

Host Communities: siting and effects of facilities

An analysis of host community
experience of the Rakaia
Waste Water Treatment Plant



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By

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This case study has contributed considerable knowledge that is important to a better understanding of the effects which host communities can expect to experience from this kind of waste water treatment and disposal operation. The research would not have been possible without the co-operation of all those who were interviewed. The level of willingness to co-operate is worthy of acknowledgement - the research team met with very few refusals.

The research team wishes to express its gratitude to all those who participated in this case study - the residents and farming businesses in the host community around the plant; also to other key informants in the host community, administrators at the Ashburton District Council, and the plant operator.

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A: Introduction to this case study

Public Good Science Fund Research

The research team at Taylor Baines & Associates was contracted by the Foundation for Research Science and Technology to carry out a piece of social research concerning the siting of Waste Water Treatment Plants (WWTP) and disposal facilities. The research has been funded out of the Public Good Science Fund.

Spread over three financial years - 1998 to 2001 - the research programme aims to assist the processes of urban and rural planning (as it applies to future waste disposal infrastructure) by developing a body of knowledge on key social factors that are relevant to the siting and operation of WWTP facilities.

This case study addresses part (Questions 2 & 3 below) of the overall research objectives. In total, the research programme is intended to answer three core questions -

1. Is there a systematic pattern of WWTP siting in NZ. If so, how would you characterise this historical pattern from the social perspective of host communities?
2. How do actual effects compare with effects that were projected at the time of siting?
3. What have been the longer-term effects on host communities of WWTP and disposal operations?

This research on WWTPs is part of a longer-term research programme currently being funded by the Public Good Science Fund into the siting and social impacts of a range of facility types. During the period 1997 to 2000, research was carried out on solid waste facilities - landfills and transfer stations. During 1998 to 2001 the research has focussed on waste water facilities. From 2000 to 2002, additional types of facilities are being investigated (Please refer to the TBA website - www.tba.co.nz - for more information.)

The research programme has received the strong endorsement of Local Government New Zealand, the New Zealand Water and Wastes Association, the Ministry for the Environment, as well as several territorial local authorities.

Reasons for this research programme on facilities and their host communities

It is a common experience that assessing the effects of WWTPs and disposal options at the time of site selection is a contentious process. The debates that surround such assessment activities are often informed more by prejudice and a strategic selection of hearsay information than by well-founded evidence.

This research aims to address both questions of possible social bias in site selection and lack of experienced-based information relevant to New Zealand communities. It is to be hoped that these

objectives will be served by carrying out the research in a setting which is quite removed from the tensions of resource consent applications, and by a team of independent researchers who have no organisational affiliation with either the developers of such facilities (usually but not always territorial local authorities) or the host communities involved.

Purpose of the case studies

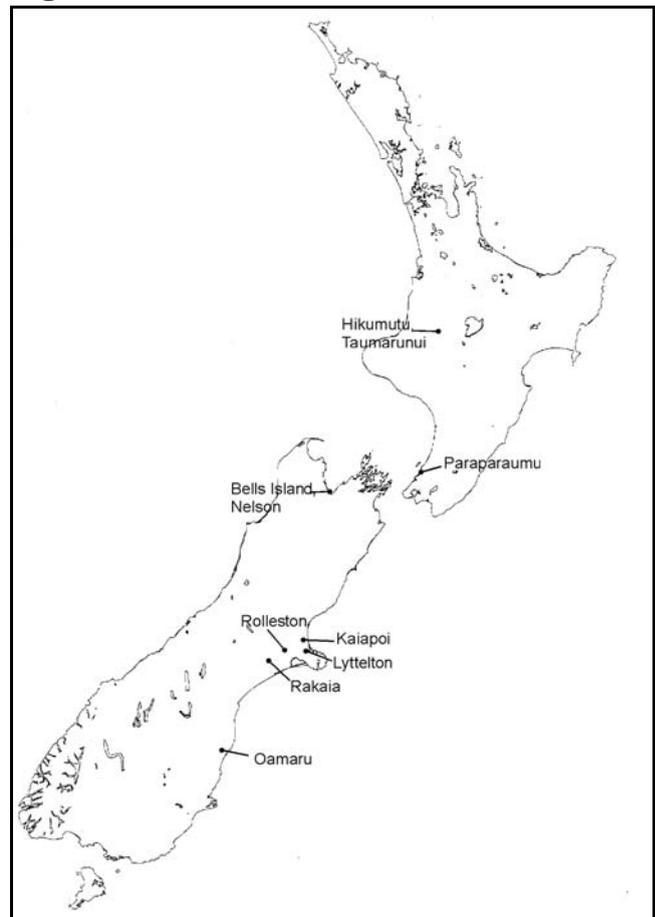
This case study on the Rakaia WWTP is one of eight such case studies being undertaken as part of this research programme¹, as shown in Figure 1. The case studies were selected to provide a range of relatively recent technology in terms of New Zealand applications, and a range of disposal media (rivers, estuaries, ocean, land, wetlands). Because of the requirement to avoid facilities involved in active resource consent proceedings or undergoing construction activities, most of the main metropolitan WWTPs could not be included in the case study work at the present time. As a result, the sample comprises mainly relatively small capacity facilities. However, it does include a variety of technology types and effluent disposal media. This makes the research particularly relevant to the increasing numbers of smaller communities which are being required to develop or upgrade reticulated sewerage systems.

