under: the Resource Management Act 1991

in the matter of: submissions and further submissions in relation to proposed Variation 1 to the proposed Canterbury Land and Water Regional Plan

and: Fonterra Co-operative Group Limited
Submitter

and: DairyNZ
Submitter

Statement of evidence of Mathew Cullen (landscape/sustainability/effluent)

Dated: 29 August 2014
STATEMENT OF EVIDENCE OF MATHEW CULLEN

INTRODUCTION

1 My full name is Mathew John Cullen.

2 I hold a Bachelors of Resource Management from Lincoln University, which was conferred in 2003. I have also attained a certificate of completion for both Sustainable Nutrient Management in New Zealand Agriculture and Advanced Sustainable Nutrient Management in New Zealand Agriculture from Massey University.

3 I have been employed by Fonterra Co-operative Group Limited (Fonterra), as a Sustainable Dairying Advisor since 2011, most recently as a Catchment Specialist since February 2012. As part of my role, I am responsible for working one-on-one with our supplier shareholders within the Te Waihora/Lake Ellesmere catchment to accelerate their adoption of good management practices. I also liaise with the dairy industry’s wider stakeholders and partners within the catchment to ensure that they are aware of sustainability initiatives being undertaken by Fonterra within the catchment; as well as ensuring delivery of clear, consistent messages for farmers in terms of how these initiatives and regulatory requirements can be adopted. I am also responsible for managing the operational aspects of Fonterra’s Nitrogen Programme.

4 Prior to my employment with Fonterra I worked for the London Borough of Southwark and the London Borough of Haringey (United Kingdom) as a Development Control Officer/Enforcement Officer in their respective Planning sections for a total of 4.5 years. These positions involved the processing of applications for planning permission and making subsequent recommendations to decision makers, as well as pursuing enforcement processes where developments contravened relevant legislation.

5 Prior to my employment in the United Kingdom, I was employed by Environment Canterbury as a Compliance Monitoring Officer for 3.5 years. This position involved both the processing of, and monitoring compliance with, resource consents within the rural sector.

6 I am familiar with proposed Variation 1 (Variation 1) of the proposed Canterbury Land and Water Plan (pLWRP) and I am authorised by Fonterra to provide this evidence on its behalf as a Fonterra representative.

7 I am not offering evidence as an expert witness, although I do have considerable practical experience in water quality and related farm management matters given my work for Fonterra and for previous employers.
SCOPING OF EVIDENCE

8 My evidence will deal with some practical issues associated with provisions in the Plan, including:

8.1 Those rules dealing with the discharge of drainage water within the Cultural Landscape/Values Management Area;

8.2 Those rules dealing with stormwater discharges into the Cultural Landscape Values Management Area;

8.3 Farm Dairy Effluent Design Standard and Code of Practice and how this relates to Schedule 24;

8.4 Stock exclusion from artificial watercourses – including drains;

8.5 Fonterra’s current national sustainability initiatives (Supply Fonterra) and Canterbury regional sustainability initiatives which will support the Plan, as well as Fonterra’s collaborative approach towards on-farm change; and

8.6 Fonterra’s non-regulatory commitments within the Selwyn Waihora zone.

ROLE OF DAIRY AND GROWTH OF DAIRYING

9 Fonterra is a global, co-operatively-owned company. Our business is based on sourcing secure, high quality milk and unlocking its natural goodness in ways that add real value to our customers and consumers around the world.

10 Within New Zealand Fonterra has approximately 10,500 shareholder suppliers who produced a total of approximately 22 billion litres of milk in the 2013-2014 season.

11 As discussed by Mr Ryan, Canterbury, and in particular the Selwyn Waihora zone west of State Highway 1 are relatively new dairy areas when compared to other parts of New Zealand. Whilst traditional dairying areas are well established in areas such as Kaikoura, Rangiora, Christchurch/Ellesmere and Clandeboye/Timaru, the majority of farm conversions have occurred in the past 20 years, with the advent of increased pastoral irrigation.

12 This has resulted in farms that generally have newer infrastructure and larger herds than the more traditional dairying areas in New Zealand. Fonterra had 158 suppliers located with the Selwyn Waihora zone during the 2013/2014 season
FONTEGRA’S INTEREST IN THE PROPOSED PLAN

13 Fonterra has an interest in the Plan because of its direct impact on its existing shareholder suppliers in the Selwyn Waihora zone and the effect the Plan will have on the Co-operative's ability to both maintain and grow milk supply in the future.

14 Both the Selwyn Waihora zone and the wider Canterbury Region has experienced strong growth in milk supply in recent times and Fonterra recognises the potential for future growth from the Region. Fonterra is supportive of this growth occurring in a manner that balances the social, economic, cultural and environmental well beings of the community.

Discharge of drainage water within the Cultural Landscape/Values Management Area

15 Rule 11.5.21 defines that where drainage water discharges within the Lake Area in the Cultural Landscape/Values management area, these will be discretionary activities requiring resource consent regardless of the quality of the water being discharged.

16 Given the high water table, which is often influenced by the water level in Te Waihora, there are an inherently significant number of drains within the Selwyn Waihora zone, a large number of which run through farm land.

17 Fonterra does not actively classify drains as part of its waterways programme, rather it classifies waterways largely on the basis of whether or not they contain water all year round. Ultimately, the majority of those waterways which are located on farm land east of SH1 will subsequently flow through the Cultural Landscape Area before discharging into Te Waihora.

18 As part of my role I have worked extensively with farmers to exclude stock from these waterways; a part of this role includes the verifying of stock exclusion works which essentially requires the walking of these farms and extent of waterways. In my experience, many of these drains serve multiple properties (which may include, rural, residential and industrial land uses), and receive runoff from roads and verges prior to discharging into Te Waihora. Below is a screenshot taken from Fonterra’s Waterways GIS software, this depicts an area adjacent to Te Waihora and the extent of waterbodies within those areas as mapped and verified by Fonterra. The key is as follows:

18.1 Green lines – are waterways where stock are excluded (fenced). The thick green lines are waterways which are considered as 'Fonterra defined’ i.e. are wider than 1m, deeper than 30cm and permanently contain water; the thin
green lines are those which typically do not permanently contain water.

18.2 Red lines – are Fonterra defined waterways which are not yet fenced.

18.3 Orange lines – are waterways are not fenced, but typically do not permanently contain water i.e. they do not meet Fonterra’s minimum standard which would require fencing.

18.4 Pink dotted lines – are waterways which are not classified, and typically exist on land which is not utilised to support dairy cows to supply milk to Fonterra.

18.5 The circles are dairy sheds i.e. each one is a different farm.

Screenshot from Fonterra’s GIS programme – showing extent of farm waterways (North-western side of Te Waihora).

19 From this information the extent and complexity of the drainage network can be clearly understood. There are drains illustrated here which encompass multiple properties, and roadsides which ultimately discharge into tributaries of Te Waihora within the Cultural Landscape/Values Management Area.

20 I support the recommendation in the section 42A report, which would require a risk assessment to be undertaken to assess
potential entry of contaminants to land drainage water and the inclusion of this risk assessment and appropriate actions as part of a Farm Environment Plan (FEP). As part of my role I am involved in working with farmers to identify potential risks to water quality in drains and the development of improvement plans which address these risks. Some more significant examples of the effectiveness of this approach include the relocation of farm races/laneways away from drainage channels, the exclusion of stock and the creation of vegetated swales between grazed pasture and drainage channels.

21 In my opinion this approach will be more effective in controlling risks associated with drainage water from drainage networks.

**Stormwater discharges into the Cultural Landscape Values Management Area**

22 Rule 11.5.28 requires that all storm water discharges within the Lake Area in the Cultural Landscape/Values Management area that are not into reticulated systems will require a resource consent as a discretionary activity.

23 A typical farm in the cultural landscape/values manage area would be expected to discharge storm water either into water or onto land in a manner that may enter water, from a dairy shed roof, clean concrete areas (such as clean dairy yards and stockholding areas outside of the dairy season), implement sheds, hay barns as well as from owners and staff dwellings. The implication of rule 11.5.28 is that resource consents would be required for at least 3 separate stormwater discharges, and potential installation of stormwater management systems (such as settling ponds) on every farm within the cultural landscape/values management area. In my opinion this is unrealistic given that the majority of these will be from roof areas which will be small and clean.

24 Rule 11.5.28 may also incentivise farmers to direct this storm water into farm dairy effluent systems, which is not recommended as good practice as this may severely impact the amount of storage available for farm dairy effluent management and could potentially result in the discharge of effluent onto land during the shoulders of the dairy season when soil moisture conditions are not ideal.

25 I support the recommendation in the section 42A report, which would delete rule 11.5.28; as in my experience rules 5.95-5.96 of the pLWRP adequately address those risks associated with the discharge of stormwater from those clean impervious areas utilised as part of farming infrastructure.
Farm Dairy Effluent (FDE) Design Standard and Code of Practice and how this relates to Schedule 24

Permitted activity rule 11.5.7 requires farm activities to implement the practices listed in schedule 24.

Practice (e) imposes practices on the management of collected animal effluent; most specifically that any new installations’ effluent management systems meet the DairyNZ Farm Dairy Effluent (FDE) Design Code of Practice (the ‘Code’); and that all existing effluent management systems undertake annual self checks of application, separation distances, depth, uniformity and intensity in accordance with Section 4 of The DairyNZ Farm Dairy Effluent Design Standard (the ‘Standard’).

Fonterra supports 24e(i) whereby all new effluent management systems installed post January 2014 meet the Standard and the Code.

My understanding of e(ii) is that it is intended to give a guide as to how farmers could self assess separation distances, application depth, uniformity and intensity against the conditions of their resource consents, rather than specifying a new set of performance criteria which would replace those specified by existing resource consent conditions.

The Standard discusses (at section 4) performance parameters for effluent management systems, however it does not provide any details of methodology as to how a farmer may undertake a self assessment to ascertain how they are performing in relation to those parameters specified by resource consent conditions. For example 4.3 ‘Application Depth’ specifies farm dairy effluent application depth is determined by soil hydraulic properties and nutrient loading calculations and must:

30.1 Account for local climate, the potential for periods of high soil moisture levels and periods of limited staff availability (e.g. calving);

30.2 Meet the criteria in Table in at least 9 out of every 10 years, based on a statistical analysis;

30.3 Account for the application uniformity of the chosen land application method; and

30.4 Comply with all local regulations.

There is no guidance in 4.3 which would assist a farmer with the practicalities of how to actually undertake a self-assessment to
determine the application depth achieved by their effluent management system.

32 As it currently stands, in my opinion the reference (in e(ii)) to The Standard adds little value to farmers in terms of guidance on what farmers are required to do to assess the performance of their effluent management systems.

33 I would suggest that instead of making reference to The Standard, e(ii) of Schedule 24 would be of greater value by referring to DairyNZ’s publications ‘Dairy farm effluent – the rules for achieving compliance in Canterbury’ and ‘A farmer’s guide to managing farm dairy effluent – a good practice guide for land application systems’. I have attached copies of these publications as Appendix 1 and 2 respectively.

**Stock exclusion from artificial watercourses – including drains**

34 Pursuant to rule 11.5.18 of Variation 1 and rules 5.68-5.71 of the pLWRP stock are required to be excluded from artificial waterways including farm drains.

35 The existing definition of “drain” in the pLWRP is ambiguous in that it does not specify a minimum size or depth, or whether it is intended to include swales and drains designed to convey stormwater (which would capture drains which flow only after significant rainfall events). As demonstrated by both the Supply Fonterra programme and commitment to restoration of Te Waihora (discussed later in my evidence) Fonterra supports the exclusion of stock from waterways where that is likely to result in significant improvement to water quality – however some clarification of this rule is required to ensure that very small drains that are impractical to fence are not captured.

36 In my experience a large number of farms within the Selwyn Waikawa zone rely on grassed swales adjacent to paddock boundaries (i.e. adjacent to every fence) to convey stormwater after a significant rainfall event, however these are in most instances ephemeral in nature, with vegetation reducing the likelihood of sediment contained in stormwater entering surface waterbodies. It is my opinion that it is not practical to fence these areas.

37 Fonterra supports the recommendation in the section 42A report, as this provides reassurance to farmers that those areas which are ephemeral in nature do not fall with the remit of rule 11.5.18.
CURRENT FONTERRA SUSTAINABILITY INITIATIVES

38 Fonterra remains committed to being among the most sustainable food producers in the world. We accept that agriculture has a responsibility to minimise its impact on the environment. In accordance with this commitment, Fonterra has implemented a number of programmes to encourage and assist farmers with sustainable production and nutrient management, which will assist, at least in part, in terms of how the water quality and growth objectives of the Plan will be achieved.

39 These are discussed below.

Sustainable Dairying Water Accord

40 **Mr Ryan** has discussed the details of the Sustainable Dairying Water Accord (SDWA). Fonterra is an Accountable Partner to the SDWA, and all new dairy conversions (or farm divisions) must meet all Accord requirements prior to supplying milk to Fonterra. This has been a condition of supply since 2005 (when it was pursuant to the Clean Streams Accord) and has required farmers to exclude stock from waterways and wetlands, have effluent management systems which are able to achieve 365 day compliance and have a nutrient management plan.

Supply Fonterra

41 In July 2012 Supply Fonterra was launched. Supply Fonterra is a programme of on-farm initiatives that will help grow and maintain a sustainable milk supply. It is a package of on-farm continuous improvement initiatives to help future-proof our dairying suppliers’ practices.

42 At its heart, Supply Fonterra is a long-term change model. It leverages Fonterra’s successful history in continuously improving our on-farm food safety performance, and more recently the positive results achieved through the “Every Farm Every Year” effluent management programme.

43 The programme is founded on four key elements that we know from experience are required to drive change on farm:

43.1 Minimum standards that must be achieved in order to supply milk;

43.2 One-on-one advice and support to guide farmers towards best practice;
43.3 Practical education and resources for farmers, including support from our industry partners DairyNZ and AgITO\(^1\); and

43.4 Recognition and reward for those who are at the cutting edge of sustainability, milk quality and animal welfare.

44 The Environment Programme for Supply Fonterra includes three modules: Effluent Management, Waterway Management and Nitrogen Management which are discussed below. There may be future modules of Supply Fonterra to address issues such as water efficiency, greenhouse gases, biodiversity and animal welfare.

45 All farmers who supply milk to Fonterra are required to participate in a Farm Dairy Assessment at least once per year. This assessment is a requirement of Fonterra’s Risk Management Programme as required by the Animal Products Act (1999) which controls food safety in New Zealand. The Farm Dairy Assessment, which is undertaken by contracted service providers, is also utilised to assess compliance with minimum standards as part of Supply Fonterra programme.

