

# **Host Communities: siting and effects of facilities**

## **An analysis of host community experience of the Oamaru Waste Water Treatment Plant**

by

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## **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 Waitaki 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](http://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.

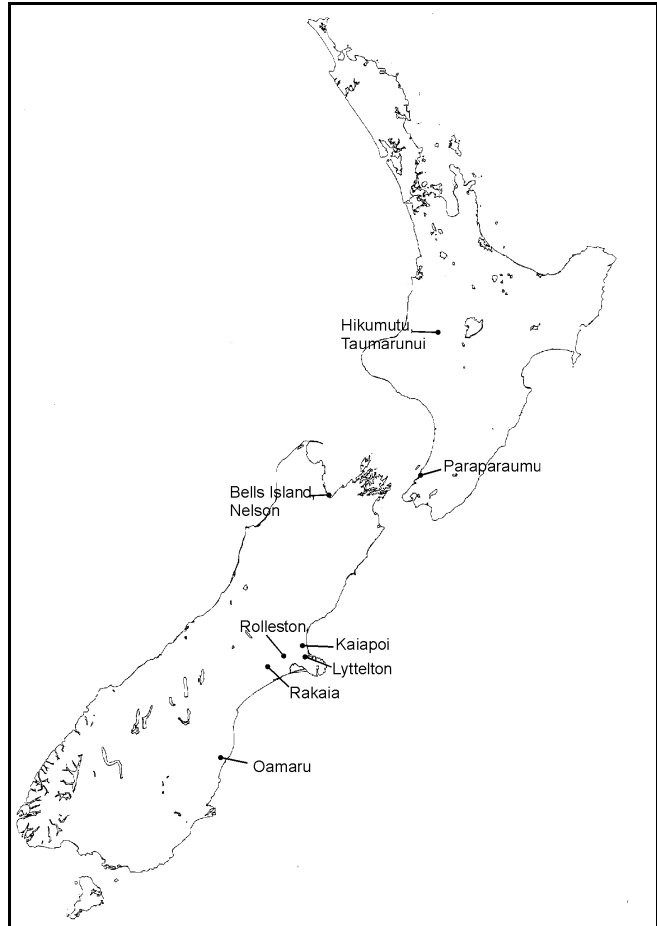
### Purpose of the case studies

This case study on the Oamaru WWTP is one of eight such case studies being undertaken as part of this research programme<sup>1</sup>, 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 accurate<sup>2</sup> 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

**Figure 1: New Zealand Case Studies**



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

<sup>2</sup> 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.

each case study in the context of the way the facility was operated and managed at the time of the case study fieldwork<sup>3</sup>.

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 Oamaru 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 waste water 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 nature<sup>4</sup>.

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

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<sup>3</sup> 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.

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

informants; secondary data records) or different perspectives (e.g. the facility operator)<sup>5</sup>. 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 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.

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<sup>5</sup> 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.

**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.

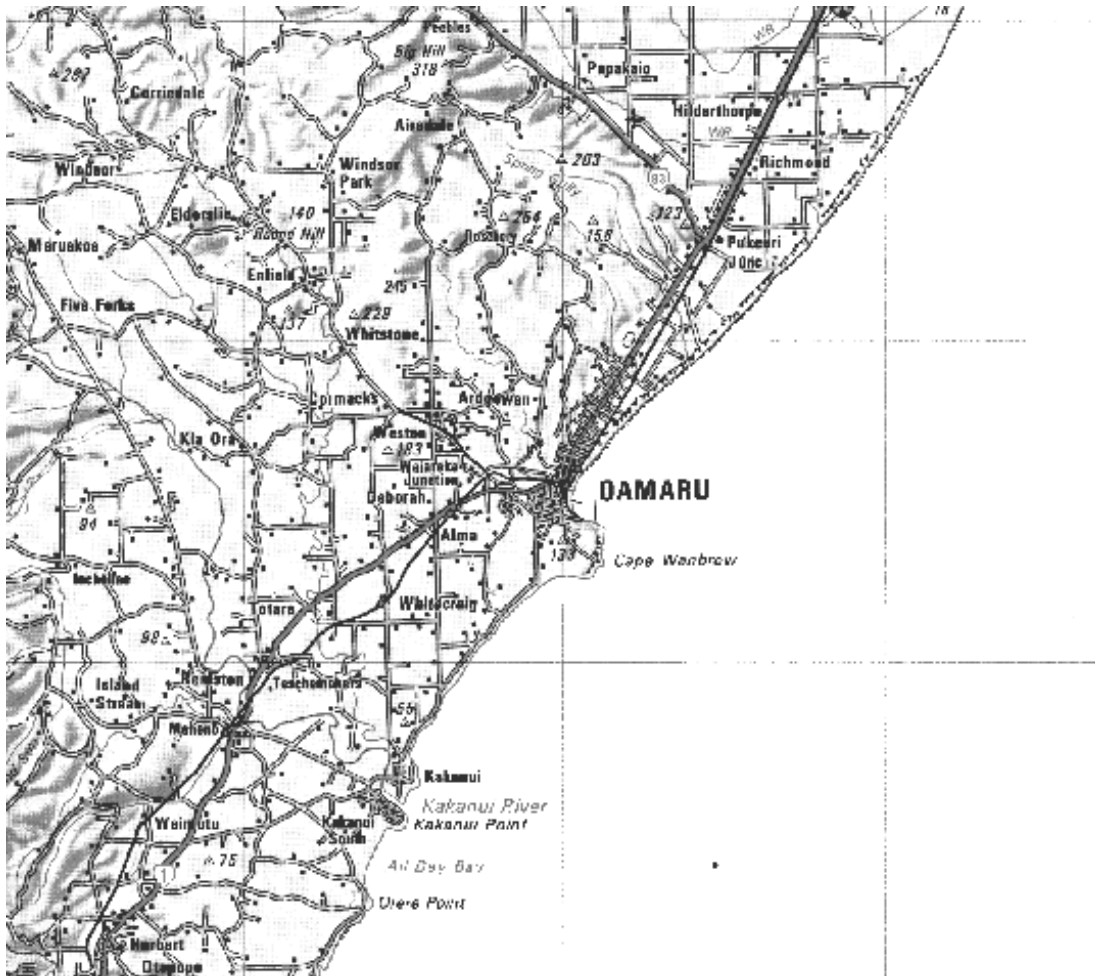


## B: History and description of the facility

### Location:

The Oamaru WWTP is located on the coast at the eastern end of TY Duncan and Orbell Roads, approximately 1,600m North East of the town boundary of Oamaru (refer to Figure 2). The topography, typical of that part of the east coast, is flat coastal plain, ending abruptly in 10-12m cliffs at the sea.