Each case study has been conducted at a time which avoids conflicts with active resource consent proceedings. Care has been taken in the social assessment research method to provide accurate² and useful descriptions of the effects experienced by host communities, by canvassing a wide range

of local observations, by accessing other relevant data sources where possible to corroborate the observations of neighbours, (and by engaging in a process to feed back preliminary findings for checking and validation by the research participants). As a result, the experience documented in these case studies should neither overstate nor understate the experience of the host communities involved. This is important, if the research is to assist participants in future planning.

Nevertheless, the case studies each represent experience at a particular point in time. The research process itself, and the case studies resulting from the research, have the potential to trigger changes

Figure 1: New Zealand Case Studies



¹ The full list of case studies includes Oamaru , Kaiapoi, Rolleston, Rakaia, Bell’s Island (Nelson/ Tasman), Paraparaumu, Taumarunui, and Lyttelton.

² The use of percentage figures in this case study is not intended to imply statistical analysis. Rather it should be interpreted for comparative purposes merely as indicating the proportion of respondents in any particular area of interviewing who gave a specified response.

in the way the facilities are operated and managed. Thus it is important to interpret the findings of each case study in the context of the way the facility was operated and managed at the time of the case study fieldwork³.

Methodology for the case studies

The research method drew on the practical and theoretical approach to social assessment described in Chapter Four of “Social Assessment: theory, process & techniques” (Taylor et al., 1995). Stages in the research included scoping the particular cases to clarify the appropriate time frame and communities of interest, community profiling, a structured survey of nearby residents and business people, in-depth key informant interviews, and accessing a range of existing data sources.

A structured questionnaire was developed to gather detailed information about the experience of many individuals living in the host community. The questionnaire explored people’s experience of day-to-day operational effects of the WWTP, their perceptions of how the presence of the WWTP has impacted on the longer-term development of the host community, and their knowledge of what has happened in their community during the years prior to and since the WWTP was established. The detailed analysis is descriptive and sometimes quantitative, but not statistical in nature⁴.

In carrying out the comparative case assessments, the assessment team had to address several issues relevant to interpreting the results and their usefulness in providing valid comparative information. These included the debate about ‘perceived’ or ‘real’ effects, the need for corroboration, and the importance of timing or context as a potential influence on individual responses.

The assessments focussed on people’s experiences of living or working near waste management facilities. The results are therefore based on a large body of individual perceptions of effects. In some feedback discussions, the distinction was made that these effects are “*only people’s perceptions; they’re not necessarily real.*” The question arises therefore as to what is the difference between a ‘perceived’ effect and a ‘real’ effect. Can ‘perceived’ effects ever become ‘real’ effects? In practical terms, the assessments identified clearly the proportions of those interviewed who experienced certain types of effects. Furthermore, wherever possible, the assessment sought to investigate these effects from other respondents and from independent sources (e.g. local key informants; secondary data records) or different perspectives (e.g. the facility operator)⁵. As researchers, it was pleasing to note how, in the great majority of cases, neighbours’ experience was strongly corroborated by the perceptions and experience of the facility operator.

