



Environmental Laboratory Services

Testing the Waters



Water Potability for Small Supplies

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Summary of suites: price includes bottle delivery on standard courier routes.

Test Code	Purpose	Cost - exc GST	Page
AFBS	AquaFarm Basic for South Island farmers	\$45	5
AFBN	AquaFarm Basic for North Island farmers	\$40	5
AFPN, AFPS	AquaFarm plus	\$180	5
NZS1	NZDWS surface water suite	\$227	6
PB	ELS surface water suite	\$112	7
NZS2	NZDWS ground water suite	\$249	8
PBB	ELS ground water suite	\$135	9
NZS3	NZDWS roof water suite	\$64	10
contract	E.coli only	\$22	10
ICE	Ice	\$60.50	11
MWAT	Bottled water suite	\$239	12
AMTI	A more thorough investigation including organics	\$1200	12
AMTI	A more thorough investigation excluding organics	\$435	12
FRM	Microbiological analysis	\$98	13
FRM	Specialist microbiological analyses	\$100	13

Cover Photo: A glass of pure NZ water

Introduction

Environmental Laboratory Services is one of New Zealand's leading experts in the areas of:

- Air quality monitoring
- Boiler water
- Environmental water
- Landfills
- Meat industry services
- Potable water for councils
- Sample Integrity
- Swimming pools
- Biological fluids
- Ceramicware and metal food containers
- Food and Dairy Products
- Legionella
- Metals
- Potable water for small communities
- Sewage and effluent
- Trade waste

The company has its origin as part of the Hutt City Council Laboratory and became a private enterprise in 1994. In 1998 the laboratory acquired the Wellington City Council Laboratory. In September 2001, ELS further expanded with the purchase of the Inorganic Chemistry section of AgriQuality New Zealand. This section was previously part of ESR, which before that was the DSIR.

We are based in a purpose built facility of 1450 m² at 85 Port Road, Lower Hutt. ELS is comprised of four separate laboratory areas – Instrumental Chemistry, General Chemistry, Biological Fluids, and Microbiology. The latter is further split into three separate rooms with clean, cleaner and ultra clean capabilities. The ultra clean lab is used for pathogenic bacteria determinations.

ELS is privately owned by scientific people committed to the science industry in New Zealand. We continue to be one of the few major laboratories in the country with such a broad microbiological and chemical analysis capability. We provide high quality, fast turnaround analyses at competitive prices.

Who should use this brochure?

This brochure has been developed to assist operators of small water systems, schools, dairy farmers, food premises owners, tankered water providers, ice manufacturers, and bottled water producers. The brochure shows you how to arrange the testing of your water and includes suite prices and useful information.

Small water systems are defined by the New Zealand Drinking Water Standards as those, which provide a population of 100 or less.

Why do we need safe water?

Excerpts from Dr Michael Taylor's excellent Ministry of Health presentation of the same name. Copies are available on request.

New Zealanders drink water with varied water qualities from many different places, such as:

- Bottled water
- Farmhouses with bore water sources
- Holiday homes using roof water collection
- Ice
- Rural supplies receiving tankered water
- Urban reticulation systems
- Workplaces

Comparison with many other countries shows that New Zealand has some of the best drinking-water quality in the world. One of the reasons for this is that New Zealand has comparatively little industry that uses processes, which generate chemical wastes.

However, there is some complacency in New Zealand about how much waterborne illness exists. This brochure details some of the ways in which you can test a water supply for a wide range of important parameters.

It is very important to point out that New Zealand has one of the highest rates of gastro-enteritis due to *Campylobacter* and the protozoa *Cryptosporidium* and *Giardia* in the developed world. But the actual numbers are not reliably known because only a fraction of the cases are notified. Most outbreaks of gastro-enteritis are usually blamed on food, but water is often implicated. Cases of waterborne disease may often be missed because the first suspicion usually falls upon food poisoning and adequate epidemiological studies are often not done.

Another reason for safeguarding the quality of our drinking-water supplies is the risk from emerging pathogens. New pathogens are emerging steadily. Humans may not have developed immunity to these if they have not been in contact with these organisms before.

ELS offers packages of tests we call suites, designed specifically around the needs of water producers and water consumers. These range from extensive suites for manufacturers of bottled water right down to farm and householder water supplies.

