REGIONAL PLAN: FARM DAIRY DISCHARGES

CONTENTS.

SUMMARY

The Auckland region's 600-odd farm dairies milk around 100,000 cows in the peak milking season, generating nearly 5 million litres of washwater every day of the season.

Farmers must safely dispose of these daily volumes of washwater, which contain effluent, sediment, detergents and milk, and periodically volumes of sludge removed from settling systems or oxidation ponds.

These discharges can have significant adverse environmental effects because the wastes are concentrated onto small areas. Together with the small size of Auckland's rural streams and the many other demands made on them, cumulative adverse effects in many catchments are of concern.

The adverse environmental effects of farm dairy discharges are summarised in Section 3.0 and Appendix A of this Plan.

Appendix A also demonstrates that well-managed land application of farm dairy washwaters and sludges can be environmentally beneficial.

In the past, the Auckland Regional Council (the ARC) has not required farmers to apply for resource consents for farm dairy discharges. However this pragmatic approach has lead to a high percentage of farmers to employ inappropriate waste disposal systems. Recent information about adverse effects of dairy washwater, in particular nitrogen, including its toxic form, ammonia on waterways, soils and underground water quality has shown that these discharges do need regulation if we are to avoid unacceptable environmental effects.

The ARC nevertheless wishes to streamline its management of farm dairy discharges, and has devised the Rules in this Plan to ensure that disposal methods which minimise adverse effects in ways set out in the Plan are permitted activities. These do not require a resource consent.

Section 6.0 is the key section for finding out if your farm dairy discharge needs a resource consent or not. It:

- outlines the categories that describe whether various farm dairy discharges require a resource consent or not, and if so, which process will be followed, and
- sets a timetable of different dates when farmers in different river catchments throughout the region must have either applied for a resource consent or complied with the conditions that enable them to be a permitted activity.

A summary of types of activities and whether or not they require a resource consent is also given in Section 2.5.

The maps in this Plan also show the timetable for compliance with this Plan, while Appendix B describes the process of applying for a resource consent.

2.0 LEGISLATIVE AND POLICY FRAMEWORK

2.1 Purpose of the Resource Management Act 1991

The Resource Management Act establishes the ARC's statutory responsibilities for resource management and the framework under which this Plan operates. The purpose of the Act is to promote the sustainable management of natural and physical resources. Section 5(2) states:

> *In this Act, "sustainable management" means managing the use, development, and protection of natural and physical resources in a way, or at a rate, which enables people and communities to provide for their social, economic, and cultural well-being and for their health and safety while-*
>
> *(a) Sustaining the potential of natural and physical resources (excluding minerals) to meet the reasonably foreseeable needs of future generations; and*
>
> *(b) Safeguarding the life-supporting capacity of air, water, soil, and ecosystems; and*
>
> *(c) Avoiding, remedying, or mitigating any adverse effects of activities on the environment.*

2.2 Principles of the Resource Management Act 1991

2.2.1 Matters of National Importance

Section 6 of the Resource Management Act states the following matters of national importance that the ARC must recognise and provide for in managing the use, development and protection of natural and physical resources. These are:

> *(a) The preservation of the natural character of the coastal environment (including the coastal marine area) wetlands, and lakes and rivers and their margins, and the protection of them from inappropriate subdivision and development;*
>
> *(b) The protection of outstanding natural features and landscapes from inappropriate subdivision, use and development;*
>
> *(c) The protection of areas of significant indigenous vegetation and significant habitats of indigenous fauna;*
>
> *(d) The maintenance and enhancement of public access to and along the coastal marine area, lakes, and rivers;*
>
> *(e) The relationship of Maori and their culture and traditions with their ancestral lands, water, sites, waahi tapu and other taonga.*

This Plan recognises and provides for these matters where appropriate.

2.2.2 Matters To Which The ARC Must Have Particular Regard

Section 7 of the Resource Management Act states the following other matters to which the ARC must have particular regard. These are:

(a)	*Kaitiakitanga;*
(b)	*The efficient use and development of natural and physical resources;*
(c)	*The maintenance and enhancement of amenity values;*
(d)	*Intrinsic values of ecosystems;*
(e)	*Recognition and protection of heritage values of sites, buildings, places, or areas;*
(f)	*Maintenance and enhancement of the quality of the environment;*
(g)	*Any finite characteristics of natural and physical resources;*
(h)	*The protection of the habitat of trout and salmon.*

The ARC has given particular regard to these matters in developing this Plan.

2.2.3 Principles of the Treaty of Waitangi

The Resource Management Act requires the ARC to take into account the principles of the Treaty of Waitangi. Section 8 of the Act states:

> *In achieving the purpose of the Act, all persons exercising functions and powers under it, in relation to managing the use, development, and protection of natural and physical resources, shall take into account the principles of the Treaty of Waitangi (Te Tiriti o Waitangi).*

The tangata whenua of the Auckland region were consulted during the development of this Plan. The effects of farm dairy washwater discharges on matters of significance to tangata whenua were identified. Objectives, policies and rules have been included in this Plan to ensure that tangata whenua concerns are taken into account in implementing its provisions.

2.3 Scope of this Plan

This regional plan regulates discharges of farm dairy contaminants onto land and into water, except where contaminants are discharged into the coastal marine area. Discharges of contaminants into the coastal marine area are regulated by the provisions in the *Proposed Regional Plan: Coastal.* The coastal marine area is defined in the Definitions Section of this Plan. Further information on the boundaries of the coastal marine area is contained in the *Proposed Regional Plan: Coastal.*

2.4 Policy Framework

As well as establishing the legislative framework for the development of this Plan, the Resource Management Act provides for statutory policy statements and plans. These make up the policy framework within which any regional plan is developed, and are summarised below.

2.4.1 Auckland Regional Policy Statement 1994

Pursuant to Section 60, the ARC publicly notified a *Proposed Auckland Regional Policy Statement* on 12 February 1994. The purpose of the *Proposed Auckland Regional Policy Statement* is:

to achieve the purpose of the Act by providing an overview of the resource management issues of the region and policies and methods to achieve integrated management of the natural and physical resources of the whole region.

The *Proposed Auckland Regional Policy Statement* contains an overview of water quality issues in the region, including the objectives, policies, and methods that the ARC wishes to achieve to maintain and enhance water quality. Under the Act, the Regional Plan: Farm Dairy Discharges must not be inconsistent with the *Proposed Auckland Regional Policy Statement.*

2.4.2 Other Regional Plans

The purpose of a regional plan is to assist the ARC in carrying out its functions in order to achieve the purpose of the Act. Regional plans may be prepared to address specific issues and in doing so, they must not be inconsistent with any policies adopted in the *Proposed Auckland Regional Policy Statement.* A regional plan may include rules as well as objectives and policies. These rules have the force and effect of regulations and are enforceable under the Act. Rules are introduced only where the ARC is satisfied that they are necessary for achieving the purpose of the Act and are the most appropriate means of exercising the ARC's functions, having regard to both efficiency and effectiveness.

Proposed Regional Plan: Coastal

The *Proposed Regional Plan: Coastal* contains objectives, policies, rules and methods which apply to any discharge of contaminants into the coastal marine area.

Proposed Regional Plan: Sediment Control

The *Proposed Regional Plan: Sediment Control* contains objectives, policies, rules and methods relating to land disturbing activities that cause sediment discharges.

2.4.3 Iwi Planning Documents

Section 66 2(c)(ii) of the Resource Management Act recognises the importance of having regard to Iwi planning documents when preparing plans.

2.4.4 District Plans - District Council Functions

Section 31 of the Resource Management Act gives district councils the following functions relevant to this Plan:

> *"a) The establishment, implementation, and review of objectives, policies and methods to achieve integrated management of the effects of the use, development, or protection of land and associated natural and physical resources of the district; and*
>
> *c) The control of the subdivision of land."*

District council requirements should be checked before any changes are made to existing washwater treatment systems or any new system is installed. Many district councils have specific rules which stipulate minimum separation distances between washwater treatment and disposal systems and adjoining properties or buildings, to mitigate the effects of spray or odour nuisances. Under the Resource Management Act, rules in district plans must be complied with as well as the rules in this Regional Plan.

2.5 Categories of Activities

The rules within this Plan determine whether a resource consent is required for any activity. All farm dairy discharges fall into the following categories of activity:

Permitted Activities:
No resource consent is required. However any permitted activity must comply with the criteria specified in the Plan. If it does comply, it can be carried out as of right.

Controlled Activities:
A resource consent is required. This Plan states the standards with which a controlled activity must comply, and the matters over which the ARC can exercise control.

The ARC cannot refuse consent for a controlled activity which meets the standards set out in the Plan. However, conditions may be imposed on matters over which the ARC exercises control. If it does not meet the standards, the activity becomes either a discretionary or a non-complying activity.

Discretionary Activities:
A resource consent is required, and the ARC may grant or refuse consent. Discretionary activities over which the ARC has retained full discretion are listed in Section 6.4.

Non-complying Activities:
A resource consent is required, and the ARC can grant or refuse consent. The activity is non-complying if it does not comply with the conditions specified for permitted, controlled or discretionary activities and it is not listed as a prohibited activity. A full assessment is conducted and full discretion is exercised by the ARC as to whether or not a resource consent is granted.

Prohibited Activities:
No application can be lodged to undertake an activity that is listed as a prohibited activity in a regional plan.

3.0 ISSUES ADDRESSED IN THIS PLAN

3.1 Effects on the Environment

3.1.1 Characteristics of Farm Dairy Washwater

Untreated farm dairy washwater has the following typical characteristics:

Characteristic	Biochemical Oxygen demand (BOD_5)mgO/1	Total Nitrogen mg/1	Total phosphorus mg/1	Total potassium mg/1	Total solids mg/1
Average	1500	200	35	160	7000
Range	1000-3250	100-325	10-50	100-430	5000-12000

1. Vanderholm et al (1984)

The adverse effects that can occur from the discharge of farm dairy washwater are summarised below. Appendix A provides more information.

3.1.2 Effects on Surface Waters

- Decreased dissolved oxygen in the water, due to biochemical decomposition, can result in the 'suffocation' of fish and other aquatic life as they compete for the limited oxygen in the water.

- High levels of ammonia in farm dairy discharges can create a toxic environment for fish and other aquatic life.

- Increased nutrient levels (eutrophication) can result in nuisance weed and algal growths, which affects water/flood flow, ecology and aesthetic qualities.

- Increased levels of bacteria can render water unsuitable for a variety of purposes, including recreation, food gathering, swimming, and stock drinking water.

- Increased siltation and solids build-up can impede water flow and greatly decrease the aesthetic qualities of water. Increased siltation also destroys the habitat of bottom-dwelling organisms e.g. invertebrates, which will adversely impact on the food chain. This is especially true for gravel-bed streams and their inhabitants.

- The suspended solids in the discharges can increase the turbidity (cloudiness) of the water which can affect feeding patterns of fish because they cannot see their prey. Increased turbidity also reduces light penetration which adversely affects aquatic plant growth. Elevated turbidity also increases heat absorption and therefore the temperature of the water which adversely affects aquatic life.

- Elevated nitrate levels in potable water can give rise to human health risks.