A number of factors have a bearing on individual experiences. Different people have different thresholds for noticing effects depending, for example, on their ability to hear or to smell, or on their

³ The fieldwork dates are noted explicitly in the case study report. Furthermore, the report attempts to describe as fully as possible the operating regime at the time of the case study.

⁴ A statistically-based analysis would have increased the scale of field work and cost several fold.

⁵ As a matter of assessment methodology, we have adopted the stance that unless more than two individual neighbours reported and corroborated the same effect, or unless a neighbour’s observation could be corroborated by an independent source, the effect would not be reported in detail, but simply noted. This reflects the stance that, while social assessment acknowledges the importance of individual observations, such observations still need to be subject to verification.

perception of what is 'exceptional'. Increasing sample size addressed this factor. Different living or recreational patterns are likely to influence people's experience of effects - whether they are on the property all day, every day, or working off the property. Day-time interviewing addressed this factor by increasing the likelihood of including individuals with a relatively high rate of occupancy. People get used to effects after a while - they can seem less exceptional. Following unprompted questions with prompted questions addressed this factor, by allowing interviewees 'a second chance' to respond.

Does the distinction between 'perceived' and 'real' effects matter? The primary purpose and value of comparative case assessment is to answer two types of questions - (i) if neighbours around a facility are experiencing certain effects, and finding that they have unacceptable impacts, what can be done to reduce or eliminate the effect, or make it less likely to happen? and (ii) if neighbours around Existing Facility A experienced certain effects and impacts from its operation, what is the likelihood that neighbours around Potential Facilities B, C or D will experience similar effects and impacts? In either situation, whether such effects are labelled as 'perceived' or 'real' is probably immaterial. However, from a "technical" perspective, replication of reported effects is important to their validation, while from a "political" perspective, the perceptions of just a few people affected can be sufficient to galvanise social action.

It is also important to remember that technical experts are not necessarily in a position to offer any more than assessments of 'perceived' effects. In the case of technical experts, their perceptions are derived with the aid of technical lenses (i.e. frameworks for analysis used by the technical expert). For example, an acoustical engineer can provide measures and predictions of likely noise levels at certain distances away from the source of the noise. The acoustical engineer is not usually in a position to draw any inferences as to likely social impacts associated with these levels of noise.

The tendency for potentially affected parties to distort or exaggerate the likelihood of effects when participating in EIA activities is not an uncommon experience for SIA practitioners. Indeed, in one of the earlier solid waste comparative case studies, background documentation from an environmental tribunal declared this point explicitly. In these comparative case assessments, this factor was addressed by ensuring that all the case studies were carried out on facilities which had no consent applications or reviews in progress.

Outputs of this research programme

Outputs from this research have taken the form of public presentations and discussion sessions, as well as a range of hard copy formats.

The latter include a series of research Working Papers, conference papers, and an abbreviated summary document for each case study.

