weather proofing your pad:

- Improved cow comfort
- Cows can be stood-off for longer
- Further reductions in pasture damage
- Less feed wastage (due to elimination of rain water)
- Reduction in effluent volumes.

Covered pads can be cleaned by either:

a. Flood washing with recycled effluent, which requires:
   - Pumps, tanks, and pipework
   - Mechanical maintenance
   - Solids to be removed before effluent is used for flood wash
   - Some form of effluent collection (additional storage volume)
   - Land application system or consent to discharge effluent.

b. Dry scraping effluent into a covered bunker; which requires:
   - A covered storage bunker (can often be added to the end of the pad)
   - Minimal additional infrastructure
   - Some additional labour
   - Routine emptying/cleaning of the bunker
   - Use of a muck spreader to effectively apply solids to land.

In a well-designed covered pad, effluent tends to dry out rapidly and can form bedding which the cows will lie on. Dry effluent is a valuable slow-release fertiliser, usually applied to pasture or crop paddocks via a muck spreader.
Including stand-off pads and feed pads in your effluent system

When adding a feed or stand-off pad to your farm, you will need to upgrade the effluent system to cater for the higher volume, nutrients and solids content. Plan your effluent system around a high-use scenario to allow for future flexibility.

To cope with the increased load on your effluent system, you may need:

- Extra storage for liquid and solid effluent
- A means of removing the solids and fibrous material from the effluent before irrigating
- A plan for handling and spreading solid effluent products (including access to land and machinery)
- More irrigation area to deal with the extra volume and nutrients.

Changes in solids from stand-off facilities and feed pads

Effluent from pads includes coarse solid materials and grit which can cause blockages and wear in the effluent system.

Solids from the pad can be:

- Held behind a weeping wall structure
- Removed with mechanical solids separators
- Settled out in a separate pond with a baffle or T-piece outlet to retain the solids.

Ponds receiving effluent from a feed pad will require more frequent desludging and may be at risk of odour episodes. Retained solids can be dried on a sealed surface and spread on land at a suitable rate to avoid nutrient overloading.
**High traffic areas**

High traffic areas have the ability to accumulate a large amount of effluent in a relatively small area and are often an issue during wetter periods of the year. Effluent has the ability to run-off into the surrounding environment; therefore it needs to be contained.

Farmers who milk through winter must have adequate infrastructure to manage additional effluent volumes.

Areas where cows mill around or stop for periods of time can accumulate effluent which needs to be captured. These areas can be an issue during wet periods and can also create hoof problems for stock if not managed well.

**Entry and exit races**

Entry/exit races are high traffic areas that accumulate a lot of effluent. When these areas are poorly managed, there is a high risk of discharging untreated effluent to water.

**Bridges and crossings**

Proximity to waterways makes bridges and crossings high risk areas for effluent to discharge directly to water. Correct construction, including bunding of bridge sides, is important to ensure effluent does not enter water.

**Underpasses**

Effluent from underpasses needs to be managed carefully during wet periods, particularly where water tables are high. More information can be found in Part 3 of the IPENZ Practice Note 27: Dairy Farm Infrastructure.

**Silage stacks**

Leachate from silage stacks is extremely toxic to waterways and all waste needs to be contained on a sealed surface and disposed of in accordance with best practice methods.
**Effluent Systems: Examples**

Compliant systems in Northland have the following features:

- Large sealed ponds which provide adequate storage
- Effluent applied at low rates across areas suitable for effluent disposal, when conditions are optimum for irrigation and pasture growth.

A number of key variables impact the selection of an effluent system best suited for your farm. Understanding these is hugely important to making an informed decision. A good way to establish the type of system that might suit your farm is to ask the following questions:

<table>
<thead>
<tr>
<th>Do you have...</th>
<th>Tick if yes</th>
<th>Consider...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poorly drained or pugged soils or soils with artificial drainage?</td>
<td></td>
<td>A low rate application system is best. A sprinkler type system is lower risk, but if you operate a travelling irrigator in these conditions it has to run at high speed to deliver low depths. You will also need extra storage as you can’t apply when soils are too wet. A low rate system is one which can achieve very low application depths compared to traditional systems; for example between 1-10mm.</td>
</tr>
<tr>
<td>To irrigate on land with a slope greater than 7°?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A high rainfall area?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A high water table?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A nutrient sensitive catchment?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A large herd (e.g. over 500 cows)?</td>
<td></td>
<td>Include a solid separation component to your system to deal with the extra nutrients and solids before they get to storage. Also check you have a large enough area for applying effluent. Separators can be mechanical or passive (see pages 33 and 34).</td>
</tr>
<tr>
<td>An intensive feeding system?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A standoff or feed pad in regular use?</td>
<td></td>
<td>You can use a range of applicators. Make sure you have adequate storage to manage through wet times and check your application rate.</td>
</tr>
<tr>
<td>None of the above risk factors?</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
System Type 1: Low-rate applicators

This system has a storm water diversion at the yard. The effluent is then gravity-fed to a passive separator where the solids are removed. The liquid is then pumped or gravitated to storage and irrigated to land via a small number of low rate applicators that are moved frequently.