**Effluent Management**

46 Formerly ‘Every Farm Every Year’, the effluent management component of the Environment Programme involves an assessment by an independent contractor of every farm’s effluent system to identify risks with the system. This is undertaken annually during the Farm Dairy Assessment. Where an issue is identified a Sustainable Dairying Advisor will meet with the farmer and formulate an agreed Environmental Improvement Plan (EIP). The EIP will be followed up with the supplier to ensure that the actions agreed are completed, and the minimum standard achieved.\(^2\)

47 Where a supplier fails to remedy the situation or work with the Sustainable Dairying Advisor to develop an EIP, the ultimate sanction is the non-collection of milk.

**Waterway Management**

48 This programme was introduced during the 2012 season and focusses on reducing the dairy industry’s impacts on surface water quality. It also addresses some of the shortcomings of the Clean

---

\(^1\) AgITO is one of New Zealand’s largest industry training organisations supporting the agricultural industry.

\(^2\) The minimum standard for the Effluent Management Programme requires our suppliers to have systems in place that manage all effluent sources in a manner that complies with the relevant Regional Council resource consent or permitted activity rules, 365 days a year; and where this is not achieved, that they work with a Sustainable Dairy Advisor to create an EIP that sets out the actions required to achieve the minimum standard.
Streams Accord (predecessor to the SDWA) in terms of reporting and verification.

49 The minimum standards for this programme are:

49.1 The exclusion of stock from all waterways that are wider than 1 metre, deeper than 30cm and permanently contain water;

49.2 All regular crossing points are required to have bridges or culverts; and

49.3 Sediment and/or effluent is not to be discharged into any waterway where it is likely to result in a significant adverse effect on the environment.

50 The programme also provides guidance and advice to suppliers about managing the risks from fodder crops and wintering practices, along with stock exclusion on run-off blocks.

51 The stock exclusion and crossing requirements are assessed during the annual Farm Dairy Assessment. Working with the farmer, the assessor uses electronic mapping technology and aerial photographs to identify and classify the waterways on the farm and the level of stock exclusion that has been achieved. The assessor is required to carry out a full visual validation of waterway fencing within 200m of the dairy farm dairy.

52 Where these minimum standards are not met a Sustainable Dairying Advisor will meet with the farmer to formulate an agreed EIP. This EIP will be followed up with the supplier to ensure that the actions agreed are completed, and the minimum standard achieved.

53 All stock exclusion and crossing information provided by farmers is subsequently verified by Fonterra employee or a third party contractor to ensure accuracy. This consists of a farm visit where all waterways and crossings are visually assessed.

54 As of August 2014 (Nationally):

54.1 82.8% of Fonterra Farms have achieved 100% stock exclusion.

54.2 Stock have been excluded from 95.3% of all defined waterways.

54.3 99% of regular crossings have been bridged or culverted.

54.4 85% of those farms who have not achieved 100% stock exclusion from defined waterways or bridged regular
crossings have an Environmental Improvement Plan in place specifying timeframes to have this completed.

54.5 There are currently 395km of waterways and 23 stock crossing points with dispensations in place. The majority of these have management plans requiring temporary stock exclusion measures or cover areas that are not accessed by dairy animals.

54.6 In numeric terms this equates to a total of 23,420km of fencing, with a further 1,122km to be completed.

55 Within Selwyn Waihora catchment:

55.1 Stock have been excluded from 97% of defined waterways.

55.2 99% of regular crossings have been bridged or culverted.

55.3 Stock have been excluded from an additional 246km of waterways which do not meet Fonterra’s definition.

**Nitrogen Management**

56 This programme was introduced in 2012 and seeks to:

56.1 Model each supplier’s nitrogen loss and efficiency at year end, using actual farm data, and in accordance with the industry developed protocol for the use of OVERSEER;

56.2 Provide this information to farmers in an easy to understand format that shows how they are performing compared to their peers; and

56.3 Provide an audited record of nitrogen loss that allows farmers to easily participate in audited self-management schemes or demonstrate compliance with regulatory requirements.

57 This programme requires farmers to submit on-farm data at the completion of the dairy season. This information is then entered into the Overseer model to indicate Nitrogen loss risk and use efficiency for the given farm system.

58 The support model for the Nitrogen Programme will commence in November of this year to assist farmers to reduce losses whilst increasing efficiency.

59 For the 2013/2014 season Fonterra received farm information from 92 (58%) suppliers. This has increased from 61 (37%) in the 2012/2013 season (the first season of this programme being in place). There have been significant challenges in increasing
awareness around the importance of the accurate recording and provision of this data, and this will be addressed as part of the support programme this season, with an aim to have 100% of farmers participating in this programme by the end of the current dairy season.

**Partnership with Te Runanga o Ngai Tahu & Whakaora Te Waihora**

Fonterra is working in partnership with Te Runanga o Ngai to accelerate improvements in ecosystem health in the Te Waihora catchment by increasing such things as on-farm support, improving nutrient management practices and developing riparian planting plans and restoration projects within the catchment. Fonterra has committed $1.3 million to this programme which started in August 2011. This work feeds into the wider long-term partnership with Environment Canterbury, Ngai Tahu and the New Zealand Government named Whakaora Te Waihora (WTW). The Whakaora Te Waihora Joint Cultural and Ecological Restoration Plan for Te Waihora was developed by Environment Canterbury and Ngai Tahu. The plan directs the co-ordination of actions within the catchment to achieve rejuvenation of the mauri (life force) and ecosystem health of Te Waihora and provides a starting point for discussions with landowners, agencies and industry.

Fonterra has increased on-the-ground resources through a dedicated Sustainable Dairying Advisor for the Te Waihora catchment to accelerate the adoption of good on-farm practice by its suppliers. Pursuant to these commitments Fonterra has a number of joint on-farm riparian restoration projects currently in progress within the Te Waihora catchment, and 40 farms within the inner catchment (east of SH1) participating in a Farm Environment Plan pilot whereby these farmers now have current Farm Environment Plans. As part of commitment to WTW Fonterra and ECAn aim to continue this pilot to the extent that all Fonterra suppliers within the inner catchment (approximately 80 farmers) will have a current Farm Environment Plan.

**Living Waters partnership**

The Living Water partnership is a joint project between the Department of Conservation (DOC) and Fonterra working with local communities, dairy farmers, iwi and other stakeholders to improve sensitive water catchments.

The Programme Vision is “A sustainable dairy industry is part of healthy functioning ecosystems that together enrich the lives of all New Zealanders.”

While dairy farming is not the only activity to impact on water quality and biodiversity in these catchments, it is a significant land
use and this programme will develop effective solutions to improve water quality.

65 The Te Waihora/Lake Ellesmere Catchment is one of five programme sites across New Zealand. The others are Waikato Peat Lakes, Miranda/Pūkorokoro in Tikapa Moana/Firth of Thames, Kaipara Harbour-Hikurangi and Waituna.

66 The Living Waters Partnership will focus on the Ararira/LII catchment within the Selwyn Waihora zone. The vision for this focus is that the ecology of the whole of the Ararira/LII River is improved in a community-wide river restoration plan that extends from Lincoln Township, through the rural landscape, to the lake.

67 Selecting the Ararira/LII sub catchment as a focal point for partnership projects will illustrate the benefits of a community wide restoration of an entire river from Lincoln, through a mixed use rural environment, through Yarrs Lagoon Reserve (belonging to Selwyn District Council) and finishing at Yarrs Flat Wildlife Reserve (managed by DOC).

68 The Ararira/LII River has been profiled as a high priority river in the catchment and it is fed by approximately 75kms of rated drains (plus other on farm drains) which the rural community depend on for farming purposes. There are around 12 Fonterra farms in this catchment including the Lincoln University Dairy Farm. Projects include:

68.1 Selected restoration projects along both the LII and its tributaries, both on private farm land and public conservation land

68.2 The development of FEP’s for those Fonterra farmers who are within the LII catchment.

68.3 Scoping the feasibility of developing constructed wetland on private farm land which encompass tributaries of LII

69 In addition to the LII catchment the Living Waters Partnership is supporting a multi-year drain rehabilitation project in partnership with Canterbury University and the Selwyn District Council Drainage Committee. This project is aimed at developing techniques to enhance the benefits of riparian fencing and planting; and will focus on reshaping, fencing and planting the drain. By achieving these aims, water quality and in stream habitat will be improved and open the way for increased aquatic diversity and ecosystem health.
Currently all fencing and the first stage of earthworks (removing of historic spoil, reshaping of drainage channel) and plantings has been completed (see photograph below).

CONCLUSIONS

The drainage network with the Selwyn Waihora zone is extensive and complex, encompassing multiple properties and land uses. Fonterra supports the recommendation in the section 42A report in requiring a risk assessment and appropriate actions being included as part of an FEP, rather than the requirement for additional resource consent(s) to address risks associated with drainage water from drainage networks.

Farming entities utilise significant infrastructure which results in the collection of stormwater during rainfall events. In a large number of instances these discharges will be from impervious areas which will be relatively clean. Fonterra supports the recommendation in the section 42A report, which removes requirement for those farms located in the Cultural Landscape Values Management Area to apply for additional resource consent, as these risks are appropriately addressed by the pLWRP.

Fonterra supports requirement that new effluent management systems are designed in accordance with The Standard and The Code (as proposed by Schedule 24e(i). In addition Fonterra supports the proposal of an annual self-check of effluent management by farmers to ensure that consent conditions are being met. However the Standard does not give any practical guidance as to what is expected of farmers to achieve this; and therefore
suggests that 24e (ii) refers to alternative guidance which has been developed to assist farmers to undertake these self-checks.

74 As demonstrated by both the Supply Fonterra programme and commitment to restoration of Te Waihora, Fonterra supports the exclusion of stock from waterways beyond those which are classified as beds of rivers, lakes and wetlands. The expectations of which areas require stock exclusion must remain practical and achievable for farmers to plan for these works. Fonterra supports the recommendations of the section 42A report which provides some reassurance to farmers that these expectations do not extent to those areas which are ephemeral in nature.

Dated: 29 August 2014

Mathew Cullen
This checklist is a self audit to give farmers confidence they will pass an Environment Canterbury Compliance Assessment. The checklist is for your own information and you do not have to share it with any organisation.

We recommend you 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.

- Not all resource consents are the same. Some older consents will not list all the conditions in this checklist. It’s a good idea to read this checklist in conjunction with your individual consent
- You must remain compliant with your consent requirements every day – regardless of the time of year, weather, breakdowns or staffing issues
- Ensure you have a plan in place to cope with all of the above scenarios
- Enforcement action is considered on a case-by-case basis, and specific factors, such as a breach during times of flood, will be taken into account during enforcement decision making
- Make sure all staff on your farm know the rules, are fully trained in the operation and maintenance of the effluent system, and know what to do and who to contact if the system breaks down
- Always aim for good practice rather than just achieving compliance.

This symbol indicates there is a tool or resource available to help you – see the list at the end of the checklist.
### Have an effluent system that is capable of complying with your consent conditions, in terms of both infrastructure and ongoing maintenance

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Checklist</th>
</tr>
</thead>
<tbody>
<tr>
<td>There is sufficient effluent storage for times when soil moisture levels are high</td>
<td>✔️</td>
</tr>
<tr>
<td>All effluent is contained within sealed structures</td>
<td>✔️</td>
</tr>
<tr>
<td>The depth and rate of effluent application has been measured and it satisfies the requirements of the consent</td>
<td>✔️</td>
</tr>
<tr>
<td>The disposal area is sufficiently large for the herd size</td>
<td>✔️</td>
</tr>
<tr>
<td>A regular maintenance regime is in place for the effluent system</td>
<td>✔️</td>
</tr>
<tr>
<td>Contingency measures are in place in the event of a system failure</td>
<td>✔️</td>
</tr>
</tbody>
</table>

### Get the right amount of effluent on the soil at the right time and in the right place

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Checklist</th>
</tr>
</thead>
<tbody>
<tr>
<td>A good effluent system will apply effluent to soil:</td>
<td>✔️</td>
</tr>
<tr>
<td>At an appropriate depth for the soil and within the limit specified on your consent</td>
<td>✔️</td>
</tr>
<tr>
<td>At times when the soil moisture is sufficiently low</td>
<td>✔️</td>
</tr>
<tr>
<td>At a rate which does not result in ponding and effluent runoff</td>
<td>✔️</td>
</tr>
<tr>
<td>At a suitable distance from waterways, bores and soak holes (check your consent)</td>
<td>✔️</td>
</tr>
<tr>
<td>Within the areas specified on the resource consent</td>
<td>✔️</td>
</tr>
<tr>
<td>Solids are stored on a sealed surface that drains back into the effluent sump</td>
<td>✔️</td>
</tr>
<tr>
<td>- Effluent systems that can deliver these results will save you money through better nutrient utilisation and will help prevent environmental effects on water</td>
<td>✔️</td>
</tr>
</tbody>
</table>

### People with the right skills and knowledge to achieve best practice in effluent disposal

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Checklist</th>
</tr>
</thead>
<tbody>
<tr>
<td>Everyone in the farming operation understands the importance of effluent management and the consequences of non-compliance</td>
<td>✔️</td>
</tr>
<tr>
<td>Everyone knows what to do if something goes wrong</td>
<td>✔️</td>
</tr>
<tr>
<td>A training schedule is maintained for staff with direct effluent management responsibilities</td>
<td>✔️</td>
</tr>
<tr>
<td>An effluent management plan is in place that clearly defines responsibilities and procedures (see <a href="http://www.ecan.govt.nz">www.ecan.govt.nz</a> for examples)</td>
<td>✔️</td>
</tr>
<tr>
<td>External training courses are utilised to increase understanding of best practice</td>
<td>✔️</td>
</tr>
</tbody>
</table>
Get familiar with the conditions of your consent and actively seek compliance

Much of the non-compliance reported in Canterbury is for minor issues that can easily be avoided. Take the time to go through your consent and make sure that all the administrative conditions have been fulfilled to reduce compliance costs and improve the reputation of the dairy industry.

- Effluent is applied to the area of land specified in your consent document.
- The number of cows being milked is within the limit specified on the consent.
- A copy of your effluent consent and management plan is displayed in a prominent place in the dairy shed.
- A copy of the effluent management plan has been provided to all employees and Environment Canterbury.
- All previous consents that are no longer required have been surrendered.
- All other requirements of the consent have been fulfilled.

1. To work out your nitrogen loading, multiply the peak number of cows being milked by 6.5 and divide by the total hectares used for effluent disposal. This will give you the kilograms of nitrogen/hectare/year.
2. Contingency measures include things like additional storage capacity, having a spare pump or irrigator or the contact details of the local vacuum tanker operator in an easy to find location.
3. Note that this limit is often imposed through a maximum volume of undiluted effluent. To calculate your undiluted effluent volume, multiply your cow numbers by 5.4 litres. If the number is bigger than the volume specified on your consent you will need to change the consent or reduce the number of cows being milked.
4. Not all consents require this, but it’s a good idea anyway. If you don’t have a copy of your consent, call Environment Canterbury customer services on 0800 EC INFO, or they are available on the website, www.ecan.govt.nz.