The research provider - Taylor Baines & Associates

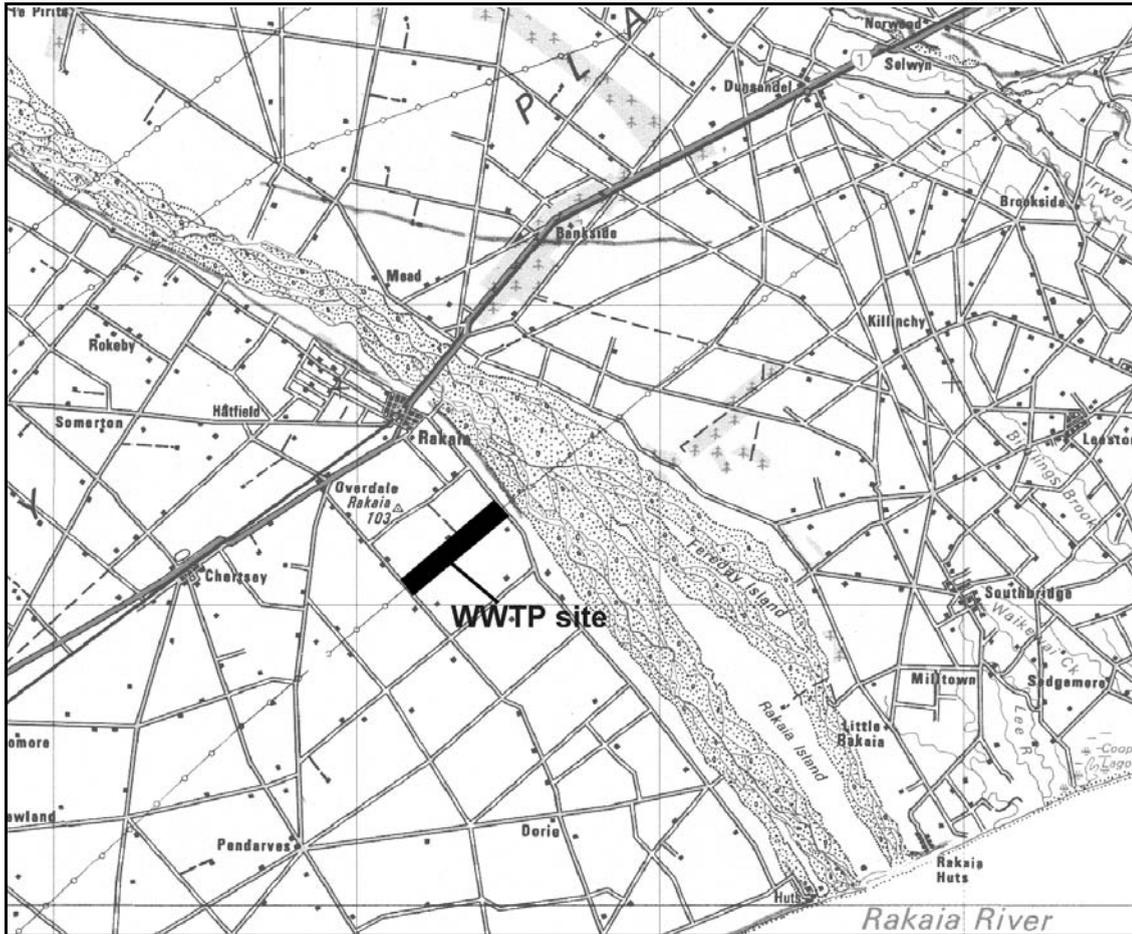
Taylor Baines & Associates has been a private provider of research, consulting and training services since 1989. The firm specialises in social research and the application of social assessment methods to a wide variety of issues in community development.

B: History and description of the facility

Location

The Rakaia Waste Water Treatment Plant (WWTP) is located on land previously used for cropping and grazing off Acton Road, to the southeast of the township of Rakaia. The site is approximately one kilometre from the eastern boundary of the town’s built up area.

Figure 2: Location map



Planning

The WWTP was a response to poor groundwater quality in the vicinity of Rakaia, resulting from the septic tanks which serviced each residential and commercial property in the township. Half-acre site requirements for septic tank soakage were being compromised by the infill development which had been occurring in Rakaia. This was creating pressure for more extensive sub-division, which is possible to the west and northwest of the township.

Consultation established that most of the host community supported the sewerage scheme and decided a high quality effluent, suitable for land disposal would be required. Disposal of effluent to pasture was preferred over disposal to forestry, mainly because there was sufficient land available

to provide for the ultimate population and it would be more cost effective to keep treatment and disposal activities to one site. Centre-pivot irrigation was favoured for a number of reasons; it would enable continuous operation without significant staffing requirements; it provides controllability and uniformity of application; it reduced the potential for aerosols (spray drift) due to their low pressure and downward spray action. The land was to be planted in a perennial species for cut and carry silage production. This was to be complemented by sludge disposal via slow infiltration to forestry, using a simple fixed spray system.