Best suited for

<table>
<thead>
<tr>
<th>Farms</th>
<th>That require flexibility in application depth and rate, such as high risk soils, high rainfall areas or sensitive catchments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soils</td>
<td>All soil types. Especially suited to poorly drained or artificially drained soils</td>
</tr>
<tr>
<td>Slope</td>
<td>All</td>
</tr>
<tr>
<td>Labour</td>
<td>Higher labour input</td>
</tr>
<tr>
<td>Capital investment</td>
<td>Moderate to higher (storage additional)</td>
</tr>
<tr>
<td>Other</td>
<td>Works well in small or irregular paddocks</td>
</tr>
</tbody>
</table>

Notes:

- If combining feed pad with farm dairy effluent from yard, separate solids from liquids
- If using low-rate irrigation separate solids from liquids
System Type 2: Travelling irrigators/slurry tankers/spreading contractor

This system would typically include a storm water diversion then flow through a stone trap to a storage facility. A pump station is required if there is no gravity to storage. Effluent is stirred and sucked from storage into a muck spreader truck and sprayed to land, or applied to land via travelling irrigator.

<table>
<thead>
<tr>
<th>Best suited for</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Farms</td>
<td>Smaller farms and lower cow numbers, or when applying effluent to remote areas</td>
</tr>
<tr>
<td>Soils</td>
<td>All</td>
</tr>
<tr>
<td>Slope</td>
<td>Flat to sloping</td>
</tr>
<tr>
<td>Labour</td>
<td>Moderate to higher labour input</td>
</tr>
<tr>
<td>Capital investment</td>
<td>Lower (storage additional)</td>
</tr>
</tbody>
</table>
Planning land application
Planning land application

Successful operation of a land application system needs careful planning. Consider:

- The volume of effluent
- The nutrient content
- The area necessary to handle the effluent effectively
- Local soils, weather patterns and groundwater conditions
- Paddock layout
- Contour of the irrigated land and proximity to drains and streams
- Safety cut-outs.

If land application is working correctly, there should be even application, little drift, and no ponding or runoff.

Only the quantity of effluent that can be held in the root zone should be applied at one time, otherwise excess can be lost to groundwater and nutrients wasted. There is also a higher risk of non-compliance with regional rules.

A Northland effluent application plan

A written effluent application plan can help you identify suitable areas of the farm for effluent application:

- From a plan or map of the farm, identify waterways, natural drainage patterns, prevailing wind direction and neighbours’ dwellings, soil types and sub-surface drainage
- Mark out the ideal area for effluent application avoiding areas noted above, noting irrigator runs for each paddock and colour-coded risk zones
- Include risk zones such as drainage areas, very wet soils or very free-draining areas with underlying gravels and accessible groundwater
- No-application zones should include all land within 20m of a drain, waterway or bore, or the boundary of a neighbouring property. (These are marked in orange in the map below).
- In addition to planning your effluent irrigation, make a plan for maintenance; showing tasks, dates to do them and who is responsible, with a space to note when they have been completed
- Consider conditions on the day that might increase the risk of effluent entering no-application zones (e.g. wind direction and speed).

FIND OUT MORE

See dairynz.co.nz for templates you can use for record keeping, staff training and maintenance. Self-audit effluent checklists are available for Northland farmers (Northland Compliance Checklist).
System design

Effective land application systems are dependent on the correct selection and integration of storage ponds, pumps, pipelines and irrigators. Correct installation, maintenance and management are critical to achieve a successful end result.

When considering land application:

- Use an accredited professional to design your system
- Beware of “off-the-shelf” or “one-size-fits-all” systems
- Understand the Northland regional rules for land application.

Who can help?

When looking at whose advice and service to use, the first thing to look for is an accredited Farm Dairy Effluent company. Accredited FDE companies are trained effluent system specialists. They understand and follow the Farm Dairy Effluent (FDE) Code of Practice and Design Standards when designing and installing FDE systems.

Using an accredited FDE company will provide assurance that:

- The investment in effluent infrastructure will be specific and relevant to you, your farming environment and your farm system
- The effluent system is capable of complying with regional council requirements when managed correctly
- The system is designed with an understanding of the current research and best technology options available at the time.
When selecting a designer/engineer, consider the following:

- Do they have experience working with your type of farm system and farm use?
- Do they have experience in the type of FDE system you would prefer to operate?
- Do they have experience working with your specific regional council rules and dairy company requirements?
- Can they demonstrate competence through testimonials and references?

**Effluent Warrant of Fitness**

The dairy industry has developed a system for the certification of Dairy Effluent Assessors as part of the Dairy Effluent Warrant of Fitness (WOF) programme. The purpose of this certification system is to enable dairy farmers to choose suitably trained and competent professionals. To find one of these professionals effluentwof.co.nz is the place to go.

**What is a Dairy Effluent WOF?**

The WoF is a full 3-4 hour assessment of your dairy farm effluent system following a consistent methodology by trained professionals.

WoF assessors will:

- View the farm’s effluent consent or permitted rules (are all requirements being met?)
- View nutrient budget (checking nitrogen loadings)
- Run the dairy effluent storage calculator to estimate if storage for the farm system is sufficient
- Assess all catchment areas, including stand-offs & feed pads
- Assess application depth and rate test of the irrigation system
- Dig a test pit to observe soil risk
- Ensure hazards are identified and any general Health and Safety concerns are recorded
- A full report is provided to the farmer with areas of concern and suggested actions.
Choosing irrigators
Choosing irrigators

It is important that when buying an irrigator or upgrading your system, you spend some time to ensure that the irrigator is suited to both the pump and hose sizes. Avoid buying irrigators “off the rack” without investigating what size pumps/drag-hose the irrigator is specified to work with.

