



**Ministry of Agriculture and Forestry**  
Te Manatu Ahuwhenua, Ngaherehere

## DISCUSSION PAPER No. 34

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### Farm Dairy Water

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# Contents

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<b>1. Executive Summary</b> .....	<b>3</b>
<b>2. Purpose</b> .....	<b>4</b>
<b>3. Risk Assessment</b> .....	<b>4</b>
<b>4. Background</b> .....	<b>4</b>
4.1 New Zealand’s legal requirements .....	5
4.2 International standards and guidelines, .....	6
4.3 Importing country requirements .....	6
<b>5. Issues</b> .....	<b>6</b>
5.1 Faecal Coliforms/Turbidity/Clarity Testing .....	7
5.1.1 Turbidity/Clarity Tests.....	7
5.1.2 Faecal coliforms.....	7
5.2 Water Exclusion Clause.....	8
5.3 Recognition of the community water scheme gradings and the management of water with a “D” or lower rating. ....	9
5.4 Amended terminology in the checklist to provide clarification of water types.....	9
5.5 A specific requirement that the assessment will be validated on site by a farm dairy assessor.....	10
5.6 Milk Quality vs Water Quality .....	10
<b>6. Implementation</b> .....	<b>10</b>
6.1 Mechanism for implementing.....	10
6.2 Changes required for implementation .....	11
6.2.1 Owners of farm dairies.....	11
6.2.2 Farm dairy product safety programmes .....	11
6.2.3 By MAF Compliance and Investigation and Third Party Agencies .....	11
6.3 Proposed implementation period.....	11
<b>7. Proposal</b> .....	<b>12</b>
<b>8. Draft Standard</b> .....	<b>12</b>
<b>9. Consultation</b> .....	<b>13</b>
<b>10. References</b> .....	<b>13</b>
<b>Appendix One</b> .....	<b>14</b>

# 1. Executive Summary

MAF Standard D106.1, “Farm Dairy Water” was issued in 1999. This Standard requires that all supplying farms complete a “Water Quality Status Checklist”. If a water supply fails to comply with the Checklist criteria then there is a requirement that a Management Plan is initiated, the water is tested to determine suitability and if unsuitable the water excluded from contact with milk. This Standard is an interim Standard, recognising that a risk assessment would be undertaken to consider how the hazards found in farm dairy water impacted on the safety of dairy produce. The results of the risk assessment would be used to review the Standard.

In 2000, the dairy industry “Dairying & the Environment Committee” commissioned work in this area and produced the “Farm Dairy Water Report 2000”. This work forms part of this discussion paper. In addition, an industry Working Group comprising MAF and dairy company staff and recognised service providers have considered the report. Based on their experiences since the Standard came into force, they have provided further proposals for the revision of the Standard.

This paper proposes the following changes to the MAF Standard for farm dairy water:

- amended standards for the quality of farm dairy water :
  - annual clarity testing in association with farm dairy assessment instead of turbidity testing; and
  - *E. coli* testing instead of faecal coliforms;
- removal of the Water Exclusion clause providing farm dairy owners with an option of not using water for specific applications;
- recognition of the Community water scheme grade ratings and the management of water with a D or lower rating;
- amended terminology in the Checklist to provide clarification of water types;
- a specific requirement that the assessment will be validated on site by a farm dairy assessor.

This paper proposes for farm dairies that:

- the revised Standard apply to all new farm dairies from date of issue by Circular;
- with the exception of cases where the exclusion option was adopted, all existing farm dairy water supplies that have been validated as meeting the Checklist/water quality requirements of D106.1 be deemed to comply with the requirements of D106.2 for a period of three years from the date of their validation, unless a significant change has been made. Thereafter, such supplies must be assessed against the requirements of the revised standard;
- those existing farm dairies using the exclusion option or having a significant change will apply the requirements of the revised Standard within 12 months of the date of issue.

This paper proposes that for farm dairy product safety programmes (PSPs):

- New PSPs will comply with the provisions of this revised Standard from the date of issue of the revised Standard.
- Existing PSPs will be revised to incorporate the requirements of the revised Standard within 12 months of the date of issue. These amendments can be included at the next review and revision of the PSP and consequently evaluated by MAF/the TPA and approved by MAF.

