Irrigation Water Compliance Monitoring Annual Report 2009-2010

Technical Report 2010–49

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Executive summary

This is the eighth Annual Report issued by the Taranaki Regional Council to report on compliance monitoring programmes associated with resource consents for the abstraction of freshwater for irrigation purposes in Taranaki. The report covers the period 1 July 2009 – 30 June 2010. It encompasses the data collected for compliance monitoring programmes for resource consents for pasture irrigation, horticultural and golf courses irrigation as per the recommendations from the previous report. Every year the Council prepares a monitoring programme for all pasture irrigation water permits.

At 30 June 2010, a total of 77 resource consents to take and use freshwater for irrigation purposes were registered in the Council's databases. Of that number, 53 were for pasture irrigation, 15 for horticultural activities and 9 for recreational purposes (golf clubs). Sixty seven consents licensed surface water abstractions (87 %) while 10 (13 %) licensed groundwater abstractions.

Other water takes for general farm purposes have been also granted by the Council but as the water abstraction is not used for irrigation purposes [dairy farm water takes in excess of the permitted 1.5 litres per second or 50m3/day entitlement per property according the Regional Fresh Water Plan for Taranaki, Rule 15], they are not commented on in this report.

Irrigation in this report, as it did in the previous one, does not refer to any effluent (wastewater) application; it applies to the use of freshwater to supply dry soils with enough moisture for assisting in growing pasture. In pasture production, irrigation is mainly used to replace precipitation during periods of drought and to fulfill crop water requirements

Maintaining environmentally appropriate flow-rates in streams and rivers to protect aquatic habitat is of primary concern to the Council, particularly with respect to the abstraction of water.

The 2009-2010 monitoring programme for irrigation water permits comprised three primary components: liaison with consent holders, site inspections, and data gathering and review and assessment for compliance. Water is a public resource and the authorisation to take it is granted through a resource consent. Associated with that permission is a public expectation that the water will be used efficiently and will not be wasted - an expectation that can be better met if the actual amounts of water taken are accurately measured and recorded.

There have been concerns that some flowmeter installations have been inadequate which greatly compromises accuracy. Irrigators and the Council need to be confident that their equipment will work accurately and effectively, therefore it is preferred that a reputable contractor be hired for the installation of flowmeters and dataloggers. All installations are inspected by the Council each year.

There continued to be several issues with faulty dataloggers; 41% experienced problems during 2009-2010, with several dataloggers that have experienced problems in the 2008-2009 season being replaced this season. Consents holders were advised of this situation on the inspection notices following the inspections, with three consent holders requesting the Council to install new dataloggers for them for the upcoming season (2010-2011).

The 2009-2010 summer period rainfall percentages for the region ranged between 56 and 129% of normal. This variation in rainfall percentages was due to a large number of localised thunderstorms in January and February. In particular, Motunui recorded 214% of its normal February rainfall; this was due to the site recording 92.0mm in one day, which is more than its average February monthly rainfall.

During the 2009-2010 irrigation season, the Council carried out compliance monitoring inspections at 67 sites, which represents an increase of 31% from the 2008-2009 irrigation season. The inspections included visual checks of the intake structures, screens, staff gauges, fencing around the pump sheds, downloading of datalogger data, and stream gauging.

It was a busy season for the Council's hydrological unit, with close and frequent monitoring required to ensure the waterway's ecological flows. During the period under review compliance with residual flow conditions for surface water abstraction sites was assessed 44 times in 14 waterways.

The examination of the data supplied to the Council, revealed that four consent holders breached limits for rate/volume abstracted. As happens each year, consent holder performance was assessed based mainly on compliance with allocated abstractions, maintenance of minimum residual flows, and the provision of abstraction records.

No complaints were received during the year, and there were no incidents recorded by the Council relating to the consent holders' water abstraction.

During the year under review a good level of environmental performance was demonstrated by pasture irrigators.

This report includes recommendations for the 2010-2011 monitoring year.

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1. Introduction

This is the eighth Annual Report issued by the Taranaki Regional Council to report on compliance monitoring programmes associated with resource consents for the abstraction of freshwater for irrigation purposes in Taranaki. The report covers the period 1 July 2009 – 30 June 2010. It also encompasses the data collected for compliance monitoring programmes for resource consents for pasture irrigation, horticultural and golf courses irrigation as per the recommendations from the previous report.

The irrigation requirements during the 2009-2010 season were high with soil moisture levels dropping to as low as 14% in coastal areas. The 2009-2010 summer period rainfall percentages for the region ranged between 56 and 129% of normal. This variation in rainfall percentages was due to a large number of localised thunderstorms in January and February. In particular, Motunui recorded 214% of its normal February rainfall; this was due to the site recording 92.0mm in one day, which is more than its average February monthly rainfall.

1.1 Structure of this report

Section 1 of this report is the background section. It presents general information about compliance monitoring under the Resource Management Act, the Regional Freshwater Plan for Taranaki and the Council's obligations and approach to monitoring through annual programmes, the resource consents held by pasture irrigators to take and use fresh water, the nature of the monitoring programme in place for the period under review, and a description of the activities and operations conducted.

Section 2 shows the results of monitoring during the period under review, including scientific and technical data.

Section 3 talks about the results, provides an explanation, and their implication for the environment.

Section 4 presents recommendations to be put into operation in the 2009-2010 monitoring year.

1.2 Compliance monitoring and the Resource Management Act (1991)

The Resource Management Act primarily addresses environmental effects that are defined as positive or adverse, temporary or permanent, past, present or future, or cumulative. Effects may arise in relation to:

(a) the neighbourhood or the wider community around a water take, and may include cultural and socio-economic effects;
(b) physical effects on the locality, including landscape, amenity and visual effects;
(c) ecosystems, including effects on plants, animals, or habitats, whether aquatic or terrestrial;
(d) natural and physical resources having special significance (e.g., recreational, cultural, or aesthetic);

(e) risks to the neighbourhood or environment.

In its management of fresh water, the Taranaki Regional Council must:

- Sustain the potential of fresh water resources to meet the reasonably foreseeable needs of future generations;
- Safeguard the life-supporting capacity of fresh water and fresh water ecosystems;
- Avoid, remedy or mitigate any adverse effects of activities on the environment.

1.2.1 Regional Freshwater Plan

Section 14(1)(a) of the Resource Management Act stipulates that no person may take, use, dam, or divert any water unless the activity is expressly allowed for by a resource consent, or a rule in a regional plan, or meets criteria set out in Section 14(3) of the Resource Management Act 1991 (Act).

The Regional Fresh Water Plan for Taranaki (RFWP) became operative on 8 October 2001. It is a statutory document which outlines the Taranaki Regional Council's policy with respect to activities in relation to fresh water under the Act.

Rule 15 of the RFWP provides for the abstraction of up to 50 cubic metres per day of surface water at a maximum rate of 1.5 litres per second as a permitted activity for each certificate of title. The same provision applies for groundwater under Rule 48 of the RFWP. The permitted allocations (*as of right entitlements*) allow for reasonable domestic and stock water needs without the need for a resource consent, provided that other conditions of the permitted rules are also satisfied.

However, most irrigation abstractions demand significantly more water than the daily permitted allocation and consequently require resource consent. Appendix I gives an example of a typical set of conditions for a consent to take and use surface water for irrigation purposes.

Following the trend from previous years, there has been an increased interest in pasture irrigation on dairy farms in Taranaki. Sources of water are rivers and streams, as these are the easiest and most economical options, but groundwater abstractions have become a possible alternative to supplement surface water use for irrigation.

1.2.2 Evaluation of environmental performance

Besides discussing the various details of the performance and extent of compliance by the consent holders during the period under review, this report also assigns an overall rating. The categories used by the Council for evaluation are described as follows:

- a **high** level of environmental performance and compliance indicates that essentially there were no adverse environmental effects to be concerned about, and no, or trivial (such as data supplied after a deadline) non-compliance with conditions.
- a **good** level of environmental performance and compliance indicates that adverse environmental effects of activities during the year were negligible or minor at most, items of concern were resolved positively, co-operatively, and quickly, the

Council did not record any verified unauthorised incidents involving significant environmental impacts and was not obliged to issue any abatement notices, there were perhaps some items noted on inspection notices for attention but these items were not urgent nor critical, and follow-up inspections showed they have been dealt with.

- **improvement desirable** indicates that the Council may have been obliged to record a verified unauthorised incident involving significant environmental impacts against the company, and/or abatement notices may have been issued; there were adverse environmental effects arising from activities and intervention by Council staff was required, and there were matters that required urgent intervention, took some time to resolve, or remained unresolved at end of the period under review.
- **poor** performance is used where there were grounds for prosecution or infringement notice

1.2.3 Regional fresh water allocation

At 30 June 2010, a total of 77 resource consents to take and use fresh water for irrigation purposes were registered in the Council's databases. Of that, 53 were for pasture irrigation, 15 for horticultural activities and 9 for recreational purposes (golf clubs). Sixty seven consents licensed surface water abstractions (87.0 %) while 10 (13.0 %) licensed groundwater abstractions. Figure 1 shows a pie-chart of the distribution of the water allocated for irrigation purposes in Taranaki as of June 2010.

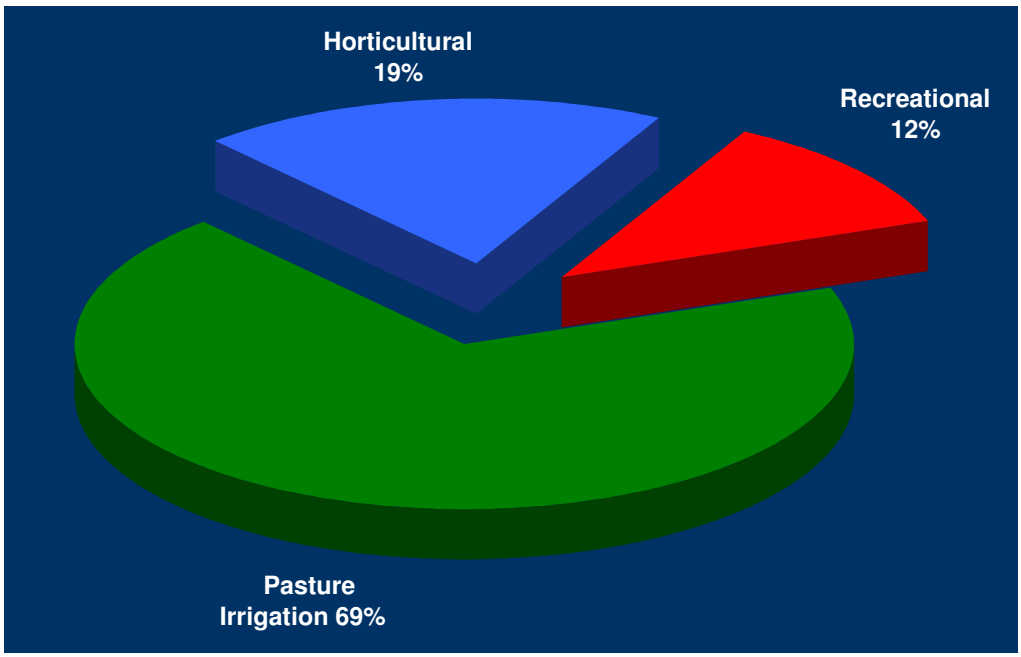

Figure 1 Percentages of water allocation per activity in the Taranaki Region

The breakdown of fresh water allocation in the region indicates that other uses[1] represent 46% of all water takes; pasture irrigation represents 37% of the total consented water abstractions.

[1] Includes: Aquaculture, Building Construction/Drainage/Flood Control, Chemical Processing/Manufacturing, Dairy Farm, Dairy, Processing/Manufacturing, Distribution, Storage, Drystock Farm, Hydrocarbon Exploration, Landfills, Local Authorities, Meat and Byproduct Processing, Petrochemical Processing, Piggery Farms, Poultry Farms, Power Generation - HydroPower Generation & Thermal, Quarries, Recreation/Tourism/Cultural, Road/Bridge Construction or Maintenance, Swimming Pools, Tanneries, Timber Treatment or Sawmills, Water Supply or Treatment.

Other types of irrigation (golf courses and for horticultural proposes) add up to only 11% (Figure 2).

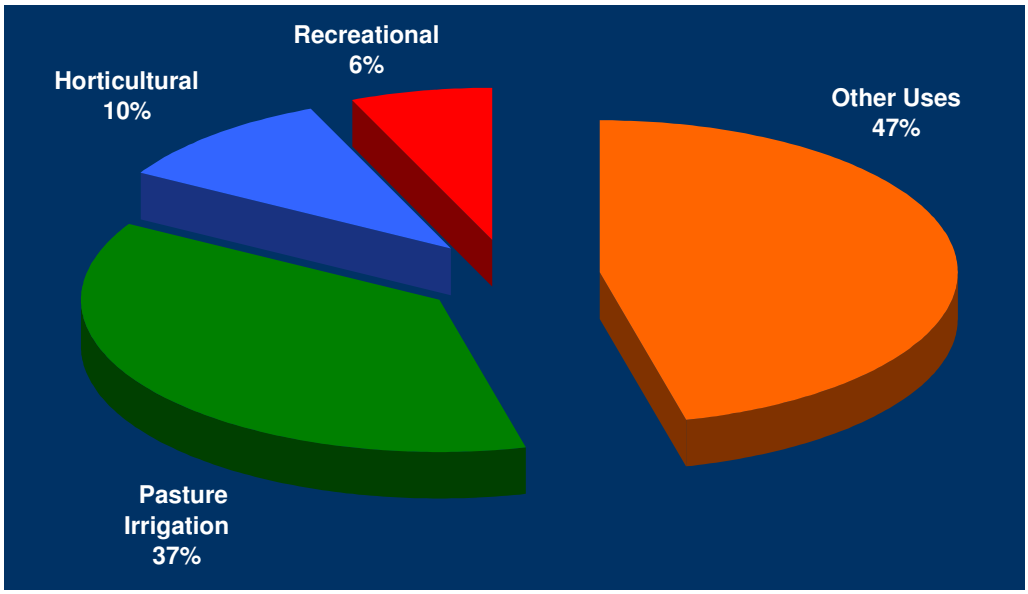

Figure 2 Total water abstractions – distribution by activity 2009-2010

Surface water is the predominant source for pasture irrigation; 47 of the 53 consented water abstractions are for abstractions from rivers and streams (Figure 3). Groundwater abstractions are mainly used as supplementary irrigation water as the relative low yields from Taranaki's aquifers are not sufficient to run an entire irrigation system.