3.1.3 Effects on Groundwater

Elevated groundwater nutrient levels, particularly nitrate, can be caused by excessive application rates of washwater onto the land or seepage from washwater storage systems. Elevated nitrate levels in potable groundwater can give rise to human health risks.

3.1.4 Effects on Air Quality

Oxidation pond systems and other washwater storage systems typically produce large volumes of gaseous methane and trace levels of other malodorous gases, which freely escape to the atmosphere. Methane is a potent greenhouse gas, with over 20 times the global warming potential of carbon dioxide. Adverse effects of spray irrigating washwater typically include odour and spray drift nuisance. Unpleasant odours can also be a nuisance from oxidation ponds or washwater storage ponds.

The ARC intends to prepare a separate regional plan on air quality which will include rules relating to odour. As the rules on odour may be applicable to farm dairy washwater treatment and disposal systems, the regional plan on air quality when complete will need to be referred to in conjunction with this Plan.

3.2 Issues of Significance to Tangata Whenua
Nga Take Tutura Mo Tangata Whenua

This section of the Plan has been written by tangata whenua who were consulted during the Plan's preparation.

Tangata whenua claim genealogical links and blood ties to taonga of the natural world as a significant principle. Inherent within the principle is the kaitiaki role with obligations and responsibility for the well being of all natural entities. Tangata whenua have consistently advocated opposition to direct discharges of contaminants to waterways, regardless of treatment standards. Continuation of such practices seriously undermines the tribal mana and desecrates the mauri of the receiving water. Direct discharges of farm dairy washwater are therefore unacceptable.

Washwater discharges also raise concerns because of the actual or potential adverse effects on:

- both traditional and commercial uses of ancestral resources, such as fish spawning and feeding grounds and mahinga maataitai;
- degradation of mana, mauri and wairua of water, and its inability to sustain life, impacts on Treaty of Waitangi as kaitiaki;
- the exacerbation of existing Treaty grievances relating to poor water quality;
- tribal resource management initiatives, particularly regarding taiapure, rahui and whakatupu;

- pollution of enclosed water bodies;
- eutrophication;
- direct agricultural and horticultural pollution;
- the location of washwater treatment and disposal systems can adversely affect Treaty of Waitangi values.

Tangata whenua confirm that their concerns can be met by ensuring that treatment standards are set and maintained, and a land component of disposal is incorporated for consents seeking discharge directly to water.

The importance of involving tangata whenua in the change and review of this Plan is recognised.

4.0 OBJECTIVES OF THIS PLAN

4.1 To maintain water quality in water bodies and coastal waters which have good water quality, and to enhance water quality which is degraded.

4.2 To provide clarity, consistency and certainty to resource users.

5.0 POLICIES

5.1 The discharge of dairy sludge and farm dairy washwater onto land shall be encouraged.

5.2 The discharge of farm dairy sludge and untreated farm dairy washwater into surface water shall be avoided.

5.3 The discharge of farm dairy washwater, untreated or treated, into any freshwater lake or into watercourses within a lake catchment shall be avoided.

5.4 Discharges shall be assessed against the following criteria:

- Permitted activities shall be assessed against the criteria listed in 6.2.1.
- Controlled activities shall be assessed against the criteria listed in 6.3.1.
- Discretionary activities shall be assessed against the criteria listed in 6.4.1.

Explanation of Policies

5.1 *This Plan advocates land disposal of farm dairy washwater for several reasons. Washwater is a valuable resource in terms of fertiliser value, and the application of washwater onto land at appropriate rates to enhance pasture growth is considered to be the best practicable option in dealing with what would otherwise be a potential pollutant of water. Such re-use of nutrients is also consistent with MAF's policy directives for sustainable agriculture and with the relevant regional plans by Environment Waikato and Northland Regional Council. Disposal incorporating a land application component is the only acceptable form of disposal to Iwi. Research commissioned by the ARC has confirmed previous research indicating that washwater discharges to surface water can have serious impacts on freshwater biota, mainly due to ammonia concentrations. Refer to Appendix A for more information.*

5.2 *The discharge of untreated farm dairy washwater to water is a prohibited activity because these discharges have significant adverse effects, as discussed in section 3.0, 'Issues' of this Plan.*

5.3 *The discharge of treated farm dairy washwater into freshwater lakes or their lake catchments is also prohibited because these lakes have an extremely limited capacity to assimilate such discharges without adverse effects.*

5.4 *All applications for controlled or discretionary activities will be assessed against all the above Policies. Policy 5.4 refers to the issues that will be given particular consideration by the ARC in assessing any application. The conditions, standards and matters in Section 6.0 list the mechanisms that can be used to adequately avoid, remedy or mitigate the adverse effects of washwater discharges. It is intended to implement this Plan in a staged manner, based on water catchments, so that all washwater discharges in each catchment can be considered at the same time. This is to ensure that the potential for cumulative adverse effects can be adequately avoided, remedied or mitigated.*

Supporting information is available from the ARC. Appendix B contains information about the resource consent process.

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6.0 RULES

6.1 Summary of Authorisation Categories for Different Activities

Activity Status	Description	Must Comply with the Following Conditions/Standards
Permitted	Discharges of dairy sludge and/or farm dairy washwater onto or into land.	Conditions 6.2.1.1 - 6.2.1.5
Controlled	Discharges of farm dairy washwater from a specification two pond treatment system into water, except for natural wetlands and the prohibited activities below.	Standards 6.3.1.1 - 6.3.1.9 Matters 6.3.2.1 - 6.3.2.5 Applications for resource consents are assessed against Polices 5.1 - 5.4
Discretionary	Discharges of dairy sludge or farm dairy washwater onto land which do not comply with the conditions for the permitted activities.	Criteria 6.4.3 - 6.4.4 Applications for resource consents are assessed against Policies 5.1 - 5.4
Discretionary	Discharges of farm dairy washwater into water which do not comply with the standards for controlled activities, except for the prohibited activities below.	Criteria 6.4.3 - 6.4.4 Applications for resource consents are assessed against Policies 5.1 - 5.4
Non-complying	This Plan does not classify any activities as non-complying.	
Prohibited	Discharges of untreated farm dairy washwater or dairy sludge into water.	

Activity Status	Description	Must Comply with the Following Conditions/Standards
Prohibited	Discharges of farm dairy washwater (untreated or treated) into the freshwater lakes or into water draining the lake catchments identified on Sheets 1 and 2 of the attached Maps.	

6.2. Permitted Activities

6.2.1. The discharge of dairy sludge and/or farm dairy washwater onto or into land which complies with Conditions 6.2.1.1 - 6.2.1.5 is a permitted activity.

Conditions:

6.2.1.1 The application rate of nitrogen from any combination of dairy sludge, farm dairy washwater and nitrogenous fertiliser shall be:

(a) at a rate not exceeding the equivalent of 150 kgN/ha/year and 30 kgN/ha/day in the following areas:

(i) those areas underlain by aeolian sands (Awhitu, Kaipara, Tapora, Pakiri, Omaha Flats); OR

(ii) those areas underlain by volcanic basalt (Pukekohe, Puni, Waiuku, Bombay, Mangere); OR

(b) at a rate not exceeding the equivalent of 200 kgN/ha/year and 50 kgN/ha/day, on low permeability clayey soils of low vulnerability due to poor groundwater quality/yield; OR

(c) at a higher rate where it can be demonstrated by site-specific analysis, to the satisfaction of the ARC prior to application occurring, that existing or reasonably foreseeable uses of the groundwater or receiving water would not be compromised.

Explanation:

The daily application rate is based on maximum recommended nitrogen application rates for pasture growth which minimise leaching rates of nitrates to soil water. This also assumes that the total nitrogen content of wet sludge is 0.166% and that 50% of the applied nitrogen to pasture is the mineralised organic fraction immediately available for plant uptake. ***For further information on this topic refer to Appendix A.***

6.2.1.2 Farm dairy washwater and dairy sludge shall be spread in a manner and in places which ensure that run-off does not result at any time

Explanation:

Management of the land application of washwater must ensure that the rate of application does not exceed the soil's infiltration capacity. This will depend on a number of factors including soil water status, slope, pasture cover, type of spreading device, weather conditions at the time and incidence of pugging by stock. Consequences of excessive application rates include anaerobic soil conditions, hydraulic overloading of soil (saturation), pasture damage and breakdown of soil structure.

6.2.1.3 Washwater or dairy sludge shall not be applied onto land or injected into land in such a place or in such circumstances that it may enter:

(a) a water body that is not part of the washwater treatment system, or

(b) any water supply bore, or

(c) the coastal marine area.

Explanation:

An appropriate separation distance is essential to minimise any adverse effects of the placing of washwater onto or into land. The safe and responsible placing of washwater and/or dairy sludge near water bodies and other notable features, will require the operator to consider the risk of runoff due to site specific conditions.

6.2.1.4 For dairy washwater there shall be contingency measures in place to ensure that there is no contravention of the above conditions in the event of duty pump or other system failure.

Explanation:

There must be either an alternative means of disposing of the washwater onto the irrigable area, or provision for storage in the event of system failure.

6.2.1.5 A financial contribution shall be paid to the ARC before 30 June each year. This amount shall be determined in accordance with the ARC's Schedule of Administrative Charges. For the year 1998/99 it shall not exceed $50. Any future increases in this fee shall not exceed the rate of C.P.I. The charges relate to the following purposes:

(a) cost of monitoring and inspecting washwater disposal system.

(b) cost of managing the ARC's dairy washwater system database.

(c) cost of ARC response to minor non-compliance issues by means of correspondence and educational material.

(d) cost of specific scientific investigations undertaken by or on behalf of the ARC into the effects of dairy washwater application onto land.

(e) cost of investigating and monitoring emerging technology for washwater treatment and disposal and dissemination of information in this regard.

Explanation:

The ARC is required to gather information, monitor and keep records as necessary to carry out its functions under Section 35 of the Resource Management Act 1991. Section 108 of the Act authorises consent authorities to impose conditions requiring financial contributions for any purpose specified in the Plan.

6.3. Controlled Activities

The Resource Management Act requires that any rule relating to a controlled activity must state:

> (*a*) *The standards with which the activity must comply. The ARC cannot refuse consent for a controlled activity if it meets the standards set out in the plan; and*
>
> *(b) The matters over which the ARC will exercise its control. The ARC can impose conditions pursuant to Section 108 of the Resource Management Act in respect of the matters which are listed as being applicable to any controlled activity.*

6.3.1. The discharge of at least secondary treated farm dairy washwater from a specification two pond treatment system to a water body, excluding natural wetlands, and freshwater lakes or into water bodies draining the lake catchments identified on sheets 1 and 2 of the attached maps, that complies with Standards 6.3.1.1 - 6.3.1.9 is a controlled activity, and shall require a resource consent.

Standards:

6.3.1.1 There shall be at least two ponds for the treatment of farm dairy washwater, comprising an anaerobic pond followed by an aerobic pond.

6.3.1.2 The required sizing of the anaerobic pond(s) shall be based on the following factors:

(a) BOD loading of 90 grams per cow per day, unless it can be demonstrated otherwise (to the satisfaction of the ARC). The maximum milking herd size shall be used in calculating the total BOD loading.