## **2. Purpose**

This discussion document provides information, discusses issues and makes recommendations relating to the review of the interim MAF Standard D106.1, “Farm Dairy Water” for water used in farm dairies for milking and cleaning the equipment that comes into contact with milk. The review of the MAF Standard for farm dairy water fulfilled the requirements for a risk assessment and also took into consideration issues identified and resolved as part of implementing the MAF Standard into approved PSPs.

## **3. Risk Assessment**

MAF Standard D106.1, “Farm Dairy Water” highlighted the need for a risk assessment to be undertaken to consider what hazards from farm dairy water actually impact on the safety of dairy products. The intention longer term is to define the New Zealand term “water of suitable quality” and develop a case for equivalence to meet the specific potable water requirements of the European legislation. A summary of this work is found in Appendix One. The industry Working Group tasked with reviewing the interim Standard will consider further recommendations on equivalence at a meeting planned for mid November.

## **4. Background**

In 1999 MAF issued a new Standard, D106.1, “Farm Dairy Water”. This Standard had interim status and was developed to establish a better understanding of the suitability of water quality on dairy farms by requiring that a farm water status checklist be completed for each supplying farm dairy. The Standard gave criteria under which a PSP could demonstrate how hazards were being identified and managed. This provided confidence that in farm dairies, all water that comes into contact with raw milk intended for the manufacture of dairy products, is of suitable quality to ensure that the raw milk is safe from microbiological and physical contamination.

The existing Checklist contains a number of options for farmers to act on. Actions are based on the outcomes derived at each farm and may differ considerably for each farm.

The interim Standard considers action needed if the water supply in use fails on any single checklist point. They are as follows:

- develop and implement a Water Management Plan;

- test the water to prove suitability for use;
- exclude the water from use.

It was decided that two tests: faecal coliforms and turbidity, would be a minimum requirement if the testing option was adopted. The Standards to be applied are:

- no more than three faecal coliforms per 100 ml and;
- no greater than 5 NTU (Nephelometric Turbidity Unit) for turbidity.

The “New Zealand Drinking Water Standard 2000” (NZDWS) was used as a base standard for deeming water suitable. The NZDWS provides a measure of potability and the two tests provide an indicator status of whether the farm dairy water in question was potable and therefore safe.

Where exclusion of water from milk contact was opted for, the farmer has to demonstrate that the Exclusion Plan is in place and workable and the Dairy Company supplied must demonstrate an ability to monitor the effectiveness of Exclusion Plans.

This system has now been in place for one dairy season and all companies except Kiwi Dairy Company has a status checklist completed for all suppliers. This season Kiwi will carry out the same exercise and all other companies will be auditing Management Plans.

Information collected in the last season has been collated and presented to the industry Working Group as a means of determining if the Standard, as promulgated, meets the needs of the safety and suitability outcomes in the legislation.

This discussion paper summarises the findings of that report and subsequent meetings held by the industry Working Group. It also proposes specific changes to the Standard.

#### **4.1 NEW ZEALAND’S LEGAL REQUIREMENTS**

In farm dairies, all water that comes into contact with raw milk intended for the manufacture of dairy products, is of suitable quality to ensure that the raw milk is safe from microbiological and physical contamination, in compliance with sections 6 (g) and 14 of the *Dairy Industry Act 1952* and regulations 3, 4, 5 and 7 (i) of *the Dairy Industry Regulations 1990*. Relevant records are kept to demonstrate this, in compliance with 6 (1)(b) of the *Dairy Industry Regulations 1990*.

All farm dairy owners supplying raw milk intended for manufacturing into dairy products must operate in accordance with a MAF-approved PSP which documents procedures to ensure that:

- All water which may come into contact with milk during milking or as a result of cleaning the milking plant, is of suitable quality to ensure that the raw milk is safe from microbiological and physical contamination, and
- Relevant records of the above requirements are kept, and made available for inspection.

## 4.2 INTERNATIONAL STANDARDS AND GUIDELINES,

Two Codex documents recommend that in food handling and processing when in contact with food, potable water be used. The Proposed Draft “Code of Hygienic Practice for Milk and Milk Products” is still under review by the Codex Committee on Food Hygiene using the Codex “Recommended International Code of Practice – General Principles of Food Hygiene” as a model for specific milk and milk product issues. Information on these Codes may be found on the Codex website: [http://www.codexalimentarius.net/ccfh34/fh01\\_01e.htm](http://www.codexalimentarius.net/ccfh34/fh01_01e.htm)

## 4.3 IMPORTING COUNTRY REQUIREMENTS

### EU legislation

**EU Milk Directive 92/46** requires that potable water, complying with their Directive on the quality of water intended for human consumption, be used in milking and in cleaning equipment which comes into contact with milk.