ELS can assist you with any analytical water quality need, so please do not hesitate to contact us.

Food Premises Process Water

The New Zealand Food Safety Authority (NZFSA) requires food processing and export premises to conduct testing on the water used in their processes. The type and frequency of testing is dictated by NZFSA for the particular premises, depending on the premises type and volume of water used. It is critical for premises to conduct their water testing on an ongoing basis, as without the necessary testing a premise can be closed by NZFSA.

ELS is IANZ and LAS (formerly MILAB) accredited to perform a full range of water testing on food premises supplies.

Please contact us for further information.

AquaFarm Packages

AquaFarm is a water-testing package designed for New Zealand farmers. It will assist farmers to meet the requirements of the NZFSA Standard on Farm Dairy Water for water that may come into contact with raw milk intended for the manufacture of dairy produce.

The NZFSA requires that water is safe from microbial and physical contamination in compliance with the Dairy Industry Act and associated regulations, and tested using methods in compliance with the New Zealand Drinking Water Standards.

Two packages are available. The basic package tests for E.coli and turbidity while AquaFarm Plus tests for the following full set of tests:

- pH
- Turbidity
- Alkalinity
- Total Hardness
- Total Manganese
- Arsenic (for Waikato)
- Odour
- Total Coliforms
- Conductivity
- Colour
- Acidity
- Total Iron
- Boron (for Wanganui/Central)
- Sulphide by smell
- Sediment by Observation
- Faecal Coliforms

Costs for these packages are as follows:

AquaFarm Basic Package South Island	\$45 + GST
AquaFarm Basic Package North Island	\$40 + GST
AquaFarm Plus Package	\$180 + GST

Small Community and Individual Drinking Water Supplies

Many New Zealanders rely on untreated water sources such as bores, springs, streams and roof supplies to meet our drinking, washing and food preparation needs. 22% of New Zealanders are currently drinking water that is either contaminated by faecal matter (4%) or of unknown quality (18%).

There are three main types of source water used for drinking:

- surface water – includes streams, rivers, lakes and reservoirs
- groundwater – includes bores and springs
- roof water – is rainwater that is stored for future use

While any test that ELS performs is a snapshot of the moment of sampling, we are still able to provide you with an indication of the water quality you may have at that particular time. We offer three different suites of tests as recommended by the New Zealand Drinking Water Standards (NZDWS).

The suites have been established by laboratory and water treatment experts and are designed to provide information necessary to set-up treatment systems. If you are testing for this reason it is important to sample at a time that the water is at its worst quality – after heavy rainfall.

ELS also offer cheaper surface and groundwater suites that provide water quality information for clients not intending to treat their supply.

NZDWS Surface Water Price for the suite = \$227 + GST

All surface waters contain bugs (which we call micro-organisms), although some water is more often and more badly contaminated than other water. A catchment is the surface run-off area for the local rainfall. Water flowing over the ground can become contaminated with various things. You find more micro-organisms in catchments where there are human wastes (from septic tanks and wastewater treatment plants) and animal wastes.

Human and animal wastes can contain bacteria and viruses that are bad for humans (pathogenic), but animals can be more of a problem because they distribute their wastes so widely. Cattle are the most likely source of *Cryptosporidium*. Basically, the closer they get to the water source, the higher the numbers of *Cryptosporidium* in the water.

Our tests attempt to assess the risk of chemical contamination of a surface water supply. These risks are associated with the sorts of things that could be going on upstream which could be causing contamination, such as factories and farming processes.

The Surface Water suite measures the most likely contaminants and includes:

