WAIKATO REGIONAL COUNCIL PROPOSED WAIKATO REGIONAL PLAN CHANGE 1
WAIKATO AND WAIPA RIVER CATCHMENTS

Submission Form

Submission on a publically notified proposed Regional Plan prepared under the Resource Management Act 1991.

On: The Waikato Regional Councils proposed Waikato Regional Plan Change 1 - Waikato and Waipa River Catchments

To: Waikato Regional Council
401 Grey Street
Hamilton East
Private bag 3038
Waikato Mail Center
HAMILTON 3240

Complete the following

Full Name: Edgar Henson

Phone (Hm): 095790202

Phone (Wk): 09589 1100

Postal Address: 15 Ellerslie Park Road, Ellerslie, Auckland.

Phone (Cell): 021763900

Postcode: 1051.

Email: et@hensons.co.nz

I am not a trade competitor for the purposes of the submission but the proposed plan has a direct impact on my ability to farm. If changes sought in the plan are adopted they may impact on others but I am not in direct trade competition with them.

I wish to be heard in support of this submission.

07/03/2017.

Signature date

beef+lamb
new zealand

Submission – General Comments

We farm 207ha hill to rolling country property at 2705 Wairamarama-Onewhero Road, Glen Murray, this is a beef finishing unit run in an **environmentally sustainable way**. We are in our fifth year and are progressively **increasing the health of the soils and productivity of the farm.**

Bush

The property has 25ha in three registered QEII covenanted bush areas we also have at least another 20ha of bush area. There is more bush and denser bush now than what was there 40 years ago.

Fencing

The QEII and other bush are currently fenced off which includes waterways. Other sections of the waterways are fenced. Some waterways are not realistically suitable or necessary to fence.

Our stock do not drink from streams and rarely from ponds.

We have a water reticulation system, sourced by pond pump with solar panels, pumped to highest point and then piped to 32 paddocks, 40 troughs (increasing), some paddocks have more than 1 trough, more than 4.5km of pipe. 17 ponds are spread over the farm, excellent sediment traps.

Our water is clean, (see attached tests OUT/IN) net effect we clean the neighbours water!

Our high productive grass areas also have a filter system below them - humus content in the soils is in the 10-12% range.

This WRC Planning Process

We have seen bad governance, bad consultation, bad planning and discrimination against us in favour of Maori land owners, dairy farmers and urban populations. The WRC has shown very poor leadership in this highly important leading issue in our community.

Plan change 1 will kill this farming operation

through the proposed nitrogen reference point and the grandparenting.
This proposed Plan will seriously affect the economics of our local community in a very negative way.

Edgar Henson

26/05/1979

Cadastral information derived from Land Information New Zealand's Landonline Cadastral Database.

Valuation Data Sourced from
Territorial Authority District Valuation Roll

ET & GF HENSON
2705 Wairamarama - Onewhero Road Tuakau

0 100 200 300 400 500 600
Metres

Scale at A3= 1:10,000

Created by: HCE
Date: 2/02/2017
Version: 1
Job No.:
File: 34012_Farm Map 2705 WairamaramaOnewhero

Waikato
REGIONAL COUNCIL
Te Kaunihera a Rohe o Waikato

OUR WATER IS CLEAN

Edgar Henson

From:	Alicia Catlin <Alicia.Catlin@waikatoregion.govt.nz>
Sent:	Tuesday, 15 November 2016 9:38 a.m.
To:	et@hensons.co.nz
Subject:	WRC Monitoring
Attachments:	Ecological condition of Waikato wadeable streams based on the Regional Ecological Monitoring of Streams (REMS) Programme – 20_.pdf

Morning Edgar,

Just to summarise what I spoke to you on the phone about; WRC does not routinely monitor surface water quality at your site, however we do sample the fish and macroinvertebrate communities within your stream as part of our regional ecological monitoring programme. We sample for fish and macroinvertebrates at your site which is part of our random network of sites around the region every three years and it was last sampled in January 2015, with the next sampling round due next summer, around January - February 2018. In past we have found longfin eels, crans bully and freshwater crayfish (Koura) at your site.

I have attached the latest ecological report that summarises the regions state and trends over the past three years.

Kind regards,
Alicia

Alicia Catlin | Environmental Monitoring Scientist – Freshwater Ecology | Environmental Monitoring | Science and Strategy Directorate
Waikato Regional Council
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out of Property

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Hamilton 3240 New Zealand

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ANALYSIS REPORT

Client:	Kaike Farm Limited	**Lab No:**	1708319 SPv1
Contact:	Edgar Henson C/- Kaike Farm Limited 15 Ellerslie Park Road Ellerslie Auckland 1051	**Date Received:**	16-Jan-2017
		Date Reported:	20-Jan-2017
		Quote No:	
		Order No:	
		Client Reference:	
		Submitted By:	Edgar Henson

Sample Type: Aqueous

Sample Name:		~~Kaura~~ Stream exiting property at the Eastern Boundary 09-Jan-2017 12:00 pm				
Lab Number:		1708319.1				
Total Nitrogen	g/m³	0.29	-	-	-	-
Nitrate-N + Nitrite-N	g/m³	< 0.002	-	-	-	-
Total Kjeldahl Nitrogen (TKN)	g/m³	0.29	-	-	-	-
Total Phosphorus	g/m³	0.008	-	-	-	-

SUMMARY OF METHODS

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively clean matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis.

Sample Type: Aqueous

Test	Method Description	Default Detection Limit	Sample No
Filtration, Unpreserved	Sample filtration through 0.45µm membrane filter.	-	1
Total Kjeldahl Digestion	Sulphuric acid digestion with copper sulphate catalyst.	-	1
Total Phosphorus Digestion	Acid persulphate digestion.	-	1
Total Nitrogen	Calculation: TKN + Nitrate-N + Nitrite-N. Please note: The Default Detection Limit of 0.05 g/m³ is only attainable when the TKN has been determined using a trace method utilising duplicate analyses. In cases where the Detection Limit for TKN is 0.10 g/m³, the Default Detection Limit for Total Nitrogen will be 0.11 g/m³.	0.05 g/m³	1
Nitrate-N + Nitrite-N	Total oxidised nitrogen. Automated cadmium reduction, flow injection analyser. APHA 4500-NO_3^- I 22nd ed. 2012 (modified).	0.002 g/m³	1
Total Kjeldahl Nitrogen (TKN)	Total Kjeldahl digestion, phenol/hypochlorite colorimetry. Discrete Analyser. APHA 4500-N_{org} D. (modified) 4500 NH_3 F (modified) 22nd ed. 2012.	0.10 g/m³	1
Total Phosphorus	Total phosphorus digestion, ascorbic acid colorimetry. Discrete Analyser. APHA 4500-P B & E (modified from manual analysis) 22nd ed. 2012. Also modified to include the use of a reductant to eliminate interference from arsenic present in the sample. NWASCA, Water & soil Miscellaneous Publication No. 38, 1982.	0.004 g/m³	1

Into Property:

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ANALYSIS REPORT

Client: Kaike Farm Limited
Contact: Edgar Henson
C/- Kaike Farm Limited
15 Ellerslie Park Road
Ellerslie
Auckland 1051

Lab No: 1720711 SPv2
Date Received: 09-Feb-2017
Date Reported: 23-Feb-2017 (Amended)
Quote No:
Order No: Test #2 + #3
Client Reference:
Submitted By: Edgar Henson

Sample Type: Aqueous

Sample Name:		Kaike Farm @B x Potters #2 04-Feb-2017	Kaike Farm QE II's #3 04-Feb-2017			
Lab Number:		1720711.1	1720711.2			
Total Nitrogen	g/m^3	0.28	0.52	-	-	-
Nitrate-N + Nitrite-N	g/m^3	< 0.002	< 0.002	-	-	-
Total Kjeldahl Nitrogen (TKN)	g/m^3	0.28	0.52	-	-	-
Total Phosphorus	g/m^3	0.008	0.020	-	-	-

Analyst's Comments

Amended Report: This report replaces an earlier report issued on 16 Feb 2017 at 4:41 pm
Reason for amendment: Testing redone at lower detection levels.

SUMMARY OF METHODS

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively clean matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis.

Sample Type: Aqueous

Test	Method Description	Default Detection Limit	Sample No
Filtration, Unpreserved	Sample filtration through 0.45µm membrane filter.	-	1-2
Total Kjeldahl Digestion	Sulphuric acid digestion with copper sulphate catalyst.	-	1-2
Total Phosphorus Digestion	Acid persulphate digestion.	-	1-2
Total Nitrogen	Calculation: TKN + Nitrate-N + Nitrite-N. Please note: The Default Detection Limit of 0.05 g/m^3 is only attainable when the TKN has been determined using a trace method utilising duplicate analyses. In cases where the Detection Limit for TKN is 0.10 g/m^3, the Default Detection Limit for Total Nitrogen will be 0.11 g/m^3.	0.05 g/m^3	1-2
Nitrate-N + Nitrite-N	Total oxidised nitrogen. Automated cadmium reduction, flow injection analyser. APHA 4500-NO_3^- I 22nd ed. 2012 (modified).	0.002 g/m^3	1-2
Total Kjeldahl Nitrogen (TKN)	Total Kjeldahl digestion, phenol/hypochlorite colorimetry. Discrete Analyser. APHA 4500-N_{org} D. (modified) 4500 NH_3 F (modified) 22nd ed. 2012.	0.10 g/m^3	1-2
Total Phosphorus	Total phosphorus digestion, ascorbic acid colorimetry. Discrete Analyser. APHA 4500-P B & E (modified from manual analysis) 22nd ed. 2012. Also modified to include the use of a reductant to eliminate interference from arsenic present in the sample. NWASCA, Water & soil Miscellaneous Publication No. 38, 1982.	0.004 g/m^3	1-2