**EU Water Directive 98/83** definition of “water intended for human consumption” includes:

“all water used in any food-production undertaking for the manufacture, processing, preservation or marketing of products ....intended for human consumption *unless the competent authorities are satisfied that the quality of the water cannot affect the wholesomeness of the foodstuff in its finished form.*”

The horizontal provisions of the **EU/NZ Vet Agreement 97/131** accept equivalence between the EU Potable Water Standard 80/778 and its amendments including 98/83, and the New Zealand Standards established under the *Meat Act 1981* and the *Health Act 1956*.

Further information on the first “Farm Dairy Water Discussion Paper” (No. 12) may be found on the MAF website <http://www.maf.govt.nz/dairy/publications/discussion/115fw.pdf>

## 5. Issues

The “Farm Dairy Water Report 2001” commissioned by the industry “Dairying and the Environment Committee” considered the need to review MAF Standard D106.1 and provided a report on specific industry recommendations for changes to the interim Standard. An in-depth summary of findings may be found in Appendix One and further information can be obtained from this Committee or by contacting Quality Consultants New Zealand Ltd, phone 07 859 2398.

The following points made in the “Farm Dairy Water Report 2001” require further discussion:

- Are the clarity, faecal coliforms, turbidity tests and Standards appropriate?
- Should the Water Exclusion clause be deleted?
- How can the Standard, validation process and subsequent audit procedure be further defined?
- Can the Checklist be further refined?
- Does the Checklist adequately consider varying water qualities used in rural/town supply under the Ministry of Health’s Community Water Scheme?

## **5.1 FAECAL COLIFORMS/TURBIDITY/CLARITY TESTING**

### **5.1.1 Turbidity/Clarity Tests**

The existing turbidity test at 5 NTU in MAF Standard D106.1 was perceived to be unnecessarily restrictive for little or no benefit. The 0.5 NTU level as defined in the “New Zealand Drinking Water Standard 2000” is an indicator that can be considered to be safe from harmful organisms such as *Giardia*. Water at 5 NTU does not meet this guideline and gave no meaningful insight into the status of the water quality. In addition, the perception is that it is not possible to distinguish visually, between waters that have an NTU level of 0.5 NTU up to a level of 35 NTU. The review therefore considered whether turbidity is the most appropriate key test for farm dairy application.

The clarity test, as defined in the existing Standard, is also highly subjective and caused considerable comment by validators. The method itself was found to be difficult to employ satisfactorily and was altered by some validators as an attempt to give a more consistent outcome. The use of a recently developed water clarity test method by National Institute of Water Atmospheric Research Ltd (NIWAR) is considered a suitable way forward to resolve both the turbidity issue and the clarity test issue. The new methodology provides a meaningful, practical tool for judging possible physical and potentially microbiological contamination in farm dairies.

The Schmarck meter developed by NIWAR is a cost-effective and simple method for assessing the clarity of water. It uses a simple column and can give a specific clarity reading rather than a subjective judgement on clarity. This will improve consistency of approach and credibility of outcomes. Because it can be calibrated to expected turbidity outcomes the turbidity test, in effect, becomes superfluous.

Therefore it is proposed that the NIWAR developed clarity test replace the existing clarity and turbidity requirements in the MAF Standard.

### **5.1.2 Faecal coliforms**

A review of the “New Zealand Drinking Water Standard 1995” last year included a change to test for *E. coli* instead of faecal coliforms as the indicator organism to indicate possible faecal

contamination of drinking water. Consideration was given to whether the MAF Standard be revised to recognise the changes in the “New Zealand Drinking Water Standard 2000”. Further details may be found on the Ministry of Health Website:  
<http://www.moh.govt.nz/moh.nsf/>

To align with changes to the “New Zealand Drinking Water Standard 2000” it is proposed that faecal coliforms be replaced with *E. coli* as the indicator organism to indicate possible faecal contamination..

## **5.2 WATER EXCLUSION CLAUSE**

The Water Exclusion clause has been an issue for discussion since the development of the Standard. It has been used extensively in some areas as a simple means of complying at little or no cost. There was some concern, particularly among those validating that there is no easy mechanism to validate on a regular basis that this clause is being carried out. Many farmers signing this clause have made honest attempts to comply, either by using an exclusion method developed themselves, or by using a dairy company designed one.