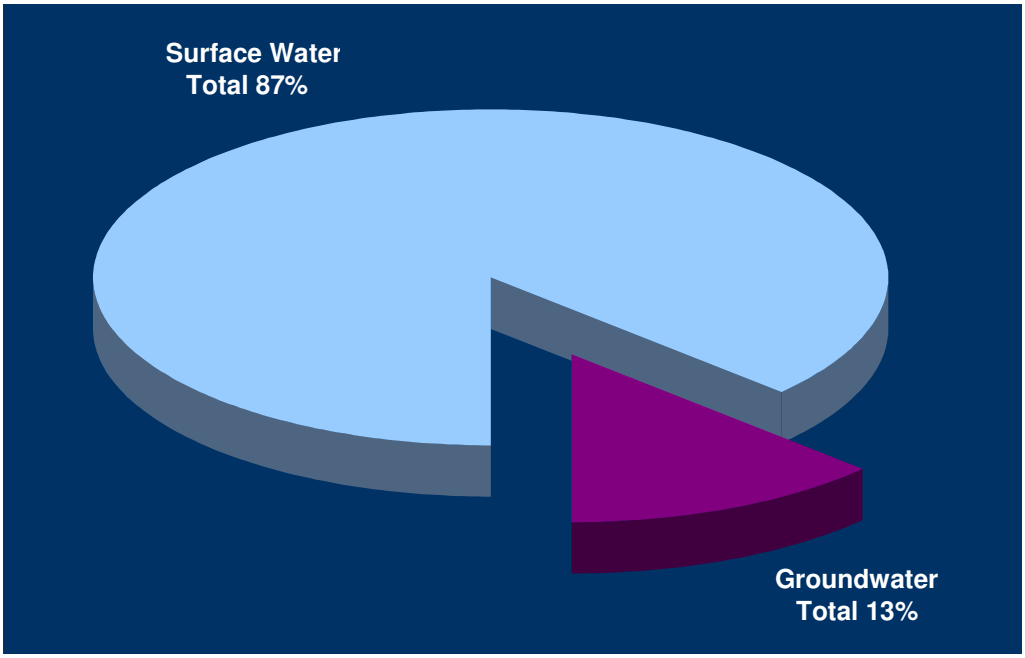

Figure 3 Source of water for pasture irrigation in Taranaki during the 2009-2010 period

Table 1 lists all the irrigation water consents issued by the Council to June 2010 classified by type and source.

Table 1 Total consents granted for irrigation water in Taranaki to June 2010

Consent	Consent Holder	Source	Type of use
0017-2	Manaia Golf Club	Surface Water	Recreational
0124-4	Kaitake Golf Club Inc	Surface Water	Recreational
0132-2	Hawera Golf Club Inc	Surface Water	Recreational
0164-2	JR & DM Baker	Surface Water	Pasture Irrigation
0184-3	Inglewood Golf Club Inc	Surface Water	Recreational
0189-3	AI & KJ Williams	Surface Water	Pasture Irrigation
0270-2	Westown Golf Club Inc	Surface Water	Recreational
0278-3	NRGE Farms Limited/Oceanview Trust	Surface Water	Pasture Irrigation
0464-3	Oakura Farms Limited	Surface Water	Horticultural
0647-3	IG Cassie	Surface Water	Horticultural
0714-2	GD & HM McCallum	Groundwater	Pasture Irrigation
0721-3	IN & AM Aiken	Groundwater	Horticultural
0880-3	IHC New Zealand Inc	Surface Water	Horticultural
1193-3	Vickers B & NM & Church G & CG	Surface Water	Horticultural
1194-3	Hakanoa Properties Management Limited	Surface Water	Horticultural
1223-3	EO & CP Lander	Surface Water	Horticultural
1253-3	KA & RD Southall	Surface Water	Horticultural
1356-3	SW & SM Carr	Surface Water	Horticultural
1721-3	Manukorihi Golf Club Inc	Surface Water	Recreational
1877-2	Te Ngutu Golf Club	Surface Water	Recreational
1879-3	Dairy Developments Ltd / Wairau Nurseries	Surface Water	Horticultural
2138-2	WM & MP Schrader	Surface Water	Pasture Irrigation
2612-2	Duncan & Davies Nursery Ltd	Surface Water	Horticultural
3171-3	Little Knoll Greenhouses	Groundwater	Horticultural
3312-3	GH Lance	Groundwater	Horticultural
3859-2	Living Light 2000 Limited	Groundwater	Horticultural
4450-2	Waitara Golf Club Inc	Surface Water	Recreational
4494-2	CT & J McDonald	Surface Water	Pasture Irrigation
4513-1	PG & BM Bourke	Surface Water	Pasture Irrigation
4783-2	Kohi Beach Farm Limited	Surface Water	Pasture Irrigation
4993-1	Sanderson H & R Trust	Surface Water	Pasture Irrigation
4994-1	H & RA & J Sanderson	Surface Water	Pasture Irrigation

Consent	Consent Holder	Source	Type of use
5057-1	Mitchfam Farm Limited	Surface Water	Pasture Irrigation
5128-1	KL Gray	Surface Water	Pasture Irrigation
5306-1	S & M Kapuni Contractors Limited	Surface Water	Horticultural
5568-1	Cornwall Farms	Surface Water	Pasture Irrigation
5570-1	Kaihihi Trust	Surface Water	Pasture Irrigation
5571-1	Jimian Limited	Surface Water	Pasture Irrigation
5623-1	WD & SC Morrison	Surface Water	Pasture Irrigation
5636-1	Schrider Family Trust	Surface Water	Pasture Irrigation
5696-1	Kokako Road Limited	Surface Water	Pasture Irrigation
5709-1	KG & CJ Sole	Surface Water	Pasture Irrigation
5773-1	Goodin FJ & Sons Limited	Surface Water	Pasture Irrigation
5778-1	Mara Trust	Surface Water	Pasture Irrigation
5781-1	Waikaikai Farms Limited	Surface Water	Pasture Irrigation
5791-1	Ionic Farm Limited	Surface Water	Pasture Irrigation
5797-1	Pihama Farms Limited	Surface Water	Pasture Irrigation
5807-1	Dickie Roger Family Trust	Surface Water	Pasture Irrigation
5813-1	Richards R J & S B Family Trust	Surface Water	Pasture Irrigation
5827-1	Walker & McLean Partnership No 1	Surface Water	Pasture Irrigation
5829-1	Julian RM & MC Family Trust	Surface Water	Pasture Irrigation
5840-1	Gibbs G Trust	Surface Water	Pasture Irrigation
5863-1	Geary AR Trust	Surface Water	Pasture Irrigation
5876-1	GA & RJ Dorn	Surface Water	Pasture Irrigation
5878-1	Woollaston Family Trust Partnership	Surface Water	Pasture Irrigation
5879-1	Hilldale Trust	Groundwater	Pasture Irrigation
5887-1	A & EN Barkla	Surface Water	Pasture Irrigation
5896-1	Kohi Investments Limited	Surface Water	Pasture Irrigation
5898-2	Pease David Family Trust	Surface Water	Pasture Irrigation
5905-1	NA & KM McColl	Surface Water	Pasture Irrigation
5950-1	WD & SC Morrison	Groundwater	Pasture Irrigation
5973-1	DR & AJ Gibson	Surface Water	Pasture Irrigation
6026-1	JR & DM Baker	Groundwater	Pasture Irrigation
6159-1	Pinehill Land Company Limited	Surface Water	Pasture Irrigation
6193-1	Cradles Farm Trust No 2	Groundwater	Pasture Irrigation
6292-1	New Plymouth Golf Club Inc	Surface Water	Recreational
6429-1	Jordan JA & MP Trusts Partnership	Surface Water	Pasture Irrigation

Consent	Consent Holder	Source	Type of use
6430-1	Ellingworth Margaret Trust	Surface Water	Pasture Irrigation
6486-1	Quintus LM & PC Family Trust	Groundwater	Pasture Irrigation
6628-1	Hamblyn Family Trusts	Surface Water	Pasture Irrigation
7161-1	A & A Fleming/Kinaki Trust	Surface Water	Pasture Irrigation
7231-1	Waimate Fields Limited	Surface Water	Pasture Irrigation
7243-1	Waiwira Trust	Surface Water	Pasture Irrigation
7270-1	Leighurst Lands Limited	Surface Water	Pasture Irrigation
7346-1	Spenceview Farms	Surface Water	Pasture Irrigation
7372-1	Pukeone Partnership	Surface Water	Pasture Irrigation
7547-1	JM Doorbar	Surface Water	Pasture Irrigation

Most of the pasture irrigation in Taranaki takes place within a 10 km-wide belt of coastal land stretching from Oakura to Waverley, with the rest of sites located between Inglewood and Eltham (Figure 5). Increasing distance from the coast generally correlates with increasing altitude and rainfall, and therefore less need for irrigation.

Irrigation in this report does not refer to any effluent (wastewater) application; it applies to the use of freshwater to supply dry soils with enough moisture for assisting in growing pasture. In pasture production, irrigation is mainly used to replace precipitation during periods of drought and to fulfill crop water requirements.

The geographical patterns for the development of irrigation in the coastal region, respond to a combination of meteorological, topographical and soil conditions; lower rainfall rates, small streams, exposure to drying winds, and the presence of lighter, freer-draining soils, particularly sandy, than in other parts of the province.

Irrigation in Taranaki dairy farms usually occurs over a 3 to 6 month period depending on location and climatic conditions. Irrigation typically commences in mid October-November and ends in late March-early April, with water use peaking in January and February; a few farms, however, irrigate for longer periods.

Most irrigation water is sourced directly from run of streams; however, there are a number of projects being established on small spring-fed streams where flows are low especially during the summer season and where it is only possible to achieve irrigation through water harvesting and storage.

1.2.4 Irrigation zones

A regional study commissioned for the Taranaki Regional Council in 2002 (Rout, 2003) identified eight irrigation zones based mainly on climate. The zones were characterised by different parameters in terms of system management and financial return (Figure 4).

The identified zones with the most potential for pasture irrigation requirements were: Normanby *Zone 2*; Inaha *Zone 3*; Hawera *Zone 4*; and Opunake *Zone 5*.

The modeling exercise predicted that pasture irrigation would be the most profitable for efficiently operated schemes in *Zones 2, 3, 4 and 5,* and generally less profitable in the other zones. The water demand modeled for Taranaki's eight irrigation zones are given in Table 2 below.

Table 2 Irrigation zones - modelled water demand (after Rout 2003)

Zone Nº	Take rate l/s / Ha	Daily volume m^3 / Ha	Annual volume m^3 / Ha	Application depth mm
1	0.40	31	2,200	44
2	0.51	40	4,840	44
3	0.58	46	6,400	32
4	0.67	53	5,120	32
5	0.63	50	4,200	30
6	0.63	50	3,600	30
7	0.53	42	4,000	50
8	0.46	37	3,960	44

Figure 4 shows the pasture irrigation zones defined by Rout, 2003 and the development potential of those zones.

Figure 5 shows the distribution of all the consented water takes for the period under review within the eight zones defined by Rout, 2003.

