

Host Communities: siting and effects of facilities

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

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**Working Paper FS11
Public Good Science Fund Contract TBA X0002**

September 2001

ACKNOWLEDGEMENTS

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, businesses and those enjoying recreational opportunities in the host community around the plant; also to other key informants in the host community, administrators at the Waimakariri District Council, and the plant operator.

The research team expresses its gratitude to the Foundation for Research, Science and Technology for its financial support of the research programme.

Acknowledgement is also due to Mr Erik Norder for his considerable effort and initiative in producing this publication.

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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.

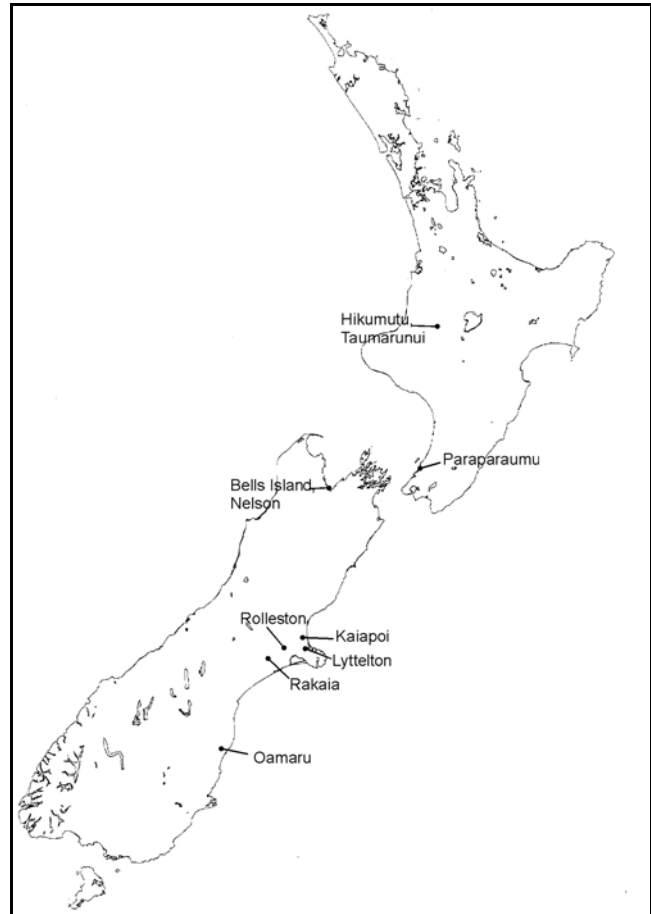
Purpose of the case studies

This case study on the Kaiapoi 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 of feedback 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 in the way the facilities are operated and managed. Thus it is important to interpret the findings of each case

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.

study in the context of the way the facility was operated and managed at the time of the case study fieldwork³.

It is also important to keep in mind the perspective of this research - the host community perspective. Primary emphasis has been put on capturing the experience of members of the host community - the community of residents and businesses in relatively close proximity to the Kaiapoi WWTP. It is their experience of the off-site effects such as odour and noise, and the impacts of such effects that will be useful to others contemplating the siting of a new solid waste facility. By the same token, there are likely to be some off-site effects such as risks to groundwater quality that will not necessarily be informed by a focus on neighbours' experience, simply because such phenomena are not often readily detectable to casual observation, even if they do occur.

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,

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,

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 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.

such observations still need to be subject to verification.

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

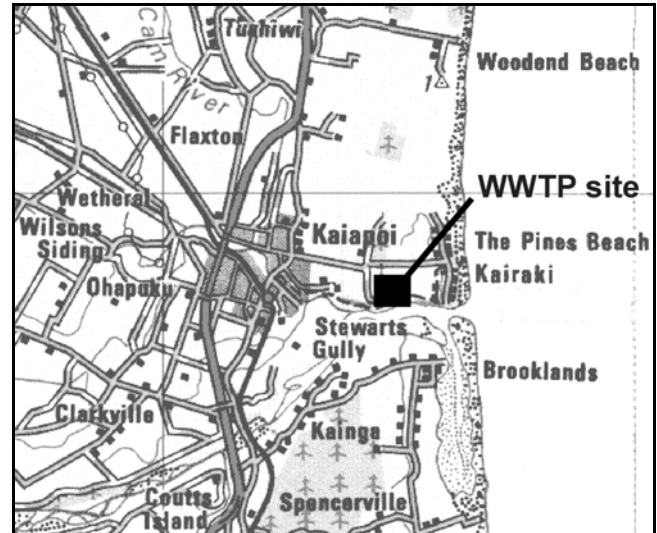
Taylor Baines & Associates has been a private provider of research, consulting and training services since 1989. The firm specialises in social research and the application of social assessment methods to a wide variety of issues in community development.

B: History and description of the facility

Location

The Kaiapoi WWTP is located one kilometre east of the township (see Figure 2) and about one kilometre upstream of the Waimakariri River mouth. The site is midway between Kaiapoi and the coastal settlements of Pines Beach and Kairaki Beach, on land owned by the Waimakariri District Council and bounded by Beach Road (to the north), Ferry Road (to the west), and the Pegasus Bay Walkway and Waimakariri River (to the south).

Figure 2: Location Map



Planning

In planning to upgrade the Kaiapoi WWTP, the Waimakariri District Council was responding to concerns that the limitations of the existing land disposal system were contributing to an unsatisfactory water quality in the lower Waimakariri River. The purpose of the upgrade was to ensure that any future discharges from the WWTP are of a quality that:

- meets public and tangata whenua expectations
- has minimal environmental effect and achieves or exceeds the environmental standards set by the Canterbury Regional Council
- causes no health risk to the public from using the lower Waimakariri River for recreation or from the local groundwater resource.

Planning documents (Royds Consulting, 1994) record the following environmental effects and issues projected at the time:

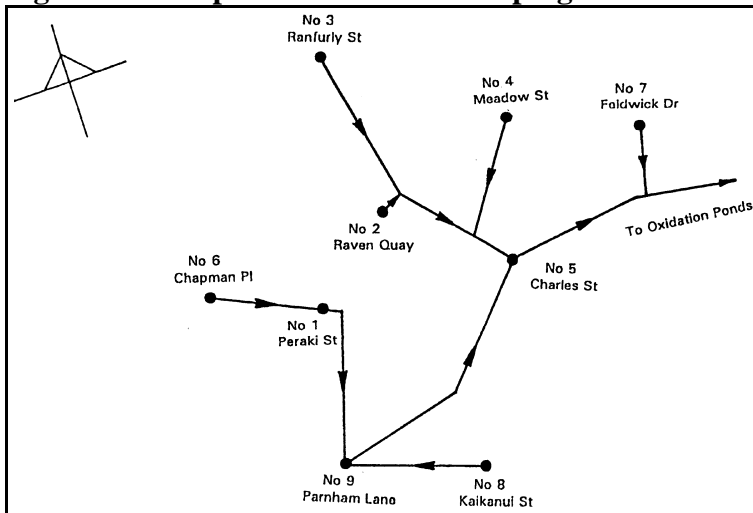
- the *visual impact* of the existing treatment plant is not considered significant; the planting of wetland species is expected to improve the appearance of the treatment system
- *windblown litter*, mainly plastic rubbish (wrappers and bags) probably sourced from the oxidation ponds, accumulates along the Pegasus Bay walkway
- past *effects on terrestrial ecosystems* within the site from the existing treatment plant were considered not significant; the development of a new wetland habitat will create opportunities for positive effects
- the treatment plant site itself has no significant *recreational, scientific or other special value for present and future generations*
- the potential exists for *impacts on archaeological sites of value*
- treatment and disposal systems will not discharge any significant *odour* to the environment