The real problem with exclusion is the ability to monitor on a regular basis. Once signed, all responsibility then shifts back to the dairy company in regard to monitoring, to demonstrate that methods adopted are actually working effectively and that they are being applied consistently. The PSP has to document what monitoring systems are being implemented to provide confidence that the outcome is being met.

From test information we know that water quality rarely impacts on milk quality and so increased testing for bacteriological quality of milk cannot determine if water exclusion is being practised. In reality, this would require daily excess water testing and a policy statement that identifies what processes will take place if a milk supply exceeds the excess water standard. This must include follow up action, penalties and a policy regarding continued use of the Water Exclusion clause and under what conditions and controls.

This issue was further confused when advice part way through the validation process disallowed exclusion when non-compliance for turbidity and/or clarity was identified. In these cases the cause of the problem must be treated. Unfortunately some farmers have been allowed to sign for exclusion in this circumstance and some have not. This situation must now be rectified.

Currently there is a lack of confidence that farmers understand the implications of exclusion and that there is no reasonable validation process in place to demonstrate on a regular basis that exclusion is being practiced. The complexity of demonstrating monitoring processes in the PSPs have also led to the recommendation that it may be more practical to disallow exclusion as a viable alternative to management.

Therefore it is proposed to remove the Water Exclusion clause from the MAF Farm Dairy Water Standard.

### **5.3 RECOGNITION OF THE COMMUNITY WATER SCHEME GRADINGS AND THE MANAGEMENT OF WATER WITH A “D” OR LOWER RATING.**

The “Farm Dairy Water Report 2001” identified that 9% of district scheme water supplies assessed in a large geographic region failed on clarity. This was also confirmed by approaches to MAF by District Councils expressing their concern that MAF Standard D106.1 was making a base assumption that all water on town/rural supplies may be deemed potable. The community water supplies are risk based with a grading system that categorises water status from A to E. It cannot be assumed that water grading results of D, d, E or e do not automatically equate to unpotability.

It therefore cannot be assumed that district/town water schemes will automatically comply with the current MAF Standard. The interim Standard uses the “New Zealand Drinking Water Standard” as a measure of potability to deem water of “suitable quality” as a mechanism for ensuring the outcome of safe and suitable dairy produce. It is also used as a basis for equivalence for market access requirements for potable water, as in the requirements for New Zealand dairy product going to Europe.

The Ministry of Health is reviewing its draft protocols for the “Public Health Grading of Drinking Water Supplies” and finished a series of public meetings in August 2001. More information can be found on the Ministry of Health’s website <http://www.moh.govt.nz/moh.nsf/>.

It is therefore proposed that those farm dairies that obtain water from rural/town water supplies with grading of D or less are required to take further action through testing and where relevant a Management Plan and/or further testing.

### **5.4 AMENDED TERMINOLOGY IN THE CHECKLIST TO PROVIDE CLARIFICATION OF WATER TYPES.**

The Checklist was reviewed by the industry Working Group to consider the use of existing terms like “secure groundwater” and “surface water”. A change from the word “secure” to “deep groundwater” more accurately reflected an understanding of what the term applied to. “Deep groundwater” from depths of ten metres or more can generally be considered to be isolated from the influence of land-based activities. As such, a less rigorous hazard identification process is required for this type of water source and that distinction is proposed in the revised Standard.

The other type of water described in the Checklist, “surface water” could be better put into context with the commentary that explained that a wide range of land and water based activities can easily contaminate surface and shallow ground waters. Special care may therefore be required to ensure that the quality of water taken from such sources is of suitable quality for use in farm dairies.

Therefore it is proposed

- to change the term “secure groundwater” to “deep groundwater” with commentary describing its context;
- to include in the Checklist a commentary providing an understanding of possible hazards from surface water and their significance.

## **5.5 A SPECIFIC REQUIREMENT THAT THE ASSESSMENT WILL BE VALIDATED ON SITE BY A FARM DAIRY ASSESSOR**

The “Farm Dairy Report 2001” recognised that in general the checklist system has been a useful tool for identifying water quality management issues on a per supply basis. The report also identified that there were some regional differences in the way the checklists have been validated. One of the significant issues identified was that for a robust validation process the farm dairy assessors needed to carry out that validation on-site. It was proposed by the industry Working Group that this be incorporated into the Standard and that the development of guidelines also be considered as an additional tool for farm dairy assessors to use during the validation process.