(b) 28 grams BOD/m^3/day for seasonal-supply milking, and 24 grams BOD/m^3/day for year-round or winter milking. [1]

Explanation:

The required size of the treatment pond system for effectively treating washwater is directly proportional to the number of cows milked. The reduction of BOD before discharge to the environment is a prime consideration.

6.3.1.3 The anaerobic pond(s) shall have the following minimum requirements:

(a) Pond depth shall be at least 3.0 metres vertical height between embankment crest and pond floor.

Explanation:

In order for the anaerobic process to function properly, there must be a depth of at least 3 metres so as to exclude interaction of any dissolved oxygen from the air.

[1] The B.O.D. loadings are based on research data from various sources (see References)

(b) The anaerobic pond(s) shall be desludged at least once in every five years, or when sludge has accumulated to half of the normal depth at the middle of the pond. At least 10% of the total pond volume shall be left in the pond after desludging.

Explanation:

Over-accumulation of sludge decreases retention time of washwater in the pond, thus decreasing treatment efficiency and increasing the risk of solids passing through to the aerobic pond. The complete emptying of anaerobic pond systems can also have a detrimental effect on the population and activity of the anaerobic bacteria that are necessary for the decomposition process. Effective sealing of the pond may also be harmed if all sludge is removed.

6.3.1.4 The aerobic pond(s) shall have the following minimum requirements:

(a) the aerobic pond(s) shall be preceded by at least one appropriately sized and constructed anaerobic pond.

(b) the surface area shall be calculated on the basis of providing at least $1m^2$ per 8.4g BOD load or 3.25 m^2 per cow. In the case of winter milk farms or year round milking, the above surface area requirement shall be increased by 20%. The maximum milking herd size shall be used in calculating the required pond area.

Explanation:

The surface area calculation is based on research data from various sources listed in the References and assumes 70% BOD removal in the preceding anaerobic pond(s). The 20% requirement is a best estimate to compensate for additional waste BOD loadings due to added milking time through the year and decreased pond treatment activity over the colder months.

(c) pond depth shall be no greater than 1.5 metres vertical height between embankment crest and pond floor.

Explanation:

At depths greater than about 1.5m, aerobic activity decreases markedly, inhibiting the rate of aerobic decomposition.

6.3.1.5 Consent holders shall ensure that ponds used for the storage and treatment of farm dairy washwater meet the following criteria:

(a) all washwater from the milking yard and pit shall be collected and directed into the pond system; and

(b) no material other than farm dairy washwater shall be allowed to enter the treatment system. The total BOD entering the treatment system (in any 30 day period) shall not exceed the design capacity of the treatment system (as specified in conditions 6.3.1.2 and 6.3.1.4).

Explanation

The treatment ponds, specified under the controlled activity 6.3.1, are designed to treat a limited quantity of BOD. Exceeding this amount will overload the treatment system and reduce the quality of the discharge to an unacceptable level. Utilising the treatment ponds to treat effluent resulting from standing cattle off pastures is acceptable, providing the loading is not exceeded. It has been estimated that the effluent produced by the entire dairy herd standing on the yard for up to 6 x 20 hour days in any 30 day period will not exceed the design loading, providing there are no other inputs.

(c) clean water shall as far as possible be diverted from entering the treatment system. Roof water and watertank overflows shall not enter the treatment system on current and new pond systems, except when such water is used for normal washdown purposes.

A clean water diversion gate shall be required:

(i) in any new pond systems built after the adoption of the Plan.

(ii) on existing systems where there is a demonstrable problem relating to excess clean water inflow, or if the roof water has not already been diverted.

(iii) on additional yard areas (such as stand off pads and feed pads) that are connected to the pond system.

The diversion shall prevent clean yard water entering the pond system when the yard is not in use; and

(d) pipes which discharge washwater into ponds shall be positioned so as not to cause erosion of the pond embankment; and

(e) suitable baffles shall be installed at the outlet of each pond to prevent excessive solids and floatable material from passing out. Baffles shall be arranged so as not to allow a siphon effect to occur at any time and to ensure that at least 400 mm freeboard is maintained between the highest pond level and the lowest point of the embankment crest.

Explanation:

400mm is a recommended minimum freeboard so as to prevent overtopping and damage to the embankment crest from wave action.

(f) baffles shall be kept clear of weeds and other obstructive matter so that normal outflow is not impeded.

6.3.1.6 Ponds shall be fenced so as to prevent uncontrolled entry and grazing of stock on the embankments.

Explanation:

Stock can seriously damage the embankment crest, resulting in erosion and weakening of the embankments.

6.3.1.7 Vegetation shall not be allowed to encroach into or grow on the surface of any pond.

Explanation:

Weed growth, particularly over the aerobic pond, greatly reduces the action of sunlight and atmospheric oxygen in treating the ponded effluent. Weed growth can also block pipes causing over-topping and weakening of the embankments.

6.3.1.8 The maximum total ammonia level in the receiving water after reasonable mixing shall not exceed 0.7g/m^3, or such greater concentration as will not have an adverse environmental impact to the satisfaction of The Director Environmental Management, Auckland Regional Council.

Explanation:

This level has been demonstrated in research overseas and in New Zealand to be the level required for the protection of sensitive aquatic organisms in terms of long term exposure.

Auckland farm dairy washwater oxidation pond systems median ammonia levels are approximately 77g/m^3 total ammonia at the point of discharge (ARWB 1990a), therefore a minimum of 100 times dilution will be required in the receiving water to assimilate the ammonia concentration.

Many Auckland streams have insufficient dilution to assimilate the ammonia in treated washwater to safe levels, for all or part of the year. The discharge from most farms is currently centered around the milking and washdown period and therefore occurs in two pulses per day. The dilution required for any discharge is dictated by washwater volume in relation to stream flow. Any mechanism which smoothes out the discharge to an even rate will assist the operator in meeting the discharge criteria, so methods of spreading the discharge period or improving the diffusion rate of the discharge should be considered. These could include using a smaller diameter outlet structure or application to a vegetated area. The use of a particular option will be the decision of the individual operator.

National Institute of Water and Atmospheric Research (NIWA) was contracted by the ARC to provide a dilution model which can be applied to any catchment in the Auckland Region. The model considers catchment hydraulic data and provides information about the assimilative capacity of a stream or waterway with respect to multiple discharges and cumulative effects. The model takes account of return-period low flows, and width of stream at the point of discharge in relation to dispersion characteristics. The model will be a tool used to assess whether there is 'sufficient dilution' and whether such dilution is available throughout the year. ***For further information on this topic refer to Appendix C.***

6.3.1.9 Any new pond(s) constructed after the date that this Plan becomes operative shall not be located:

(a) in flood-prone areas or in areas unduly subject to surface water or ground water intrusion, or

(b) in such a place where seepage of contaminants may enter and potentially cause adverse effects on:

(i) a water body that is not part of the washwater treatment system, or

(ii) any water supply bore, or

(iii) the coastal marine area.

Explanation:

The safe and responsible placement of new pond systems in proximity to water bodies and other notable features will require consideration of potential adverse effects. The ARC has not prescribed a separation distance as this will vary on a case by case basis depending on site specific considerations. In doing this the ARC recognises that operators know their own situations best and intends to enable them to utilise their knowledge to support decisions about appropriate system siting.

6.3.2 Matters over which the ARC may Exercise Control

The following matters may be considered by the ARC for inclusion as conditions of any resource consent to discharge farm dairy washwater under Rule 6.3.1:

6.3.2.1 Pond siting and construction, including materials used, batters and pipeworks;

6.3.2.2 Measures to avoid, remedy or mitigate adverse effects on matters of cultural and historical significance to tangata whenua, including the location of discharges and ponds in proximity to areas of special value as identified in the *Proposed Regional Plan: Coastal 1995*;

6.3.2.3 Measures to avoid, remedy or mitigate adverse effects on the following:

(1) areas identified as being susceptible to degradation and/or with special values as detailed in Tables 8.1 and 8.2 and Map Series 5 Maps 1-4 in the *Proposed Auckland Regional Policy Statement 1994*; and

(2) heritage resources (including natural, geological, cultural and landscape resources) identified in the *Proposed Auckland Regional Policy Statement 1994* as having significant values; and

(3) Coastal Protection Areas as identified in the *Proposed Regional Plan: Coastal 1995*.

6.3.2.4 Monitoring requirements for the discharge.

6.3.2.5 The maximum consent term shall be 15 years in accordance with the recommendations in Section 3 of Appendix B.

6.3.3 Notification of Controlled Activities

Applications for controlled activities will be considered without notification or the need to obtain the written approval of affected parties, in accordance with Section 94(1)(b) of the Resource Management Act unless, in the opinion of the ARC, there are special circumstances justifying notification in accordance with Section 94(5) of the Resource Management Act.

6.4 Discretionary Activities

6.4.1 The discharge of dairy sludge or farm dairy washwater onto land where that discharge does not comply with the conditions for a permitted activity is a discretionary activity and shall require a resource consent.

6.4.2 The discharge of farm dairy washwater into a water body where that discharge does not comply with standards 6.3.1.1 - 6.3.1.9 for a controlled activity is a discretionary activity and shall require a resource consent.

6.4.3 Applications for discretionary activities shall demonstrate that the proposal is the best practicable option (as defined in Section 2 (1) of the Resource Management Act) and shall be assessed against the following criteria:

(1) that the volume and level of contamination of the discharge has been minimised to the greatest extent practicable; and

(2) any adverse effects on people or communities shall be avoided, remedied or mitigated where practicable; and

(3) adverse effects on the present and reasonably foreseeable use of the receiving waters for recreation purposes and the suitability of fish and shellfish for consumption have been avoided, and where this is not practicable, remedied or mitigated; and

(4) the discharge, after reasonable mixing, does not, either by itself or in combination with other discharges, give rise to any or all of the following effects:

(a) the production of any conspicuous oil or grease films, scums or foams, or floatable or suspended materials;

(b) any emission of objectionable odour;

(c) the rendering of fresh water unsuitable for consumption by farm animals;

(d) any significant adverse effects on aquatic life and the life-supporting capacity of air, water, soil and ecosystems;

(e) any significant adverse effects on aesthetics or amenity.

6.4.4 In assessing the types of discharges specified in 6.4.3, particular regard shall be given to the protection of the values of the following:

(1) areas identified as being susceptible to degradation and/or with special values as detailed in Tables 8.1 and 8.2 and Map Series 5: Maps 1 - 4 in the *Proposed Auckland Regional Policy Statement 1994*; and

(2) areas of significance to tangata whenua as identified in the maps of the *Proposed Auckland Regional Policy Statement 1994* and in the *Proposed Regional Plan: Coastal 1995*; and

(3) heritage resources (including natural, geological, cultural and landscape resources) identified in the *Proposed Auckland Regional Policy Statement 1994* as having significant values; and

(4) Coastal Protection Areas as identified in the *Proposed Regional Plan: Coastal 1995*.

6.4.5 Notification of Discretionary Activities

An application for a resource consent need not be notified in accordance with section 94 of the Resource Management Act if:

(a) the consent authority (in this case the ARC) is satisfied that the adverse effect on the environment of the activity for which consent is sought will be minor; and

(b) written approval has been obtained from every person who, in the opinion of the consent authority, may be adversely affected by the granting of the resource consent unless, in the authority's opinion, it is unreasonable in the circumstances to require the obtaining of every such approval.

