A guide to managing farm dairy effluent

West Coast
Acknowledgements

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Please note that while this book has been reprinted in 2011 it has not been completely updated since 2007. Please consult an effluent specialist for specific advice relating to your farm.

Disclaimer:

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Please note all references to legal requirements are correct at the time of printing.
Managing farm dairy effluent

About this booklet

Farm dairy shed effluent is a valuable resource and if managed well can increase pasture production and reduce fertiliser costs. However, effluent also poses an environmental risk due to the nutrients and disease-causing bugs it contains. If untreated effluent enters waterways or groundwater it can have a detrimental effect on the health and quality of waterways. There are a number of systems currently available for effluent treatment, however, this booklet provides best management practices for the main systems currently operating on the West Coast.

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Effluent treatment to match your farm system

Each West Coast dairy farm is different, and your effluent system needs to reflect the unique situation on your particular farm.

As farm systems become more diverse, the old ‘rules of thumb’ may no longer apply.

Effluent volume and nutrient concentration will vary depending on:

- Stocking rate and amount of fertiliser applied
- Pasture fed – quantity and quality
- Supplements fed – type and quantity
- Washdown system and technique
- Frequency of milking (once or twice a day)
- Storage and pre-treatment of effluent e.g. how long the effluent has been in a holding pond and whether the pond is stirred while pumping
- Areas effluent is collected from – farm dairy and yards, stand-off area, feed pad
- Time the herd spends on a stand-off area or feed pad and frequency of washdown
- Herd management and handling while in the yards.

Because each farm is different, to have accurate information you need to do your own effluent nutrient analysis to be sure of the nutrient content you are actually applying. A nutrient budget can help you determine if your effluent application area is big enough, and allow you to come up with a nutrient management plan, treating the effluent blocks separately from the rest of the farm.

Many land application systems are currently being used in a manner that applies too much effluent for the conditions. Check out your current application rates according to the information in this booklet to ensure you are complying with the rules and making the most of the fertiliser value of your effluent.

Dairy effluent treatment is an evolving field. Different effluent systems have their advantages and disadvantages. Important considerations are the system’s effectiveness, capital cost, and labour requirements (including maintenance). In addition to the traditional choices of pond treatment systems, vehicle spreading or travelling irrigators, options now include various different land-based systems.

Lower application rates and more even spray patterns create less environmental risk. Low-rate sprinkler systems and oscillating irrigators give better performance than standard travelling irrigators in high-risk areas (high rainfall, wet soils and mole or tile drained soils). Low application rates also retain more nutrients in the rooting zone, resulting in better utilisation. They may also require less storage capacity.
**Technologies for low application and more even application of effluent**

**K line system**
This system involves protective plastic ‘pods’ with sprinklers in them, linked by 40mm low-density polythene pipe. The sprinklers cover a radius of 8-10m, and the whole line is typically moved after 4-5 hours of application, taking similar time to move as a travelling irrigator.

Alternatively, extra lines can be laid out in advance for greater labour flexibility. Application rates of 4mm/hr can be achieved with this system. Depth of application can be controlled by timer switches, which also allow for intermittent pumping (e.g. half-hour on, half-hour off), further reducing the application rate. The system can be used on undulating or rolling country, as long as there is four-wheel motorbike access. The 4mm nozzles require solids to be effectively screened out of the effluent prior to application.

**LARALL™ (Low Application Rate and Low Labour) system**
This involves installing a series of connection points (hydrants) in each paddock on the effluent block, to which sprinklers can be attached. Each sprinkler covers an 18-20m radius, and twelve or more sprinklers can be operated at a time. Most LARALL™ systems irrigate into three or more paddocks at once, allowing large volumes of effluent to be pumped while still achieving low application rates (3-4mm/hr). These application rates give greater flexibility for the nutrient levels applied in the effluent to be fine-tuned, as long as the nutrient concentration in the effluent is tested. For example, a farmer requiring an input of 20kg nitrogen might achieve this through 2.5 hrs pumping, applying 9mm of effluent. The systems are designed to have the same pressure at all sprinklers, giving an even application throughout the system. Sprinklers are disconnected and moved around after use, but because the piping is all installed below ground in the paddock, minimal time for shifting is required (labour can be as low as 30 minutes per week). Nozzle sizes of 6mm and 7mm are used, with a self-cleaning screen attached to the base of pumps to avoid blockages in the system. Existing effluent systems can be easily converted to the LARALL™ system.

**Oscillating irrigators**
An oscillating travelling irrigator has a more even spray pattern than the conventional travelling irrigator. This gives more even fertiliser benefits and pasture growth while creating less risk of surface runoff or leaching.

Planning also means considering potential future changes:
- Will your herd size or land area expand, or will there be an increase in stocking rate or supplementary feeding?
- Will a feed pad or stand-off area be built?
- Will you have enough storage for very wet periods?
- Will land use around the farm change in the future?

As changes to the system may be costly, building in flexibility at the design stage can allow for any future changes. When you intensify your farm operation, or when you build additional structures and collect effluent from them, your effluent system needs to change to keep up.

**Effluent from feed pads and stand-off areas must be collected and treated. In most cases, this will require a change to the effluent treatment system to cope with the extra effluent.**
Minimising dairy shed effluent

Why is it important?
Reducing the quantity of effluent by minimising stormwater and washwater off the yard will save you money and improve effluent treatment.

The advantages of keeping effluent to a minimum are:

For land application systems:
- Cost savings if pumping the effluent for spray irrigation
- Longer period in your storage ponds before they need to be emptied
- Storage ponds can be smaller.

For pond treatment systems:
- Better retention time and more effective treatment of the effluent.

How can I minimise dairy shed effluent?

Install an effective stormwater diversion – and use it!
Stormwater diversion systems can only be used when the yards or feed pads are completely clean.

Allowing stormwater to mix with effluent, only means you have a significantly greater volume of diluted effluent to store, handle and pump. This can impact on farm costs.

Infrastructure
- Install effective guttering and downpipes on the dairy shed and divert away from the yards
- Install drains around storage and treatment ponds to ensure stormwater does not enter.

Management
- Maintain stormwater diversion drains around ponds regularly
- Ensure holding tanks, troughs and other clean water systems do not overflow
- Pre-wet the yard before milking to speed up the hosing-down
- Use a scraper to remove solids before hosing. A chain on the backing gate helps break up pats
- Use a high-flow (3.5-4.5 litres/second), low pressure (100-150kpa) washdown system. Recommended hose diameter is at least 40mm with a nozzle diameter of 20-25mm.
Minimising dairy shed effluent

Poor for yard washdown
low volume, high pressure

Excellent for yard washdown
high volume, low pressure

If your water comes from a tank, you can estimate the water used in a single washdown and divide by the number of cows to find out how many litres per cow are used.

It is generally assumed that the quantity of effluent and washwater generated at the farm dairy is about 50 litres per cow per day, but this can vary with breed and cow handling practices, washdown system and technique (range from 30 to 100 litres per day).