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, Federated Farmers, Environment Canterbury, Synlait, New Zealand Dairies, AgITO and Fonterra take no responsibility whatsoever for the currency and/or accuracy of this information, its completeness or fitness for purpose.

Contacts

If you answered no or not sure to any of the questions above, you can call the following organisations for assistance:

- Fonterra: Sustainable Dairying Team 0800 65 65 68
- Environment Canterbury: 0800 324 636
- DairyNZ: Sustainability team 0800 4 DairyNZ (0800 4 324 7969)
- Federated Farmers: 0800 Farming (0800 327 6464)
- Synlait: Environmental Manager 03 373 3000
- New Zealand Dairies Ltd: Supply Liaison 03 690 9048
- AgITO: 0800 691 111
What’s the problem with effluent ponding?

Ponding of effluent on the paddock can have both environmental and economic impacts. Applying too much effluent at once, or applying effluent too fast, can cause the effluent to pond on the soil surface.

**Economic impacts of ponding**

- Valuable nutrients are lost and unable to be used by plants
- Can impede pasture growth and earthworm activity
- Increases the risk of pugging damage
- Cows don’t like eating grass covered in effluent (under-utilisation of pasture).

All the above will reduce pasture growth and can lead to increased weed content in the pasture.

**Environmental impacts of ponding**

Risk of effluent running off into a nearby waterway

- Increased nutrients and therefore, nuisance plant growth in streams
- The effluent can be toxic to insects and fish
- Health risk to downstream river users
- Unsightly appearance of stream.

Risk of the effluent leaching into shallow groundwater

- Increased nitrate leached to groundwater, which affects groundwater users downstream
- In some cases, may cause movement of bacteria into the shallow groundwater
- Affects the water quality of nearby spring-fed streams
- Health risk to people and stock that rely on groundwater-sourced drinking water supplies.

To order a copy of *A guide to managing farm dairy effluent – Canterbury* or for more information on managing your system contact the DairyNZ farmer information line 0800 4 DAIRYNZ (0800 4 324 7969), or download a copy from dairynz.co.nz
## Compliance gradings for effluent ponding in Canterbury

<table>
<thead>
<tr>
<th>No ponding - Fully compliant</th>
<th>Minor ponding - Grade 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>![Image](42x568 to 289x690)</td>
<td>![Image](306x311 to 554x426)</td>
</tr>
<tr>
<td>There may be a small amount of effluent in depressions immediately after irrigation, however this disappears quickly</td>
<td>Small puddles are present and they remain for some time after the irrigator has passed over. This makes up a significant proportion of the non-compliance statistics</td>
</tr>
<tr>
<td><strong>Likely Environment Canterbury action:</strong></td>
<td><strong>Likely Environment Canterbury action:</strong></td>
</tr>
<tr>
<td>• Written warning</td>
<td>• Written warning</td>
</tr>
<tr>
<td>• Re-visit will be conducted to check compliance at the consent holder’s expense</td>
<td>• May lead to an increased frequency of monitoring</td>
</tr>
<tr>
<td>• Likely to result in infringement notice(s) being served on the farm owner, sharemilker and/or staff responsible for the breach</td>
<td>• May be graded as significant for repeated occurrences</td>
</tr>
<tr>
<td>• Abatement notice likely to be issued to the farm owner and/or sharemilker</td>
<td>• May lead to enforcement action for repeated occurrences.</td>
</tr>
<tr>
<td>• Possible prosecution of the farm owner, sharemilker and/or staff responsible for the breach, especially for repeat occurrences.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Significant ponding - Grade 3</th>
<th>Major ponding - Grade 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>![Image](43x311 to 289x426)</td>
<td>![Image](306x568 to 552x690)</td>
</tr>
<tr>
<td>Medium to large puddles are present and they may remain for longer than 2-3 hours after the irrigator has passed over</td>
<td>Large areas of pooled effluent are present and also likely to be sludge build-up. May take days to drain away. Likely to result in overland flow to drains or waterways on sloping land</td>
</tr>
<tr>
<td><strong>Likely Environment Canterbury action:</strong></td>
<td><strong>Likely Environment Canterbury action:</strong></td>
</tr>
<tr>
<td>• Written warning</td>
<td>• Re-visit will be conducted to check compliance at the consent holder’s expense</td>
</tr>
<tr>
<td>• Re-visit will be conducted to check compliance at the consent holder’s expense</td>
<td>• Likely prosecution of the farm owner, sharemilker and/or staff responsible for the breach, especially for repeat occurrences²</td>
</tr>
<tr>
<td>• Likely to result in infringement notice(s) being served on the farm owner, sharemilker and/or staff responsible for the breach</td>
<td>• Highly likely that infringement notice(s) will be served on the farm owner, sharemilker and/or staff responsible for the breach, should a prosecution not be taken¹</td>
</tr>
<tr>
<td>• Abatement notice likely to be issued to the farm owner and/or sharemilker</td>
<td>• Abatement notice likely to be issued to the farm owner and/or sharemilker.</td>
</tr>
<tr>
<td>• Possible prosecution of the farm owner, sharemilker and/or staff responsible for the breach, especially for repeat occurrences.</td>
<td></td>
</tr>
</tbody>
</table>

Note: This sheet is intended as a guide only and Environment Canterbury will consider each case on its own individual merits and take the action that it sees is appropriate.

¹ The infringement fee for an effluent breach is $750. This can be issued to multiple parties for the same offence
² An abatement notice is a formal notice issued under the RMA. It can require you to undertake an action, or cease undertaking an action. Failure to comply with an abatement notice can result in a $1000 infringement fine or a court prosecution
³ The maximum penalties under the RMA for an individual are $200,000, and $10,000 a day for any continuing offence, or a prison term of up to 2 years. Convictions also carry a criminal record. For companies and partnerships the maximum fine is $600,000, and $10,000 a day for any continuing offence
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](http://dairynz.co.nz) website under publications and tools, or order a copy by calling 0800 4 DairyNZ (0800 4 324 7969).

**Tools and resources available to help with effluent management**

### Training staff

**Effluent Training Record**
To help make sure you cover all the bases when training new staff. Serves as a file away record of training should you ever need it.

**AgITO Dealing with Dairy Farm Effluent**
A one day course looking at the reasons why, and how to treat dairy effluent on farm. Suitable for all the farm team. Includes a one-on-one practical assessment on the participant’s farm.

AgITO 0800 691 111

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

AgITO 0800 691 111

**Top Tips for Effluent Irrigators**
Make sure your staff get it right every time with this poster for the dairy, outlining top tips for trouble free effluent irrigators

**Effluent Management Plan**
A visual plan to pin up in the dairy so all staff know the drill with effluent management

### Upgrading your system

**Farm Dairy Effluent Systems: Planning the Right System for Your Farm**
A farmer guide to the farm dairy effluent system design standards and code of practice. Helps you plan your system with your designer so you get a system which is fit for purpose

**Improve your system**

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

AgITO 0800 691 111

**Top Tips for Effluent Irrigators**
Make sure your staff get it right every time with this poster for the dairy, outlining top tips for trouble free effluent irrigators

**Effluent Management Plan**
A visual plan to pin up in the dairy so all staff know the drill with effluent management

### Improving farm performance

**FarmFacts**
A set of fact sheets explaining all things dairy including effluent – one of DairyNZs most popular resources

**Nutrient Management Case Studies**
Nutrient use efficiency is all about finding productivity gains on your farm. Pick up some ideas on where you may be able to use your nutrients more effectively from farmers from across the country.

**Minimising Muck, Maximising Money Guide and Case Studies**
Avoid the pitfalls when designing feed pads and stand-off facilities with this guide to design and management of feed pad and stand-off areas, including case studies from farmers around the country

**Compliance Toolkit**
Are you complying with your legal requirements? Find out with this easy to use online tool for cutting through the red tape. Covers all aspects of farm compliance; employment, health and safety, animal welfare and environment. Download copies of the Compliance Checklist for dairy regions across the country, or use the consent scoping tool to minimise your compliance risks. Visit [compliancetoolkit.co.nz](http://compliancetoolkit.co.nz)

**Farm Enviro Walk**
A good practice self-assessment for environmental performance on farm. Covers effluent, soil, nutrient, waterways and other hotspots on farm. A useful training tool
A farmer’s guide to managing farm dairy effluent

A good practice guide for land application systems
A farmer’s guide to managing farm dairy effluent

About this booklet

Farm dairy effluent is a valuable resource, and when managed well, can increase pasture production and reduce fertiliser costs. Poorly managed effluent poses an environmental and business risk.

Raw effluent entering waterways can have detrimental effects on human health and water quality, and could result in regional council enforcement action for breaches of the Resource Management Act. The dairy industry is committed to achieving effluent compliance 365 days of the year.

This guide is for farm owners and senior farm staff to provide an overview of effluent management, with links to other DairyNZ resources for more detailed information on specific topics.

This is a good practice guide for the management of land application systems; it doesn't cover the compliance requirements specific to each region. For more details about the rules and requirements for your region, check your council consent, and a copy of your region’s Compliance Checklist which can be found on dairynz.co.nz.

This symbol indicates these other DairyNZ resources on this topic. These are listed in the back pages, and are available to order or download on the dairynz.co.nz website.

We recommend you get professional advice specific to your farm, from a reputable source, before making any significant changes or investments in your system.

For more information visit dairynz.co.nz

DairyNZ
Corner Ruakura and Morrinsville Roads
Private Bag 3221
Hamilton 3240

Phone 0800 4 DairyNZ (0800 4 324 7969)

Version 1 - Feb 2013

Disclaimer

DairyNZ Limited ("DairyNZ", "we", "our") endeavours to ensure that the information in this publication is accurate and current. However we do not accept liability for any error or omission.

The information that appears in this publication is intended to provide the best possible dairy farm management practices, systems and advice that DairyNZ has access to. However, the information is provided as 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 takes no responsibility whatsoever for the currency and/or accuracy of this information, its completeness or fitness for purpose.

©DairyNZ Limited 2013

Copyright

Copyright in this publication (including text, graphics, logos, and icons) is owned or licensed to DairyNZ.

Other than for the purposes of, and subject to the conditions prescribed under, the Copyright Act 1994 and similar legislation which applies in your location, and except as expressly authorised by these terms and conditions, you may not in any form or by any means adapt, reproduce, store, distribute, print, display, perform, publish, or create derivative works from any part of this publication or commercialise any information, products, or services obtained from any part of this publication without our written permission.
This booklet will cover

1.0  The benefits of good effluent management 4

System design

2.0  Planning the right system for your farm 5
2.1  Make sure the system will be up to the job 5
2.2  What needs to be captured? 6

Soil and water

3.0  How landscape and climate affect effluent system design and management 12
3.1  Soil texture 12
3.2  Soil and Landscape Classifications and risk profiles 14
3.3  Effluent application plans 16

Land application

4.0  Applying effluent to land 17
4.1  How to test application depth and rate 17
4.2  Matching effluent application to the soil water deficit 23
4.3  Evaluate your applicator spray patterns 25
4.4  Nutrient management – know the nutrient loading from effluent application 26

Storage

5.0  Collection and pond storage 30
5.1  Sealed facilities 30
5.2  Storage capacity 30
5.3  Managing storage volumes 32
5.4  Minimising the volume of effluent to manage 33
5.5  De-sludging and de-watering effluent solids 34

Solids and slurries

6.0  Stand-off areas and feed pads 35
6.1  Including a feed pad or stand-off area in your effluent system 35

The farm team

7.0  The farm team 38
7.1  Orientation and Training 38
7.2  Farm team effluent management plans 39
8.0  Safety around the effluent system 40
9.0  Working with effluent spreading contractors 41
9.1  Keeping contractors safe 41
9.2  Environmental compliance 41

Operation

10.0  Operating and maintaining an effluent system 42
10.1  Irrigator run sheets and calibration recording 42
10.2  Tips for operating a travelling irrigator system 43
10.3  Tips for operating a low application sprinkler system 45
10.4  Tips for maintenance 47

11.0  Tools and resources available to help with effluent management 51
10 The benefits of good effluent management

Good effluent management is a combination of having a well-designed effluent system and processes for people that make sure the effluent the system collects is applied to pasture in the right amount at the right time.

To achieve this, the system must reliably:

- Store effluent until conditions are suitable to apply it to land, and
- Apply effluent to land in a controlled way – at a depth and intensity which match the soil moisture and infiltration conditions and topography.

On-farm benefits of good effluent management include:

- Fertiliser savings by using the nutrients in effluent, and reducing nutrient losses off the farm. See section 4.4 for more about the value of effluent
- Preventing animal-health issues such as milk fever which can be caused by a build-up of potassium (K) levels in the soil
- Improved soil condition from the addition of organic matter, including microbial and worm activity, as well as aeration, drainage and water holding capacity
- Complying with council rules or resource consent, this may lead to less frequent compliance visits and reduced monitoring fees.
2.0 Planning the right system for your farm

The design and construction of an effective dairy effluent system is a complex process. It requires the assistance of experts who are qualified and experienced in the field. Communication with the system designers, installers and contractors will be crucial to ensure the end result is fit-for-purpose in your farming situation.

A good effluent service provider will offer:

- certainty that their product will perform
- guarantees and producer statements
- after-sales care, service and support, and
- farm team training on the operation and maintenance of the system.

Designers and installers should be involved in the project from start to finish supervising the quality and standard of workmanship during the installation and commissioning of the system. They should be willing to stand by their work.

DairyNZ recommend farmers use suitably qualified and accredited effluent system designers. A list of accredited designers can be found on effluentaccreditation.co.nz. For more information about designing and upgrading an effluent system, see the dairynz.co.nz website under Environment>Effluent, or call 0800 4 DairyNZ (0800 4 324 796).

2.1 Make sure the system will be up to the job

A poorly designed system will be expensive and frustrating in the long term, particularly for the farm team. Like milking too many cows through a dairy, it can be done but it takes longer and the likelihood of fatigue, breakdown and general frustration is extremely high.

A system which is poorly designed may result in problems such as:

- high risk of non-compliance with regional council requirements
- no contingency for adverse weather events, staff absence or system breakdown
- high demand on labour and time
- expensive to operate and maintain
- the need to irrigate on days when ponding, runoff, and leaching risk is high
- additional pressure on the farm team over calving or wet weather
- unrealised investment in the system if it is not user-friendly or doesn’t achieve compliance, and
- little room for future expansion.

