

Host Communities: siting and effects of facilities

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

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**Working Paper FS14
Public Good Science Fund Contract TBAX0002**

July 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 Selwyn 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

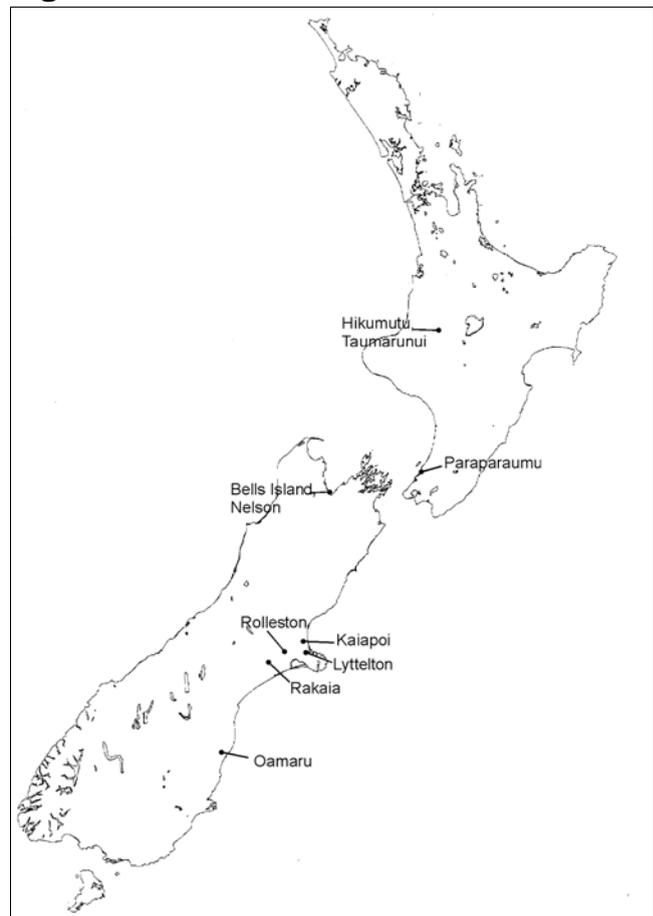
This case study on the Rolleston WWTP is one of eight such case studies being undertaken as part of this research programme¹, as shown in Figure 1. The case studies were selected to provide a range of relatively recent technology in terms of New Zealand applications, and a range of disposal media (rivers, 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

Figure 1: New Zealand Case Studies



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

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

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

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 Rolleston 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

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.

informants; secondary data records) or different perspectives (e.g. the facility operator)⁵. As researchers, it was pleasing to note how, in the great majority of cases, neighbours' experience was strongly corroborated by the perceptions and experience of the facility operator.

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

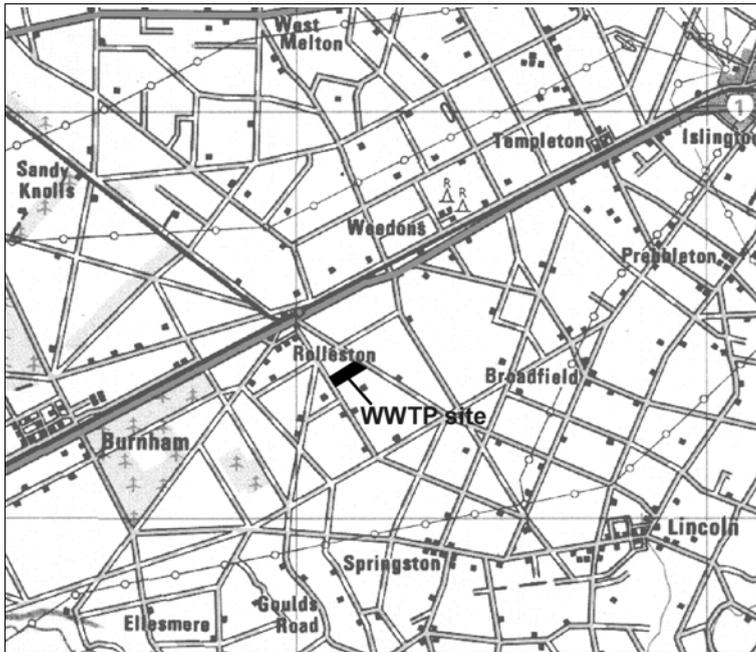
Taylor Baines & Associates has been a private provider of research, consulting and training services since 1989. The firm specialises in social research and the application of social assessment methods to a wide variety of issues in community development.