Test	Notes
Arsenic	Associated with geothermal areas, mining or timber treatment areas, and can appear in other groundwaters.
Boron	Associated with geothermal areas.
Bromide	Forms bromate when oxidised by ozone.
Calcium	Is required in order to calculate the calcium hardness
Calcium hardness	Determination of the calcium component of the water hardness. Is required for the saturation index.
Chloride	High levels indicate seawater intrusion, and will also affect taste and corrosiveness of the water.
Conductivity	Useful water quality parameter, and is used in the calculation of saturation index.
E.coli	Indicator of faecal contamination
Fluoride	Common in some water sources, is good for health at low levels, but not so good at elevated levels.
Iron (Dissolved)	Common in many water sources and can cause taste and staining problems.
Iron (Total)	Total iron is included for treatment information.
Langelier Saturation Index	Calculated from the pH, alkalinity, conductivity, and calcium hardness results. A good indicator of likely scale formation in pipes.
Magnesium	Is required in order to calculate the total hardness
Manganese (Dissolved)	Common in many water sources and can cause taste and staining problems.
Manganese (Total)	Total manganese is included for treatment information.
Nitrate	Elevated levels can affect the health of infants
pH	Useful water quality parameter, and is used in the calculation of saturation index.
Potassium	Dairy effluent contamination indicator.
Suspended solids	Needs to be below 5 mg/L for UV treatment.
T ₂₅₄	Transmission of UV light at 254nm. Useful for determining suitability of UV treatment.
Total alkalinity	Useful water quality parameter, and is used in the calculation of saturation index.
Total hardness	Calculated from the calcium and magnesium tests. This is an indicator of likely scale formation in pipes.
Turbidity	Low turbidity needed for clarity and UV treatment.

ELS Basic Surface Water Price for the suite = \$112 + GST

This suite of tests measures the most likely contaminants including:

- E.coli
- Chloride and Nitrate
- Iron, Copper, and Manganese
- pH, Conductivity, Turbidity

NZDWS Ground Water Price for the suite = \$249 + GST

Care must be taken when defining a groundwater source. While springs are often described as a groundwater the source of the spring may be only a few metres away and above ground. Wherever you are unsure of the source of your groundwater, always treat it as though it is surface water and therefore likely to be contaminated. Most groundwater supplies are not secure and cannot be considered safe to drink unless proven by laboratory analysis.

Secure bores have historically been microbiologically the safest water supply and if they are properly secured and well away from septic tanks then they are difficult to contaminate.

If you use groundwater for your water source, and you live near hydrothermal or geothermal areas, your water may contain above-average concentrations of boron, fluoride, and arsenic. Although fluoride helps to prevent tooth decay, generally drinking water levels should be as low as possible.

Groundwater from areas that have a lot of farming, orchards and market gardens, or where waste water is disposed into the ground, may contain levels of nitrate higher than the maximum acceptable value (or MAV). This usually only affects infants. Some shallow groundwaters may contain traces of pesticides if these are used heavily in your district, but so far these have hardly ever been found at levels that could make people sick, so we don't routinely test for them.

The following tests have been specifically designed to offer the best value suite of tests for a ground water source.

Test	Notes
Arsenic	Associated with geothermal areas, mining or timer treatment areas, and can appear in other groundwaters.
Boron	Associated with geothermal areas.
Bromide	Forms bromate when oxidised by ozone.
Calcium	Is required in order to calculate the calcium hardness
Calcium hardness	Determination of the calcium component of the water hardness. Is required for the saturation index.
Chloride	High levels indicate seawater intrusion, and will also affect taste and corrosiveness of the water.
Conductivity	Useful water quality parameter, and is used in the calculation of saturation index.
E.coli	Indicator of faecal contamination
Fluoride	Common in some water sources, is good for health at low levels, but not so good at elevated levels.
Iron (Dissolved)	Common in many water sources and can cause taste and staining problems.
Iron (Total)	Total iron is included for treatment information.
Langelier Saturation Index	Calculated from the pH, alkalinity, conductivity, and calcium hardness results. A good indicator of likely scale formation in pipes.

Test	Notes
Magnesium	Is required in order to calculate the total hardness
Manganese (Dissolved)	Common in many water sources and can cause taste and staining problems.
Manganese (Total)	Total manganese is included for treatment information.
Nitrate	Elevated levels can affect the health of infants
Nitrite	Indicator of the likely contamination by human or animal waste.
pH	Useful water quality parameter, and is used in the calculation of saturation index.
Potassium	Dairy effluent contamination indicator.
Suspended solids	Needs to be below 5 mg/L for UV lamps.
T ₂₅₄	Transmission of UV light at 254nm. Useful for determining suitability of UV treatment.
Total alkalinity	Useful water quality parameter, and is used in the calculation of saturation index.
Total hardness	Calculated from the calcium and magnesium tests. This is an indicator of likely scale formation in pipes.
Turbidity	Low turbidity needed for clarity and UV treatment.