Therefore it is proposed that on site validation of checklists should be specified in the Standard to ensure consistent application of validation measures.

## **5.6 MILK QUALITY VS WATER QUALITY**

The New Zealand dairy industry instigated a study into the effect of water quality on milk quality in 1998. One hundred and forty-five farms had water and milk samples taken on the same day. Samples were checked for *E. coli*, coliforms and aerobic plate count. New Zealand Dairy Group extended the study above by comparing water test results against milk quality results for the same suppliers. This study continued for two dairy seasons.

Based on the information collected and further data provided in the water report, the report concluded that water quality rarely impacts on milk quality. This outcome offers an opportunity to seek more input into the appropriateness of the selected tests and test parameters and to further refine the Standard, checklist and validation procedures. The review of the interim Standard begins this process. The industry Working Group will be meeting in mid-November to decide how this information may be used as a basis for equivalence to specific European requirements longer term.

Further information on the report may be found in Appendix One.

# **6. Implementation**

## **6.1 MECHANISM FOR IMPLEMENTING**

The changes proposed above would be implemented by revising the MAF Standard for farm dairy water.

## **6.2 CHANGES REQUIRED FOR IMPLEMENTATION**

### **6.2.1 Owners of farm dairies**

- Where owners of farm dairies had already complied with the requirements of MAF Standard D106.2, “Farm Dairy Water” no further changes would be required except where the water exclusion option had been selected or there had been significant changes to the water supply. In both situations the owner would need to comply with the revised Standard within 12 months of the Standard being issued.
- Similarly all new farm dairies would need to comply with the revised Standard from the date of issue of the Standard.

### **6.2.2 Farm dairy product safety programmes**

- New PSPs will need to apply the provisions of this revised Standard from the date of issue of the revised Standard.
- Existing PSPs will need to be revised to incorporate the requirements of the revised Standard, These amendments can be included at the next review and revision of the PSP and consequently evaluated by MAF/the TPA and approved by MAF.
- The procedures, checklists and reports used for the assessment of farm dairies will require upgrading with the requirements of the revised Standard.
- Farm dairy assessors will require training in the new requirements and also the application of the clarity test. In addition some farm dairy assessors may require training in the on-site validation of the farm dairy water.
- The accountable person will need to ensure that farm dairies currently using the water exclusion option comply with the requirements of the Standard.

### **6.2.3 By MAF Compliance and Investigation and Third Party Agencies**

- Revision of evaluation and verification criteria to include requirements of the revised Standard; and
- Evaluation of revisions to PSPs.

## **6.3 PROPOSED IMPLEMENTATION PERIOD**

The revised Standard will apply to all new PSPs from the date of issue by Circular.

For existing PSPs, a 12 month implementation period is usually used for MAF D-series Standards unless there is some specific reason otherwise. Assuming that the Standard is issued on or about 31 January 2002, then the Standard would have come into force on or about 31 January 2003.

## 7. Proposal

With regards to the revision of MAF Standard D106.1, “Farm Dairy Water” the following are proposed:

- that the existing Standard be revised to incorporate changes to the water quality standards;
- specifically that this Standard require:
  - annual clarity testing in association with farm dairy assessment instead of turbidity testing; and
  - *E. coli* testing instead of using faecal coliforms as a key water quality parameter
  - removal of the Water Exclusion clause providing farm dairy owners with an option of not using water for specific applications.
- amended terminology in the Checklist to provide clarification of water types;
- a specific requirement that the assessment will be validated on site by a farm dairy assessor;
- For farm dairies that:
  - the revised Standard apply to all new farm dairies from date of issue by Circular;
  - with the exception of cases where the exclusion option was adopted, all existing farm dairy water supplies that have been validated as meeting the Checklist/water quality requirements of D106.1 be deemed to comply with the requirements of D106.2 for a period of three years from the date of their validation, unless a significant change has been made. Thereafter, such supplies must be assessed against the requirements of the revised Standard;
  - those existing farm dairies using the exclusion option or having a significant change will apply the requirements of the revised Standard within 12 months of the date of issue.
- For farm dairy PSPs:
  - new PSPs will comply with the provisions of this revised Standard from the date of issue of the revised Standard;
  - existing PSPs be revised to incorporate the requirements of the revised Standard within 12-months of the date of issue. These amendments can be included at the next review and revision of the PSP and consequently evaluated by MAF/the TPA and approved by MAF.