The table below looks at the pros and cons of each of the irrigator options.

<table>
<thead>
<tr>
<th>Pros</th>
<th>Cons</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Traveller</strong> – application depth 8mm+</td>
<td>• Unsuited to topography steeper than 7° and high rainfall or high drainage areas</td>
</tr>
<tr>
<td>• Low capital outlay</td>
<td>• High application rates and depths</td>
</tr>
<tr>
<td>• Can distribute large quantities of effluent at one period</td>
<td>• Risk of poor performance due to poor daily set up</td>
</tr>
<tr>
<td>• Doesn’t require fine solids removal</td>
<td>• Risk of poor performance due to poor design and lack of maintenance</td>
</tr>
<tr>
<td>• In case of breakdown, easy to interchange with alternate traveller</td>
<td>• Not well-suited to small or irregular paddocks</td>
</tr>
<tr>
<td>• Easy to service and maintain</td>
<td>• High application depth when travelling at slow speeds</td>
</tr>
<tr>
<td></td>
<td>• More difficult to get even application throughout the paddock particularly if different people shifting it each time</td>
</tr>
<tr>
<td></td>
<td>• More shifts involved to get same volume of effluent as traveller (depending on soil moisture deficit)</td>
</tr>
<tr>
<td></td>
<td>• Easily blocked (need solids separation or filtration)</td>
</tr>
<tr>
<td></td>
<td>• Specific planning and design needed to get correct pressures and volumes to all sprinklers</td>
</tr>
<tr>
<td>**Low rate sprinkler systems – application depth 1-10mm+</td>
<td>• Reliant on contractor’s timetable</td>
</tr>
<tr>
<td>• Low application rates</td>
<td>• Less benefit from regular water and nutrient application</td>
</tr>
<tr>
<td>• More irrigation days available</td>
<td>• Must make sure contractor applies within the rules</td>
</tr>
<tr>
<td>• Less moving parts therefore easy to maintain</td>
<td>• Cost of contractors</td>
</tr>
<tr>
<td>• Less chance of spray drift over boundaries etc.</td>
<td></td>
</tr>
<tr>
<td>• Can distribute large quantities of effluent at one time period at low depths if multiple sprinkler units are used over a large area</td>
<td></td>
</tr>
<tr>
<td>• Easier to shift and run in rolling topography</td>
<td></td>
</tr>
<tr>
<td>• Suits high rainfall/high risk soils/rolling or artificially drained land</td>
<td></td>
</tr>
<tr>
<td><strong>Contract spreader</strong></td>
<td></td>
</tr>
<tr>
<td>• Very low capital investment</td>
<td></td>
</tr>
<tr>
<td>• Very low labour requirement</td>
<td></td>
</tr>
<tr>
<td>• Empties pond fast</td>
<td></td>
</tr>
<tr>
<td>• Proof of placement</td>
<td></td>
</tr>
</tbody>
</table>
### Pros
- Can access most parts of rolling farms
- Excellent low application depths
- Can move large volumes of effluent relatively quickly
- No solids removal required
- Easy to allow for wind drift
- Excellent placement control
- Has the ability to suck out sumps and other sources that don’t have pumps
- Relatively cheap option compared to pumps, pipes and irrigators etc.
- Return more organic matter to soils

### Cons
- Heavy gear causing damage to pastures and races
- Need good vehicle access to ponds
- Health and safety risks for drivers on steep land

### Managing nutrients
To maximise fertiliser value, land application of effluent should be managed as an integral part of the farm fertiliser programme, and should be taken into account when discussing your nutrient budget with your fertiliser representative.

### Getting it right - what's it worth?
Nutrient levels in effluent vary widely depending on:
- Type, quality and quantity of feed
- Stage of lactation
- Volume of water used
- Volume of stormwater intrusion
- Weather conditions
- Time stored.

Your nutrient budget will calculate the nutrient inputs and outputs from all sources on your farm. The nutrient value of effluent for your farm is based on stock, feed and management practices. The amount of nutrients coming in can be determined in the budget and this can also be translated to the equivalent fertiliser value.
Solid fertiliser equivalent of effluent from 100 cows under different scenarios

The nutrient content of effluent depends on the effluent solids content, the length of time cows spend on any area that collects effluent, the cow’s diet, and the length of time effluent is stored in a pond before it is applied to land.

Due to the large variations in nutrient levels and the difficulty in getting representative samples it is recommended that:

- The effluent block is routinely soil tested
- Minimum application area is best calculated through a nutrient budget
- Effluent and solid fertiliser application is adjusted based on soil test results
- Effluent is sampled so the amount of nutrients being applied through effluent applications is known.

