the state of our environment

Published by Gisborne District Council

Gisborne 2009 and 2010

Fresh Water Resources

Principal findings

- Current use of surface and groundwater in Gisborne District appears to be sustainable
- More information is needed for long term planning
- Far more water is allocated "on paper" than is needed for irrigation
- Initial steps have been made towards development of a Freshwater Plan for Gisborne District
- Water quality in rivers is generally acceptable, though sediment loads can be excessive
- Ground water quality is in general good, with the exception of some saline bores or excessive hardness
- It is anticipated that intensive forms of farming involving high nutrient loadings will increase in Gisborne District, and this may adversely affect water quality unless managed.

Gisborne District is in an enviable position regarding water resources: monitoring data suggests that use of both surface and ground water is at present sustainable, in contrast to some other parts of New Zealand where demand for water for irrigation and hydro-generation cannot be sustainably met by natural water resources.

This has not always been the case, however. Gisborne District Council has a network of monitoring bores that provide information on groundwater levels. There was a steady and continual drop in the Makauri aquifer during the 10 years from 1982 to 1992. Since then water levels have recovered due to wetter climatic conditions observed since then. The period of stress in the Makauri Aquifer also coincided with peak water use during the kiwifruit boom of the 1980s. This situation illustrates the importance of Council's monitoring programme, and the risks to our irrigation resource due to normal climate variability, long-term climate change, and any increased future demand.

Gisborne District is fortunate that our climate does typically provide rainfall at intervals over summer, and this significantly alleviates pressure for irrigation water. Nor is allocated irrigation water taken all at one time: abstraction for frost protection doesn't overlap with summer irrigation, for instance. However, consents for surface and groundwater often allocate an annual volume of water 'on paper' much greater than the volume of water that is actually taken or even needed.

Above: Growers are increasingly using technology to schedule irrigation. Here a tensiometer reading helps deterimine whether soil moisture is at its optimum level, midway between field capacity and wilting point.

How is fresh water currently managed?

Gisborne District Council takes a pragmatic approach and currently manages the District's freshwater in a number of ways:

- Discharges to freshwater are managed through the Discharges Plan
- Sedimentation is managed through the District Plan including requirements to plant 'Land Overlay 3A' – the worst eroding land in the district
- Water permits are granted for a maximum of 5 years. This allows adaptation to medium-term fluctuations in water availability and changes in land use
- Permits for surface water takes within the Waipaoa catchment include conditions to cease abstraction if river levels drop below specific thresholds
- The Poverty Bay Water Users' Group collaborates to manage water resources across the Waipaoa catchment within Council minimum flow levels.

The National Policy Statement (NPS) for Freshwater Management came into effect on 1 July 2011, and requires that councils identify freshwater values – ecological, economic, and cultural - and develop water quality standards and allocation limits. Water availability and quality is likely to be influenced in the future by changing land use, land development, climate change and economics. These issues are to be explored in depth as a freshwater plan for Gisborne District is developed.

The future for freshwater management: developing a Freshwater Plan

The Waipaoa Catchment has been the focus so far, as there is reasonable data and there are several important values. Council is open to a broad range of methods for managing water, not just policies and rules under the Resource Management Act.

Preparing a regional water plan involves a broad range of considerations including flows and water levels for ecological values, cultural, recreational, landscape and amenity values, as well as the use of water for social and economic benefit.

So far information has been gathered on groundwater, annual flows, tangata whenua values and ecological flows.

- Assessment of mean annual low flows for the Waipaoa and Te Arai Rivers has been completed
- Assessment of minimum ecological flows for the Waipaoa and Te Arai Rivers has been completed
- Methodology for determining tangata whenua freshwater values has been identified
- A method for calculating groundwater recharge rates has been identified
- Repots have been prepared by NIWA to assist Council with development of the Freshwater Plan
- The Gisborne Fresh Water Advisory Group has been formed to guide Council officers in early policy development.