## 8. Draft Standard

MAF Standard D106.1, “Farm Dairy Water”, has been revised based on the findings and recommendations of the industry hazard analysis that is detailed in this discussion document. Copies of the draft revised MAF Standard D106.2 can be obtained from MAF’s website [www.maf.govt.nz](http://www.maf.govt.nz) or by contacting MAF Food: Dairy and Plant Products.

## 9. Consultation

The draft revised Standard is of concern to farm dairy owners, farm dairy assessors and people accountable for farm dairy PSPs in the New Zealand dairy industry. Internal and external consultation will be conducted according to the MAF Food: Dairy & Plants Consultation Policy. The deadline for submissions is 2 November 2001. Instructions for making submissions are provided with the draft Standard.

## 10. References

- MAF Standard D106.1, “Farm Dairy Water”  
<http://www.maf.govt.nz/dairy/publications/standards/d106-991.pdf>
- Farm Dairy Water - Discussion paper No 12  
<http://www.maf.govt.nz/dairy/publications/discussion/115fw.pdf>
- Farm Dairy Water Quality Survey Report NZDRI/Quality Consultants of New Zealand 2001. Available from Quality Consultants New Zealand Ltd, Ph 07 859 2398
- Proposed Draft “Code of Hygienic Practice for Milk and Milk Products”, and the Codex “Recommended International Code of Practice – General Principles of Food Hygiene”. Codex website: [http://www.codexalimentarius.net/ccfh34/fh01\\_01e.htm](http://www.codexalimentarius.net/ccfh34/fh01_01e.htm)
- New Zealand Drinking Water Standard 2000, Ministry of Health,  
<http://www.moh.govt.nz/moh.nsf/>

## Appendix One

### FARM DAIRY WATER REPORT 2001

Commissioned by the Dairy Industry “Dairying & The Environment Committee 2000”

#### 1.0 Milk Quality vs Water Quality

The New Zealand Dairy Industry instigated a study into the effect of water quality on milk quality in 1998. One hundred and forty-five farms had water and milk samples taken on the same day. Samples were checked for *E. coli*, coliforms and Aerobic Plate Count (APC).

The results showed that there was no correlation between water and milk quality across all three parameters.

	<i>Log(APC Water)</i>	<i>Log(APC Milk)</i>	<i>Log(colif Water)</i>	<i>Log(colif Milk)</i>	<i>Log(E.coli Water)</i>	<i>Log(E.coli Milk)</i>
<i>Log(APC Water)</i>						
<i>Log(APC Milk)</i>		0.13				
<i>Log(colif Water)</i>	0.69	0.12				
<i>Log(colif Milk)</i>	-0.07	0.17	-0.04			
<i>Log(E.coli Water)</i>	0.60	0.14	0.86	0.01		
<i>Log(E.coli Milk)</i>	-0.03	-0.04	-0.04	0.69	-0.01	

In the table above, a correlation factor of 1.00 is highly significant. As the correlation factor decreases so too does the significance of the correlation. The numbers shown in red are determined to be significant. Numbers shown in blue are mildly significant. As can be seen, there is a strong correlation between the outcomes of the water tests but no correlation between milk and water tests.

Based on this information, and further data provided in the water report, it was concluded that water quality rarely impacts on milk quality. This outcome offers an opportunity seek more input in to the appropriateness of the selected tests and test parameters and to further refine the Standard, checklist and validation procedures.

New Zealand Dairy Group extended the study above by comparing water test results against milk quality results for the same suppliers. This study continued for two dairy seasons.

The table on the following page shows the correlations between water test results (APC 37° C, APC 22° C, total coliforms, *E. coli* and faecal streptococci) and milk quality results for all milk quality parameters. Over the two year period no significant correlation could be found\*.

\*A minor correlation could be shown between faecal streptococci and somatic cell counts in year one, however given the nature of the two tests this is likely to be coincidental. This correlation was not found in year two.

