FARM DAIRY EFFLUENT MONITORING

There are approximately 1,130 dairy farms in Northland. Collectively they produce over 11 million litres of farm dairy effluent (FDE) per day. This effluent can be applied to land or it must be adequately treated before disposal to water. For more information about different treatment/disposal systems refer to pages 6 and 7.

The discharge of FDE to water can have the following effects on receiving waters:

- Increased nutrient loadings (especially nitrogen and phosphorous), which can result in algal blooms.
- Increased ammonium concentrations, which can be toxic to fish species.
- Microbial contamination rendering the water unsuitable for stock drinking or contact recreation.
- Increased suspended solids, which reduces light penetration and can smother benthic (bottom-dwelling) invertebrates.
- Decreased oxygen concentration, which is required by aquatic organisms for respiration.

What are the Rules?

The rules that apply to Farm Dairy Effluent are set out in Section 16 '*Rules for Animal Effluent Discharges*' of the Regional Water and Soil Plan for Northland (refer to NRC website).

The disposal of untreated or treated effluent to land is a "permitted activity" provided that there is:

- No effluent discharged to water;
- No effluent is applied within 20m of water;
- No overland flow of sludge;
- No effluent runoff to water;
- No contamination of ground water;
- No effluent discharge within 20m of the property boundary; and
- Contingency measures in place to ensure that there is no discharge to water due to equipment failure, overflow of effluent, or prolonged wet weather.

Photo: Poorly treated FDE discharge

The photo above shows discolouration in a stream caused by a FDE discharge. All the farms that meet the above permitted activity rule are monitored annually as non-consented farms (refer page 5).

The disposal of treated effluent to water is a "discretionary activity", meaning that Resource Consent is required to authorise the discharge. The consent holder is required to abide by the conditions contained in that specific consent. Qualified contractors monitor all these farms annually. The results from 2004-05 are presented in the resource consent monitoring section (refer to pages 3 and 4).

The discharge of untreated effluent to water is prohibited. The Resource Management Act 1991 also prohibits the discharge of untreated effluent into or onto land in circumstances that may result in that effluent entering water.

Monitoring targets are set and followed to gauge compliance with the rules. Check out performance targets (refer page 8) for FDE monitoring. In 2004-05, of the farms monitored, 216 FDE consented discharges were fully compliant with their consent conditions and 126 non-consented farms met the 'permitted activity' rule.

Resource Consent Monitoring

Annual inspections are done by contractors to check if Resource Consent conditions are being complied with. Water samples are taken to measure if the discharge is having an adverse affect on the receiving water quality.

Generally, three samples are taken; an upstream sample, a point of discharge (POD) sample, and a downstream sample. The water quality at the downstream site (also called the consent compliance site) must meet the water quality conditions as specified in the Resource Consent. An upstream sample is taken to rule out any other factors that may be affecting the quality of the water at the time of sampling. The water is tested for temperature, dissolved oxygen concentration, faecal coliforms, pH and ammonium. Faecal coliforms are used as an indicator for all pathogenic organisms.

Typical Test Results

The table below shows typical test results for a compliant consented farm.

All test results at the consent compliance site meet their consent conditions.

Consent compliance site

Analyses	Sampling Sites		
	20 m upstream of POD	Point of Discharge (POD)	20 m downstream of POD
Dissolved Oxygen (g/m^3)	8.7	1.8	7.9
Faecal Coliforms (No/100 mL)	92	1100	400
Ammoniacal Nitrogen (g/m^3)	0.01	30.1	0.04
pH	7.9	7.6	7.7
Temperature (^oC)	13.9	18.6	14.4

The photo below highlights the difference in samples collected from a non-compliant FDE treatment system with the upstream sample to the far left (numbered one), the point of discharge sample in the centre (numbered two) and the downstream sample (numbered three).

Monitoring Results

In 2004-05 there was 216 farm dairy effluent consented discharges that met all their consent conditions and 256 that had minor non-compliance. Farms reported as having minor non-compliance had good water quality results that met their consent conditions but required maintenance on their system i.e. their pond needed cleaning or emptying due to excessive weed growth or solids.

A further 249 farms had significant non compliance with the conditions on their FDE resource consent, which means their water quality results did not meet consent conditions. Follow up visits by NRC staff were carried out on all farms with significantly non-compliant FDE treatment/disposal systems and formal enforcement action, including abatement and infringement notices, was taken where required.

The table below summarises the FDE Consented Discharges for 2004-05.