B: History and description of the facility

Location

The Rolleston WWTP is located between Springston Rolleston Road and Lincoln Rolleston Road, immediately south of the residential sections on the southern side of Lowes Road. It occupies approximately 13.75 hectares (Figure 2).

Figure 2: Rolleston - Location of WWTP



Planning

The planning process for the treatment plant began in 1994. The design of the plant won a Canterbury Regional Council Resource Management Award. Operation of the plant started in March 1998.

Prior to the installation of the WWTP, all dwellings in Rolleston used septic tank systems, or other on-site wastewater disposal. With plans for the future development of a new township proposed around 1993/1994, there was a clear need for a reticulated sewerage system. Initially, three sites with oxidation ponds were considered. However opposition to this type of wastewater treatment resulted in the consideration of alternative systems and sites. The Planning Tribunal ruled that community sewerage schemes would be allowed on areas of 50 acres or more (~20 hectares). This would have resulted in 26 sewage treatment plants in the area. Realising that there was another solution, a centralised facility was proposed by Helpet Investments. The plan was to service 2,000 people initially in Stage 1, and up to 4,400 people after expansion at Stage 2. Since the area has become more popular and more developments are planned, a hearing was held later in 2000, in which a group of property owners in Rolleston (including the Selwyn District Council) applied for expansion to service 14,000 people, which will act as a catalyst for further development of the township. At the time of the case study, Stage 2 is being constructed.

The planning document⁶ projected the following effects of the WWTP on the environment, neighbourhood and wider community:

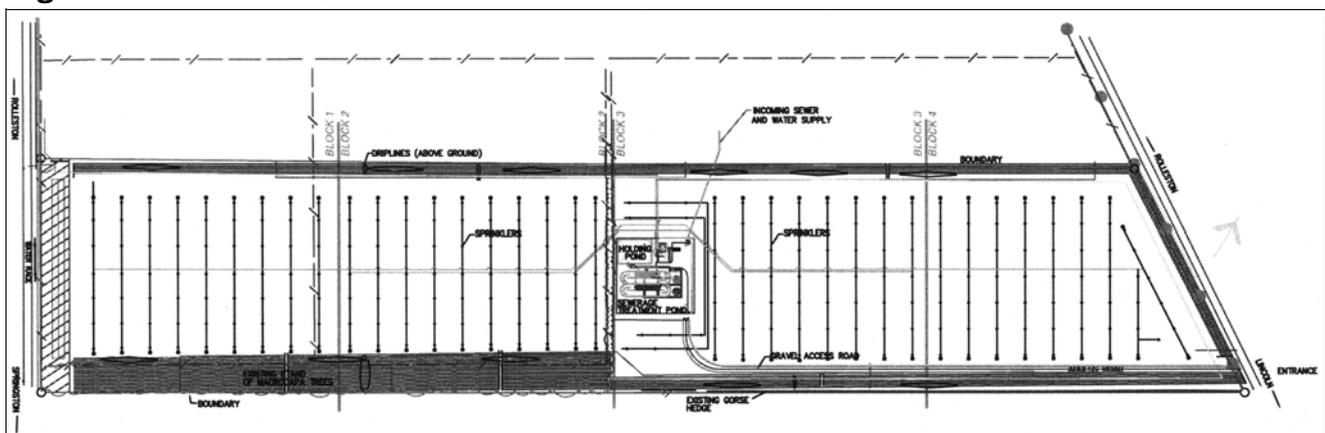
- **Increase in developments** and subdivisions in the area
- **Removal from rural productive use** of the WWTP site, but this is not expected to be a concern
- Little or no **visual effects** from the WWTP buildings and structures due to their design
- Planting of **screening vegetation** in three rows will screen the **visual effects**, prevent any potential **spray drift**, reduce **noise** and protect the site from all wind conditions
- The WWTP will not have any **effects on ecosystems** around the sites
- No **odour** is expected from the discharge of contaminants, but some may occur from the collection and storage of screenings, sludge and from the extended aeration process (although this process does not usually generate odour)
- Low level **noise** effects may be experienced, but should not be significant
- No risk from **hazards** (either natural or from hazardous substances)
- Wastewater for discharge to land will be of a high quality, with **low bio-chemical oxygen demand, and low levels of suspended solids (SS) and nitrogen**
- **Groundwater effects** - some infiltration of contaminants from the irrigation system into the groundwater is likely, but there is no risk to groundwater for water supplies and no influence on community or private wells is expected
- No likely effects from **aerosols**

The report indicated that these effects would be minimal or non-existent with the mitigation measures that were intended. These measures also alleviated many concerns that were aired during the consultation process.