## COMPARISON OF WATER RESULTS VS MILK RESULTS

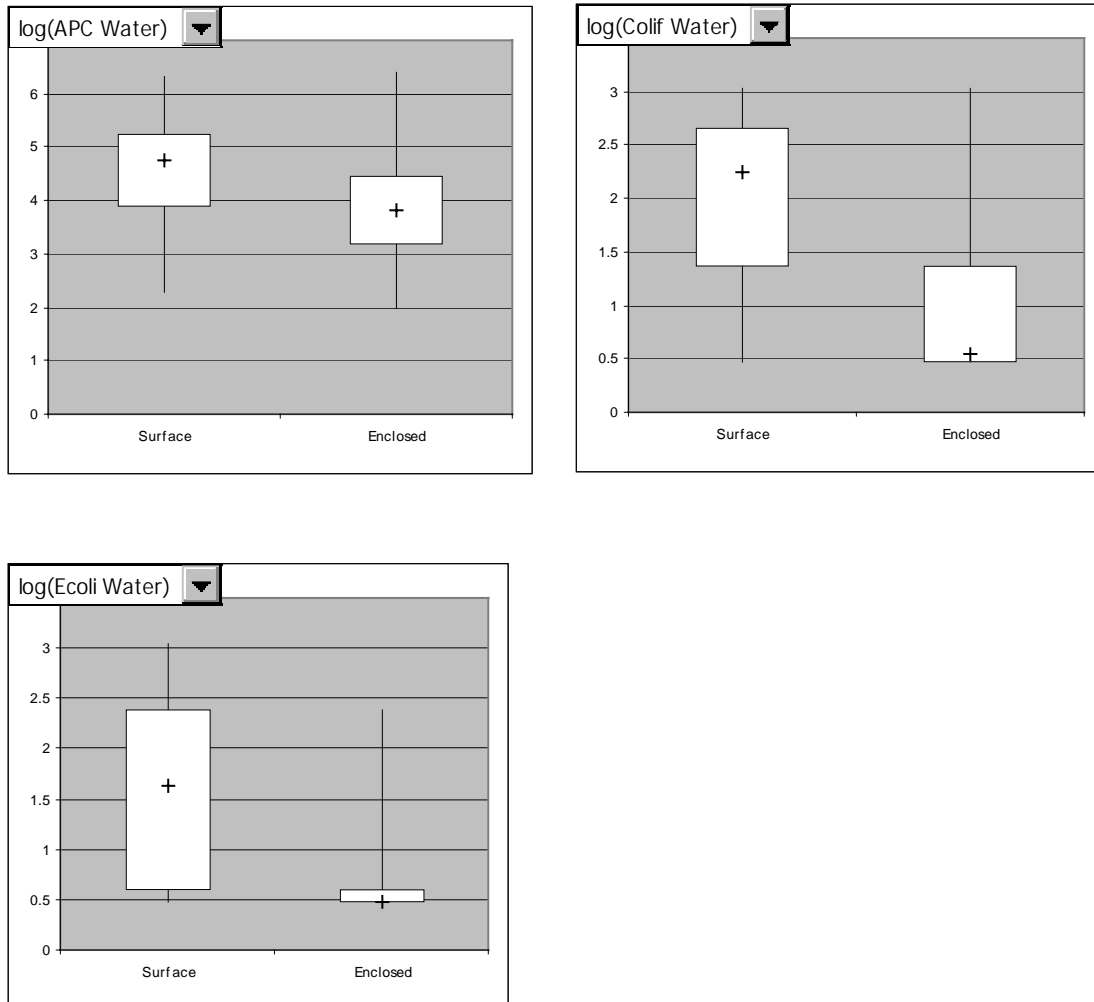
	log(APC 37C)	log(APC 22C)	log(Total Coli)	log(Faecal Coli)	log(Faecal Strep)	log(SCC1)	log(Bacto1)	log(Coli1)	log(Thrm1)	log(Others1)	log(SCC2)	log(Bacto2)	log(Coli2)	log(Thrm2)	log(Others2)	
log(APC 37C)	1.000															
log(APC 22C)	0.883	1.000														
log(Total Coli)	0.612	0.635	1.000													
log(Faecal Coli)	0.463	0.494	0.804	1.000												
log(Faecal Strep)	0.520	0.530	0.751	0.676	1.000											
log(SCC1)	0.292	0.309	0.167	0.101	0.189	1.000										
log(Bacto1)	0.129	0.130	0.019	0.027	-0.078	0.122	1.000									
log(Coli1)	0.046	0.090	0.083	0.136	0.058	0.235	0.288	1.000								
log(Thrm1)	-0.024	-0.025	0.035	0.038	0.072	0.245	-0.103	0.068	1.000							
log(Others1)	0.175	0.125	0.070	0.026	0.043	0.095	0.113	0.008	-0.134	1.000						
log(SCC2)	0.143	0.145	0.093	0.057	0.059	0.408	0.176	0.104	0.057	0.096	1.000					
log(Bacto2)	0.008	-0.020	-0.097	-0.094	-0.084	0.207	-0.018	0.085	0.053	0.135	0.155	1.000				
log(Coli2)	-0.016	-0.014	-0.117	-0.066	-0.084	0.048	0.048	0.139	0.152	-0.007	0.049	0.399	1.000			
log(Thrm2)	0.011	0.003	0.021	0.009	0.053	0.002	-0.003	-0.108	0.231	-0.030	0.222	0.027	0.099	1.000		
log(Others2)	0.053	-0.015	-0.064	0.030	0.008	0.052	-0.010	-0.097	-0.019	0.009	0.024	0.179	0.192	-0.064	1	