It is important to think about potential changes to the farm system, especially intensification, including an increase in cow numbers, greater use of stand-off and feed pads or the addition of wintering facilities. If these are desired but finances don’t allow you to accommodate these now, plan for a staged expansion to the system as you require it. Get the system designed with the changes in mind – it can save a big expenditure in the future.

The system must be capable of storing all effluent when conditions aren’t suitable to irrigate, and then allow the option of getting effluent onto land and emptying the pond when conditions permit.

Further reading:

- Farmer guide to planning the right system for your farm
- Farm Dairy Effluent (FDE) Design Standards
- Farm Dairy Effluent (FDE) Design Code of Practice
- Farm Dairy Effluent (FDE) ‘A farmer’s guide to building a new effluent storage pond’
- IPENZ Practice Note 21: Farm Dairy Effluent Pond Design and Construction
2.2 What needs to be captured?

All areas where effluent is generated should be incorporated into the effluent system design. Effluent includes liquids, sludge, slurries and solids from cow dung and urine. Other contaminants such as milk and silage leachate must also be collected, contained and not allowed to reach waterways. A good way to do this is to use the effluent system to capture and distribute these sources. Regional council requirements for each may vary, but if you are building or upgrading any of the areas listed below, it is good practice to use sealed surfaces to capture all effluent and contaminants.

Examples of areas where effluent should be captured include the following areas:
What type of system may suit you?

<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, however if you operate a travelling irrigator in these conditions it has to be 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 page 8).</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></td>
</tr>
<tr>
<td>None of the above risk factors?</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>
</tbody>
</table>

Understanding the different components of an effluent system

The following information describes the individual components of common effluent systems in New Zealand.

**Stormwater diversion**

Storm water diversion is when rainfall that has landed on an effluent free yard (including any pad etc.) can be safely diverted away from the effluent storage pond. It is an effective way to reduce the volume of water that can be added to the pond in rainfall events, especially if you are not milking. This has savings via decreased pumping costs, less time staff are irrigating dilute effluent, and less risk of having to irrigate when soils are wet.

There are a huge number of stormwater diversion designs available, including manual and mechanical. Regardless of design, care needs to be taken to manage the stormwater diversion correctly. Installing an automatic facility or warning devices is advised.

Farms located in high rainfall areas would benefit from a stormwater diversion. Farmers may choose to only use stormwater diversion at times of the year when not milking. If using regularly during the milking season it is essential that robust systems are in place to ensure mistakes are not made.

**Example:** 100mm of rain on a 400m² roof or yard = 40m³ of water. If pumping from the effluent pond at 15m³/hr = 2.6 additional hours of pumping costs, plus labour and wear and tear on equipment.
Stone trap

Stone traps are designed to slow down and redirect the flow of effluent so sand, stones and debris can drop out. This will prevent blockages in the effluent pipe work, pumps, storage facilities and applicators.

Stone traps are generally made of concrete and have a wide base which slopes down toward the pumping or draining end. The inlet is normally well above and on the opposite side/end of the stone trap to the outlet.

The solids that accumulate in the stone trap need to be regularly removed onto a sealed surface located directly beside the stone trap which drains any liquid back to the stone trap. The solids should be applied evenly to land.

Not all systems need a stone trap, but it is highly recommended. Systems which use weeping walls or two pond systems which use the first pond as a separation system may be exceptions.

Pump station

The pump station’s purpose is to transfer effluent from one location to another. Where possible it is better and more cost effective to use gravity to move effluent. Pump stations may be required to get effluent to storage and are definitely required to transfer effluent from storage to the applicator. There are a wide range of options available for transfer pumps including different types, sizes and capabilities. It is important that your pump specifications match the system specifications and the outcomes required, to ensure your effluent system works effectively.

Solids separator

Solid separation involves the removal of coarse solids from the effluent resulting in a liquid effluent which is stored until use.

Using solid separation in the system will mean there is less liquid to be stored and storage facilities may require de-sludging less frequently. The removal of solids also allows the liquid effluent to be applied through any type of applicator. Low rate and mainline centre pivot systems must have a solids separator or some sort of inline filtration to prevent blockage on smaller applicator orifices.

Solid separation should be considered when operating a feed pad or high feed input system as the amount of solids in the effluent is greatly increased in these systems.

If solids are separated effectively, water recirculation for use as yard or pad wash-down can also be considered (See DairyNZ Farmfact 6-65 for more about the use of recycled effluent for yard washing). This would also lower the storage volume required.

There are two main methods of solid separation:

1. Mechanical separators: Mechanical separators achieve a high rate of separation and produce a dry solids component which is held on a pad or bunker for use at a later date. Once the solids are removed the liquid component is transferred to a storage facility. Mechanical separators are normally either slope screen, rotary screen or screw presses.
2. Passive separation: These are usually weeping walls. Weeping walls are lined storage areas which have a narrow slotted wall along the length of the store. There should be two storage areas which can be alternated. The liquid drains through the wall into a drainage channel and is transferred to a liquid storage facility. The solids remain in the storage area. Once the solids build up to a certain level they can be left to dry out and then applied to land. The sizing and design of the weeping wall is critical to its success.

All solids need to applied to land in a way that meets regional council rules and consent conditions. See pg 34 for more about solids management, and pg 41 for hiring effluent spreading contractors.

<table>
<thead>
<tr>
<th>Pros</th>
<th>Cons</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low risk of breakdown</td>
<td>Farm specific - design different on every farm</td>
</tr>
<tr>
<td>Very low ongoing labour input</td>
<td>Solid product has higher water content</td>
</tr>
<tr>
<td>Low energy usage</td>
<td>Solids can become anaerobic causing odour</td>
</tr>
<tr>
<td>Liquid effluent is better filtered</td>
<td>Takes up a large physical area</td>
</tr>
<tr>
<td>Requires smaller physical area</td>
<td>Emptying bunkers bigger job. May require a contractor</td>
</tr>
<tr>
<td>Produces a drier solids product, to store and spread</td>
<td>(take care with liners).</td>
</tr>
</tbody>
</table>

Pros Cons

Passive separator (Weeping wall or settling pond)

- 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 cost
- Higher 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 separators.

Storage

The storage component of an effluent system is critical for all farms. Having sufficient storage for your effluent provides flexibility in terms of application. This means you can apply effluent when soil conditions are right and nutrient uptake can be maximised and allows you to irrigate at a time that suits you.

Storage facilities can be either in-ground or above-ground ponds and tanks. These need to contain the effluent without leaking, so are commonly lined with synthetic products or clay (where soil types permit).

The amount of storage you need depends on your farm system and local environment. It is best calculated by using the Dairy Effluent Storage Calculators. This is best used by your effluent system designer or your pond/tank company.

Include an agitator or stirrer in the storage facility. Continuously agitating and homogenising the effluent will keep solids in suspension hence reducing odour and the need to desludge, it will also ensure useful nutrients are applied to the farm instead of settling to the bottom of the pond. Match the stirrer to the type of pond liner.

For more detailed information on the design and construction of storage facilities refer to the IPENZ Practice Note 21: Farm Dairy Effluent Pond Design and Construction, this can be downloaded from dairynz.co.nz.
Applicator

The applicator distributes the effluent to the paddock. There are a large number of applicators including:

- Travelling irrigators
- Low rate application systems (sprinklers)
- Pivots
- Slurry tanker

* The user is the final component in the system. The correct use and management of all of these hardware components has the greatest impact on effective effluent management and fully realising the capital investment in the system.
<table>
<thead>
<tr>
<th>System</th>
<th>Pros</th>
<th>Cons</th>
</tr>
</thead>
</table>
| **Traveller** – application depth 8mm+ | • Low capital outlay  
• Can distribute large quantities of effluent at one time period  
• Don’t require fine solids removal  
• In case of breakdown, easy to interchange with alternate traveller  
• Easy to service and maintain. | • Unsuited to topography steeper than 7˚ and high rainfall or high drainage areas  
• High application rates and depths  
• Risk of poor performance due to poor daily set up  
• Risk of poor performance due to poor design and lack of maintenance  
• Not well suited to small or irregular paddocks  
• High application depth when travelling at slow speeds. |
| **Low rate sprinkler systems** – application depth 1-10mm+ | • Low application rates  
• Many irrigation days available throughout the year, and less storage required  
• Suited small or irregular shaped paddocks  
• Less moving parts – easy to maintain  
• Less chance of spray drift over boundaries etc  
• Can distribute large quantities of effluent at one time period at low depths if multiple sprinkler units are used over a large area  
• Easier to shift and run in rolling topography  
• Suits high rainfall/high risk soils/rolling or artificially drained land. | • More difficult to get even application throughout the paddock particularly if different people shifting each time  
• More shifts involved to get same volume of effluent as traveller (depending on soil moisture deficit)  
• Easily blocked (need solids separation or filtration)  
• Specific planning and design needed to get correct pressures and volumes to all sprinklers. |
| **Pivot** – application depth 1mm+ | • Excellent low application depths  
• Many irrigation days available throughout the year  
• Can get rid of extremely large volumes of effluent quickly  
• Requires much less storage  
• Uses existing infrastructure  
• Little time spent setting up and moving  
• Covers large area easily with valuable nutrients. | • May have to wash effluent out of lines afterwards. Must have back-flow preventer (valve)  
• Pivots have been known to get stuck when operating during the winter  
• Requires computer operated valves if irrigating effluent over paddocks with water courses and drains  
• Some ‘add on’ effluent sprinklers to pivots i.e. guns have very poor distribution uniformity  
• Need excellent solids removal or nozzles will block  
• Can have different application at each bay. |
| **Contract spreader** | • Very low capital invested in system  
• Very low labour requirement  
• Empties pond fast  
• Proof of placement. | • Reliant on contractors timeframes  
• Less benefit from regular water and nutrient application  
• Must make sure contractor applies with rules  
• Cost of contractors. |
| **Slurry tankers** | • Can access any part of farm that is drivable  
• 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  
• A relatively cheap option compared to pumps, pipes, irrigators etc  
• Return of more organic matter to the soil. | • Heavy gear causing damage to pastures and races  
• Not ideal on wet soils due to wheels causing pugging and compaction  
• Need good vehicle access to ponds  
• Health and safety risks for driver on steep land. |
Technology

‘Fail safe’ technologies suitable to various application methods can be built into your system.

These can include:

• pond or sump level alarms
• traveller motion alarms
• variable rate irrigation on pivots
• software for planning, monitoring and recording effluent management
• integrated telemetry and data logging systems for soil moisture deficit monitoring
• cut-out switches on pumps
• pump pressure and flow rate meters
• anti-siphon valve at pond
• anti-drain valve at paddock.

3.0 How landscape and climate affect effluent system design and management

There are three main landscape and climate factors which play a role in the success of effluent application:

• the soil drainage characteristics
• landscape contour and topography
• climate.

3.1 Soil texture

Soil is like a sponge, the amount of water soil can hold is determined by the soil texture.

Soil texture is defined by the size of the particle that it 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), thus affects how applied effluent moves in the soil.

The water holding capacity and the current water content of the soil determine the depth of effluent which can be applied before it goes past the root zone to groundwater.
Clay soils have smaller particle sizes, and smaller pores. They can hold more water than coarser soils, and also hold onto the water more tightly. When effluent is applied to these soils it cannot drain quickly and may pond on the surface.

Sandy soils have larger pores and hold less water, but make it easier for the plant roots to extract the water. Effluent drains freely through the large pores and care must be taken so that it does not go straight to groundwater.

The water holding capacity is expressed as a depth, in mm/m. It varies from 45-55 mm/m for sand to 175-190 mm/m for clay.

3.1 Soil drainage

Soil drainage can be characterised by three methods of water movement through or over the soil:

**Matrix flow**
- Uniform movement down through the soil
- High infiltration rates
- Well drained soil profile
- High porosity
- Fine soil structure

**Preferential flow**
- Water fast tracks through soil through cracks and channels
- Poor natural drainage
- Mole and pipe drainage
- Heavy or very coarse soils

**Surface runoff**
- Very little infiltration, water moves across the surface or ponds
  - Influenced by:
    - Length of slope and steepness
    - Soil moisture content
    - Soil infiltration rate
    - Ground cover and land-use
    - Soil compaction

Further reading:
- Pocket guide to determine soil risk for farm dairy effluent application.
3.2 Soil and landscape classifications and risk profiles

This classification system is used to determine an appropriate effluent application depth and effluent storage requirements (using the Dairy Effluent Storage Calculator). Soil and landscape features may be categorised into one of the five classifications noted below. An explanation of these soil classifications appears on the page opposite.

Many of the soils in New Zealand have been mapped in detail and may help you determine the soil characteristics on your farm. Visit smap.landcareresearch.co.nz. The soils in your effluent block may have been classified if you have had the Dairy Effluent Storage Calculator used on your farm. A field guide for classifying soils into the different risk profiles has also been produced by DairyNZ as listed below.

- Effluent can be applied to ‘Low Risk’ soils 24 hours after rainfall or irrigation has stopped, and any water puddles have disappeared
- ‘High Risk’ soils require a soil water deficit equal or greater than the depth of the effluent to be applied
- The Dairy Effluent Storage Calculator assumes you will use ‘Low Risk’ soils if irrigation must occur 24 hours after a rainfall.

Further reading:
- Dairy Effluent Storage Calculator
- Pocket guide to determine soil risk for farm dairy effluent application.

Soils with 80% or more soil aggregates captured on a 10 mm sieve within the top 300 mm soil layer are considered to have coarse soil structure.
Soil and landscape categories A and B:
Artificial drainage or coarse soil structure refers to soils which drain very rapidly such as soils with mole and tile or artificial drainage. Also includes very freely draining coarsely textured soils such as stony soils with a thin topsoil. The main risk on these soils is preferential flow (effluent bypassing the soil and making its way into ground and surface water quickly).

Impeded drainage or low infiltration rate soils are very slow to drain, these may be heavy such as the high clay content ones which pug easily. The main risk on these soils is ponding and runoff as effluent irrigation will not soak into the soil quickly.

Management tips: application depth must be less than soil water deficit. These soils suit low rate application systems because of improved control over application rate and depth.

Soil and landscape category C:
Sloping land (>7°) or land with hump and hollow drainage refers to soils which are gently rolling to steep. Also includes soils which have been humped and hallowed. The main risk is runoff on these soils.

Management tips: application depth must be less than soil water deficit and application rate must be less than soil infiltration rate. A low rate application system is the only practical way of applying effluent without ponding and runoff.

Soil and landscape category D:
Well drained flat land (<7°) refers to soils which are generally wet-weather-safe, with deep free draining subsoil. The main risk on these soils is over application of nutrients.

Management tip: ideal for applying effluent because soil behaviour under drainage is less of an issue. Both high rate and low rate application systems can give good control.

Soil and landscape category E:
Other well drained but very ‘light’ flat land (<7°) refers to soils which drain well but may have a very thin topsoil. They don’t typically have effluent or wet weather risks. These may be the soils which dry out first on the farm. The main risk on these soils is leaching of effluent past the root zone.