- equipment at the site (e.g. pumps) will create very little *noise*
- there is very little risk of the treatment and disposal system representing any *risks from natural hazards*; the only potential risk would arise from flooding if the stopbanks were over-topped and the treatment plant inundated
- the risk of *contaminating shallow, unconfined aquifers with excessive nitrates, faecal coliforms or organic matter* is likely to be very localised; the wetland will minimise the risk of nitrate contamination
- the proposed modifications (infiltration wetlands) will *create an ecosystem more appropriate to the moisture status of the area*, improving the existing situation by establishing plant species suited to the situation
- will *extend the habitat for birds* and *re-establish some of the decreasing wetland areas* that provide important breeding environments for wildlife
- the potential *threat to public health*, resulting from birds picking up contaminated objects from the treatment plant and distributing them elsewhere, does not appear to have occurred in the past; this situation should not alter with the upgrade
- *ecological impacts on Jockey Baker Creek* will not be significant
- the *impact on aesthetic value (visual effect) of Jockey Baker Creek* as viewed from the Pegasus Bay Walkway, resulting from green algae in the effluent discharge, should improve
- impacts on the *water quality* Jockey Baker Creek and the Waimakariri River, in terms of BOD, faecal content, toxic substances, etc.; these should not be noticeable for the River, but may be noticeable under certain conditions for the Creek
- consequent *effects on public health* from the discharge of faecal coliforms into the Creek and the River should not be detectable, since the effluent meets the guidelines for contact recreation and is better than existing levels in the lower part of the River
- the risk of *compromising tangata whenua policy on discharge to water* with occasional discharges of effluent to water (although it will now pass over land prior to disposal into Jockey Baker Creek rather than pass directly from the oxidation ponds as at present).

Site development and waste water treatment operations

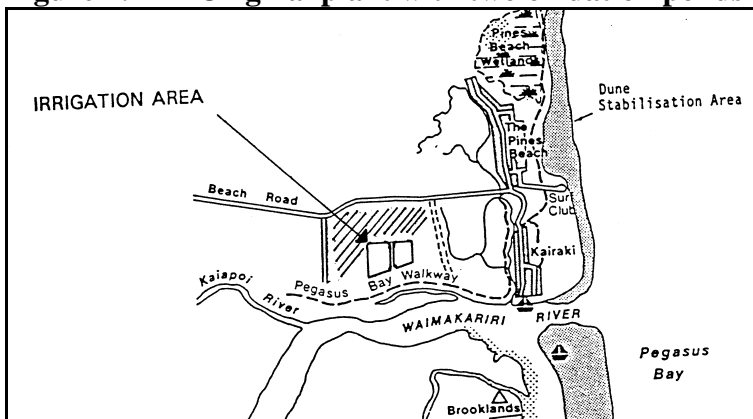
The site occupies approximately 50 hectares of land north of the Waimakariri River and is screened on three sides by well-established rows of pines trees. The WWTP was first commissioned in 1960, catering to the needs of Kaiapoi township and the communities of Pines Beach and Kairaki, with a design capacity of 10,550 population equivalents. The collection network involves a series of pumping stations in the town as shown in Figure 3.

Figure 3: Kaiapoi's Network of Pumping Stations



The original plant involved two oxidation ponds with a total area of 8.5 ha. The effluent from these ponds discharged either to 34 ha of adjacent pasture, using a distribution system of border dykes, or into the Waimakariri River, via a side stream known as Jockey Baker Creek (see Figure 4).

Figure 4: Original plant with two oxidation ponds



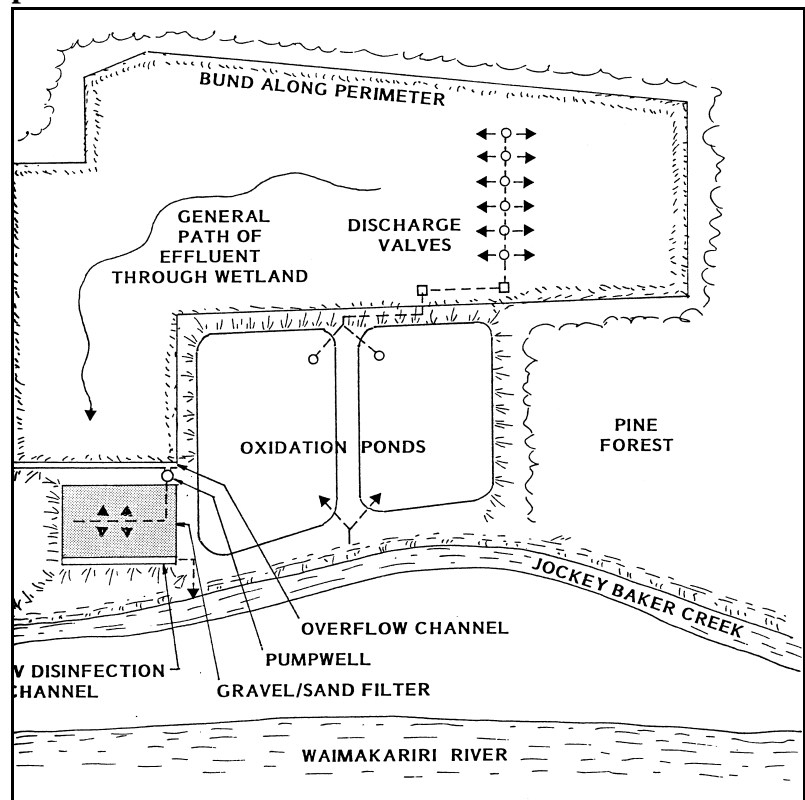
Because of high water tables under the site, the operator had to make decisions as to whether or not irrigation was feasible, or whether ponding would occur and damage the pasture. The irrigation system was labour intensive to operate, requiring 7 man-hours for each cycle of irrigation every two days, while the ponds themselves were inspected on a weekly basis. Parts of the irrigating system were prone to leakage or partial blockage, and the operators found it difficult to balance inflows and outflows for the ponds with the capacity of the irrigation area, without resorting to frequent and significant periods of discharge direct to the river (Ibid, pp 25-26). Land disposal of effluent at this

time did not appear to result in groundwater contamination⁶. However, the effluent quality suitable for land disposal is not of sufficiently high quality for discharge direct to a river and still meet statutory requirements and public expectations.

The upgrade in 1997 was intended to eliminate the discharge of primary oxidation pond effluent directly into the Waimakariri River, to develop a more resilient land disposal system capable of performing satisfactorily in wet conditions, and to reduce the level of operator adjustment and decision making. The upgrade, which was commissioned in early March 1997, involved converting the irrigation area from pasture into an infiltration wetland system, with plant species that could tolerate both wet and dry conditions⁷. A contingency would still be provided, whereby if the wetland area became flooded to a depth greater than 300 mm, overflow to the river would be allowed. Nevertheless, this discharge to the river would still pass through a sand and gravel filter and UV disinfection channel (see Figures 5 and 6).

The establishment of the wetlands did not proceed as expected, and difficulties were experienced. The plant operator described the “mixed success” for the natural regeneration of introduced wetland species planted in previous years. As a result, the wetlands are not working as well as intended. In terms of residual effluent discharge to the River, the original expectation was for continuous discharge for about six months over winter followed by six months of infiltration over summer. In the last few years, the pattern has been variable⁸, but tending towards a split of eight months river discharge and four months infiltration.