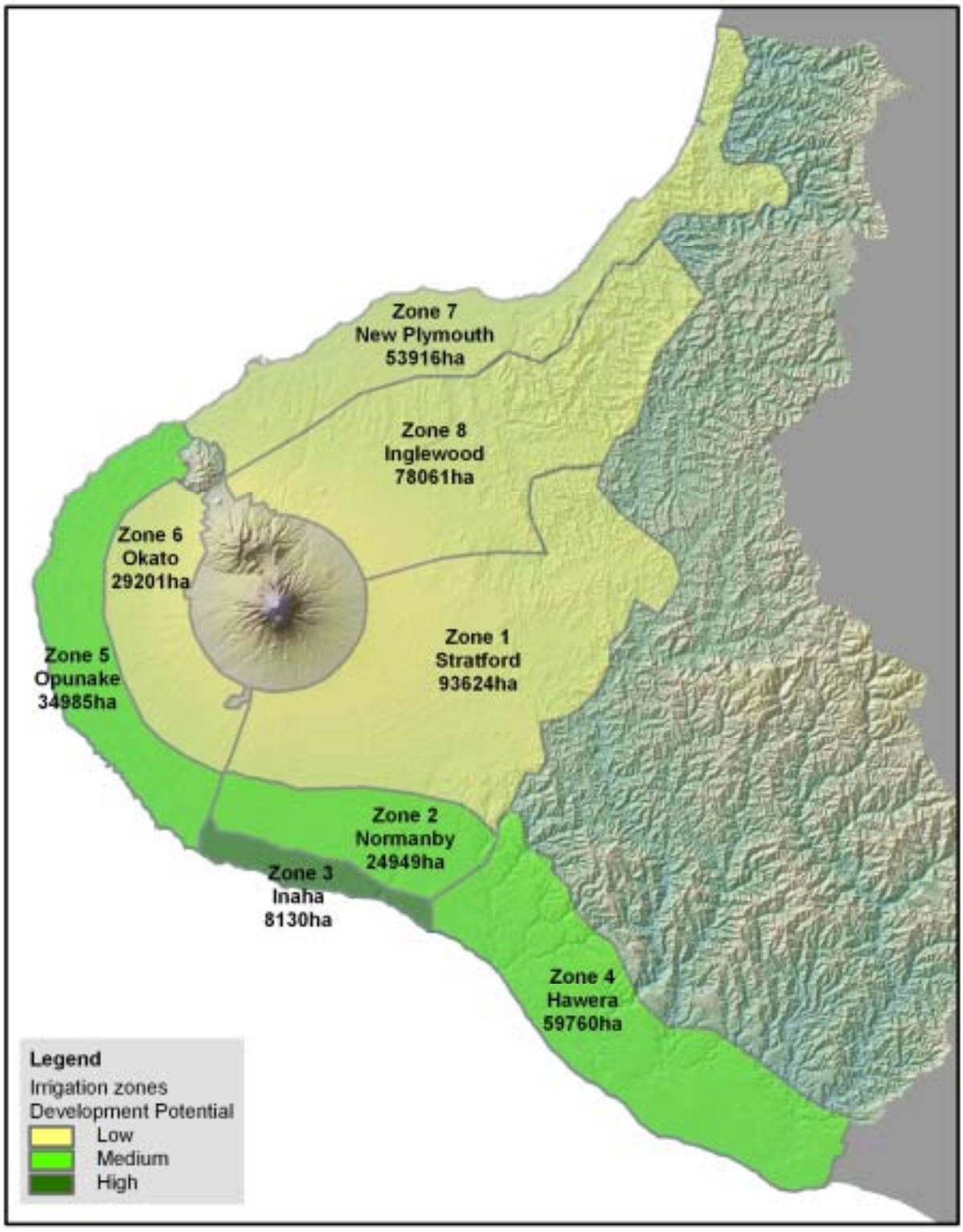

Figure 4 Pasture irrigation zones and development potential

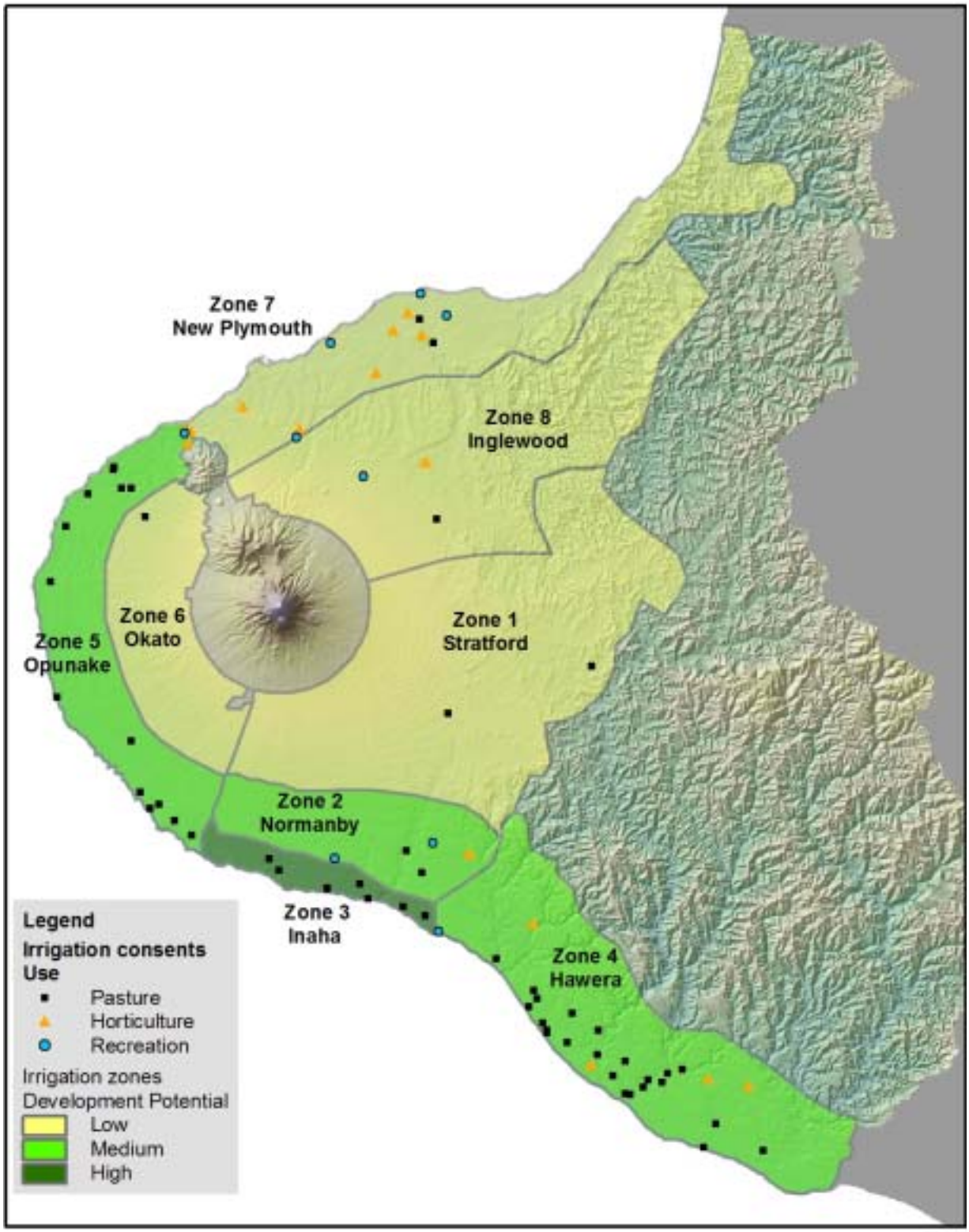

Figure 5 Distribution of all the consented water takes, defined by use, within the eight zones to 30 June 2010

1.2.5 Irrigation systems

In general there are two types of irrigation methods: surface and pressurised. The majority of irrigation systems currently in operation in the province fall into the pressurised category; within this type of system, there are subclasses based on the method of operation and equipment used. A summary of the systems encountered in the region and some of their advantages and disadvantages are summarised below:

K-line and long-lateral types – impact sprinklers mounted on moveable laterals (Photo 1)

- low capital cost;
- K-lines particularly suited to windy conditions due to sprinkler cowling;
- easily adapted to existing farm layouts and topography;
- allows low application rates;
- low operating pressures;
- high maintenance;
- high labour input to shift (*drag and drop*);
- K-line systems are simple in construction and are relatively easy to operate;
- consists of flexible hoses line designed to ease irrigation applications;
- the main characteristic of the system is a series of small, sturdy plastic pods protecting a small sprinkler firmly attached to special low density polyethylene pipe.

Photo 1 Mosaic of pictures depicting K-line systems

Centre pivot type – spray nozzles mounted on a movable lateral (Photo 2)

- high capital cost;
- large circular irrigating area;
- allows versatility in application rates and return periods;
- low operating pressures;
- low maintenance;
- low labour input;
- centre pivots have become very popular all over the world;
- most are provided with automatic controls and metering equipment;
- frequently desirable on steep, rocky, or uneven soils;
- not ideal where energy may be undependable or expensive.

Photo 2 Centre pivot system in South Taranaki

Traveling irrigators-spray nozzles mounted on fixed or rotating boom (*rotary boom, fixed boom, gun irrigator, effluent irrigator*) (Photo 3)

- winch driven irrigators that drag a soft hose;
- low capital cost;
- the rotation of the boom usually drives the winch;
- may cover a large irrigating area;
- simple operation;
- allows some control with application rates;
- poor performance in windy conditions;
- uneven application, particularly at end or runs;
- not suited to irregular farm layout (*boom irrigators only*);
- high operating pressures (*hard hose gun irrigators only*).

Photo 3 Mosaic depicting the differing types of travelling irrigators

The distribution of these different types of irrigation systems in the province are charted below in Figure 6.

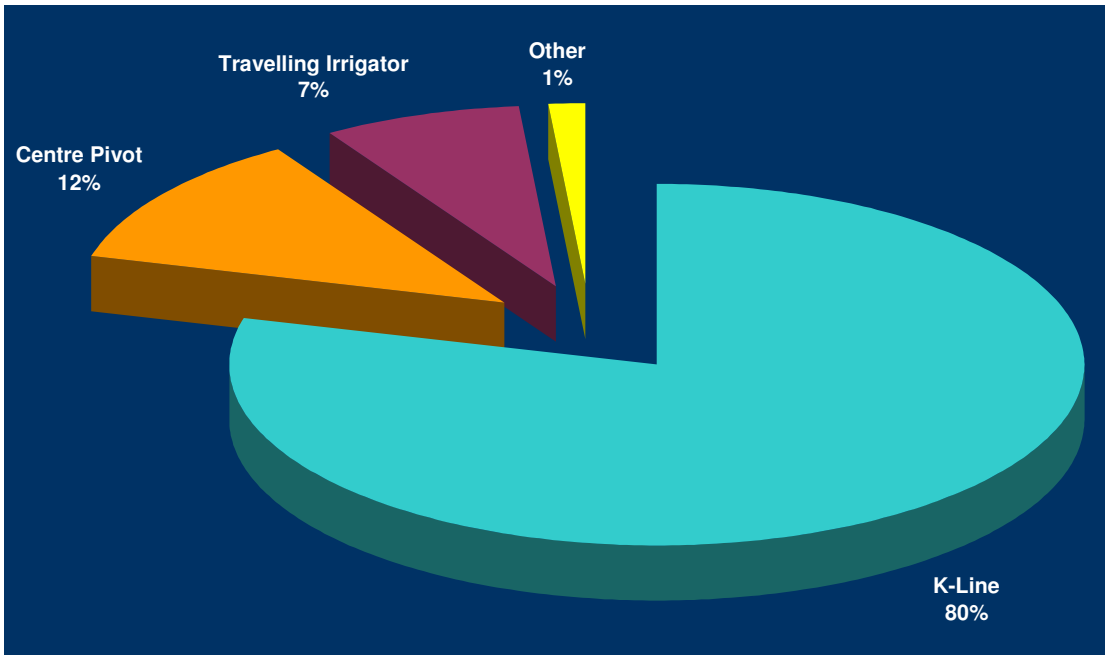

Figure 6 Percentages of irrigation system types in Taranaki

1.2.6 Water demand and availability

The establishment of new irrigation schemes in several catchments within Zones 2, 3, 4 and 5 (TRC 2003), may be limited by the increasing demands and restricted availability of surface freshwater in these irrigation zones.

However, in spite of being a more costly option, the development of deep groundwater resources (well fields) will always be an alternative, provided the appropriate environmental considerations and scientific tests are conducted for new projects.

1.2.7 Environmental effects of exercising water permits

Environmental effects of water abstraction can include a loss of aquatic habitat and biodiversity, and impacts on cultural, recreational and aesthetic values. In an effort to reduce such impacts, the Council encourages the efficient use of water through technical irrigation system design, and maintenance and management practices that help with the achievement of high irrigation efficiencies.

Surface water abstractions

Expected periods of peak irrigation water demand normally coincide with periods of low flow in rivers and streams. During these periods, the Council closely monitors river flows and the exercise of water permits.

Most of the surface water permits for irrigation require the abstraction to cease when the flow in the abstracted waterway reaches or falls below a specified level. Policy 6.1.5 of the Regional Freshwater Plan for Taranaki states that at least 2/3 (brown trout) habitat at mean annual low flow (MALF) is to be retained in rivers and streams.

For many smaller waterways, 2/3 habitat roughly equates to 2/3 MALF, however, the cut-off flow level on many irrigation abstraction consents is generally set at MALF. It is the responsibility of the consent holder to ensure compliance with consent conditions at all times.

Under certain tide and stream flow conditions in the coastal reaches of some waterways, sea water travels upstream. Pumping under these conditions could draw saline or brackish water which would pose undesirable consequences on the equipment, crop and soil.

Groundwater abstractions

Groundwater levels in coastal bores should be maintained proportionally to the depth to saline water interface from mean sea level and the height of the piezometric surface above mean sea level, and should be monitored to avoid the risk of sea water intrusion.

Fortunately in Taranaki, the risk of salt-water intrusion, in general, is not a concern but the Council has started to consider closer monitoring as the demands on groundwater resources along the coastal belt increases; this will inevitably incorporate a saltwater intrusion monitoring system to provide advance warning using water level and water quality data from a number of critical bores.

Groundwater abstracted behind the saltwater front is typically unsuitable for irrigation. Elevated levels of sodium, chloride, sulphate and hardness resulting from sea water contamination can affect the taste and corrosiveness of water and can cause scale (Cameron & White 2004). Irrigation with saline water reduces the ability of the plant's roots to take up water. In between irrigations, as the soil moisture decreases, the salts in the soil concentrate to several times the initial value in the irrigation water.

Poor crop growth due to irrigation with saline water is usually due to the osmotic stress caused by the total concentration of salts rather than due to specific ions. Irrigation water containing a high ratio of sodium to calcium and magnesium can adversely affect soil structure (sodicity) and highly saline water can impair plant growth, although the effects of salinity are very situation specific (ANZECC 2000).

Nutrient loading

Irrigated pasture typically supports higher stock numbers compared with non-irrigated pasture and consequently a higher nutrient (nitrate) loading per hectare. This is particularly the case in areas where the underlying soils are sandy and free-draining.

Irrigation schemes in Zones 2, 3 and 4 occur in areas where groundwater is known to be at risk of nitrate contamination (TRC 1998, 2005). In these zones, careful management of irrigation water and fertilizer application regimes is required to minimise the risk of groundwater contamination and surface water with nitrates.

Implementation of riparian management plans, planting of riparian margins, and fencing can help reduce contamination of surface water by nitrates in runoff or soakage from irrigated pasture.

1.2.8 Streamflow measurements

In order to check for compliance with consent conditions set to safeguard the intrinsic values of Taranaki's streams, minimum flows are to be complied with and maintained at all times. To establish compliance the Council undertakes streamflow measurements by indirect and direct methods at control points usually upstream and downstream of water abstraction points.

These methods involve the measurements of velocity and cross-sectional areas which are both used to determine the flow rate.

Flow is measured by the speed of a small propeller attached to the end of the wading rod. Multiple readings are taken across the river to calculate the volume of water passing the point of measurement. Several measures are carried out under different flow conditions until a rating curve is developed. A rating curve is the result of a very approximate relationship between a staff gauge (water level) and a flow rate. Once the rating curve has been developed, discharge values can be obtained by just reading the staff gauge. Rating curves have to be constantly updated with additional stream-gaugings to compensate for any shifts or changes in the stream cross section.