Management tip: Do not apply more than 10 mm of effluent at a time.
3.2.1 Soil mapping

Soil types and risk profiles vary across a farm depending on the soil forming features. The best way to fully manage the variation and implications of the varying soil types is to have a farm scale soil map produced.

This information will be useful for fertiliser decisions, effluent and water irrigation planning, cropping and grazing rotation decisions, and other farm management decisions.

Electromagnetic (EM) mapping is an emerging technology that is also starting to be used by farmers for mapping of soils at paddock scale for more precise application of nutrients and water.

3.3 Effluent application plans

All farms contain high-risk and low-risk areas for effluent application. An effluent application plan can help to identify suitable areas of the farm for effluent application, and areas to avoid. All staff need to be aware of the effluent application plan. Check your consent conditions for any restrictions (minimum distances, application area, irrigating after rainfall or minimum irrigation intervals for example). It is usually recommended paddocks are rested for 10-14 days between application and grazing or further applications.

Making a plan:

- From a map of the farm, identify waterways, natural drainage patterns, soil types and sub-surface drainage, slope, prevailing wind direction and neighbours’ dwellings
- **Low risk areas** are ideal for effluent application (shown in green on the map below); note irrigator runs for each paddock and high risk or no-application zones
- **High risk zones** include mole or tile drainage areas, > 7° slope, very wet soils or very free-draining areas with porous subsoil and accessible groundwater (shown in orange on the map below).
- **No-application zones** include all land within 20 m* of a drain, waterway or bore, or the boundary of a neighbouring property (shown in red in the map below).

If you have to irrigate over mole and tile drains, try to have runs which go across the drains, rather than down the length of them. When soils are wet or very dry, decrease application depth or defer application until conditions are more suitable for irrigation.

Many of the soils in New Zealand have been mapped in detail and may help you determine the soil characteristics on your farm. Visit smap.landcareresearch.co.nz.

* Some councils, such as Otago may require a greater buffer zone. Be familiar with your councils requirements.
4.0 Applying effluent to land

There are four key principles to capturing the value of effluent:
1. know the depth of effluent application
2. keep it in the root zone - don’t exceed the soil water deficit when you irrigate
3. be aware of spray patterns - test your irrigator’s output to see how even it is
4. know the nutrient loading from effluent application.

4.1 How to test application depth and rate

Test location
Test the application depth at the location which puts the pump under the greatest work load, e.g. at the greatest distance from the pump, or at the highest elevation above pump station.

Collection containers
When testing you can use either rectangle trays with straight sides, rectangle trays with sloped sides or standard round buckets. You will need about 20 of these. You must use a different calculation depending on the type of collection container.

Step 1
Containers
Before applying effluent, put containers in a line across the path of the applicator:
1. 1-2 metres apart
2. use enough containers across the spray width of the irrigator
3. put a stone in each container to stop it blowing over.

Step 2:
Run irrigator
Run the irrigator as normal:
1. record the actual amount of time that effluent is falling in the containers.
Step 3:
Measure the depth of effluent in every ‘wet’ container.

For **RECTANGLE TRAYS WITH STRAIGHT SIDES**:
1. use a tape measure
2. remove the stone
3. measure how deep the effluent is in each container (mm)
4. write down depth for each container.

For **RECTANGLE TRAYS WITH SLOPING SIDES**:
1. remove stone
2. tip effluent into measuring jug record the volume (ml)
3. write down volume for each container.

For **ROUND BUCKETS WITH SLOPING SIDES**:
1. remove stone
2. tip effluent into measuring jug record the volume (ml)
3. write down volume for each container.

**Go to pages 20-22 for calculation steps.**

**Low rate application systems**

**Step 1: Location**

Go to the middle pod on the last pod line in the series (furthest away from the hydrant)
Step 2: Layup containers

Lay out collection containers out in an “L” shape from the middle pod. Containers should be spaced at 1 m intervals and cover right to the edge of the spray area of the pod. Put a stone in each container to stop it blowing over if needed.

Step 3: Turn on

Turn the system on. Run the pods for one hour. Record the start and finish time.

Step 4: Measure how much

Measure the depth of effluent in every ‘wet’ container.

For RECTANGLE TRAYS WITH STRAIGHT SIDES:
1. use a tape measure
2. remove the stone
3. measure how deep the effluent is in each container (mm)
4. write down depth for each container.

Tip: Make sure container is level (not on a slope) before you measure.
For RECTANGLE TRAYS WITH SLOPING SIDES:
1. remove stone
2. tip effluent into measuring jug record the volume (ml)
3. write down volume for each container.

For ROUND BUCKETS WITH SLOPING SIDES:
1. remove stone
2. tip effluent into measuring jug record the volume (ml)
3. write down volume for each container.

How to calculate application and depth rates

Rectangle trays with STRAIGHT sides

Record the depth from each container, e.g. on a sprinkler with a 40 m diameter wetted area, there may be 20-40 containers.

<table>
<thead>
<tr>
<th>Container 1</th>
<th>Container 2</th>
<th>etc ...</th>
<th>TOTAL (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>TOTAL (mm)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>NUMBER OF CONTAINERS</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>AVERAGE APPLICATION DEPTH (mm)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>TIME (hrs) (e.g. 1hr 15 mins = 1.25 hrs)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>AVERAGE APPLICATION RATE (mm/hr)</td>
</tr>
</tbody>
</table>

Note: Maximum application depth = The CONTAINER with the deepest measurement.

Tip: To convert seconds or minutes to decimal, divide by 60 e.g. 21 mins = 21 \div 60 = 0.35 hrs.
How to calculate application and depth rates
Rectangle trays with SLOPED sides

Record the depth from each container, e.g. on a sprinkler with a 40 m diameter wetted area, there may be 20-40 containers.

<table>
<thead>
<tr>
<th>Container 1</th>
<th>Container 2</th>
<th>etc ...</th>
<th>TOTAL (ml)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CONTAINER WIDTH (mm)</th>
<th>CONTAINER LENGTH (mm)</th>
<th>CONTAINER AREA (mm²)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>1000</th>
<th>AVERAGE VOLUME (ml)</th>
<th>CONTAINER AREA (mm²)</th>
<th>AVERAGE APPLICATION DEPTH (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>AVERAGE APPLICATION DEPTH (mm)</th>
<th>TIME (hrs) (e.g. 1hr 15 mins = 1.25 hrs)</th>
<th>AVERAGE APPLICATION RATE (mm/hr)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: Maximum application depth = The CONTAINER with the deepest measurement.

**Tip:** To convert seconds or minutes to decimal, divide by 60 e.g. 21 mins = \( 21 \div 60 = 0.35 \) hrs.
How to calculate application and depth rates
Round buckets with SLOPED sides

Record the depth from each container, e.g. on a sprinkler with a 40 m diameter wetted area, there may be 20-40 containers.

<table>
<thead>
<tr>
<th>Container 1</th>
<th>Container 2</th>
<th>etc ...</th>
<th>TOTAL (ml)</th>
</tr>
</thead>
<tbody>
<tr>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TOTAL (ml)</th>
<th>NUMBER OF CONTAINERS</th>
<th>AVERAGE VOLUME (ml)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CONTAINER WIDTH (mm)</th>
<th>2</th>
<th>CONTAINER RADIUS (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CONTAINER RADIUS (mm)</th>
<th>CONTAINER AREA (mm²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.14</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>AVERAGE VOLUME (ml)</th>
<th>CONTAINER AREA (mm²)</th>
<th>AVERAGE APPLICATION DEPTH (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1000</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>AVERAGE APPLICATION DEPTH (mm)</th>
<th>TIME (hrs)</th>
<th>AVERAGE APPLICATION RATE (mm/hr)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(e.g 1hr 15 mins = 1.25 hrs)</td>
<td></td>
</tr>
</tbody>
</table>

NOTE: Maximum application depth = The CONTAINER with the deepest measurement.

Tip: To convert seconds or minutes to decimal, divide by 60 e.g. 21 mins = 21 ÷ 60 = 0.35 hrs.
For assistance and advice on testing application depths and rates on pivot systems, please contact DairyNZ.
4.2 Matching effluent application to the soil water deficit

**Soil water deficit (SWD)**, measured in mm (sometimes %), is the amount of available water removed from the soil within the plants active rooting depth. It is also the amount of water required to refill the root zone to bring the soil moisture conditions to field capacity.

- **Field capacity** refers to the amount of water held in the soil after excess water has drained away. This is typically a day after soil saturation (e.g. from rain or irrigation). Adding water/effluent at this point will result in ponding, runoff or leaching. A SWD increases with drainage and evapotranspiration, and decreases with rainfall or irrigation.

- **Deferred irrigation** means irrigation is delayed (or deferred) until there is a big enough SWD to allow for more water to be added to the soil without causing runoff, ponding or leaching.

- The greater the application depth and intensity of the irrigator (i.e. travellers vs. sprinklers), the greater the SWD required for irrigation. It may be inappropriate to proceed with effluent irrigation if:
  - the soil is too wet following rainfall or irrigation – effluent may pond, run off to waterways, or leach through to groundwater
  - the soil is very dry and cracked, especially over tile or mole drains – effluent may travel through soil cracks to underground drains and then flow into waterways
  - the soil is compacted or frozen.

Take care when applying effluent at the same time as fresh water irrigation. The SWD principles still apply, and total water application should be considered otherwise there is a risk of leaching or ponding if soil is over-irrigated.

Irrigating at times of low soil moisture and at a rate the soil can absorb.

Do not apply more effluent than the soil can absorb. Ponding causes pasture damage and leaching to groundwater.

It is important to make sure that application depth and intensity do not exceed the soil water deficit or the application limit on your consent at any time to prevent ponding or runoff to waterways.
4.2.1.1 Measuring soil water deficit

The most accurate way to measure the SWD is with soil moisture technology. Getting good advice before investing in measuring devices is vital. Get a qualified technician to calibrate the system for your farm and provide a soil moisture deficit range for safe irrigation. Make this system simple for the farm team to use.

Here are some different methods for measuring soil moisture:

- handheld instantaneous probes are the cheapest option. They need to be calibrated to your soil type and situation by a qualified technician
- permanent in-ground sensors can be read either by hand-held devices or via telemetry and software systems. Telemetry systems allow for remote monitoring
- a fully integrated system which monitors climatic data, effluent pond level, soil moisture levels, soil mapping, irrigator positioning and run recording and can be used for full irrigation scheduling, with remote monitoring. You can be sent text alerts and recommendations based on your farm’s irrigation system. These systems are more costly but allow for precise monitoring and are particularly good for large operations or absentee owners. Staff training in these systems is essential.
4.3 Evaluate your applicator spray patterns

Spray pattern uniformity varies depending on the type and condition of the applicator. Sprinkler systems and oscillating applicators have a more even spray pattern than standard travelling irrigators. A fast traveller speed will have a more even pattern than a slower one.

Ensuring the applicator is in good condition through on-going maintenance (e.g. cleaning, greasing, correct gearing, check rubberware and tyre pressure) will get the best performance out of the system.

A regular servicing and maintenance program with your local service provider can save you money and hassle in the long run.

Replace irrigator rubberware when you replace the rubberware in the dairy.

4.3.1 The effect of uneven spray patterns

Travelling irrigators have a ‘donut’ shaped spray pattern, increasing the load applied to certain parts of the paddock. Areas at the outer edge of a travelling irrigator’s spray pattern receive effluent for longer periods, so there is a band of heavier effluent loading on each side of the irrigator’s run, with a lighter loading in the middle.

Uneven spray patterns can result in ponding or runoff, if the instantaneous application at certain parts of the spray pattern is higher than the soil can absorb.

Travelling irrigator runs must be wide enough apart so there is no overlap on the outer edges.

The spray pattern can be improved by making sure the irrigator is well maintained and has been set up correctly. See pg 42 and 43 for more tips for travellers.
4.4 Nutrient management – know the nutrient loading from effluent application

4.4.1 Nutrient value of effluent

Farm dairy effluent offers a source of nitrogen (N), phosphorus (P), potassium (K), magnesium (Mg) and sulphur (S), as well as trace elements to increase pasture or crop production.

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 nutrient 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**

<table>
<thead>
<tr>
<th>System</th>
<th>Description</th>
<th>Nutrients in effluent from 100 cows (kg/yr)</th>
<th>Effluent area needed to apply 150 kgN/ha (recommended annual loading)</th>
</tr>
</thead>
<tbody>
<tr>
<td>One</td>
<td>All-grass system</td>
<td>1.7 t of urea, 1.0 t of superphosphate, 1.5 t of muriate of potash</td>
<td></td>
</tr>
<tr>
<td>Two</td>
<td>Maize</td>
<td>2.3 t of urea, 1.5 t of superphosphate, 2.1 t of muriate of potash</td>
<td></td>
</tr>
<tr>
<td>Three</td>
<td>0.6 t Maize + 0.4 t PKE/cow/yr on feed pad</td>
<td>2.5 t of urea, 1.8 t of superphosphate, 2.1 t of muriate of potash</td>
<td></td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Time on the pad</th>
<th>N</th>
<th>P</th>
<th>K</th>
<th>% of farm*</th>
<th>ha /100 cows*</th>
</tr>
</thead>
<tbody>
<tr>
<td>½ hour per day on pad</td>
<td>838</td>
<td>100</td>
<td>868</td>
<td>14</td>
<td>5.6</td>
</tr>
<tr>
<td>1 hour per day on pad</td>
<td>1008</td>
<td>120</td>
<td>1044</td>
<td>17</td>
<td>6.8</td>
</tr>
<tr>
<td>2 hours per day on pad</td>
<td>1348</td>
<td>160</td>
<td>1396</td>
<td>22</td>
<td>8.8</td>
</tr>
</tbody>
</table>

* Effective effluent application area excludes waterways/drains/buffer zones and other exclusion areas.

As your farm system changes for example, adding a feed pad; update nutrient budgets to see if you still have enough area in your effluent block to avoid applying too much N and K (see pg 29). Ensure supplement and fertiliser-use are accurately recorded in your nutrient budget.
4.4.2 Taking nutrient samples

To work out the value of nutrient in effluent, collect a sample to send to a lab for analysis. The nutrient content of effluent will vary due to variations in the cows’ diet during the season and between seasons, the solids content of effluent (how well agitated the effluent is prior to application), and the length of time the effluent has been stored.

Take the sample from the effluent collected during the depth test (see pg 17). Be sure to take the sample from the irrigator not the pond.

**Step 1.** Fill a sampling bottle about two-thirds full with the effluent from the jug, squeeze till effluent reaches the top to remove air, and then cap. Name and sample ID the bottle.