Figure 5: Layout of upgraded waste water treatment plant

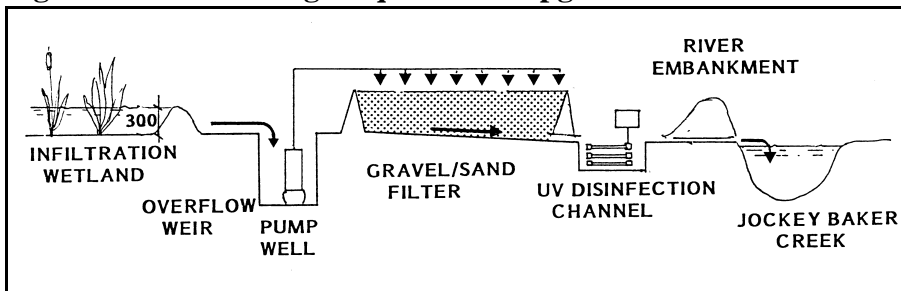


⁶ Analyses of water in shallow bores as close as 200 m to the boundary of the disposal area had not shown any evidence of nitrogen contamination (Ibid, p.29)

⁷ Unlike more conventionally constructed wetland designs in which the bottom is sealed and effluent is maintained at a constant height by an outlet weir, this ‘infiltration wetland’ would be a wetland during periods of high rainfall or high water table, but would largely dry up in summer through infiltration of the effluent into the groundwater and evapo-transpiration losses to the air.

⁸ For example, in 2000, discharge to the River was continuous until the end of December, but in 2001 discharge to the River did not commence until June.

Figure 6: Discharge sequence for upgraded



The situation in December 1999

The Kaiapoi WWTP is operated by an internal ‘Water Unit’ under ‘an internal contract’⁹ to the Council.

The WWTP is visited by the operator once a week for testing and record keeping purposes, and otherwise on an ‘as required’ basis.

At the present time, sewage is predominantly domestic, with approximately 5% of the load coming from light industrial premises in the town, including a small meat processing plant on the south side of Kaiapoi. The plant is not operating within its design parameters at all times due to the effluent discharge problems described above; that is to say, expected effluent discharge volumes are often exceeded.

Prior to 1998, Council administrators described the complaints procedure as “*a loose system*” in which complaints would sometimes “*disappear*”. The complaints procedure now involves a specified telephone number at the Council with a formal record for the operator to log complaints. Since 1999, no complaints have been recorded.

Liaison between the facility and the host community

Since the limited consultation activities that took place in 1994 during the planning and resource consent stage, there has been no formal liaison arrangement with any nearby residents or recreational groups.

⁹

This is described in terms of having an annual fixed operating fee for set work, with variations to the contract for extra-ordinary items.

C: The host community

Overview

The location of the Kaiapoi WWTP - adjacent to the northern banks of the Waimakariri River estuary - means that the host community is somewhat more diffuse and segmented than in most other case studies¹⁰. While the WWTP provides sewerage services to Kaiapoi and the coastal settlements of Pines and Kairaki, geographically the host community incorporates residential communities all around the estuary as well as recreational areas that are important to local and Christchurch residents alike.

Two rivers - the Waimakariri and Kaiapoi Rivers - converge less than one kilometre upstream of the WWTP site, and one-and-a-half kilometres upstream of the point where WWTP effluent discharged into Jockey Baker Creek enters the estuary. The Cam River also flows into the Kaiapoi River on the northwest corner of the town and several smaller streams join the Kaiapoi River before its confluence with the Waimakariri, while the Styx River flows into the Brooklands Lagoon.

Members of the Ngai Tuahuriri Resource Management Committee described the location of the WWTP on swamp land which was the original “*kitchen garden*” for local Maori who lived in moving camps along the coastline. However, they indicated that the site involved no sites known to be of particular spiritual significance.

Residential areas

Kaiapoi is 18 km north of Christchurch at the northern end of the motorway. In recent times numerous subdivisions have been developed and an influx of residents has seen Kaiapoi, with a population nearing 10,000, become a dormitory suburb of Christchurch.

Most of the residential development in Kaiapoi in the 1990s has taken place to the south of the town centre, between the Kaiapoi and Waimakariri Rivers. Initially new residential sub-divisions occurred on the west side of Williams Street (the main north-south thoroughfare through the town) south of Kaiapoi High School on land bounded by the northern motorway to the west and the Kaikainui Stream to the south. Closure of the Kaiapoi freezing works has seen more recent sub-division to the east of Williams Street and the Main Trunk Railway Line (MTRL), on land south of Raven Quay¹¹.

Residential development north of the Kaiapoi River and east of Williams Street has been limited by the availability of land within the existing town boundary, which runs along Beach Road and a line south from Beach Road to the end of Cass Street. Two small sub-divisions were underway at the time of the case study field work on Askeaton Drive (at the easternmost end of Cass Street).

The beach settlement of Pines/Kairaki is one of a number of such coastal settlements along Pegasus Bay. The settlement began in the early years of the 20th century as a holiday destination. The sandy beach, good fishing and boating in the Waimakariri River have always made it a major attraction for permanent residents and visitors alike. In the 1920's the Canterbury Provincial Government transferred the ownership of the land at Pines/Kairaki to the Kaiapoi Borough Council. Sections were leased until 1986

¹⁰ The Bells Island (Nelson/Tasman) case study involves a similar situation.

¹¹ This includes the Courtney Downs sub-division.

when the Council began a process of free-holding. As Pines/Kairaki becomes a settlement with increasing numbers of permanent residents its character is changing; baches are being replaced with permanent homes, houses are being upgraded, and rental opportunities and cross leasing becoming common.

Population change 1986-96

Both Kaiapoi and Pines-Kairaki Beach have experienced considerable growth in permanent residents in recent years, as shown in Table 1.

Table 1: Change in Usually Resident Population

	UR pop. 1986	UR pop. 1991	Change 1986-91	UR pop. 1996	Change 1991-96
Kaipoi	6,457	6,894	+6.8%	8,082	+17.2%
Pines-Kairaki Beach	560	608	+8.6%	647	+6.4%

Industrial influences on the Waimakariri River Estuary

Many of those interviewed for this case study remarked on the dominant influence exerted over water quality in the estuary by the discharges of numerous industries into the Lower Waimakariri River and other nearby tributaries - *“It seems as though the lower Waimak is treated as a discharge area; it’s just far enough away from the City to get away with unsociable discharge”*; *“the Waimak is so polluted; you see the scum from the freezing works”*; *“pollution from the freezing works is bad”*; *“pollution affects the amount of water skiing in Brooklands area - the ski club tends to hold events elsewhere”*; *“the Styx River is in a poor state”*; *“the Kaiapoi has a bad name for being polluted”*; *“the Cam River is a worry”*; *“the Rangiora treatment plant is green and tends to run on the right side of the river”*; *“notice the poor condition of the rivers due to the Rangiora discharge - it’s poor for fishing”*; *“it’s not just the Kaiapoi waste water treatment plant - other pollutants need cleaning up”*.

Royds Consulting (1994, p. 23) noted the following discharges into the lower Waimakariri River and its tributaries -

Discharges to the Waimakariri River:

- Canterbury Frozen Meat Co Limited
- Christchurch Readymix Concrete Limited
- Waimakariri District Council Kaiapoi Oxidation Ponds
- Fulton Hogan Limited

Discharges to the Cam River:

- Waimakariri District Council Southbrook Oxidation Ponds
- McAlpines Sawmilling Limited

Discharges to the Cust River:

- 9 Dairy Shed Discharges

Discharges to the Kaiapoi River (Courtenay):

- Polarcold Stores

Discharges to Otukaikino Creek (South Branch):
Christchurch City Council Belfast Oxidation Ponds

Discharges to Styx:
6 Dairy shed wastes

It is evident that upstream of the Kaiapoi WWTP discharge point, the rivers are receiving substantial discharges from a variety of point sources which would contribute to perceptions of poor water quality in terms of organic wastes, faecal coliforms, suspended solids and elevated nutrient levels. Indeed, the consultants report prepared during the planning for the Kaiapoi Upgrade concluded (Royds Consulting, 1994, p. 47) “the proposed discharge to water would be of a higher standard than the present receiving water quality. It could be said that the discharge will improve water quality in the river system.”