All properties within the Rakaia township have now been connected to the new reticulated sewerage scheme. Septic tanks were decommissioned in early 1999. The Ashburton District Council advised property owners to have their tanks cleaned out, using the services of two septic waste contractors operating in the district.

Planning documents⁶ record the following environmental effects, issues and anticipated outcomes projected for the Rakaia WWTP site during the planning process:

- the construction of a centralised sewage treatment system is expected to have a positive effect on the local community ... and should allow for the economic growth of Rakaia
- the sewage treatment plant and disposal to land are not expected **to affect any ecosystems**
- the sewage treatment plant is not expected to create any **odour** nuisance; the effluent and sludge disposals to land are not expected to create any odour nuisance
- the sewage plant will have low **noise** levels, suitable for 24 hour operation within a rural area; the pumps will not be a significant noise generator; the trickling filter distributor arms will create insignificant splashing noise; potential noise will also be reduced by tree planting around the perimeter fence of the site and the separation distances to residential dwellings;
- the site is unlikely to be subject to the natural hazard of **flooding**
- the centre pivot irrigators can deliver the treated effluent close to ground level which will limit the possibility of **air-borne transport of bacteria** beyond the irrigation area
- the site is suited to sludge disposal with a low risk of **runoff** due to the free draining soils, generally flat topography and low potential for surface ponding
- the sludge disposal is expected to have a low potential for microbiological **contamination of the groundwater**
- the sewage treatment plant will have minimal **visual impact**, particularly as the plant will be over 300 m from areas of public access

⁶ Montgomery Watson, 1997: Rakaia Sewage Treatment and Disposal System - Assessment of Effects on the Environment and Technical Support Document. Prepared for the Ashburton District Council, September 1997.

Site history and waste water treatment operations

Land was purchased from a neighbouring farmer, in exchange for an adjacent block. The topography of the disposal site is generally flat with slight undulations. The soils on the site are sandy loam, a soil with favourable qualities for the absorption of nutrients, making it suitable for sewage effluent irrigation (Montgomery Watson, 1997).

A water race, which previously passed directly through the WWTP property, had to be diverted to accommodate the treatment plant.

Commissioning began in February 1999, and the plant was officially opened in November 1999. In September 1999, a contract was let to Ashburton Contracting⁷ to operate the treatment plant.

The present situation (2000)

The sewage from Rakaia township is principally domestic in nature, with insignificant input from trade waste.

The treatment process involves the following main stages:

- initial screening of incoming sewage, with the solids removed into a wheelie bin which is taken twice a week to the landfill for disposal;
- a primary clarifier, from which sludge is emptied once a day and spray irrigated onto pine trees on the WWTP property through fixed-set sprays; this is always done in the late afternoon to allow frozen lines to thaw; sludge spraying to each sector lasts 8-9 minutes, and is controlled by an automatic timer;
- the liquid goes to a trickle filter and then to a secondary clarifier (sludge irrigated as before); the liquid is re-circulated through the trickle filter before passing through UV disinfection to the irrigation holding pond;
- the centre-pivot irrigator operates for 4-5 hours on 3-4 occasions each week.

If the plant is running properly⁸, the operator is present on site twice each week for about three hours, to clean the screen and empty the bin. In practice, the operator has spent considerably more time on site cleaning the solid screen and clearing pumps and pipes used to irrigate the sludge.

Except where the trees have been planted, the irrigated paddocks are cut 'informally' by a contractor who bales the cut and removes it off-site. The ADC is looking to establish a medium-term

⁷ A Local Authority Trading Enterprise (LATE).

⁸ The plant operator reported that there have been a number of operating problems during the first year, mostly related to screen and pump blockages.

lease/access agreement to make silage, with the revenue being used to off-set the operation and maintenance costs of the WWTP⁹.

Liaison between the facility and the host community

The local community was involved with the planning for the project since its early stages, including two public meetings and regular Working Party meetings during the first half of 1995.

An Open Day was held before the official opening in November 1999.

No complaints have been made directly to the plant operator on site, nor has the operator had any other dealings with neighbours. Indeed, there has been no formal liaison arrangement between neighbours and the plant operator since the plant was commissioned. The Environmental Health Officer at the Ashburton District Council receives any complaints which are logged on computer¹⁰.