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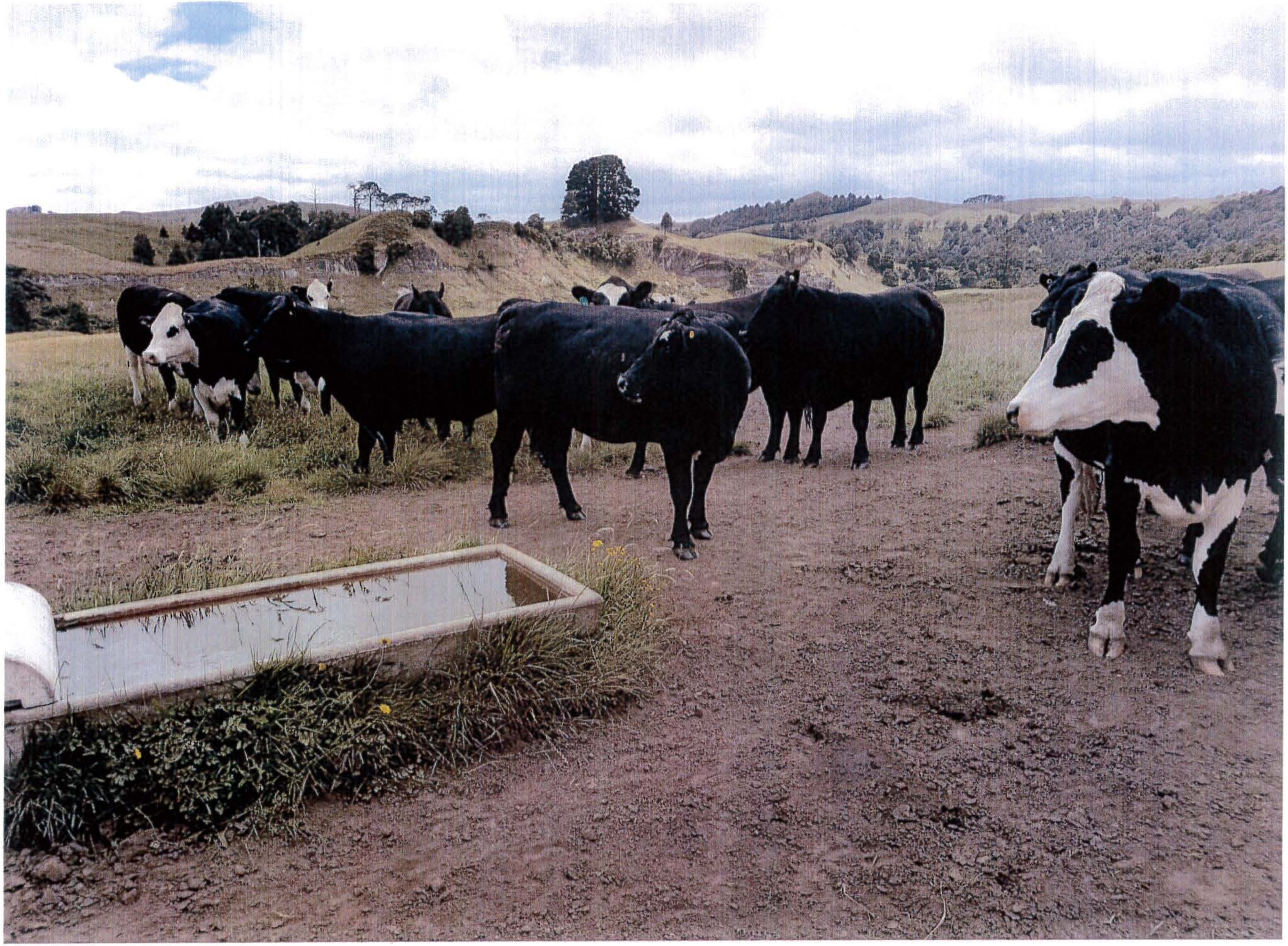
This Laboratory is accredited by International Accreditation New Zealand (IANZ), which represents New Zealand in the International Laboratory Accreditation Cooperation (ILAC). Through the ILAC Mutual Recognition Arrangement (ILAC-MRA) this accreditation is internationally recognised.
The tests reported herein have been performed in accordance with the terms of accreditation, with the exception of tests marked *, which are not accredited.



The specific provisions my submission relates to are: **State specifically what Objective, Policy, Rule, map, glossary, or issue you are referring to.**	**My submission is that:** **State:** • **whether you support, or oppose each provision listed in column 1;** • **brief reasons for your views.**	**The decision I would like the Waikato Regional Council to make is:** **Give:** • **precise details of the outcomes you would like to see for each provision. The more specific you can be the easier it will be for the Council to understand the outcome you seek**
Provision Objective 1. Objective 2. Objective 3.	I support/ oppose/ and for each whether or not you wish to amend The reasons for this are: I support. I Support. I support in principal. But no base measurements in our tributary, and inequitible blanket rules, with no scientific evidence.	I seek that the provision is: Deleted in its entirety/ Retained as proposed/ amended as set out below As an alternative I propose We have done water tests. We are clean "see attached" Tests for water (IN) and water (OUT)

WAIKATO REGIONAL COUNCIL PROPOSED WAIKATO REGIONAL PLAN CHANGE 1 - WAIKATO AND WAIPA RIVER CATCHMENTS

Provision	I support/ oppose/ and for each whether or not you wish to amend The reasons for this are:	I seek that the provision is: Deleted in its entirety/ Retained as proposed/ amended as set out below As an alternative I propose
Objective 4.	We support = principle – BUT only after scientific data for our catchment. Also where is the WRC "cost benefit analysis" as required by the RMA.	This plan will Kill our environmentally sustainabe. business.

WAIKATO REGIONAL COUNCIL PROPOSED WAIKATO REGIONAL PLAN CHANGE 1 - WAIKATO AND WAIPA RIVER CATCHMENTS

Provision	I support/ oppose/ and for each whether or not you wish to amend The reasons for this are:	I seek that the provision is: Deleted in its entirety/ Retained as proposed/ amended as set out below As an alternative I propose
Objectives.	I oppose. Ownership of the land should not determine what rules are applicable. The issue is contaminant discharge.	Flexibility should be based on containment impact from the activity regardless of the ownership of the land. The rules need to be common to all.

WAIKATO REGIONAL COUNCIL PROPOSED WAIKATO REGIONAL PLAN CHANGE 1 - WAIKATO AND WAIPA RIVER CATCHMENTS

Provision	I support/ oppose/ and for each whether or not you wish to amend The reasons for this are:	I seek that the provision is: Deleted in its entirety/ Retained as proposed/ amended as set out below As an alternative I propose
Policy 1.	I support in principile.	
	c. Is wrong for a lot of hill country propertees.	Lets get better science and testing on this.
Policy 2.	I support a + b.	
	c. I support, But question the ability of the OlsenP/ OVERSEER tools to get it right.	Better science is needed.
	d. OPPOSE. this is muddled thinking.	The polluters should be hit hard and soon.

PART B

Edgar Henson

From: Edgar Henson <et@hensons.co.nz>
Sent: Tuesday, 7 March 2017 4:07 p.m.
To: 'healthyrivers@waikatoregion.govt.nz'
Subject: SUBMISSION.. PLAN CHANGE 1.
Attachments: office@hensons.co.nz_20170307_151506.pdf

Importance: High

Edgar Henson
Director
Kaike Farm Limited.
15 Ellerslie Park Road.
Ellerslie.
Auckland.1051
edgar@hensons.co.nz
095891100
021763900

-----Original Message-----
From: office@hensons.co.nz [mailto:office@hensons.co.nz]
Sent: Tuesday, 7 March 2017 3:15 p.m.
To: et@hensons.co.nz
Subject: Scanned image from Hensons Realty Ltd

Reply to: office@hensons.co.nz <office@hensons.co.nz> Device Name: Hensons Realty Ltd Device Model: MX-2640N Location: Ellerslie

File Format: PDF (Medium)
Resolution: 200dpi x 200dpi

Provision	I support/ oppose/ and for each whether or not you wish to amend The reasons for this are:	I seek that the provision is: Deleted in its entirety/ Retained as proposed/ amended as set out below As an alternative I propose
Policy 5.	I support in principle. But needs to be backed by scientific data at each sub-catchment point. Your schedule p63 has no data for our sub-catchment.	Each sub-catchment needs to have detailed water quality monitoring data over a suitable period of time.
Policy 6.	I support.	
Policy 7.	I support in principle on the condition that it is backed by robust scientific data.	~~We~~ seek that clause be is removed.

WAIKATO REGIONAL COUNCIL PROPOSED WAIKATO REGIONAL PLAN CHANGE 1 - WAIKATO AND WAIPA RIVER CATCHMENTS

Provision	I support/ oppose/ and for each whether or not you wish to amend The reasons for this are:	I seek that the provision is: Deleted in its entirety/ Retained as proposed/ amended as set out below As an alternative I propose
Policy 8.	I support.	Need scientific data for all sub-catchments listed in table 3.11-2 needs to be provided before this Plan Change is implemented.
Policy 9. Policy 10.	I. support I oppose It the issue is contaminants into the river - regardless of their source.	We seek that all point source discharge resource consents are reviewed immediately in line with PLAN CHANGE 1.

WAIKATO REGIONAL COUNCIL PROPOSED WAIKATO REGIONAL PLAN CHANGE 1 - WAIKATO AND WAIPA RIVER CATCHMENTS

Provision	I support/ oppose/ and for each whether or not you wish to amend The reasons for this are:	I seek that the provision is: Deleted in its entirety/ Retained as proposed/ amended as set out below As an alternative I propose
Policy 11.	I oppose. This allows polluters to keep on polluting and to defeat the clean water mitigation efforts that we are practising.	This clause should be removed.
Policy 12.	I oppose.	
Policy 13	I oppose	
Policy 16	I oppose. Ownership of land should not determine what rules apply.	Remove policy.

It is about contaminant discharges, the rules should be the same.