Freshwater Advisory Group

The Fresh Water Advisory Group was formed to guide Council staff through the policy process, and had its inaugural meeting on 8 December 2010. The purpose of the group is to provide a collaborative approach to the development of a freshwater plan, a forum for discussion on freshwater management issues, and information sharing between group members, their respective organisations and the community.

Members of the Group include water users; horticulturists and farming interests; iwi representatives; government departments; recreational and environmental users and Council staff. While the group has a purely advisory capacity, it has the endorsement of the Environment and Policy Committee of Council.

Funding for development of a Freshwater Plan

The Ministry of Agriculture and Forestry's Community Irrigation Fund made a grant in 2009/10 of $23,330 for the ecological flows assessment of the Waipaoa and Te Arai Rivers, and for assessing groundwater recharge rates (August 2010 – June 2011) and total allocatable water volumes in the catchment.

For 2010–2012 a further Community Irrigation Fund Grant of $50,000 was approved for research related to agriculture and horticulture freshwater uses on the Poverty Bay Flats and engagement with key stakeholders.

The Foundation for Research, Science and Technology approved a total of $155,000 worth of grants through the Envirolink grant scheme, towards gathering robust and defensible data for decision-making. These reports are able to be viewed on the GDC website www.gdc.govt.nz/freshwater-reports/

Demand for groundwater

There are five main aquifers beneath the Poverty Bay Flats: the Te Hapara Sand, Shallow Fluvial Deposits, and the Waipaoa, Makauri, and Matokitoki Gravel Aquifers. There are currently 85 consents to abstract up to a total of 60,980 m^3/day "on paper" from the five aquifers.

The Makauri Gravel Aquifer is the primary source of groundwater for the Poverty Bay flats and has experienced an 85% increase in allocation since 1997. Currently, the Aquifer supplies approximately 52% (31,524 m^3/day) of the District's total consented groundwater allocation (60,980 m^3/day).

In the long term, Gisborne District Council will need to identify what proportion of the current allocation is really needed by consent holders to cover their worst-case dry seasons. If existing consent holders are currently allocated more than they need, there may be even more water available for use in the District than it appears.

The Waipaoa River is the main source of recharge for the Makauri Gravel Aquifer, with flow losses from the river to subsurface flow of 13,000 - 35,000 m^3/day. Therefore, allocations to take water from the Makauri Gravel Aquifer account for as much as 90% of the available recharge from the river, and may possibly exceed river recharge during low flows by more than 200%. We don't know if this is sustainable long-term, nor what the effects of climate change in the future will be.

Groundwater monitoring

Gisborne District Council has a network of 79 bores used to monitor groundwater quality, and these plus an additional 9 bores are monitored for pressure/static water levels. Testing occurs at fortnightly intervals. In addition IGNS samples 6 bores, 4 times per year, as part of national water quality monitoring. Groundwater quality results for key parameters are given in the table below.