Photo 4 Installation of a staff gauge at a new control point

Photo 5 Streamflow measurement using a wading rod and propeller

1.3 Irrigation water permits to June 2010

The number of active resource consents for freshwater abstractions for irrigation purposes to June 2010 is 77. This is a decrease of three from the previous monitoring period 2008-2009. During the period under review, one new consent was granted and two new applications for water for irrigation purposes were received. Table 3 lists the new consent for irrigation granted during 2009-2010.

Table 3 New, renewed, surrendered and lapsed irrigation water consents during 2009-2010

	Consent Number	Consent Holder	Catchment	Stream
New	7547-1	JM Doorbar	Waitara	Lake Cowley
enewed	0721-3	MD Aiken Family Trust	Waitotara	-
	3321-3	GH Lance	Whenuakura	Unnamed Trib
	4450-2	Waitara Golf Club	Waitara	Unnamed Trib
	4494-2	CT & JM McDonald	Mangaroa	Mangaroa
	4793-2	Kohi Beach Farm Limited	Wairoa	Wairoa
Surrendered	0497-3	OJ & FH Wood	Onaero	Unnamed Trib
	0639-2	IR Ogle	Tangahoe	Mangapoua 2
	5830-1	CC Bishop	Timaru	Unnamed Trib
Lapsed	6136-1	Crawford AM & TF Trust	Whenuakura	Unnamed Trib

Two consents were transferred between July 2009 and June 2010, they were consents 0721 and 1356. The land holder for 0721 is now MD Aiken Family Trust, it was previously held by Aiken IN and AM and the land holder for 1356 is now Ponui Family Trust, it was previously held by SW and SM Carr.

Five resource consents were renewed during 01 July 2009 and 30 June 2010 (Table 3). Several current consents are scheduled to be renewed in June 2011. A renewal of a resource consent is always considered as a new application for which a complete assessment of environmental effects has to be provided along with the application.

During the monitoring period, there were three consents surrendered (Table 3), while one consent was lapsed, as it had not been exercised within its first five years of being granted.

1.4 Climatological data and irrigation requirements

The Taranaki Regional Council provides live on-line data on soil moisture, precipitation and temperature via its website. Eight sites along the southern coast and throughout the hill country provide climatological information about the most intensively developed irrigation zones.

Rainfall has a direct impact not only on river and stream flows but on the amount of water for recharge reaching the province's aquifers and contributing to the base flow of groundwater discharges. Rainfall recharge is critical to maintain groundwater levels and thus the potential to supply water in the zones where there is more pressure on the surface water.

Accurate interpretation of climatological data is paramount for the planning, scheduling and operation of efficient irrigation systems. Precipitation and evapotranspiration data are fundamental to carrying out reliable water budget calculations and, subsequently, crop (pasture) water requirements. Crop water requirements can be defined as the depth of water needed to meet the water loss through evapotranspiration from the crop. The methods for calculating evapotranspiration from meteorological data require the knowledge of climatological and physical parameters.

In order to know the irrigation requirements for pasture production, the amount of water needed to compensate for evapotranspiration and the amount of rainfall are required. To avoid crop water stress, rainfall and irrigation must be sufficient to meet the pasture's evapotranspiration requirement. In other words, for any period of time, the net irrigation requirement is the amount of water which is not effectively provided by rainfall.

The calculated amounts of irrigation water to be efficiently applied to pasture, should also account for the water that is lost while transporting it from its source to the pasture root zone. Some of the losses that need to be estimated are those which occur due to leakage from pipelines, and evaporation from droplets sprayed through the air. To compensate for these losses, additional water must be pumped than that required to be stored in the pasture root zone. The gross irrigation requirement then, is the total amount that must be pumped which takes into consideration the irrigation efficiency.

The third variable that should be accounted for when planning and operating irrigation systems is the soil moisture. Some of the water that is required by the pasture may already be held in the soil, so it is critical to quantify it. There is no extra value in applying more water than the soil can hold, this only results in unnecessary costs and wastage. The only reliable way of knowing how much irrigated water can be stored in the soil at the time of irrigation is by measuring the soil moisture.

By measuring the soil moisture the irrigator can be more certain that:

a) only the amount of water required by the plant is applied
b) leaching of nutrients is minimised
c) pasture growth and quality is optimised
d) the benefit of rainfall and irrigation is maximised
e) the environmental impacts are minimised
f) costs are reduced

1.4.1 Droughts in Taranaki

Droughts are a normal, recurrent feature of climate. This phenomenon occurs almost everywhere though its features vary from region to region. Defining drought is difficult as it depends on need, physical differences in regions, and varying disciplinary perspectives. In the most general sense, drought originates from a deficiency of precipitation over an extended period of time, resulting in damage to crops and resultant loss of yields.

The 2009-2010 summer period rainfall percentages for the region ranged between 56 and 129% of normal. This variation in rainfall percentages was due to a large number

of localised thunderstorms in January and February. In particular, Motunui recorded 214% of its normal February rainfall; this was due to the site recording 92.0mm in one day, which is more than its average February monthly rainfall.

Mount Taranaki recorded between 66 and 100% of normal rainfall for the five month (summer irrigation) period, which meant that most rivers were generally running slightly below normal flows. However, with the localised rainfall and thunderstorms, the rivers did sustain flows above mean annual low flows; which in turn meant that the irrigators had the ability to take for longer periods before they were advised to cease abstracting due to low flows. Figure 7 shows the distribution of rainfall from 1 November 2009 to 31 March 2010.

Climate change scenarios suggest that Taranaki may experience more severe weather extremes in the form of dry spells as well as heavy rainfall events. The most severe droughts in Taranaki have been in 1969-1970, 1977-1978 and 2007-2008. Changes in drought risk for Taranaki region indicate a slight increase in the annual accumulated potential evapotranspiration (in mm), with a higher increase in the southern coast of the region. Developing climatology assessments of drought for a region provides a greater understanding of its characteristics and the probability of recurrence at various levels of severity. Information of this type is extremely beneficial in the development of response and mitigation strategies and preparedness plans.

When there is substantial rainfall to recharge the moisture levels in the rivers, lakes and soils, droughts are considered to be broken. Soil water reserves are replenished first, followed by streamflow, reservoirs and lakes, and groundwater. Drought impacts may diminish rapidly in the agro-pastoral sector because of its reliance on soil water, but linger for months or even years in other sectors dependent on stored surface or subsurface supplies. Groundwater users, who are often the last to be affected by drought during its onset, may be the last to experience a return to normal water levels[2].

1.5 Monitoring programme

1.5.1 Introduction

Section 35 of the Resource Management Act sets out an obligation for the Taranaki Regional Council to gather information, monitor, and conduct research on the exercise of resource consents and the effects arising from their use, within the Taranaki region.

The Council may, therefore, make and record measurements of physical and chemical parameters, take samples for analysis, carry out surveys and inspections, conduct investigations, and seek information from consent holders.

Every year the Council undertakes monitoring programmes for all pasture irrigation water permits. The programmes list all of the work that the Council could undertake during the forthcoming monitoring period and the cost of the activities to the consent holder. Because irrigation is climate dependent, the level of monitoring varies from year to year. Monitoring necessarily increases in drier years.

[2] National Drought Mitigation Center, Nebraska, USA.

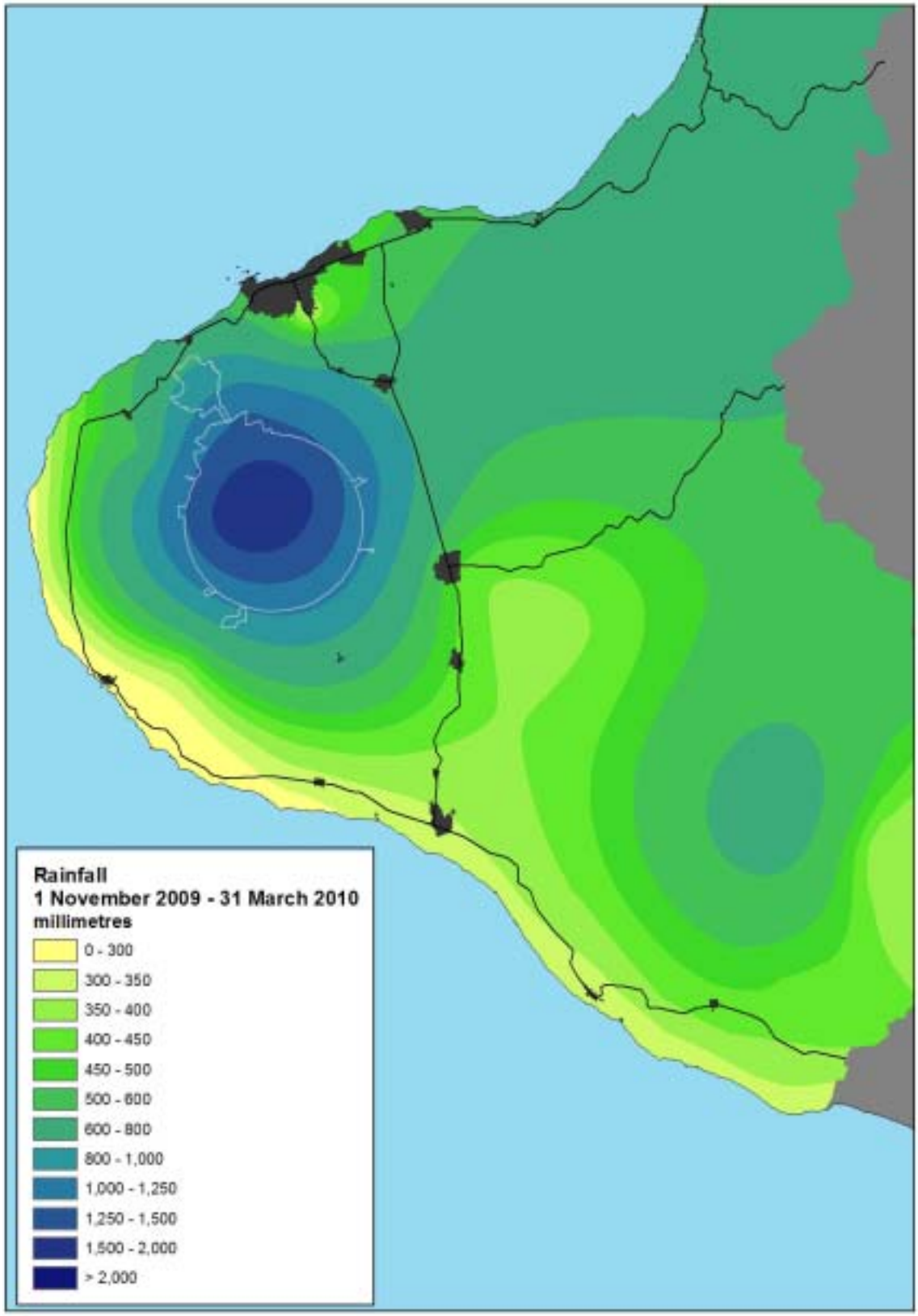

Figure 7 Distribution map of the total rainfall recorded from 1 November 2009 to 31 March 2010

The 2009-2010 monitoring programmes for irrigation water permits are comprised of three primary components; liaison with consent holders, site inspections, and data review and assessment for compliance. In the next sections, a brief discussion of these components is presented.

1.5.2 Programme liaison and management

There is generally a significant investment of time and resources by the Taranaki Regional Council in ongoing liaison with resource consent holders over consent conditions and their interpretation and application, in discussion about monitoring requirements, preparation for any reviews, renewals, or new consents, advice on the Council's environmental management strategies and the content of regional plans, and consultation on associated matters.

In 2009-2010, due to the variable weather throughout summer, the flows in many of the streams remained above the consented cut-off limits for longer, meaning there were less farms required to stop irrigating than in previous years. During periods where the flows in any catchment's waterways drop below the mean annual low flow, the Council endeavours to closely work with the consent holders to achieve full consent compliance.

1.5.3 Site inspections

During the period under review, the Council endeavoured to inspect all the surface water compliance monitoring programmes in place. Additionally, the "non-otherwise monitored" activities comprising golf courses, horticultural irrigation schemes and stock and dairy shed takes were also inspected.

The 2009-2010 pasture irrigation monitoring programmes provided for an annual inspection of each pasture irrigation abstraction site, to assess/evaluate compliance with consent conditions. The percentage of irrigation consents that were inspected during the 2009-2010 period was 99%.

Site inspections are focused on the overall set-up of the irrigation equipment's intakes structures; visual inspections for appropriate screenings, flow gauges, fences, planting of riparian vegetation, flowmeters and datalogger devices are carried out on the basis of the conditions of each individual consent.

Monitoring programmes for surface water abstraction include checking compliance with the residual flow conditions of the consent. Residual flow conditions set minimum environmental flows to be maintained during pumping in the waterways downstream from the abstraction point. Compliance with the residual flow conditions is assessed through hydrological flow gaugings which are carried out during low flow conditions in summer. The results of residual flow monitoring are summarised in section 2.3 and Table 7.

Observance of allocated maximum daily volume and flow rates were assessed by direct measurement where dataloggers fitted to the intake of the irrigation system record all the abstraction data, or indirectly through working out the abstraction data submitted by the consent holder.

For sites where no dataloggers are fitted, assessments of water takes for the 2009-2010 year were carried out by a combination of data obtained from the consent's holder records and information derived from previous computerised calibration checks of the pump discharge rate when the systems were operating during the summer period; it should be said that these calibrations took place during the irrigation seasons of 2003-2005 and will need to be re-done every five years by an independent body, to be in accordance with the new Regulations for Measurement and Reporting of water takes made under the RMA. This regulation comes into affect from 10 November 2010.

Sites are normally not inspected if the Council receives information from the consent holder that the water permit is not to be exercised. Inspection results are summarised in section 2 below.

1.5.4 Abstraction records

A special condition of all irrigation water abstraction permits **requires the consent holder to keep a record of abstraction.** This key information is necessary in order for the Council to assess consent compliance, and determine actual water use.