Recreational activity

The following notes are taken largely from a catchment resource survey (NCCB & RWB, 1986) which reported on recreational use during the summer of 1984/85 (Royds Consulting, 1994, pp. 23-24). The general overview provided here is supported by anecdotal information gathered during interviews. However, levels of activity specific to various locations may have changed, although there has been no more recent survey work to provide quantitative indicators of such change.

The Waimakariri River and tributaries provide a valuable freshwater recreational resource for the South Island. This resource is particularly valuable to nearby Christchurch residents. The Waimakariri is the most heavily used jet boating and salmon fishing river in New Zealand, and trout angling, estuarine fishing and whitebaiting are higher in the Waimakariri catchment than any other within Canterbury. Parts of the river and tributaries are used for yachting, power boating, water skiing, rowing, canoeing and swimming. The river banks are used frequently for land based water related activities, such as picnicking, recreational driving, walking, game shooting and off-road driving.

The lower Waimakariri River downstream of the motorway bridge is most heavily used, as access is good, facilities and accommodation are available at Kairaki, Brooklands and Stewarts Gully; and fishing, picnicking and boating are relatively good and close to population centres.

Water based recreational use of the lower Waimakariri River is highest during spring (due largely to white baiting, jet boating and estuarine fishing); reduced in early summer (whitebaiting finished) despite an increase in boating (power boating and water skiing and yachting); increased in the warmer months and the start of the Kahawai fishing season; and increased substantially during late summer (attributed largely to salmon angling and picnicking).

Water based recreation was lowest during winter, the main activities being boating and estuarine fishing. Land based activities are less affected by season, remaining reasonably high over winter and spring, and increasing over summer, in particular later summer.

The lower Waimakariri River and Brooklands Lagoon are used by power boats for fishing, pleasure boating, water skiing and access to other parts of the lower river. Boating regulations administered by the Ministry of Transport restrict speed on the lower Waimakariri River (not Brooklands Lagoon) to 8 km/hr. Water skiing is almost entirely within Brooklands Lagoon, with activities based mainly from the Christchurch Water Sports Club clubrooms and boat ramp on the eastern shore.

There are two sailing clubs with club rooms on the lower Waimakariri River at Stewarts Gully, the Stewarts Gully Yacht Club, and at Kairaki, the Waimakariri Sailing and Power Boat Club. Both clubs hold races around high tide during the season, September to April.

Estuarine fishing at Kairaki is especially popular with a range of people year round. Rods, lines and nets are used to catch (principally) yellow eyed mullet (herring), flounder, red cod, kahawai, eels and occasionally trout; this was confirmed as still being true by a key informant interviewed during the case study.

The survey of river uses reports that most people listed pollution of the lower Waimakariri as being the issue of greatest concern to them. No data was discovered to indicate recent trends in recreational use around the estuary.

A long time resident of Kairaki noted that Jockey Baker Creek is popular for some local families to fish for whitebait, although most do not with the knowledge of the WWTP discharge. However, fish in Jockey Baker Creek move out into other areas of the estuary where they are caught and eaten.

Changes in land use around the Kaiapoi WWTP

In the immediate vicinity of the Kaiapoi WWTP, land use has changed very little during the last decade. Most land is in pastoral farming, with a small, well-established forestry block to the north. A visit to the site shortly after the feedback meetings confirmed that the plantings which have surrounded the WWTP had been cut, leaving the site exposed to view from the main road to Pines Kairaki.

D: Coverage of consultation and Interviews

Numbers and categories of interviewee

The main focus of this case study has been on neighbours' experience of the WWTP over the past three years, since the last major upgrade in 1996/97 (the introduction of wetlands, sand/gravel filtration and UV treatment).

In all, 154 interviews were conducted for this case study. A structured interview schedule was applied to interviews with 114 residents, 30 recreationists and 2 businesses in the vicinity of the WWTP, along the Waimakariri River from the WWTP to the river mouth, and up to Williams Street. For analysis purposes, the 2 businesses were grouped into the residents category, and any significant differences have been highlighted in the assessment of each effect in the following sections. Six other key informants were interviewed using a semi-structured format with themes similar to the structured interview schedule.

The interviews were conducted during twelve days in October, November and December 1999.

Areas of interviewing

Interviews with neighbours of the WWTP were structured to provide responses across a range of separation distances, labelled "near" and "far" (see Table 2). Reflecting the fact that many off-site effects are influenced by weather conditions, particularly wind speed and direction¹², interviews were conducted on neighbouring properties on all sides of the WWTP as well as more distant properties lying to the south-west of the facility. Greatest emphasis was on immediately neighbouring occupied properties - all adjacent neighbours were interviewed. There are very few occupied properties north of the WWTP that would come within the range of off-site effects, much of the land is used for farming.

¹² The predominant wind direction was described by many of those interviewed as being from the north-east.

Table 2: Summary information for interviews

Sub-group	Interviews	Area description	Distance to WWTP boundary	Length of occupation
NEAR Zone				
Kaiapoi Near	20	Kaiapoi residents closest to facility, between Ferry Road and back to the beginning of Feldwick Drive	1000-1250 m	7/20: <2 years 13/20: >2 years
Ferry Road	4	Adjacent to WWTP facility. Has a number of houses at road entrance to the access point of the facility. Pegasus Walkway access point	250-400 m	4/4: >2 years
FAR zone				
Kaiapoi Far	16	Kaiapoi township, west of Kaiapoi Near, up to Williams St	1700-1900 m	7/16: <2 years 9/16: >2 years
Kaiapoi Township	16	William Street between Beach Rd and Kaiapoi River	2000-2300 m	3/16: <2 years 13/16: >2 years
Brooklands	16	South of WWTP, close to the Brooklands lagoon, on southern bank of Waimakariri River mouth	1200-2000 m	5/16: <2 years 11/16: >2 years
Lower Styx Road	12	Runs into Brooklands, up to Anfield St	approx 3000 m	2/12: <2 years 10/12: >2 years
Kairaki	8	Adjacent to northern side of Waimakariri River mouth and Kairaki Beach,	approx 1000 m	1/8: <2 years 7/8: >2 years
Pines	7	Beach north of Kairaki Beach, north of the eastern end of Beach Road	1100-2000 m	2/7: <2 years 5/7: >2 years
Stewarts Gully	12	South-west of WWTP, in 'odour path' during north-easterly winds	approx 1800 m	6/12: <2 years 6/12: >2 years
Kainga	5	South-west of Stewarts Gully	approx 3000 m	1/5: <2 years 4/5: >2 years
RECREATIONAL		<u>Boating</u> – 11 interviews, Waimakariri River; 3 <2 years; 9 >2 years <u>Whitebaiting</u> – 6 interviews, Waimakariri River; 2 <2 years; 10 >2 years <u>Fishing</u> – 12 interviews, Waimakariri River, Styx River; 2 <2 years; 10 >2 years <u>Running/walking</u> – 1 interview, Pegasus Bay Walkway (<i>n</i> years missing)		

List of other key informants

- Representative of the Pines/Kairaki Yacht Club
- a residential property developer active in Kaiapoi
- two long-time residents of Kairaki and fishers in the vicinity of Jockey Baker Creek
- the WWTP operator
- the WDC Waste Water Assets Engineer

Feedback meetings

Three feedback meetings were held between May and July 2001 for the purposes of discussing the preliminary findings of the field research. The first was with administrators of the Waimakariri District Council; the second with four members of the Resource Management Committee of Ngai Tuahuriri; the third with two neighbours of the WWTP and a local community board member. The meetings generally confirmed the preliminary findings as accurate. Particular attention was drawn to impacts on groundwater levels and fishing in Jockey Baker Creek, and also to the fact that the forestry plantation which has provided visual screening around the WWTP for so many years had been felled.