Average groundwater quality monitoring results 2009-2010

Aquifer (bore) and location		Nitrates g NO/m^3	Salinity ppt	pH -log(H+)	Manganese g/m^3	Hardness g/m^3
Te Hapara Sands Aquifer (GPB099) at Cameron Road	Average Minimum Maximum Grade	<0.002 <0.002 <0.002 ✓✓	0.1 0.21 0.31 ✓✓	8 7.0 8.1 ✓✓	0.011 0.01 0.013 ✓✓	166 153 180 ✓
Te Hapara Sands Aquifer (GPC030) at McDonald's Road	Average Minimum Maximum Grade	1.52 0.5 2.5 ✓	0.22 0.2 0.3 ✓✓	7.3 7.2 7.4 ✓✓	0.029 0.02 0.04 ✓✓	295 270 350 ✓
Te Hapara Sands Aquifer (GPA004) at Childers/Stanley Road	Average Minimum Maximum Grade	0.012 <0.002 0.07 ✓✓	0.2 0.2 0.2 ✓✓	7.6 7.6 7.7 ✓✓	0.112 0.119 0.11 ✓✓	225 220 230 ✓
Shallow fluvial Deposit (GPC051) at Dunstan Road	Average Minimum Maximum Grade	<0.002 <0.002 <0.002 ✓✓	1.91 1.7 2.2 ✗	7 6.9 7.1 ✓✓	2.34 2 2.6 ✗	734 630 810 ✗
Makauri Gravel Aquifer (GPH008) at Lavenham Road	Average Minimum Maximum Grade	n/a	0.26 0.2 0.3 ✓✓	7.6 7.4 7.7 ✓✓	0.4 0.31 0.5 ✓	257 160 300 ✓
Makauri gravel Aquifer (GPB135) at Cameron Road	Average Minimum Maximum Grade	n/a	1.9 1.9 1.9 ✗	7 7 7 ✓✓	0.976 0.92 1 ✗	714 660 790 ✗
Waipaoa Gravel Aquifer (GPE040) at Waerenga a hika	Average Minimum Maximum Grade	n/a	0.28 0.1 0.5 ✓✓	7.28 7.1 7.7 ✓✓	0.44 0.11 0.79 ✓	260 100 400 ✓
Matokitoki Gravel Aquifer (GPB102) at Cameron Road	Average Minimum Maximum Grade	n/a	0.5 0.5 0.5 ✓✓	7.7 7.6 7.9 ✓✓	0.138 0.15 0.12 ✓	304 280 340 ✓
Matokitoki Gravel Aquifer (GPB126) at Kings Road	Average Minimum Maximum Grade	n/a	0.5 0.5 0.5 ✓✓	7.27 7.2 7.4 ✓✓	0.36 0.3 0.37 ✓	337 330 350 ✓
Matokitoki Gravel Aquifer (GPD111) at Bushmere Road	Average Minimum Maximum Grade	n/a	0.54 0.5 0.6 ✓✓	7.23 6.9 7.7 ✓✓	0.36 0.3 0.37 ✓	372 360 410 ✓
Key to symbols	✓✓ good	✓ acceptable	✗ unacceptable	n/a not available		

River monitoring

The Council's hydrological telemetry network provides a continuous record of data on selected river levels. Fourteen rivers (28 sites) in the Waipaoa catchment/ Gisborne area and 14 East Coast rivers (16 sites) are monitored. Automatic recording stations measure the river's water level (stage height) and the data is relayed back to the Council's computer system.

The volume of water flowing down a river is a factor of the flow, water level and cross sectional area of the river bed. A rating curve is used for each site to calculate river flow from the measured water level. Manual flow gaugings are therefore carried out at different river levels to ascertain the relationship between water level and flow, which is then plotted as the rating curve for that site. Gaugings can be carried out by wading, using a boat or from a bridge.

Above: Hydrotechnologies Limited carrying out a manual gauging on the Te Arai River.

On 25 rivers, 270 manual gaugings are carried out each year. The number of gaugings per site ranges from 2 to 31 a year, though the main rivers are gauged 18 times a year. In addition, 8 rivers require flood gauging when levels get above a trigger height.

Eighteen River sites have cross section surveys carried out twice yearly, and 4 sites have cross section surveys annually.

Water quality samples are taken each time a river or stream is measured for flow, and a range of water quality parameters are measured. Nineteen river sites are monitored for suspended solids. Additional samples are taken whenever any work is programmed at a particular site.

The table of river quality monitoring results highlights some key parameters measured, but there are numerous other tests performed. Sampling and water testing is carried out by Hydrotechnologies Ltd., who are contracted for five years to September 2014.

The Waipaoa River

The Waipaoa River is the main source for surface water abstractions in the District, and has a mean flow at Kanakanaia of 31.567 m^3/s, and a mean annual low-flow of 2.6 m^3/s. The 31 existing permit holders who take water from the Waipaoa River are subject to a consent condition requiring permission of a Council-delegated officer to take water if the flow drops below a minimum flow of 1.33 m^3/s.

Silt in rivers

The most significant water quality issue for the rivers of Gisborne District is siltation, or suspended solids. Particles of silt in the water are often the vehicle for bacterial contamination, as bacteria, often coliforms from the gut of animals, tend to adhere to the surfaces of silt particles, and are carried with them into water courses.