The Council annually reminds consent holders (in July) requesting that their abstraction records be provided for the forthcoming year ending 30 June. The daily irrigation record should include:

(1) date/time when the pump was operated;

(2) water meter reading at start and end of each day; and

(3) number of hours the pump was operated; these records can be kept manually, or electronically using an approved datalogger.

Consent holders who had fitted an approved datalogger on their intake system in time to record 2009-2010 irrigation water use, were not required to submit annual hard copy records to the Council for the review period. Data logged on the dataloggers were downloaded in the field by Council staff.

By the end of the 2009-2010 irrigation season, 27 dataloggers had been fitted to consent holder water pumps. During 2009-2010, no flowmeters were installed on irrigation systems.

The list of consent holders who have their intake systems equipped with dataloggers and their installation date can be found in Table 4.

The information derived from the flowmeters is important to the Regional Council to help manage the resource more sustainably and assess compliance – this is particularly important in drier localities or in water shortage times. Likewise, the information is useful to users for the management of inputs to their operations, identifying energy savings, identifying leakages in their systems and making water efficiency gains[3]. The information shows water managers the difference between what is allocated and when and how the resource is actually used.

[3] Water Programme of Action Ministry for the Environment.

If a water meter is not installed following the manufacturer's instructions and specifications, the data is not reliable as large errors may occur. The error produced by a valve installed immediately upstream of the flowmeter can be as much as 50% and errors produced by sharp bends upstream of the water meter can amount to up to 20% of the reading. Photo 6 below shows an example of a good installation of a flowmeter.

Photo 6 Properly installed flowmeter

Photo 7 Improperly installed flowmeter

There are new Regulations for Measurement and Reporting of water takes made under the RMA (section 360(1)(d), which take effect from 10 November 2010. The regulations apply to a water permit that allows fresh water to be taken at a rate of 5 litres per second or more, unless the taking of the water is non-consumptive. These regulations will apply directly to existing consents without review of individual consents, and will provide a simpler regulatory framework.

These regulations will help improve the management of fresh water in Taranaki by ensuring accurate measurement of water takes. The regulations will require:

- All water permits allowing the take of five litres per second or more to collect and report records to a set of minimum requirements[4].
- Measurement at the point where water is taken from a river, lake or groundwater system.
- Continuous records of daily volumes to be collected using an appropriate flowmeter with the data transferred to the Council on an annual basis.
- The flowmeter to meet an accuracy standard, and should be properly installed and calibrated independently every five years.
- The consent holder to be responsible in recording and transferring the data to the Council.

However, the Council may apply more stringent requirements on consent holders, such as the ability to require measurement of water takes below five litres per second or further requirements for measurement over the minimum standards specified by the regulations.

In Taranaki there are many flowmeters installed that do not comply with the minimum technical requirements for installation and therefore the readings given are not correct. Likewise, many of the water meters installed are approaching the end of their operating life and an overhaul may be needed.

Appendix II presents a preliminary draft of the guidelines for flowmeters for the Taranaki Regional Council.

All of the dataloggers were checked and the data downloaded where possible. There continued to be several issues with faulty dataloggers; 41% experienced problems during 2009-2010, with several dataloggers that have experienced problems in the 2008-2009 season being replaced with iRIS 150's this season. Consents holders were advised of this situation on the inspection notices following the inspections, with three consent holders requesting the Council to install new dataloggers for them for the upcoming season (2010-2011).

The Council has recommended other alternatives for datalogging, as the overall performance of the *Hydroflow*™ units has not been satisfactory. Also, the *Hydroflow*™ dataloggers only have a battery life span of approximately 7 years and many of these dataloggers in use are fast approaching this. Council staff have advised the appropriate consent holders of this fact and it is expected that remedial action will be taken prior to the next irrigation season.

[4] Refer to the document Resource Management (Measuring and Reoprting of Water Takes) Regulations 2010. REF 2010/267.

Table 4 Dataloggers installed to June 2010

Consent	Holder	Datalogger serial Nº	Installation date	Malfunctioning
0164	JR & DM Baker	41084152	2009	Yes[5]
0714	GD & HM McCallum	41084139	Nov-08	Yes[6]
		41084137	Nov-08	Yes[6]
1721	Manukorihi Golf Club Inc	AG3-0114	Nov-08	No
1877	Te Ngutu Golf Club	AG3-0029	Nov-08	No
2138	Schrader WM & MP	302100367	Feb-05	Yes[7]
4494	McDonald	AG3-0484	Jan-10	No
4783	Kohi Beach Farm	302100215	Dec-03	Yes[8]
5128	KL Gray	302100111	Sep-04 reset	Yes[8]
5623	WD & SC Morrison	AG3-0447	2010	No
5636	Schrider Trust	407100574	Nov-05	Yes[9]
5696	Kokako Road Limited	-	Nov-08	Yes[6]
5709	KG & CJ Sole	302100120	Dec-03	Yes[9]
5778	Mara Trust	302100436	Dec-05	No
5827	Walker & McLean Partnership No 1	AG4-0406	Nov-09	No
5840	Gibbs G Trust	AG4-0406	Nov-09	No
5876	RJ Dorn	AG3-0142	Feb-10	No
5896	Kohi Investments Limited	41081080	Nov-08	No
5898	Pease David Family Trust	41081095	Feb-08	No
5950	WD & SC Morrison	302100398	Mar-05	No
5973	DR & AJ Gibson	30210042	Dec-03	Yes[8]
6026	JR & DM Baker	41084153	2009	Yes[6]
6159	Pinehill Land Company Limited	302100277	Nov-04	No
6193	Cradles Farm Trust No 2	30210050	Dec-03	Yes[8]
6430	Ellingworth Margaret Trust	302100434	Nov-05	Yes[8]
6486	Quintus LM & PC Family Trust	302100143	Dec-03	Yes[7]
6628	Hamblyn Family Trusts	407100784	Jul-06 replaced	Yes[8]

Per the monitoring programmes the Council's staff gather, review and collate water abstraction records. All records are entered into the Council's databases and are available upon request.

The results of the 2009-2010 annual abstraction data review are summarised in Section 2 of this report.

[5] New datalogger installed by Scott Technical, but the battery has gone flat already. Was found that the batteries only have a shelf life of 5 years and had been sitting unused for some time in their depot before being installed in the logger.

[6] Fault with datalogger, unable to be turned on and/or no communications.

[7] Datalogger recording erroneous values

[8] Datalogger battery has gone flat. This is the original datalogger and has a battery life of approximately 7 years.

2. Results

Results of compliance monitoring of water abstractions for irrigation purposes in 2009-2010 are given below. The background to the monitoring programmes was given in previous introductory sections.

During the year, 40 out of a total of 53 current consents to take and use water for pasture irrigation were exercised. Thirteen consents were not exercised, with eight of those not yet in operation.

The results of the monitoring carried out in 2009-2010 are given below in sections 2.1 to 2.7 and summarised in Tables 5 to 10. Separate tables are given for groundwater and surface water abstractions.

2.1 Site inspections

During the 2009-2010 irrigation season, the Council carried out compliance monitoring inspections at 67 sites (Table 5), compared to 61 inspections carried out for the 2008-2009 irrigation season. The inspections included visual checks of the intake structures, screens, staff gauges, fencing around the pump sheds, downloading of datalogger and stream gauging as described in Section 1.2.8. The results of compliance monitoring of allocated abstraction rate and volume are given in sections 2.3 and 2.4.

The assessment of efficient use of water has proven to be a difficult task to carry out as most of the irrigation events take place at night when inspections are not conducted (unless there is an obvious waste of water). Assessments of losses for deep percolation, drifting or ponding need to be evaluated at the on-farm level and can easily be missed when only one inspection per year is carried out.

When manual data is received from the consent holder, daily abstraction records are processed, formatted and incorporated into the Council's hydrological database. Inspection notes are also recorded in the Council's database. Table 5 lists the consents inspected during the period being reviewed and reported on.

Table 5 Sites inspected during 2009-2010 for consent compliance

Consent	Consent Holder
0017-2	Manaia Golf Club
0124-4	Kaitake Golf Club Inc
0132-2	Hawera Golf Club Inc
0164-2	JR & DM Baker
0184-3	Inglewood Golf Club Inc
0189-3	AI & KJ Williams
0270-2	Westown Golf Club Inc
0278-3	NRGE Farms Limited/Oceanview Trust
0464-3	Oakura Farms Limited
0647-3	IG Cassie
0714-2	GD & HM McCallum

Consent	Consent Holder
0721-3	MD Aiken Family Trust
0880-3	IHC New Zealand Inc (NORTH TARANAKI)
1193-3	Vickers B & NM & Church G & CG
1194-3	Hakanoa Properties Management Limited
1223-3	EO & CP Lander
1721-3	Manukorihi Golf Club Inc
1877-2	Te Ngutu Golf Club
2138-2	WM & MP Schrader
2612-2	Duncan & Davies Nursery Limited
3171-3	Little Knoll Greenhouses
3312-3	GH Lance
4450-1	Waitara Golf Club Inc
4494-1	CT & J McDonald
4783-1	Kohi Beach Farm Limited
4993-1	Sanderson H & R Trust
4994-1	H & RA & J Sanderson
5057-1	Mitchfarm Farm Limited
5128-1	KL Gray
5568-1	Cornwall Farms
5570-1	Kaihihi Trust
5571-1	Jimian Limited
5623-1	WD & SC Morrison
5636-1	Schrider Family Trust
5696-1	Kokako Road Limited
5709-1	KG & CJ Sole
5773-1	Goodin FJ & Sons Limited
5778-1	Mara Trust
5781-1	Waikaikai Farms Limited
5791-1	Ionic Farm Limited
5797-1	Pihama Farms Limited
5807-1	Dickie Roger Family Trust
5827-1	Walker & McLean Partnership No 1
5829-1	Julian RM & MC Family Trust
5840-1	Gibbs G Trust
5863-1	Geary AR Trust
5876-1	GA & RJ Dorn
5878-1	Woollaston Family Trust Partnership
5879-1	Hilldale Trust
5887-1	A & EN Barkla
5896-1	Kohi Investments Limited

Consent	Consent Holder
5898-2	Pease David Family Trust
5950-1	WD & SC Morrison
5973-1	DR & AJ Gibson
6026-1	JR & DM Baker
6159-1	Pinehill Land Company Limited
6193-1	Cradles Farm Trust No 2
6292-1	New Plymouth Golf Club Inc
6430-1	Ellingworth Margaret Trust
6486-1	Quintus LM & PC Family Trust
6628-1	JW & MT Hamblyn Family Trusts
7161-1	A & A Fleming/Kinaki Trust
7231-1	Waimate Fields Limited
7243-1	Waiwira Trust
7270-1	Leighurst Lands Limited
7346-1	Spenceview Farms
7372-1	Pukeone Partnership
TOTAL	**67**

2.2 Non-exercised consents

Of the 77 resource consents granted to date for water abstractions for irrigation purposes, 13 were not exercised during 2009-2010 (Table 6). Several consents were granted in the middle or towards the end of the irrigation season and the systems were not operative during the season.

Table 6 Consents non-exercised during 2009-2010

Consent	Consent Holder
0721-3	MD Aiken Family Trust
4513-1	PG & BM Bourke
5057-1	Mitchfam Farm Limited
5696-1	Kokako Road Limited
5813-1	Richards R J & S B Family Trust
5878-1	Woollaston Family Trust Partnership
5905-1	NA & KM McColl
6429-1	Jordan JA & MP Trusts Partnership
6486-1	Quintus LM & PC Family Trust
7161-1	A & A Fleming/Kinaki Trust
7231-1	Waimate Fields Limited
7346-1	Spenceview Farms
7547-1	JM Doorbar

2.3 Residual flow compliance

The 2009-2010 irrigation season was a busy one for the Council's hydrological unit as the weather conditions called for close and frequent monitoring of waterway's ecological flows[9]. During the period under review compliance with residual flow conditions for surface water abstraction sites were assessed 44 times in 14 waterways. Flow gaugings were carried out between 21 October 2009 and 16 April 2010. Table 7 lists the consents assessed for residual flow compliance and the dates of the monitoring.

Table 7 Stream gaugings carried out for residual flow compliance

Gauging No	River	Site	Stage	Flow (l/s)	Date/Time	Consent No.
7391	Waiau 2	Below 7372	0.258	159	16/Apr/2010 12:24	7372-1
7386	Mangaroa	D/S of 7243	0.345	217	13/Apr/2010 13:38	7243-1; 5696-1; 4494-1
7385	Waireka 2	Parsons Rd	NA	7	13/Apr/2010 11:43	6159-1
7384	Kokako	Kokako Rd	0.710	142	13/Apr/2010 9:53	5896-1
7383	Wairoa	Kohi Beach Farm	0.367	209	09/Apr/2010 13:54	4783-1
7382	Wairoa	D/s Dam	-	253	09/Apr/2010 12:46	5807-1
7381	Wairoa	D/s Dam	0.120	122	09/Apr/2010 11:49	5807-1
7373	Kaihihi	SH45	0.295	383	29/Mar/2010 12:22	5128-1, 5570-1, 5773-1, 5778-1
7357	Ouri	SH45	0.37	207	19/Mar/2010 10:29	5791-1
7354	Kaihihi	SH45	0.285	460	17/Mar/2010 14:03	5128-1, 5570-1, 5773-1, 5778-1
7350	Mangaoraka	Upland Rd	-	165	12/Mar/2010 9:04	7626-1
7349	Waikaikai	Flume	-	56	12/Mar/2010 11:04	5863-1
7348	Waikaikai	Geary Rd	-	25	12/Mar/2010 10:37	5863-1, 5781-1
7347	Waikaikai	D/s Overflow Pipes	-	14	12/Mar/2010 9:15	5863-1, 5781-2
7346	Waikaikai	Above Waikaikai Confluence	-	4	12/Mar/2010 8:29	5781-1
7345	Oeo	5797-1	0.439	127[10]	12/Mar/2010 13:52	5797-1
7340	Waiokura	SH45	0.255	92[12]	09/Mar/2010 10:21	5827-1, 5840-1
7339	Unnamed Stream 1	7669-1	0.165	14	04/Mar/2010 11:01	7669-1
7336	Ouri	SH45	0.379	202	05/Mar/2010 15:42	5791-1
7335	Otahi 2	Ihaia Rd	0.505	93[12]	05/Mar/2010 14:11	5973-1
7334	Taungatara	SH45	0.295	489[12]	05/Mar/2010 12:27	5829-1
7331	Waiau 2	Below 7372	0.255	118	03/Feb/2010 11:32	7372-1
7330	Oeo	5797-1	0.439	129[12]	01/Mar/2010 13:22	5797-1
7326	Waikaikai	Flume	-	139	26/Feb/2010 11:51	5863-1
7325	Waikaikai	Geary Rd	-	69	26/Feb/2010 11:09	5863-1, 5781-1
7324	Waikaikai	D/s Overflow Pipes	-	55	26/Feb/2010 10:06	5863-1, 5781-2
7323	Waikaikai	Above Waikaikai Confluence	-	4	26/Feb/2010 9:35	5781-1
7319	Waiau 2	Below 7372	0.261	197	11/Feb/2010 10:52	7372-1
7316	Waikaikai	Flume	-	125	19/Feb/2010 15:35	5863-1
7315	Waikaikai	Geary Rd	-	62	19/Feb/2010 13:25	5863-1, 5781-1
7314	Waikaikai	D/s Overflow Pipes	-	44	19/Feb/2010 12:18	5863-1, 5781-2
7313	Waikaikai	Above Waikaikai Confluence	-	3	19/Feb/2010 11:44	5781-1
7312	Waiau 2	Below 7372	0.288	208	18/Feb/2010 12:54	7372-1

[9] Ecological flows are defined as the flows and water levels required in a water body to provide for the ecological function of the flora and fauna present within that water body and its margins. (Ministry for the Environment 2008).
[10] When the flow in the stream was gauged as being below the irrigators' cut-off limit.