<table>
<thead>
<tr>
<th>Water used in washdown</th>
<th>Number of cows</th>
<th>Washdown water per cow</th>
</tr>
</thead>
<tbody>
<tr>
<td>7500 litres</td>
<td>300 cows</td>
<td>25/l/cow</td>
</tr>
</tbody>
</table>

Add in the volume of effluent that the cow will deposit while it is in the farm dairy – about 3.5 litres per hour.

<table>
<thead>
<tr>
<th>Time herd in yards</th>
<th>Effluent deposited</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.5 hours</td>
<td>5.25l/cow</td>
</tr>
</tbody>
</table>

Multiply this figure by two if you are on twice a day milking.

<table>
<thead>
<tr>
<th>Effluent washdown</th>
<th>Effluent volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>30.25l/cow</td>
<td>60.5l/cow/day</td>
</tr>
</tbody>
</table>
**Effluent treatment ponds**

**Two-pond systems**

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 level of organic matter flowing into the second pond. Some nutrient removal also occurs. Anaerobic ponds need to be at least 3 metres deep (4-5m being ideal).

The second (aerobic) pond is shallower, enabling the penetration of sunlight and aeration of the water by wind to maintain higher oxygen levels. Aerobic ponds must be less than 1.5 metres deep.

**Pond construction in areas with high water tables**

On the West Coast where high water tables are common, it is important to consider the sealing of ponds and the depth of construction.

**Sealing**

It is crucial that any pond is sealed to ensure effluent is not leaching into groundwater. There are a number of options available for sealing ponds. Compacted clay is a good option if it is available and constructed correctly. More costly options include polyethylene plastic liners or concrete or equivalent; these will ensure your ponds are adequately sealed. A ripped liner or split clay can be an expensive mistake.

**Depth of construction**

In some cases especially for deeper anaerobic ponds it has been known for ponds to “pop out” of the ground due to extremely high water tables. One solution is to construct your pond so that it is partially below or to construct a pond that is fully above ground level. This will reduce the chances of it “popping up”, and the lower the risk of groundwater pressure cracking clay linings. It is important that the above ground component of the pond is sealed to prevent effluent seeping out.


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**Pond systems require resource consent from the West Coast Regional Council (WCRC). If your system is not consented then contact WCRC on (03) 768 0466 for assistance.**
How do I know if my pond system is big enough?

The effluent pond system will work if:
- The ponds are the correct size for the number of cows plus any extra effluent from feed pads, stand-off areas etc
- The bottom sludge is not allowed to build up (desludge annually)
- The retention and settling time is not less than 60-90 days
- Stormwater is diverted from entering ponds.

The following signs indicate a poorly operating pond system:
- Sludge build-up or excessive crusting
- Bubbling has stopped in the anaerobic (first) pond
- Discolouration of the receiving waterway
- Bad smells from the receiving waterway.

The most common reason for poor performance of a pond system is undersized ponds.
Anaerobic pond size worksheet

Use this worksheet as a guide for determining whether your pond system is big enough:

☐ Yes  Is stormwater from your dairy shed and surrounding land diverted away from your pond treatment system?  ☐ No

Anaerobic pond – volume calculation

What is the batter slope on the interior bank?

The batter of the pond is the angle of the pond walls. If the batter slope is 1:1 it means that for every one metre the bank goes down, it goes one metre across (45° angle). A batter slope of 2:1 means the bank goes across two metres for every one metre it goes down (22.5° angle).

For a 2:1 batter use the value 2, for a 1:1 batter use the value 1, etc

Place this value in the corresponding boxes in the equation below.

Batter Effect (BE) = \[
\frac{\text{Pond depth}^* \times \text{Batter Value}}{\text{BE}} = \]

\[
\frac{(\text{Length} - \text{BE}) \times (\text{Width} - \text{BE}) \times \text{Depth}^*}{(\text{BE}) \times (\text{BE}) \times \text{Depth}^*} = \]

*Depth from bottom of pond to top of bank.

\[\text{X 0.95 = ANAEROBIC POND VOLUME = } \text{ (m}^3\text{)}\]
Compare your anaerobic pond volume with the recommended sizes for seasonal and winter milking herds below (note pond is larger for winter milking herds):

<table>
<thead>
<tr>
<th>No. of cows</th>
<th>Volume **</th>
<th>Depth</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>650 m³</td>
<td>3.0 m</td>
<td>17 m x 24 m</td>
</tr>
<tr>
<td>150</td>
<td>960 m³</td>
<td>3.0 m</td>
<td>18 m x 32 m</td>
</tr>
<tr>
<td>200</td>
<td>1260 m³</td>
<td>3.0 m</td>
<td>19 m x 37 m</td>
</tr>
<tr>
<td>250</td>
<td>1570 m³</td>
<td>3.0 m</td>
<td>21 m x 40 m</td>
</tr>
<tr>
<td>300</td>
<td>1920 m³</td>
<td>4.0 m</td>
<td>21 m x 43 m</td>
</tr>
<tr>
<td>350</td>
<td>2230 m³</td>
<td>4.0 m</td>
<td>21 m x 49 m</td>
</tr>
<tr>
<td>400</td>
<td>2540 m³</td>
<td>4.0 m</td>
<td>21 m x 55 m</td>
</tr>
<tr>
<td>450</td>
<td>2840 m³</td>
<td>4.0 m</td>
<td>21 m x 61 m</td>
</tr>
<tr>
<td>500</td>
<td>3150 m³</td>
<td>4.0 m</td>
<td>21 m x 67 m</td>
</tr>
</tbody>
</table>

**Assumes stormwater from the dairy shed and surrounding land is NOT entering the pond. Also assumes no feed pad or stand-off area effluent is added to the pond. A larger volume will be required if this is not the case.

If stormwater or additional effluent is entering the pond system, contact the West Coast Regional Council or your effluent consultant for advice.

☐ Yes — Does your anaerobic (first) pond meet the recommended volume for the herd? ☐ No □

☐ Yes — Are the solids retained in your anaerobic (first) pond by an effective baffle or T-piece? ☐ No □
**Aerobic ponds**

Measure your aerobic pond. If you have more than one aerobic pond, work out the surface area of each pond then add them:

<table>
<thead>
<tr>
<th>Length</th>
<th>Width</th>
<th>Surface Area</th>
</tr>
</thead>
<tbody>
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<td></td>
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</tbody>
</table>

**Aerobic Pond One**

\[ \text{Surface Area} = \text{Length} \times \text{Width} \]

**Aerobic Pond Two (if relevant)**

\[ \text{Surface Area} = \text{Length} \times \text{Width} \]

**Aerobic Pond Three (if relevant)**

\[ \text{Surface Area} = \text{Length} \times \text{Width} \]

Your Total Surface Area of Aerobic Ponds = \[ \text{Surface Area} \]