Site development and waste water treatment operations

Access to the site is from a service road that enters from Lincoln-Rolleston Road (see Figure 3).

Figure 3: Rolleston Site Plan



⁶ Royds Consulting Limited, (1994). *Rolleston Sewage Treatment and Disposal System: Assessment of Effects on the Environment and Technical Support Document*. Prepared for Helpet Investments Limited, August.

The type of system is known as an activated sludge plant, where the waste is screened then transferred to the boat clarifier where it is aerated. An auxiliary anoxic tank is used for nitrogen removal. The screenings are stored in drums for disposal to the landfill, and are removed every two weeks from the plant. Sludge is removed by tanker off site about three times per month. The wastewater passes through a UV treatment unit, after which it is stored in a holding tank for spray or trickle irrigation.

The irrigation system comprises 248 sprinklers that are fixed into the ground, as well as a trickle system around the boundary of the property where screening vegetation has been planted. The sprinklers spray the treated effluent over four paddocks on a sequential basis, and are placed far away enough from the boundary to avoid spray drift. The irrigation system waters one paddock at a time for a variable but pre-set period, and has an automatic cut-off using a wind anemometer to stop the sprinklers if the wind becomes too strong, increasing the risk of spray drift. No irrigation occurs within 20 m of the water race which passes along the southern boundary of the WWTP property. The irrigation then diverts to the trickle system. Once the grass is long enough to be cut, it is baled and sold off.

The situation in late 2000

The WWTP is operated by the Selwyn District Council's water and sewerage contractor. One of the plant's two operators is a resident from a neighbouring property. Operating staff are present on site for a minimum of three days a week. The facility operates continuously, and is monitored remotely by the Council's alarm monitoring system known as SCADA.

Future development is expected to occur if the plans for expansion are approved. There is, however, a hydraulic constraint imposed by the area of land available for disposal under irrigation. That is, there is a limit to the volume of water which can be disposed on the type of soil found on the land without causing saturation. At present several options are being considered (including piping the treated wastewater off-site to another suitable property).

Liaison between the facility and the host community

There is no formal arrangement for direct liaison between plant operators and neighbouring residents.

Complaints are dealt with through the Selwyn District Council, or the Canterbury Regional Council. The Selwyn District Council is required to note all complaints, although there had been only one complaint recorded in 2000, according to the Council engineer. There is a computer-based public complaints system held at the Selwyn District Council, where all complaints are logged. Prior to this system being implemented approximately a year ago, complaints were logged in a manual folder.

Monitoring

The operators keep a log of events at the treatment plant, and staff at the Council conduct monthly monitoring for faecal coliform and nitrate levels in the effluent from the plant which is sprayed onto the surrounding paddocks.

C: The host community

Overview

The township of Rolleston comprises two areas: the existing Rolleston township, extending from the southern side of State Highway 1 to the Reserve, and having a population of around 900 people; and the New Rolleston subdivisions (further south of the existing township) which has grown to a population of approximately 2,150 people since 1994 (at the time of the research field work). According to some of the developers, there is a wide range of people that make up the community in Rolleston, including first and second home buyers, business people and young families. The area is still developing rapidly, and at the time of this case study a number of shops and other services were being built. There is a new community centre with sporting facilities and meeting rooms.

Prior to the installation of the WWTP, dwellings in the existing township used septic tank systems. This part of Rolleston is now in the process of connecting to the main reticulation system (approximately 60 households in the existing township were connected at the time of writing). There are now approximately 2,150 residents in the New Rolleston area, which equates to around 785 households connected to the treatment plant. The properties on rural land south of the WWTP site remain on individual septic tank systems.

Land use

The New Rolleston area contains residential sections approximately 750-1000 m² in size. Rural residential blocks south of the township are about 4 hectares in size. There are a number of rural farming activities on these blocks, including emu, deer, alpaca, horse, and cattle farming as well as a very small number of sheep. There are no significant crops grown in the area.