**Figure 2: Oamaru Area Map**



### Planning:

The Oamaru WWTP replaced ageing and overloaded Imhoff tanks and a series of ocean outfalls which had discharged almost untreated sewage onto beaches near Oamaru for many decades.

The principal criteria considered in selecting a site were distance from existing dwellings, land suitability, and pumping costs. Two other sites were considered; one further north near the Pukeuri freezing works, and the other south of Cape Wanbrow and the town (refer to Figure 2).

The selected site was previously in use for dairy farming and grazing, as was the case for other land in the general vicinity, and the adjacent coastal area had no easy public access. The Waitaki District

Council purchased open pasture land from a neighbouring farmer, as well as the nearest residential property on TY Duncan Road. Planning began in 1991; resource consent applications were made in 1992 and the plant began operating in 1995.

Planning documents<sup>6</sup> record the following environmental effects, issues and anticipated outcomes projected for the Oamaru WWTP site during the planning process -

- little if any **seepage** will occur from the treatment ponds and disposal area and reach the groundwater. The small amount which does, will be substantially purified by the filtering capacity of the soils. Nevertheless, the neighbour on the northern boundary of the plant expressed concern that seepage will enter his property.
- an increase in available **habitats** and consequently a greater **diversity and abundance of plant and animal species** resulting from the development of a forest and dedicated wetlands.
- **noise** from aerator electric motors will be barely discernable beyond the boundaries of the site. At the nearest house, this noise will not be discernible above background noise levels.
- **road traffic** will be no more than a few light vehicles per day and one light truck per day transporting screenings in an enclosed bin. Nevertheless, residents of T Y Duncan Road and Abattoir Road expressed concerns about **increased traffic** and the consequent **dust** problem (appears to be related mainly to construction phase activity, although at the time TY Duncan Road was unsealed, as was Shortland Road).
- the aeration ponds and screening area will have the potential to release **odours** but this is not likely to cause a nuisance nor be discernible beyond the site boundaries.
- the treatment plant will have minimal **visual impact** as most of the plant will be contained within banks with a top level of no more than one or two metres above existing ground level. The main change to the existing open pasture vista will occur over a number of years as the trees in the land disposal area grow.
- there will not be any **health risk** involved due to proximity of neighbouring dwellings.
- several neighbours expressed concern about the **adverse affect on property value and saleability**.
- effluent discharge into Landon Creek will not cause any **scour or erosion**.
- the continuous flow of effluent will result in green algal growth, but this will not have an adverse effect on the **ecology of the stream**.
- discharge into Landon Creek will not result in any impact on the very limited **recreational use of the creek or the foreshore**.

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<sup>6</sup>

Beca Steven (1992): Oamaru Sewage Treatment & Effluent Disposal Scheme - Environmental Impact Assessment. Report prepared for the Waitaki District Council. March 1992.

## Site development and waste water treatment operations:

Sewage treatment at the Oamaru WWTP involves coarse screening of raw sewage prior to passing through an aeration lagoon, into two partially-aerated oxidation (“facultative”) ponds, operating in parallel, and then into a series of three maturation ponds. Effluent disposal is via spray irrigation onto 21 hectares of land, comprising grassed channels between rows of new trees<sup>7</sup>. Any effluent which is not lost within this land treatment system<sup>8</sup> flows into an area of wetland, with ultimate discharge into a dry watercourse - Landon Creek - which runs to the sea no more than 200 m downstream.

The WWTP was commissioned during the period December 1994 to March 1995.

Screenings are removed weekly and taken for disposal at the Oamaru landfill.

Aerators are running 24 hours a day in the aeration lagoon, where the raw sewage is stirred up and oxygen added. In the other ponds, the aerators are turned on only as required to assist with the direction of liquid flow around the pond. These aerators will operate only during daylight hours. The large water areas of the ponds attract waterfowl. Large numbers of ducks have been noted during the duck-shooting season. Bird scarers (i.e. canons) were used for one season in an attempt to disperse the ducks. However, a fault with the timing device controlling the bird cannon during the 1998 season<sup>9</sup> has led to the discontinuation of this practice. Plant operators say that the presence of large numbers of birds on the oxidation and maturation ponds does not inhibit plant operation.

The area for spray irrigation is laid out in 14 bays, with pipework buried underground and spray nozzles standing less than 1 m above the ground. Effluent is sprayed onto two bays at a time, during daylight hours<sup>10</sup>, leading to a 7-day cycle for each bay. After four years of operation, tree heights range from two to five metres.

It is necessary to crop the grass every three months in order to avoid rank grass forming a densely packed layer, rotting and preventing further grass growth. This is an expensive exercise<sup>11</sup>. It has also been made more difficult by the initial spacing of the trees planted in rows in the irrigation area. To improve herbage removal, while maintaining the visual attractiveness of the growing plantation, it is intended that some rows of trees will be removed so that mechanical equipment can gain easier access.

According to District Council administrators when first established, the wetland areas attracted very high numbers of waterfowl, with the result that faecal coliform counts in the effluent discharged to

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<sup>7</sup> A mixture of eucalyptus, pine and macrocarpa.

<sup>8</sup> By evapo-transpiration into the atmosphere. There is no seepage into the ground, since the area is underlaid by impermeable soils. As a result, in terms of water volumes, a very high proportion of the water that is irrigated onto the grass and trees, flows through to the wetlands and creek discharge.

<sup>9</sup> The timer fault resulted in the bird cannon discharging during the night, to the annoyance of neighbours.

<sup>10</sup> Generally between 7 am and 5 pm. During periods of wet weather, when liquid volumes through the plant are higher, spraying may start earlier in the morning, but this is described by the plant operator as very rare.

<sup>11</sup> Approximately \$55,000 annually to cut the 21 hectare area and remove the grass four times a year.

Landon Creek were excessive. Consequently, most of the wetland plants were removed in 1996, leaving mainly clear channels. Waterfowl numbers in this part of the facility have reduced as a result.

Discharge of effluent to Landon Creek occurs every day of the year. There is generally a lag of about 2-3 hours between the time that spraying begins and the time that discharge to Landon Creek begins.

