the state of our environment

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Gisborne 2007 and 2008

Fresh Water Resources

Principal findings

- Irrigation demand was much higher than usual and Gisborne's water resources coped, though aquifer recharge was slow.
- By the end of December 2008, it was clear water levels in the Mangapoike dams, supplying Gisborne City, would fall below the one-in-fifty-year drought level.
- All of Gisborne District's water-takes are metered, and this proved valuable in assessing amounts allocated versus amounts of water abstracted.
- Users abstracted only 50% of water allocations. Allocated and actual takes need to be better aligned.
- New software will enable environmental data, new and historical, to be better reported in future State of Our Environment reports.
- Kent's Lake was closed for recreational use due to algal blooms for 5 months in 2008.

As a result of prolonged groundwater abstraction, the Makauri Aquifer, was again drawn down to record low levels and the recovery period in which aquifer static water level and pressure recharge was prolonged. The aquifer did fully recover by the end of August 2008.

A new tool: email communication with users of surface water

Commencing in summer 2008, email communication was set up with water-permit holders in three catchments. Fortnightly low-flow gauging data were plotted on a rating curve and emailed to the permit holders. This gave users up-to-date flow information to assist with planning irrigation, and an overall view of river fluctuation over the entire summer irrigation season. Feedback from users was very positive, and this system will be continued.

Aquifer draw-down during two very dry summers

By January 2007, markedly drier than normal summer conditions had already had a noticeable effect on water pressures and levels within the most significant aquifer on the Poverty Bay flats, the Makauri Aquifer, particularly around the O'Grady Road, Bolitho Road and Makauri areas.

Dry conditions on the flats persisted until March, by which time the Makauri Aquifer was at a four-year low. Final analysis of users' data collected by water meters revealed over 754,000 cubic metres had been extracted, a 75% increase on the 430,000 cubic metres that is typical.

Water levels/pressures were also markedly reduced within the shallow unconfined Te Hapara Sand Aquifer, found beneath Gisborne city where it is often used for domestic use, and beneath the coastal flat land south east of the city where it is drawn for irrigation.

In all over one million cubic metres of water were extracted from the Poverty Bay aquifer systems during the 2006-07 irrigation season, with some users still irrigating well into autumn.

Slow aquifer recharge 2007 – 2008

Gisborne District continued to receive well below-average rainfall throughout the remainder of 2007 and throughout the 2007-2008 summer irrigation season.

Above: River flows were very low, and very clear, over summer 2007 – 08.

Above: Irrigation of pasture, seldom seen in Gisborne District, became a fairly common sight over the very dry summer of 2007 – 2008.

Water allocation versus amount actually used

Traditionally, water-permit holders abstract only a fraction of the amount allocated to them. A water-use survey on abstraction from the Waipaoa River commenced in the irrigation season of 2008-2009. Permit holders were asked how much water they had abstracted and how much they budgeted to use over that summer.

Gisborne District is in a unique situation to be able to conduct a study like this: every water-take in the District is metered, and users are required to provide returns to Council on a regular basis, stating exactly the volume of water they have used. This situation is a legacy of the 1980s kiwifruit boom, when it seemed water resources were becoming stretched. As a result, every permit holder was required to have a meter installed, and that requirement has continued to the present day.

The survey provided invaluable water-use information during another exceptionally dry season. The results were surprising: users used on average around 50% of their allocated water permit. This means Council has allocated very high amounts of water "on paper", amounts that are unlikely to be used unless there is a dramatic change in the type of crops grown on the Poverty Bay flats.

Council is currently scoping a water allocation plan for Gisborne District. A review of water volumes currently allocated is required to better reflect actual usage of surface water. The next step of data collection will therefore be to obtain more detailed information from water permit holders in the form of their irrigation management plans.

Gisborne City water supply

In the 1940s the Council of the day purchased 450 hectares of land at Mangapoike and constructed 3 dams: the Sang Dam (347,568m^3) that gravity feeds into the Clapcott and Williams Dams (1,121,365m^3 and 2,291,864m^3 respectively). Raw water is also sourced from the 1,100 hectare Te Arai bush catchment. Nearly all of Gisborne' s water supply is being treated at the Waingake treatment plant.