Table 1: Summary information for interviews

Sub-group	Interviews	Area description	Distance to WWTP boundary	Length of occupation
Near - Near North	14 full	Properties immediately north of the WWTP in between Springston Rolleston and Lincoln Rolleston Roads, up to Lowes Road. Includes Helpet Park.	0-250 m	6/14 <2 yrs 8/14 >2 yrs
Near - Near South	12 full	Properties immediately south of the WWTP between Springston Rolleston and Lincoln Rolleston Roads, and continuing south until approximately level with Dynes Road and the bottom of Branthwaite Road.	0-1000 m	1/12 <2 yrs 11/12 >2 yrs
Middle - S-R Road	5 full	Residential blocks on the southern side of Springston Rolleston Road in between Lowes Road and Dynes Road. This area is across the road and south of the WWTP.	50-700 m	1/5 <2 yrs 4/5 >2 yrs
Middle -Lowes Road	10 full	Section of Lowes Road between Springston Rolleston Road and Lincoln Rolleston Road, on the northern side of the road only.	400-450 m	5/10 <2 yrs 4/10 >2 yrs 1/10 dk
Middle - North East	8 full	Properties along Lowes Road, east of Lincoln Rolleston Road along to Weedons Road, and properties east of Lincoln Rolleston Road from the northern point of the new Rolleston township down to Branthwaite Road.	500-1500 m	3/8 <2 yrs 4/8 >2 yrs 1/8 dk
Far - Rapid New Rolleston	29 rapid	Properties in the new Rolleston township between Masefield Drive and Tennyson Street, but south of Rolleston Drive (and down to but not including those on Lowes Road).	400-850 m	18/29 <2 yrs 10/29 >2 yrs 1/29 dk
Far - Rapid South	3 rapid	Properties in between Goulds Road and Springston Rolleston Road, and south of Dynes Road.	700-1000 m	1/3 <2 yrs 1/3 >2 yrs 1/3 dk
Far - Rapid West	8 rapid	Properties west of Goulds Road and west of the section of Springston Rolleston Road that lies north of Lowes Road (before the old Rolleston township).	300-600 m	5/8 <2 yrs 1/8 >2 yrs 2/8 dk
Total sample	89 total			48% <2 yrs 52% >2 yrs

List of key informants

- Two WWTP operators
- Selwyn District Council contractor for new connections in the existing Rolleston township
- Two Selwyn District Council waste water administrators
- Real Estate agent
- Planning consultants to the developer
- Selwyn District Councillor
- resident agricultural scientist

Feedback meetings

A feedback meeting was held on 17 May 2001, attended by one resident. Consequently, a summary of the preliminary findings of the case study research was mailed out to all who had expressed interest in receiving feedback, with a short list of questions to evaluate the accuracy and balance of the findings. Five written responses were received, all of which endorsed the accuracy and balance of the preliminary findings.

E: Operational effects of the WWTP on neighbours

Main conclusions

Overall, a relatively low proportion of neighbours of the Rolleston WWTP reported noticing any off-site effects from the plant's operation. Furthermore, the impacts experienced are generally minor or negligible. Neighbours' experience of the plant's operation has improved over time.

There were three off-site effects which generated significant numbers of observations without any prompting. These were visual effects, odour and noise, with visual effects being the most frequently mentioned by one in five people interviewed.

Odour was a more noticeable effect twelve months prior to the interview period. Although two neighbours initially experienced some loss of amenity, this is no longer the case. Off-site odours are experienced on rare occasions within 500-600 m of the plant boundary.

Visual effects were also more noticeable earlier on, due to the lack of height in the vegetation surrounding the WWTP. Lowering of neighbourhood amenity is associated with perceptions of the state of vegetation around the edges of the WWTP property.

While noise from the WWTP is noticed on rare occasions at distances up to 400 m from the boundary, it never causes any negative impacts for neighbours.

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

- groundwater effects
- aerosols
- removal of rural land from productive use

In addition to comments directly related to the WWTP, a number of residents in Lowes Road reported experiencing problems from their sewerage reticulation pipes. These are discussed briefly in Appendix I.

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 2: Effects projected and reported

Effects projected	Effects reported unprompted	Effects reported after prompting	Effects projected but not reported or without corroboration ⁷	Effects reported but not projected
<ul style="list-style-type: none"> • visual effects • odour • noise • groundwater effects • aerosols • removal of rural productive land use • increase in development 	<ul style="list-style-type: none"> • visual effects • odour • noise 	<ul style="list-style-type: none"> • visual effects • noise 	<ul style="list-style-type: none"> • groundwater effects • aerosols • removal of rural productive land use • increase in development 	

In unprompted questioning, 64% of respondents had observed no effects at all, while in prompted questioning, 60% still recalled no observations of effects.