Control of operations at the waste water facility is highly computerised. Inflows and outflows for each pond are monitored, as are the liquid levels in each pond. Data is automatically transmitted back to the District Council and operator offices. Any aberrations are immediately communicated to the cell phones of operator and District Council administrator.

The facility also includes two septage ponds, into which the contents of septic tanks are dumped. Typically there are 3 visits a day by the septic tank contractor vehicle, and deliveries occur seven days a week. Monday is usually the busiest day<sup>12</sup>, with the additional trips occasioned by the need to empty commercial grease traps around Oamaru after the weekend. Each septage pond is approximately 20 m by 10 m in area, and open to the air. When the liquid level in these ponds nears the top, the supernatant liquid is pumped into the oxidation ponds for treatment. This occurs once every 2-3 months. When the ponds ultimately fill with solids. New ponds will have to be dug for this purpose.

The Waitaki District Council uses a small area of land at the WWTP as a storage compound for such things as roading materials and bulk quantities of kleensaks.

### **The situation in late 1999:**

The current WWTP occupies approximately 65 hectares of which the major components are -

- two oxidation lagoons totalling 11 ha
- three maturation ponds totalling 4 ha
- 21 ha of overland flow area
- 2 ha of wetlands

Whitestone Roding, a Local Authority Trading Enterprise, contracts to the Waitaki District Council to manage the WWTP operations. Whitestone Roding has always operated the plant; its contract began in 1997, was extended in 2000, and expires in June 2002, at which time the contract will be put out for open tender. The WWTP operator has responsibility for the operations of all parts of the reticulated sewerage network<sup>13</sup> in Oamaru, as well as other WWTPs in the District. Consequently, the plant operator is not present on site all the time, and the staffing level is less than one full-time equivalent. Normally, the operator will visit the plant at the beginning of daily operations, and in the middle of the day. His other responsibilities mean that he is travelling to and fro several times on most working days.

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<sup>12</sup> Up to 8 visits in a day.

<sup>13</sup> There are several pumping stations at different locations around Oamaru, and a network of rising mains, etc.

Herbage removal is also contracted out to the neighbouring dairy farmer, who bales the hay and uses it to supplement stock feed on his dairy farm. The same dairy farmer leases Council-owned pasture land immediately adjacent to the ponds to the east and north.

Transportation of the contents of septic tanks and grease traps to the WWTP, and of screenings from the WWTP is carried out by various private contractors.

The plant takes general municipal sewage from Oamaru, as well as wastewater from a textile factory, abattoir, confectionery production, chicken, bacon, fish and cheese processing. The facility is not operating at full capacity. The town of Weston, just west of Oamaru, was connected into Oamaru's reticulated sewerage system in December 1999.

The Waitaki District Council does not keep a written log of events or complaints. However, the operator logs any unusual events at the plant. Every report or complaint of odour is reported to the Otago Regional Council.

Since it opened, the WWTP has attracted visits from a variety of groups - school classes, garden groups, and walking groups. The Council neither discourages nor encourages such visits, because of OSH liability considerations. Nevertheless, all groups who do visit are given a guided tour of the facilities.

#### **Liaison between the facility and the host community:**

Since the consultation activities that took place in 1992 during the planning and resource consent stage, representatives of the Waitaki District Council report regular discussions with local farmers and neighbours, particularly regarding odour. However, there is no formal liaison arrangement with a group of neighbours.

## C: The host community

### Overview

The Oamaru Waste Water Treatment Plant is situated just north east of the town of Oamaru in the Waitaki District.

The WWTP locality has historically been totally rural, dominated by grazing pastures, with dairy farming arriving in recent years, boosted by an irrigation scheme on the north side of the plant. To the west and south of the plant - east of the Main North Road - smaller grazing properties<sup>14</sup> are slowly giving way to hobby farmers<sup>15</sup> and lifestyle blocks.

The Pukeuri freezing works is situated 3km to the north of the WWTP, while the ABCO abattoir is 2 km to the southwest of the plant. The Pukeuri works was considered for inclusion in the WWTP operations during the planning stages, but declined to be involved. Currently the works discharges untreated waste water into the sea at an ocean outfall 3 km up the coast from the WWTP, although it has recently gained consents to develop its own stand-alone WWTP on site. The ABCO abattoir sends its waste water for treatment at the Oamaru WWTP.

The South Island Main Trunk Railway Line passes 600 m west of the plant boundary, with SH1 a little further to the west (900 m from the boundary).

The predominant wind is from the North East.

### Population change 1991-96

The population of the District has been in decline for more than a decade, a decline that is reflected in the population statistics for district, Oamaru town, Pukeuri rural area unit, and the mesh-blocks which make up the rural host community around the WWTP, as shown in Table 1.

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<sup>14</sup> For a long time there were about four 'butchers' blocks', i.e. 10-20 acre blocks of pasture owned by butchers in Oamaru, where they could hold stock prior to having them killed at the abattoir at the end of Redcastle Road. Only two such butchers' blocks remain.

<sup>15</sup> Including several retired thoroughbred and standardbred breeders and trainers who maintain an involvement with a few horses.

**Table 1: Decline in Usually Resident Population and change in the number of private occupied dwellings**

	<b>UR pop<sup>n</sup> 1986</b>	<b>UR pop<sup>n</sup> 1991</b>	<b>Pop<sup>n</sup> change '86-'91</b>	<b>UR pop<sup>n</sup> 1996</b>	<b>Pop<sup>n</sup> change '91-'96</b>
Waitaki District	22375	21887	-2.2%	21573	-1.4%
Oamaru	12288	11970	-2.6%	11761	-1.7%
Pukeuri	258	219	-15.1%	204	-6.8%
WWTP host		195		171	-12.3%
	<b>Pvt Dw. 1986</b>	<b>Pvt Dw. 1991</b>	<b>Dw. Change '86-'91</b>	<b>Pvt Dw. 1996</b>	<b>Dw. Change '91-'96</b>
Waitaki District	7991	8347	+4.5%	8548	+2.4%
Oamaru	4613	4762	+3.2%	4824	+1.3%
Pukeuri	82	85	+3.7%	79	-7.1%
WWTP host		69		66	-4.3%

**Changes in land use - 1991-96**

The early 1990s saw some significant changes in land use in the host community. One real estate agent interviewed described an exodus of horses from the district during that period and the development of lifestyle block sub-divisions. This trend has almost stopped in the last five years, due partly to lack of demand and partly to a change in town planning provisions. The transitional plan<sup>16</sup> has proposed two changes in the host community locality - land west of Shortland Road has been classified as Business 4 (i.e. potentially industrial), while land east of Shortland Road out to the coast has been classified as Rural General, which is more restrictive on sub-division size than previously<sup>17</sup>.