Because Gisborne District is a area of soft rocks and steep hills, accelerated erosion has a detrimental effect on the quality of most of our rivers. Appropriate treatment in the form of suitable tree cover is now a requirement for the most eroded and erosion-prone land, mapped as Overlay 3A in the District Plan.

Dairy cattle and their influence on water quality

The Gisborne district has historically been a sheep and beef farming area, and dairy farming has only ever been a minor land use. In the past few years, two new dairy farms have been developed, and we have also seen an influx of dairy cows from other neighbouring districts for winter grazing. Dairy cow numbers, as surveyed by Statistics New Zealand, are double what they were in 1990, and in 2008 reached a peak of three times the 1990 numbers. Intensive dairy farming in the Gisborne district could further degrade water quality, as has happened in other parts of New Zealand, but for the present, numbers remain relatively low.

The upper Motu River catchment is an area where dairy farming and grazing may intensify. It is also a sensitive area. The Motu River is subject to a Water Conservation Order to protect it's unique wild characteristics, and the river and its tributaries are highly regarded trout fisheries.

However, in other dairying regions, water quality has actually been shown to improve in severely degraded streams when farmers adopt best management practices.

The possible land use changes in the Motu catchment therefore present an opportunity to monitor impacts of change in land use from sheep-beef to dairy, and to implement best management practices from the outset.

Shingle extraction

Since most of the rivers of Gisborne District are aggrading, accumulated bed loads of gravel allow for sustainable shingle extraction.

Gisborne District Council, roading contractors and the major forestry companies hold shingle extraction consents. The majority of extracted material is used in road construction and maintenance.

	Shingle extracted m^3	
Source/river	**2009**	**2010**
Aorangiwai	0	16,549
Awatere	0	3,500
Hikuwai	830	0
Karakatuwhero	14,931	0
Makarika	1,525	0
Mangaoporo	1,547	21,312
Mangaraukokore	0	6,811
Mangatu	0	0
Maraehara	0	0
Mata	33,110	16,410
Pauariki	0	0
Taurangakautuku	7,534	4,969
Waiau	0	1,350
Waikohu	0	285
Waipaoa	71,584	27,456
Waitahaia	18,283	19,819
Wharekahika	0	0
Total	151,353	120,471

Popular swimming spots

Although these sites are not subject to Ministry of Health guidelines, Council staff monitor bacteriological water quality over summer at Donneraille Park, Rere Falls and the rockslide, because these are such popular swimming holes. Times when these sites fail to meet bathing water quality guidelines include following significant rainfall (when contamination levels can be very high due to run off from surrounding farmland) and occasionally also when water flow is very low. Generally 75% of the time it is safe to swim. Yearly variations relate to rainfall and run off rather than changes in land use.

References

Meriano, M., Schmidt, J., Rouse, H. (2010) Review of groundwater information for the Poverty Bay Aquifers. NIWA Client Report: CHC2010-022, prepared for Gisborne District Council April 2010.

Norton, N., (2009). Implications of the Proposed National Environmental Standard on Ecological Flows and Water Levels for the Gisborne District. NIWA Client Report: CHC2009-120, July 2009.

Ballantine, D.J. and Davies-Colley, R. J., (2009). Recommendations for water quality monitoring of a new dairying area – Upper Motu Catchment. NIWA Client Report HAM2009-168, November 2009.