Structure for reporting the effects experienced

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

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

Visual effects

Visual effects on neighbours’ properties were noticed mostly in the two areas immediately adjacent to the facility. Reports of visual effects from residents in other zones referred to their observations when they travel past the wastewater treatment plant (Table 3).

⁷ 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.

Table 3: Percentage of residents (sampled) who experience visual effects from the Rolleston WWTP

Interview sample	% Unprompted + Prompted	Comments
Whole sample	20	
Near	48	Irrigation system/ sprinklers Inadequate screening Untidy vegetation
Middle	20	Irrigation system Screening Untidy vegetation
Far	0	

What effect do they notice? Source of the effect?

Most of the visual effects fell into three categories: seeing the WWTP sprinklers in operation, seeing the physical structures of the plant, seeing untidy vegetation at the perimeter of the WWTP property. One uncorroborated observation of increasing vehicle numbers to the WWTP was not analysed any further.

Six residents said they notice the sprinklers or spray on the WWTP property while the irrigation is in operation. Four of these residents were immediate neighbours while the other two lived west of the treatment plant. Five people thought the vegetation that was planted for screening purposes is growing more slowly than they expected, and as a result they see the plant more than they had expected to. One of these said they notice the “*harsh grey concrete*” structures of the facility. One reported froth rising in the WWTP tanks, and was curious about whether this was normal. The plant operator confirmed that this was not uncommon⁸. Four residents were concerned about the state of the vegetation surrounding the perimeter of the WWTP. All of these respondents said that the vegetation looked “*untidy*”, particularly the unevenness of the trees and the unkempt state of long, un-cut grass.

Timing; frequency; trends?

These observations are generally related to the immature state of the vegetative screening around the boundary of the WWTP property in the years immediately following the establishment of the facility. Thus these visual effects at present are noticed frequently. Neighbours recognised that the effects related to screening will diminish over time as the purposefully planted trees become better established and gain in height.

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A system of sprays is used to ensure that the foam does not become excessive.

Mitigation attempts?

Screening of the site was a deliberate mitigation measure. The plant operator referred to difficulties in the past getting water to some of the trees via the trickle system, which may account for the slower-than-expected growth of the trees. He indicated that more planting is planned, especially to fill in some gaps.

Impacts?

Nearly half of those interviewed who mentioned visual effects said that it does not impact them at all. This was typical of those who reported noticing the sprinklers in action and some of those who reported noticing the physical structures more than they had expected. However, it was apparent that unlike most of the immediate neighbours who may have become used to the idea of living adjacent to the WWTP, some of those slightly more removed did not expect still to be able to see the plant.

Six sets of comments fell into the “unpleasant/loss of amenity” category, with two expressing disappointment with the council/WWTP operator for not “*keeping their promise*” on how the site looks, two who said it “*annoyed*” them, one who expressed concern about the untidy look of the site, and one immediate neighbour who was annoyed because untidy vegetation on the boundary between the WWTP and their property made their property boundary less attractive than their neighbour’s. One also suggested that the long grass on the fence line is a fire hazard in summer, and would therefore like to see this area maintained better. All of these comments were about the inadequate screening or the untidy state of the vegetation.

Summary evaluation

Visual effects were noticed mostly by residents who shared a common boundary with the WWTP property, or those in relatively close proximity but with middle-distance views to the north east and south west of the WWTP property. While some neighbours reported that the physical structures remained more visible than they had expected them to be after several years, they acknowledged that this effect would diminish over time. The principle concern of a few neighbours - and sense of amenity loss - focusses on the state of vegetation around the edges of the WWTP property - gaps in trees and uncut grass. These are matters they would like to see attended to by the owner or operator of the plant.

Odour effects

Of all the effects observed from this WWTP, off-site odour was the only one which elicited all comments without any prompting. Table 4 below shows distance-related reduction in experience of off-site odours. One resident from further afield said that if she noticed an odour, it was only when she was walking past the WWTP (this comment was placed into the Near zone for the analysis).

Table 4: Percentage of residents (sampled) who experience odour effects from the Rolleston WWTP

Interview sample	% Unprompted + Prompted*	Comments
Whole sample	12	
Near	27	Mostly faint, inoffensive odour, except for a couple of residents
Middle	18	infrequent, low impact but occasionally unpleasant
Far	0	

* none of the odour effects reported were prompted

What effect do they notice? Source of the effect?

Residents who said they notice an odour from the WWTP described the smell as an unpleasant sewage smell. Most residents described it as connected generally with the operation of the WWTP, although three were more specific, saying that the source of the odour they notice is the spray from the sprinklers. The residents noticed the odour only outside their property, or within one kilometre of the WWTP in the case of the resident who walks in the vicinity.