Land sales in the whole district are reported as having slowed down in the last five years, and rural property values everywhere have eased back as well. The progressive loss of rural employment opportunities is probably a major factor in these trends. Another real estate commentator suggested that a coastal location in this area is not viewed positively - being cooler, and exposed to the predominant east/north east winds. He suggested that there is a perception in North Otago that "*west and south is the place to be*". He expressed the view that small farmlets elsewhere are turning over relatively quickly at the moment.

<sup>16</sup> Not yet operative, therefore casting additional uncertainty over future land-use opportunities.

<sup>17</sup> Minimum size for parcels of land used to be 5 acres; now they will be 10 acres.

## D: Coverage of Consultation and Interviews

### Numbers and categories of interviewee

In all, 37 interviews (October 1999) were conducted for this case study. A structured interview schedule was applied to interviews with 17 residents and 16 farming and other businesses in the vicinity of the WWTP and between the WWTP and the north-east quarter of Oamaru township. Four other key informants were interviewed using a semi-structured format with themes similar to the structured interview schedule.

The initial round of interviews was conducted during the period 18 to 20 October 1999. Several follow-up interviews were carried out in early 2001, associated with the feedback phase of the research.

### 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 direction<sup>18</sup>, interviews were conducted on neighbouring properties on all sides of the WWTP as well as more distant properties lying to the south-west quarter from the facility. Greatest emphasis was on immediately neighbouring occupied properties - all immediate neighbours were interviewed. There are very few occupied properties north of the WWTP that would come within the range of off-site effects. The occupants of two dwellings within 900 m of the northern boundary of the ponds were interviewed.

**Table 2: Summary information for interviews**

Sub-group <sup>19</sup>	Interviews	Area description	Distance to WWTP boundary	Length of occupation <sup>20</sup>
Near	12 total 7 residential 5 farmers/bus.	Both sides of TY Duncan Road east of the SI Main Trunk Railway line; north side of Hedges Road and east side of Shortland Road <sup>21</sup> ; southern end of McCulloch Road, near Orbell Road.	50-400 m	8/12: <8years 4/12: >7years
Far	21 total 10 residential 11 farmers/bus.	Adjacent to SH1 north of Oamaru as far as Orbell Road; industrial estate north of Oamaru; north-eastern end of Salisbury Crescent.	550-1,700 m	10/21: <8years 11/21: >7years
<b>Totals</b>	33 total 17 residential 16 farmers/bus.			55%: <8years 45%: >7years

<sup>18</sup> The predominant wind direction was described by many of those interviewed as being from the north east.

<sup>19</sup> ‘Near’ interviews are those with dwellings no more than 500 m from a facility boundary.

<sup>20</sup> Seven years was taken as a distinguishing time period since consultation for the Environmental Impact Assessment took place in 1992.

<sup>21</sup> Shortland Road used to be known as Abattoir Road.



**List of other key informants**

- Two real estate agents with experience of both rural and residential property development
- Waitaki District Council Reticulated Services Engineer
- Whitestone Roding WWTP operator

**Feedback meetings**

On 23 May 2001, a feedback meeting for neighbours was held for the purposes of discussing the preliminary findings of the field research. The meeting was attended by nine residents who live in the vicinity of the WWTP. Discussions at this meeting both endorsed and updated the preliminary findings of the case study research. Comments have been added into the report at various points and referenced to the feedback discussions, particularly in relation to traffic, odour, effluent discharge and community liaison.

Opportunity was also taken to hold discussions with the manager of the Department of Conservation Office in Oamaru.

## E: Operational effects of the WWTP on neighbours

### Main conclusions

The only off-site effect which generated significant numbers of observations without any prompting was odour. The other two effects which attracted a notable level of comment (mostly after being prompted) were the increase in wildlife present around the WWTP and the increase in traffic using TY Duncan road. Other, less common effects related to visual aspects and changes in local recreational amenity values.

Initial experience of WWTP odours for neighbours was distinctly negative. However, with the exception of a very few nearby households, odour now causes no more than a minor and occasional impact. In feedback discussions, members of the neighbouring community expressed dissatisfaction with the arrangements for complaints, wanting a more responsive arrangement with the operator, and wanting to avoid creating adverse publicity by having a public argument with the Council.

The increase in wildlife, in particular the variety of bird life, is generally viewed favourably by neighbours of the WWTP. The noticeable increase in commercial traffic, from both WWTP operations and the sealing of Shortland Road, has surprised a number of local residents. However, none report any significant impacts. For some near neighbours, the development associated with the WWTP operations is giving rise to a positive change in landscape.

A small number of observers made somewhat conflicting comments about possible impacts of the effluent discharge to Landon Creek, depending on the perspective (close up versus the big picture). Department of Conservation staff noted the absence of actual monitoring of coastal water quality but pointed to anecdotal evidence supporting the perception that coastal water quality has improved since the WWTP came into operation - increasing levels of kai moana harvesting along the coast and fishers now cleaning fish in Oamaru harbour where this never used to happen previously.

Of the potential WWTP effects projected during planning, the following elicited no adverse comments at all, or no corroborated observations -

- seepage effects on groundwater
- noise

A strong spatial pattern - diminishing impact with increasing separation distance - is evident for most effects observed. No significant off-site impacts have been experienced at distances greater than 400 m from the facility boundary. However, within 400 m, neighbours have experienced significant negative impacts, particular in the first two summers after commissioning. Such experiences are now relatively rare for almost all immediate neighbours, although not totally absent.

### 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 <sup>22</sup>	Effects reported but not projected
<ul style="list-style-type: none"> <li>• odour</li> <li>• wildlife habitat</li> <li>• increased traffic</li> <li>• visual effects</li> <li>• recreational amenity</li> <li>• seepage</li> <li>• noise</li> </ul>	<ul style="list-style-type: none"> <li>• odour</li> <li>• wildlife habitat</li> <li>• increased traffic</li> <li>• visual effects</li>   <li>• erosion</li> <li>• flies and wasps</li> <li>• aerosols</li> </ul>	<ul style="list-style-type: none"> <li>• odour</li> <li>• wildlife habitat</li> <li>• increased traffic</li> <li>• visual effects</li> <li>• recreational amenity</li> </ul>	<ul style="list-style-type: none"> <li>• seepage</li> <li>• noise</li> </ul>	<ul style="list-style-type: none"> <li>• erosion</li> <li>• flies and wasps</li> <li>• aerosols</li> </ul>

In unprompted questioning, 48% of respondents had observed no effects at all, while in prompted questioning 33% still recalled no observations of effects.