6.5. Prohibited Activities

6.5.1 The discharge of untreated farm dairy washwater or dairy sludge into a water body is a prohibited activity.

6.5.2 The discharge of farm dairy washwater (untreated or treated) into the freshwater lakes or into water draining the lake catchments identified on Sheets 1 and 2 of the attached Maps is a prohibited activity.

6.6 Rule Relating to other Regional Plans

This Plan does not authorise any land use or discharge activity which is controlled in any way by other regional plans. For example, if the discharge is into the coastal marine area, then the provisions of the *Proposed Regional Plan: Coastal 1995* shall apply.

6.7 Time Frames for Lodging of Resource Consent Applications

The rules in this Plan will become operative in each of the catchments in the region at the time specified in the Table below, and as shown on Sheets 3 and 4 of the attached Maps.

All new dairy farms established after the adoption of this Plan are required to comply with the Plan prior to the commencement of milking (refer to the table under 6.1 for activity status).

Priority and Active Date	Catchment Areas
Priority 1	
6 months from the date that the Plan becomes operative.	Waitapu Waiteitie Oruawharo Tauhoa Okahukura Peninsula Lower Hoteo Hays Stream (upstream of Hays Creek Road)
Priority 2	
1 year from the date that the Plan becomes operative.	Mangawhai Poutawa Stream Pakiri Whangateau Matakana Mahurangi Puhoi Waiwera Orewa Weiti Upper Waitemata

Priority 3	
18 months from the date that the Plan becomes operative.	Kaipara South Head Ototoa/Kuwakatai Lake West Kaipara River Lower Kaipara River Muriwai Kumeu Ararimu Kaukapakapa Upper Kaukapakapa Makarau Araparera
Priority 4	
2 years from the date that the Plan becomes operative.	Pakuranga Otara Turanga Mangere West Airport Pukaiki/Waokauri Papakura Stream Waikopua Lower Wairoa Taitaia Hays Stream (downstream of Hays Creek Road) Hingaia Mangawheau Upper Wairoa Hunua Aroaro/Awahero Orere South East Wairoa

Priority 5	
30 months from the date that the Plan becomes operative.	Awhitu West Coast South Matakawau Rangiriri/Ohiku Kohonui/Te Hakono Waipipi West Waiuku
Priority 6	
3 years from the date that the Plan becomes operative.	Waiuku Taihiki Kingseat Te Hihi Glassons Creek Pukekohe Ngakoroa All other catchments in the Auckland Region

Explanation:

This Plan will become operative in different catchments within the region at different times. This is to enable the discharge consent applications within each catchment to be assessed together, to enable consideration to be given to potential cumulative adverse effects on water. It also enables operators to have certainty as to when they will be required to meet the conditions for the permitted activities or apply for a resource consent. The order in which the priorities have been set is based on historical compliance information. For each priority catchment group the ARC will notify operators in advance of the application lodgement date.

6.8 Other Resource Management Methods

In conjunction with this Plan, the ARC will produce a series of guidelines to assist operators in meeting its requirements. The ARC endorses the guidelines promulgated in the Dairying and the Environment manual (Heatley, P, 1995) produced by the Dairying and the Environment Committee. The periodic (at least annually) routine monitoring of washwater systems will be performed under contract to the ARC. This provides an independent assessment of washwater treatment systems and their degree of compliance, bringing about cost efficiencies.

Explanation:

In promulgating design and operating standards, there is a need for information to be made available to operators, contractors, and any other interest groups outlining required standards, and including examples of how such systems could be built or managed using readily available materials and proven ideas as examples. The national guidelines document produced by the Dairying and the Environment Committee will be considered the foremost reference.

Appendix B summarises the consent processing procedures under the Resource Management Act.

7.0 ANTICIPATED ENVIRONMENTAL RESULTS

The results anticipated through the implementation of this Plan are:

The maintenance and enhancement of water quality in water bodies and coastal waters, at a level which:

- ensures the life supporting capacity of water and ecosystems; and
- ensures the use and enjoyment by people and communities.

These results are to be achieved by:

(1) ensuring that discharges to surface water are only allowed where adverse effects will be adequately avoided, or mitigated;

(2) ensuring that the application rates of washwater (especially the nitrate component onto land) are limited to avoid, or mitigate any adverse effects on groundwater quality;

(3) requiring that washwater discharges are not located in areas of special value for tangata whenua, or sensitive receiving waters where they are likely to cause adverse effects; and

(4) requiring particular regard to be had to avoiding, remedying or mitigating adverse effects in areas that have been identified as having special values in the *Proposed Auckland Regional Policy Statement.*

8.0 CROSS-BOUNDARY ISSUES

There are seven territorial authorities (city and district councils) in the Auckland region, and two neighbouring regional councils where the boundaries are defined by property boundaries and do not follow water catchment boundaries.

The discharge of farm dairy washwater may require consideration by both the ARC and any of these councils. Processes to be used in dealing with such cross-boundary issues with other local authorities will be as follows:

1. Ongoing consultation and liaison will be undertaken with the local authority involved by both staff and Councillors.

2. The ARC will make its statutory and non-statutory documents available to other local authorities for comment in order to share up-to-date information.

3. The ARC will make comments and/or submissions on statutory and non statutory documents produced by other local authorities.

4. The ARC will monitor the state of the environment of the region and the effectiveness of this Plan. This information will be publicly available. Pollution abatement and enforcement will also be carried out.

5. The ARC will use education programmes, non-statutory guidelines and industry codes of practice, provide advice to applicants, and generally advocate for the benefit of the environment in respect of the issue of farm dairy discharges.

6. Surveys, research and modelling are carried out for the purposes of the *Proposed Auckland Regional Policy Statement* and other regional plans on a regular basis. Any information concerning this issue will be made available to the relevant local authorities.

7. The ARC will make use of the powers given under Section 102 of the Resource Management Act for joint resource consent hearings. If found to be appropriate, the transfer of powers under Section 33, or the creation of joint bodies and plans under Section 80 may also be used.

8. The ARC will liaise with other local authorities on legislative matters that could affect cross-boundary issues.

These processes, together with ongoing consultation and liaison, will be used to deal with issues between territorial authorities and between regions.

9.0 MONITORING

9.1 Procedures to Monitor and Review this Plan

In accordance with Section 79 of the Resource Management Act, a full review of this Plan is required to commence no later than 10 years after it becomes operative. There is also provision for a review of the Plan within this ten year period if required either by the ARC, or by any other person. Similarly, Section 35 of the Act requires that the ARC gather such information as is necessary to carry out effectively its functions.

The monitoring which the ARC will carry out is outlined below.

9.1.1 Compliance Monitoring

All farm dairy washwater treatment and disposal systems will be monitored at least annually. The ARC will maintain a computer database of the information received. ARC staff will make return visits to farms where non-compliance is recorded. The costs of follow up compliance monitoring or visit(s) in relation to a valid complaint will be borne by the consent holder or permitted activity holder.

9.1.2 System Monitoring

The performance of washwater disposal/treatment systems will be monitored through the analysis of compliance data. The consent holder may be required to undertake treatment system performance monitoring in special circumstances, for example, where a disposal system is a discretionary activity and the ARC considers that significant environmental impacts may occur if the system is not operated correctly.

Non-compliance with conditions of resource consents will initially result in a visit by an ARC officer. If there is further on-going non-compliance, enforcement action could result. The costs of such visits by ARC officers, or of visits in relation to a valid complaint will be borne by the consent holder, or permitted activity holder, rather than by ratepayers or operators in general. Where there is on-going non-compliance with conditions for a permitted activity, the discharge from the treatment/disposal system may need to be authorised by a resource consent.

9.1.3 Environmental Monitoring

The monitoring of effects on specific receiving environments may be undertaken periodically by the ARC in order to assess the effectiveness of a particular treatment/disposal system. In special circumstances, environmental monitoring by the consent holder may be required, if in the opinion of the ARC, significant impacts on receiving water might result from the discharge. Self-monitoring conditions, if imposed, would take into account the practicalities of such monitoring.

The ARC's long term baseline monitoring programme will continue to monitor water quality in the Auckland region and the results will to some degree reflect the performance of treatment systems on a catchment-wide basis, although results can not be extrapolated to the performance of individual systems.

The above monitoring will help ensure that the objectives, policies and rules in this Plan are achieved and will help formulate future management decisions. It is expected that such monitoring will enable the ARC to further understand the extent and effects of farm dairy discharges and evaluate the effectiveness of current methods. This information will be used to update and change consent conditions as appropriate.

If the above monitoring shows provisions of the Plan are not adequately achieving the objectives, the appropriate parts of the Plan will be reassessed and may be reviewed through the relevant procedures of the Act.

10.0 DEFINITIONS

Many of the definitions detailed below are from Section 2 of the Resource Management Act. Where terms are defined in the Act, they shall have the same meaning in this Plan. If the Act is amended and any definitions detailed in Section 2 of the Act are amended, then the new definitions in the Act will override those listed below. The following terms are defined for the purposes of this Plan:

Aerobic Well oxygenated

Anaerobic With minimal oxygen

Best Practicable Option In relation to a discharge of a contaminant, means the best method for preventing or minimising the adverse effects on the environment having regard, among other things, to:

(a) The nature of the discharge or emission and the sensitivity of the receiving environment to adverse effects, and

(b) The financial implications, and the effects on the environment, of that option when compared with other options, and

(c) The current state of technical knowledge and the likelihood that the option can be successfully applied.

BOD (Biochemical Oxygen Demand) The amount of oxygen required to degrade organic material to a stable form, using a standard 5 day test at 20^{o} Celsius.

Coastal marine area The foreshore, seabed, and coastal water, and the air space above the water-

(a) Of which the seaward boundary is the outer limits of the territorial sea:

(b) Of which the landward boundary is the line of mean high water springs, except that where that line crosses a river, the landward boundary at that point shall be whichever is the lesser of:

(i) One kilometre upstream from the mouth of the river; or

(ii) The point upstream that is calculated by multiplying the width of the river mouth by 5.

The precise boundaries, including river mouth boundaries are contained in the *Proposed Regional Plan: Coastal.*

Controlled activity An activity which:

(a) is provided for as a controlled activity, by a rule in a plan or proposed plan, and

(b) complies with standards and terms specified in the Plan for such activities, and

(c) is assessed according to matters the consent Authority has reserved control over in the plan or proposed plan, and

(d) is allowed only if a resource consent is obtained in respect of that activity.

Dairy sludge The accumulated organic solids from dairy oxidation ponds, barrier ditches, storage ponds, wintering barns or hard-stand areas.

Farm dairy washwater All dairy effluent and contaminated washwater generated on the site of the farm dairy and associated yard area. This includes machine washwater, pit washings, faecal matter, urine, sediment, washwater and other inputs associated with the use of the yards for routine dairy farming practices.

Farm drainage canal Any artificially formed open channel formed principally to drain water from high watertable land. Note: this is different from a 'modified watercourse' which is considered to be a naturally formed water course which has been modified.