Policy 17. I support

Provision	I support/ oppose/ and for each whether or not you wish to amend The reasons for this are:	I seek that the provision is: Deleted in its entirety/ Retained as proposed/ amended as set out below As an alternative I propose
3.11.4.1 ·2 ·3 ·4 ·5 ·6 ·7 ·8 ·9 ·10 ·11 ·12	I. Support.	
3.11.5.1.	I Support. But 5. stocking be increased to 10 stockunits/Ha.	

WAIKATO REGIONAL COUNCIL PROPOSED WAIKATO REGIONAL PLAN CHANGE 1 - WAIKATO AND WAIPA RIVER CATCHMENTS

Provision	I support/ oppose/ and for each whether or not you wish to amend The reasons for this are:	I seek that the provision is: Deleted in its entirety/ Retained as proposed/ amended as set out below As an alternative I propose
3.11.5.2.	I support the Permited Activity Rule. I oppose a). the method of producing the NRP. I oppose b) This allows existing high discharge rates to continue if they have been set as part of the NRP. This rewards existing polluters. I oppose c)	① See attached "OLSEN P: the Best Test for Soil phosphorus?". ② OLSEN P METHODS AND SOIL QUALITY MONITORING: "are we comparing APPLES with APPLES" Clause 4(c) should be removed.

I oppose the grandparenting of the NRP.

WAIKATO REGIONAL COUNCIL PROPOSED WAIKATO REGIONAL PLAN CHANGE 1 - WAIKATO AND WAIPA RIVER CATCHMENTS

Provision	I support/ oppose/ and for each whether or not you wish to amend The reasons for this are:	I seek that the provision is: Deleted in its entirety/ Retained as proposed/ amended as set out below As an alternative I propose
Schedule A.	I support. But 5(f)	Needs clarification. When 1 July or 1 January?.
Schedule B.	I oppose. This will Kill our business. It does not recognise the enviromentally sustainable facts on our property.	Need to get the science right. Problem with OLSEN P and OVESEER. (See attached) See attached Beef+Lamb re OVERSEER.

Our property shows qualities recognised in the reports attached

See:
"Soil carbon offers amazing benefits"
"Carbon Key to building resilience on farms"

soiltech
soil testing specialists

The following article was written by Soiltech Soil Scientist, Dave McKie MAgSc (Hons)

OLSEN P: The Best Test for Soil phosphorus?

Phosphorus (P) is of critical importance in NZ agriculture, mainly because it exists at plant available levels in most soils which are too low for optimal production. This situation provided the impetus necessary to search for a test to aid primary producers to determine levels of plant available P in their soils. The Olsen P test demonstrated itself to be the best test available at the time and so, in the mid 1970's, it was adopted as the standard soil test for phosphorus in NZ.

For almost a generation now, the Olsen P test has grown in stature and reputation. Its' position is so dominant that a casual observer might easily conclude that the Olsen P test is the definitive statement on soil P, perhaps even the de facto test for soil fertility. The "Olsen P mindset" is so ingrained that for many farmers, ongoing applications of P fertiliser are regarded as mandatory until Olsen P test readings of between 20-30 are achieved. The need for discernment in the use of the Olsen P test appears to have been overlooked, as has an appreciation of the limitations of this test. Readings of 20-30 are after all only an arbitary target or guideline, not an absolute assessment of available P. Several factors impinge on the reading obtained.

The Olsen P test was originally developed in North America to estimate plant available levels of P in alkaline soils. There are however, a number of other useful tests available today as well. Some of these include the Resin P test, the Total Phosphorus test and the P retention test. When combined with the Olsen P test, they give a better appreciation of the P status in a soil than the Olsen P test alone.

Most NZ soils are acidic (pH < 7.0). Where soils are quite acidic (< pH 5.5), the Olsen P test can give an inaccurate assessment, overestimating plant available P. In these circumstances the Olsen P test result suggests that P levels are adequate, whereas this may not be the case. Even in alkaline soils, Olsen P can give a misleading result, underestimating the levels of plant available P. This is especially the case on recently limed soils i.e. a low Olsen P test result is obtained and the conclusion is drawn that more fertiliser P is required, whereas actual plant available levels may be more than adequate. In other situations, such as where a slow release P fertiliser like RPR (reactive phosphate rock) or a liquid fertiliser have been used, Olsen P also tends to underestimate plant available P levels.

Olsen P estimates plant available inorganic P levels; it makes no assessment of the organic component of P in the soil. If the organic fraction comprises 50% of the total P in a soil (as it often does), then the Olsen P test ignores a sizeable fraction of the P that will be mineralised by the decomposition of organic matter.

The Olsen P test can produce variable results, often in the order of 20%. If an Olsen P test gives a reading of 15, then this could equate to a concentration of P in the sample anywhere between 12-18mg/Litre.

Soil is a dynamic system; it is constantly changing. Some of this variability is inherent to soil properties (P retention level, texture, depth etc); some is related to climatic factors (soil moisture status and season etc) and some to topography (stock camps on ridges, depressions etc). Olsen P test results can differ simply as a result of sampling technique and/or variation in the lab.

Now obviously, these comments also apply to other P tests as well but collectively they warn us that a soil test P test is not an absolute and unequivocal determination. Every test has some inherent limitations. A test for available P is simply an estimate at one point in time in a system which is constantly changing. If however, testing has been undertaken for several years, then the end-user can put more confidence in the results obtained i.e. a trend is usually of more value than one isolated individual result.

Given the other P tests that are available today, it is hardly wise "to put all your soil test P eggs" in the "Olsen P basket" even though Olsen P has been a useful test over the years. A more prudent approach is to utilise a combination of soil P tests to establish a more comprehensive picture of the soil P landscape.

The Resin P test has been available for many years now. Though it also has some limitations, it does overcome many of the anomalies associated with the Olsen P test. Perhaps foremost of these is that it extracts P at soil field pH (rather than pH 8.5) using water (rather than a bicarbonate solution). This gives a closer approximation of actual plant available P levels in the soil as well as more closely correlating to the P nutrient status experienced by a plant root. A related advantage is that it more directly accounts for the P retention status of the soil i.e. it directly estimates plant available P without the need to make adjustments for soil type etc. The Resin P test is also more accurate when RPR has been used and in other situations where P exists in lower soil quantities.

The Total P test estimates the amount of inorganic and organic P in a soil. It is therefore a useful diagnostic test in that it gives a better appreciation of the reason plants may not be performing optimally in a certain soil i.e. it helps to determine whether this is because P levels in the soil are simply too low (and thus more fertiliser should be added) or whether the problem is simply one of P availability (there is an adequate total amount present in the soil). In the latter case, availability may be improved by methods other than applying fertiliser i.e. stimulating soil microbes to breakdown organic matter and speed up nutrient cycling or altering pH to levels that are more optimal for P availability.

P Retention is a useful test in its own right but in combination with those mentioned above it provides valuable information with which to assess plant available P levels. In soils with lower P retention, more plant available P is usually available than in high P retention soils. However, high P retention soils which have received P fertiliser for many years have a greater potential to release P back into plant available forms.

When a farmer decides to carry out a soil test, Olsen P is often the only phosphorus test offered. Requesting other tests may cost more, however, when one considers the cost of applying fertiliser, especially if it may not be required, the small extra cost should more correctly be viewed as an investment rather than a liability. In some cases, the price of the soil test also includes a comprehensive report and interpretation of the results by technical experts. Therefore it pays to check what you are actually buying. The temptation may be to take the cheapest option but in soil testing, as in other areas, "you get what you pay for."

2013.

OLSEN P METHODS AND SOIL QUALITY MONITORING: ARE WE COMPARING "APPLES WITH APPLES"?

J Drewry[1], M Taylor[2], F Curran-Cournane[3], C Gray[4] & R McDowell[5].

[1] *Greater Wellington Regional Council, PO Box 41, Masterton*
[2] *Waikato Regional Council, Private Bag 3038, Waikato Mail Centre, Hamilton*
[3] *Auckland Council, 1 The Strand, Takapuna, Auckland*
[4] *Marlborough District Council, PO Box 443, Blenheim*
[5] *AgResearch Invermay, Private Bag 50034, Mosgiel*

Abstract

Olsen P is a commonly used soil fertility and soil quality monitoring indicator. In New Zealand, Olsen P is widely used by the agriculture and horticulture industries to help assess on-farm nutrient management. It is also widely used by many regional councils in State of the Environment soil quality monitoring, and by many other researchers to study soil quality.

Soil can be measured on a volumetric (volume) or gravimetric (weight) basis prior to chemical extraction in a laboratory. We investigated if Olsen P results reported from these different methods by regional councils, the agriculture industry and other researchers are able to be compared. New Zealand fertiliser advice is based on a volumetric basis. We report the influence of laboratory method prior to chemical extraction, undisturbed bulk density, sieving methods and soil sampling depth.

Our results and analyses confirm that Olsen P data on a gravimetric basis is different from Olsen P data on a volumetric basis, when concentrations exceeded 10 ppm (i.e. mg/L or mg/kg). Comparing Olsen P results requires correcting data for undisturbed bulk density. In some cases variation can be wide particularly with soils of low bulk density or with Olsen P > 50 ppm. When undisturbed bulk density was used to convert Olsen P values to an equivalent basis median values still differed by about one third.

Sample depth (0-7.5 or 0-10 cm) had a small (4% on average) and significant effect on Olsen P. Differences were noticeably greater for samples with Olsen P > 60 mg/kg. While either depth provides suitable data for assessing the P status of soils, users should consider these differences in values when interpreting between the SOE and industry soil monitoring methods.

Olsen P when measured on a gravimetric basis negates the influence of bulk density. Undisturbed bulk density measurements must be incorporated into soil quality information if volumetric and gravimetric methods are to be compared on an equal basis, if data are to be compared to work done overseas, for the purposes of a mass balance (and between depths) and for incorporation into environmental soil P assessments.

We recommend that users of soil quality data pay careful note of the units for results reported by laboratories, and for interpretation of data such as subsequent comparison with guidelines. The differences in methodology discussed in this paper should be considered when developing and interpreting soil quality data.