### Structure for reporting the effects experienced

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

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

### Odours

Of all the effects observed from this WWTP, off-site odour was the only one which elicited comments mostly without any prompting.

*What effect do they notice? Source of effect?*

A very high proportion of those interviewed in the ‘near’ area (92%) have noticed odours (nine unprompted and two after prompting), while for the ‘far’ area the proportion is substantially lower (43%, all unprompted).

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<sup>22</sup> 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.

For those within 400 m of the WWTP boundary, the experience has varied - from relatively mild to extremely objectionable. This is reflected in the kinds of comments recorded - from *“a real stale smell”*; *“unpleasant”*; *“not that strong - not as bad as the horses next door; not as bad as seaweed in town”*; *“a septic tank smell”*; *“a whiff occasionally”* to *“shocking smell at times”*; *“shitty, foul, nauseating”*; *“intense stench at times - different smells at different times - intermittent, variable, transient”*.

Interviews with these neighbours show that they can discriminate a number of different sources of odour, which were confirmed in discussions with the plant operator. Two thirds of the neighbours recalled odour problems associated with the establishment and commissioning of the main WWTP ponds - *“filling up the ponds and settling down process”*; *“teething problems”*. The operator confirmed that in the aeration ponds, when the sewage is stirred mechanically to add oxygen, vaporisation can sometimes lead to aerosols in high winds. The cyclical use of the irrigators - *“opening up the sprinklers”* - leads to *“a whiff every now and then”* of gas venting from the spray nozzles. The operator pointed out that the whole irrigation network has to be closed periodically to allow for the cutting of the grass, and this will also lead to a build up of smelly gas in the pipes which will be purged when the pumps are restarted. One source which had not been anticipated by the operators of the plant was the uncovered septic tank pit, clearly distinguished by at least two neighbours. The operator acknowledged that this is experienced as a constant source of odour when working nearby, one that becomes particularly pungent during the summer.

Neighbours also reported other sources. Several notice the rotting seaweed smell that is so familiar to residents of Oamaru - *“in town it gags you”* - while even more have experienced odours from Pukeuri freezing works. One reported that the *“neighbours septic tank also smells”* while another acknowledged their *“own septic tank might be the source occasionally”*

Most of these near neighbours report experiencing the odours outside their homes, but two report experiencing odours inside their homes - *“invades the whole house sometimes - when most intense”*; *“sometimes inside during the summer”*.

For those who live or work further away (550m- 1,700 m), most experiences are more diffuse - *“not a harsh smell - Pukeuri works is far worse”*; *“very faint smell - faint unpleasant smell”*; *“a sewerage smell - not obnoxious”*; *“detergent type sweet smell”* - although some have experienced stronger odours - *“putrid smell - stale, like septic tank smell”*; *“a bad smell”*. Because of the greater distance involved, there is no discrimination over source, with most attributing the odours to the ponds. Furthermore, there is a greater tendency to experience the odour out in the open, away from buildings - *“outside on my property”*; *“out in the yard”*; *“not at the house, but in the southern paddocks”*; *“mainly in the coastal paddocks”*

*Timing; frequency; trends?*

Many respondents appear to agree that the greatest risk of WWTP odours is during warmer summer months. The operator reported that the temperature in the ponds will rise to a summer average of 20 degrees Celsius, from a winter average of 12 degrees. The months from December to February are also often associated with a consistent pattern of on-shore north easterly winds which exacerbate the potential for problems. The operator recounted two particular summer events in recent experience (February '98 and march '99) when lagoon 3 had become anaerobic for several days following an algal bloom and an associated infestation of daphnia fleas.

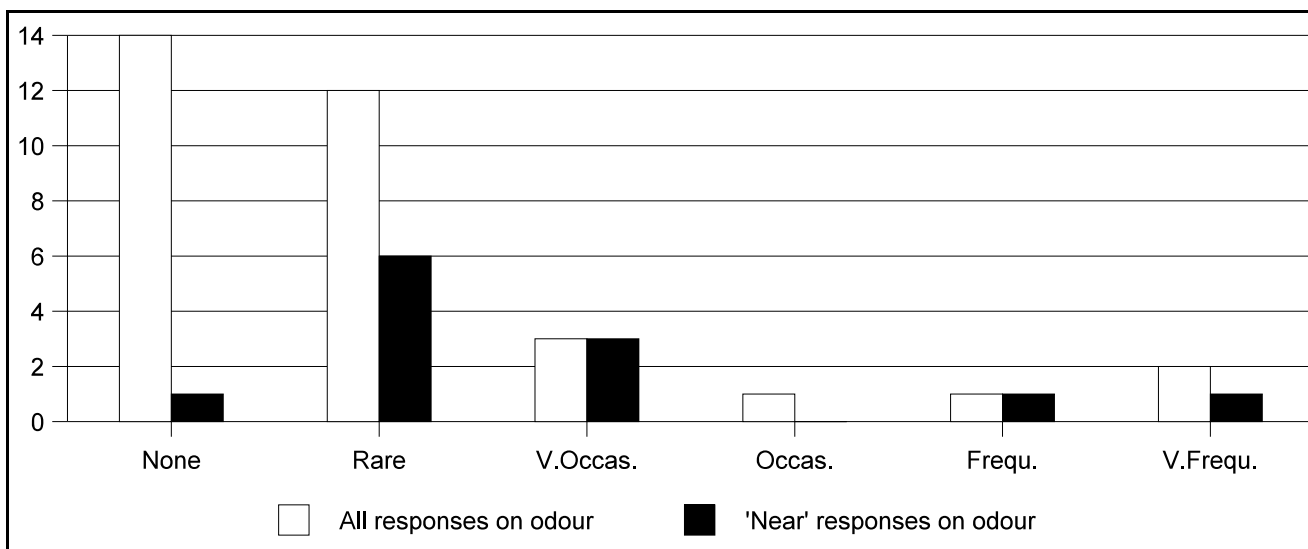
To summarise responses about the frequency of experiencing odours, it is helpful to distinguish different frequencies of occurrence by relating some quantitative indicators to the qualitative descriptors used by respondents, as follows -

**Table 4: Frequency bands for observing effects**

Level - descriptor	Frequency range	Frequency on a monthly basis
0 No observations reported		
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

For all those interviewed who reported experiencing odour effects, the distribution of frequencies is shown in Figure 3. Corresponding data for the ‘near’ areas are included for comparison.