⁹ These costs are currently met out of a special rate for Rakaia township ratepayers, who also pay a Uniform Annual Change.

¹⁰ At the time of the case study research, two complaints had been received, both in the very early days of the plants operations.

C: The host community

Overview

Rakaia is a small town in Mid Canterbury near the South Island's east coast located adjacent to the Rakaia River, with SH 1 and the SI Main Trunk Railway passing through its centre. The town's main role is as a rural service town. It also has some light industry and growth associated with recreation and tourism, principally related to recreational use of the Rakaia River. The Rakaia River is the largest braided river in New Zealand and of significant value for wildlife and fisheries. The lower Rakaia River is extensively used for fishing and jet boating. The river also serves a major function for nearby rural areas by recharging underground aquifers.

The WWTP site is approximately 1,500 m from the active river channels of the Rakaia. A water race, established in 1922, takes water from the Rakaia River and distributes it to farming properties southwards as far as Seafield.

The site lies in a Rural B zone, characterised by low-density rural development with a range of rural activities. The zone provides for larger lot sizes (than Rural A zone) and for greater separation distances between neighbouring properties, so that a wide range of land-based activities can continue in a compatible manner.

Population trends

The usually resident population of Rakaia township at the last census (1996) was 882 people, who occupied 360 private dwellings. At that time, the township had been growing steadily over the previous decade, although most of the population growth had occurred during the early 1990s - see Table 1.

In terms of trends within the township, Rakaia follows a pattern typical of many towns and cities in New Zealand where growth in resident population and dwelling numbers has been faster on the northern side of the township than elsewhere (see NW meshblock in Table 1).

It is also evident that population growth in nearby rural areas has been more marked on the western side of Rakaia than on the eastern side where the WWTP was sited (see E meshblock and W meshblock in Table 1).

Table 1: Usually resident population and private dwellings - 1986 to 1996

	UR popⁿ 1986	UR popⁿ 1991	Popⁿ change '86-'91	UR popⁿ 1996	Popⁿ change '91-'96
Rakaia township	753	762	1.2%	882	15.7%
NW meshblock	75	81	8.0%	93	14.8%
W meshblock	63	66	4.8%	102	54.5%
E meshblock	69	63	-8.7%	75	19.0%
	Pvt Dw. 1986	Pvt Dw. 1991	Dw. Change '86-'91	Pvt Dw. 1996	Dw. Change '91-'96
Rakaia township	270	312	15.6%	360	15.4%
NW meshblock	27	33	22.2%	42	27.3%
W meshblock	21	27	28.6%	39	44.4%
E meshblock	24	21	-12.5%	27	28.6%

Pattern and trends in land use

The recent trend in land use in the immediate locality of the WWTP has been towards greater diversification. This has resulted in the present pattern of mixed land uses of intensive cropping, including vegetables for export, grains for seed, wheat for milling, and exotic flowers on properties within 1 km of the WWTP. Some dairying and sheep grazing continues. Three years ago a vegetable packing house began operation two kilometres further east along Acton Road.

D: Coverage of consultation and Interviews

Numbers and areas of interviewees

The main episode of fieldwork took place on 2 and 9 June 2000.

Interviewing was targeted at neighbouring rural residents and landowners, as well as residents in Rakaia township. Two types of interviews were employed. In-depth interviews aimed at identifying the full range of effects experienced, as well as detailed descriptions of these effects, were carried out with people living and working in the immediate vicinity¹¹ of the WWTP site (N=10). Rapid appraisal interviews were carried out in eastern parts of Rakaia township in order to provide a spatial dimension to the analysis of effects (N=14).

List of other key informants

- WWTP operator
- Asset Manager, Ashburton District Council
- Septic Waste contractor
- Environmental Health Officer, Ashburton District Council

Feedback meeting

A feedback meeting was held on 17 May 2001, attended by three neighbours. Discussions endorsed the preliminary findings and reinforced some of the observations which had been made almost a year previously.

¹¹ All permanent rural residents within 2 km of the WWTP were the subject of detailed interviews.