**Compare your aerobic pond size against the recommended sizes below**

<table>
<thead>
<tr>
<th>No. of cows</th>
<th>Surface Area</th>
<th>Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>480 m²</td>
<td>1.2 m</td>
</tr>
<tr>
<td>150</td>
<td>720 m²</td>
<td>1.2 m</td>
</tr>
<tr>
<td>200</td>
<td>950 m²</td>
<td>1.2 m</td>
</tr>
<tr>
<td>250</td>
<td>1190 m²</td>
<td>1.2 m</td>
</tr>
<tr>
<td>300</td>
<td>1420 m²*</td>
<td>1.2 m</td>
</tr>
<tr>
<td>350</td>
<td>1660 m²*</td>
<td>1.2 m</td>
</tr>
<tr>
<td>400</td>
<td>1900 m²*</td>
<td>1.2 m</td>
</tr>
<tr>
<td>450</td>
<td>2140 m²*</td>
<td>1.2 m</td>
</tr>
<tr>
<td>500</td>
<td>2370 m²*</td>
<td>1.2 m</td>
</tr>
</tbody>
</table>

*Make up required surface area with two or more ponds.

\[ \text{□ Yes} \quad \text{□ No} \]

Does your aerobic (second) pond/s meet the recommended surface area for the size of your herd?

\[ \text{□ Yes} \quad \text{□ No} \]

If you have a stand-off area or feed pad, is your pond system designed to cater for the additional effluent from these areas?

If you have answered Yes to all of these questions then your pond treatment system should be adequately sized.

If you have answered No to any of these questions then refer to the information on the next page.
**Possible issues with your pond system**

| Stormwater diversion | Minimising the volume of your dairy shed effluent is very important. By installing and using an effective stormwater diversion you are decreasing the amount of rainwater entering your system. Consider an average combined yard and roof area of 250m² – an annual rainfall of 2875mm will add 719m³ (717,750 litres) of water to the pond system! If you choose not to divert rain water, you will need to increase the capacity of your anaerobic and aerobic ponds, or add on another treatment system such as land application from your aerobic pond. |
| Undersized anaerobic pond | When your anaerobic pond is undersized it has the following effects:  
- Increases the solid content of your aerobic (second) pond, which decreases its efficiency  
- Increases the solid content of the treated wastewater entering receiving waterways.  
To improve the situation of an undersized anaerobic pond:  
- Either increase the size of your existing pond, or add another anaerobic pond until your total anaerobic volume meets the recommended size for your herd plus any additional effluent inputs (e.g. feed pads)  
- Add on another treatment system such as applying effluent to land. Use your effluent ponds as storage and irrigate from the aerobic (second pond). |
| Ineffective baffle or T-piece (Outlet from first pond) | By allowing solids to move from the anaerobic pond to the aerobic pond, you are overloading the capacity of these aerobic ponds. To retain solids in the anaerobic pond:  
- Ensure the baffle or T-piece on the discharge pipe is set up correctly and does not block.  
- The position of the inlet and outlet pipes is very important. The inlet should be at the top of your pond (off to one side) while the outlet should be at the other end (diagonally opposite the outlet pipe). |
| Undersized aerobic pond(s) | An undersized aerobic pond (assuming that the anaerobic pond capacity is adequate) results in elevated faecal bugs and ammonium nitrogen levels in your wastewater. To make improvements:  
- Increase the size of your existing aerobic pond or add another pond (two average-sized aerobic ponds are better than one large aerobic pond)  
- Add another treatment system, such as application to land, and pump your effluent from the aerobic pond. Retaining your pond will provide storage capacity. |
| Pond system is not designed to cater for stand-off/feed pad effluent | By adding effluent from a stand-off or feed pad, you are overloading your pond system. Options for improvement include:  
- Scrape solids off the feed pad or stand-off area and stockpile them on a sealed area where they will not contaminate waterways or groundwater  
- Install a separate solids retention pond that will take the effluent from your stand-off/feed pad area. Ensure that the size of this is adequate for your herd size and frequency of use. Install an effective baffle or T-piece to prevent solids entering the existing anaerobic treatment system  
- Increase the capacity of your pond system by adding on extra ponds  
- Add another system such as land application from your aerobic pond. Retain your old ponds for storage capacity. |
**Pond system maintenance**

**Daily**
- Before and after every milking, check that the stormwater or washwater diversion is in the correct position.

**Weekly to monthly**
- Clean and clear the effluent stone trap and gratings
- Check that the pipes running in and out of the ponds are not blocked
- Check the effect of the discharge on the receiving waterway, discharge should be odourless and clear
- Check that the pond walls are stable, and that there is no seepage. Visible wetness or pasture that is growing exceptionally well are indicators of seepage problems
- Control weeds in and around ponds
- Check that the fencing remains stock-proof; exclude stock at all times.

**Six-monthly to annually**
- When the area around the ponds and any seepage areas are dry, graze them in a well controlled manner
- Check that there is not excessive build-up of solids in the anaerobic pond
- Desludge ponds regularly, (i.e. when the sludge level is over half the normal effluent depth) this can be checked with a long pole
- If dewatering sludge, it should be placed on an impermeable surface where run-off can be contained.

**Desludging effluent ponds**
- Anaerobic ponds should never be emptied out completely. A third of the sludge should be left behind, as it will contain bacterial populations necessary for the continuation of the anaerobic processes
- When using contractors or hiring equipment make sure that the equipment used has been cleaned before use on your farm
- Mix sludge with liquid effluent before spreading directly on to pasture to prevent plant damage
- Sludge and crusts are usually removed with excavation machinery
- If possible, the surface liquid effluent should be removed before desludging by suction drawing it into a vehicle spreader
- Alternatively, pond stirring to mix the various layers of the pond before emptying can remove the need for excavators to desludge ponds
- Use vehicle spreaders when soils are dry
- Sludge usually has a higher nutrient content than liquid effluent, so application rates need to be lower. West Coast Regional Council rules require that sludge applications should be no more than the equivalent of 275 kg N/ha/yr
- Do not allow grazing of pasture recently treated with effluent. Either wait for rain or allow at least a 10-day stock withholding period before grazing. This will ensure the pasture is sterilised by sunlight and air or washed by rainfall.
**Better management of effluent pond systems**

- Reduce effluent volume with efficient washdown practices in the farm dairy or pad
- Divert rainwater from the farm dairy before it reaches the pond system. Also install a channel around the pond embankments to prevent stormwater run-off from surrounding land entering the pond system
- Prevent chemicals from entering ponds (such as excessive amounts of copper sulphate or other foot treatment chemicals). Many chemicals can affect the breakdown of effluent
- Ensure that waste products do not enter ponds (i.e. Al gloves, syringes). These can block the inlet and outlet structures
- Ensure that the pond is well sealed so that effluent cannot leak into groundwater and underground spring water cannot enter ponds
- Where ponds are lined with a plastic liner, ensure that the pumps or other machinery never interfere with the liner. Contractors should be made aware that a liner is present
- Ensure that your pipe work is installed correctly. Inlet and outlet pipes placed in the wrong position can result in the short-circuiting of effluent through the system. Optimising retention time is critical
- Ensure that pond fences are stock-proof and child proof to prevent damage to pipework and embankments
- Avoid tree planting near ponds as trees reduce the aeration effect of wind, and their roots can cause blockages and damage to pond walls and liners
- Ponds must be maintained regularly and properly. Maintenance involves desludging, controlling weeds and repairing pipes, structures and the pond seal
- Desludge first pond annually to remove solids build-up on the bottom, stirring the pond while pumping, but leave 1/3 of sludge behind
- Consider improvements to the pond system, such as mechanical aeration, or additions such as a constructed wetland following pond treatment, or an advanced pond system. More information on these options can be found in the Dairying and the Environment Committee Manual – *Managing Farm Dairy Effluent* on the DairyNZ website [dairynz.co.nz](http://dairynz.co.nz)
**Barrier ditch systems**

**What are they?**

Barrier ditches are essentially elongated ponds. As with pond systems, they must be designed to ensure that the effluent is retained in the system for a minimum of **60 to 90 days**. For successful operation the ditch must be divided into at least two separate sections by an earthen or timber baffle. The first section operates like an anaerobic pond – retaining a majority of the solids. The recommended minimum dimensions of ditch systems for different herd sizes on the West Coast are shown below.