Nutrient application for cropping:

- Effluent should be applied to crop paddocks in autumn when soils are in moisture deficit
- Effluent applied in spring is likely to result in nutrient losses and may delay cultivation.
**Managing solids**

The management of solids is vitally important for ensuring that the system runs effectively and efficiently. If not managed correctly, solids can have adverse effects on pump and irrigator performance and storage facilities. Solids management can be through either passive or mechanical solid separation and each has its pros and cons as outlined below:

<table>
<thead>
<tr>
<th></th>
<th>Pros</th>
<th>Cons</th>
</tr>
</thead>
</table>
| Passive separator (weeping wall or settling pond) | • Low risk of breakdown  
• Very low ongoing labour input  
• Low energy use | • Farm specific – can be hard to retro-fit into existing systems  
• Solid product has higher water content  
• Solids can become anaerobic causing odour  
• Takes up a large physical area  
• Emptying bunkers can be a big job. May require contractor (be careful if weeping wall is synthetically lined) |
| Mechanical     | • Liquid effluent is better filtered  
• Requires smaller physical area  
• Produces a drier solids product to store and spread | • Ongoing mechanical maintenance  
• Increased risk of breakdown  
• High capital costs  
• High energy costs  
• Requires stone and grit removal prior to separation  
• Works best when effluent properties are consistent  
• Feed waste such as palm kernel grit or pumice and other fibre or waste can cause issues for mechanical separation. |
Passive separation

Weeping walls

A sludge bed with a weeping wall is a common method of passive solid separation. Most filtering occurs through solid settlement in the sludge bed and not the weeping wall. Each design varies and is dependent on individual farm operation. However, it is vital that the floor of the sludge bed is level. The examples below show some designs that are known to work well throughout New Zealand.

IPENZ Practice Note 27: Dairy Farm Infrastructure (Part 2, Section 3.0)
Gravel traps

Although not traditionally referred to as solid separation, a well-designed and routinely cleaned gravel trap will collect stones and race debris before it enters ponds.

Good designs will:

- Slow down water so stones/gravel will sink
- Direct flow of water away from exit drain
- Have the exit drain at the same height as entry pipe
- Be sited at least 10m away from the milking platform.

Gravel will:

- Accumulate in ponds and be difficult to remove
- Shorten the life of pumps
- Settle in irrigation lines and block irrigators.

Mechanical separation

The use of mechanical separation to deal with solids before they reach effluent storage is increasingly used. The options for mechanical separation include:

- Slope screens
- Inclined augers
- Screw presses
- Rotating drum screens.

All of these options have advantages and disadvantages and often the reason for using one over another is down to personal preference. Professional advice can help with:

- Selection of a mechanical separator that would be best suited to your current farm system, taking into account any of the changes that may be undertaken in the future
- Positioning of the separator to ensure the solids can be accessed for spreading and the surface on which the solids are stored after being separated is sealed and meets regulations
- Size of the containment area and structure to ensure all nutrients are captured and disposed of to land
- How to manage solids after separation.

FIND OUT MORE

IPENZ Practice Note 27: Dairy Farm Infrastructure (Part 2 Solids Separation)
Order or download from dairynz.co.nz
Applying solids to land

Effluent solids need to be spread at a much lower depth than normal effluent to account for the increase in nutrient value, and the high solids contents will bind the soil surface. Effluent sampling prior to application, a DairyNZ FDE Spreading calculator and your nutrient budget, will help you to work out the area you will need to spread solids effectively. Rest pasture for at least 10 days, or as long as possible between application of solids and grazing for stock health and pasture palatability reasons.

Treat effluent solids as a fertiliser asset and consider incorporating them into cultivated land for crops.

Note that some of the N will be separated out with the solids, but much of the K is soluble and will remain in the liquid. Test the liquid portion of effluent for K content this will help to adjust future fertiliser applications and avoid animal health issues.

Do not apply solid effluent to any soils not suitable for liquid effluent irrigation. Spreading effluent solids must follow the same distances from waterways and buildings as liquid effluent. Ideally solid effluent should be applied uniformly across the area covered.
Pumps, pipes and irrigators
Pumps, pipes and irrigators

To irrigate or not to irrigate?

The most difficult question with effluent management is: *When can I irrigate?*

The second most difficult question is: *When can’t I irrigate?*

Before making a decision, consider the following:

Avoid irrigating:

- During and/or after periods of wet weather
- A few days before significant rainfall is forecast to occur
- If pasture and soils squelch underfoot (that is, they are waterlogged)
- When you are standing cows off to prevent pasture damage to wet paddocks
- If there is water in the wheel tracks made by the quad or the tractor
- If effluent from the irrigator ponds excessively on the land surface, or flows overland, at the time of application,
- If water is discharging from sub-surface drains
- When pasture is not growing and nutrients are likely to pass through the root zone.

If effluent from the irrigator is causing excessive ponding, or showing any sign of overland flow, the application should be stopped immediately.

Applying effluent to land when conditions are not suitable can result in pasture damage and increases the risk of surface and/or ground water contamination.

Frequency of application

The optimum time between return applications is dependent on individual nutrient budgets. Factors to consider are:

- Soil moisture
- Nutrient levels in soils and pasture
- Pasture palatability
- Animal health risks
- Soil health
- Effect on grazing rotation
- Application to crop paddocks should occur during autumn when vegetation is present in paddocks.

Routine soil and pasture tests should be done, and then effluent and solid fertiliser application adjusted to optimise nutrient levels.

It is recommended that at least 10 days should pass before cows return to graze on paddocks where effluent has been applied.
Before starting, make a habit of checking specific aspects of the effluent system, such as:

- The irrigator drag hose layout is correct
- The irrigator winch and cable are in good order
- The cable anchor is secure
- The speed setting is suitable for conditions
- The winch is in gear
- Check that the cut-off on the winch system is working
- Irrigator nozzles are not blocked or damaged (conical nozzles allow solids and small stones to pass)
- All hydrant and pipe couplings are connected in the correct position
- Pump and level switches are working
- Water troughs are protected from contamination
- The air break (anti-siphon) valve, where fitted, is working.