Keywords: Olsen P, soil phosphorus, soil quality, bulk density

Introduction

Olsen P is a commonly used soil fertility indicator used by agricultural and horticultural industries to help assess on-farm nutrient management. It is also widely used by regional councils and many researchers to study soil fertility, soil quality, and interactions of soil and water.

Regional councils in New Zealand regularly monitor soil quality in State of the Environment (SOE) monitoring. Monitoring the state of the environment is a specific requirement for regional councils under the Resource Management Act 1991. Specific requirements are to report on the "life supporting capacity of soil" and to determine whether current practices will meet the "foreseeable needs of future generations" (Gray 2010).

A project popularly known as the "500 Soils Project" was set up from previous programmes for the purposes of establishing monitoring programmes for regional councils. The project involved 10 of the 16 regional authorities in 2000-2001 (Sparling et al. 2004). Many regional councils have continued soil quality monitoring and regularly report results (e.g. Gray 2010; Stevenson 2010; Taylor et al. 2010; Taylor 2011a; Sorensen 2012). Methods were established by Landcare Research and were recently published in a manual by the Land Monitoring Forum (e.g. Hill and Sparling 2009). Olsen P is one of a suite of soil quality indicators routinely measured.

The agricultural industry has for many years in association with current and former government and research organisations used soil fertility indicators such as Olsen P to measure soil fertility on farms for assessing nutrient and fertiliser requirements. For example, for pastoral farms, a very large body of research in soil fertility and pastoral yield response was undertaken (e.g. Cornforth and Sinclair 1984; Sinclair et al. 1997; Edmeades et al 2006). Much of this work has culminated in recommendations to avoid higher than needed soil fertility levels. For example, the established industry recommended guidelines for Olsen P levels on dairy farms of between 20 and 40 mg/L for sedimentary soils (depending on milk solids production level) were reported in Roberts and Morton (2009). Recommendations for other soil groups (ash, pumice and peat soils) are also detailed. This booklet was first produced in 1993 and is widely used.

Recently, we investigated if monitoring results such as Olsen P in State of the Environment soil quality monitoring by regional councils, by other researchers and in the agriculture industry are able to be compared with one another and with established industry recommended guidelines. We investigated if there are different monitoring and laboratory methods used, and if so, what the differences mean for interpretation.

This paper aims to raise awareness of and help quantify some of the key differences of soil quality monitoring commonly used in New Zealand, and provide recommendations for improved interpretation, reporting and further research.

Overview of selected laboratory methods

Soil can be measured on a volumetric (volume) or gravimetric (weight) basis prior to chemical extraction in a laboratory. In Australia for example, Rayment and Lyons (2011) detail soil chemical procedures. For Olsen P, Rayment and Lyons (2011) recommend as standard procedure weighing 5.0 g air-dry soil (<2 mm). Subsequent chemical extracts are then undertaken. Olsen P when quoted on a gravimetric basis negates the influence of bulk density (McDowell and Condron 2004).

The Olsen P chemical extraction is a well defined, documented and routine test, so is not discussed here in detail. It appears that the way the soil is prepared once it is received in a bag by the laboratory is a key difference between some New Zealand laboratories, before any subsequent chemical extraction. In New Zealand, for example, several large commercial laboratories measure soil received in the laboratory prior to Olsen P chemical extraction by volume. From our investigation we have found that, for example, Hill Laboratories, the ARL laboratory and some commercial laboratories measure the soil on a volume basis. There may be others.

The Landcare Research laboratory and many researchers measure soil gravimetrically prior to chemical extraction. In this paper we have not attempted to detail all laboratory methods or from all New Zealand laboratories.

The extensive Ministry of Agriculture and Fisheries (MAF) and AgResearch trials (e.g. Cornforth and Sinclair 1984; Sinclair et al. 1997; Edmeades et al 2006; Roberts and Morton 2009) on which field-calibrated pastoral nutrient response curves and soil fertility recommendations were and are currently based were developed from the volumetric method. Sinclair et al. (1997) reported that the Ministry of Agriculture and Fisheries adopted the Olsen P test in the mid 1970s as the standard on which to base fertiliser advice for New Zealand farms. Sinclair et al. (1997) reported that the soil test was actually a modification of the original test, in that a volume rather than a weight of soil was used. Mountier et al. (1966) reports the use of routine volumetric sampling in New Zealand laboratories for a variety of tests. Grigg (1977) reported that Olsen P was measured on a volumetric basis as it yielded a better coefficient of determination to the relative yield of pasture and arable crops than if measured on a gravimetric basis. Grigg (1977) also reported several other reasons for adoption of the modified test.

Methods, results and comparisons

This section presents brief methods and results from recent studies for a variety of soils and regions across New Zealand evaluating effects of volumetric and gravimetric methods and undisturbed bulk density, soil depth and sieving methods.

Undisturbed bulk density measurements must be incorporated into soil quality information if volumetric and gravimetric methods are to be compared on an equal basis, if data are to be compared to work done overseas, for the purposes of a mass balance (and between depths) and for incorporation into environmental soil P assessments.

Comparison of volumetric and gravimetric methods and undisturbed bulk density – Southland soils

This study compares volumetric and gravimetric measurements of soil for Olsen P extraction and bulk density.

Approximately 40 pastoral soils of the Brown, Gley and Organic soil orders were sampled from coastal Southland (0-7.5 cm depth). These were air-dried, crushed, sieved < 2-mm and analysed for Olsen P concentration using gravimetric and volumetric methods, the latter utilizing a 2 mL scoop. Samples for undisturbed bulk density (0-7.5 cm) were also collected.

A comparison of gravimetric and volumetric data indicated a wide variation (Figure 1). However, when split into quartiles according to bulk density good relationships were found between the two methods. In general, data indicated that the disparity between the two methods increases with decreasing soil bulk density (Figure 1). For example, the relationship was closest to 1:1 (ie slope = 1.016; Figure 1) for soils with bulk density > 0.87g/cm^3. Caveats to the use of this data are that they only represent three soil orders, pastoral soils (of 0-7.5 cm depth) and have a limited pH and P concentration range.

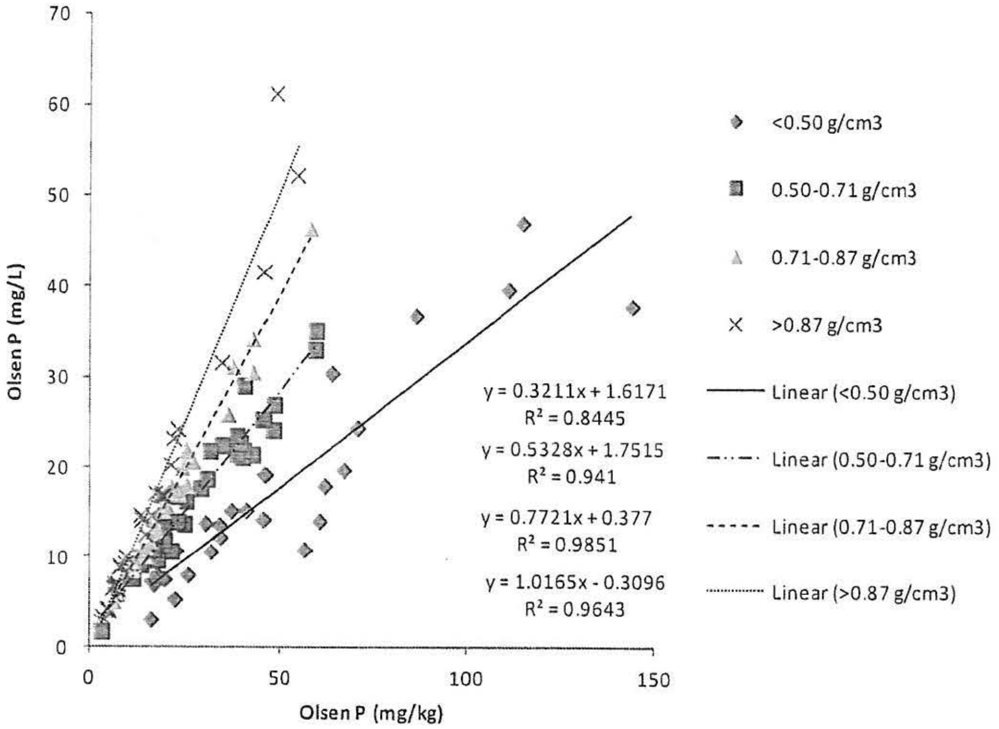


Figure 1: Comparison of Olsen P values for volumetric (mg/L) and gravimetric (mg/kg) methods with bulk density (g/cm^3) grouped by bulk density quartile for Southland region soils.

Comparison of volumetric and gravimetric methods

In this study, 55 soil samples were collected over several soil orders including the Allophanic, Brown, Gley, Granular, Pallic, Recent, and Ultic soil orders from the Auckland, Wellington and Marlborough regions. Samples were collected, as per sampling protocols (Hill and Sparling 2009), from 0-10 cm depth from a 50 m transect per site as part of the three regional council's SOE monitoring program for indigenous forest/scrub and dairy pasture land uses. Sample cores per site were bulked and mixed. For the Marlborough and Wellington regions, once mixed, samples were split to send a subsample to each laboratory. For the Auckland region, samples were sent to Landcare Research, then the laboratory sample was sent to Hill Laboratories. All samples were analysed for Olsen P at Hill Laboratories, Hamilton (volumetric basis, results in mg/L), and also at Landcare Research, Palmerston North (gravimetric basis, results in mg/kg) by their standard methods. Note that in this paper, results expressed in ppm mean either mg/L or mg/kg. Three samples for undisturbed bulk density at 0-7.5 cm were also collected per transect using stainless steel rings, with a 3 cm subsample ring then extracted for analysis at Landcare Research.

Figure 2 shows a comparison of the measured gravimetric and measured volumetric data split into quartiles according to bulk density. The relationships in Figure 2 indicated a slope range of 0.67-0.87, suggesting that gravimetric values of Olsen P were greater than for volumetric values.