### Recommended sizes of barrier ditch systems on the West Coast

<table>
<thead>
<tr>
<th>No of cows</th>
<th>Recommended examples of dimensions required</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Volume (m³)</td>
</tr>
<tr>
<td>100</td>
<td>800</td>
</tr>
<tr>
<td>150</td>
<td>1090</td>
</tr>
<tr>
<td>200</td>
<td>1450</td>
</tr>
<tr>
<td>250</td>
<td>1810</td>
</tr>
<tr>
<td>300</td>
<td>2170</td>
</tr>
<tr>
<td>350</td>
<td>2530</td>
</tr>
<tr>
<td>400</td>
<td>2890</td>
</tr>
<tr>
<td>450</td>
<td>3250</td>
</tr>
<tr>
<td>500</td>
<td>3260</td>
</tr>
</tbody>
</table>

As with anaerobic ponds, barrier ditches require regular desludging. The first section of the ditch should also be kept weed free (to minimise the organic loading to the treatment system).

**The most common reason for the poor performance of a barrier ditch system is undersized ditches.**

For best practices related to the management of barrier ditches refer to those recommended for effluent pond systems (See pg 13-14)

**Note:** First sections of barrier ditches require more frequent cleaning than anaerobic ponds due to the lower volume and typically shallower depth.

**Barrier ditch systems require resource consent from the West Coast Regional Council (WCRC). If your system is not consented then contact WCRC on (03) 768 0466 for assistance.**
Storage ponds

Storage (or holding) ponds are built to store effluent before it is applied to land. This is particularly necessary in spring or during wet periods when land application is impractical and undesirable. Effluent irrigation during these times can result in surface ponding, leaching and runoff. Systems without adequate storage cannot comply with West Coast Regional Council Rule 73.

Having sufficient storage capacity is an asset to your farm. There is no one-size-fits-all approach in determining volume requirements. Generally four months is recommended for the West Coast.

The amount of storage volume required depends on:

- Rainfall (seasonal and frequency of prolonged wet periods)
- Adequate stormwater diversion
- Soil moisture (as per rainfall – how many good irrigation days do I have?)
- Effluent sources – farm dairy, feed pad, yarding, number of cows or increase in time spent at dairy or yard area etc
- Labour requirements – do I need flexibility during stressful periods?
- Contingency for breakdowns, poor weather, labour requirements.

Adequate contingency storage allows:

- Irrigation to be deferred during periods of high labour demand (e.g. calving)
- Application at times when pasture nutrient uptake is high and losses are minimised
- Application when ground conditions are suitable
- Co-ordination of irrigation with the grazing rotation
- The irrigator to operate in “steady state” for long periods (the pump stops and starts frequently when operating in a sump)
- Compliance with Regional Rules.

The “contingency” is not available if the pond is always full. Make sure your pond is emptied in Autumn when ground conditions are suitable to allow for winter and spring storage.

It may be necessary to have two smaller storage ponds rather than a single large pond if:

- The pond is likely to be too large for effective pumping, de-sludging and stirring
- The pond is too long for the site and interferes with existing structures such as fences. In the case of site restrictions to pond length, two smaller storage ponds could be placed side by side.

The use of a plastic or compacted clay liner, or a concrete pond interior will ensure your ponds are sealed and not leaching any nutrients into groundwater. The permeability of the liner should not exceed 1 x 10^-9 m/s. Remember to inform anyone doing any work if plastic or clay liners are present. A ripped liner or split clay can be an expensive mistake.

As long as they are sealed, existing treatment ponds make good storage ponds for farms converting to land application. Contact Westland Milk Products, DairyNZ or West Coast Regional Council if you would like advice before building a pond.

If your soils are heavy and are often too wet to irrigate or if your effluent block has mole or tile drainage, then you need sufficient storage to carry you through until you can irrigate safely again.
Effluent storage facilities

Adequate storage capacity enables effluent to be applied at the most beneficial times for pasture.

If you are switching to land application existing treatment ponds should be retained for storage.

A well-fenced pond lined with concrete to ensure it is sealed.

Stone trap not emptied and inadequate storage causing system overload.

Inadequate storage causing effluent to overflow.

Unsealed ponds leaching contaminants into groundwater.
Land application of effluent

Dairy effluent is an asset that you can either utilise to its fullest potential or let go to waste. A nutrient budget can give you the value of your effluent but the real savings only come from managing the distribution of the nutrients onto pasture. If this is done correctly, savings in fertilisers can give a return on investment that will more than pay for the cost of installing or upgrading an effluent system that works for your farm.

A well designed system and management plan will enable as much as 80 to 90% retention of the nutrient value. A badly designed system and poor management can waste more than 50% of the nutrient value.

A good effluent system is one of the few capital costs on a farm where you can get a return on your investment by savings made through cost reductions (i.e. fertiliser). As fertiliser becomes more expensive, the return on investment is greater.

What is the fertiliser value of effluent?

Farm dairy effluent offers a source of nitrogen (N), phosphorus (P), potassium (K) and sulphur (S), as well as trace elements to increase pasture or crop production. The organic matter in the effluent will also improve nutrient retention, soil aeration, drainage and soil tillage characteristics.

The composition of effluent from the farm dairy is extremely variable. The only way to be sure of the nutrient content of your dairy effluent is to have a sample tested. The values in the table below show how nutrient content changes with a feed pad scenario.

### Nutrients in the effluent from 100 cows under different scenarios

<table>
<thead>
<tr>
<th>Nutrients in effluent from 100 cows (kg/yr)</th>
<th>Effluent area needed to apply 275 kgN/ha*</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>No feed pad – farm dairy effluent</strong></td>
<td></td>
</tr>
<tr>
<td>All grass system (milking 270 days, twice a day)</td>
<td>590</td>
</tr>
<tr>
<td><strong>Using a feed pad – farm dairy effluent plus feed pad effluent (2 hours per day on the feed pad)</strong></td>
<td>4tDM/ha/yr Grass silage</td>
</tr>
</tbody>
</table>

Table adapted from B. Longhurst, AgResearch 2004 – Adding Environmental and Economic Value to Dairy Effluent

*Note: While 275 kg/ha/yr is the maximum N loading under West Coast Regional Council rules, a lighter loading is recommended to protect water quality, and avoid metabolic problems in cows due to potassium loading. These figures should therefore be seen as a minimum farm area for effluent irrigation.