After starting check:

- The pump for excessive noise or vibration
- That the irrigator is operating as planned
- Pipes, hydrants and drag hose for leaks.

Keep checking for

- Any sign of effluent in subsurface drains
- Overland flow/runoff
- Ponding
- Breakdowns.

Where mains-powered pumps and irrigators are operated at night to reduce electricity costs, special checks need to be made to ensure the system is operating correctly.

Leaks at joints and split hoses will cause loss of irrigator pressure and can cause effluent to enter waterways.
Set up your irrigation system properly

- Correct hose layout is critical for travelling irrigators.
- The spray line between the mainline and the travelling irrigator can create considerable drag on the applicator.
- Set up the hose with a tight loop behind the irrigator.

Laying out the irrigator – Good and bad examples

**Correct**

- The drag hose should be no more than 3m apart from the wire rope.
- The tighter the loop behind the irrigator, the more efficient the irrigator becomes. There is less strain on the wire rope lessening the risk of breakage.

**Incorrect**

- The wide loop behind the irrigator requires a lot of energy to pull it through the grass. The irrigator will run less efficiently.

Half way

Hydrant
A number of irrigator monitoring/control systems are available. These systems can shut the system down when it malfunctions. Warnings can be set up by flashing light, siren, and/or text message.
**System maintenance for land application systems**

It is important with effluent systems that a maintenance routine is adhered to so that equipment is not affected by wear and tear. In order to do this, routinely:

<table>
<thead>
<tr>
<th>Action</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Check irrigator nozzle (replace at same time dairy rubber ware is replaced).</td>
<td><img src="image1.png" alt="Image" /></td>
</tr>
<tr>
<td>Check irrigator tyre pressure and wheel bearings.</td>
<td><img src="image2.png" alt="Image" /></td>
</tr>
<tr>
<td>Grease nipples.</td>
<td><img src="image3.png" alt="Image" /></td>
</tr>
<tr>
<td>Routinely grease the irrigator.</td>
<td><img src="image4.png" alt="Image" /></td>
</tr>
<tr>
<td>Grease the pump, stirrer, gear box and oil sump.</td>
<td><img src="image5.png" alt="Image" /></td>
</tr>
<tr>
<td>Check PTO pump and pump mounting.</td>
<td><img src="image6.png" alt="Image" /></td>
</tr>
</tbody>
</table>
The movement and use of effluent systems is a very important part of day-to-day farm management. Poor staff management is a common reason for non-compliance and so ensuring that all staff are well-trained in proper and effective use of the effluent system, as well as understanding their responsibilities allows for farm owners/managers to increase focus in other areas.

Resource consent holders, farm owners, trustees, companies, company directors, farm managers, contractors, sharemilkers, herd managers and farm employees (including relief staff) are all responsible and can be held accountable for non-compliance.

**Health and safety**

Every year many people are seriously injured or killed carrying out everyday tasks on-farm. It is important to understand that the farmer is legally liable and there have been prosecutions when accidents have occurred. The effluent system is a particularly hazardous area.

A Health and Safety Plan is a legal farm requirement.

Some practical things to consider when designing or managing your effluent system are:

- Install fences and signposts around storage facilities
- Provide training for system operators that includes instructions on how to operate and maintain the effluent system in a safe manner. Safety information, including emergency protocols, should be included in the farm operations manual and farm orientation
- Be sensible about the operation of effluent spreading machinery such as slurry tankers which are prone to tipping on steep country. If in doubt, use contractors who understand where equipment is not suitable
- Make sure staff and visitors are aware of hidden hazards like pipework, wire ropes, hydrants in the paddock, overhead and/or buried power cables
- Earth all electrical equipment
- Turn off and/or secure moving parts when shifting or checking irrigators (boom arms etc.)
- Guard moving parts on pumps or machinery
- Always work in pairs in and around storage facilities
- Use non-slip surfaces next to storage facilities
- Stabilise pontoons and have an approved gantry for servicing pumps and stirrers
- Ensure exit/rescue options are in place e.g. ropes, ladders and buoys for storage facilities.
**Orientation and training**

An orientation and training package for every team member should include:

- Identifying the health and safety risks, and good practice, around the effluent system
- A walk-through of the system, including important daily jobs
- Explaining the effluent consent conditions as they affect each staff member and their level of responsibility
- Explaining the scheduled maintenance tasks and how and when to do them
- Clarifying responsibilities and who to ask if a staff member is unsure what to do
- Problems to look out for and basic troubleshooting
- A buddy system for an initial period where new staff are closely supervised
- Contingency plans for what to do when things go wrong, e.g. who to call, back up equipment.

The PITO provides entry and manager level courses on effluent management. Your effluent system designer or installer may also be able to provide on-farm system training for the farm team.

**Training**

Operation and maintenance of the effluent treatment/disposal system is often delegated to farm workers.

All levels of staff involved in the farm operation must understand the importance of effluent treatment/disposal and be trained to effectively operate the system.

See your local Primary ITO for courses or contact the accredited professional who installed your system who will provide appropriate and useful advice.