E: Operational effects of the WWTP on neighbours

Relatively few off-site effects have been experienced at all so far by neighbours of the Rakaia WWTP. The only effect causing significant concern was the lack of control of noxious weeds on the WWTP property because of the risk that they will spread to neighbouring rural properties.

Half of the ten rural neighbours reported no effects at all, even when prompted.

Of those effects anticipated during the planning stages, odour (x3), noise (x1) and visual effects (x1) were reported, but none was reported as having any significant impact on neighbours. No observations were reported of spray drift or effects on ground or surface water quality.

Three additional effects reported (that were not discussed in the assessment of effects) were constraints on land use (x2), construction disturbances (x1), and the growth of noxious weeds on the treatment plant property (x3).

No off-site effects at all have been experienced by those residents of Rakaia township interviewed.

No impacts at all from the daily operations of the WWTP have been experienced by neighbours outside the 300 m buffer zone from the WWTP facility.

Five types of effects were reported unprompted in interviews with rural neighbours:-

- noxious weeds
- land-use constraints
- odour
- visual effects
- construction effects

When prompted, one interviewee reported noticing the noise of the treatment plant equipment.

Noxious weeds

What effect do they notice? Source of effects?

Three immediate neighbours reported noticeable levels of nodding thistle; one reported broom and wild oats. One suggested that the weeds had become evident after the water race was shifted - that the seed source was in the silt of the existing water race. Two others attributed the levels of weeds observed to a lack of weed control and poor ground maintenance, since the property had been

converted from pasture to WWTP. All these neighbours agreed that they controlled weeds on their own land to avoid causing weed spread to others.

Spatial distribution?

Weed growth was reported as worse under the pine trees growing on the WWTP land, since this area is not mowed. While all three reported the weeds growing on the WWTP, one noted that “it is starting to come on to our property”. This was confirmed during the feedback discussions.

Timing; frequency; trends?

A permanent and cumulative effect since the property changed hands.

Mitigation attempts?

Prior to the case study investigations, no mitigation was carried out. It is now intended that weeds on the WWTP property should be sprayed annually, as a recognised aspect of facility management.

Impacts; acceptability?

Noxious weeds are a threat to neighbouring properties and impose costs and significant financial risks. This arises from the extra effort required to control or eradicate weeds on farming properties, particularly those engaged in cropping - “we have to ensure there are no wild oats in our cereal crop - no firm would take from us”, “we are ‘comprehensive seed quality certified’ - nodding thistle seeds are not acceptable”.

One neighbour expressed the view that it is “not setting a good example” to relax weed control standards on Council property. Two had made complaints - one to the Council and one to a councillor.

Summary evaluation

Not an effect necessarily associated with waste water treatment facilities, and not anticipated in the assessment of possible effects, but nevertheless a significant potential impact on neighbours; requires a response and should be straight forward to remedy.

Land-use constraints

What effect do they notice? Source of effects?

Two neighbours reported the restrictions imposed on land use in the 300 m buffer zone which surrounds the irrigated area. These restrictions prohibit residential development.

Spatial distribution?

A 300 m zone around the boundary of the WWTP property, affecting five neighbouring properties.

Timing; frequency; trends?

A permanent effect.

Impacts; acceptability?

One neighbour considered it “*not a significant problem - a sub-divider could still find a way of building on the section*”. Another neighbour expressed the contrary view “*it would be a cost; would be noticeable if we wanted to sub-divide*” and had contacted their lawyers, but not followed up any further.

Note also that the nearby pig farm is probably a more obvious deterrent to residential sub-division in this immediate neighbourhood - its odours are considered far more intrusive.

Summary evaluation

Clearly an off-site effect; would in principle have been amenable to remedy if the buffer zone had been included in the parcel of land purchased.

Odour

What effect do they notice? Source of effects?

Three neighbours reported odour experiences. However, with the close proximity of a pig farm, and with the spreading of septic tank contents on nearby paddocks by septic waste contractor¹², two were not certain that the WWTP was in fact the source of the odour they experienced.

Spatial distribution?