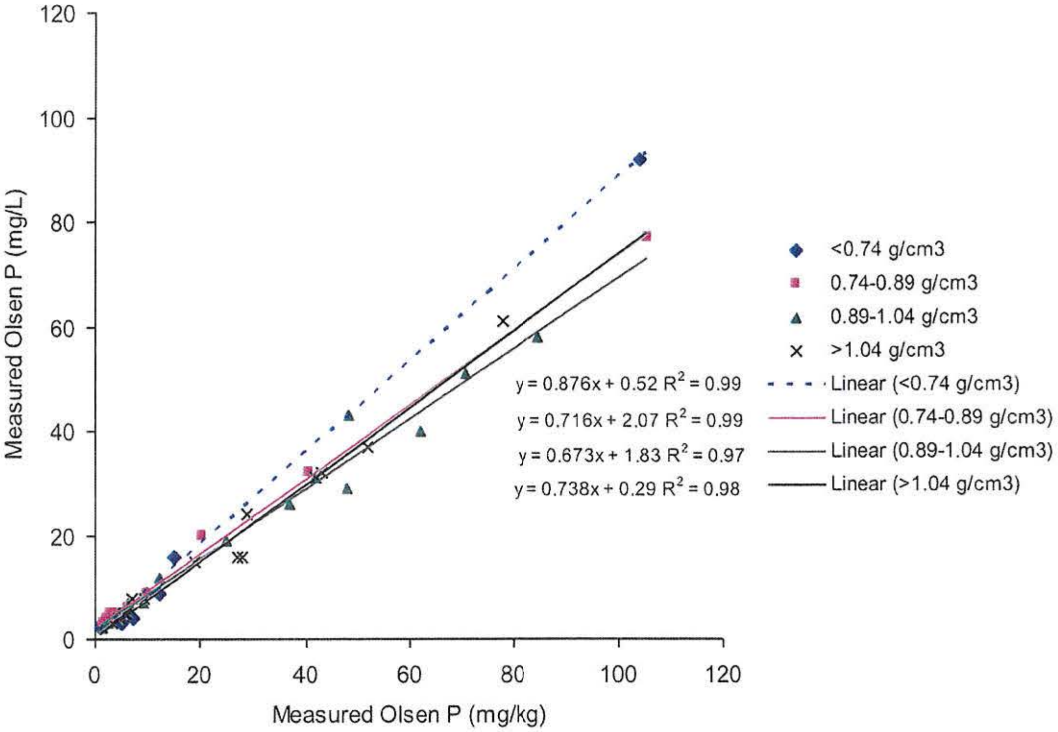


Figure 2: Comparison of Olsen P values for volumetric (mg/L) and gravimetric (mg/kg) methods with bulk density (g/cm^3) grouped by bulk density quartile for Auckland, Wellington and Marlborough region soils.

Gravimetric and volumetric treatments were not significantly different (p=0.116, paired t-test after data log transformed). However, samples with Olsen P values greater than 10 ppm were consistently higher when measured gravimetrically, while both methods gave similar results for samples with values below 10 ppm. There were 33 samples with Olsen P <10 ppm. These include 26 indigenous sites from Auckland and 7 from Wellington regions (Table 1).

Bulk density was then used to convert the volumetric results (from Hill Laboratories) data to a gravimetric result. Some Olsen P values have been received as rounded values which may affect comparisons especially for low values. The calculated gravimetric result (i.e. volumetric treatment converted using bulk density) was then significantly higher (p<0.0001, paired t-test after data log transformed) than the measured gravimetric treatment for this <10 ppm dataset.

Table 1. Comparison of volumetric and gravimetric methods between two laboratories for samples with Olsen P <10 ppm. Some values have been rounded.

Sample	Olsen P value Hill Laboratories volumetric (mg/L)	Landcare Research gravimetric (mg/kg)	Bulk Density (g/cm^3)	Hill Lab Olsen P with field bulk density conversion to (mg/kg)
Average	4.7	4.7	0.81	5.8
Median	4.0	4.1	0.77	5.4
Std dev	2.1	2.9	0.19	2.6

Note: Four values of Olsen P >10 as a result of gravimetric conversion

The remaining 22 samples with Olsen P >10 ppm are presented in Table 2. Gravimetric results were on average 33% greater than those from the measured volumetric method ($p<0.0001$, paired t-test after data log transformed) - but note that these results have not yet been converted using bulk density.

Bulk density was then used to convert the volumetric results (from Hill Laboratories) data to a gravimetric result for the remaining 22 samples with Olsen P >10 ppm. The calculated gravimetric result (i.e. volumetric treatment converted using bulk density) was then significantly higher ($p<0.0003$, paired t-test after data log transformed) than the measured gravimetric treatment for this dataset.

When bulk density was used to convert measured volumetric values to a gravimetric comparison, the average converted Olsen P value (38.8 mg/kg) was 17% less than the average measured value (47 mg/kg; Table 2). When bulk density was used to convert measured volumetric values to a gravimetric comparison, the median converted Olsen P value (28.5 mg/kg) was 32% less than the median measured value (42 mg/kg; Table 2).

Similarly, bulk density was also used to convert the gravimetric results (from Landcare Research Laboratory) data to a volumetric equivalent result (Figure 3). The calculated volumetric result (i.e. gravimetric treatment converted using bulk density) was then significantly higher ($p<0.001$, paired t-test after data log transformed) than the measured volumetric treatment for this dataset. The median converted value (40.7 mg/L) was 32% greater than the median measured value (31 mg/L; (Figure 3).

Table 2. Comparison of volumetric and gravimetric (i.e. laboratory) differences for samples with Olsen P >10 ppm. Some values have been rounded.

Sample	Olsen P value Hill Laboratories volumetric (mg/L)	Landcare Research gravimetric (mg/kg)	Bulk Density (g/cm^3)	Hill lab Olsen P with field bulk density conversion to (mg/kg)
Average	35.4	47.0	0.98	38.8
Median	31.0	42.0	1.00	28.5
Std dev	21.1	27.1	0.16	30.6

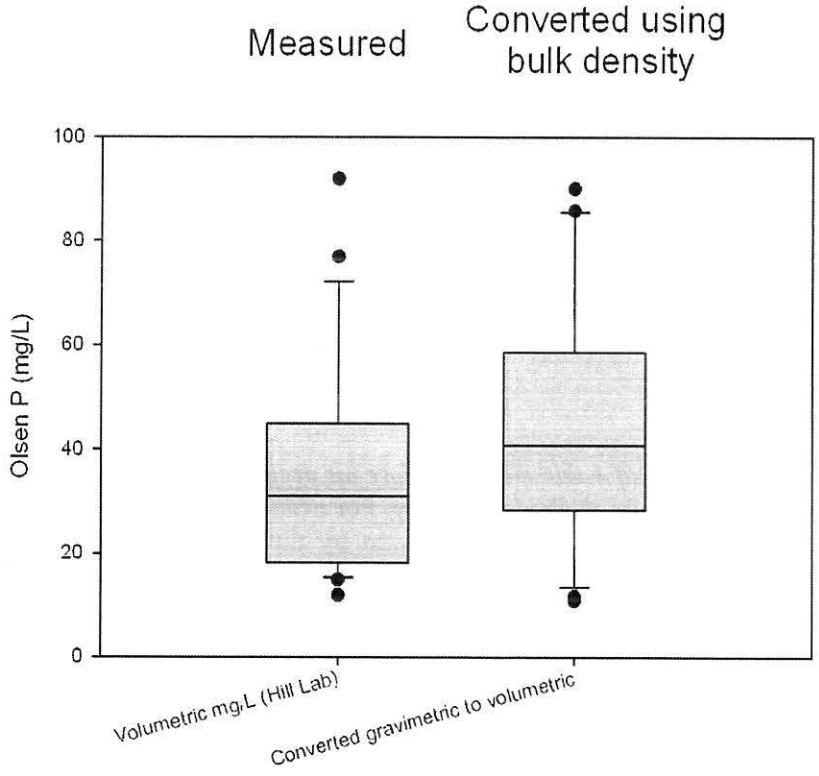


Figure 3: Comparison of Olsen P values for measured volumetric (mg/L) and measured gravimetric that has been converted to equivalent volumetric basis using undisturbed bulk density for Auckland, Wellington and Marlborough region soils.

Comparison of Olsen P measured at 0-7.5 cm and 0-10 cm soil depths

Soil quality monitoring by regional councils is undertaken at 0-10 cm soil depth across all land uses (Hill and Sparling 2009). Soil sampling by the fertiliser and agricultural industries for pastoral landuse is undertaken at 0-7.5 cm soil depth (Roberts and Morton 2009). The sampling depth for pastoral yield response research and soil fertility guidelines is 0-7.5 cm.

To assess the effect of these two soil depths on Olsen P values, 38 pastoral soil samples were taken from separate sites at two depths (0-10 cm and 0-7.5 cm) in the Waikato and Marlborough regions. Adjacent 0-10 cm and 0-7.5 cm samples were taken every one metre of a 5 m transect, per site, for the Waikato samples.

Soil orders sampled included Allophanic, Brown, Gley, Organic, Pumice and Recent Soils. The Olsen P analysis was carried out gravimetrically at Landcare Research, Palmerston North for Waikato (EW) samples and results are presented gravimetrically (mg/kg, Table 3). The Olsen P analysis was carried out volumetrically at Hill Laboratories for Marlborough (MDC) samples and results are presented volumetrically (mg/L, Table 3). For the purposes of this analysis the comparison is for depth, not method, so bulk density was not included.

Olsen P was on average 4% higher for the 0-7.5 cm sample depth compared with 0-10 cm, and statistically significant (p= 0.0075, paired t-test after data log transformed). Differences were noticeably greater (either more negative or more positive) for samples with Olsen P values greater than 60 ppm compared with lower Olsen P values.