![Effluent management plan](image)

An effluent management plan can aid in planning effluent applications across the farm and help staff if there is a breakdown or issue.
Record keeping

Best management practice requires record keeping. The person/s responsible for operation of the system should document:

- Irrigator operation by paddock number
- Irrigator run number
- Time of start and finish of operation
- Exceptions to normal operation
- Checks on equipment
- Maintenance done.

FIND OUT MORE

Irrigator run sheets and other useful staff training tools can be found on the DairyNZ website (dairynz.co.nz)
Rules and regulations
Northland Regional Council rules for animal effluent discharge

The rules which apply to Farm Dairy Effluent disposal are set out in Section 16 of the Regional Water and Soil Plan for Northland (Rules for Animal Effluent Discharges). These rules relate to animal effluent generated from farm dairies, entry/exit races, feed/stand-off pads, wintering barns and underpasses. They also cover pig, poultry and beef farms when feedlots and/or stand-off is used.

The rules are designated permitted activity, discretionary or prohibited (as described below):

**Permitted**

The activity can be carried out without a resource consent as long as you comply with the criteria outlined below.

**Discretionary**

A resource consent is needed to carry out the activity.

**Prohibited**

The activity is not allowed.

You must meet the following key points (from permitted activity Rule 16.1, for Land Application):

There must be no discharge to surface water:

- Directly
- Via overland flow
- Via any tile, mole or other subsurface drain; and
- Directly to groundwater.

Effluent must not be discharged to land within a distance of:

- 20 metres of any waterway
- 20 metres of any drain which contains water, or 10 metres of any dry drain
- 20 metres of any water supply bore
- 20 metres of any neighbouring properties without the property owner’s written permission
- 50 metres of any occupied dwelling.

There must be contingency measures in place to ensure that there is no rule contravention due to equipment failure or when ground/weather conditions are unsuitable for application.
Any effluent storage ponds must be sealed or lined to prevent seepage into groundwater.

Effluent must be applied so that it:

- Is evenly distributed
- Does not exceed the soil’s ability to assimilate it
- Minimises overland flow
- Does not cause overland flow into setback distances from drains, watercourses etc.

Note

You will not consistently comply with the above criteria if you:

- Have no, or insufficient, contingency storage
- Use an open hose to apply effluent
- Do not move stationary irrigators frequently
- Irrigate when soils are at or near saturation.

If you do not comply with all permitted activity criteria at all times, you will need to apply for resource consent.

Discretionary Activities

Any system which does not consistently meet the above criteria and is not a “Prohibited Activity” is deemed a “Discretionary Activity” and requires application for resource consent.

Prohibited Activities

There shall be no discharge of:

- Untreated effluent to water; or
- Treated animal effluent into any dune lake or any watercourse flowing into any dune lake listed in Schedule E (Section 16 of the Regional Water & Soil Plan), or any river, section of river or lake deemed to have outstanding values (listed in appendix 18 of the Regional Water & Soil Plan).

Section 15(1) (b) of the Resource Management Act 1991 also states:

‘No person may discharge any contaminant onto or into land in circumstances which may result in that contaminant entering water’.

The discharge of any contaminant to water or to land in any way in which it is likely to contaminate water is an offence under the Act, unless the discharge is expressly allowed by a national environmental standard, regional rule, or resource consent.

Northland Regional Council (NRC) monitoring programme

All farms are monitored at least annually during the period of peak effluent loadings. The inspections are done by either NRC staff or qualified contractors. All officers are warranted under the Resource Management Act 1991 and thereby have ‘right of entry’ to carry out the inspections. Officers drive vehicles with a prominent NRC logo. Visits are ‘non-notified’ and a visit note is left at the dairy, if no farm representative is present.

Permitted Activity Farms

These farms are visually inspected to determine compliance against the “Permitted Activity” criteria outlined in Rule 16.1 of the Regional Water and Soil Plan (see key points above).
**Consented Farms**

Systems and discharge are routinely monitored against the Permitted Activity rules and/or resource consent conditions to determine any adverse effects on the receiving environment. Water quality test results must meet, or be better than, conditions specified within the Resource Consent.

**Note:** When effluent is applied to land, the permitted activity criteria must comply with the regulations.

All farms are graded either:
- Fully compliant
- Non-compliant or
- Significantly non-compliant

**Responsibilities**

The Resource Management Act 1991 (RMA) delegates responsibility to the Regional Council for the management of natural resources. This includes the control of discharges which may adversely affect the quality of land, water or air. Policies, rules and processes are outlined in The Regional Water and Soil Plan for Northland and the Long Term Council Community Plan. This can be viewed at www.nrc.govt.nz

The RMA states that resource consent holders, farm owners, trustees, companies, company directors, farm managers, contractors, sharemilkers, herd managers and farm employees (including relief staff) are all responsible and can be held accountable for non-compliance.
New Zealand Food Safety Rules

Dairy farms must also comply with NZCP1 (the Food Safety Code of Practice for the design and operation of farm dairies) which in some cases may be different to those of the Northland Regional Council. In such cases compliance with the most stringent rule is required.

The Code of Practice (NZCP1) sets the minimum standards applicable to all farm dairy activities and applies to all farm dairies unless an alternative has been accepted by the Ministry of Primary Industries (MPI) when registering the Risk Management Programme. It covers the approval, design, fabrication, installation, layout and operation of farm dairies and equipment installed in farm dairies to guarantee the standard of performance is sufficient to ensure dairy products are fit for their intended purpose.