All three reports referred to odours experienced within the immediate vicinity of the WWTP property, either on neighbouring properties or on Acton Road, when driving past with car windows open. These reports are well within the 300 m buffer zone around the boundary of the WWTP.

Timing; frequency; trends?

Two of the observations referred to morning times. The two neighbouring property owners referred to essentially one-off episodes - “*only ever one or two days at the beginning - never since then*”, “*two times two months ago - April 28*”, while the observer who noticed the odours when driving along Acton Road past the WWTP property described a frequency of “*3 times a month*”, generally “*in warmer weather, when the car windows are open*”.

¹² During the decommissioning of the township’s septic tanks, one of the contractors disposed of the waste on a nearby paddock in Duncans Road, over a period of three to four months. Public complaints ultimately led to an abatement notice being served in May 1999. The risk of this practice should now reduce markedly, since all the properties in Rakaia township have been connected to the public sewerage scheme, leaving only rural properties still using septic tank systems.

ADC records indicate one complaint received regarding odour from the plant, during its first few days of operation. This tallies with information provided by those interviewed.

Mitigation attempts?

Adoption of the buffer zone.

Impacts; acceptability?

None of the three neighbours who reported noticing odour described a significant negative impact on their local amenity of lifestyle - “no problems at all really; best to speak up early on”, “no effect - too far away”, “went up to the WWTP and could not smell anything”

Summary evaluation

From the experience reported by neighbours of the WWTP, it would appear that odour is only very rarely experienced beyond the WWTP property boundary, and probably never outside the 300 m buffer zone¹³. Not a significant effect. There was a clear consensus amongst those interviewed that odours from the pig farm and the septic tank contractor activities were very noticeable, whereas odours from the WWTP were barely noticeable.

Visual effects

What effect do they notice? Source of effects?

One neighbour claimed to see the plant structure and building from most of his property.

Mitigation attempts?

He noted that planting trees would remedy this effect, if he wanted to.

Impacts; acceptability?

He acknowledged that there was no significant visual impact - “not upsetting me”. Another noted that the centre pivot irrigator is no different from other irrigators used locally.

Summary evaluation

Not a significant effect at all.

¹³

Acton Road passes adjacent to the northern boundary fence of the WWTP, and therefore passes through the buffer zone for almost 1 km.

Construction effects

What effect do they notice? Source of effects?

One immediate neighbour reported “*piles of shingle, broken fence wires, shingle left on the road side*” during and after the construction of the WWTP, with particular reference to the connecting pipework from the township to the plant. Another neighbour confirmed at the feedback discussions that the fence wires remained broken.

Spatial distribution?

Along Burrowes Road and Acton Road.

Timing; frequency; trends?

During and immediately following construction activity.

Impacts; acceptability?

The impact was both visual - “*a bit of an eyesore, when the fence is still not fixed*” - and a nuisance, since the shingle “*blunts the mower*”. However, no complaint was made at the time, because it was not known whom to contact.

Summary evaluation

An unnecessary effect that should have been remedied by closer supervision of the construction contractors, if complaints had been made at the time.

Noise

What effect do they notice? Source of effects?

A hum from the electric motors during irrigation.

Spatial distribution?

Within 200 m of the WWTP property boundary.

Timing; frequency; trends?

Daily.

Impacts; acceptability?

No negative impact claimed - “*not a problem at all; not as loud as a lawn mower next door*”.

Summary evaluation

Not a significant effect.

F: Longer-term effects of the WWTP on settlement patterns and development in the locality

In this case study, the time since plant commissioning is probably too short for any 'long-term' impacts to become evident. Indeed, most of those interviewed were unaware that the siting and operation of the WWTP has so far had any effect on development and settlement on the eastern side of Rakaia. They certainly expressed the view that there had not been any negative impact on the township's development or prospects - *"no benefits yet, but expect there will be"*.

However, two respondents pointed to recent new housing near Burrowes Road. These two respondents expressed the view that the advent of the WWTP has already had positive effects on the township - *"now see it as an 'asset' to the village"*, while another reported *"two firms which have not come to Rakaia in recent years because there was no serviced sewerage"*.

Irrigation holding ponding



Centre pivot irrigator



Pine plantation



Diverted water race