E: Operational effects of the WWTP on neighbours

Main conclusions

Respondents' assessments of effects from the WWTP were confounded by other sources of effects in the same area. Discharges from other activities into the Waimakariri made it difficult for many people to attribute effects such as odour and surface water quality exclusively to the Kaiapoi WWTP. Since impacts from odour or surface water discharges do not show a clear spatial concentration around the Kaiapoi WWTP, this suggests that there are multiple sources of the problems affecting this part of the Waimakariri River.

It is important to keep this fact in mind when reading the analysis which follows. There is no doubt that people are inclined to attribute effects such as odour and water quality impacts to the operation of a WWTP, even if other empirical evidence does not always strongly support this.

Although unpleasant odour was the most notable effect in the general locality, reported by almost one third of all respondents, with little prompting, the pattern of impact severity suggests that the Kaiapoi WWTP does not stand out as the only source of odour or even the most noticeable source of odour in this locality. Other sources include sewage pumping stations and other discharges to the River. Several immediate neighbours of the WWTP confirmed that odour is more noticeable since the long-established shelter belt surrounding the WWTP was felled in May to July 2001.

The next most frequently mentioned effect was that of effluent discharge on water quality in the river, with nearly 15% of respondents discussing this effect. However, as with odour, the spatial pattern of observations suggests that the Kaiapoi WWTP does not stand out as the prime determinant of poor water quality, although negative impacts were reported, associated with the WWTP's direct discharge into Jockey Baker Creek, which is occurring for longer periods than originally anticipated.

About 6% of the respondents said they had noticed an improved habitat for birds since the upgrade of the WWTP, and 5 people (representing 3% of the sample) had experienced litter around the perimeter of the WWTP.

Groundwater effects - contaminated wells and increased surface water logging - was reported by two respondents to the survey and corroborated by two other neighbours during feedback discussions.

Of the potential WWTP effects identified during planning, the following elicited no comments at all, or no corroborated observations:

- visual impact (although this has changed recently with the felling of the shelter belt which has surrounded the WWTP site on three sides for many years)
- impacts on archaeological sites
- risk from natural hazards
- impacts on cultural values
- threat to public health from birds distributing contaminated material off-site.

One effect not predicted during the planning process, yet mentioned in a consistent manner by more than two people was an increase in the presence of midges, which caused significant impacts for immediate neighbours during hot summer periods.

Effects projected and reported

The following table provides a summary analysis of the effects reported during the community-based fieldwork, and compares neighbours responses with expert projections.

Table 3: Effects projected and reported

Effects projected	Effects reported unprompted	Effects reported after prompting	Effects projected but not reported or without corroboration ¹³	Effects reported but not projected
<ul style="list-style-type: none"> • odour • surface water quality • improved habitat for birds • windblown litter • noise • groundwater contamination • visual impact • impacts on archaeological sites • risk from natural hazards • impacts on cultural values 	<ul style="list-style-type: none"> • odour • surface water quality • improved habitat for birds • windblown litter • groundwater contamination • mosquitoes 	<ul style="list-style-type: none"> • odour • surface water quality • improved habitat for birds • windblown litter • noise • groundwater contamination 	<ul style="list-style-type: none"> • visual impact • impacts on archaeological sites • risk from natural hazards • impacts on cultural values 	<ul style="list-style-type: none"> • mosquitoes

In unprompted questioning, 75% of residents and 60% of recreationists had observed no effects at all, while in prompted questioning 64% of residents and 43% of recreationists still recalled no observations of effects.

Structure for reporting the effects experienced

Detailed analysis of each effect experienced by neighbours of the Kaiapoi WWTP is reported under the following sub-headings:

- What effect do they notice? Source of effect?
- Timing; frequency; trends?
- Mitigation attempts?
- Impacts?
- Summary evaluation

¹³ Corroborated observations means cases where there are observations from more than two individual local observers, or where an individual observation can be corroborated by other sources of data. The final two unprompted effects were each reported by only one respondent. These were included because they came from a business adjacent to the WWTP, and from the local yacht club, and there are no other respondent types in these categories to corroborate the responses with.

It should be noted that questions about experiences of effects potentially originating from the Kaiapoi WWTP were focussed explicitly on the past two years (1998-1999).

Odour

The most frequently mentioned effect in both the residents and recreationist surveys was offensive odours. Nearly one third of all respondents reported odours. Most (75% of residents and 91% of recreationists) of the odour responses were unprompted.

What effect do they notice? Source of effect?

The smell was described as “*an unpleasant effluent odour*”, or as one Lower Styx respondent described, “*it is similar to the old sewerage ponds near Aranui in Christchurch*” where he had lived previously. Others used words like “*bad*”, “*rotten eggs*”, “*stink*”, and “*sewage smell*” to describe the odour. Many of the residents and recreationists believed that the source of the smell was definitely the Kaiapoi WWTP. Some people were not sure of the source, but assumed it was the WWTP facility. Several people mentioned that the smell was from the general discharge into the Waimakariri River from various sources, and that the WWTP was contributing to this. Most recreationists reported that the smell is usually noticeable in the waterways of the Waimakariri River, or in the nearby creeks, suggesting that the river water itself was smelling as a result of contamination from various sources.

A few people as far away as three kilometres from the site at Kainga and Lower Styx said they had experienced odours from the Kaiapoi WWTP. However, most (86%) of the residents who mentioned odour effects live within two kilometres of the treatment plant. The areas of Kairaki and Ferry Road displayed the most consistent level of responses, with 75% of respondents reporting odour effects. Although the sample sizes are small, the survey included all households in Ferry Road and the sample of residents in Kairaki represents about 5% of households in that area. Odour effects were mentioned by 45% of the boating recreationists, and one third of the fishers and whitebaiters.

Over half of the residents said they noticed the smell outside their house, and several people noticed it inside as well. Three of the residents’ comments about the smell related to their use of MacIntosh’s Hole, a popular fishing spot at the end of Ferry Road near the treatment plant, next to the southwest corner of the WWTP land. Four others also reported offensive odours in areas other than the immediate residential area. These places were on the river (Waimakariri), at the Waimakariri Yacht Club, on Beach Road where the pine plantation is located (i.e. the WWTP), and at the campground at Kairaki.

Recreationists’ reporting of odour effects occurs both west (upstream) and east (downstream) of the WWTP - around the Waimakariri Sailing Club and river mouth, and in the Styx River or at MacIntosh’s Hole. The Assets Engineer confirmed odours emanating from the screenings being experienced on the Walkway, and also pointed to pumping stations, such as the one in Charles St, as being occasional sources of unpleasant odours.

Timing; frequency; trends?