**Figure 3 Frequency of experiencing off-site odours**



Two thirds of the ‘near’ neighbours who reported odour effects commented how bad the initial commissioning period had been, and how marked the improvement has been since that time - *“shocking for the first five to six weeks; have to expect that”*; *“for the first one and a half years, everyone complained - its been fixed now; in the last 18 months I’ve smelt it once”*; *“not so bad now - five to six times in the last two years”*. Several more noted no change because odour has always only been a background effect for them. In two cases, odour remains either a frequent or intrusive experience. More than half of the respondents designated ‘far’ fall into the no-change, background-effect category, while several experienced the unpleasantness during commissioning - *“just temporary - no longer”*; *“bad when it started - first three weeks”*.

*Mitigation attempts?*

There has been a change in the way in which the septage pits are managed. It was reported by District Council staff that no longer are loads of septic tank contents dumped directly on top of the

existing contents of the pits. Instead, it is fed into the pits by pipe so that the surface crust is not continually being broken. Residents at the feedback meeting reported noticing an improvement.

*Impacts?*

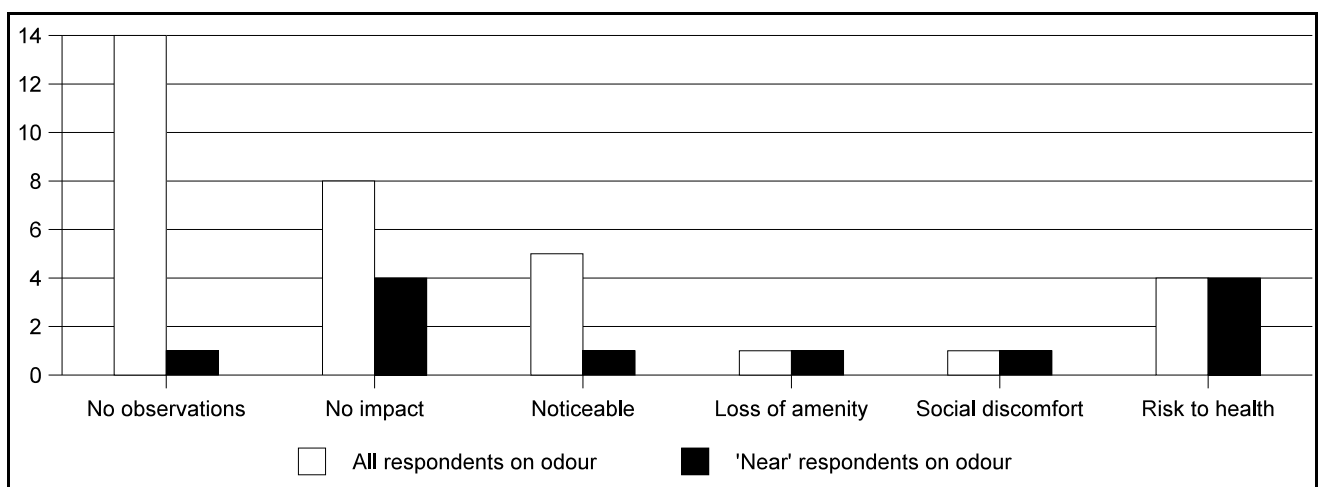
One way of summarising responses on the impacts of off-site odours is to relate them to a spectrum of impact severity, based on respondents descriptions, as follows -

**Table 5: Spectrum of impact severity for odour effects**

Level	Description	
0	No observations reported	
1	No impact at all	- none whatsoever - doesn't annoy us at all
2	Noticeable, but not unbearable	- not unduly - you do get used to it - doesn't really; never stopped us doing anything
3	Loss of personal residential amenity; very unpleasant	- had to shut it out - close the windows - serious odour problem
4	Social discomfort or embarrassment	- visitors comment
5	Impacts on personal health and well being	- made everything unpleasant; asthma came back - health effects when stench; serious compromise to quality of life - sometimes felt like vomiting

For all those interviewed who reported experiencing odour effects, the distribution of severity experienced is shown in Figure 4. Corresponding data for the 'near' areas is included for comparison.

**Figure 4: Severity of odour impacts**



It should be noted that the most extreme impacts have been experienced by those in closest proximity to the WWTP (within 400 m). Furthermore, these extremes tend to have been associated with the early years of plant operation, and are now relatively rare for almost all neighbours. This finding is somewhat different from the conclusion projected at the time of the environmental impact

assessment, which stated “the aeration ponds and screening area will have the potential to release odours but this is not likely to cause a nuisance nor be discernible beyond the site boundaries.”

It is also worth noting that half of those who experienced odours (10 out of 20) did not complain to anyone. However, in the case of the Oamaru WWTP, almost all who experienced impacts at a level greater than 2 (on the scale of impacts in Table 5 above) have complained at some time, as did several others who experienced milder impacts.

Discussions at the residents’ feedback meeting noted the quirky, unexplained differences in the experience of different neighbours, but nevertheless confirmed the accuracy of this description. They expressed collectively a dissatisfaction with the arrangements for handling complaints, wanting a more responsive arrangement with the plant operator, and reporting how this relationship had changed with changing personnel. Noting a petition to the Council which had been circulated amongst themselves and others twelve months previously<sup>23</sup>, and had created some degree of publicity, they expressed a desire to avoid creating adverse publicity around the WWTP operations by having a public argument with the Council. While odour no longer poses a concern to many neighbours, they expressed the view that “*when it does concern us, we’d like to think something would be done about it - then we’d be happy*”. As a group of neighbours, it was pointed out that if some neighbours of the WWTP are unhappy with the off-site effects, this can have an upsetting impact on others as well.

### *Summary evaluation*

The most intrusive source of odour was the ponds during the first couple of summers after the WWTP was commissioned. Another persistent and intrusive, but less widely experienced odour source used to be the septic tank pit, while gas venting from spray nozzles is a relatively low-level nuisance both in terms of intensity and duration. Initial experience of WWTP odours for immediate neighbours was distinctly negative. However, with the exception of a very few nearby households, odour now causes no more than a minor and occasional impact.