Gauging No	River	Site	Stage	Flow (l/s)	Date/Time	Consent No.
7310	Mangaoraka	Upland Rd	-	210	22/Feb/2010 10:26	7672-1
7306	Mangaoraka	Upland Rd	-	83	11/Feb/2010 12:26	7672-1
7300	Waikaikai	Flume	-	74	09/Feb/2010 14:41	5863-1
7299	Waikaikai	Geary Rd	-	27	09/Feb/2010 13:34	5863-1, 5781-1
7298	Waikaikai	5781-1	-	4.02[12]	09/Feb/2010 12:30	5781-1
7296	Waireka 2	Parsons Rd	-	6.5	04/Feb/2010 13:00	6159-1
7290	Kaihihi	SH45	0.34	692	28/Jan/2010 11:51	5128-1, 5570-1, 5773-1, 5778-1
7264	Waiokura	SH45	0.285	199	19/Jan/2010 10:17	5827-1, 5840-1
7234	Unnamed Stream 1	7669-1	0.23	633	16/Dec/2009 10:39	7669-1
7187	Unnamed Stream 1	7669-1	0.172	21	11/Nov/2009 12:32	7669-1
7162	Unnamed Stream 1	7669-1	0.19	37	21/Oct/2009 12:03	7669-1

The periods when the stream gaugings activities take place coincide with the periods of low flows. Of the 44 gaugings, six were found to be breaching the residual flow requirement set out by the consent, meaning the irrigators were required to stop taking until further notice. Photo 7 shows a stream gauging activity taking place downstream of one of the consented water takes.

Photo 8 Stream gauging

2.4 Compliance with abstraction rate and volumetric limits

Compliance with abstraction rate and volume is assessed for all the consent holders from whom data is available[11]. Compliance with abstraction rate limits was determined either by direct measurement or by working it out from records provided as discussed earlier.

Of the consents for which data were received, 89% were within compliance for flow-rate allocation. Non compliance with consent conditions for abstraction rate is discussed further in section 3.

[11] Some dataloggers presented problems during 2009-2010 and therefore the data was not available.

During the monitored period 11 consent holders did not submit records to the Council; details on these consents are reported under section 2.5.

Table 8 displays the information for consents that were found to be in breach of the allocated flow-rate or volumetric amount at any time during the exercising of the consent during the 2009-2010 review period. It is considered that a consent condition breaches abstraction limits when the exceedance is greater than 5% of the consented limit.

Table 8 Consents breached for exceeding allocation limits during 2009-2010

Consent	Holder	Source	Breach	Compliance
5827	Walker & McLean Partnership No 1	Surface Water	Voumetric/Rate	No[12]
5950	WD & SC Morrison	Groundwater	Volumetric/Rate	No[13]
6628	Hamblyn Family Trusts	Surface Water	Volumetric/Rate	No[14]
7243	Waiwira Trust	Surface Water	Volumetric/Data	No[15]

2.5 Record keeping compliance

For the 2009-2010 review period, abstraction records were received **on time** from all but **11** water abstraction consent holders who exercised their permits. Written notifications and telephone calls received advising the non-exercising of consents were also taken as provision of records. Consents holders who have dataloggers fitted to their intake systems are exempted from providing data to the Council as the data collection is yearly undertaken by Council's staff as part of the compliance monitoring programmes. In the 2009-2010 season, it was found that eleven of the dataloggers had malfunctioned (Table 9).

Table 9 Dataloggers that failed in 2009-2010

Consent	Holder
0164	JR & DM Baker
0714	GD & HM McCallum x2 dataloggers
2138	Schrader WM & MP
5128	KL Gray
5696	Kokako Road Limited
5709	KG & CJ Sole
6026	JR & DM Baker

[12] Breached both volume and rate according to datalogger records. However, it is suspected that there is a fault with the flowmeter pulse output.

[13] Both volume and rate were breached for the entire irrigation period, consent holder has applied for change of consent conditions.

[14] Both volume and rate were breached for most of the irrigation season.

[15] Only supplied volumes, no rates/times supplied. Breached volume for majority of irrigation season, has since applied for change of consent conditions.

Consent	Holder
6193	Cradles Farm Trust No 2
6430	Ellingworth Margaret Trust
6628	Hamblyn Family Trust

The 11 consent holders from whom data **were not** received in time are listed in Table 10.

Table 10 Consents for which data were not received by the Council at 31 July 2010 for the 2009-2010 irrigation season

Consent	Consent Holder	Received late ?
0464-3	Oakura Farms Limited	**Never**
0880-3	IHC New Zealand Inc (NORTH TARANAKI)	**Never**
1194-3	Hakanoa Properties Management Limited	**Never**
1223-3	EO & CP Lander	**Never**
3312-3	GH Lance	**Never**
3859-1	Living Light 2000 Limited	**Never**
5306-1	Kapuni Contractors Limited	**Never**
5568-1	Cornwall Farms	**Never**
5863-1	Geary AR Trust	**Never**
7270-1	Leighurst Lands Limited	**Never**
7372-1	Pukeone Partnership	**Never**

Consent holders whose data is not received will be issued with abatement notices with the requirement to keep manual records or install dataloggers to account for their water abstraction permit.

2.6 Irrigation water usage 2009-2010

Water use for irrigation is based on consent holder abstraction records. The following general comments can be made from the processed irrigation data:

- Of the non exercised consents during 2009-2010, 62% of the irrigation systems were not yet operational. Four consents were not exercised even though the irrigation systems were in place.
- Compared with previous years, there were fewer breaches for exceeding limits on allocated rates and volumes in spite of the fact the season was drier than 2008-09.
- All the golf clubs exercised their water rights during 2009-2010.
- One new consent for pasture irrigation was granted during the period under review.

- Water harvesting has been an alternative to on-demand stream abstraction that farmers are considering more and more as part of their on-farm water management.

2.7 Register of incidents

The Taranaki Regional Council operates and maintains a register of all complaints or reported and discovered excursions from acceptable limits and practices, including non-compliance with consents, which may damage the environment. The 'Unauthorised Incident Register' (UIR) includes events where the consent holder concerned has itself notified the Council. The register contains details of any investigation and corrective action taken.

Incidents may be alleged to be associated with a particular site. If there is an issue of legal liability, the Council must be able to prove by investigation that the identified consent holder is indeed the source of the incident (or that the allegation cannot be proven).

In the 2009-2010 monitoring year, there were no incidents recorded by the Council that were associated with the consent holder's water abstraction

3. Discussion

In drafting and reviewing conditions on water take permits and in implementing monitoring programmes, the Taranaki Regional Council assesses the "effects on the environment" as much as it is appropriate for each water take source. Monitoring programmes are therefore not only based on existing permit conditions, but also on the obligations of the Resource Management Act to assess the effects on the environment from the exercising of consents.

Improving the **efficiency of water use** is a key outcome sought by the Water Programme of Action. Water is a public resource and the permission to take is granted through a resource consent. Associated with that permission is a public expectation that the water will be used efficiently and will not be wasted - an expectation that can be better met if the actual amounts of water taken are accurately monitored. Measuring actual water used is part of demonstrating and measuring progress towards more efficient water use.

3.1 Discussion of consent holder performance

Each year the Taranaki Regional Council assesses consent holder performance based on compliance with allocated abstraction rates and maximum daily volumes, protection of minimum residual flows, and the provision of abstraction records.

The examination of the data supplied to the Council, revealed that only four (8%) of the consent holders breached limits for rate/volume abstracted, while one did not supply all the required information as shown in Table 8. There have now been fifteen dataloggers that have either started to show signs of failure or are now faulty. With water abstractions in Taranaki being of relative minor amounts when compared with other regions of the country, the Council considered the options available for a compact and economic datalogging device and originally recommended the installation of the *Hydroflow*™ units. Most of these units have been installed for over six years. However, during 2009-2010 there were increasing examples of units malfunctioning.

The Council has been committed to explore new alternatives for data-logging devices and recommends the same type of instruments used by the Council for its own hydrological monitoring stations. It is anticipated that as more already deployed *Hydroflow*™ units begin to breakdown, their replacement with more reliable units will be promoted.

As noted earlier, the number of poorly-installed water meters (flowmeters) has become a concern for the Council. Most resource consents for water takes issued by the Taranaki Regional Council have specific conditions about the installation of a water meter devices. A reliable and accurate flowmeter is crucial to providing good information to the consent holder and the Regional Council alike.

To comply with Taranaki Regional Council requirements, the water meter should:

- Have an accuracy of +/-5% under field conditions, with calibration certified.
- Be simple to operate and read
- Be tamper-proof and sealed.

- Be capable of continuous measurement in cubic meters
- Include a pulse output that is compatible with the dataloggers recommended by TRC.
- Have sufficient pipe length for TRC to use a strap-on meter for periodic checks. Pipe length should be at least 10 times the diameter before the meter and 5 times the diameter after the meter or manufacturer's specifications.
- A detailed plan of the installed meter and distances to any potential turbulence sources (e.g. elbows, bends, valves etc) shall be submitted to the Taranaki Regional Council within 30 working days of the installation to certify that the flowmeter has been installed to the manufacturer's specifications.

It is important that the contractors hired for the installation of the flowmeter do so in accordance with the manufacturer's specifications. Good installations leave sufficient straight length of pipe between gate valves, elbows etc and the flowmeter to ensure there is no turbulence in the water passing through the meter, which reduces accuracy.

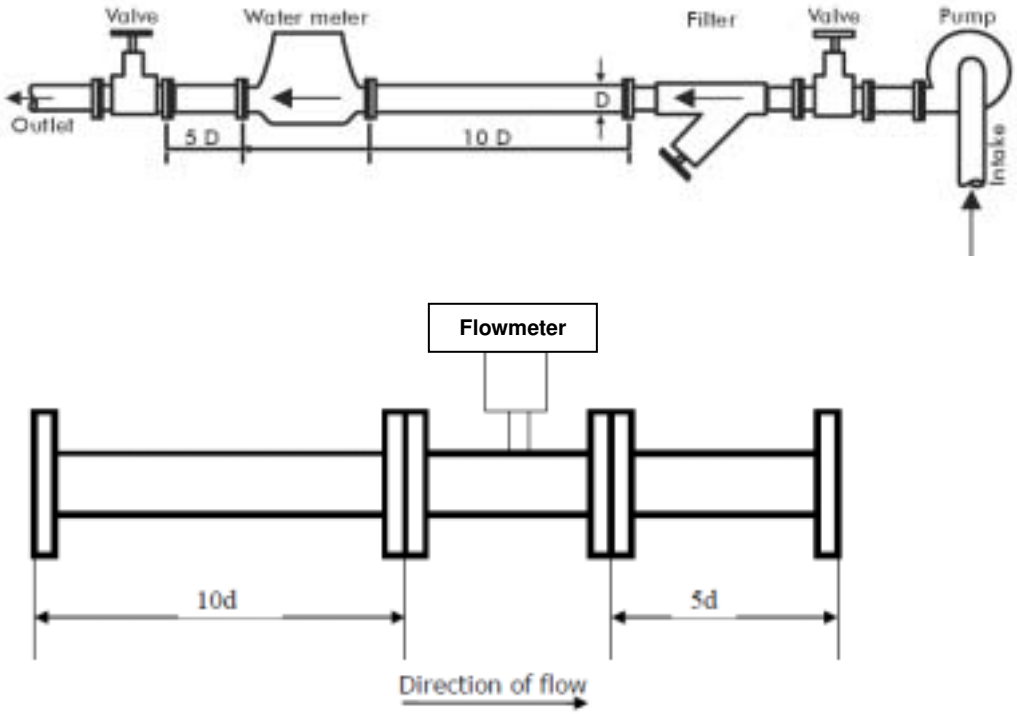

Figure 8 Flow-meters: Pipe layout recommendations

Most flowmeters should be installed so that there is a significant run of straight pipe before and after the location of the flowmeter. This is intended to allow the straight pipe run to "smooth out" any turbulence produced by the presence of valves, filters, chemical injectors and diffusers, and changes in pipe direction. This type of turbulence produces error in the reading of most flow meters.