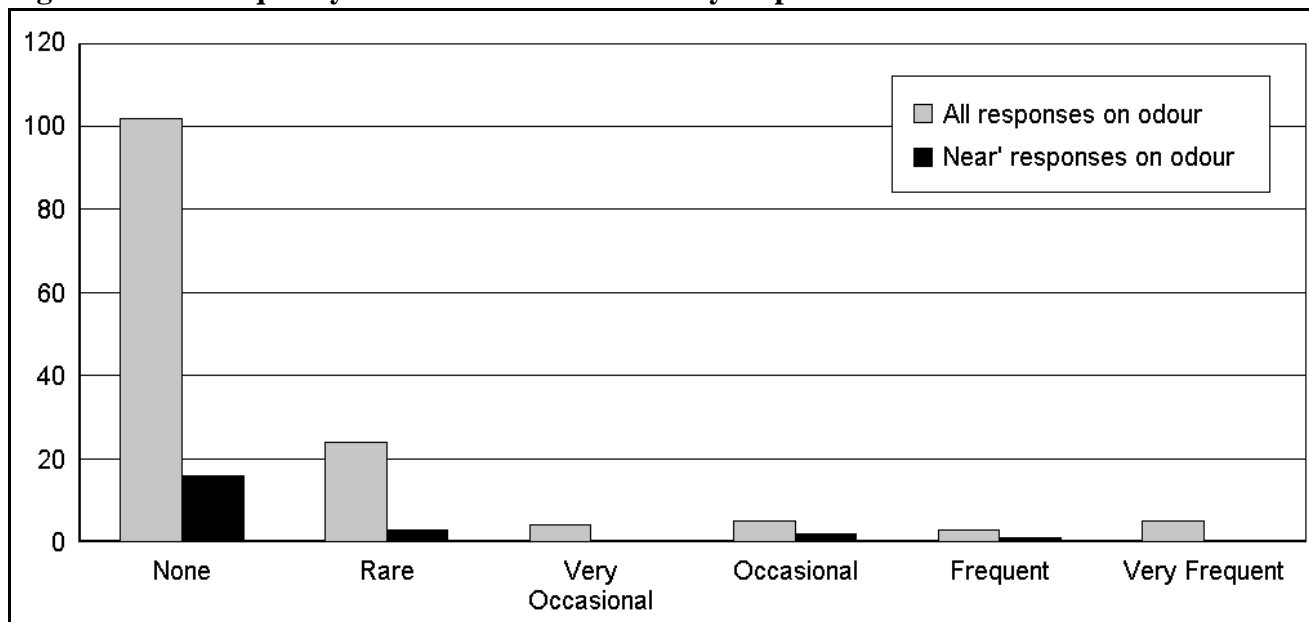
To assist with interpretation and comparisons, it is helpful to distinguish different frequencies of occurrence by relating some quantitative indicators to the qualitative descriptors used by respondents, as follows:

Table 4: Frequency bands for observing effects

Level – descriptor	Frequency range	Frequency on a monthly basis
0 No observations reported	0	0
1 Rare, irregular	Few times a year	<0.5x/month
2 Very occasional	Once a month	1x/month
3 Occasional	Twice a week to twice a month	2-8x/month
4 Frequent	Several times (>2x/week)	8-30x/month
5 Very frequent	Daily	30x/month

Over half of the respondents who reported odour effects said that odours are noticeable only a few times per year. The remainder of the respondents (11% of the total number of people surveyed) detect odours at least once a month. For all those interviewed, the distribution of frequencies is shown in Figure 7. Corresponding data for the ‘near’ areas are included for comparison.

Figure 7: Frequency of odour effects - all survey responses



A similar analysis for recreationists alone showed that most observations are rare or very occasional, reflecting their usage of the locality. Two very frequent observations were made by regular visitors to MacIntosh’s Hole and the river mouth.

Interviewing did not reveal any consistent trends. When asked if there were any trends in the effect (i.e. is it improving, becoming worse or staying about the same), most did not reply, twelve said it was getting better, nine said it was staying about the same, six people said it was becoming worse and others were unsure if there were any trends.

Impacts?

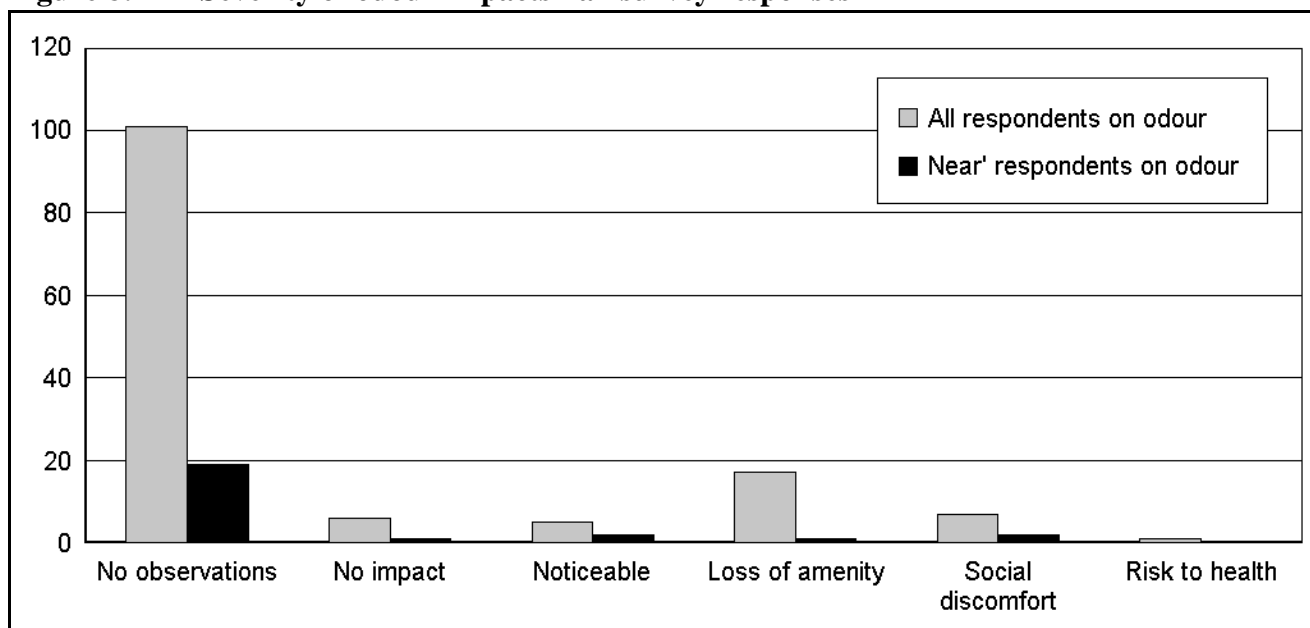
Once again, to assist comparisons, it is helpful to distinguish varying degrees of impact, based on respondents’ descriptions.

Table 5: Spectrum of impact severity for odour effects

Level	Description	Comments
0	No observations reported	
1	No impact at all	No impact; none
2	Noticeable, but not unbearable	It's unpleasant but doesn't really impact on me
3	Loss of personal residential amenity	Can't enjoy outside and have to keep windows closed
4	Social discomfort or embarrassment	It's embarrassing if we have visitors
5	Impacts on personal health and well being	It made me throw up

For all those interviewed who reported experiencing odour effects, the distribution of severity experienced is shown in Figure 8. Corresponding data for the 'near' areas are included for comparison.

Figure 8: Severity of odour impacts - all survey responses



Of all the respondents (residents and recreationists) 30% said that the smell doesn't really affect them (level 1), or they just put up with it (level 2), while 35% indicated that they go inside (some close up their house), or do not use the area recreationally anymore because of the smell (level 3) and 30% find the smell annoys them. Two said it makes them feel sick. A respondent from the Pines-Kairaki Yacht Club said that the smell has lowered the number of members joining the club.