**Step 2.** Keep sample chilled! This is very important.

**Step 3.** Record your details and the tests requested on the lab’s form, attach to the sample, and send to the lab as soon as possible. Useful tests include % DM, total nitrogen (N), phosphorus (P), potassium (K), sulphur (S), calcium (Ca), magnesium (Mg) and sodium (Na).

The DairyNZ Farm Dairy Effluent Spreading Calculator can help you find the nutrient application rate for your farm.

4.4.3 Calculating nutrient application per shift

**Step 1.** Determine total applied. An application depth of 1 mm = 10 m$^3$ effluent applied per hectare. So, for example, if the average application depth was 18 mm:

<table>
<thead>
<tr>
<th>AVERAGE APPLICATION DEPTH (MM)</th>
<th>M$^3$ APPLIED/HECTARE</th>
</tr>
</thead>
<tbody>
<tr>
<td>18 mm</td>
<td>10 × 10 = 180 m$^3$/ha</td>
</tr>
</tbody>
</table>

**Step 2.** Calculate loading. For this example, assume the nutrient concentration from the lab is 0.42 kg nitrogen/m$^3$

<table>
<thead>
<tr>
<th>m$^3$ APPLIED/HECTARE</th>
<th>Nutrient concentration (kg N/m$^3$) (from the lab results)</th>
<th>m$^3$ applied/ha</th>
</tr>
</thead>
<tbody>
<tr>
<td>180 m$^3$/ha</td>
<td>0.42 kgN/m$^3$</td>
<td>75kg N/ha</td>
</tr>
</tbody>
</table>

If you are putting on too much nutrient per pass, the fertiliser value is wasted and you risk environmental losses. In this case 75 kg N/ha is too high for plant uptake. Aim to apply less than 50 kg N/ha/pass. Speed up irrigator to apply less effluent, or consider lower rate effluent applicators.

**Step 3. Compare**

Compare your nutrient loading against your consent, permitted activity rules or Compliance Checklist. The amount of nutrient may be specified as a per event or annual loading. If it is an annual loading you will have to multiply the per pass amount by the number of times the applicator is run in that position.

Using an OVERSEER nutrient budget to size your effluent application area is the most financially and environmentally efficient approach. Application rates based on N-loading requirements may result in excess K. Good practice is to size the effluent block to meet maintenance K application. This can be difficult on medium to high-input systems. The general rule is to avoid grazing springers, calvers or recently calved cows on any effluent paddocks.
4.4.4 Using a nutrient budget to size the effluent application area

Using a nutrient budget to check the nutrient status of your effluent block will ensure you:

- size the effluent block to get the maximum value from nutrients in your effluent
- use fertiliser efficiently
- avoid animal health problems from potassium (K) build-up
- comply with rule/consent conditions regarding N loading
- some regional council consent conditions may also specify the size of your effluent block. Make sure you do not exceed this.

Example of a nutrient budget showing an under-sized effluent block before it is expanded

This nutrient budget is for the effluent block on a 112 ha dairy farm with flat, well drained soils. The effluent block is currently 12 ha. For the example, this regional council recommends a maximum loading of 150kg N/ha/yr to pasture.

Other farm details:

- Stocking rate = 3.2 cows/ha
- Supplement = 1.3 t/ha grass silage
- Production = 975 kg MS/ha

Nutrient budget for effluent original block (12 hectares)

<table>
<thead>
<tr>
<th>(kg/ha/yr)</th>
<th>N</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 and lime</td>
<td>60</td>
<td>45</td>
<td>0</td>
<td>60</td>
<td>80</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Farm effluent added</td>
<td>232</td>
<td>28</td>
<td>246</td>
<td>18</td>
<td>37</td>
<td>15</td>
<td>5</td>
<td>-5.7</td>
</tr>
<tr>
<td>Atmospheric/clover N</td>
<td>50</td>
<td>0</td>
<td>2</td>
<td>4</td>
<td>2</td>
<td>17</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Irrigation</td>
<td>10</td>
<td>0</td>
<td>6</td>
<td>10</td>
<td>37</td>
<td>9</td>
<td>38</td>
<td>0</td>
</tr>
<tr>
<td>Slow release</td>
<td>0</td>
<td>3</td>
<td>4</td>
<td>0</td>
<td>3</td>
<td>5</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>Supplements imported</td>
<td>39</td>
<td>3</td>
<td>33</td>
<td>3</td>
<td>7</td>
<td>2</td>
<td>2</td>
<td>-1.2</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>68</td>
<td>11</td>
<td>17</td>
<td>4</td>
<td>14</td>
<td>1</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>Net transfer</td>
<td>39</td>
<td>4</td>
<td>38</td>
<td>3</td>
<td>6</td>
<td>2</td>
<td>1</td>
<td>-0.9</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</td>
</tr>
<tr>
<td>Atmospheric</td>
<td>86</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>-0.6</td>
</tr>
<tr>
<td>Leaching/runoff</td>
<td>33</td>
<td>1</td>
<td>68</td>
<td>75</td>
<td>70</td>
<td>16</td>
<td>54</td>
<td>-2.4</td>
</tr>
<tr>
<td>Net immobilisation/absorption</td>
<td>165</td>
<td>29</td>
<td>0</td>
<td>13</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>-0.6</td>
</tr>
<tr>
<td>Change in inorganic soil pool</td>
<td>0</td>
<td>35</td>
<td>168</td>
<td>0</td>
<td>75</td>
<td>16</td>
<td>8</td>
<td>-2.5</td>
</tr>
</tbody>
</table>

The increase in P in the soil pool is predicted to raise the Olsen P by 3.5 units per year. This may raise P above optimum levels, depending on soil test values.

**Recommendation:** The effluent area must be increased to lower K and N loading, and current fertiliser application is excessive. The following example shows the effect of increasing the effluent area from 12 to 19 hectares, reducing P fertiliser and cutting out extra N fertiliser on the effluent block.
### Nutrient budget for an expanded effluent block (19 hectares)

<table>
<thead>
<tr>
<th>Inputs</th>
<th>N</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>Fertiliser and lime</td>
<td>0</td>
<td>20</td>
<td>0</td>
<td>60</td>
<td>80</td>
<td>0</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Farm effluent added</td>
<td>146</td>
<td>18</td>
<td>156</td>
<td>11</td>
<td>23</td>
<td>10</td>
<td>3</td>
<td>-3.6</td>
</tr>
<tr>
<td>Atmospheric/clover N</td>
<td>81</td>
<td>0</td>
<td>2</td>
<td>4</td>
<td>2</td>
<td>4</td>
<td>17</td>
<td>0.0</td>
</tr>
<tr>
<td>Irrigation</td>
<td>10</td>
<td>0</td>
<td>6</td>
<td>10</td>
<td>37</td>
<td>9</td>
<td>38</td>
<td>0.0</td>
</tr>
<tr>
<td>Slow release</td>
<td>0</td>
<td>3</td>
<td>5</td>
<td>0</td>
<td>3</td>
<td>5</td>
<td>6</td>
<td>0.0</td>
</tr>
<tr>
<td>Supplements imported</td>
<td>39</td>
<td>3</td>
<td>33</td>
<td>3</td>
<td>7</td>
<td>2</td>
<td>2</td>
<td>-1.2</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>68</td>
<td>11</td>
<td>17</td>
<td>4</td>
<td>14</td>
<td>1</td>
<td>5</td>
<td>0.0</td>
</tr>
<tr>
<td>Net transfer</td>
<td>39</td>
<td>4</td>
<td>39</td>
<td>3</td>
<td>6</td>
<td>2</td>
<td>1</td>
<td>-0.9</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>60</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>-0.3</td>
</tr>
<tr>
<td>Leaching/runoff</td>
<td>27</td>
<td>0</td>
<td>58</td>
<td>71</td>
<td>66</td>
<td>16</td>
<td>54</td>
<td>-1.9</td>
</tr>
<tr>
<td>Net immobilisation/absorption</td>
<td>81</td>
<td>28</td>
<td>0</td>
<td>11</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>-0.3</td>
</tr>
<tr>
<td>Changes in inorganic soil pool</td>
<td>0</td>
<td>1</td>
<td>90</td>
<td>0</td>
<td>66</td>
<td>10</td>
<td>6</td>
<td>-1.3</td>
</tr>
</tbody>
</table>

Soil P is not predicted to change much under this scenario, as inputs and outputs are balanced. Using the nutrient budget to reduce fertiliser inputs will result in savings for the farm.

4.4.5 Sizing your effluent area to meet potassium (K) maintenance levels

Over time K levels on effluent blocks can become elevated. This can increase the potential for metabolic problems in cows at calving/lactation. Sizing the effluent area to meet maintenance K levels is good practice and N application rates will be well within council requirements.

Potassium is a valuable element, so making full use of levels contained in effluent can reduce your K fertiliser bill. Management considerations for K levels are:

- aim to keep K levels below soil test level QTK 10
- avoid grazing effluent irrigation areas with the springer herd and recently calved cows. Where this is not possible, take additional measures to prevent metabolic disorders, such as increasing magnesium supplementation
- take herbage samples - they shouldn’t exceed 3-3.5% K. Adjust feed/supplementation in consultation with a farm consultant or veterinarian if necessary
- harvest silage or hay off your effluent blocks to reduce K levels, if levels are very high, consider a crop such as maize.
5.0 Collection and pond storage

Having adequate storage offers flexibility for effluent application to fit around farm activities and irrigation conditions.

Key points for effluent collection and storage:

- collect effluent from all sources in a sealed storage facility
- reduce the water volume of effluent where you can
- have enough storage to meet management and compliance requirements
- keep storage as empty as possible to make the most of the capacity you have when you need it.

5.1 Sealed facilities

Storage facilities must be sealed so they do not leak or allow contaminants to seep out. All areas where effluent or leachate is stored should be sealed to prevent leachate losses to groundwater. Avoid placing effluent storage facilities in sites with high water tables or a risk of flooding.

The use of well installed and guaranteed synthetic (e.g. plastic, rubber or concrete) liners is recommended. You may be asked for a producer statement to demonstrate the pond and liner can meet the construction and sealing requirements for your district or regional council.

5.2 Storage capacity

You need enough storage for:

- rainy periods when the soil is too wet to irrigate
- busy periods when farm labour is stretched and you do not want to irrigate
- equipment failures (pumps or irrigator) when you cannot irrigate.

Adequate storage will allow you to keep effluent for use when nutrients are most needed (i.e. drier months or when putting down a crop).

5.2.1 The Dairy Effluent Storage Calculator

A Dairy Effluent Storage Calculator has been developed by Massey University and Horizons Regional Council to allow calculation of effluent storage volume requirements.

The calculator uses farm specific data such as:

- soil risk for effluent irrigation (high risk, low risk soil types, see pg 14)
- milking routine (number of cows, water use in the dairy, etc.)
- rainfall catchment area – what is the total surface area collecting rain water and directing it into the storage facility
- storage facilities currently on farm
- irrigation system and equipment
- climate (annual daily rainfall).

The Dairy Effluent Storage Calculator provides a storage volume recommendation based on the daily rainfall events over the last 30 years and the number of days conditions would have been suitable to apply effluent.

The Dairy Effluent Storage Calculator is now available in most regions. DairyNZ recommend you take storage volume advice from a qualified and reputable consultant. Contact your regional council, your milk processor or DairyNZ to find a suitable person to do the calculation for your farm.

See the DairyNZ publication Farm Dairy Effluent Pond Design and Construction for more information about storage and sealing.

Key points for effluent collection and storage:

- collect effluent from all sources in a sealed storage facility
- reduce the water volume of effluent where you can
- have enough storage to meet management and compliance requirements
- keep storage as empty as possible to make the most of the capacity you have when you need it.
5.2.2 Effluent Storage: Working Volume Calculator

DairyNZ have developed a calculator to find the dimensions and working volume of your existing effluent pond or tank. The calculator can be found on the DairyNZ website with the other Effluent resources under the Environment tab. This should be used in combination with the effluent storage volumes generated from the Dairy Effluent Storage Calculator or for calculating the working volume of existing ponds or tanks.

NOTE: this tool does not calculate your effluent storage requirements, but it can be used to find dimensions for a volume obtained from the Dairy Effluent Storage Calculator.
5.3 Managing storage volumes

**Pond levels throughout the year**

Having an empty pond will give you the capacity you need when you can’t irrigate because of unsuitable conditions, or if you have factored in extra storage for times of year such as calving.

A full pond may overflow or cause odour problems, and may result in financial loss as you lose control of effluent and capital investment tied up in the pond.

**Seasonal targets**

- **Spring** – the pond is filling with effluent, particularly during wet weather, or when the farm team are too busy to manage the effluent system. Small volumes of effluent can be irrigated as soil water deficits allow.
- **Summer** – the pond should be kept as empty as possible.
- **Autumn** – the pond should be maintained at a low level through autumn. It is important to try and get the pond as empty as possible while conditions still permit.
- **Winter** – the pond should be kept as empty as possible. Where possible prevent stormwater entering the pond, off unused yard areas etc. Any areas contaminated with dairy effluent cannot be diverted.

Consider using the safety escape ladder for your pond level marking system.

The designer/installer of the system should be able to help set this up, and mark out the different gauge levels. Bear in mind that if the pond has a sloped side where the bottom of the pond is narrower than the top (as in the diagram above), then the halfway-mark on the ladder won’t be the same as ‘half full’. Train the staff about how to use the gauge for decision making.

The Effluent Storage: Working Volume Calculator can be used to find the gauge level depths.
5.4 Minimising the volume of effluent to manage

Reducing effluent volume will save time and money on handling and pumping effluent, as well as reduce the amount of storage you require.

Ways to reduce water use:

- guttering and downpipes to direct roof water away from the effluent collection system
- bund the concrete tanker apron to prevent water from the tanker loop flowing onto it
- if permitted by your council, use a stormwater diversion system to take clean rainwater off the yard into stormwater drains and not into the ponds
- if you are standing your herd off, consider a system that requires less water for effluent collection (e.g. bark peeling pad or a barn system with slats/bunkers to collect effluent
- in high rainfall areas, consider covering and diverting the roof water from large feed and standoff pads to reduce the catchment area for the effluent system
- pre-wet the yard before milking to speed up the hosing process
- use a rubber scraper to remove solids before hosing
- low water-use backing gate wash-down options
- look at ways to reduce the water usage on the milking platform – e.g. water used to get cows off platform, and automatic cup wash systems and repair any leaks
- consider using recycled water for flood wash systems for yard and pad wash-down. There are strict food safety guidelines for this relating to minimum distances and water quality and method of application, contact your milk quality advisor from your dairy processor before going ahead with this option.

5.4.1 Stockmanship

Good stockmanship will help reduce the amount of effluent generated. To help with this:

- plan herd management so that stock spend less time in the yards and dairy
- eliminate slippery surfaces and sources of excessive noise or stray voltage in the yards
- train staff in good stockmanship practices.