River quality monitoring results – average values 2009-2010

River / sample location		Suspended soilids[1] g/m³	pH[2] –log (H+)	BOD[3] g/m³	Dissolved oxygen[4] g/m³	Ammonia[5] g/m³	Temperature °C
Waipaoa@ Matawhero Bridge 19700005	Average Minimum Maximum Grade	179 3 900 ✗	8.0 7.4 8.2 ✓✓	1.3 0.6 2.9 ✓	9.3 7.3 11.1 ✓✓	0.03 0.1 0.1 ✓	15.5 8.3 26.1
Waipaoa@ Kanakanaia Bridge 19700023	Average Minimum Maximum Grade	235 3 1300 ✗	8.1 7.8 8.2 ✓	0.9 0.5 3.2 ✓✓	9.4 8.3 11.7 ✓✓	0.01 0.02 0.03 ✓✓	15.7 6.8 24.9
Waimata @ Monowai Bridge 19600056	Average Minimum Maximum Grade	26 2 240 ✓✓	8.1 7.9 8.2 ✓	1.7 0.5 4.5 ✓	9.7 7.8 11.7 ✓✓	0.02 0.01 0.05 ✓	14 7.2 20
Taruheru @ Lytton Rd Bridge 19603015	Average Minimum Maximum Grade	42 9 120 ✓✓	7.7 7.3 7.9 ✓✓	1.4 0.7 3.3 ✓	7.0 4.0 10.2 ✓	n/a	14.7 9.2 26
Turanganui @ Gladstone Rd Bridge 19600020	Average Minimum Maximum Grade	69 13 300 ✓✓	7.9 7.6 8.1 ✓✓	1.1 0.5 2.2 ✓	8.5 5.7 12.1 ✓	n/a	15.5 9.4 21.7
Waiapu @ SH 35 Bridge 18300003	Average Minimum Maximum Grade	93 2 380 ✓✓	8.0 7.7 8.2 ✓✓	0.5 0.5 0.5 ✓✓	9.6 6.4 11.5 ✓✓	0.1 0.1 0.1 ✓	12.7 9.8 18.9
Mata @ Pouturu Bridge 18300004	Average Minimum Maximum Grade	195 2 1300 ✗	8.2 8.0 8.3 ✓	1.1 0.5 2.2 ✓	10.1 7.2 13.2 ✓✓	0.02 0.01 0.04 ✓	13.5 3.2 23.4
Hikuwai @ Willow Flat Bridge 18900003	Average Minimum Maximum Grade	56 2 410 ✓✓	8.0 7.8 8.1 ✓✓	1.2 0.5 3.7 ✓	9.7 7.4 11.5 ✓✓	0.02 0.01 0.03 ✓	14.2 7.8 22.2
Pakarae @ Pakarae Rd Bridge 19100001	Average Minimum Maximum Grade	24 2 160 ✓✓	8.0 7.9 8.1 ✓✓	1.1 0.5 2.1 ✓	9.6 8.4 10.9 ✓✓	0.02 0.01 0.08 ✓	16.1 9.5 24.4
Waiomoko @ SH35 19200001	Average Minimum Maximum Grade	7.5 3 14 ✓✓	8.0 7.8 8.0 ✓✓	1.0 0.6 1.3 ✓	8.9 5.7 12.0 ✓	0.2 0.1 0.2 ✓	17.7 11.2 26
Ihungia @ Ihungia Rd Bridge 18326002	Average Minimum Maximum Grade	34 2 250 ✓✓	8.1 7.5 8.2 ✓	1.1 0.5 2.6 ✓	10.2 5.3 13.0 ✓✓	0.01 0.01 0.03 ✓✓	11.9 4.6 21.3
Te Arai River @ Pyke's weir 19703039	Average Minimum Maximum Grade	42 2 360 ✓✓	8.1 8.0 8.2 ✓	1.8 0.5 4.6 ✓	9.8 7.2 11.8 ✓✓	0.03 0.01 0.12 ✓	13.5 7 21.3
Wharekopae @ Rangimoe 19704011	Average Minimum Maximum Grade	14 0 110 ✓✓	8.0 7.9 8.3 ✓	1.7 0.5 3.4 ✓	10.2 8.4 12.2 ✓	0.03 0.01 0.12 ✓	13.3 6.2 21.1
Quality grade	✓✓ good	✓✓acceptable	✗ unacceptable	n/a Not available			

1. Suspended silt, sand and clay. Too much may suffocate eggs of aquatic organisms and clog gills of fish.
2. Aquatic life will tolerate a pH range from 5 to 9.
3. BOD = biochemical oxygen demand, and indicates bacterial load in water.
4. Requirement for aquatic life. For fish must be over 3g/m3.
5. Should not exceed 0.9g/m3. Sources include stock effluent, fertilisers, and breakdown of organic matter in water.