It should be noted that there was no concentration of more severe impacts in close proximity to the Kaiapoi WWTP, suggesting that the WWTP does not stand out as the only source of odour or even the most noticeable source of odour in the estuary for most residents. Residents who describe impacts above level two are distributed all around the estuary (Kainga, Stewarts Gully, Brooklands, Kairaki Beach, Ferry Road and as far west in Kaiapoi township as Williams St). This is not to say that nearby residents have never experienced off-site odour effects clearly attributable to the Kaiapoi WWTP. Indeed, in feedback discussions, several observations confirmed that odour is more noticeable immediately adjacent to the WWTP site since the long-established shelter belt surrounding the WWTP was felled in May to July 2001, and particularly when the breeze is from a southerly quarter or in still foggy winter days. It was noted that this issue had been brought up at the local community board prior to the felling of the trees.

A similar analysis just of recreationists' responses reinforces this finding that there is no particular concentration of severe impacts nearer to the Kaiapoi WWTP, although the plant is definitely one source of odours.

Summary evaluation

Offensive odours in the locality were noticed more by recreationists than residents. A confounding problem in assessing odour effects directly attributable to the WWTP is the effluent discharged into the Waimakariri River from other sources, which is probably contributing to the offensive odours in the area. The severity of odour impacts does not appear to be concentrated immediately around the Kaiapoi WWTP, suggesting that the WWTP does not stand out as the only source of odour or even the most noticeable source of odour in this locality. Further information about other effluent in the river will need to be gathered to determine the exact nature and source(s) of the effect for this locality as a whole.

Surface water quality

Almost one in six respondents mentioned surface water quality effects, mostly without any prompting. However, an analysis of locations indicates that at least half the observations relate to experiences at locations upstream of the Kaiapoi discharge point (14 observations), a few relate to experiences on the southern side of the Waimakariri River estuary and lower Styx River (3 observations), others relate to experiences near the Waimakariri River mouth associated with the accumulation of all upstream discharges (6 observations), while four respondents describe impacts from discharges into Jockey Baker Creek itself, as did the observations of two key informants.

What effect do they notice? Source of the effect?

Almost half of those who commented on surface water quality spoke of “*a brown scum*” or “*off-white froth*” on the surface of the water in the Waimakariri River. One recreationist commented specifically that “*the low tide water is brown, coming out of the Cam and Kaiapoi Rivers*”. These observations are clearly associated with more general river water quality and a wider array of discharges (refer to Section C for details of other discharges in the locality).

Of those who reported seeing actual discharges into Jockey Baker Creek, two said the discharge effects were noticeable in the vicinity of MacIntosh's Hole as “*brown, frothy and atrocious*” while a third described “*a green discharge that smells like sewage coming out of Jockey Baker Creek*”, noticed at low tide when boating past the Creek, an observation reinforced by another key informant interview. The plant operator described how there had been problems with the plant over the start-up period leading to high algae levels in the wetlands and resulting in green coloured effluent discharges to Jockey Baker Creek. He recalled this happening only in the first season of operation.

Two long-time fishers at Jockey Baker Creek concurred in their observations of “*red mites*” in the effluent “*which block up the whitebait nets*”.

Timing; frequency; trends?

The frequency of the observed surface water quality effects reflected the respondents' use of the area rather than any particular pattern of discharge from whatever source. Furthermore, there were relatively few comments offered about trends over time, and those that were made showed no consistency - equal numbers suggesting improvements or worsening over recent years.

The Asset Engineer reported that, after the period of difficulties described above, effluent discharges now tested “almost clear” visually.

Mitigation attempts?

The Asset Engineer reported that the results of water quality monitoring carried out by the plant operator revealed consistently that nitrate levels, suspended solids, faecal coliforms and biochemical oxygen demand levels were all within consent requirements, although levels of dissolved reactive phosphorus did not always pass the test.

Impacts?

In discussing the impacts of poor water quality, two of those who observed WWTP discharges into Jockey Baker Creek indicated that they would not eat fish from the river. They also commented that many people who used to fish for whitebait in Jockey Baker Creek had since stopped doing so. The timing of effluent discharges is critical to this impact. They noted that if effluent discharges avoided the whitebait season, locals would be likely to resume whitebaiting in Jockey Baker Creek.

This particular impact is little different from the impacts associated with poor water quality throughout the estuary locality. Indeed, it is only one of a much wider range of impacts described in relation to perceived water quality conditions in the Waimakariri River estuary generally. These include a loss of recreational amenity (less swimming, less fishing, reduced membership of the local boating club), ecological impacts (fewer fish, smaller fish, dead fish), perceived increased public health risks (incidence of sickness or infection or loss of body hair), and negative perceptions of the locality for customers (signage warning against drinking and swimming in the river water).

Summary evaluation

As with odour, the spatial pattern of observations suggests that, since the start-up period, the Kaiapoi WWTP does not stand out as the prime determinant of poor water quality, although negative experiences were reported, associated with the WWTP’s direct discharge into Jockey Baker Creek. It is acknowledged that effluent discharge into Jockey Baker Creek is occurring for considerably longer periods than was anticipated at the resource consent applications.

Again, the problem of other significant sources of effluent in the Waimakariri River blurs most direct effects of the WWTP, so it is impossible for lay observers to identify how much of the problem is caused by the treatment plant effluent discharge, if any.

Improved habitat for birds

What effect do they notice? Source of effect?

Nine respondents (6%) mentioned an increase in the number of birds in the area; six were local residents, two were recreational users of the area, and one operated a business near Brooklands Lagoon. None of the comments about the birds were unprompted.

Some comments mentioned specifically ducks, herons, geese, and seagulls. Four people thought that the WWTP, in particular the establishment of the new wetlands, was responsible for the increase in bird numbers, saying they notice more birds in the immediate area around the WWTP, including MacIntosh’s

Hole. However, the other five were unsure of the reason; two said they see more birds flying around the general area, and one said they notice more birds along the river.

At the feedback meeting, a neighbouring farmer described an increase in geese numbers living in the wetlands, especially between January and May.

Timing; frequency; trends?

Two people in this category said they notice more birds all year round, while two others said they only notice more birds during duck-shooting season. For other respondents, the timing of bird sightings was linked to their use of the area.

Most of the respondents reported a trend of progressive increases in bird numbers over recent years.

Impacts?

Four of the nine respondents said the increased number of birds is a positive thing for them, personally. They like seeing the birds and having them in the area. The neighbouring farmer observes the geese eating his pasture, and noted that six geese can eat grass equivalent to the consumption of one sheep.

The rest of the respondents said increasing bird numbers have no impact on them.

Summary evaluation

A relatively small proportion of those interviewed have noticed an increase in bird numbers which they attribute to the improvement in seasonal habitat resulting from the introduction of the wetlands system to the Kaiapoi WWTP. Whilst some viewed this as a positive environmental impact, it appeared to pose a loss of grazing potential on the neighbouring farmer.

Litter

What effect do they notice? Source of effect?

Five people mentioned seeing litter that they thought was related to the WWTP. The sort of litter they saw included sanitary items, condoms, toilet paper and wrappers. All thought that the rubbish they saw came from the open ponds. Research team members corroborated these observations when visiting the Walkway in November 1999. The plant operator explained that strong norwesterly winds created surface waves which “flick up” litter from the surface of the oxidation ponds. At their most southerly corner, the ponds are very close to the boundary of the site and to the Pegasus Walkway.