## 2.0 Water Quality versus Water Source

Data from the original study does show a correlation between water source and water quality.



The tables above show that bacteriological loadings correlate to water source and that surface waters tend to present with higher loadings than enclosed waters. This supports the stance that surface waters generally pose a higher risk than groundwater. This is compounded by surface water being susceptible to seasonal effects such as heavy rainfall and subsequent runoff.

It should be noted that most of the grading episodes reported being caused by water quality (“Farm Dairy Water Report – 2001”) came about during periods of high rainfall and heavy contamination of water supplies by surface runoff and silt.

### Key findings

For ease of understanding it was decided to present the analyses of information supplied by each company as data sets rather than by checklist, test parameters etc. Conclusions have been drawn from the analysis of each data set and all conclusions then summarised. This was made

necessary by the considerable variance in reporting methods adopted by each responding company or region.

The most significant conclusions to come out of this study are:

- There is no correlation between water quality test results and checklist passes.
- There was no observable association between failing either of the water quality test parameters and numbers of days milk was graded for standard plate count, thermoduric plate count and coliform plate count.
- No correlation could be found between water and milk tests for the three test parameters: APC, coliforms and *E. coli*.
- There is a case for altering the test methods and standards to allow annual screening to be done on site using a portable turbidity meter, and then testing for faecal coliforms if the turbidity standard is not met. If a sample fails on both the screen and faecal coliform test then a full test profile should be recommended to enable adequate advice on treatment to be offered.

Other conclusions which have been used in proposals for revision of the Standard are:

- Feedback from experienced milk quality traceback experts suggests that highly contaminated waters, typically taken from a surface water source, can sometimes cause milk quality failure for the bacterial analysis parameters but that the number of proven episodes is likely to be extremely low.
- 9% of district scheme supplies assessed in a large geographic region have failed on clarity. It cannot be assumed that district/town water schemes will automatically comply with the current Standard.
- In the same geographic area 99% of secure groundwater supplies have successfully passed the Checklist criteria whereas 11% of surface water supplies have failed on clarity.
- There are a number of significant associations within the surface water criteria. For example, where there are known problems there is a strong probability that there will also be other known risks and, where supplies have failed on either running water additional criteria or enclosed water additional criteria there is also a probability of a failure to meet the criteria for other known risks.
- There are some regional differences, probably linked to the predominant type of water source in use.
- There is an observed association between faecal coliform test results and turbidity test results. This association shows in Data Sets 3 and 5.
- In one data set a strong correlation could be found between water source and water test results for APC, coliforms and *E. coli*. In another set no correlation could be found between the test results for water (APC 22° C and 37° C, coliforms, faecal coliforms and faecal streptococci) and the water source. However there is a strong link between these tests for individual supplies. The size of the data sets is very small and more analysis could be indicated. It would be expected that enclosed and surface waters should show a difference in water test outcomes for bacteriological indicators.

- A regional difference in water clarity is observed when comparing data sets.
- Regional differences also appear when comparing outcomes for the secure groundwater criteria and reticulation criteria. This may be due to interpretation of the Checklist by farmers and validating bodies.
- This regional difference is not so apparent when comparing data sets 1 and 5 for the surface water criteria. This is not consistent with the outcome when comparing between locations within data set 1 however data set 5 is much smaller.
- Attending to points in the Checklist where criteria have not been met can help to effect an improved chance of complying with the current test parameters.
- There were some regional differences in the way the Checklists have been validated. In general however, the checklist system has been a useful tool for identifying water quality management issues on a per supply basis.
- Some attention needs to be given by MAF to improving the consistency between the flow chart in D106.1, the wording of the document and subsequent advice given to validating bodies.