Flowmeter's errors can be quite large if installed incorrectly. The error produced by a gate valve or a butterfly valve upstream of a flow meter can be as much as 50-60%;

The error produced from a partially closed ball valve can be as much a 50% for flow meters. Chemical injectors can produce significant error in the flow meter reading also.[16]

3.1.1 Compliance issues

Four consents were found to be in breach of the abstraction limits as discussed in section 2.4. The following are the graphs of the data against the limits set on the water permits.

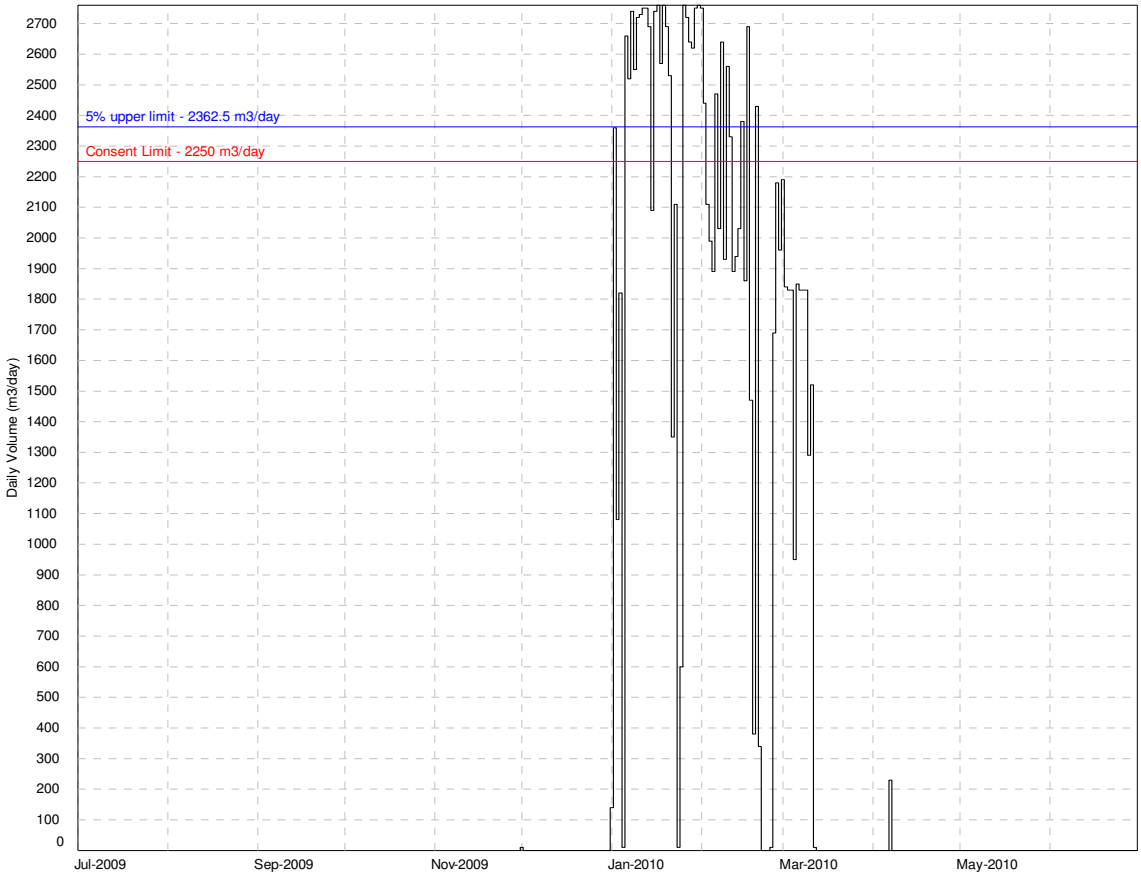

Figure 9 Amounts and dates of exceedance of daily volume of abstraction for consent 5827

[16] Global Water Instrumentations; FLOW METERS: PIPE LAYOUT RECOMMENDATIONS. www.globalw.com

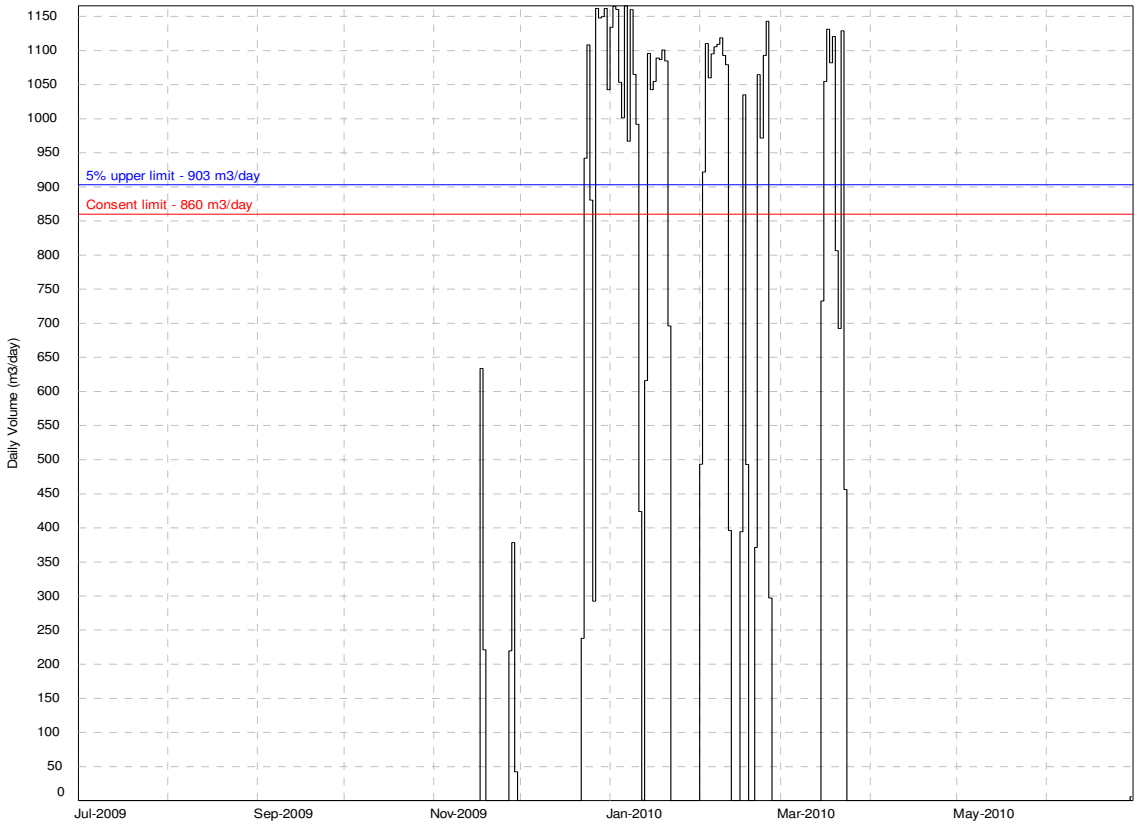

Figure 10 Amounts and dates of exceedance of daily volume of abstraction for consent 5950

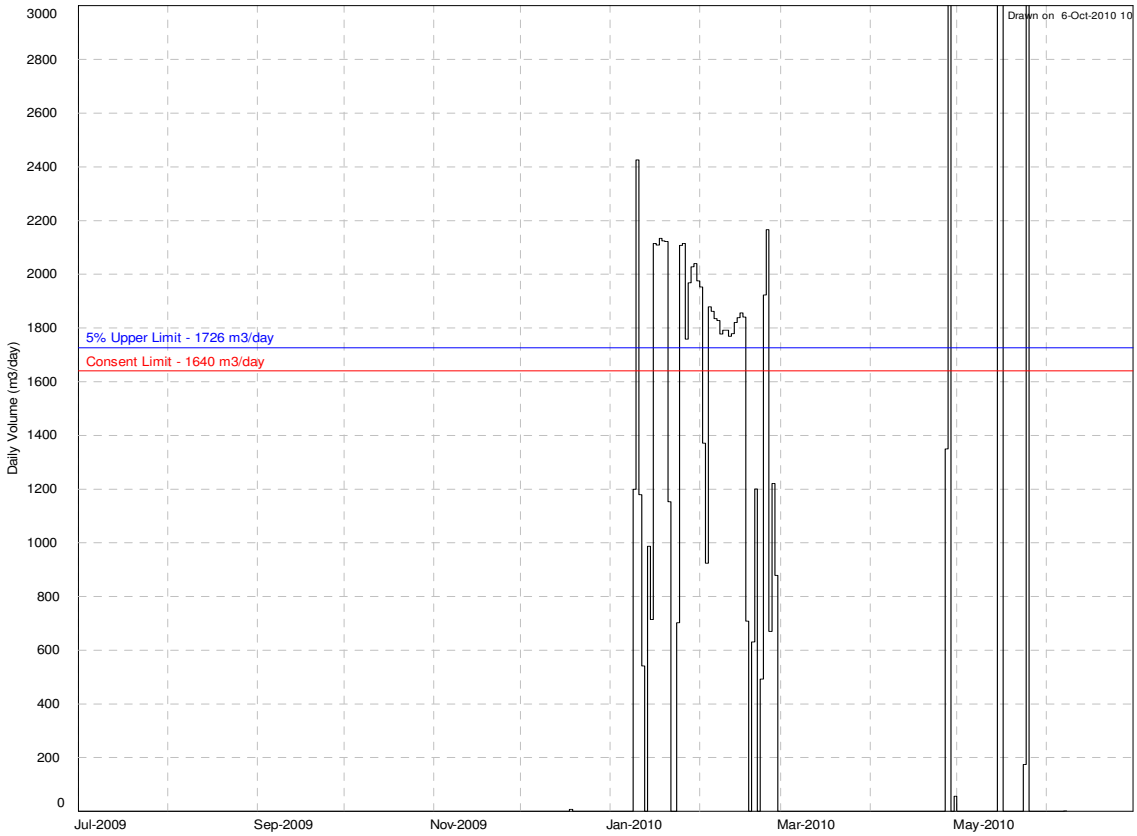

Figure 11 Amounts and dates of exceedance of daily volume of abstraction for consent 6628

Figure 12 Amounts and dates of exceedance of daily volume of abstraction for consent 7243

3.2 Evaluation of performance

During the year under review a good level of environmental performance and compliance was demonstrated by most irrigators. The four consent holders that exceeded their consent limits generally exceeded it on a long term basis, but these actions did not result in any significant adverse environmental effects.

Nevertheless, improvement will be required in complying with consent conditions for allocated abstractions for the following consent holders:

5827 Walker & McLean Partnership No 1
5950 WD & SC Morrison
6628 Hamblyn Family Trusts
7243 Waiwira Trust

Improvement will be required in complying with consent conditions for abstraction records for the following consent holders:

0464 Oakura Farms Limited
0880 IHC New Zealand Inc (NORTH TARANAKI)
1194 Hakanoa Properties Management Limited
1223 EO & CP Lander
3312 GH Lance
3859 Living Light 2000 Limited

5306 Kapuni Contractors Limited
5568 Cornwall Farms
5863 Geary AR Trust
7270 Leighurst Lands Limited
7372 Pukeone Partnership

Issues with dataloggers which may include replacement of units are due for:

0164 JR & DM Baker
0714 GD & HM McCallum x2
2138 WM & MP Schrader
5128 KL Gray
5696 Kokako Road Limited
5709 KG & CJ Sole
6026 JR & DM Baker
6193 Cradles Farm Trust No 2
6430 Ellingworth Margaret Trust
6628 Hamblyn Family Trust

3.3 Recommendations from the 2008-2009 annual report

In the 2008-2009 Annual Report, it was recommended:

1. THAT the level of monitoring of pasture irrigation water permits in 2009-2010 remains unchanged from that undertaken in 2008-2009.

2. THAT the consent holders whose dataloggers are coming to the end of their life are made aware of this situation so that improvements in compliance at all times with consent conditions are achieved.

Recommendation 1 was completed for the period under review.
With regards to recommendation 2, the Council has been liaising with consent holders whose dataloggers are coming to the end of their life or becoming faulty and recommending replacement loggers. The Council has been instructed to install new dataloggers before for the 2010-2011 season by three consent holders.

3.4 Alterations to monitoring programmes for 2010-2011

In designing and carrying out the monitoring programmes for water abstractions for irrigation water in the region, the Taranaki Regional Council has taken into account the extent of information made available by previous authorities, its relevance under the Resource Management Act, the obligations of the Act in terms of monitoring of the taking and use of fresh water and effects, and subsequently, reporting to the regional community the scope of assessments required at the time of renewal of permits.

4. Recommendations for 2010-2011

1. THAT the level of monitoring of pasture irrigation water permits in 2010-2011 remains unchanged from that undertaken in 2009-2010.

2. THAT the consent holders whose dataloggers are coming to the end of their life are made aware of this situation so that improvements in compliance at all times with consent conditions are achieved.

3. THAT the Council encourages consent holders that do not supply good quality records or provide no records at all to install a datalogger.

4. THAT the Council investigates the possibility to take over the ownership of dataloggers on the water takes that are yet to comply with a resource consent condition to install dataloggers as well as the feasibility to make them telemetered; sending data back to the Council Offices, to have live data online available to the consent holders.

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MAF 1997: Best Management Guidelines for Sustainable Irrigated Agriculture. MAF Policy Technical Paper N^{o} 00/05, ISBN 0-478-20050-1. 47 pp.

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TRC 1998: State of Environment Monitoring report 1994-97 groundwater levels, quality and nitrate monitoring. Unpublished technical report 97-86 by Taranaki Regional Council, January 1998, 27 pp.

TRC 2003: A preliminary evaluation of surface water availability and demand for pasture irrigation purposes in Taranaki. Unpublished report by Taranaki Regional Council, July 2003, 14 pp.

TRC 2005: State of the Environment Monitoring 2001-2002 – Nitrates in shallow groundwater. Unpublished technical report 2003-22 by Taranaki Regional Council, March 2005, 19 pp.

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Taranaki Regional Council 2004: Pasture irrigation monitoring Annual Report 2003-2004. Technical Report 2004-63.

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Taranaki Regional Council 2006: Pasture irrigation monitoring Annual Report 2005-2006. Technical Report 2006-04.