Freeboard The vertical distance between the top of an embankment or storage vessel and the maximum water/wastewater level in a pond or storage vessel.

Hapu Sub-tribe, usually a number of Whanau with a common ancestor.

Herd size Maximum number of cows milked through the farm dairy on any one milking.

Iwi Maori tribe, usually a number of hapu with a common ancestor.

Kaitiaki The tangata whenua guardians who exercise the ancestral responsibilities of Kaitiakitanga.

Kaitakitanga The exercise of guardianship; and in relation to a resource, includes the ethic of stewardship based on the nature of the resource itself.

Lactation days	The average number of milking days in an average year.
Mahinga Maataitai	Coastal food gathering areas.
Natural wetlands	Includes permanently wet areas, shallow water, and land/water margins that support a natural ecosystem of plants and animals that are adapted to wet conditions.
Nitrogenous Fertiliser	For the purposes of this plan, nitrogenous fertiliser shall mean any form of organic or inorganic nitrogenous input added to the land by the operator or farmer's agent. This does not therefore include clover nitrogen fixation and excreta from normal grazing practices.
Oxidation pond sludge	Means dairy sludge.
Permitted activity	An activity that is allowed by a plan without a resource consent, if it complies in all respects with any conditions specified in the Plan, (including any conditions in relation to any matter described in Section 108 or 220 of the Resource Management Act).
Primary treated	At least an ARC specification anaerobic pond or other system approved by the ARC.
Rahui	A form of temporary restriction on the use of and access to particular areas or food resources for a special purpose or function, including conservation, restoration and respect for the dead.
Reasonable mixing	The point at which the mixing of the treated washwater and the receiving water is assumed to have occurred. The point of compliance with the standard shall be that point downstream which is 30 times the receiving water channel width at the point of discharge and one third the width across. See Appendix C for further information.
Receiving water	A continually flowing body of fresh water. Includes a stream and modified watercourse but does not include any artificial watercourse (including an irrigation canal, water supply race, canal for the supply of water for electricity power generation and farm drainage canal). See Appendix C for further information.
Runoff	The uncontrolled flow or channelling of washwater away from the application site as a result of the rate of application being greater than the soil's daily rate of absorption, or at a rate which may result in contamination of surface water.

Specification two-pond treatment system	An engineered system that meets the minimum specifications of standard 6.3.1 of this Plan.
Taiapure	Local Fisheries Management Areas subject to the provisions of Section 54A to 54K of the Fisheries Act 1983.
Taonga	That which is highly prized or treasured, tangible or intangible, that contributes to Maori well-being. The term equates roughly to the concept of a resource, but incorporates a range of social, economic and cultural associations. Included, for example, are waahi tapu, waterways, fishing grounds, mountains and place names.
Tangata Whenua	In relation to a particular area, means the iwi, or hapu that holds mana whenua over that area.
Treated	Washwater which has at least been treated through an ARC specification two pond treatment system as specified in condition 6.3.1. of this Plan.
Untreated	Farm dairy washwater which has not received treatment via a specification two pond treatment system at least.
Waahi tapu	A place sacred to Maori in the traditional, spiritual, religious, ritual or mythological senses.
Wairua	Spiritual dimension.
Washwater	The same as farm dairy washwater.
Water body	Fresh water or geothermal water in a river, lake, stream, pond, wetland, or aquifer, or any part thereof, that is not located within the coastal marine area.
Wetland	Includes any natural permanently or intermittently wet areas, shallow water, and land water margins that support a natural ecosystem of plants and animals that are adapted to wet conditions.
Whakatupu	A form of temporary restriction on the use of and access to particular areas or food resources for conservation purposes.
Whanau	An extended Maori family including the nuclear family.

APPENDIX A:

THE RATIONALE FOR LAND DISPOSAL OF FARM DAIRY WASHWATER

1.0 BACKGROUND

Following the findings and the recommendations of the Waitangi Tribunal on the Manukau claim, the Auckland Regional Water Board (ARWB) prepared the Manukau Harbour Water Quality Management Plan (MHWQMP) (ARWB, 1990b) which summarised the findings of a 3 year comprehensive study of water quality issues in the Manukau Harbour catchment. Many of the findings of the MHWQMP were applicable to the region as a whole.

The research found that dairy farm discharges constituted the largest point-source of rural pollution in the Auckland region, particularly in terms of nitrogen and phosphorus loadings to the harbour. ARC Rural Pollution Abatement Officers have since found that similar nitrogen and phosphorus loadings from farm dairy washwater occur in all rural parts of the region.

During the preparation of the MHWQMP a concentrated effort was made to improve dairy washwater treatment on farms in the Manukau Harbour catchment. This was successful in reducing the percentage of direct (untreated) discharges from 36% to zero, but was less successful where treatment systems were in place, but were inadequate. Upon completion of the MHWQMP, 22% of farms still had treatment systems which were substandard in terms of MAF specifications at the time.

By the end of the Manukau Harbour Water Quality Action Plan, oxidation ponds were the most common form of treatment for farm dairy washwater, being used on approximately 56% of farms. Spray irrigation of washwater onto land was also common, being used by 27% of dairy farms. The remainder operated a variety of systems, including overland flow, tankering and barrier ditches.

A similar mix of farm dairy washwater treatment and disposal methods applies in all the region's dairy farming areas, so that adverse effects from nutrient discharges on rural waterways are widespread throughout rural Auckland.

Consideration of the following matters led the ARC to conclude that land application of farm dairy wastes is the preferred option for the Auckland region:

- the estimated volumes discharged
- contaminants of concern and their likely concentrations in farm dairy discharges
- the ability of Auckland waterways to assimilate these contaminants
- the areas of land that would be needed to assimilate these contaminants without adverse environmental effects

Information about these is summarised below, followed by some examples to show how operators can work out the area of land they need to dispose of their farm dairy wastes in a way that complies with the rules of this Plan.

2.0 ACCEPTED AVERAGE WASHWATER VOLUME FROM FARM DAIRIES

The volume of the washwater produced by farm dairies depends on different variables for each farm. The residence time of cows on the yard is a primary factor which is in turn determined by other factors like the time of year, type of milking system, yard and shed design, milking plant type and labour availability. Other secondary factors include the level of stress on the cows whilst being milked or waiting to be milked, the type of plant wash down system and milking management.

Measured volumes range from 40 - 70 litres per cow per day but from discussions with operators and observations of ARC staff, there is a decreasing marginal rate of washwater produced per cow as herd size increases. For example, a herd of 500 cows has a washwater volume that may be as low as 30 litres/cow/day.

The ARC has adopted a figure of **50 litres/cow/day** as a representative volume, given the research outlined below. This rate is the best estimate to date from available data, and is therefore the rate assumed in this Plan. The following is a review of the average washwater volumes discharged per cow from farm dairies.

2.1 Dairy Shed Oxidation Pond Effluent Quality in the Auckland Region, Working Report No. 57, ARWB, 1990

From this survey of 20 farms in the Franklin District, the average dairy washwater volume was estimated from six of the farms as follows.

2700 l/90 cows	=	30 l/day
5000 l/115 cows	=	43 l/day
4500 l/90 cows	=	50 l/day
10000 l/150 cows	=	67 l/day
3300 l/70 cows	=	47 l/day
8000 l/130 cows	=	61.5 l/day
Average	**=**	**50 l/cow/day**

2.2 Agricultural Livestock Waste Production Figures, Massey University, Agricultural Engineering Department

The figure used is based on data collected from the Massey University dairy units and is **65 l/cow/day.**

2.3 Effluent Characteristics of Dairy Shed Oxidation Ponds and their Potential Impacts on Rivers, Hickey C W, et al, 1989

In this report, the authors assume a volume **80 l/cow/day** based on previous work by Drysdale and Painter (1983), Warburton (1983) and Vanderholm (1984). This rate assumes the use of reverse-flow washdown systems in each case.

2.4 Agricultural Waste Manual, Vanderholm, D H, et al, 1984, NZ Agricultural Engineering Institute

In this manual, a discharge rate of **50 l/cow/day** is used, and where there is a reverse-flow washdown system employed, a rate of **80 l/cow/day** is assumed.

2.5 Cowshed Effluent Survey 1993 - 1994, Northland Regional Council, 1994

This survey measured the same volume as Hickey et al (1989) of **80 l/cow/day.**

2.6 Proposed Changes to Environment Waikato's Transitional Regional Plan - Dairy Shed Effluent, Environment Waikato, 1993

Environment Waikato undertook a survey of six dairy farms, from which they found that the average washwater volume was **45 l/cow/day.** As a result of this survey and with consideration of data by Vanderholm et al (1984), the figure of **50 l/cow/day** was adopted for the purposes of the Draft Environment Waikato Regional Plan.

2.7 Kay's Stream Report - A Study of the Impact of Dairy Shed Wastes on a Small Rural Auckland Stream, ARWB, 1989

In this report, the average volume for this one farm was measured to be approximately 8,140 litres from a herd of 185 cows equating to a volume of **44 l/cow/day.**

2.8 Land Application of Farm Wastes, NZ Land Treatment Collective, Technical Review No. 9, October 1993

This review bases volumes of waste water produced on Vanderholm et al (1984), that is **50 or 80 l/cow/day.**

2.9 A review of monitoring results of dairy effluent systems in the Auckland region visited by MAF between June and September 1997 indicates a mean washdown volume of 30 l/cow/day (range 9-75). The individual data from which this mean is derived are rough estimations of washdown volume from the operator and/or the MAF Inspector.

3.0 CONTAMINANTS OF CONCERN AND THEIR LIKELY CONCENTRATIONS IN FARM DAIRY DISCHARGES

The MHWQMP identified that discharges from oxidation ponds frequently cause significant water quality degradation, especially when there is little dilution available in the receiving water. This is supported by a DSIR national survey of oxidation pond discharges (Hickey et al 1989), which revealed that massive dilution is necessary mainly to avoid ammonia toxicity to sensitive organisms in the receiving water. This is based on the United States Environmental Protection Agency (USEPA) ammonia toxicity criteria (USEPA, 1986). Ammonia was identified as the critical contaminant in oxidation pond discharges.

There is generally a lack of documented data on the levels of nutrients flowing off dairy yards in New Zealand. Recent research (unpublished) by Dr AHC Roberts of AgResearch Ruakura indicated that the concentration of nitrogen in dairy washwater off the yard is much higher than previously documented. Average levels of 23 gN/cow/day off the yard have been measured compared with 10 gN/cow/day previously reported by Vanderholm et al (1984). On this basis, the minimum land area for applying effluent must be increased accordingly. However a large proportion of the total nitrogen is likely to be nitrified and volatilised between the yard and being applied to the land, the proportion depending on the time of the year and weather conditions. Generally, a nitrogen loss of about 20% is estimated between untreated washwater collection and spreading onto land (Vanderholm et al, (1984).

The ARC has adopted the rate of **20 gN/cow/day** mainly on the basis of Dr Roberts' results, rounded down in light of the Agricultural Waste Manual data (Vanderholm et al, 1984). Also Jersey Cattle Breeders Association of NZ requested that Regional Councils take into consideration the lower stock unit values of Jersey cattle compared with Friesians when making assumptions about nutrient output.