Table 3. Comparison of the effect of sample depth on Olsen P in pastoral soils from Waikato and Marlborough regions. Some values may have been rounded. EW samples were reported gravimetrically (mg/kg), MDC samples were reported volumetrically (mg/L).

	Olsen P (mg/L or mg/kg)	
Sample	0-10 cm sample depth	0-7.5 cm sample depth
Average	63.6	67.4
Median	51.8	51.4
Std dev	59.3	62.8

Comparison of the effect of 4 mm sieving before air drying and grinding to 2 mm.

Soil sieving and preparation methods can vary. For example, soil is commonly air dried and crushed to pass through a 2 mm sieve. Driven by the requirements of the anaerobically mineralised nitrogen analysis, Landcare Research carries out an additional step of 4 mm sieving before air drying the sample and grinding to 2 mm. The effect of this additional sieving step on soil quality parameters has not been published.

To investigate effects of sieving preparation, 39 samples from the Waikato region were analysed for Olsen P at Landcare Research, Palmerston North and results are presented gravimetrically (mg/kg). Samples sieved to 4 mm followed by air drying and grinding were compared to those which just had obvious roots removed by hand (no sieving) before air drying and grinding.

The treatments were significantly different ($p=0.0304$). Samples sieved to 4 mm before air drying and grinding were on average 4% less than those with hand removal of obvious roots (Table 4). Olsen P values in 14 samples were greater with 4 mm sieving and 25 were lower compared with hand removal of obvious roots. Differences ranged from -25 to 20 mg/kg. Replication was considerably better below values of 50 mg/kg, which includes the recommended ranges for most crops and pasture.

Table 4. Comparison of soil sample preparation before drying on Olsen P values.

	Olsen P (mg/kg)	
Sample	Hand removal of roots	4 mm sieving
Average	66.8	64.1
Median	55.9	49.4
Std dev	60.3	62.2

Discussion

Our results and analyses show that Olsen P data on a gravimetric basis is different from Olsen P data on a volumetric basis, but only significant for concentrations > 10 ppm. This suggests that either method is suitable for measuring and reporting Olsen P values below 10 mg/kg and 10 mg/L. Comparing results with values > 10 ppm requires correcting data for undisturbed field bulk density. There was one noticeable consistency across several studies presented in this paper. Reproducibility of Olsen P data was much poorer above values of 50 ppm. Rajendram et al. (2003) suggested that conversion to volumetric from gravimetric measurement may not be straightforward, possibly due to chemical or other factors. Rajendram et al. (2003) also reported poorer relationships between volumetric and gravimetric methods for organic soils with low bulk densities than for sedimentary soils, a similar result as for organic soils sampled in Southland.

Whether or not Olsen P exceeds the current agronomic and SOE monitoring targets is important to regional councils and values above recommended guidelines would be considered to exceed soil quality targets. Many regional councils report SOE monitoring in relation to whether or not indicators are within or exceed relevant guidelines (e.g. Gray 2010; Stevenson 2010; Taylor 2011a). There has been some debate on the target values for Olsen P in regional council SOE reporting. Initial provisional SOE reporting targets were developed by Sparling et al (2008) based on crop production. For pastoral agriculture, the Olsen P SOE guideline of Hill and Sparling (2009) was generally considered too high. Recently Olsen P SOE guidelines have been revised (Taylor 2011b). For example, the current pastoral Olsen P SOE target values for sedimentary and organic soils are 20-35 (Taylor 2011b). Industry guidelines such as those in Roberts and Morton (2009) are also widely used to compare with soil quality results. However, there is increasing interest in research showing a greater risk to water quality as soil Olsen P concentrations increase (e.g. McDowell et al. 2003).

A perusal of some of the New Zealand published literature suggests that on some occasions Olsen P is reported on a gravimetric or volumetric basis interchangeably, or with direct comparison with guideline values of different units. Similarly, a perusal of regional council SOE soil quality reports over the last decade reveals that some report Olsen P on a gravimetric basis while others on a volumetric basis. Reports viewed were all clear on the units reported. Some were clear if they had converted gravimetric results to volumetric using bulk density. There were examples of publications comparing gravimetric results with the volumetric based industry guidelines. Also apparent was that the Land Monitoring Forum manual Olsen P recommended guidelines did not report measurement units. Similarly, some fertiliser industry publications did not report units. We note that early publications (e.g. Sparling et al. 2004) were clear that gravimetric results were converted to a volumetric basis using bulk density data. Rajendram et al. (2003) also reported some confusion or unawareness of volume and weight methods.

Bulk density must be incorporated into soil quality information data if the data are to be compared to work done overseas, for the purposes of a mass balance (and between depths), for soil comparisons, and for incorporation into environmental soil P assessments. When soil quality data are expressed volumetrically then comparisons can be made with New Zealand fertiliser industry guidelines. This is particularly important as sample bulk densities move below or above a value of 1 g/cm^3, as illustrated in some results in this paper. Similarly, for example, a sedimentary soil with bulk density of 1.17 g/cm^3, a measured Olsen P of 33 mg/kg has an equivalent calculated Olsen P value of 39 mg/L. A sedimentary soil with bulk density of 0.86 g/cm^3, a measured Olsen P of 71 mg/kg has an equivalent calculated Olsen P value of 61 mg/L.

Sample depth had a small (4% on average) effect on Olsen P. Differences were noticeably greater (either more negative or more positive) for samples with Olsen P values > 60 mg/kg (Waikato samples). For the samples taken in the Waikato, pasture is regularly renewed so it is likely the soil is ploughed at least every 10 years. Unploughed land is likely to show a greater gradient down the first 15 cm of the profile. Coad et al. (2010) reported greater differences in Olsen P at 0-7.5 cm of approximately 15% on average compared with 0-10 cm depth. While either depth provides suitable data for assessing the P status of soils, users should consider these differences in values when interpreting between the SOE and industry soil monitoring methods.

The effect of sieving before drying was not consistent compared to the hand removal of roots. There may be several factors impacting on the Olsen P result including effects of the roots themselves on the adjacent soil and how much this soil is removed with the roots (e.g. roots depleting P in the immediate vicinity of the root, root extrudes extracting P, transfer of P from less bioavailable pools; Schachtman et al. 1998). The variability in the data suggests a number of unaccounted for processes and/or the amount of soil removed with roots varied. Spatial variation may also be a factor.

Some caution should be applied with our preliminary results given sample sizes, limited range of soil orders and some variation on methods. For one of the studies, bulk density measurements at 0-7.5 cm were used to help evaluate Olsen P at 0-10 cm so some caution should be applied. While we attempted to minimise variation, and have a range of soils, there is a potential risk of type I or II statistical errors. Further research is recommended to quantify and minimise errors associated with re-sampling, depth and spatial variation. It may be helpful to also quantify dried sample weights and volumes for each method. Further research is recommended to evaluate the implications between some of the methods in this paper.

There are other aspects of soil quality that users should be aware of but one is only briefly mentioned here, as these are beyond the scope of this paper. For example, gravels and stones are a soil property affecting measurements such as Olsen P. Rajendram et al. (2011) showed that the exclusion of the gravel fraction prior to analysis (common laboratory practice) would have lead to higher Olsen P recommendations required to maintain maximum pasture production. Testing the soils with gravel was more representative of the original sampled soil, particularly if the soils contain large amounts of gravel. The exclusion of gravel will also have implications on other chemical tests in the soil. Greater losses of P may also be likely in gravelly soils so the percentage of stones > 2 mm should also be considered.

There are other considerations for further research or comparison. There is also need for investigating the effects of gravimetric, volumetric and other laboratory methods on other soil quality indicators, and whether assumptions and methods from earlier studies and methods are still used routinely today. The use of near infrared reflectance (NIR) techniques and other new technologies are likely to mean other differences in methodology such as for organic matter and nitrogen measurements. There is also likely to be scope for potential utilisation of extensive industry results to help characterise the state of the environment and reporting to aid resource management, so this should be investigated.

Conclusions

From our investigations we conclude that there are some key differences in soil quality monitoring approaches in New Zealand.

- Many commercial laboratories and some researchers measure and report Olsen P on a volumetric basis. New Zealand fertiliser industry guidelines for Olsen P are measured on a volumetric basis. For simplicity, units have not always been reported. Some research laboratories and researchers measure and report Olsen P on a gravimetric (weight) basis.

- Preliminary results and analyses show that Olsen P data on a gravimetric basis is different from Olsen P data on a volumetric basis. In some cases variation can be wide particularly with soils of low bulk density. The variation between the methods can increase with decreasing bulk density or as bulk density moves away from 1 g/cm^3.
- Comparing volumetric and gravimetric results on an equal basis requires correcting data for undisturbed bulk density, but results can be variable.
- When bulk density was used to convert measured volumetric and measured gravimetric values that were converted to an equivalent volumetric basis using undisturbed bulk density, median values differed by about one third.
- Sample depth (0-7.5 or 0-10 cm) had a small effect on Olsen P.

We recommend

- that users of soil quality data pay careful note of the units for results reported by laboratories and for interpretation of data such as subsequent comparison with guidelines;
- that where needed clear statements are reported for use of conversion methods; and
- that the differences in methodology are taken into consideration for resource management decisions, when developing policies such as for managing to limits for freshwater management, and when interpreting soil quality data and monitoring programmes.

Acknowledgements

We thank Bernard Simmonds for supplying some of the Southland soil data and analyses. Thanks to Paul McGill who helped raise the initial discussions, Ngaire Foster, Fiona Calvert, Gordon Rajendram and many others who contributed ideas and information.