5.4.2 Stormwater diversion

When used properly, a stormwater diversion system will reduce the volume of effluent you need to manage. Stormwater diversion systems can only be used when the yards or feed pads are completely clean but roof water can be delivered all year. Stormwater must be diverted prior to the stone trap. The best systems are close to the dairy and have a visible reminder for staff. Train staff in the use of these systems. Reminders can include:

- an ear-tag on the vacuum pump switch which has to be moved before milking
- a flashing light visible from the farm dairy and yard area
- a flag system on the yard gate latch, which has to be moved to open the yard gate
- diversion system connected to dairy plant power / pump switch.

Further reading:

- Smart Water Use Resources

See the DairyNZ publication Farm Dairy Effluent Pond Design and Construction for more information about storage and sealing.
5.5 De-sludging and de-watering effluent solids

Large storage ponds

A stirrer system which continuously agitates the entire storage facility will keep all solids in suspension and remove the need for desludging. Consult your effluent system designer for advice on your system, as stirrers need to be matched to liner type.

Remember to inform anyone doing any maintenance work on the pond what kind of liner is present. A damaged liner can be an expensive mistake.

- Prior to desludging, stir the pond to mix the various layers of the pond before emptying (caution: wave action created by pond stirrers can damage clay liners)
- Solids should be stirred and sucked out with a hose to minimise risk of damaging the pond liner. Do not use excavation equipment for desludging lined ponds due to the risk of damaging the liner
- Sludge usually has a higher nutrient content than liquid effluent, so application rates need to be lower. See 6.1.3 pg 36 for more on applying solids to land.

Check the nutrient concentration before application if you can. This applies whether you or a contractor are applying the sludge. Higher application depths may be used on crop areas due to the higher nutrient removal. This can be calculated on the DairyNZ FDE Spreading calculator.

- Allow for at least a 10-day stock withholding period before grazing.

You can use the communication template for employing effluent spreading contractors at compliance toolkit.co.nz > create forms > effluent contractors communication form.

Stone traps and sumps

Stone traps need to be emptied regularly to perform. A concrete dewatering pad should be built adjacent to the storage facility with all liquids draining back into the system.

Further reading:

- DairyNZ FDE Spreading calculator
- Available online, search dairynz.co.nz > Effluent > Compliance or Operating and Managing an effluent system.
6.0 Stand-off areas 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; sealing 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 unsealed 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 no effluent is reaching groundwater.

6.1 Including a feed pad or stand-off area 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.

Further reading:

- Minimising Muck and Maximising Money. DairyNZ Farmfacts

Talk to your regional council prior to putting in a new feed pad or stand-off pad to check if there are any resource consent or rule implications.
6.1.1 Dealing with more effluent from feed and stand-off pads

A pad can generate up to ten times the effluent coming from a farm dairy, depending on:

• the size of the pad and cow numbers
• the time stock spend on the pad
• the feed given, and any lost feed
• cleaning methods (scrape vs. wash) and wash-down frequency
• exposure of the surface to rainfall.

You can reduce effluent volume from the pad by:

• using a stormwater diversion system when the pad is clean
• covering the pad
• designing the pad for scraping to reduce the frequency of wash-down
• using recycled yard water for wash-down.

6.1.2 Coarse solids from feed and stand-off pad effluent

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

Solids washed off 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.

Settling ponds receiving effluent from a feed pad will need to be sealed, and will require more frequent desludging. Retained solids can be dried on a sealed surface and spread on land at a suitable rate to avoid nutrient overloading.

6.1.3 Applying effluent 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 blind the soil surface. Effluent sampling prior to application, use of the DairyNZ FDE Spreading calculator and your nutrient budget, will help to work out the area you will need to spread solids to comply with council rules and good practice. Rest pasture for at least ten 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.

Do not to apply solid effluent to any soils not suitable for liquid effluent irrigation. Spreading effluent solids should follow the same distances from waterways and buildings as liquid effluent. Ideally solid effluent should be applied uniformly across the area covered.
DairyNZ have developed a calculator to help you calculate a suitable application depth or volume/ha for effluent solids. This uses either your own lab test results or a best guess based on lab test results from other samples. To download the tool go to: dairynz.co.nz> Environment> Effluent> Managing/Operating Effluent Systems.

If you are using an effluent spreading contractor, see pg 41 for more details.

The longer the period of time that cows spend on a feed pad, the greater the volume of effluent and its value as a fertiliser.

6.14 Farm Dairy Effluent (FDE) Spreading Calculator

A screenshot of the Farm Dairy Effluent Spreading Calculator.
7.0 The farm team

The importance of effluent management needs to be highlighted to the whole farm team.

A lack of time or knowledge in the effluent system’s operation and maintenance are key causes of system failure and potential non-compliance regardless of the sophistication/quality of the effluent infrastructure. Owners (including absentee owners), sharemilkers, managers and staff can all be held responsible for effluent non-compliance.

See dairynz.co.nz for a series of tools and resources to use with your farm team including training and recording templates, posters and operation guides for travellers and low rate systems. Search Environment > Effluent > Training Staff.

Good practice for farm teams includes:

- setting clear expectations around effluent management in staff contracts, job descriptions and sharemilker agreements – including daily tasks and supervision responsibilities
- acknowledging and rewarding good effluent management through staff performance and incentive systems
- having rosters for daily effluent tasks and routine maintenance with names assigned to each one
- posting the consent conditions on the wall of the farm dairy.

7.1 Orientation and training

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

- 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 AgITO provide entry and manager level courses for effluent management. Your effluent system designer or installer may also be able to provide on farm training on your system with the farm team.
7.2 Farm team effluent management plans

An effluent management plan covers the effluent related tasks, and who will be responsible for doing them. The plan also covers basic trouble-shooting, including what to do, and who to call when something goes wrong.

Plan ahead and make arrangements in advance, so that accidents and breakages can be managed before there is an environmental risk. For example, keep spare hose clips, nozzles, seals, grease and other items which may be required if there is a breakage.

For bigger issues, consider making an agreement with neighbours about equipment which could be borrowed in an emergency situation, e.g. backup pumps, generators, slurry wagons, irrigators and front end loaders.

Make sure that staff know that the most important issue after their personal safety is to make sure that effluent does not reach waterways.

These details need to be kept up-to-date at the dairy or staff notice board.

Use the DairyNZ Effluent Management Plan poster to tailor to your own system and hang it in the dairy. Go to dairynz.co.nz >Environment>Effluent Systems>Training Staff.

Further reading:
- The DairyNZ HR toolkit
- The DairyNZ Compliance Toolkit- Staff Orientation Checklist and Staff Records
- A Staff Guide to Operating Your Effluent System
- Top Tips for Effluent Irrigators Poster
- Irrigator Run sheet template
- Effluent Management Plan Poster
- Effluent Pump Maintenance Hazard
- DairyNZ Farmfacts
8.0 Safety around the effluent system

Every year people are seriously injured or killed carrying out everyday tasks on farm. The effluent system is a particularly hazardous area. A Health and Safety Plan is a legal farm requirement. Use the DairyNZ Compliance Toolkit (compliancetoolkit.co.nz) to ensure you meet your obligations to keep people safe on your farm.

A health and safety induction is an important first step when bringing people onto the farm, including new staff and contractors.

**Practical things to consider when designing or managing your effluent system include:**

- training for system-operators relating to safe operation and maintenance of the effluent system. Safety information, including emergency protocols, should also be covered in the farm operations manual and included in farm induction
- making sure staff and visitors are aware of hidden hazards, like pipework, wire ropes, hydrants in the paddock and overhead or buried power lines. Provide a mainline and electrical cables map where possible
- earth all electrical equipment
- turn off and secure moving parts when shifting or checking irrigators (boom arms, etc.)
- guard moving parts on pumps or machinery
- use non-slip surfaces next to storage facilities
- install barriers or fences around ponds, sumps, stone traps, sludge bunkers or weeping walls
- stabilise pontoons and have an approved gantry for servicing pumps and stirrers. Never allow staff to get on pontoons without supervision, any maintenance around ponds, stone traps and sumps should be done in pairs
- ensure exit/rescue options are in place, e.g. ropes and ladders for effluent storage facilities.

**Potential hazards of effluent irrigation**

- Hoses and wires in paddocks whilst riding/driving farm vehicles
- Rotating boom on irrigator
- Falling into the effluent pond
- Breaking the crust on the pond releasing gas
- Crush warning
- Electricity at the pump
- No heavy lifting
- Unstable pontoons

**Further reading:**

- The DairyNZ Compliance Toolkit. DairyNZ Farmfacts
9.0 Working with effluent spreading contractors

9.1 Keeping contractors safe

The DairyNZ Compliance Toolkit has templates for creating health and safety induction sheets for contractors. Most contractors should have their own health and safety plan, but it’s important to point out any hazards particular to your farm and secure their working environment by turning off power and pumps while anyone is working around the system.

9.2 Environmental compliance

No matter who is applying the effluent, consent conditions and permitted activity rules still apply. Farm owners and contractors can both be liable for non-compliance.

It is important to tell the contractor what is required in writing. Make the following clear:

- health and safety considerations specific for your farm
- care with pond liners
- maximum application depth (depending on solids and nutrient content of the effluent)
- no ponding or runoff to waterways
- all regional council rules or consent conditions (refer to the Compliance Checklist for more detail about the rules).

It is recommended not to apply solid effluent to any soils not suitable for liquid effluent irrigation. Spreading effluent solids should follow the same distances from waterways and buildings as liquid effluent. Ideally solid effluent should be applied uniformly across the area covered. Make your expectations and requirements about this explicit to contractors.

Employment contracts for services

When employing casual or contracted service providers, it is recommended that farmers seek legal advice for drawing up contracts. This can help to ensure that the contractors are suitably qualified to do the work and have insurance and good operating procedures. Federated Farmers have contract templates available for purchase on their website (fedfarm.org.nz).

Communication

To complement the employment contract, there is a DairyNZ Effluent spreading contractors’ communication template for farmers to use with contractors (included on the Compliance Toolkit website). This is a way to provide contractors with important instructions and any special care requirements such as what type of pond liner is present. Providing clear instructions in writing can help ensure you get the exact service you are expecting. The communication template can be used to meet some of the points listed above.

9.2.1 Calculating the depth and volume of effluent solids to apply

For high-solids effluent such as sludges and slurries at the bottom of ponds, and weeping wall solids; the application depth will need to be less than normal effluent to account for the additional nutrient loading.

Good practice is to test the nutrient content of effluent prior to application to calculate a suitable depth. For example, an effluent consent may state that effluent can be applied to a depth of 20 mm, but based on nutrient testing an appropriate depth of application for solids may be 5 mm.

DairyNZ have developed a calculator to help you find the suitable application depth or volume/ha for effluent solids for your farm. This uses either your own lab test results or a good estimate based on lab test results from other samples. To download the tool go to: dairynz.co.nz > Environment>Effluent> Managing/Operating Effluent Systems.

Further reading:

- Find the Effluent spreading contractors communication template for effluent contractors on compliance/toolkit.co.nz > create forms > Sharemilkers and Contractors.
- Find the DairyNZ FDE Muck and Slurry Spreading Calculator on dairynz.co.nz > Environment > Effluent > Managing/Operating effluent systems
- The Compliance Checklist
10.0 Operating and maintaining an effluent system

Principles for smooth operation of the effluent system:
1. plan ahead, discuss pond level, soil conditions, weather forecast, etc with team regularly
2. stay on top of maintenance so it doesn’t get on top of you
3. adjust your plan according to conditions (e.g. soil moisture, weather or labour availability)
4. set up your irrigation system properly for optimum performance (observe that it is actually going before you leave)
5. don’t “set and forget”. Be vigilant – use cell phone reminders to come back and check.

10.1 Irrigator run sheets and calibration recording

Check your council rules/resource consent or Compliance Checklist to see what types of records are required.

Records can help in the following ways:
• to avoid applying effluent to the same area too many times, and optimise nutrient use
• to ensure maintenance gets done
• for compliance – to show that any issues with the irrigator have been fixed quickly or to demonstrate that farm infrastructure has been built to meet compliance requirements, e.g. pond or stand-off pad sealing standards.

Keeping records of effluent application

During the season, record actual effluent application runs, noting when each shift occurred and observations about soil conditions. Adjust the plan accordingly. Keep a running log sheet to record applications (an example of a DairyNZ template is shown below).

Effluent application recording sheet example

<table>
<thead>
<tr>
<th>Paddock</th>
<th>Date</th>
<th>Run number</th>
<th>Signature</th>
<th>Comment (e.g. signs of ponding or runoff)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>15/8/10</td>
<td>7</td>
<td>FNP</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>16/10/10</td>
<td>8</td>
<td>FNP</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>12/12/10</td>
<td>4</td>
<td>WJP</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>6/9/10</td>
<td>10</td>
<td>WJP</td>
<td>Ponding at south end, too wet?</td>
</tr>
</tbody>
</table>

Make planning, setting up and recording runs easier. Mark irrigator runs by painting the top of fence posts or attaching numbered ear tags or ice-cream container lids to them. This also works well for lines of sprinklers.

Keep the day-to-day records in an easy access location such as a folder in the dairy, so that they are more likely to be used. Alternatives to using this template include use of the Fonterra Dairy Diary or photocopies of farm maps with a new sheet for each month. The farm team can date and draw the runs onto each paddock as the irrigator is shifted.

Further reading:
• A Staff Guide to Operating Your Travelling Irrigator
• A Staff Guide to Operating Your Low Rate Application System.
• Irrigator run sheet template
10.2 Tips for operating a travelling irrigator system

DairyNZ have a guide for the operation of a travelling effluent irrigation. The guide is designed for farm staff and covers setup, maintenance and trouble shooting. Below is a summary of tips for travelling irrigators.

Travelling irrigator application depth varies according to the speed they travel (faster speed = lower depth applied). Good practice is to run the irrigator on its fastest setting. Correct hose layout is critical for optimal travelling irrigator performance.

Avoid using travellers on slopes

Travelling irrigators are not recommended for use on slopes greater than 7°, as these soils are categorised as high risk (see page 14 for more about soil risk categories). Low application systems such as sprinklers are preferred to cover these areas.

A 7° slope is gently rolling country. See the diagram below depicting a vehicle on a 6° and 14° slope.

Operational tips

The drag hose can be very heavy, especially if it is too long; this can cause excessive wear on the gears and over application of effluent. Keeping the hose loop tight behind the irrigator will reduce drag. Here are some additional considerations:

• the wire rope should be well secured away from waterways
• camlock couplings should face the opposite direction the hose is pulled to stop them getting caught and breaking off
• be sure you have enough run length left for the time you plan to irrigate
• set a reminder on your cell phone to tell you to shift the irrigator
• when shifting to the next spot, tow the irrigator no faster than walking pace
• replace irrigator nozzles every time you replace the rubberware in the dairy, or earlier if they are split, perished or they have stretched
• ask your effluent service and maintenance expert to do a pressure test at the irrigator at the furthest point from the pump to make sure there is enough pressure to drive the traveller.