4.0 THE ABILITY OF AUCKLAND WATERWAYS TO ASSIMILATE NITROGEN

As a result of the findings of the MHWQMP, the ARC commissioned a report (ARC, 1992a) on the suitability of USEPA criteria for assessing ammonia toxicity levels in the New Zealand fresh water situation. This report by the New Zealand National Institute of Water and Atmospheric Research concluded that the use of USEPA criteria is appropriate for New Zealand fresh waters. The dilutions required to achieve the USEPA salmonoid criteria vary from the median of 97 fold to 95 percentile of 248 fold dilution, (Hickey et al 1989). A further dairy oxidation pond study undertaken by the ARWB in 1990 (ARWB, 1990b) indicated similar dilution requirements for ammonia as that found by Hickey et al (1989), namely a range from a median of 92 fold to the 95 percentile of 244 fold dilution.

A stream flow of approximately 50 l/sec would therefore be required to achieve the minimum dilution necessary for a stream to assimilate ammonia from a pond discharge rate of 0.5 l/s for 50% of the time. The required dilution increases to 124 l/sec if the water course is to be protected 95% of the time.

The ARC proposes to use one-in-five year low-flow to determine available dilution in the summer period. While many water bodies may be able to achieve these dilutions during winter flow conditions, few will have enough volume during the summer, especially when abstractions are taken into account.

The ARC then commissioned a further investigation (ARC, 1992b) of the efficacy of systems to augment the treatment efficiency of conventional oxidation ponds by removal of ammonia. Most of the options studied were expensive and required a high degree of operator involvement. The report concluded that most feasible add-on systems were overland flow and spray irrigation. The next most feasible systems were rotating biological contact units but these are costly to install, require power to the site and need regular maintenance. The use of constructed wetlands was not covered in this study, as results from trial constructed wetland systems to date have not achieved sufficient or consistent ammonia reduction.

As a result of the above findings, the ARC concluded that ammonia toxicity and nitrogen concentrations generally in farm dairy washwater and the lack of dilution in most of Auckland's waterways indicated that, for Auckland, land disposal is the preferred option.

However, applying excessive nitrogen onto land can also have adverse environmental effects, so the ARC needed to investigate acceptable levels for land application.

5.0 ACCEPTED NITROGEN LEVELS FOR THE DISCHARGE OF FARM DAIRY WASHWATER ONTO LAND

The ARC's objective in setting a nitrogen limit is environmental protection as required by the Resource Management Act 1991. Excessive nitrogen applications are a possible threat to underground aquifer systems. Degradation of aquifers compromise the suitability of groundwater for potable, stock and irrigation supply and can result in contamination of spring flows into waterways.

A considerable amount of investigative work has been undertaken by the Waikato Regional Council in setting the appropriated nitrogen application rate for their region. Its primary focus was the protection of near-surface groundwater for potable water supply from a public health point of view. The ARC considers that this approach is applicable to the Auckland region where protection of aquifer systems for potable supply is the objective.

The ARC's adopted nitrogen application rates for disposal of dairy sludge and washwater are:

(a) at a rate not exceeding the equivalent of **150 kgN/ha/year** and **30 kgN/ha/day** in the following areas:

    (i) those areas underlain by aeolian sands (Awhitu, Kaipara, Tapora, Pakiri, Omaha Flats);

    (ii) those areas underlain by volcanic basalt (Pukekohe, Puni, Waiuku, Bombay, Mangere);

(b) at a rate not exceeding the equivalent of **200 kgN/ha/year and 50 kgN/ha/day,** on low permeability clay soils of low vulnerability due to poor groundwater quality/yield.

The following is a literature review and discussion of the levels of nitrogen adopted for the Auckland region.

5.1 Literature Review

5.1.1 Agricultural Waste Manual, Vanderholm, D H et al, 1984

The authors of this manual suggest that as an upper limit to excess nutrient application, up to twice the plant's requirements for nutrients could be applied without serious effects on plant growth and groundwater quality. The average uptake of nitrogen in grazed pasture is cited as 200 kgN/ha/year, and so a corresponding upper limit for nitrogen application of 400 kgN/ha/year could be promulgated.

5.1.2 Forestry Bulletin CGGREF April 1993, No 35. French Ministry of Agriculture and Forestry

The EEC proposes that for identified risk zones or risk areas, the maximum annual nitrogen application from animal wastes on land should be 200 kgN/ha/year, reducing to 170 kgN/ha/year after 1995. The main considerations in identifying the risk areas are potable water quality and eutrophication of water bodies and coastal waters.

The protection of potable groundwater is of prime importance. Lowland streams recharged from groundwater are susceptible to compromised water quality from excess nitrate levels (eutrophication) in the soil profile.

5.1.3 Regional Plan - Dairy Shed Effluent: Operative Plan, Environment Waikato (1994)

Environment Waikato has adopted a maximum nitrogen rate of 150 kgN/ha/year across the region in the above plan, based on research and a review of information by Dr N Selvarajah. However, compared with the Auckland groundwater resources, Waikato groundwater resources are generally shallow and unconfined and groundwater quality is more subject to impact from surface activities. The application rate reflects this high contamination risk.

The Waikato maximum limit was also based on research into clover suppression from excessive nitrogen application and research into the rates of application of nitrogen applied to stony soils from piggery effluent.

However, Environment Waikato's redrafted plan change for farm dairy effluent disposal also states that nitrogen can be applied at a higher rate than 150 kgN/ha/year provided there is no elevation of groundwater nitrogen concentrations such that existing or reasonably foreseeable uses of the receiving groundwater or surface water would be compromised.

5.2 Discussion

The ARC's rural groundwater monitoring information shows that for much of the region near-surface groundwater is not used for potable supply to any great extent. This is mainly because of the poor quality of this resource due to high iron levels and more importantly, sustainability at the time of greatest need, during the summer months. Exceptions are the Southern Manukau volcanic aquifers and the sand systems of the Awhitu and Kaipara Peninsulas. In many areas deeper groundwater systems are heavily utilised for water supply, however most of these systems are confined or semi-confined, that is, there is little or no connection between the upper poor quality aquifers and the underlying groundwater system, so they are less vulnerable to contamination from surface activities.

Auckland Aquifers can be divided into the following broad groupings:

Aquifer Type 1 = sandy soils which are vulnerable due to their high permeability;

Aquifer Type 2 = volcanic soils which are vulnerable due to their high permeability and heavy abstractions;

Aquifer Type 3 = deeper aquifers connected to type 2 aquifers; and

Aquifer Type 4 = low permeability clay soils of low vulnerability due to their poor water quality or low yield.

Potential risks to groundwater quality can be established for these different aquifer types as follows:

Nitrogen loading rate (kgN/ha/year)	**Aquifer types (See above for type of Aquifer)**		
	1	**2 & 3**	**4**
100	minimal	minimal	minimal
150	minor	minor	minimal
200	moderate	moderate	minor
200+	major	major	moderate

The ARC has adopted a precautionary approach[1] and used nitrogen application rates which pose a minimal/minor risk to groundwater quality. The risks include a wide range of factors both environmental and physical which influence nitrogen uptake and mobility.

[1] The 'precautionary approach' is detailed in the *Proposed Auckland Regional Policy Statement.*

The ARC considered managing these application rates by producing regional maps delineating zones where the different rates would apply. However, the difficulty with this approach is that farm boundaries often cross several different soil types. The ARC's preferred approach utilises the operators' knowledge about their specific context to use the appropriate application rate.

The above evaluation assumes that the land where washwater is applied also receives input of nitrogen from normal farm grazing practices. Alternative land uses such as cropping can sustain considerably higher nitrogen loading, but such proposals will require consideration from the ARC on a case-by-case basis.

Some examples of how to apply the ARC's recommended nitrogen application rates are given below.

6.0 HOW TO WORK OUT YOUR ANNUAL AND DAILY NITROGEN APPLICATION RATES

In order to prevent short term over-application within the maximum annual application rate, the ARC promulgates daily maximum application rates for nitrogen of:

- 50 kgN/ha/day for clay soils; and
- 30 kgN/ha/day for sandy soils

These limits have been set to guard against potential adverse effects of increased levels of nitrogen in potable surface and groundwater, notwithstanding the limitations of the other standards. The maximum rates of 30 and 50 kgN/ha/day are based upon reasonable nitrogenous fertiliser applications to ensure economic benefit and to reflect standard practice (AgResearch 1994). With nitrogen application rates greater than these, the economic benefit in terms of added kilogram dry matter per kilogram nitrogen decreases at a marginal rate as the nitrogen application rate increases and the risk of nitrate leaching increases.

Nitrogen loading occurs from land disposal of farm dairy:

- treatment system sludge
- washwater

6.1 Sludge Application

For farms with clay soils, the application rate = 50 kgN/ha/day
= 60,000 litres/ha/day of sludge.

For farms with sandy soils, the application rate = 30 kgN/ha/day
= 36,000 litres/ha/day of sludge.

These both assume that the mean total nitrogen component of sludge is 0.166% (*pers comm* AHC Roberts, AgResearch) and that only 50% of the nitrogen component is the mineralised organic fraction immediately available for plant uptake. The remaining fractions are the organic and residual components which become mineralised in subsequent years.

A further safeguard against excessive nitrogen application is that at least 20% of nitrogen in the mineralised fraction will be lost through volatilisation during and after application, thus diminishing the risk of nitrate leaching to groundwater (Hart and Speir, 1992).

The above application rates of nitrogen are regarded as strategic applications for boosting pasture production. As such, effluent should be applied when pasture is actively growing, normally Autumn and Spring. Operators would apply sludge to land at these times in any case, when soil conditions allow the passage of heavy machinery.

6.2 Washwater Application

6.2.1 Worked examples for a farm on clay soil

(a) Annual rate

The maximum annual nitrogen application rate is 200 kgN/ha. Assuming a nitrogen concentration of 20 gN/cow/day in the washwater off the yard (untreated), for a range of herd sizes and lactation lengths, the minimum total irrigation area can be represented in the following table:

Minimum annual irrigation area requirements for farm dairy washwater application (ha)

	Herd size(H)			
Lactation days (L)	**100**	**150**	**200**	**250**
220	2.2 ha	3.3 ha	4.4 ha	5.5 ha
240	2.4 ha	3.6 ha	4.8 ha	6.0 ha
260	2.6 ha	3.9 ha	5.2 ha	6.5 ha

The above minimum areas can be calculated for any herd size and lactation length using Formula A-1 below:

Formula A-1 **Clay Soils**	Minimum annual irrigation area for farm dairy washwater application $= \frac{H \times L}{10{,}000}$

(b) Daily Rate

The minimum daily irrigation area needed depends on whether irrigation is sourced:

- directly from the yard, or
- from a holding or oxidation pond/s.

(i) Daily irrigation from yard washdown

Base the daily minimum area on **20gN/cow/day** through the yard.

For example:

100 cows x 20 gN/cow	=	2 kg N
The nitrogen limit	=	50 kgN/ha/day
Therefore the minimum area needed	=	2 / 50
	=	0.04 ha/day
	=	400 m^2 /per day
Therefore for 200 cows	=	0.08 ha
	=	800 m^2 /per day

Rule of Thumb:	**at least 4m^2 per cow**

(ii) Periodic irrigation from a holding pond system

Base the daily minimum irrigation area on an assumed nitrogen concentration of **0.04%**.