The spread of this litter was very localised around the ponds, but spilled onto the Pegasus Walkway particularly along the fence line. One respondent described seeing similar litter along the shore of the Brooklands lagoon.

Timing; frequency; trends?

The frequency with which the respondents see the litter appears to be fairly high, with two of the respondents indicating they see it at least once a week, another person said once a month, and one resident

said they see it every time they walk there. However, the plant operator expressed the view that it is probably “*residual litter*” that people are seeing, since mitigation measures were put in place in October 1999. Neither of the immediate neighbours who attended the feedback meeting had observed such litter in recent months.

Mitigation attempts?

In October 1999, screens of shade cloth were put in place along the boundary fence to trap windborne litter inside the site boundary.

Impacts?

Three of the five respondents said that they no longer use the area around the ponds because of the offensive litter, while another reported less frequent use of the area. A business operator said that it does not look good (for his customers) from the window of his business.

Summary evaluation

Although not reported by many people, off-site litter from the WWTP clearly has the potential to be very offensive with significant impacts on local amenity values. However, the problem now seems to be under control.

Midges

What effect do they notice? Source of effect?

Five residents said they notice more midges in the area. All of the respondents thought that the ponds or wetlands at the WWTP provide the breeding sites which are responsible for the increase in these insects. They notice the midges inside their houses and around their immediate residential area. Three of these respondents live on Ferry Road immediately west of the WWTP land, one in Kaiapoi (near), and one at Kairaki. Discussion at the feedback meeting confirmed the presence of swarms of midges in the summer time.

Timing; frequency; trends?

Two of the respondents said they notice the midges any time during the day or week, and four said they notice them most in summer especially during the evenings, or in “muggy” weather.

Mitigation attempts?

No mitigation has been attempted, although the Asset Engineer acknowledged that they are a seasonal problem, and that comments had been received by the plant operator.

Impacts?

Those reporting increased midge numbers said they either shut the house up (which is not desirable on a warm summer evening) or spray to reduce the number of insects.

An increase in the number of midges was not an effect predicted during the planning stages for the WWTP upgrade.

Summary evaluation

Further investigations will need to be made to determine the breeding areas of the mosquitoes, and whether the upgrade to Kaiapoi WWTP, particularly the introduction of wetlands, is part of this problem.

Noise

Four residents mentioned noise as an effect of the WWTP operation, and all of these responses were prompted. Two of these (living on Ferry Road and in ‘Kaiapoi Near’) reported hearing the noise on their properties, while the other two reported observations of noise when in very close proximity to the WWTP (on the Waimakariri River, near MacIntosh’s Hole, or when walking past the WWTP along the Pegasus Bay Walkway).

What effect do they notice? Source of effect?

Three residents reported truck and machinery noise either from their properties or when on the River, while one reported “*getting a fright*” as she walked past the WWTP when the pumps started up, and now is aware of the pump motors whenever she walks past and they are on.

Timing; frequency; trends?

One resident said he had noticed the truck and machinery noise only during the construction period. Such noise was noticed only when people were close to the WWTP facility, and the frequency of the noise varied according to when the respondents are in the area of the WWTP. This minimal level of noise did not support any trend regarding noise observations.

Impacts?

Three of the four respondents said the noise does not impact on them at all. As noted above, one received a fright on one occasion - a chance coincidence - but no longer experiences any significant impact.

Summary evaluation

Noise is not a significant concern to residents and recreationists in the area.

Ground water effects

Two residents responded in the survey about their experience of possible ground-water contamination, both unprompted. Both residents lived on Ferry Road and said that their water supply was discoloured and had an offensive odour. The residents claim the WWTP is affecting their artesian well. At the feedback meeting, two other immediate neighbours including a farmer pointed to surface effects related to altered groundwater levels. The farmer reported noticeably longer periods of water-logged paddocks during the winter months since the infiltration wetlands had been brought into use, while the other neighbour, who lived on Ferry Road, noticed that what used to be the driest part of his property was now the wettest, and believed it was associated with the irrigation of the wetlands at the WWTP.

These effects have been occurring only since irrigating of the wetlands began and the new system was installed at the WWTP. One resident has installed a roof tank at his own expense, and does not drink the water from the main water supply, while the other one said the water makes their washing discoloured and smelly. Both residents said they have contacted the council about their situation, and one mentioned that the council ignored her complaint.

Feedback discussions with the Council administrators confirmed that the Council had subsequently connected one of the neighbours onto the town's reticulated water supply, running a 50 mm pipe down Beach Road at the Council's expense.

Summary of responses

The following Table 6 provides a summary of the proportions of those interviewed who discussed particular effects in their responses to the structured questionnaire. It is important to note that these percentages do **not** represent the proportions of neighbours who experienced significant off-site impacts.

Table 6: Summary table of responses (N=146)

Effect reported	% Unprompted	% Unprompted + Prompted
Odours	24	31
Surface water quality	12	15
Improved habitat for birds	6	6
Litter	1	3
Noise	3	3
Ground water contamination	2	2

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

In exploring the longer-term effects of the Kaiapoi WWTP, residents of the host community were asked for their observations on -

- the major changes that have occurred in settlement pattern in the locality over recent years, and
- whether the location of the WWTP had influenced the way in which the community had developed.

Major changes in land use and settlement

As noted in Section C, in the immediate vicinity of the Kaiapoi WWTP, land use has changed very little during the last decade, a trend which does not seem to have altered since the WWTP upgrade in 1997. Most land is in pastoral farming, with a small, well-established forestry block to the north. Historical land-use zoning boundaries still appear to demarcate land-use patterns in the immediate vicinity of the Kaiapoi WWTP.

Since 1997, residential sub-division in Kaiapoi has been focused on areas south of the Kaiapoi River, an area more than one and a half kilometres west of the WWTP. This focus is evident from survey responses as well. According to the respondents, there are new houses and new people moving into the Kaiapoi area “*all the time*”. New sub-divisions, particularly one south of the Kaiapoi River, near Courtney Drive, were commented on. Some neighbours had recently sub-divided and sold off one section of their property for new houses to be built. A couple of people said that Kaiapoi has a “*transient*” population, therefore there are always new people moving into the area, and many moving out. Some people thought that Kaiapoi was becoming a busier place to live, that there has been an increase in general traffic and noise in the area, as well as an increase in the number of businesses.

The influence of the WWTP on the settlement pattern in the locality

Since the upgrade of the Kaiapoi WWTP, the township has been continuing to grow. The vast majority of those interviewed (89%) expressed the view that the presence of the WWTP has not influenced the way the community has developed. Of those who did think that the WWTP had influenced the community growth, contrasting views were expressed. Eight people thought that there has been a negative influence - associated with direct displacement of development opportunities (i.e. you cannot build where the WWTP is located) and odour effects related to the plants operation. This is interpreted as having prevented more houses being built closer to the beach, and the risks to investment in property any closer to the WWTP site. However, strict enforcement of land-use zones has been the primary factor which explains why new residential development has not occurred closer to the WWTP site. These comments do not suggest that the 1997 upgrade has altered the situation at all.

Five people commented that the effect has been positive - because the community's experience of the WWTP has not been bad, the upgraded plant now deals with the sewage more effectively, removing most of the effluent from the river, and fishers continue to have good road access to the river near the WWTP.

References

Royds Consulting (1994): Technical Support Document to accompany an application by the Waimakariri District Council for resource consents to discharge from the Upgraded Kaiapoi Sewage Treatment Plant. June 1994.

North Canterbury Catchment Board and Regional Water Board (1986): Waimakariri River and Catchment Resource Survey. Volumes I, II and III. Christchurch.