ELS Basic Ground Water Price for the suite = \$135 + GST

The following tests have been specifically designed to offer the best value suite of tests for a bore water source. Tests include

- E.coli
- Fluoride, Chloride, Nitrate and Sulphate
- Calcium, Manganese, Iron, and Arsenic.
- pH, Conductivity, Alkalinity, Calcium Hardness and Langelier Index.

NZDWS Roof Water Price for the suite = \$64 + GST

Contrary to popular opinion, roofwater supplies have caused many illnesses due to micro-organisms. Here are a few tips for reducing the risk of getting sick.

- Keep the roof and gutters clean.
- Install a first-flush diverter.
- Don't bury the storage tank or pipework.
- Ensure the tank is securely covered, and that birds or animals (or their wastes) can't get in. The cover should always be locked.

Because roofwater may contain microorganisms it usually needs to be disinfected before you can drink it. If you can, arrange for the storage tanks to be in series (one after the other). Then drinking water should be drawn from the last tank, because it will be much cleaner (have fewer microorganisms) than water in the first tank. There are more microorganisms in the sludge in the bottom of the tank than near the surface, so you should desludge your storage tanks regularly.

People with roofwater collection systems should avoid burning oil, wood or coal because poisonous chemicals from the smoke can deposit on the roof. This is particularly likely if the fuel is burned in a slow burner (not an open fire). Also, the smoke is often acidic so it can dissolve lead from lead flashing, which can result in lead getting into your drinking water.

If you think there may have been pesticide spray drift around your house, you should rinse the roof off, and make sure the rinsed water goes into your wastewater. We can arrange for pesticide testing if you require it.

The following tests have been specifically designed to offer the best value suite of tests for a roof water source.

Test	Notes
Conductivity	Useful water quality parameter
Copper	Can arise from copper guttering in rainwater supplies.
E.coli	Indicator of faecal contamination
Lead	Can arise from roofing materials in rainwater supplies.
pH	Useful water quality parameter
Zinc	Can arise from roofing materials in rainwater supplies.

E.coli only Price = \$22 + GST and courier costs

As part of the regular monitoring program prescribed by NZDWS, E.coli should be tested at frequencies dependant on risk. In high-risk water sources the frequency is monthly.

If you are a registered water supply within the NZDWS framework then the results of those tests will also need to be put into the National Water Information for New Zealand database known as WINZ. Under contract arrangements, ELS will schedule bottle deliveries, analyse samples, and enter the data into WINZ. Please ask us for further details.

Using Janola to sterilise private water tanks

Janola is a chlorine-based disinfectant made to strict quantitative processes. As a water disinfectant, it is very effective and killing a wide range of bacteria, but not Cryptosporidium. It works quickly and when dosed and mixed well at the correct level is virtually tasteless.

Multiply the tank volume in litres by 0.033 to get the amount of Janola to use in mL. For example a 38,000L tank will require 1254mL of Janola to achieve a chlorine level of 1g/m³.

Lead from your taps

The Ministry of Health has identified that New Zealand has naturally acidic water that can dissolve metals such as lead out of your taps while sitting for long periods of time. The Ministry therefore has recommended that everybody flush a cup full of water each morning before collecting your drinking water.

Water Tankers

The Ministry of Health has identified that a large number of New Zealanders receive their drinking water from tankered water suppliers. The operation of these services and quality of water they supply will be included in the upcoming release of the NZ Drinking Water Standards.

While usually seasonal it is still an important part of the drinking water system within New Zealand. The regulations will take a while to come into effect and until then ELS will recommend the following to all clients:

- Use a dedicated and experienced tankered water provider. It is expected that this profession will soon see registered operators following strictly documented protocols.
- Insist on knowing where the water has come from – preferably from a city supply of known quality.
- Avoid using water from creeks or streams that may be contaminated.
- Avoid using an operator that may have used his tank for other purposes (such as emptying a septic tank) before delivering your water.

Please note that when the water is emptied into your tank it will stir up all the sediment at the bottom. This may cause contamination to spread through your pipes and into your drinking water. Also, if there is chlorine present in the tankered water, this will react with the sediment and cause a bad taste.