Because there are so many factors influencing the effluent nutrient content, the only way to be sure of the nutrient content of your dairy effluent is to have a sample tested.

Effluent analysis can be done at any laboratory that carries out soil or herbage testing. Nutrient content will vary throughout the year, so regular testing is recommended.
Value of effluent

Research shows that 1kg N from effluent is equivalent to 1kg N from urea, in terms of pasture production, composition and nitrate leaching. Therefore farm dairy effluent can produce a good pasture response, up to 10-15kg DM/kg N applied in effluent.

The table below shows the fertiliser value of the effluent from 100 cows on an all-grass system.

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Solid fertiliser equivalent and dollar value of effluent from 100 cows (all grass system)</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>1.3 t of urea $940</td>
</tr>
<tr>
<td>P</td>
<td>0.7 t of superphosphate $295</td>
</tr>
<tr>
<td>K</td>
<td>1.1 t of muriate of potash $1180</td>
</tr>
<tr>
<td>Mg</td>
<td>0.2 t magnesium oxide $110</td>
</tr>
<tr>
<td>Total dollar value</td>
<td>$2525</td>
</tr>
</tbody>
</table>

(Approximate bulk prices valid as of July 2010)

Nutrients applied compared to farm maintenance requirements

<table>
<thead>
<tr>
<th>Nutrients applied</th>
<th>Amount from 100 cows over 4 ha (all grass system)</th>
<th>Maintenance requirements (1000 kg MS/ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>P</td>
<td>18</td>
<td>50</td>
</tr>
<tr>
<td>K</td>
<td>135</td>
<td>80</td>
</tr>
<tr>
<td>S</td>
<td>12</td>
<td>60</td>
</tr>
</tbody>
</table>

This shows that in the case of a typical system, effluent from 100 cows spread over five hectares can provide over half of the required P, four times the required K and one half of the required sulphur. This indicates that while N loading may be at an acceptable level, a larger area for effluent spreading would be needed to bring down K loading.

Most of the potassium in effluent is available for pasture uptake, and can cause animal health problems if not managed carefully. Therefore, K loading should always be considered when deciding on the appropriate area for effluent irrigation.

Application rates that meet N-loading requirements may cause an excess of pasture K, which should be checked by preparing a nutrient budget for your effluent block.
**Nutrient management planning**

The best way to work out the area required for the nutrients in your dairy effluent is to create a nutrient management plan, guided by your nutrient budget results. To be accurate, use your own soil and herbage tests and do a nutrient budget for your effluent block separate to other areas. If you also sample for effluent nutrient content, and test your actual irrigator application rate, you can ensure optimum nutrient loading for each irrigation event.

Sound nutrient management planning can ensure you get the most from the nutrients in your dairy effluent, and use fertiliser efficiently to enhance production and avoid animal health problems.

**Sample nutrient budget**

This nutrient budget is for a 6ha effluent block on a 100ha farm on a podzol soil. No additional N fertiliser is applied to the block.

Other farm details:
- Stocking rate = 2.1 cows/ha
- Imported Supplement = 1.5tDM/ha grass silage fed out in paddock
- Wintering off = 20% of herd off for 8 weeks
- Production = 800kg MS/ha

<table>
<thead>
<tr>
<th>Nutrient budget for effluent block (6 hectares)</th>
<th>N (kg/ha/yr)</th>
<th>P</th>
<th>K</th>
<th>S</th>
<th>Ca</th>
<th>Mg</th>
<th>Na</th>
<th>H+</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Inputs</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fertiliser</td>
<td>0</td>
<td>23</td>
<td>0</td>
<td>27</td>
<td>50</td>
<td>0</td>
<td>0</td>
<td>-3.4</td>
</tr>
<tr>
<td>Effluent added</td>
<td>295</td>
<td>37</td>
<td>319</td>
<td>24</td>
<td>66</td>
<td>26</td>
<td>8</td>
<td>-7.8</td>
</tr>
<tr>
<td>Atmospheric/clover N</td>
<td>10</td>
<td>0</td>
<td>2</td>
<td>3</td>
<td>10</td>
<td>71</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Irrigation</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Slow release</td>
<td>0</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Supplements</td>
<td>36</td>
<td>5</td>
<td>30</td>
<td>3</td>
<td>8</td>
<td>3</td>
<td>2</td>
<td>-1.1</td>
</tr>
<tr>
<td><strong>Outputs</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Product (milk, meat, fibre)</td>
<td>58</td>
<td>10</td>
<td>14</td>
<td>3</td>
<td>13</td>
<td>1</td>
<td>4</td>
<td>-0.6</td>
</tr>
<tr>
<td>Transfer</td>
<td>28</td>
<td>3</td>
<td>28</td>
<td>2</td>
<td>6</td>
<td>2</td>
<td>1</td>
<td>-0.7</td>
</tr>
<tr>
<td>Supplements removed</td>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Atmospheric</td>
<td>38</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>-0.4</td>
</tr>
<tr>
<td>Leaching/runoff</td>
<td>58</td>
<td>13</td>
<td>106</td>
<td>51</td>
<td>100</td>
<td>70</td>
<td>232</td>
<td>-3.5</td>
</tr>
<tr>
<td>Immobilisation/absorption</td>
<td>160</td>
<td>40</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>-0.9</td>
</tr>
<tr>
<td>Change in inorganic soil</td>
<td>0</td>
<td>1</td>
<td>204</td>
<td>0</td>
<td>16</td>
<td>-25</td>
<td>-153</td>
<td>-6.4</td>
</tr>
</tbody>
</table>

The results show that the effluent area must be increased to lower K and N loading. The following example shows the effect of increasing the effluent area from 6 to 15 hectares.

**The DairyNZ publication Making Dollars and Sense of Nutrient Management gives more guidance on nutrient management planning. (See dairynz.co.nz/sustainability).**

N loading from the effluent is currently 295kg N/ha/yr, exceeding the limits under West Coast Regional Council rules (275kg N/ha/yr).

K levels are excessive and can cause metabolic problems.

No change is predicted in the soil P and S soil test levels, but K levels are predicted to increase 3-4 units per year.
Increasing the effluent area to 15ha better utilises the fertiliser value of the effluent by spreading the potassium over a greater area and reducing the N loading. Note some urea and slightly more P fertiliser is now being spread on the effluent area.