The Waipaoa augmentation plant, opened in 1992 following cyclone Bola, is used to boost the city's water supply with water from the Waipaoa River in periods of high consumption (typically January-February), or as an alternative supply in emergency situations.

Low rainfall and drought periods very early in the season trigger careful consideration of risks by Council staff for both urban and rural resource users. Planning must take account of projected water demand for irrigation and food processing throughout the summer months.

Voluntary water restrictions for Gisborne City residents may be triggered when actual dam levels approach emergency storage levels, especially if this happens early in summer. If the downward trend continues, restrictions can become compulsory and operation of the Waipaoa Augmentation plant is considered in order to conserve Waingake dam storage.

However, operating costs of the Waipaoa plant are high, as the water requires a more extensive treatment process and electrical consumption is significant because of pumped systems.

It was apparent in the summer of 2008/09 that dam water levels were falling critically early in the season. Water levels had not been this low since the dry summer of 1997-1998.

Data telemetry

Above: GDC staff member taking a water-meter reading.

Above: Mangapoike Dams from the air.

How does Gisborne District Council continuously collect a wide variety of environmental data simultaneously across far-flung localities the length and breadth of the District?

The job is done by forty-two automated telemetry stations, that record some or all of the following information at key locations: rainfall, water levels, water flows, temperature, wind direction, wind speed, and humidity.

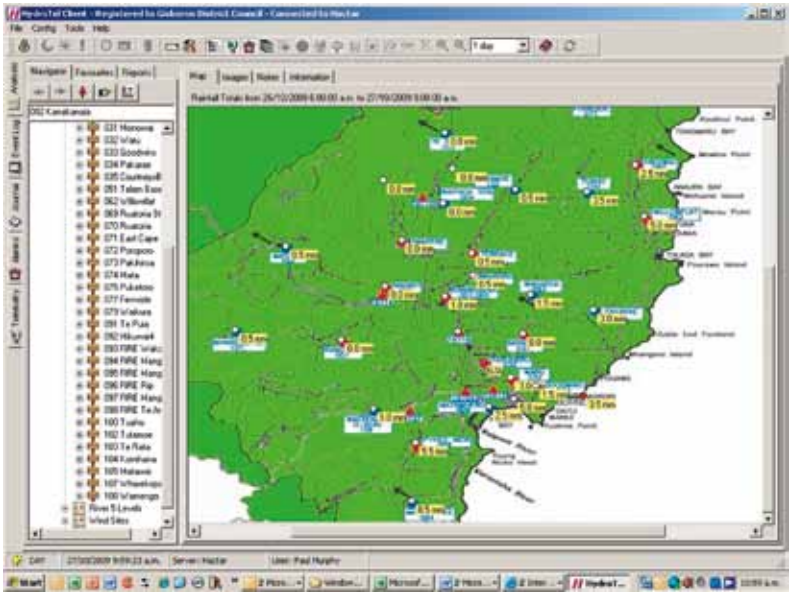
The telemetry stations automatically send the data via UHF radio to the software system Hydrotel, operated by staff at the Gisborne District Council, enabling staff to view the latest values for all the telemetry stations in the District at the click of a computer mouse.

Hilltop will give an even better view of data

Over the past few years it became apparent that the Council needed to purchase new software to assist in the collection, collation and interpretation of environmental monitoring information.

"Hilltop" software was chosen, as it will enable all the various environmental data that has been previously collected and stored in a range of software systems to be managed by one

Above: Kanakanaia telemetry station, which records data on the Waipaoa River.



Above: Telemetry data, as it appears on screen at Council offices.

single package.

Hilltop software also has the ability to create graphs and tables easily and automatically. Rainfall and river levels are now available "live" online via the Gisborne District Council website. This is very useful to farmers and growers, who are now able to observe rising river levels and rainfall data from their home computers, and plan accordingly.