Two examples of rules that impact dairy effluent system designs in Northland are as follows:

**Sumps**

Sumps must be made of concrete or another impervious material and must be designed to be easily cleaned. Sumps must not be located within 10 metres of the milking, milk receiving and milk storage areas unless the effluent is pumped away on a daily basis or piped to effluent ponds.

- Sumps between 10 and 20 metres of the farm dairy must not have a storage capacity greater than 22,500 litres and must not have a footprint exceeding a diameter of 4m or 12.5m².
- Sumps between 20 and 45 metres of the farm dairy where storage capacity exceeds 22,500 litres are permitted provided:
  - Storage capacity does not exceed 100,00 litres
  - Structure must not have a footprint exceed a diameter of 7m or 38.4m²
  - Level is controlled to a maximum storage volume of 22,500 litres; and
  - This structure is not utilised as the primary effluent storage facility.

**Green-water washdown**

Effluent, wastewater and water recovered from the farm dairy effluent system must not be used for any purpose in or near any part of the farm dairy other than the yard unless it has been treated to meet potable water standards.

Water recovered from the dairy effluent system must not be used within the farm dairy except to clean the dairy yard, in which case:

- The system operates at low pressure, with no detectable mist or aerosol
- The water recovery system is of a design that will consistently deliver water that does not contain excessive sediment or offensive odours and is acceptable to the farm dairy assessor
- The system must be of fixed design and must not include hand held hoses
- If pumped, the delivery outlet is to be fixed at no more than 300mm above the yard surface
- The system must be completely separate from the fresh water wash down system
- The yard is of concrete construction with no surface cover, and rinsed with clear water if necessary to remove any residual sediment
- The activity does not have a negative impact on the hygiene status of the milking plant, milking and milk storage environment, water used in the milking area, the cleanliness of milking animal teats and udders, or any other thing that might to lead to contamination of the milk;
The raw milk is not intended for the manufacture of unpasteurised dairy products

The Farm Dairy Operator has documented the design and follows written procedures that are sufficient to ensure the requirements detailed in this section are met; and

All other requirements under section 8.9 of the Act are met.

**Sustainable Dairying: Water Accord**

The purpose of the Accord, signed by the industry, is to enhance the overall performance of dairy farming as it affects freshwater. The expectation is that:

- Dairy farms will comply with regional council effluent management rules and/or resource consent conditions
- Effluent systems installed on dairy farms will be fit for purpose and able to achieve 365-day compliance with applicable rules.

**Dairy Companies will:**

Arrange for the assessment of supplier dairy farms on a three-yearly basis to review compliance (or ability to comply) with regulatory requirements (resource consents and regional plan rules). For farms identified as being at risk of non-compliance, a farm specific management plan shall be put in place to ensure 365-day compliance. An annual assessment will be undertaken until such time as the management plan is fully implemented and non-compliance risk is remedied.
Dairy farm effluent
– helping to achieve compliance in Northland

This checklist is supported by the following organisations: DairyNZ, Farmers of New Zealand, Fonterra, Federated Farmers and the Northland Regional Council who are committed to improving water quality in both Northland and New Zealand. Minimising the risk of effluent entering surface or groundwater 365 days a year is a critical step you can take to help maintain and improve Northland’s precious water resources.

This checklist is a self audit for you and your staff to ensure ongoing compliance of your effluent system with regional council rules. Some good practice tips are included to help achieve year round compliance.

We strongly urge you to follow up any boxes that are not ticked as soon as possible. If you need assistance, please contact one of the organisations listed at the back of the checklist for help.

Note: Please see for Rule 16 & 17 of the Regional Water and Soil Plan for Northland for exact rule wording if required (nrc.govt.nz)

• You must ensure that your effluent treatment/disposal system and any discharge from the system complies with regional rules and (where applicable) your resource consent conditions at all times, regardless of the time of year, weather conditions, breakdowns or staffing issues

• Ensure that contingency plans are in place and documented

• Aim for every day good practice rather than just achieving compliance on inspection day

• Fully train your staff on:
  - the rules;
  - the operation and maintenance of your effluent system; and
  - what to do and who to contact if the system breaks down

• Ensure your plan is adjusted to match any changes to your farm system

• The Resource Management Act states any discharge to water is illegal unless authorised.
**Northland checklist**

**Effluent discharge** – includes liquids/solids/sludge/slurries generated from:

- milk room and washdown water
- yards, entry/exit races, concreted races
- sumps, gravel traps
- ponds (desludging)
- stand-off areas (includes races if used for holding stock)
- feed pads, wintering barns and calf rearing facilities
- underpasses.

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**Do you understand the regional council rules for effluent management?**

**Do you understand the conditions of your resource consent?**

(If you do not, please contact your regional council farm dairy effluent team for an explanation of your conditions)

If you have done any of the following: increased the number of cows, changed your milking regime, added imported feed, stand-off pads, feed pads, underpasses, wintering barns, loafing pads, calf rearing facilities, piggeries etc, has your effluent system been upgraded?

Has Northland Regional Council been notified of these changes?