K loading now reduced to 128kg K/ha/yr

There is still a surplus of K being applied but soil K levels are now predicted to increase by only one unit a year (see options for managing K levels, on the next page)

N loading now reduced to 118kg N/ha/yr, within regional council limits

<table>
<thead>
<tr>
<th>Nutrient budget for effluent block (15 hectares)</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Inputs</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fertiliser</td>
<td>30</td>
<td>47</td>
<td>0</td>
<td>54</td>
<td>100</td>
<td>0</td>
<td>0</td>
<td>-2.2</td>
</tr>
<tr>
<td>Effluent added</td>
<td>118</td>
<td>15</td>
<td>128</td>
<td>10</td>
<td>27</td>
<td>11</td>
<td>3</td>
<td>-3.1</td>
</tr>
<tr>
<td>Atmospheric/clover N</td>
<td>43</td>
<td>0</td>
<td>2</td>
<td>3</td>
<td>10</td>
<td>20</td>
<td>71</td>
<td>0.0</td>
</tr>
<tr>
<td>Irrigation</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Slow release</td>
<td>0</td>
<td>3</td>
<td>4</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>3</td>
<td>0.0</td>
</tr>
<tr>
<td>Supplements</td>
<td>36</td>
<td>5</td>
<td>30</td>
<td>3</td>
<td>8</td>
<td>3</td>
<td>2</td>
<td>-1.1</td>
</tr>
<tr>
<td>Output</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Product (milk, meat, fibre)</td>
<td>58</td>
<td>10</td>
<td>14</td>
<td>3</td>
<td>13</td>
<td>1</td>
<td>4</td>
<td>-0.6</td>
</tr>
<tr>
<td>Transfer</td>
<td>28</td>
<td>3</td>
<td>28</td>
<td>2</td>
<td>6</td>
<td>2</td>
<td>1</td>
<td>-0.7</td>
</tr>
<tr>
<td>Supplements removed</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Atmospheric</td>
<td>32</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>-0.2</td>
</tr>
<tr>
<td>Leaching/runoff</td>
<td>38</td>
<td>20</td>
<td>59</td>
<td>69</td>
<td>85</td>
<td>70</td>
<td>232</td>
<td>-1.8</td>
</tr>
<tr>
<td>Immobilisation/absorption</td>
<td>71</td>
<td>35</td>
<td>0</td>
<td>-4</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>-0.3</td>
</tr>
<tr>
<td>Changes in inorganic soil</td>
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<td>1</td>
<td>62</td>
<td>0</td>
<td>41</td>
<td>-41</td>
<td>-158</td>
<td>-2.9</td>
</tr>
</tbody>
</table>
Options for managing potassium (K) levels

Over time the application of farm dairy effluent to land increases both soil and pasture potassium levels – particularly in winter and spring. This can increase the potential for metabolic problems in dairy cows at calving and in early lactation. Some management considerations for K levels are:

- Consider the K content of the effluent when deciding effluent application rates and maintenance fertiliser applications. Soil test effluent areas separately to the rest of the farm, as it is unlikely that effluent blocks will require additional potassium fertiliser.
- Carry out a nutrient budget for your farm using OVERSEER® with your fertiliser rep or consultant. Address your effluent block separately and adjust fertiliser application rates to take into account the increased nutrients being added through effluent.
- Increase the area irrigated – this will reduce the amount of both N and K applied per hectare. The area irrigated may need to double to bring K application rates down to maintenance levels.
- Plan to avoid grazing effluent irrigation areas with springing cows and recently calved cows to avoid milk fever and grass staggers. Where this is not possible take additional measures to prevent these metabolic disorders, such as increasing magnesium supplementation.
- Analyse pasture from effluent and non-effluent areas and adjust feed/supplementation in consultation with a farm consultant or veterinarian if necessary.
- Harvest silage or hay off your effluent blocks to reduce potassium levels, or if levels are very high, consider a crop of maize or turnips.
- Consider using a contractor who is capable of efficiently spreading stored effluent to remote paddocks outside the effluent spray irrigation area.
**Application rates**

No ponding. Wide-boom irrigator set to fastest speed applying less than 10mm.

Minor ponding, causing damage to pasture and soil life. Any ponding is unacceptable and a breach of rules.

Irrigating at times of low soil moisture, to avoid ponding.

Ponding, causing leaching to groundwater.

Cover over water trough to prevent effluent contaminating water.

Severe ponding – irrigator has not been moved, ruining pasture and polluting groundwater.
**Hose layout for a travelling irrigator**

The sprayline 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 sprayline – 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.

### Avoiding problems

- Ensure the irrigator is set up correctly so that it is not slowed down by the drag line.
- Speed up your irrigator by changing gears and/or adding an extra cam.
- Make sure the irrigator is turned off when the run is finished and does not get stuck – check the cut-off on the winch winding facility regularly to ensure it is working.
- Anchor the wire rope to a post that will not pull over – posts by drains may not be secure – instead cross the wire to the post on the other side of the drain.
- Beware of the wire rope when riding through the paddock as it can be hard to see.
- Ensure the drag hose cannot snag on anything such as rocks, stumps or the water trough.
**The right amount, at the right time**

Applying too much effluent in one pass, applying it too fast, or applying it to overly wet soils can:

- Damage pasture and soil life
- Cause ponding, leaching and runoff
- Breach West Coast Regional Council rules.

**Timing of effluent irrigation**

Adequate storage facilities allow you to apply effluent when the time is right – when soils are dry enough to absorb the effluent, but not so dry that there are large cracks in the soil. Effluent can flow through soil cracks to underground drains or groundwater.

Applying effluent when grass is actively growing will allow pastures to make the best use of the nutrients and water applied.

Storage also gives you flexibility to manage effluent applications with respect to staff availability; avoiding busy periods (calving and mating) or when staff are away.

In the West Coast region the best time for applying effluent to land is between November and April, at times of low soil moisture.

**How much is too much?**

The conditions for applying effluent to land without a consent require that there is no ponding or runoff to water, and that no more than 275kg N/ha/yr is applied.

Light soils hold less moisture, and should receive lower application. Recommended maximum application rates for different soil types are in the table below. You can work out what your irrigator is applying by placing containers under the path of the irrigator and measuring the depth of effluent they collect in one pass.

**Effluent application recommendations for various soil types under pasture cover**

<table>
<thead>
<tr>
<th>Soil type</th>
<th>Maximum application depth</th>
<th>Maximum application rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sand</td>
<td>15mm</td>
<td>32mm/hr</td>
</tr>
<tr>
<td>Pumice</td>
<td>15mm</td>
<td>32mm/hr</td>
</tr>
<tr>
<td>Loamy Sand</td>
<td>18mm</td>
<td>32mm/hr</td>
</tr>
<tr>
<td>Sandy Loam</td>
<td>20mm</td>
<td>20mm/hr</td>
</tr>
<tr>
<td>Fine Sandy Loam</td>
<td>20mm</td>
<td>17mm/hr</td>
</tr>
<tr>
<td>Silt Loam</td>
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<td>10mm/hr</td>
</tr>
<tr>
<td>Clay Loam</td>
<td>18mm</td>
<td>13mm/hr</td>
</tr>
<tr>
<td>Clay</td>
<td>18mm</td>
<td>10mm/hr</td>
</tr>
<tr>
<td>Peat</td>
<td>20mm</td>
<td>17mm/hr</td>
</tr>
</tbody>
</table>

**Note:**

- *These figures are for soils with 50% water holding capacity prior to the application of effluent, not wet soils!*
- *If soils are wet, application depth and rate should drop, or application should be deferred until conditions are drier.*
Land application of effluent

Maintenance and management considerations

Regularly check your irrigation system and flush clean water through to prevent blockages. Check all moving parts are clean and greased everytime you shift it.