Hilltop software also has the capability to integrate historic data from the original Ministry of Works Soil and Water Division information systems. The Council has a wealth of detailed and consistent historic hydrology data dating back to the 1940s. The data was originally recorded on a card system and, having been converted to electronic format, will allow medium- to long-term trends to be considered. This is a new capability that will provide information for the next State of Our Environment Report.

Algal bloom in Kent's Lake

Kent's Lake was closed for recreational use due to cyanobacteria blooms from March through to August 2008. Monitoring for toxic algal blooms, and informing the public, is the responsibility of the Public Heath Unit of Tairawhiti District Health.

Cyanobacteria are commonly called blue-green algae, but are actually aquatic bacteria that can photosynthesise like algae, and often grow in colonies large enough to see. These are the same types of algal blooms common in many of the Rotorua lakes.

Algal blooms can decrease the clarity of the water, turning it a green or brownish colour and reducing light penetration. Algae can form layers of scum or foam on the surface, may cause unpleasant smells, deplete oxygen levels, alter the pH and disrupt the ecology of a lake system.

Between a quarter and a half of cyanobacteria blooms are associated with toxin production that can cause severe skin and eye irritation, a sore throat, asthma symptoms and even dizziness.

Drinking water containing high levels of toxic cyanobacteria can result in severe illness and even death of stock or humans.

Rights of passage for native fish

Many of New Zealand's indigenous fish must migrate from the sea to suitable stream habitat during the course of their lifecycles. All five juvenile galaxiid species that comprise whitebait, must migrate from the sea into freshwater streams to grow, mature and spawn.

These tiny migrating fish are able to conquer some incredible physical obstacles, such as rapids, natural waterfalls, and even land for short distances. However many fish need low-speed zones and wetted margins at the water's edge which climbing species can traverse. Just a single, impassable man-made barrier in their path, debris build up around structures and floodgates, concentrated too-fast water, thinly-spread too-

shallow water, or a culvert that's too long and dark, can prevent fish from completing their lifecycles leading to catastrophic decline in fish populations.

In 2008 the Department of Conservation surveyed all in-stream structures on public roads and some on private property within the Waipaoa Catchment. There were 169 in-stream structures that would impede or prevent fish passage, 81% of them culverts, 17% fords and 2% were combined types of structure. DoC staff determined that around 16% of fish habitat within the Waipaoa Catchment was unavailable to fish due to these barriers.

The best native fish habitat within the Waipaoa catchment is the Waterworks Bush, but access for fish is very restricted by several barriers in the Te Arai River. Hihiroa Stream and streams within Mangatu forest, both potentially high-quality fish habitat, also contain barriers to fish passage. These three habitat areas are of high priority for remediation. In most cases the problems are relatively easy to fix.

It is a legal requirement for structures placed in waterways after 1984 to allow for fish passage. Guidelines are available from both the Gisborne District Council and DoC. The Biodiversity Condition and Advice Fund may be available to assist private landowners wishing to enhance fish passage on private property. Criteria are available at www.biodiversity.govt.nz

Above: Culverts with a 'drop' such as this prevent fish passage.