For these reasons it is very important to stop anything other than water entering your water tank and for you to clean it out on a regular basis. Refer to the roof water section on page 9.

Following Ministry of Health guidelines, ELS can provide approved testing for water companies who use tankers to deliver water, as well as for their clients wishing to check the quality of water they have paid for.

Ice

Ice is a water product that is not included in the drinking water standards because it is considered a food. However, no food standard yet specifically covers ice, so ELS offers a microbiological suite recommended by our own analysts. The cost of this suite is \$60.50 + GST.

- Total Coliforms
- E.coli
- Heterotrophic plate counts at 22°C and 35°C

Mineral Water Used for Bottling

Standard 2.6.2 of the Food Standards Code for non-alcoholic and brewed soft drinks (<http://www.foodstandards.gov.au/foodstandardscode/>), lists an extensive set of definitions and chemical test requirements. This code has been used to prepare the following suites of analyses offered by ELS.

In the code, mineral water or spring water has been defined as being a "ground water obtained from subterranean water-bearing strata that, in its natural state, contains soluble matter".

Non-Alcoholic and Brewed Soft Drinks Price for the suite \$239 + GST

The defined parameters in the above code are:

- Copper, Manganese, Zinc, Arsenic, Barium, Cadmium, Chromium, Lead, Mercury, and Selenium
- Borate as H₃BO₄ (*analysed as Boron*)
- Fluoride, Nitrate, Nitrite
- Organic Matter by permanganate (as O₂) - (*analysed as TOC*)
- Hydrogen Sulphide
- Cyanide (as CN⁻)
- pH
- Total Dissolved Solids


Chromium is analysed directly and if significant amounts are found then a further sample should be tested for Chromium (VI).

All of the ELS detection limits easily satisfy the guideline requirements. Please note that we require at least 2 litres of sample to complete these analyses.

<u>A More Thorough Investigation</u>	Price for the full suite	\$1200 + GST
	Price excluding organics	\$435 +GST

If you are serious about potential bottling or want to assess water which you are already bottling, a thorough investigation of the chemical quality of the water is warranted and the parameters listed below are recommended. The listed parameters are largely based on testing for a potable water supply. Hydrogen sulphide and organic matter have been added so that all of the parameters listed in the Food Regulations are also covered. Please provide us with at least 5 litres of sample for the analyses.

- pH, alkalinity, total alkalinity, acidity, turbidity, absorbance at 270 nm, colour, conductivity, total hardness
- Sulphate, soluble phosphate, chloride, fluoride, bromide, nitrate, nitrite, ammonia
- Total cyanide
- Hydrogen sulphide
- Total dissolved solids

- Total organic carbon (TOC)
 - Sodium, silica, magnesium, potassium, calcium, arsenic, barium, boron, chromium, cadmium, copper, iron, manganese, lead, lithium, nickel, selenium, zinc, mercury
 - Chlorophenols including pentachlorophenol
 - Acid herbicides
 - Semi Volatile Organic Contaminants
 - Volatile Organic Contaminants
- 
- ORGANIC SUITES

Market/Export Specific

If a specific market is intended, you should find the specific requirements for that market. The US for example has quite stringent requirements depending on the intended label (natural versus spring versus mineral waters etc).

Microbiological Analyses Price for the suite = \$98 + GST

The Ministry of Health in their Microbiological Reference Criteria for Food 1995 gives guidelines for microbiological testing of packaged waters. We require at least 1 litre of sample to complete these tests.

The tests required are:

- Total Coliforms
- *E. coli*
- Group D streptococci
- *Pseudomonas aeruginosa*

Recent mineral water surveys show that the gastroenteritis pathogen *Aeromonas hydrophilia* can be isolated from New Zealand bottled waters. This faecal contaminant can proliferate in water at room temperature and can render a product unsafe for consumption. *Aeromonas hydrophilia* and sulphite-reducing anaerobes (clostridia) are tested for overseas exporting.

For these extra tests please provide an additional 1 litre of sample. The price for the extra microbiological tests is \$100 + GST

- Aeromonas
- Clostridia

Sampling and Delivery Details

"The result of any test can be no better than the sample on which it is performed".

The objective of sampling is to collect a portion of material small enough in volume to be transported conveniently and handled in the laboratory while still accurately representing the material being sampled.