A poorly maintained irrigator, with higher potential to break down and cause problems.

Regularly check nozzles and sprinklers for blockages, and replace any damaged or split parts. Do not cut bigger holes in the nozzle as it will not spread properly. Change nozzle at same time as rubberware in dairy.

A split pipe causing effluent to pool and leach through to groundwater.

Ensure pumps are regularly oiled and cleaned. Check pump impellers for wear.

Aerial view – poor management of effluent is a waste of an excellent fertiliser resource, and can cause long term pasture damage.
**Maintenance and record keeping for land application systems**

**Daily**
- Check that the storm water or washwater diversion is in the correct position before and after every milking.
- Assess whether the soil is dry enough and the water table is low enough to allow effluent application to pasture without ponding or runoff.
- Adjust application rates according to soil conditions to avoid ponding or surface runoff.
- Record effluent application information.

**Regularly**
- Shift the spray applicator system to a new area.
- Make sure the spray application system is not sending effluent into water troughs.
- Waterways should be checked regularly to ensure that effluent is not moving into the water.
- Clean and clear the effluent stone trap and gratings.
- Check that the float switches are clear and working.
- Grease all moving parts on the applicator. Ensure above-ground connections are clear of dirt, and the sprayline is free of cuts or splits.
- Check that the nozzles are not blocked or damaged.
- Flush clean water through the delivery line and sprinklers to keep them from blocking.
- Check tyre pressure on the irrigator.

**Six-monthly to annually**
- Strip down the pump for oiling and cleaning.
- Check the pump seals as these are the components most susceptible to wear.
- Have a nutrient analysis done on the stored effluent, soil and pasture.
- Remove sludge from the storage pond and spray any weeds growing on surface.

**Correct irrigator maintenance**

- **Moving parts**: Make sure that moving parts are cleaned and greased.
- **Spray nozzles**: 30° above horizontal split or damaged nozzles replaced.
- **Spray line**: Free of cuts and splits.
- **Tyres**: At correct pressure.
**Best management practices for land application**

- Apply effluent at the lowest possible application rate and only when soil conditions are appropriate (ensure you have adequate storage to be flexible)
- Only spread effluent where it cannot enter drains and waterways
- Soils that have high-risk areas should be avoided when irrigating during wet periods – use your farm map to plan and record this
- Apply effluent onto short pasture. Graze the area a few days prior to application
- Withhold cows from grazing pastures treated with fresh farm dairy effluent for at least 10 days to minimise animal health risks
- Record which paddock and irrigator run is used on which day – this will ensure that you are not returning to those runs too early
- Ensure you have the right sized pumps and pipes for the job
- Take care to keep propellers from stirrers and the suction end of pumps away from pond liners
- Regularly maintain your irrigation system. Make sure the pipes and sprinklers are not blocked or damaged and that the pump is in good working order
- Where you have staff shifting the irrigators, highlight the importance of doing this job correctly and acknowledge a job well done. Provide adequate training to staff and display the conditions of the permitted activity rules for land application of effluent. Please note that all staff may be liable if an environmental problem occurs
- Soil test your effluent paddocks separately from the rest of the farm, do separate nutrient budgets for effluent blocks and other areas, and strategically apply fertiliser based on the results
- Remove nutrients from the effluent block by harvesting silage or a crop.
How does my land application management stack up?

Read through this table and tick the management activities that apply to you:

<table>
<thead>
<tr>
<th></th>
<th>Optimum/good practice</th>
<th>Okay</th>
<th>Not okay</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Effluent storage</strong></td>
<td>Irrigate from a sealed storage pond with approximately 4 months storage capacity</td>
<td>Irrigate from a sealed storage pond with 10-12 weeks storage capacity</td>
<td>Irrigate direct from sump – have to irrigate every day</td>
</tr>
<tr>
<td><strong>Nutrient loading</strong></td>
<td>Effluent is sampled for nutrient content at least twice a year and applied to farm area based on a nutrient budget (N and K). Application rate is checked under the irrigator</td>
<td>Effluent area is worked out with a nutrient budget. Application rates are planned using a single effluent sample and manufacturer’s claims about irrigator’s application rate</td>
<td>Effluent is applied using a ‘rule of thumb’ (e.g. 4ha/ 100 cows) without testing effluent nutrient content or actual application rates and without a nutrient budget</td>
</tr>
<tr>
<td><strong>Application depth</strong></td>
<td>Effluent is applied only using a low rate sprinkler system with depths of 10mm or less</td>
<td>The travelling irrigator is set up to travel at its fastest speed (applying 10mm)</td>
<td>The travelling irrigator is set up to travel at its slowest speed (applying &gt;20mm)</td>
</tr>
<tr>
<td><strong>Scheduling of irrigation</strong></td>
<td>Only irrigate in dry months (September to April), and at times of low soil moisture (deferred irrigation)</td>
<td>Irrigate only after a period of more than one week since a significant rainfall event</td>
<td>Irrigate daily, or when storage facilities are full, despite weather and soil conditions</td>
</tr>
<tr>
<td><strong>Nutrient management</strong></td>
<td>You have a nutrient management plan. Hay or silage is taken off effluent blocks. Contractors are used to spread effluent to more remote parts of the farm. Regular soil tests, effluent analysis and nutrient budgets guide fertiliser use</td>
<td>You manage nutrients by regular soil testing and nutrient budgets with effluent blocks treated separately</td>
<td>Receives the same amount of fertiliser as the rest of the farm and no separate nutrient budget is done for the effluent block</td>
</tr>
<tr>
<td><strong>Staff</strong></td>
<td>Staff are fully trained, keep good records, and know the ‘Plan B’ if system breaks down</td>
<td>Staff know how to use the system and what conditions must be met</td>
<td>Least experienced member of the staff gets this job, with little training</td>
</tr>
<tr>
<td><strong>Maintenance</strong></td>
<td>Irrigator regularly cleaned and greased, hoses and nozzles checked. Pump stripped six-monthly</td>
<td>Pump and irrigator cleaned and oiled annually</td>
<td>Maintenance occurs when system fails</td>
</tr>
</tbody>
</table>

(Table adapted from M.J. Hedley, D.J. Houlbrooke & D.J. Horne - Fertiliser & Lime Research Centre, Massey University)

Download a Compliance Checklist from compliancetoolkit.co.nz to check if you are meeting the regional council rules.
West Coast Regional Council’s perspective - land application

Irrigating dairy farm wash water is a Permitted Activity (no consent required) only if the following conditions are met. Otherwise you require a resource consent.

Effluent application rules

You MUST NOT:

- Allow any effluent to enter water (water bodies, drains or coastal water)
- Cause ponding, flooding or pasture burning
- Exceed an application rate of 275 kg N/ha/yr
- Exceed an application depth of 20 millimetres when applying sludge to land
- Irrigate within:
  - 20m of any water body or drain
  - 20m of any adjoining property
  - 50m of any well or bore used for potable water supply.