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PART ~~B~~ C

Edgar Henson

From: Edgar Henson <et@hensons.co.nz>
Sent: Tuesday, 7 March 2017 4:07 p.m.
To: 'healthyrivers@waikatoregion.govt.nz'
Subject: SUBMISSION.. PLAN CHANGE 1.
Attachments: office@hensons.co.nz_20170307_151506.pdf

Importance: High

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095891100
021763900

-----Original Message-----
From: office@hensons.co.nz [mailto:office@hensons.co.nz]
Sent: Tuesday, 7 March 2017 3:15 p.m.
To: et@hensons.co.nz
Subject: Scanned image from Hensons Realty Ltd

Reply to: office@hensons.co.nz <office@hensons.co.nz> Device Name: Hensons Realty Ltd Device Model: MX-2640N Location: Ellerslie

File Format: PDF (Medium)
Resolution: 200dpi x 200dpi

Attached file is scanned image in PDF format.
Use Acrobat(R)Reader(R) or Adobe(R)Reader(R) of Adobe Systems Incorporated to view the document.
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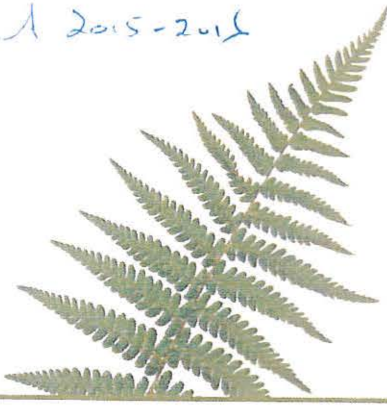
Beef + Lamb NZ Annual Report 2015-2016

There was a 20% increase in the number of farmers attending B+LNZ farm and environment planning workshops between the 2014-15 and 2015-16 seasons —853 farmers, compared with 713. Significantly, farmers have began moving on to the level 2 workshops.



Julia Beijeman

After completing a Bachelor of Forestry Science, Julia worked in biosecurity with the Canterbury Regional Council. She was then a policy analyst with the Ministry for Primary Industries. Julia moved to Ho Chi Minh City, where she trained and worked as an English teacher, before going on to Western Australia, where she was Environment Policy Manager for the advocacy body, the Western Australian Local Government Association. "In all cases, it was about building relationships, communicating clearly, and delivering on what you said you would do."

Julia describes her B+LNZ role as being "the translator and tour guide for farmers". "I translate policy language into plain English, so farmers do not have to read through thousands of pages. Then they can respond back to council in an informed way."

And tour guide? Julia takes farmers on the submission process journey and helps them form their ideas. "If I do my job properly, I'll hopefully do myself out of employment. Farmers will be doing it themselves."

Corina Jordon

Corina came to B+LNZ after nine years with Fish and Game, where she provided planning and freshwater ecology expertise; she later became the organisation's National Environmental Manager. Corina has extensive experience working across government organisations and was heavily involved in the Land Water Forum.

Over the years, Corina had worked alongside B+LNZ senior management and directors and liked their values and approaches to environmental policy.

She has a Bachelor of Science, Honours in natural resource management and a Master's in environmental management.

Corina is enjoying engaging with farmers. "I see real strength in building farmer capacity and capability around the sustainable management of land and water resources to enable them to advocate on behalf of themselves and the sector."

She believes that solutions lie with communities, and will be dependent on strong leadership from individuals, including farmers.

"The biggest challenge of the job is ensuring success. Farmers have a voice and they are using it, but ultimately we need to see farmers' values reflected back in the policy."

USE OF OVERSEER

In 2016, B+LNZ funded a review of Overseer's use and relevance for the sheep and beef sector—and some of the findings are already in place. B+LNZ is working with others to build industry capability in the nutrient modelling area. Efforts include developing nutrient budgets for the B+LNZ Sheep and Beef Farm Survey properties, producing a guide to streamline information collection and input into Overseer, and recommending research that will improve the model's accuracy.

MOUNTAINS TO THE SEA

The "From the Mountains to the Sea" environment project kicked off in early 2016.

Backed by the B+LNZ Southern South Island Farmer Council, it involved three farms across Southland. The project aimed to show the value of farm environment planning and explore the challenges and opportunities associated with three very different farms in three very different catchments.

A field day was held at each farm and regionally specific environmental topics were discussed, such as winter grazing, hill country cultivation, artificial drainage and stock exclusion form waterways.

Through the field days, the three project farmers were able to share their experiences with the wider community. Their key message was that every farm has its own challenges and opportunities, and working through a B+LNZ Farm Environment Plan is a great way to identify and prioritise key on-farm actions.

ENVIRONMENT CONFERENCE

B+LNZ hosted its second Environment Conference in Wellington in December 2015.

The two days involved 60 farmers and were designed to equip them with the skills and knowledge to negotiate sustainable land and water management regulations in their regions. Session topics included how to communicate the sector's environmental story effectively and the role of farm plans. The next conference is scheduled for February 2017.

Soil carbon offers unsung benefits

Soil carbon, in the form of soil organic matter, has a number of widely recognized benefits for crop production.

It is a slow-release form of key nutrients including nitrogen, phosphorus and sulphur that helps both plants and soil microbes to thrive.

It can hold more water and release it as needed, helping protect crops from dry conditions.

Organic matter helps stabilize the pH and acidity of soils.

Carbon-rich soil is darker than soils without it, so it warms more quickly in the spring.

Organic matter binds soil particles together, much like glue, and makes soil less prone to erosion.

It binds nutrient ions, such as potassium, calcium and magnesium, in the soil to prevent losses through leaching.

Some of the organic material in soil humus is thought to act as plant growth stimulants.

Soil organic matter is a major part of the Earth's carbon cycle, and is thought to be twice as large as the plant and atmospheric pools.

Organic matter also plays a major role in the ability of soils to tie up or absorb pollutants, where they can then be degraded by soil organisms.

Source: prairiesoilsandcrops.ca

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Carbon key to building resilience on farms

Building soil carbon supports soil biota and makes for a healthier farming system

244 73

By Laura Rance FOLLOW
Editorial Director

Published: November 21, 2016
Crops
1 comment

A healthy soil that's high in carbon can make your farm a more efficient user of nutrients.

Farmers often see themselves as feeding the world, but farmers attending the Organic Connections conference here recently were told the first step towards that goal is feeding the "starving and homeless" micro-organisms in their soil.

> "Your job is to feed them and maintain their habitat," Kristine Nichols, the chief scientist with the Rodale Institute told farmers attending the Organic Connections conference Nov. 3 in Regina.

Kristine Nichols

"There are 10 billion organisms and all they need from you is food and a place to live."

The Rodale Institute, based in Pennsylvania, has been researching organic farming systems since 1947. Much of its recent work has focused on reducing or eliminating tillage in organic systems.

Nichols said finding ways to add carbon is key to building resiliency into farming systems. "Soil is your most important resource, if you don't feed it, it's not going to feed you."

She said evidence is showing the cost of farming rises as soil quality declines. "What's happening is the amount of nitrogen that is needed is actually going up. It takes more nitrogen today to grow a bushel of grain than it did in 1960," she said. "The reason is, we have decoupled the system from biology."

Nichols, a soil microbiologist, said adding cover and green manure crops and reducing tillage can help restore the diversity of organisms within the soil, which in turn improves its ability to nourish crops and efficiently use water.

She is suggesting farmers shift their focus from using high yields to measure the success of their farming system to focusing on high carbon.

The balance between carbon and available nitrogen can be improved by using different combinations of crops, rotations and including perennial legumes in the mix.

But there are no shortcuts or "bug in a jug" farmers can buy to accomplish that goal, she warned. "If you can afford to go out and do that, then you can afford to change your system. There is no immediate gratification."

Nichols said the biological webs beneath the surface are "incredibly elegant" and easily destroyed by tillage operations. If farmers do till, they need to provide an environment that allows those networks to reform as quickly as possible.

Nichols told farmers it's impossible for her to advise them on which cover crop mixes are best because soils in different areas and in different phases respond differently. There is no one single recipe that will work for all, rather principles that can help guide their decisions. "It takes time, patience and thought."

Two of those principles include including perennials and livestock. "Overall, as far as helping build biologically healthy soil, having a perennial phase in the system is really important," she said.

Livestock is also an asset when attempting to build an integrated approach to improving soil biology because it is adept at recycling nutrients.

The three-day conference attracted about 150 farmers.

This article was originally published on OrganicBiz.ca.

Provision	I support/ oppose/ and for each whether or not you wish to amend The reasons for this are:	I seek that the provision is: Deleted in its entirety/ Retained as proposed/ amended as set out below As an alternative I propose
Sediment.	I support the adoption of Stratergies to stop erosion.	This started 30 years ago on our property. See attached

WAIKATO VALLEY AUTHORITY

AGREEMENT made the 24th DAY OF August 19 83 BETWEEN THE WAIKATO VALLEY AUTHORITY constituted under the Waikato Valley Authority Act 1956 (hereinafter called "the Authority") of the one part AND Gordon Gerald Shane Fleming of Glen Murray farmer as to the land first mentioned and Kitemoana Station Limited at Pukekohe as to the land secondly mentioned. (hereinafter called "the owner") of the other part WHEREAS the owner is the registered proprietor of an estate in fee simple/or leasehold in the land described in the first schedule hereto (hereinafter called the "said land") AND WHEREAS pursuant to section 30 of the Soil Conservation and Rivers Control Act 1941 the Authority is authorised to make payment as grantor to the owner for the purposes specified in this agreement.

NOW THIS AGREEMENT WITNESSETH that it is hereby agreed and declared by and between the parties hereto as follows:

1. IN consideration of the payment of a grant by way of a subsidy at the rate or rates set out in the second schedule hereto paid or credited to him by the Authority the owner within or throughout (as the case may be) the specified periods in the second schedule will carry out to the satisfaction of the Authority the works and requirements set out in the second schedule. Alternatively by agreement all or some of the works specified in Part V of the second schedule may be carried out by the Authority and in this event and upon being advised of the amount the owner will forthwith pay his share of the cost of such works to the Authority unless prior arrangement is made to pay such share by instalments in which case the said share together with a share at the same rate or rates of any escalation of costs shall be paid by the owner in ―――――― annual instalments the first of such instalments of $―――――― to be paid on or before ―――――― day of .... 19――――――

2. UPON completion of the works to the satisfaction of the Authority within the period specified in Part I of the second schedule the Authority shall pay or credit to the owner a grant by way of a subsidy at the rate or rates set forth in Parts I and V of the second schedule.