### **Increased traffic**

All responses about increased traffic in the vicinity of the Oamaru WWTP came as a result of prompting. Nevertheless, the ten respondents (6 ‘near’ and 4 ‘far’) provided a very consistent set of observations, which were subsequently corroborated by the plant operator.

#### *What effect do they notice? Source of effect?*

People living or working in the vicinity of the Oamaru WWTP noticed more traffic particularly on TY Duncan Road, which is a relatively quiet rural road. The increase, from commercial vehicles servicing the plant, was described as “*a marginal increase*”, with “*sewerage trucks - identified by their markings*” and “*the septic tank truck a regular visitor*”. In addition to this commercial traffic, the plant operator reported that a lot of visitors came soon after the WWTP was constructed and began operations, curious to see the new facility.

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<sup>23</sup>

This petition had therefore occurred between the time of the case study fieldwork and the feedback meeting.

Another cause of increased traffic in the neighbourhood was the sealing of Shortland Road, which has also encouraged more abattoir traffic to use TY Duncan Road, providing an alternative route to SH1, and also providing “a race track for young ones”, as reported by local residents at the feedback meeting. These latter effects were acknowledged as not being related to the WWTP siting or operation.

#### *Timing; frequency; trends?*

The observations reported point to a step increase in traffic along TY Duncan Road when the WWTP was first opened. This level of traffic occurs daily, seven days a week, and can be up to 20 or 30 vehicle movements just for the WWTP on most days.

#### *Impacts?*

Almost all the respondents who reported increases in local traffic noted no real negative impacts. One respondent reported no longer taking the horses down TY Duncan Road, while one local farmer mentioned the increased risk of accidents involving vehicles and livestock, although no accidents have actually been reported. This finding confirms local residents’ concerns expressed at the time of the environmental impact assessment, and suggests that assessment may have somewhat underestimated this effect when it concluded that “road traffic will be no more than a few light vehicles per day and one light truck per day transporting screenings in an enclosed bin.

#### *Summary evaluation*

The level of increase in commercial traffic, from both WWTP operations and the sealing of Shortland Road, has surprised a number of local residents. However, none report actual significant impacts, reinforced by the fact that all responses arose only after prompting.

### **Changes in wildlife activity**

One third of all those interviewed described changes they had observed in the levels of wildlife activity in the vicinity of the WWTP. Most responses (9 out of 11) were prompted.

#### *What effect do they notice? Source of effect?*

Neighbours have observed substantial increases in the numbers and variety of birds, mainly aquatic species - “nesting everywhere”; “notice the waterfowl in large numbers”; “no wildlife when we first came - now we see ducks, oyster catchers, pied stilts, plovers, ...”. This is attributed to the presence of wetlands, ponds and trees, providing a source of “food, shelter and water”.

The wildlife are observed on the WWTP property itself, and on neighbouring properties as well. Even those living further away have noticed a change - “ducks, geese, swans, paradise ducks, shags, pukekos - certainly increased - the locality is a dry region otherwise”; “more ducks and geese down Orbell Road”



*Timing; frequency; trends?*

The effect is described as permanent and seasonal in nature - “noticed a lot in the last two years”; “increasing year by year”; “permanent and accumulating effect”.

*Mitigation attempts?*

What were seen as excessive bird numbers have been reduced by removing aquatic plants from some areas of the wetlands.

*Impacts?*

This changes is generally viewed very favourably. However, there was also the occasional experience reported of geese eating out sections of pasture or some birds killing weak lambs - so there can be a cost involved for farmers. However, the immediate neighbouring farmers did not express negative sentiments overall. Indeed, by immediate neighbours, the effect is generally viewed the most strongly - “a good sign; a plus”; “no interference between birds and homes - a real plus”; “clean up slugs in the garden”; “all pretty positive - pleasant on the eye”. This finding confirms the environmental impact assessment which concluded that “an increase in available habitats and consequently a greater diversity and abundance of plant and animal species resulting from the development of a forest and dedicated wetlands.

*Summary evaluation*

The increase in wildlife, particularly in the variety of bird life, is generally viewed favourably by neighbours of the WWTP.

**Visual effects**

Five neighbours (four prompted) commented on the visual changes that have emerged since the WWTP began operations.

*What effect do they notice? Source of effect?*

Their remarks reinforce the positive response about wildlife described previously, with additional comments on the visual attractiveness of the growing plantation, landscaping and mounding. This effect is more likely to draw comment from near neighbours who experience the WWTP at relatively close quarters.

*Timing; frequency; trends?*

This is described as a permanent and accumulating effect over time.

*Impacts?*

As with the increases in wildlife, the visual changes are generally experienced as a very positive aspect by the few who made such observations. This finding suggests that the environmental impact assessment underestimated the positive perceptions of the changing landscape when it concluded

“the treatment plant will have minimal visual impact as most of the plant will be contained within banks with a top level of no more than one or two metres above existing ground level. The main change to the existing open pasture vista will occur over a number of years as the trees in the land disposal area grow.”

### *Summary evaluation*

For some near neighbours, the development associated with the WWTP operations is giving rise to a positive change in the landscape.

### **Effects on recreational activities**

Another consequence of establishing the WWTP in this locality has been its impact on recreational activities, reported by four neighbours - all prompted, and all ‘near’.

#### *What effect do they notice? Source of effect?*

These observations are evenly split between the negative and the positive. Two respondents report that they have experienced a loss of recreational amenity as a result of the WWTP - “*I used to walk in the paddocks where the sewage plant is*”; “*it’s restricted our use of the creek bed*” because the level of WWTP discharge has resulted in permanent ponding downstream. However two others report a gain in amenity values - “*it’s brought fish back to the mouth of Landon Creek - it used to be a polluted old creek*” ; “*plantation and wildlife .... lots of variety*” to be enjoyed when out walking.

#### *Timing; frequency; trends?*

These effects are all permanent.

#### *Impacts?*

The loss of walking route evoked the comment “*doesn’t bother me - I go walking in other places*”, while the concern over the state of the creek bed was linked to a perception of potential danger “*when high sees combine with a full creek*”. The perceived ecological gains bring positive benefits with new recreational opportunities.

### *Summary evaluation*

On balance, from a host community perspective, the effects on recreational amenity appear to be positive, with more people having experienced gains than losses.