For example, if you wish to empty 100,000 litres (100 m^3) of effluent from a holding pond onto land on one day:

100,000 litres @ 0.04% N	=	0.04 / 100 x 100,000
	=	40 kgN
The nitrogen limit	=	50 kgN/ha/day
Therefore the minimum area needed	=	40 / 50
	=	0.8 ha
	=	8,000 m^2

Rule of Thumb:	**no more than 125m^3/ha/day**

6.2.2 Worked examples for a farm on sandy soils

(a) Annual rate

The maximum annual nitrogen rate on sandy soil is 150kgN/ha. Assuming a nitrogen concentration of 20gN/cow/day in the washwater off the yard (untreated), for a range of herd sizes and lactation lengths, the minimum total irrigation area can be represented in the following table:

Minimum annual irrigation area requirements for farm dairy washwater application (ha)

	Herd Size (H)			
Lactation Days (L)	**100**	**150**	**200**	**250**
220	2.9 ha	4.4 ha	5.9 ha	7.3 ha
240	3.2 ha	4.8 ha	6.4 ha	8.0 ha
260	3.5 ha	5.2 ha	6.9 ha	8.7 ha

The above minimum areas can be calculated for any herd size and lactation length using formula A-2 below:

Formula A-2 **Sandy Soils**	Minimum annual irrigation area for farm dairy washwater application $= \frac{H \times L}{7{,}500}$

(b) Daily Rate

The minimum daily irrigation area needed depends on whether irrigation is sourced:

- direct from the yard, or
- from a holding or oxidation pond/s.

(i) Daily irrigation from yard washdown

Base the daily minimum area on **20gN/cow/day** through the yard.

For example:

100 cows x 20gN/cow	=	2 kg N
The nitrogen limit	=	30 kgN/ha/day
Therefore the minimum area needed	=	2 / 30
	=	0.07 ha/day
	=	700 m^2 per day
Therefore for 200 cows	=	0.14 ha
	=	1400 m^2 per day

Rule of Thumb:	**at least 7m^2/cow**

(ii) Periodic irrigation from a holding pond system

Base the daily minimum irrigation area on an assumed nitrogen concentration of **0.04%**.

For example, if you wish to empty 100,000 litres (100 m^3) of effluent from a holding pond onto land on one day:

100,000 litres @ 0.04% N	= 0.04 / 100 x 100,000
	= 40 kgN
The nitrogen limit	= 30 kgN/ha/day
Therefore the minimum area needed	= 40 / 30
	= 1.3 ha
	= 13,000 m^2

Rule of Thumb:	**no more than 75m^3/ha/day**

Note: These calculations are only based on the nitrogen application rate condition. Other conditions such as avoiding run-off at any time must also be considered when applying washwater to land.

APPENDIX B

CONSENT PROCESSING

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APPENDIX B:

CONSENT PROCESSING

The rules detailed in Section 6 determine whether an application for a resource consent is required for a particular activity. Any activity listed as a permitted activity can be undertaken if it complies with all of the specified conditions. The applicant should confirm with the ARC that the activity in question is permitted by filling in and returning the appropriate form, available from the ARC.

1.0 MAKING AN APPLICATION FOR A RESOURCE CONSENT

A resource consent is required for any activity listed as a controlled or discretionary activity. An application form for a controlled or discretionary activity can be obtained from the ARC.

1.1 Costs

A deposit fee schedule relating to the type of application being made will be issued with the application form. If the application is publicly notified and a hearing is required it is likely that the cost of processing the application may be more than the deposit fee.

1.2 Controlled and Discretionary Activities

In applying for a Controlled or Discretionary Activity, Section 88(4) of the RM Act requires that an application include:

1. a description of the activity for which consent is sought, and its location; and

2. an assessment of the actual or potential effects that the activity may have on the environment, and the ways in which any adverse effects may be mitigated; and

3. any information required to be included in the application by a plan or regulations; and

4. a statement specifying all other resource consents that the applicant may require from any consent authority in respect of the activity to which the application relates, and whether or not the applicant has applied for such consents.

The assessment of effects submitted with an application needs to be sufficiently detailed to correspond with the scale and significance of the actual and potential effects that the activity may have on the environment. This assessment needs to be prepared in accordance with the Fourth Schedule of the RM Act.

A description of any methods proposed to avoid, remedy or mitigate any adverse effects of the proposal should be included in the application.

2.0 PROCESSING AN APPLICATION

Following receipt of an application by the ARC, a request for additional information may be made at any reasonable time before the hearing of an application if it is considered that such information is necessary to understand the proposal, its environmental effects and the ways of mitigating them (Section 92 of the RM Act).

The request for further information will delay the processing of any application. Accordingly, applicants are encouraged to discuss their proposal with ARC staff prior to submitting an application, so that the appropriate information can be supplied at the outset.

If the ARC is of the opinion that a significant adverse effect on the environment may result from a proposed activity it may require an explanation of:

(a) any possible alternative locations or methods for undertaking the activity and the reasons for the proposed choice; and

(b) the consultation undertaken with other affected parties.

2.1 Notification of an Application

When an application has been accepted, the ARC will decide whether it is required to be notified in accordance with Section 93 of the RM Act. The RM Act provides a discretion as to whether an application will need to be publicly notified. Pursuant to Section 94(2) an application for a discretionary activity can be non-notified if the ARC is satisfied that the adverse effects of the activity will be minor and written approval has been obtained from every person who may be adversely affected by the granting of the resource consent, unless the ARC considers it is unreasonable to do so.

If an activity is listed as a controlled activity, the Plan provides that these activities will not be publicly notified, nor the consent of affected parties obtained, unless in the opinion of the ARC there are special circumstances relating to the application which justify notification, or the need to obtain the written approval of affected persons.

When a resource consent application is notified, submissions are called for and any person may lodge a submission within 20 working days of public notification in support of, or in opposition to the proposed activity.

2.2 Hearing of Resource Consent Applications

Following the close of the submission period, if the applicant or any submitter requests to be heard, or if the ARC decides a hearing is necessary under Section 100 of the RM Act, a hearing will be convened. Before the formal hearing, pre-hearing meetings (Section 99 of the RM Act) may be held for the purpose of clarifying, mediating or facilitating the resolution of any issue within the resource consent application. The ARC encourages such meetings as a forum to resolve issues before the hearing.

If issues under contention are resolved during discussions, the submitter(s) may withdraw their request to be heard and a hearing may no longer be necessary.

2.3 Decisions

Section 104 of the RM Act sets out the matters to be considered by the ARC in respect of a resource consent application. The decision is made pursuant to Section 105 of the RM Act.

The ARC may grant or refuse a resource consent for a discretionary activity and may impose conditions as listed in Section 108 of the RM Act.

Under Section 115 of the RM Act, a written decision must be given to the applicant and any submitters within 15 working days following the conclusion of a hearing, or if no hearing was required, within 20 working days after receipt of the completed resource consent application.

2.4 Appeals to the Environment Court and High Court

The applicant or any submitter that does not agree with a decision made by the ARC may appeal to the Environment Court, in accordance with Section 121 of the RM Act, against the whole or any part of the decision including any conditions. The Environment Court then hears the appeal and generally the Court's decision is final, although Section 299 of the RM Act allows for a further appeal to the High Court on a point of law.

3.0 DURATION AND REVIEW OF RESOURCE CONSENTS

The RM Act provides the ARC with the discretion to determine the duration of a consent. Pursuant to Section 123 of the RM Act the maximum period for a resource consent is 35 years. If the ARC does not specify the term of the consent, its duration will be five years in accordance with Section 123(d) of the RM Act. It is proposed that any resource consents granted for controlled or discretionary activities will have a maximum duration of **fifteen** years from the date that the resource consent is granted.

4.0 IMPLICATIONS FOR FARM DAIRY CONSENTS

It is extremely important from the perspective of integrated resource management that all conflicting uses of a resource are considered when undertaking catchment management planning. Water resources are fully allocated for abstraction purposes throughout much of the region. Therefore consideration of any consents to discharge to waterways must be integrated with water take review processes. The ARC's stream water allocation plans are reviewed on a 15 year cycle according to the Council's catchment expiry date system. The term of farm dairy discharge consents will therefore initially range from approximately 7 to 15 years depending on the catchment concerned.

Section 128 of the RM Act provides for the ARC to review resource consent conditions to deal with any adverse effect on the environment arising from the exercise of the consent, or for any other purpose specified in the consent. In order for the ARC to exercise this power, conditions of the resource consent must include provision for this review. All consents will contain review conditions so that should the 10 year review process of this plan (as required by the RM Act) result in significant changes, these can be reflected in the discharge consents.

If a resource consent is not exercised within two years after it was granted, then the consent lapses (Section 125 of the RM Act) unless the consent holder applies for an extension of time.

APPENDIX C

DEFINITION OF 'RECEIVING WATER', 'REASONABLE MIXING' AND 'ADEQUATE DILUTION', WITH RESPECT TO STANDARD 6.3.1.8

Contents

APPENDIX C:

DEFINITION OF 'RECEIVING WATER', 'REASONABLE MIXING' AND 'ADEQUATE DILUTION' WITH RESPECT TO STANDARD 6.3.1.8

1.0 RECEIVING WATER

The ARC has decided to use the presence or absence of water during the low flow period, as determined by a visual check, as the criterion for deciding where receiving waters from a given discharge begin. This approach has the merits of simplicity and cost advantage and, moreover, operators' experience of the waterways on their properties during low flows can also be utilised. The ARC will be able to calibrate the reasonableness of the approach adopted in each case by backing up the decision with scientific assessments based on catchment baseflow information, or measured flows where these are available.

The result of this approach is to define the '**Receiving Water**' to include part of the definition of '**River**' in Section 2 of the Resource Management Act as follows:

"Receiving Water"

Means a continually flowing body of fresh water; and includes a stream and modified water course but does not include any artificial watercourse (including an irrigation canal, water supply race, canal for the supply of water for electricity power generation and farm drainage canal).

2.0 REASONABLE MIXING

It is important to clarify some of the common misunderstandings about reasonable mixing. Reasonable mixing is not total mixing and therefore must not be considered the sole use of the receiving environment, and thus should not create a toxic barrier to the migration of fish or other aquatic life into the catchment above the point of discharge. Therefore the mixing zone is an area which may be toxic to an organism resident within it for an extended period but an organism's travel through the area is not obstructed by the present contaminants. The term does not envisage that filling a waterway from bank to bank with acutely toxic material would be permitted. Therefore, many Auckland streams will only support mixing zones of short physical extent or plumes of high quality wastewater, particularly during the summer low-flow period.

Several publications, both from New Zealand and overseas, were considered before defining this term.

The definition chosen is considered to be the best available, in that the width of the particular waterway is the determining factor. This value is easily obtained by the operator and the formula could be applied without specialist knowledge. Therefore there is a significant cost benefit from adopting this proposed rule of thumb.