3. THE OWNER throughout the currency of this agreement shall permit the Authority by its officers, servants and agents at all reasonable times to enter upon the said land for the purpose of inspecting the same and to ascertain whether the owner has complied with his obligations hereunder.

4. IF the owner howsoever makes default in complying with any of his obligations under this agreement, the Authority by notice in writing delivered to or posted by registered post to the owner specifying the default may either at the sole option of the Authority require him to repay to the Authority all subsidies paid or credited to him or such proportion thereof as the Authority shall stipulate or within one calendar month after receipt of such notice to remedy such default in such manner as the Authority may therein require; and if following receipt of such notice the owner fails within one calendar month thereafter to comply with the requirements thereof it shall be lawful for (but not obligatory on) the Authority by its servants, agents or contractors to enter upon the land described in the first schedule hereto and carry out all works necessary to secure compliance with the requirements of such notice and recover from the owner the cost of so doing by action at law or otherwise.

5. ALL the provisions of Sections 30 and 30A of the Soil Conservation and Rivers Control Act 1941 shall apply to this agreement and in particular the owner agrees that it shall run at law with the land against the title to which it is registered so as to impose on present and future owners of the land an obligation to observe and perform the agreement during their occupancy of the said land.

6. MAINTENANCE of all works and requirements set out in Parts II and V of the second schedule shall be the sole responsibility of the owner to do and provide the cost thereof with the exception of any specified items in Part IV of the second schedule which may attract a maintenance grant.

IN WITNESS WHEREOF these presents have been executed the day and year hereinbefore written.

The Common Seal of Kitemoana Station Limited was Affixed hereto in the presence of:

Signed G.G.S. Fleming

G G Fleming

Owner

Witness: A L [illegible]

Address: Hamilton

Occupation: Asst Soil Conservator.

Pursuant to a resolution of the Authority the Common Seal of the Waikato Valley Authority is affixed hereto in the presence of:

Chairman: [illegible]

Member: [illegible]

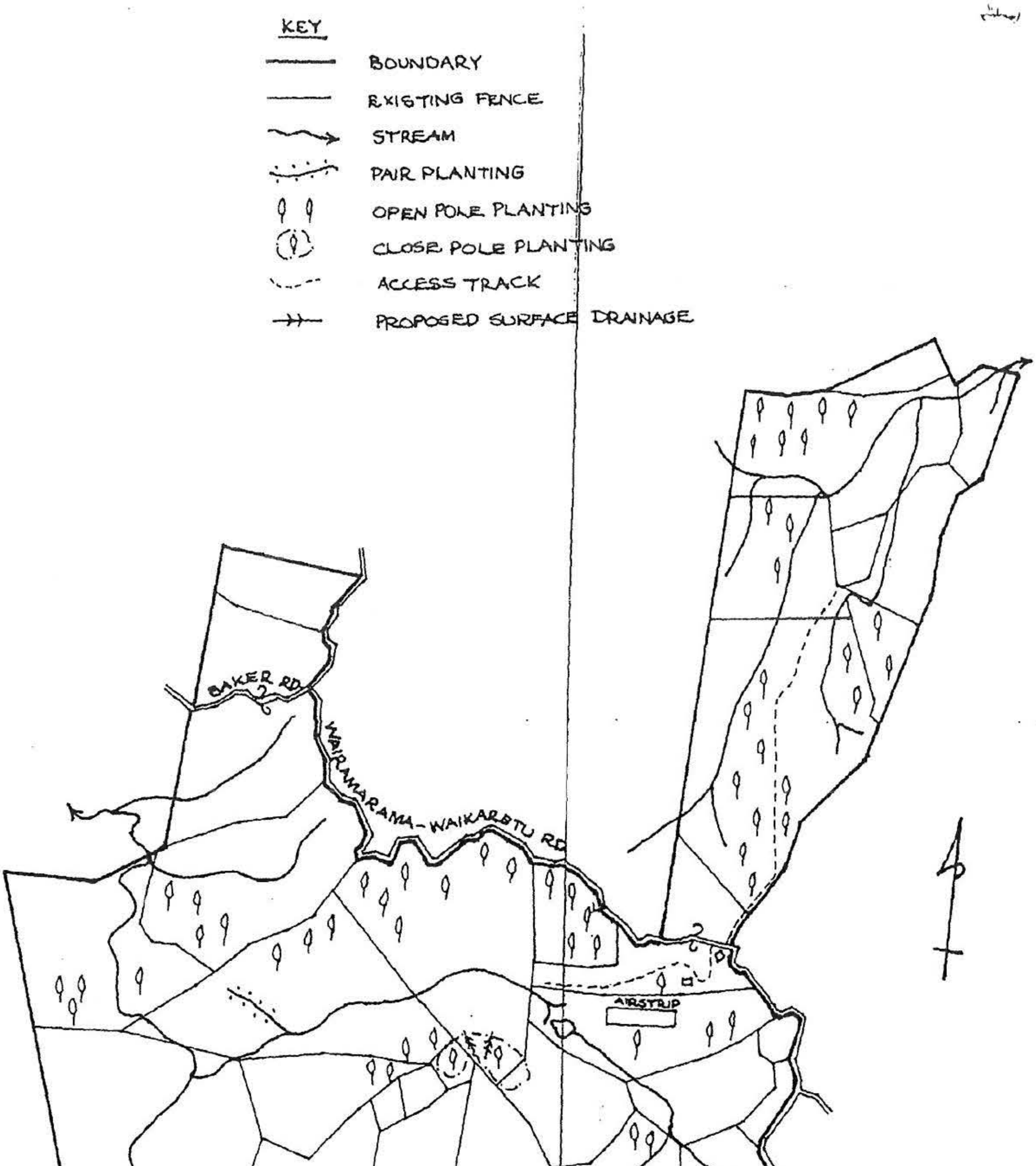
Secretary: [illegible]

THE FIRST SCHEDULE

Description of Land:

FIRST: all of that land in the South Auckland Land District comprising 183.7019 hectares being Lots 1 and 2, DPS 11913 and being all of the land in Certificate of Title 10A/48 and

SECONDLY: all of that land in the said land district comprising 645.0891 hectares being Sections 1 and 4, Block VI, Awaroa Survey District, Lot 1, DPS 8863 and Lot 1, DPS 16924 and being all of the land in Certificate of Title 915/117, 11A/654 and 15A/417.


KEY
BOUNDARY
EXISTING FENCE
STREAM
PAIR PLANTING
OPEN POLE PLANTING
CLOSE POLE PLANTING
ACCESS TRACK
PROPOSED SURFACE DRAINAGE
BAKER RD
WAIRAMARAMA-WAIKARETU RD
AIRSTRIP

THE SECOND SCHEDULE

PART I

It is agreed that the conservation works as set out in Part V and described on the plan endorsed or attached subject to such amendments as may be mutually agreed upon in writing by the owner and the Authority will be carried through to completion over a period of five years and the rate of grant applicable to initial capital works shall be 60 % Grant 40 % Owner.

PART II

WORKS AND REQUIREMENTS	SPECIFIED PERIODS	CONDITIONS
Fencing	For ——— years	To be constructed and maintained in stockproof condition except that renewal of fences shall be as set out in Part III of this agreement.
Tree Planting	For 99 years	To apply such silvicultural practices as the Authority deems necessary to ensure that the trees are kept in good condition. Mature trees may be utilised with the approval of the Authority, but shall be re-established with approved species by and at the cost of the owner.
Crossings	For ——— years	To be constructed and maintained so as not to obstruct normal and flood flows or to allow stock access to areas retired from grazing, this requirement also applies to existing crossings or those relocated with the consent of the Authority.
Structures	For ——— years	To be maintained as deemed necessary by the Authority.
General	For ——— years	No building to be erected or cultivation, agricultural cropping, soil removal or other unprescribed land use to be undertaken in areas fenced out for conservation and coloured green on plan.
Stocking	For ——— years	No stock to be grazed in areas fenced out for conservation and coloured green on plan.
Sundry	For ——— years	For details see sheet inserted.

PART III

Maintenance is defined as the activities to maintain soil conservation works, existing or established under this agreement, being the care of trees, plantations, protection forest areas, vegetation established or protected directly for the mitigation of specific erosion and any additional work carrying capital subsidy as detailed above, including water supply reticulation, firebreaking and bridges.

In addition it includes subsequent replanting or willow layering, the spraying or clearing of undesirable vegetation in channels, gullies, waterways and contour works, planted strong points being kept in good order, together with repairs as necessary to flumes, conduits, structures, culverts, floodgates, fences and access tracks.

When fences are due for renewal and providing proper maintenance has been done as and when required such fence renewal will be subsidised at the rates then applicable.

PART IV:

~~Rate of grant for maintenance of specified work or requirements shall be as follows~~:

Fencing % grant ~~% owner~~

Planting ~~% grant~~ % owner

~~Sundry (specify) % grant % owner~~

PART V:

Works:

SUMMARY OF WORKS

Pole planting and drainage of earth flow areas, open space pole planting of other erodable areas and pair planting of isolated eroding gullies.

Estimated Costs:	Pole planting	1800 3m poles @ $5	$ 9,000
	Drainage	200m - machine hire 3 hours @ $50	150
	Service Fee	25%	2,287
			$11,437

Subsidy	60%	$6,862
Local Share	40%	$4,575

CCI 2050

G

WAIKATO VALLEY AUTHORITY

Land Improvement Agreement

I hereby certify that this agreement is the duplicate of a Land Improvement Agreement and I apply for registration against the land described in the 1st schedule hereto and certify it is one that may be registered under Section 30A Soil Conservation and Rivers Control Act 1941.

Secretary

403324

915/117 15A/417
10A/48
11A/654

Registry

B. Lloyd.

Yours sincerely

Signature Date