You MUST:

- Ensure that all storage is properly sealed
- Have contingency measures in place to ensure that these conditions are met in case of pump or system failure or unsuitable soil conditions
- Make a financial contribution to the West Coast Regional Council to cover costs of monitoring and administration

For more information visit wcrc.govt.nz or freephone 0508 800 118. DairyNZ can also provide effluent management advice on 0800 4 DairyNZ (0800 4 324 7969).

If effluent irrigation does not comply with the rules, then contractors, relief staff, workers, managers, sharemilkers and owners may all be liable. Employers must take all reasonable steps to ensure staff and contractors meet these responsibilities.

All pond treatment systems and barrier ditch systems require a consent, as do some stand-off areas and feed pads. Contact West Coast Regional Council for information on consents.
Stand-off areas and feed pads

Stand-off areas and feed pads must have an effluent management system including:

- Sealing/bundling and collection of liquid effluent from the pad so that it cannot drain into groundwater, or surface water. Drains underneath pads with soft surfaces should direct effluent to a treatment system
- Sealed storage areas for any solid effluent scraped off the area (e.g. sawdust, manure)
- Sufficient capacity in your storage and treatment system for additional effluent from pads.

It is far cheaper to set up a good effluent system during construction than to try and adapt it later. Plan your effluent system around a high use scenario to allow future flexibility.

Feed pads are an extra source of effluent in addition to the farm dairy. The effluent also tends to have a higher solids content and a higher nutrient content than farm dairy effluent from a grazing herd.

If you are putting the effluent from stand-off areas or feed pads into your existing effluent pond system, you are likely to overload the system and will need to upgrade it to cater for the higher volume, nutrient and solids content.

If you apply effluent from feed pads onto land, you will need to expand the irrigated area and consider how to remove coarse solids that can cause system wear and blockages.

This could be by adding capacity to your pond system or by switching to land application. If you decide to switch to land application, retain your ponds for storage capacity and to settle out solids. Ponds receiving feed pad effluent require more frequent desludging.

Effluent sampling and nutrient budgets will help you decide how to remain compliant with regional rules while making the most of the extra nutrients brought in as feed and collected in the effluent from the pad.

Every stand-off/feed pad situation is different. Therefore the effluent treatment system should be designed for your particular situation.

Stand-off/feed pad areas can be made out of different surface materials (such as concrete, rock, limestone, wood chip or sawdust etc). Each of these surfaces requires different effluent management. It is crucial that no effluent from a pad runs off into waterways or leaks through to groundwater. Therefore you may be asked to demonstrate that you have an appropriate seal and collection system beneath the pad.

The time that cows spend on these areas, the frequency of washdown and exposure of the surface to rainfall determine the volume of effluent created – which could be up to 10 times that coming from a farm dairy. Your system must improve to account for this.
Some factors to consider

- Is the area able to be washed down, and if so, can your current system handle the increased volumes and land area required to spread effluent to?

- Is the pad roofed, or can stormwater be diverted off this area when not in use? (This usually depends on the surface material used e.g. concrete vs. sawdust)

- Can the solids be scraped off and stockpiled where they will not enter any waterway or leak to groundwater? (Scraping sealed surfaces reduces the water required for cleaning)

- If feeding out on these areas, what percentage of feed do you lose? What type of feed is it? Is silage fine chopped? Finely chopped silage has a greater surface area allowing faster breakdown in an effluent system, as well as decreasing the risk of blockages. Chopper pumps can also be used in the effluent holding pond to reduce fibre length.

- Do you have a way to remove solids from this effluent? You can use a separate solids retention pond with a baffle or T-piece to prevent solids entering the application system. For large herds or intensive systems, alternative technologies may be used (e.g. mechanical solids separation or methane digestion).

- Can effluent bunkers be used to store effluent under the floor of the herd shelter? For example, Herd Homes are a plastic-roofed wintering pad with a concrete slatted floor. Effluent falls through the slats into bunkers below where liquid evaporates and the semi-dried effluent is then removed and spread with a ‘muck spreader’.

For additional information on stand-off and feed pad design and construction check out the DairyNZ publications: *Minimising Muck, Maximising Money, Stand-off and Feed Pads Design and Management Guidelines*, and *Stand-off and Feed Pads Case Studies*. 
West Coast Regional Council perspective

Effluent management options for stand-off areas and feed pads

Scrapings from feed pads must be stored on a sealed, bunded area.

Weeping wall' structures allow solids to be retained and liquids directed to the treatment system.

Feed pad slurry can be stored for drying, as long as liquids are captured and treated.

A solids separator provides a solid fertiliser product and dilute liquid that can be easily applied to land. Separated solids should be removed to a dry, sealed and covered holding bay for storage.

Methane digestion produces energy that can cut farm power costs.

‘Herd Homes’ have slatted concrete floors where effluent collects and dehydrates before removal.
Tools and resources available to help with effluent management

The following are a series of practical tools which have been developed by DairyNZ with farmers. They are available to download on the dairynz.co.nz website under publications and tools, or order a copy by calling 0800 4 DairyNZ (0800 4 324 7969).

Compliance checklist
A self-audit to assess whether your effluent system is compliant 365 days of the year. Download from compliancetoolkit.co.nz.

Effluent Training Schedule
Keep a record of individual staff training history and requirements with this one page effluent training schedule.

Irrigator Run Sheet
A one page template for recording travelling irrigator runs, includes date, paddock number, run number and sign off area for person responsible for moving irrigator.

Minimising Muck, Maximising Money Guide and Case Studies
A guide to design and management of feed pad and stand-off areas.

Tasks for Effluent Management
A small poster planner for ensuring daily and weekly management and maintenance tasks are completed, and signed off by irrigator operators.

Farm Enviro Walk
A self-assessment for environmental practices. Covers effluent, soil, nutrient, waterways and other hotspots on farm.

On-Farm Effluent Checklist
A one page checklist to assess how your effluent practices compare with best practice.

Effluent to Land – Getting it right
A ten minute DVD outlining 7 key principles of applying effluent to land.

Correct Irrigator Setup
A one page photo example of correct hose layout for optimal effluent applicator performance.

Top Tips for Effluent Irrigators
A poster for the dairy, outlining top tips for trouble free effluent irrigators.

Compliance Toolkit
An online resource covering all aspects of farm compliance; Employment, Health and Safety, Animal Welfare and Environment (released 2010/11). Download a copy of the Compliance Checklist, or use the consent scoping tool.

Farm Dairy Effluent Design Code of Practice and Standards
For effluent system designers and installers.

Best Management Practices for Maize
Covers using effluent on maize crops.

Agriculture ITO Dealing with Dairy Farm Effluent
A one day course suitable for whole farm teams looking at the reasons why, and how to treat dairy effluent on farm. Includes a one-on-one practical assessment on the participant’s farm. Agriculture ITO 0800 691 111

Agriculture ITO Effluent Management Planning
A one day course for herd managers, supervisors, sharemilkers etc. Templates and tutor expertise to help create an effluent management plan for your farm. Includes a follow up session to discuss practical implications. Agriculture ITO 0800 691 111