Sampling is an often underestimated but very crucial step in the process of determining sample integrity. Many things can go wrong before the sample reaches a laboratory so we offer assistance to minimise risk associated with:

- Inappropriate sample types and locations
- Incorrect sampling technique
- Sample contamination
- Incorrect labelling
- Sample homogeneity
- Delivery timeframes

Our service provides clear and easy to follow sampling procedures using colour coded labels wherever possible. ELS has its own team of samplers so we know what is needed to ensure accurate and safe sampling under all types of conditions.

Sampling

We provide you with colour-coded bottles to make sampling easier. Each bottle corresponds to a particular preservative type and ensures the parameters under examination remain as constant as possible.

For example ammonia is a very unstable chemical that requires either on-site acidifying or freezing depending on the sample type under examination.

We can advise the most appropriate way to accurately record the various parameters under examination.

Delivery to ELS

All samples should be delivered to the laboratory as soon as possible but within 24 hours. Microbiological activity continues even at 4°C so the sooner we receive samples the better. We include a temperature control bottle, and slika pads with each chilly bin we send. Please follow the instructions we include.

Dedicated chilly bins are provided for contractual services. They are sterilised with Virkon upon receipt at ELS, reloaded with sampling equipment/bottles and returned on the same day. Virkon is an antiviral product that ensures all bacteria and viruses are destroyed, assuring staff safety at both ends.

A chain of custody should be included with all deliveries so that we can check the sampling time and sample details. The details included on the Chain of Custody will be used to prepare your report.

ELS operates 365 days a year and accepts samples from Monday to Saturday. Please remember that if you send samples on a Friday your courier may require a Saturday delivery sticker.

We are happy to assist with setting up scheduled courier pickups to ensure consistent sample delivery to ELS.

Sending Packages of Samples to ELS

After you have read this brochure and decided which suite you require, please give us a ring to arrange the delivery of bottles to you. Alternatively you could visit our website and order through there.

You will receive the bottles within a few days. Please fill them up following the instructions and then send back to ELS within 24 hours. Please include your cheque as payment. We will process the samples and deliver a report within 10 working days.

Suite Packages	Code	Price GST Incl	Submission Instructions
Aquafarm Basic – Sth Island	AFBS	\$50.65	Please freeze the ice pack prior to taking sample. At time of sampling, fill all sample bottles provided including 'Temperature Control' bottle if included. Complete the submission form and the bottle labels with permanent pen. Courier the completed kit to ELS, to be received within 24 hours of sampling Cheque must be included with samples
Aquafarm Basic – Nth Island	AFBN	\$45.00	
Aquafarm Plus –	AFPN	\$202.50	
NZDWS Surface Water Suite	NZS1	\$255.40	
ELS Surface Water Suite	PB	\$126.00	
NZDWS Ground Water Suite	NZS2	\$280.15	
ELS Ground Water Suite	PBB	\$151.90	
NZDWS Roof Water Suite	NZS3	\$72.00	
Ice	ICE	\$68.10	
Bottled Water Suite	MWAT	\$268.90	
A More Thorough Investigation + Organics	AMTI	\$1350.00	
A More Thorough Investigation, no Organics	AMTE	\$489.40	
Microbiological Analysis	FRM	\$110.25	
Specialist Microbiological Analysis	FRMS	\$112.50	

Contact Details

Please feel free to contact ELS by any one of the methods shown below.

TELEPHONE

Main lines to Central Services

Main Telephone	(04) 576-5016
Facsimile	(04) 576-5017
Free Phone	(0800) 576-5016

Direct Lines

Joanne	Accounts	(04) 568-1205
Rob Deacon	General Manager	(04) 568-1203
Sue Meiklen	Occupation Health	(04) 568-1207
Sunita Raju	Microbiology	(04) 568-1206
Terry Manning	Managing Director	(04) 568-1204
Tracy Morrison	Instrumental Chemistry	(04) 568-1200
Jacinta Hira	General Chemistry	(04) 568-1209

Email can be directed to staff using "first initial last name"@els.co.nz

COURIER

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NZFSA Laboratory Approval Scheme
Accreditation Number 905

IANZ Accreditation Numbers:
Biological 639, Drinking Water 787,
Chemistry 414, Dairy L1921