The ARC's proposed definition of reasonable mixing (that is, the point of compliance for consideration of the ammonia standard for treated dairy washwater discharges) is:

'30 times the width of the receiving water downstream and 1/3 the width across'

3.0 ADEQUATE DILUTION

3.1 Development of the Ammonia Standard

The ARC has promulgated a receiving water standard of 0.7g/m^3 of total ammonia after reasonable mixing.

This value was set after considering the potential environmental effects of the toxic components of dairy oxidation pond wastewater discharges. Other regulatory authorities have historically based their consideration of dairy wastewater effects on waterways upon suspended solids and biochemical oxygen demand. However work by Hickey et al (1989) showed that of the contaminants discharged from these systems, ammonia had the greatest potential for adverse environmental effects.

Investigations by the ARC, other regional councils and research organisations have generally produced similar results in terms of average ammonia concentrations in pond discharges. Auckland studies found on average total ammonia levels of 77g/m^3. Various studies have shown that pond systems discharge for prolonged periods and a large number of days each year.

The appropriate standard for comparison is therefore considered to be the chronic (long term) aquatic protection criteria promulgated by the USEPA. The ARC was concerned that it might be inappropriate to adopt a standard from criteria specified for another country in that New Zealand species may be of greater or lesser sensitivity. Consequently the ARC contracted the National Institute of Water and Atmospheric Research (NIWA) to conduct toxicity tests on native fauna typical of Auckland streams (fish and invertebrate species) to ensure that the levels recommended were appropriate. The results of this study indicated that the USEPA criteria would provide an adequate level of protection for New Zealand species, although it was noted that local species seemed to be more sensitive than those tested by the USEPA.

3.2 Summer Flow Regimes

The ARC undertakes monitoring of stream flows at a large number of locations throughout the Region. One of the objectives for these studies is to provide a baseline of supporting information for allocation of scarce resources under pressure from conflicting resource uses, especially abstraction of water and the assimilation of wastewater discharges. The issue becomes more acute during summer low flow periods each year when the need for water supply is greatest and stream flows available for waste assimilation are at their minimum.

The ARC allocates up to 70% of the one 1 in 5 year low flow for abstraction purposes. The residual 30% is intended to maintain aquatic ecosystems and assimilate wastewater discharges. Discharges from dairy wastewater treatment systems have historically not required a discharge consent and the lack of records has made it difficult to estimate the flows needed to dilute them.

Summer low flows are mainly dictated by soil lithology in the catchment concerned. The predominant soil type throughout much of the Region is relatively low permeability weathered Waitemata Series materials (sandstone and mudstone) and greywacke. Other lithologies include high permeability sands of Awhitu and South Kaipara Peninsulas and weathered volcanic materials particularly in the Southern Manukau.

ARC stream flow data predicts that for catchments with low permeability soils, 0.5 l/sec/km^2 can be used as a rule-of-thumb 1:5 year summer low flow specific discharge. This return period is considered appropriate as it is used to predict available run of stream flow for water allocation. Clearly it is not a worst case low flow, however the ARC considers that it represents a reasonable frequency for evaluation of environmental protection.

With some other lithologies basic rules-of-thumb cannot be applied as flow predictions are complicated by discrete spring flows which have unique characteristics. In these catchments flow characteristics will need to be evaluated on a case-by-case basis.

The practicability of oxidation pond wastewater discharge assimilation during summer low flow periods can be estimated by considering a number of worked examples, as follows:

3.2.1 Scenario 1

Assumptions
(a) Two discrete pulses of effluent (12 hrs daily in total)
(b) 50 l washwater/cow/day
(c) 1:5 year low flow specific discharge = 0.5 l/sec/km^2
(d) No water abstractions

	200 Cow Herd	150 Cow Herd	100 Cow Herd
Daily volume (m^3)	10	7.5	5
Effluent discharge (l/sec)	0.23	0.174	0.116
100 times dilution (l/sec)	23	17.4	11.6
Required catchment area (km^2)	46	34.8	23
Catchment area (ha)	4,600	3,480	2,300

3.2.2 Scenario 2

Assumptions
(a) Effluent spread evenly over 24 hour period
(b) 50 l washwater/cow/day
(c) 1:5 year low flow specific discharge = 0.5 l/sec/km^2
(d) No water abstractions

	200 Cow Herd	150 Cow Herd	100 Cow Herd
Daily volume (M^3)	10	7.5	5
Effluent discharge (l/sec)	0.116	0.09	0.06
100 times dilution (l/sec)	11.6	9.0	6.0
Required catchment area (km^2)	23.2	18	12
Catchment area (ha)	2,320	1,800	1,200

The above scenarios clearly highlight substantial impediments to achieving the required dilution of treated dairy wastewater discharges to streams throughout the Region. Especially when the run of stream flows used for existing authorised abstractions are considered.

ARC records indicate that all catchments in the southern Manukau are heavily utilised for abstraction for irrigation and are therefore also unlikely to support wastewater discharges during the low flow period.

This problem is made even more acute by the cumulative effects of multiple discharges. For this reason the ARC contracted NIWA to develop a catchment based ammonia assimilation model. This model, which is a complex series of mathematical formulae, will be used to support decisions on whether sufficient dilution is available for individual discharges considering other catchment inputs.

3.3 Winter Flow Regimes

As stated in Section 3.2, the ARC monitors the stream flows at a large number of locations throughout the Region. These studies provide rating information for a wide variety of flow scenarios, enabling the ARC to provide supporting information on winter flow patterns for catchments of differing lithologies throughout the Region.

The ARC has considered a number of winter flow measures for evaluating the practicability of treated dairy wastewater discharges. The ARC needs to be confident that the measure chosen will afford environmental protection in the majority of discharge scenarios without being unnecessarily restrictive, yet be scientifically robust and defensible

Measures considered were:
- winter 1:5 year low flow,
- mean flow and
- median flow.

Stream flows in the Auckland Region fluctuate a great deal during both winter and summer. The ARC's stream flow monitoring measures:
- summer low flow gauging for the purposes of water allocation,
- high flow gauging summer or winter to assess flood events, and
- representative gaugings throughout the normal range of flow regimes.

All of this information is then combined to produce a rating for the waterway measured.

The 1:5 year winter low flow was considered an unsuitable measure primarily because of the lack of gauging information for this return period.

Mean flows were considered inappropriate as they are derived from all the combined flow information and therefore can be unduly influenced by extreme flow events, either high or low, depending on the balance of high and low flow assessments and the severity of high flows.

Median flows are also influenced by the balance of high and low flows, but provided sufficient flow gaugings are included, should provide a reliable flow estimate for general use. By using the median flow the ARC can be confident that 50% of the time stream flows will be greater than or equal to the stated value. The ARC can also be confident that during the winter flow period, generally accepted to lie between the 1st May and 31st October, flows will exceed this value most of the time.

ARC flow gauging for a large number of catchments throughout the region indicates that median flows for rural catchments range between 6.6 - 11.6 l/sec/km^2.

The practicability of oxidation pond wastewater discharge assimilation during winter flow periods can be gauged by consideration of a number of worked examples, as follows:

3.3.1 Scenario 1

Assumptions
(a) Two discrete pulses of effluent (12 hours daily)
(b) 50 litres washwater/cow/day
(c) Median flow specific discharge = 6.6 l/sec/km^2

	200 Cow Herd	150 Cow Herd	100 Cow Herd
Daily volume (m^3)	10	7.5	5
Effluent discharge (l/sec)	0.23	0.174	0.116
100 times dilution (l/sec)	23	17.4	11.6
Required catchment area (km^2)	3.5	2.6	1.8
Catchment area (ha)	350	260	180

3.3.2 Scenario 2

Assumptions
(a) Effluent spread evenly over 24 hr period
(b) 50 l washwater/cow/day
(c) Median flow specific discharge = 6.6 l/sec/km^2

	200 Cow Herd	150 Cow Herd	100 Cow Herd
Daily volume (m^3)	10	7.5	5
Effluent discharge (l/sec)	0.116	0.09	0.06
100 times dilution (l/sec)	11.6	9.0	6.0
Required catchment area (km^2)	1.75	1.36	0.91
Catchment area (ha)	175	136	91

The above indicates that assimilation of oxidation pond discharges will be practicable for most catchments during the winter flow period. Where multiple discharges are proposed in a catchment, the Council will utilise the NIWA model described above to assess cumulative impacts.

REFERENCES

- AgResearch, 1994. Nitrogen Fertiliser for Pasture Agfacts, March
- Auckland Regional Council, 1992a. Toxicity of Ammonia to Selected Native Freshwater Invertebrates, Technical Publication No. 23.
- Auckland Regional Council, 1992b. Critical Review of Techniques for the Reduction of Ammonium in Rural Point Source Discharges, Technical Publication No. 8.
- Auckland Regional Council, 1994. Proposed Auckland Regional Policy Statement.
- Auckland Regional Council, 1995. Proposed Regional Plan: Coastal.
- Auckland Regional Council, 1995. Proposed Regional Plan: Sediment Control.
- Auckland Regional Water Board, 1989. Kay's Stream Report - A Study of the Impact of Dairy Shed Wastes on a Small Rural Auckland Stream.
- Auckland Regional Water Board, 1990a. Dairy Oxidation Pond Study. Working Report No. 57.
- Auckland Regional Water Board, 1990b. Manukau Harbour Water Quality Management Plan.
- Environment Waikato, 1993. Proposed Changes to Environment Waikato's Transitional Regional Plan - Dairy Shed Effluent.
- Environment Waikato, 1994. Regional Plan: Dairy Shed Effluent: Operative Plan.
- Hart P.B.S and Speir T.W, 1992. Agricultural and Industrial Effluents and Wastes as Fertilisers and Soil Amendments in New Zealand.
- Heatley P, 1995. Managing Farm Dairy Effluent. Dairying and the Environment Committee.
- Hickey C.W. et al, 1989. Effluent Characteristics Of Dairy Shed Oxidation Ponds And Their Potential Impacts On Rivers. NZ Journal of Marine and Freshwater Research, Vol. 23:569-584.
- Massey University, 1982. Agricultural Livestock Waste Production Figures.
- Ministry of Agriculture and Forestry (France), 1993. Bulletin (GGREF, April 1993, No 35).
- National Institute of Water and Atmospheric Research, 1994. DO Flow (oxygen) and LOST AM (Ammonium) Models.
- Northland Regional Council, 1994. Cow Shed Survey 1993-1994.
- Northland Regional Council, 1995. Proposed Regional Water and Soil Plan For Northland (Section 1) - Discharges and Land Management.
- NZ Land, Treatment Collective, 1993. Land Application of Farm Wastes. Technical Publication Review No 9.
- Roberts, A.H.(unpublished research)
- United States Environmental Protection Agency, 1986. Quality Criteria for Water, EPA 440/5-86-001.
- Vanderholm D. H. et al, 1984. Agricultural Waste Manual, NZ Agricultural Engineering Institute, Lincoln College, Christchurch.

MAPS

Sheet 1 **Northern Region**

Lake catchments where discharges (untreated or treated) into water are a prohibited activity.

Sheet 2 **Southern Region**

Lake catchments where discharges (untreated or treated) into water are a prohibited activity.

Sheet 3 **Northern Region**

Catchment priorities

Sheet 4 **Southern Region**

Catchment priorities