Taranaki Regional Council 2007: Pasture Irrigation Compliance Monitoring Annual Report 2006-2007. Technical Report 2007–55.

Taranaki Regional Council 2009: Irrigation Water Compliance Monitoring Annual Report 2007-2008. Technical Report 2008-84.

Taranaki Regional Council 2010: Irrigation Water Compliance Monitoring Annual Report 2008-2009. Technical Report 2009-100.

Water meter guidelines. Environment Waikato Regional Council

Appendix I

Example surface water abstraction permit for pasture irrigation

Consent 4494-2

TARANAKI
REGIONAL
COUNCIL

CHIEF EXECUTIVE
PRIVATE BAG 713
47 CLOTEN ROAD
STRATFORD
NEW ZEALAND
PHONE: 06-765 7127
FAX: 06-765 5097
www.trc.govt.nz

Please quote our file number on all correspondence

Water Permit

Pursuant to the Resource Management Act 1991 a resource consent is hereby granted by the Taranaki Regional Council

Name of Consent Holder:	Craig Timothy & Joanne Maree McDonald 5 Nadine Stanton Drive Bell Block NEW PLYMOUTH 4312
Consent Granted Date:	1 June 2010

Conditions of Consent

Consent Granted:	To take and use water from the Mangaroa Stream for pasture irrigation purposes at or about (NZTM) 1720379E-5604145N
Expiry Date:	1 June 2016
Review Date(s):	June 2013
Site Location:	Lower Ball Road, Kakaramea, Patea
Legal Description:	Lot 5 DP 2782 Bk II Carlyle SD
Catchment:	Mangaroa

For General, Standard and Special conditions pertaining to this consent please see reverse side of this document

www.trc.govt.nz

Doc# 764168-v1

General condition

a. The consent holder shall pay to the Taranaki Regional Council [the Council] all the administration, monitoring and supervision costs of this consent, fixed in accordance to section 36 of the Resource Management Act.

Special conditions

1. The volume of water taken shall not exceed 2,160 cubic metres per day [25 litres per second].

2. During periods of low flow in the Mangaroa Stream between the point of residual flow assessment and the point of take of 5636 [Schrider], the applicant shall manage the abstraction of water, specified in special condition 1, such that sufficient water is available for the exercise of consent 5636 to the satisfaction of the Chief Executive, Taranaki Regional Council.

3. Before exercising this consent the consent holder shall install, and thereafter maintain a water meter and a datalogger at the site of taking. The water meter and data logger shall be tamper-proof and shall measure the rate and volume of water taken to an accuracy of ± 5% at intervals not exceeding 15 minutes.

   Note: Water meters and dataloggers must be installed, and regularly maintained, in accordance with manufacturer's specifications in order to ensure that they meet the required accuracy. Even with proper maintenance water meters and dataloggers have a limited lifespan.

4. Upon reasonable notice the consent holder shall provide the Chief Executive, Taranaki Regional Council with a document from a suitably qualified person certifying that:

   a. any water measuring or recording equipment required by the conditions of this consent has been installed and/or maintained in accordance with the manufacturer's specifications; and/or

   b. any water measuring or recording equipment required by the conditions of this consent has been tested and shown to be operating to an accuracy of ± 5%.

5. If any measuring or recording equipment breaks down, or for any reason is not operational, the consent holder shall advise the Chief Executive, Taranaki Regional Council immediately. Any repairs or maintenance to this equipment must be undertaken by a suitably qualified person.

6. The water meter and data logger shall be accessible to Taranaki Regional Council officer's at all reasonable times for inspection and/or data retrieval.

7. The taking of water authorised by this consent shall be managed to ensure that the residual flow in the Mangaroa Stream immediately downstream of the intake point for consent 7243, held by Waiwira Trust [Grid reference 1720771E-5603021N] is not less than 18 litres per second. No taking shall occur when the flow is less than 18 litres per second.

8. The consent holder shall take all reasonable steps to avoid, remedy or mitigate any adverse effect on the environment arising from the exercise of this consent, including, but not limited to, the efficient and conservative use of water.

9. The consent holder shall ensure that the intake structure is screened and designed to avoid the entrainment of fish.

10. In accordance with section 128 and section 129 of the Resource Management Act 1991, the Taranaki Regional Council may serve notice of its intention to review, amend, delete or add to the conditions of this resource consent by giving notice of review during the month of June 2013, for the purpose of ensuring that the conditions are adequate to deal with any adverse effects on the environment arising from the exercise of this resource consent, which were either not foreseen at the time the application was considered or which it was not appropriate to deal with at the time.

Signed at Stratford on 1 June 2010

For and on behalf of
Taranaki Regional Council

Director-Resource Management

Appendix II

Preliminary draft of Council guidelines for flowmeters installation

Flowmeter guidelines – Surface and groundwater abstractions

ENVIRONMENTAL MANAGEMENT

MOST RESOURCE CONSENTS FOR WATER TAKES ISSUED BY THE TARANAKI REGIONAL COUNCIL HAVE SPECIFIC CONDITIONS ABOUT THE INSTALLATION OF A WATER METER DEVICE (FLOWMETER)

A fit for purpose, reliable and accurate flowmeter is crucial to providing good information to the consent holder and the Regional Council alike. Purchase and installation of the meter is the consent holder's responsibility, so there are some important things you need to consider when choosing a flowmeter

The installation of a flowmeter benefits you and is required to comply with environmental regulations.

WHY HAVE A FLOWMETER?

A good flowmeter is needed to accurately measure the amount of water being used. Measuring water is a requirement for:

a) Monitoring: Metering is used by authorities to monitor individual consent holders use against abstraction permits, to find out how much water is being extracted from the system and to demonstrate compliance with regulations.

b) Distribution: Metering is necessary to manage delivery of water because it allows measurement of how much water is used in each part of the system, be it for irrigation, consumption or other uses.

c) Management: Water metering is essential for calculating the efficiency of the system and to identify and minimise losses.

d) Environmental purposes: Metering assists in resource accounting and monitoring what is actually being taken from natural systems. This helps to ensure minimum flows are maintained in natural waterways, meeting legislative and environmental requirements that help protect our streams and groundwater, while allowing use of our resource.

CHOOSING A FLOWMETER

A number of issues need to be discussed with your contractor when deciding which type of flowmeter is the most suitable for your activity.

WATER SOURCE

Do you take your water from a waterway that has high contents of silt and weeds, and highly variable flow rates. Do you take it from a surface or groundwater source?

PRESSURE HEAD

How much head do you have? Do water levels fluctuate during a season? How much head does the flowmeter need to properly work?

FLOW RANGE

What is the flow range of the abstraction throughout the year? Most meters have a minimum flow below which they cannot provide an accurate reading. Large meters may give erroneous readings when the flow reaches the lower end of the flow range. Meters continually operated in the high flow range wear out and fail much quicker than meters that operate in the middle of their flow range. The flowmeter should be sized based on the flowrate to be abstracted.

ACCESS TO POWER

Does the unit need power? What type of power does it need? Can it work appropriately and accurately on solar power? Does it need batteries or does it even need power at all?

ACCURACY

You will need to choose a meter with a minimum of +/-5% accuracy. Remember that a meter will only be accurate if the environmental conditions meet all the manufacturer's requirements of flow profile, temperature, humidity, flow range, vibration water quality etc.

ACCESS TO METER

Meters can be buried, with some manufacturers providing special containers for just this purpose; however, this can cause access problems for you and the Council. It is preferable that meters be installed so they are accessible at all times. In particular, the Council requires access to the meter itself and the straight length of pipe before and after the meter.

LONGEVITY

What is the average operating life before overhaul is required? Mechanical and electromagnetic meters have very different average operating life. A water meter needs to be reliable and give accurate readings at all times. The operating life of any meter will always depend on water quality and the situation the unit is used in.

PULSE OUTPUT

What is the level of required accuracy? What units are the data calibrated in? Can a datalogger/telemetry link be used to record the pulse output? The flowmeter output should comply with Regional Council requirements.

COST

One of the most important things to decide on is the cost. Generally, the more accurate and reliable the meter, the more expensive it is. However, the purchase price is not the only consideration; also consider the cost of installation, maintenance, data collection, calibration and longevity. A cheap meter will generally require greater maintenance and calibration.

TRC REQUIREMENTS

TO COMPLY WITH TARANAKI REGIONAL COUNCIL REQUIREMENTS, THE WATER METER SHOULD:

- ✓ Have an accuracy of +/-5% under field conditions. When you purchase a flowmeter and have it installed, ask for a calibration certificate.
- ✓ Be simple to operate and read
- ✓ Be tamper-proof and sealed.
- ✓ Be capable of continuous measurement with a read-out in cubic metres.
- ✓ Include a pulse output that is compatible with our dataloggers recommended by TRC.
- ✓ A detailed plan of the installed meter and distances to any potential turbulence sources (e.g. elbows, bends, valves etc) shall be submitted to the Taranaki Regional Council within 30 working days of the installation to certify that the flowmeter has been installed to the manufacturer's specifications.

INSTALLATION OF FLOWMETERS

Installing your flowmeter in accordance with the manufacturer's specifications is essential for your meter to be as accurate as it claims. Good installations leave sufficient straight length of pipe between gate valves, elbows etc and the flowmeter to ensure there is no turbulence in the water passing through the meter, which reduces accuracy. This may also be part of your consent conditions.

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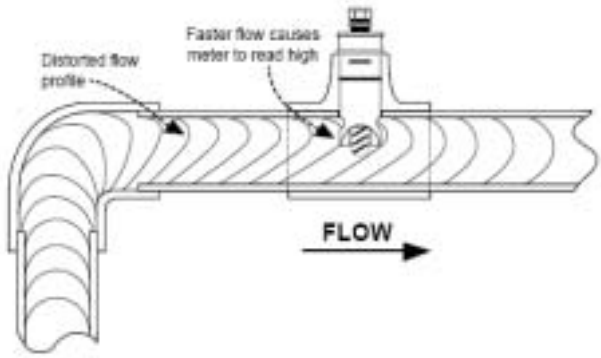
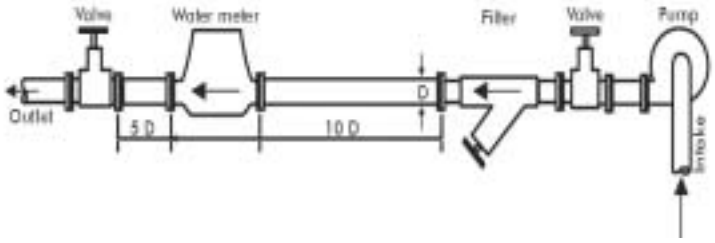


INSTALLATION

- ✓ Installation should strictly comply with the manufacturer's installation instructions.
- ✓ The accuracy of all measuring devices must be independently verified every five years.
- ✓ We suggest at least 10 diameters of straight pipe run upstream and 5 diameters of straight pipe run downstream of any flow meter installation to achieve proper accuracy.



FLOW METERS: PIPE LAYOUT RECOMMENDATIONS

TYPES OF FLOWMETERS

SPECIFICATIONS	ELECTROMAGNETIC FLOWMETER	MECHANICAL INSERT METER (PADDLE OR TURBINE)
Accuracy	+/-0.15% - 2%	+/-2% - 5%
Reliability and tamper proof protection	Very High	Medium
Flow rate indication available	Yes	Yes - with data logger attached
Remote reading capability	Yes	Optional
Average operating life before overhaul (dependant on water quality)	20 years	4 years
Pressure (head) loss	Negligible	400mm (insertion type meter) Negligible (paddle type meter)
Resistance to blockage	Very High	Medium
Resistance to blockage with weed	High	Medium
Relative installed cost	Medium	Relatively low
Water quality	Can cope with silty water	Prone to wear with continued exposure to silty water

Note: This table is only a guide. Always contact manufacturer for complete details and specifications

READING YOUR WATER METER

Once your flowmeter has been properly installed, you must read and record the data at regular times if you do not have a data-logger installed. Standard consent conditions provide for daily recording of water abstractions.

Always record the reading and the time when the reading was made.

.

ELECTROMAGNETIC METER

Consists of a section of pipe with a magnetic field around it and electrodes to detect electrical voltage changes. Electrodes in the probe detect the voltages generated by the flowing water. Measurement of the voltage is then converted to velocity so flow rate can be derived. This type of meter is produced in a range of standard sizes and flow capacities.

ADVANTAGES

- High degree of accuracy (+/-0.15%-2%) and consistent over full flow range.
- Wide flow range and no obstructions of flow.
- Robust with only minimal routine maintenance required.
- No moving parts.

DISADVANTAGES

- Power supply required.
- Electronic components vulnerable to lightning damage.
- Repairs require skilled technician and specialised equipment.

MECHANICAL INSERT METER

An impellor is rotated by water passing through the meter, which is translated to a volumetric reading. The mechanism is calibrated by an adjustable device that is preset and security sealed. These meters are available in various sizes and have to be full of water during measuring.

ADVANTAGES

- Reliable and accurate means of measurement providing meter is correctly installed.
- Relatively low initial cost.
- In-line maintenance with simple, efficient mechanism.
- Headworks replacement readily available.

DISADVANTAGES

- Mechanical parts can be damaged, making frequent accuracy testing necessary.
- Prone to wear in silty water, potentially resulting in loss of accuracy and need for replacement.
- Some headloss possible.
- Short useable life.

POOR INSTALLATION

Meter too close to elbow

Meter too close to control valves, T and in only one branch of distribution pipes

Meter too close to elbow, gate valve and insufficient straight length of pipe

GOOD INSTALLATION

Good installation

Good installation, sufficient straight length of pip between flowmeter and fittings and bends

Flowmeter installation in a mobile pump

References

Water meter guidelines. Environment Waikato Regional Council
Flowmeters, Systems and requirements explained. Environmental Canterbury
Choosing a Flowmeter. Horizons Regional Council
Seametrics Technical Bulletin. Flow Meter Installation: Straight Run

If you require further explanation of the information in this pamphlet please contact:

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Private bag 713, Stratford
Ph: 06 765 7127 or 0800 736 222
Fax: 06 765 5097 www.trc.govt.nz