### **Other effects observed**

The presence of flies and wasps, the scouring of Landon Creek, and the possibility of aerosols bearing pathogens or chemicals each drew comment from one or two neighbours which was corroborated by the plant operator. Single, uncorroborated observations about the risk from pathogens for neighbour’s children playing in the stream bed immediately below the effluent discharge point, about foam on the sea related to effluent discharge, and about off-site noise were not analysed any further.

***Flies and wasps:***

One immediate neighbour of the WWTP property reported two separate incidents. One incident involved the presence of large numbers of blowflies on an area of irrigated land in the WWTP. The plant supervisor confirmed concentrations of blowflies during a period in the summer of 1997 when the long grass on the irrigated area was being cut and stockpiled, and had begun to decompose. He described this as a one-off event. Some lines of trees in the irrigated area have been removed to allow easier cutting and removal of the long grass at regular intervals. The incident involving wasps was not directly attributable to the operation of the WWTP, being more the result of the adjacent creek bed drying out completely.

***Erosion of Landon Creek:***

One neighbour reported extensive scouring of the stream walls below the discharge point from the WWTP. However, it appears that the immediate cause of this erosion, which was described as scouring five metres off the southern bank, was a single major flood event during the winter of 1999, and nothing to do with the WWTP discharge. The plant supervisor pointed out that the Council had assisted by clearing the dry creek bed so as to clear a better channel for sediment transfer. He also noted that the discharge structure had been modified to re-route the flow lines away from the southern stream margins, to reduce any risk of contributing to scouring action.

***Aerosols and public health:***

One nearby farmer raised questions about the possibility of health risks related to aerosols from the WWTP, saying that the pattern appeared to follow his experience of odour events from the ponds. The supervisor confirmed the possibility of aerosols being generated by the action of mechanical stirrers in the aeration ponds. However, no medical test results were available to shed light on the level of risk.

**Summary of responses**

The following two tables (6 and 7) provide 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 from residential neighbours (N=33)**

<b>Effect reported</b>	<b>% Unprompted</b>	<b>% Unprompted + Prompted</b>
Odours	55	61
Changes in wildlife	6	33
Increased traffic	3	30
Visual effects	3	15
Changes in recreational amenity	0	12

All these effects display a distance-related pattern, either because of the influence of the wind regime, or because they are the kinds of effects that are most noticeable in the immediate locality.

**Table 7: Spatial distribution of observations reported**

<b>Effect reported</b>	<b>% Unprompted + Prompted</b>		
	<b>Total sample (N=33)</b>	<b>'Near' (N=12)</b>	<b>'Far' (N=21)</b>
Odours	61	92	43
Changes in wildlife	33	67	14
Increased traffic	30	50	19
Visual effects	15	33	5
Changes in recreational amenity	12	33	0

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

In exploring the longer-term effects of the Oamaru 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.

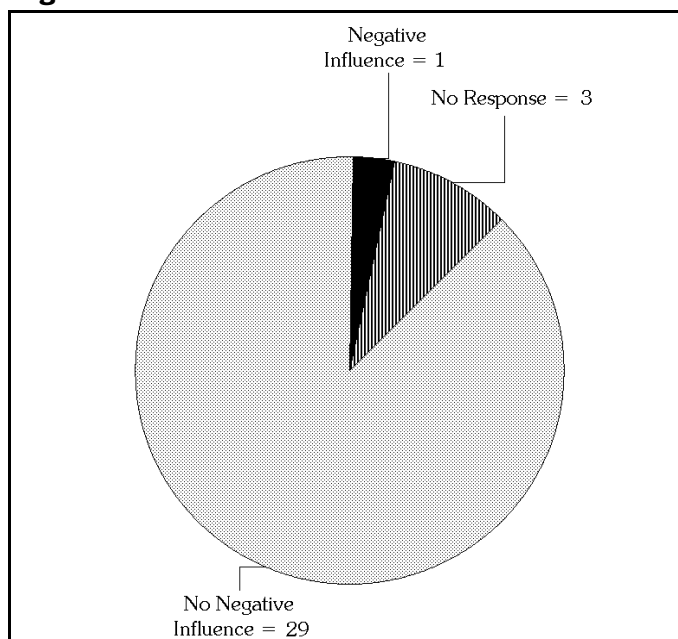
### Major changes in land use and settlement

As noted earlier, in Section C, the early 1990s - i.e. before the WWTP came into operation - saw some significant changes in land use in the host community area. The dominant influences at that time were considered to be changes in town planning, and difficulties being experienced in the rural economy. It was also noted that exposure to the coastal wind environment was a factor inhibiting more intensive residential development in this locality.

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

Since the WWTP began operations in 1995, the rural area north east of Oamaru township has experienced very little change. However, the presence of the WWTP is not generally considered by those interviewed to be a dominant influence in this. Analysis of responses to the question on whether or not the presence of the Oamaru WWTP has influenced the settlement pattern in its locality shows an overwhelming perception amongst local residents and business operators that there has been no negative influence, as shown in Figure 6.

**Figure 6:**



Typical comments from those who live or operate businesses nearby (within 400 m) include -

*“No, not really”*

*“It has beautified that corner”*

*“A nice plantation, if you could get rid of the smell”*

*“When it’s working well, you’d hardly know it was there”*

*“Don’t think so; much the same as its always been”*

*“Would prefer it wasn’t there - but accept it now”*

*“No it hasn’t - it’s all positive”*

*“I’d be able to sell this property with confidence - because of the good management, plantation shelter”*

*“Everyone’s just got on with their lives”*

*“It would be good to use the wastewater for farm irrigation”*

And from those who live or operate businesses a little further away (more than 500 m) -

*“Once it was up and running - no worries”*

*“Got two titles here - would build again next door; sewage plant wouldn’t put me off; they’ve done a good job; the trees are a real asset to the neighbourhood”*

*“It’s worked OK - no problem; a lot of discussion with neighbours initially; in the long run, not a big deal”*

*“Quite impressed - not a visual eyesore”*

*“Good to have it - better than into the ocean”*

*“Plant looks good - they’ve done it well”*

Even the one respondent who suggested that the WWTP has had a negative influence on the locality also noted that they had bought the property knowing that the plant was going to be built there. Nevertheless, without having had direct experience of such a facility, the members of the household encountered negative impacts which they had not anticipated, including a permanent loss of privacy.

## References

Taylor, C. Nick; Goodrich, Colin and Bryan, Hobson (1995). "Social Assessment: theory, process & techniques". Taylor Baines & Associates, Christchurch.