Full Consent Compliance	Minor non-compliance	Significant non-compliance	TOTAL
216	256	249	721

Non-Consented Monitoring

Visual inspections are carried out annually on farms that do not have resource consent. The treatment/disposal system is graded on a scale of 1 to 5, with a '1' being a good system with no work required, and '5' indicating an unsatisfactory system which needs urgent or major work.

Of the farms inspected in 2004-05, 126 met the criteria for the 'permitted activity' rule (includes grades 1 and 2), while 140 discharged treated effluent to water and required resource consent. A further 18 farms discharged untreated effluent to water, which were deemed as prohibited activities.

Similarly to the consented discharges, NRC staff carried out follow-up visits on all farms with significantly non-compliant (graded 3, 4 or 5) treatment/disposal systems and formal enforcement action was taken where required.

The table below shows all the gradings for non-consented farms monitored.

Grade	2004-05	2003-04
1	37	44
2	89	97
3	100	73
4	40	46
5	18	11
TOTAL	**284**	**271**

Typical FDE Systems

In Northland heavy soils, hilly terrain and prolonged wet weather often makes effective land disposal difficult. "Environmentally friendly" systems are generally those with high volume storage or treatment ponds combined with land application when soil conditions are suitable.

- ***Land Application***

Effluent can be irrigated to land directly from the dairy shed or from a storage pond. Irrigating directly from the dairy shed does not meet the contingency requirement of the permitted activity rule. Daily land application is a high maintenance option and without contingency storage often has a high risk of discharging untreated effluent to water. Irrigation from a storage pond offers much greater flexibility in the timing of effluent application.

- ***Pond Systems***

The purpose of oxidation ponds is to change the physical and chemical nature of the effluent. To achieve this the effluent should remain in the treatment system for at least 90 days, which enables the settling out of solids and the breakdown of organic material by microbes.

Series of oxidation ponds

Typically, two ponds are used. The first pond (anaerobic pond) is where solids settle out and are digested by bacteria that thrive in the absence of oxygen. An effective anaerobic pond will result in a 75% reduction in the organic load in the effluent. These ponds should be at least 3 metres deep. The second pond (aerobic pond) is shallower, enabling the penetration of sunlight, which kills bacteria and encourages algae growth and aeration by wind to maintain higher oxygen levels

- ***Constructed Wetlands***

Often used as a tertiary treatment following a pond system. Constructed wetlands can be effective at stripping nutrients and producing an overall better treated discharge. However this is dependant on the effectiveness of the pond system and the design and maintenance of the wetland.

- ***Ditch systems***

Barrier ditches are essentially elongated ponds. As with pond systems they must be designed to ensure that the effluent is retained in the system for 90 days or more. For successful operation the ditch must be divided into at least two sections by an earthen

or timber baffle. The first section operates like an anaerobic pond by retaining the majority of the solids.

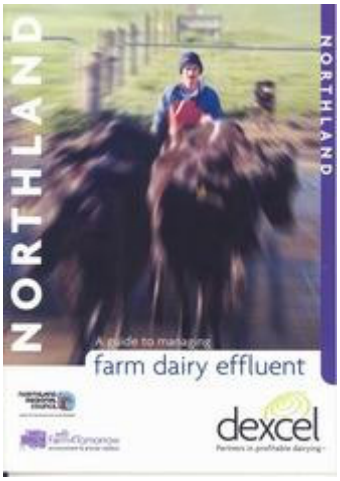
- ***Newer Technology***

Some newer technologies being used to manage FDE include mechanical solids separators and "Geo-tubes" (essentially big perforated bags which retain the solids), Advanced Pond designs incorporating barriers and aeration are also operating on some larger farms.

- ***Feed Pads and Standoff Pads***

The proliferation of feed pads and standoff pads combined with increased stocking rates and supplementary feed is of concern where adequate treatment is not provided. Investigations indicate that huge organic loads discharge from feed pads.

For further information the booklet "*A Guide to Managing Farm Dairy Effluent*" is available from the Northland Regional Council.



Performance Targets for Farm Dairy Effluent

To monitor compliance with farm dairy effluent discharge standards, by:

- Inspecting all farm dairy effluent treatment and discharge systems that received adequate to poor grades (grades 3, 4, or 5), and half of those that received good grades (grades 1 or 2), for their last inspection, record inspection details and report these to the farmers responsible and to the Council.
- Testing effluent and receiving water quality for systems with resource consents to discharge directly to streams.
- Follow up on all systems with poor grades or non-complying, requiring maintenance or upgrades when needed.