River quality monitoring results – average values

River / sample location	Suspended soilids[1] g/m³ 2007/2008		PH[2] –log (H+) 2007/2008		BOD[3] g/m³ 2007/2008		Dissolved oxygen[4] g/m³ 2007/2008		Ammonia[5] g/m³ 2007/2008		Temperature °C min 2007/2008		Temperature °C max 2007/2008	
Waipaoa@ Matawhero Bridge 19700005	126 mod ✓	401 high ✗	8.1 mod ✓✓	8 mod ✓✓	0.82 low ✓✓	0.72 low ✓✓	9.26 high ✓✓	9.05 high ✓✓	0.025 low ✓✓	0.1 low ✓✓	7.8	7.2	22.2	26.1
Waimata @ Monowai Bridge 19600056	8 low ✓✓	22 low ✓✓	8 mod ✓✓	8 mod ✓✓	0.86 low ✓✓	1.54 mod ✓	9.25 high ✓✓	9.33 high ✓✓	0.03 low ✓✓	0.02 low ✓✓	8.9	7.5	22.2	21.8
Taruheru @ Lytton Rd Bridge 19603015	32 low ✓✓	37 low ✓✓	7.7 mod ✓✓	7.8 mod ✓✓	8.37 high ✗	1.44 mod ✓	6.46 mod ✓	7.3 high ✓✓	0.02 low ✓✓	0.03 low ✓✓	11.5	7.1	21.3	22.4
Turanganui @ Gladstone Rd Bridge 19600020	35 low ✓✓	111 mod ✓✓	8 mod ✓✓	7.9 mod ✓✓	0.67 low ✓✓	1.3 low ✓✓	7.63 high ✓✓	7.98 high ✓✓	n/a	n/a	8.5	9.6	20.1	21.5
Wharekahika @ u/s Wharf Rd Br. 17600004	19 low ✓✓	30 low ✓✓	7.6 mod ✓✓	7.6 mod ✓✓	0.55 low ✓✓	0.53 low ✓✓	9.6 high ✓✓	9.85 high ✓✓	0.06 low ✓✓	0.1 low ✓✓	8.9	10.7	19.1	16.8
Awatere @ SH35 Bridge 17900002	60 low ✓✓	799 high ✗	8 mod ✓✓	8 mod ✓✓	0.6 low ✓✓	0.9 low ✓✓	9.27 high ✓✓	9.18 high ✓✓			11.3	6.9	20.9	19.7
Mata @ Pouturu Bridge 18300004	60 low ✓✓	799 high ✗	8 mod ✓✓	8 mod ✓✓	0.6 low ✓✓	0.9 low ✓✓	9.27 high ✓✓	9.18 high ✓✓	n/a	n/a	11.3	6.9	20.9	19.7
Hikuwai @ Willow Flat Bridge 18900003	260 high ✗	279 high ✗	8.0 mod ✓✓	8.2 mod ✓✓	0.88 low ✓✓	0.83 low ✓✓	10.23 high ✓✓	9.73 high ✓✓	0.01 low ✓✓	n/a	5.6	7.2	20.5	19
Pakarae @ Pakarae Rd Bridge 19100001	77 mod ✓	76 mod ✓✓	8.0 mod ✓✓	8.0 mod ✓✓	0.85 low ✓	0.95 low ✓✓	10.53 high ✓✓	10.42 high ✓✓	n/a	0.03 low ✓✓	9.7	7.7	24.7	24
Waiomoko @ SH35 19200001	50 mod ✓	9 low ✓✓	8.0 mod ✓✓	7.9 mod ✓✓	0.7 low ✓✓	1.3 low ✓✓	9.78 high ✓✓	10.33 high ✓✓	0.03 low ✓✓		8.3	9.7	22	23.3
Ihungia @ Ihungia Rd Bridge 18326002	36 low ✓✓	303 high ✗	8 mod ✓✓	8.2 mod ✓✓	1 low ✓✓	0.77 low ✓✓	9.72 high ✓✓	10 high ✓✓	0.72 low ✓✓	0.42 low ✓✓	6.7	4.6	21.2	21.7
Key to symbols	✓✓ good		✓acceptable		mod moderate		✗ unacceptable			n/a Not available				

1. Suspended silt, sand and clay. May suffocate eggs of aquatic organisms and clog gills of fish.
2. Aquatic life will tolerate a pH range fromn 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, breakdown of organic matter in water.