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**At the farm dairy**

Stormwater from buildings is diverted away from the effluent system (i.e. guttering leads to drain or holding tank)

Clean stormwater from the dairy yard is diverted away from the effluent system before the stone trap, but effluent contaminated stormwater is never diverted

Effluent from all sources is captured within an effluent treatment system

Sumps and gravel traps are sealed and are designed so that any overflows are directed into the effluent system *Note: sealing requires construction with non-permeable material*

Gravel traps and sumps are regularly cleaned out

Solids removed from feed pads and gravel traps and other areas are stored on a contained, sealed surface which drains back into the effluent system

Solids/sludges/slurries and stand-off pad bedding material is spread evenly over land with no runoff to waterways, and meets land application criteria (see Land Application section)

Stand-off pads are designed so all effluent is contained within a bedding layer, or collected in a sealed effluent system. For more information refer to *Stand-off pads – your essential guide to planning, design and management*

There is enough contingency storage to ensure effluent is not irrigated during periods when soil is saturated (or likely to be, due to forecast of heavy rain). *Note: if your ponds are full you have no effective contingency storage*
## Land application

Pumps, pipelines, hydrants, connections and irrigators are all well maintained and managed. For more information refer to *A Northland farmer’s guide to managing farm dairy effluent*

Effluent applicator has been well maintained, such as tyre pressure, lubrication, nozzle condition, hoses. For more information refer to *A staff guide to operating your effluent irrigation system – travelling irrigator* and *A staff guide to operating your effluent irrigation system – low rate irrigator*.

There is at least a 20m setback between effluent spray/overland flow and any waterways or drain containing water

There is at least a 10m setback between effluent spray/overland flow and any dry drain

There is at least a 20m setback between effluent spray/overland flow and any neighbouring property

There is at least a 50m setback between effluent spray/overland flow and any occupied dwelling

There is no effluent discharge via sub-surface drains

There is no excessive ponding of effluent after application. *(Note: under council rules ‘excessive’ means there is no ponding for longer than 3 hours)*

All necessary actions are taken to minimise overland flow of effluent

Effluent application is evenly distributed onto the application area

## Management, maintenance, people and contingency

Everyone in the farming operation understands the importance of effluent management and the consequences of non-compliance. For more information refer to *A Northland farmer’s guide to managing farm dairy effluent*

There is a documented operating procedure for effluent system operators which includes:
- areas of the farm used for land application of effluent
- areas of the farm to avoid applying effluent
- basic use of the farm land application system
- a daily/weekly task list to sign off
- correct irrigator hose layout
- basic maintenance requirements of the effluent system
- a contingency plan which includes: key contact names and numbers for when there are system failures, bad weather or issues which may compromise the correct operation of the system

All people with effluent management responsibilities have been trained in the operating procedure, and training records are kept

External training courses are utilised to increase understanding of good practice

There is a documented effluent system maintenance plan in place which is followed. For more information refer to the *Effluent management plan* poster
### Pond discharge treatment systems

<table>
<thead>
<tr>
<th>Condition</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treated discharge does not cause any significant change to the colour or clarity of the receiving water</td>
<td></td>
</tr>
<tr>
<td>Pond is sealed (lined or compacted clay where suitable) to restrict leaching</td>
<td></td>
</tr>
<tr>
<td>No untreated effluent is able to get into waterways or within setback areas</td>
<td></td>
</tr>
<tr>
<td>The first (anaerobic) pond is routinely desludged. <em>(Note: ask the regional council how often the pond should be cleaned)</em></td>
<td></td>
</tr>
<tr>
<td>Embankments are not damaged and do not leak. <em>(Note: damage can often be caused by heavy stock or machinery)</em></td>
<td></td>
</tr>
<tr>
<td>There is freeboard in the pond so they don’t overflow. <em>(Note: freeboard is the difference between the water level and the lowest part of the embankment – usually 0.5 m)</em></td>
<td></td>
</tr>
<tr>
<td>Pond surface and pipework is clear of weeds and obstructions</td>
<td></td>
</tr>
<tr>
<td>The baffle or tee on discharge pipe from anaerobic pond is keeping solids out of the aerobic pond</td>
<td></td>
</tr>
<tr>
<td>No evidence of effluent short-circuiting the system</td>
<td></td>
</tr>
<tr>
<td>Solids are prevented from entering the aerobic pond</td>
<td></td>
</tr>
<tr>
<td>Ponds are well maintained and fenced off</td>
<td></td>
</tr>
</tbody>
</table>

### Rule 17. Permitted Activity – Key points for making silage, disposal of dead stock and disposal of offal

- There must be no discharge:
  - within 50m (horizontally) from any surface water or water supply bore
  - within 50m of any residence
  - of leachate to water

- and
  - catchment runoff must be prevented from entering any disposal site
  - offal pits and dead stock disposal sites must be covered to prevent nuisance odours
  - the volume of any silage pit is not greater than 1000m³

**Any activity which does not meet the permitted activity criteria requires application for resource consent.**

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**Disclaimer**

The information that appears in this checklist is intended to provide the best possible compliance guidelines for dairy farm effluent practices. However, the information is provided as a general guidance only and is not intended as a substitute for specific advice. Practices, systems and advice may vary depending on the circumstances applicable to your situation. The information may also be subject to change at any time without notice. DairyNZ, Farmers of New Zealand, Federated Farmers, Fonterra, Northland Regional Council and AgITO take no responsibility whatsoever for the currency and/or accuracy of this information, its completeness or fitness for purpose.
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