Do not apply effluent within 20 m\(^*\) of a waterway

A 3 m loop makes the irrigator easier to pull, and less likely to over-apply effluent or break the wire rope

See pg 17 for more on measuring the depth and rate of application for travelling irrigators.

**Further reading:**
- Top Tips for Effluent Irrigators Poster
- A Staff Guide to Operating Your Effluent Irrigation System

\(^*\) In some regions like Otago, there must be a 50 m buffer between effluent application and waterways. Be familiar with your regional council rules.
10.3 Tips for operating a low application sprinkler system

Low rate systems such as sprinklers and pods suit a wide range of situations, and are particularly useful for irrigating on high risk soils. See page 14 for definitions of high and low risk soils with regard to effluent management.

Sprinkler systems usually have fixed application rates. The application depth is controlled by the length of time the effluent is applied. Sprinkler systems with timing control can be pulsed, e.g. 15 minutes on and 45 minutes off, giving control over the total depth applied and the hourly rate. Spacing and pressure must be correct with these systems.

Any reduction in pressure at the irrigator can result in effluent being applied at higher application depths and rates. This can result from:

- low pump capacity or poor pump performance
- nozzle damage
- too much hose or incorrect hose layout.

After starting your applicator, visually check that it appears to be operating at the correct pressure by observing the width of the diameter of the wetted area created by the spray.

**Period of time between moving pods to achieve 15 mm depth**

Know your system’s application rate then use the table below to determine the length of time between moves. For example: If you run your system 20 min on / 20 min off and your application rate is 4 mm per hour you could leave the pods 7.5 hours before moving.

<table>
<thead>
<tr>
<th>Minutes operating</th>
<th>Your system’s average application rate per hour</th>
<th>Period of time between moves (hrs)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2 ml</td>
<td>3 ml</td>
</tr>
<tr>
<td>On</td>
<td>off</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>15</td>
<td>15.00</td>
</tr>
<tr>
<td>15</td>
<td>30</td>
<td>22.50</td>
</tr>
<tr>
<td>15</td>
<td>45</td>
<td>30.00</td>
</tr>
<tr>
<td>20</td>
<td>20</td>
<td>15.00</td>
</tr>
<tr>
<td>20</td>
<td>40</td>
<td>22.50</td>
</tr>
<tr>
<td>30</td>
<td>30</td>
<td>15.00</td>
</tr>
<tr>
<td>60</td>
<td>60</td>
<td>15.00</td>
</tr>
<tr>
<td>On continuously</td>
<td></td>
<td>7.50</td>
</tr>
</tbody>
</table>

* Use 4 ml application rate if you have not had your system tested and hence do not know your systems specific application rate.

See pg 18 for more on measuring the depth and rate for sprinkler systems.

**Further reading:**

- A Staff Guide to Operating Your Travelling Irrigator
- A Staff Guide to Operating Your Low Rate Application System.
No ponding. Irrigator set to fastest speed and hose layout is correct.

Correct operation of irrigation systems

Optimal pressure to deliver the correct depth of effluent.

Correct operation of irrigation systems

Sub-optimal operation of irrigation systems

Sub-optimal pressure and blocked nozzles mean system delivers higher depths of effluent.

Sub-optimal operation of irrigation systems

Optimal pressure to deliver the correct depth of effluent.

Sub-optimal operation of irrigation systems

Sub-optimal pressure or incorrect spacing can give a high depth of effluent even from a low application system.

Sub-optimal operation of irrigation systems

Systems operating at the correct spacing and layout to deliver good application depths and a uniform spread.

Sub-optimal operation of irrigation systems

No ponding. Irrigator set to fastest speed and hose layout is correct.

Poor hose layout creates drag on the irrigator; irrigator slows down and applies too much effluent.
10.4 Tips for maintenance

- Make maintenance a routine which all of the farm team are involved in
- Have a maintenance schedule posted in the farm dairy and sign off on maintenance tasks as they are done
- Leave a list of important phone contacts in the farm dairy in case of equipment failure. If in doubt, have your equipment serviced by a professional every year.

10.4.1 Suggested tasks for travelling applicator maintenance

**Daily**
- Soil is dry enough to apply effluent without ponding, runoff or leaching
- No sign of ponding in low-lying parts of the application area
- Pump sounds normal when switched on
- Effluent application is recorded (run, paddock, etc.)
- The irrigator is set up correctly (not slowed down by the drag line) and securely anchored
- Auto stop is far enough away from the end to stop before hitting the post or effluent entering waterways
- Irrigator is in gear at the start of the new run with no overlapping wire
- Irrigator appears to be operating normally
- The irrigator is turned off when the run is finished/use of cut-off switches and wire stoppers
- Irrigator is operated during daylight hours so that the operation can be monitored
- No evidence of uneven or excessive spray pattern on the ground
- No sign of effluent getting into drains
- No effluent getting into water troughs
- Sprinkler nozzles are not blocked, split or damaged.

**Weekly**
- Drag-line is free of cuts and splits
- The irrigator is set to the highest travel speed
- Cut-off on the winch winding facility is working
- Clean and grease all moving parts and grease nipples
- Check the cable, bearings, gear mechanisms, anti-siphon valves and other moving parts for signs of wear and repair before a breakage occurs
- Pipes running in and out of the pond are not blocked
- Anti-siphon valves are not blocked
- Effluent stone trap cleaned out
- Flush clean water through the delivery line and sprinklers to prevent blockages
- Float switches are clear and working
- Grease the pump (they must never run dry) – there are ____ grease nipples.
**Monthly**
- Pump pressure OK (use a pressure gauge)
- No leaks in pump and reticulation lines
- Tyres are at the correct pressure
- Water blast or clean the irrigator.

**Seasonally**
- Test the application depth and rate are within acceptable limits (3-4 times per season)
- Staff trained in effluent management
- Clear tile drain outlets of vegetation so that they can be easily checked
- Pump maintenance (strip down the pump for inspection, oil and cleaning, check the pump seals, check the pump impeller and casing for wear)
- Nutrient analysis on stored effluent, and nutrient budget and fertiliser recommendation for effluent application area
- Complete a Compliance Checklist to stay proactive about compliance requirements.

**Correct irrigator maintenance:**

- **Moving parts**
  Make sure that moving parts are cleaned and greased

- **Spray line**
  Free of cuts and splits

- **Pipes**
  Check for cracks in welding and joining rubber rings

- **Nozzles**
  No stretching, splits, blockages or damage

- **Wheels**
  Tyres at correct pressure
  Bearings not worn
10.4.2 Suggested tasks for sprinkler applicator maintenance

**Daily**
- Soil is dry enough to apply effluent without ponding, runoff or leaching
- No sign of ponding in low-lying parts of the application area
- Shifted to a new run, not too close together, or overlapping recent applications or high risk areas
- No effluent leaking from sprinklers at low points after the pump is shut down
- Pump sounds normal when switched on
- Effluent application is recorded (run, paddock, etc.)
- No uneven or excessive spray patterns on the ground
- No sign of effluent getting into drains
- No effluent getting into water troughs
- Sprinkler nozzles are not blocked or damaged.

**Weekly**
- Drag-line is free of splits or leaks
- Grease the pump (it must never run dry) - there are ____ grease nipples
- Pipes running in and out of the pond are not blocked
- Solids are not getting into the pond
- Separation system is working
- Effluent stone trap cleaned out
- Anti-siphon valves are not blocked
- Flush clean water through the delivery line and sprinklers to prevent blockages
- Float switches are clear and working.

**Monthly**
- Pump pressure OK (use a pressure gauge)
- No leaks in pump and reticulation lines.

**Seasonally**
- Test the application depth and rate are within acceptable limits
- Staff trained in effluent management
- Check that correct nozzle size is on for season depth required
- Clear tile drain outlets of vegetation so that they can be easily checked
- Pump maintenance (strip down the pump for inspection, oil and cleaning, check the pump seals, check the pump impeller and casing for wear - this should be done by a suitably qualified person)
- Nutrient analysis on stored effluent, and nutrient budget and fertiliser recommendation for effluent application area
- Complete a Compliance Checklist to stay proactive about compliance requirements.
10.4.3 Suggested tasks for storage maintenance

Daily
- Before and after milking, check that the stormwater diversion is in the correct position
- Prevent rubbish entering the system – have rubbish bins in the farm dairy and yards
- Remove any rubbish on grates
- Check levels on storage ponds, and that float switches are clear and working.

Weekly to monthly
- Clean and clear the effluent stone trap; store on a sealed surface or apply directly to land if conditions allow
- 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 child and stock proof
- Make sure that stock don’t have access to the pond wall embankments
- Guide wires that secure pumps, stirrers, and pontoons are correctly aligned so that the pump stays level
- Make sure guide wires are not rubbing on any pond lining surface.

Six-monthly – annually
- Remove trees and other woody vegetation growing near the pond. There should be no large trees within 40 meters of a pond bank
- Remove solids from the weeping wall (if you have one)
- Maintain/service mechanical separator (if you have one)
- Assess whether the pond requires desludging
- Maintain drains around the storage facility so that rainwater doesn’t enter the pond
- Agitator service
- Pump service.
110 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).

Training staff

Effluent Training Record
To help make sure you cover all the bases when training new staff. Serves as a file away record of training should you ever need it.

AgiTO Dealing with Dairy Farm Effluent
A one day course looking at the reasons why, and how to treat dairy effluent on farm. Suitable for all the farm team. Includes a one-on-one practical assessment on the participant’s farm. AgITO 0800 691 111

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

Top Tips for Effluent Irrigators
Make sure your staff get it right every time with this poster for the dairy, outlining top tips for trouble free effluent irrigators

Effluent Management Plan
A visual plan to pin up in the dairy so all staff know the drill with effluent management

A Staff Guide to Operating Your Effluent Irrigation System
A visual and practical guide aimed at farm staff, covers setting up and monitoring an effluent irrigation system

Effluent Management Training Record
A recording template for training and assessing new staff competencies around the effluent system. Complete, sign and date with each new staff member, and file away with staff records

Managing and monitoring

Irrigator Run Sheet
Get the best financial return from the fertiliser in effluent by recording where it goes with this one page template for recording irrigator runs. Includes: date, paddock number, run number and sign off area for person responsible for moving the irrigator

Fonterra Dairy Diary
A handy all-in-one place for recording daily monitoring and management information, including effluent

Compliance Checklist
A summary of the regional council rules and requirement for effluent in each area. Complete the checklist over winter and again mid-season to make sure you are on track with effluent compliance

DairyNZ Effluent Storage: Working Volume Calculator
Calculate the working volume of a potential or existing pond. This can be used with the Dairy Effluent Storage Calculator
DairyNZ FDE Spreading Calculator
Use to determine a suitable depth or volume to apply FDE solids to land. Use with the Effluent spreading contractors’ communication form if you are hiring a contractor to empty the pond or spread the solids

Effluent Spreading Contractors’ Communication Form
Use when employing contractors to empty a pond or spread solids, to minimise the risk of communication breakdown. compliancetoolkit.co.nz/index.asp?pageID=2145891142

A Staff Guide To Operating Your Travelling Irrigator
Understanding how to operate your effluent irrigation system properly is an essential task on farm. This booklet helps take farm staff through the important parts of operating and maintaining a travelling irrigator effluent system

A Staff Guide To Your Low Rate Application System
Understanding how to operate your effluent irrigation system properly is an essential task on farm. This booklet helps take farm staff through the important parts of operating and maintaining a low rate application system

Farm Dairy Effluent Systems: Planning the Right System for Your Farm
A farmer guide to the farm dairy effluent system design standards and code of practice. Helps you plan your system with your designer so you get a system which is fit for purpose

Farm Dairy Effluent Systems: Planning the Right System for Your Farm
A farmer guide to the farm dairy effluent system design standards and code of practice. Helps you plan your system with your designer so you get a system which is fit for purpose

Improving farm performance

FarmFacts
A set of fact sheets explaining all things dairy including effluent – one of DairyNZ’s most popular resources

Nutrient Management Case Studies
Nutrient use efficiency is all about finding productivity gains on your farm. Pick up some ideas on where you may be able to use your nutrients more effectively from farmers from across the country

Minimising Muck, Maximising Money Guide and Case Studies
Avoid the pitfalls when designing feed pads and stand-off facilities with this guide to design and management of feed pad and stand-off areas, including case studies from farmers around the country

Compliance Toolkit
Are you complying with your legal requirements? Find out with this easy to use online tool for cutting through the red tape. Covers all aspects of farm compliance; employment, health and safety, animal welfare and environment. Download copies of the Compliance Checklist for dairy regions across the country, or use the consent scoping tool to minimise your compliance risks. Visit compliancetoolkit.co.nz

Best Management Practices for Maize
Covers using effluent on maize crops so you can optimise the fertiliser value of effluent, crop yield and improve soil condition by adding organic material

Farm Enviro Walk
A good practice self-assessment for environmental performance on farm. Covers effluent, soil, nutrient, waterways and other hotspots on farm. A useful training tool
Designing an effluent system

Farm Dairy Effluent (FDE) Design Standards

Farm Dairy Effluent (FDE) Design Code of Practice

These resources have been developed in partnership with the effluent industry to provide good practice advice for upgrading your existing effluent systems or building a new one from scratch.

Pocket Guide to Determine Soil Risk for Farm Dairy Effluent Application

Soils across New Zealand have been classified into high and low soil risk categories for farm dairy effluent application. This field guide will take you step by step through the process of working out the soil risk for a farm.

Effluent storage ponds

Farm Dairy Effluent (FDE) ‘A farmer’s Guide to Building a New Effluent Storage Pond’

When making the decision to install a new farm dairy effluent storage pond, there are a number of things to be considered. This guide aims to help farmers through the process and various factors to consider when building a new effluent pond including; planning, working with consultants and contractors, and design options.

IPENZ Practice Note 21: Farm Dairy Effluent Pond Design and Construction

The Institution of Professional Engineers (IPENZ), with support from principal sponsors DairyNZ, has brought together a group of professionals from civil, geotechnical, agricultural, and environmental engineering backgrounds to develop a Practice Note on the design and construction of FDE ponds.

Smart Water Use

Smart Water Use Resources

Smart Water Use resource materials address water use in the dairy shed (including practices to minimise effluent volumes) and management of the farm water system (to ensure secure water supply for stock). The focus is on using water as efficiently as possible and reducing water loss in operations. These have been tested extensively with farmers to ensure they are both comprehensive and easy to use.