Average groundwater quality monitoring results 2007-2008

Aquifer (bore) and location	Nitrates g/m³ 2007/2008		Salinity ppt 2007/2008		pH -log(H+) 2007/2008		Iron g/m³ 2007/2008		Manganese g/m³ 2007/2008		Hardness g/m³ 2005/2006	
Te Hapara Sands Aquifer (GPB099) at Cameron Road	n/d	n/d	0.13 low ✓✓	0.1 low ✓✓	7.57 mod ✓	8 mod ✓	n/d	n/d	0.02 low ✓✓	0.01 low ✓✓	190 low ✓✓	180 low ✓✓
Te Hapara Sands Aquifer (GPC030) at McDonald's Road	0.13 low ✓✓	0.83 mod ✓	0.2 low ✓✓	0.23 low ✓✓	7.37 mod ✓	7.43 mod ✓	0.12 low ✓✓	0.33 low ✓✓	0.03 low ✓✓	0.03 low ✓✓	254 mod ✓	276 mod ✓
Te Hapara Sands Aquifer (GPA004) at Childers/Stanley Road	0.57 low ✓✓	0.01 low ✓✓	0.22 low ✓✓	0.2 low ✓✓	7.4 mod ✓	7.6 mod ✓	0.23 low ✓✓	0.38 low ✓✓	0.03 low ✓✓	0.11 low ✓✓	265 mod ✓	220 mod ✓
Shallow Fluvial Deposit (GPC051) at Dunstan Road	n/d	n/d	1.5 high ✗	1.47 high ✗	7.0 mod ✓	7.03 mod ✓	0.4 low ✓✓	0.27 low ✓✓	1.84 high ✗	1.9 high ✗	789 high ✗	535 high ✗
Makauri Gravel Aquifer (GPH008) at Lavenham Road	0.11 low ✓✓	0.01 low ✓✓	0.25 low ✓✓	0.35 low ✓✓	7.35 mod ✓	7.5 mod ✓	0.04 low ✓✓	0.08 low ✓✓	0.4 mod ✓	0.15 low ✓	218 mod ✓	210 mod ✓
Makauri Gravel Aquifer (GPB002) at Makauri School	0.01 low ✓✓	0.45 low ✓✓	0.35 low ✓✓	0.4 low ✓✓	7.5 mod ✓	7 mod ✓	0.08 low ✓✓	1.65 high ✗	0.15 low ✓✓	0.92 mod ✓	210 mod ✓	246 mod ✓
Makauri Gravel Aquifer (GPB135) at Cameron Road	0.01 low ✓✓	0.09 low ✓✓	1.9 high ✗	1.9 high ✗	6.93 mod ✓	6.9 mod ✓	4.9 high ✗	3.97 high ✗	0.96 mod ✓✓	0.99 mod ✓✓	964 high ✗	905 high ✗
Waipaoa Gravel Aquifer (GPE040) at Waerenga a hika	0.02 low ✓✓	0.02 low ✓✓	0.47 low ✓✓	0.5 low ✓✓	7.2 mod ✓	7.3 mod ✓	4.43 high ✗	5.53 high ✗	0.56 mod ✓	0.56 mod ✓	380 mod ✓	398 mod ✓
Matokitoki Gravel Aquifer (GPB102) at Cameron Road	0.37 low ✓✓	0.32 low ✓✓	0.43 low ✓✓	0.5 low ✓✓	7.47 mod ✓	7.5 mod ✓	3.14 high ✗	11.08 v. high ✗	0.13 low ✓✓	0.13 low ✓✓	369 mod ✓	406 mod ✓
Matokitoki Gravel Aquifer (GPB126) at Kings Road	n/d	0.01 low ✓✓	0.5 low ✓✓	0.5 low ✓✓	7.2 mod ✓	7.26 mod ✓	6.1 high ✗	5.62 high ✗	0.36 low ✓✓	0.37 low ✓✓	366 mod ✓	400 mod ✓
Matokitoki Gravel Aquifer (GPD111) at Bushmere	0.02 low ✓✓	0.02 low ✓✓	0.5 low ✓✓	0.05 low ✓✓	7.03 mod ✓	7 mod ✓	2.17 high ✗	2.35 high ✗	0.37 low ✓✓	0.38 low ✓✓	426 mod ✓	440 mod ✓
Key to symbols	✓✓ good		✓ acceptable		✗ unacceptable		mod moderate		n/d not done			