Timing; frequency; trends?

The reported timing of the odour effects appears to be related to the residents' use of the area, as much as any particular weather conditions. That is, they said they notice the odour when they are home (day time or evening, depending on the resident's work hours), on walks, or in particular weather conditions such as wind or "heavy atmosphere". Asked if there were any particular circumstances when the effect is most noticeable or most likely to occur, about half said that odour is most noticeable in certain wind conditions, with direction depending on where they live in relation to the WWTP. It appears that odour effects are very localised and that odour drift in the immediate vicinity of the WWTP in light winds is also typical of their experience.

When asked about any trends over time, most residents said they had only ever noticed off-site odours a few times, and that frequency had either remained the same or off-site odours had ceased altogether. Only one person who walks in the vicinity said that the odour is more frequent than it used to be, but still at a frequency which falls within the 'rare' category (see Table 5 below).

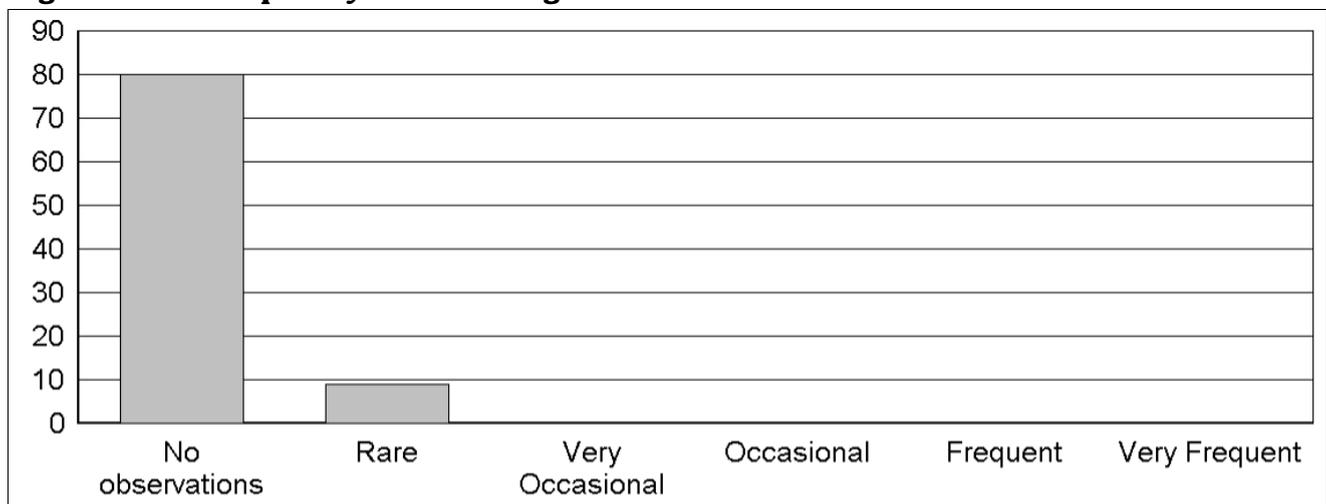
To assist with interpretation and comparisons, it is helpful to distinguish different frequencies of occurrence by relating some quantitative indicators to the qualitative descriptors used by respondents, as follows:

Table 5: 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

The frequency of observing odour effects amongst neighbours interviewed is shown in Figure 5.

Figure 5: Frequency of observing odour effects



Mitigation attempts?

The operator of the treatment plant thought that off-site odours are infrequent. Plant failures and other events at the site that would produce enough odour for neighbours to notice were not common. He identified a few possible sources of odours that may help to explain the case study findings. Screenings are kept in the drums for up to two weeks, and currently do not have a lid to contain odours. While he said that they do not smell very much, it is possible that warmer conditions may have lead to an occasional odour. Changes in the near future will see these drums sealed with lids and the screenings will be contained in bags. Warmer conditions also dried out the surface of the sludge in early 2000, resulting in a stronger odour. They now use sprinklers on the sludge to prevent this from happening. When the plant first began operation, there were problems with growing enough of the necessary bacteria for the operation to work effectively (this is apparently a common problem when this type of treatment plant starts up). The plant was “quite smelly” at that time, which may explain why some residents thought that the odour effects had improved. He said that the spray from the sprinklers should not smell as it was treated wastewater, and the pipelines for the trickle system should also be odourless as they are always kept full to prevent the water from stagnating.

Impacts?

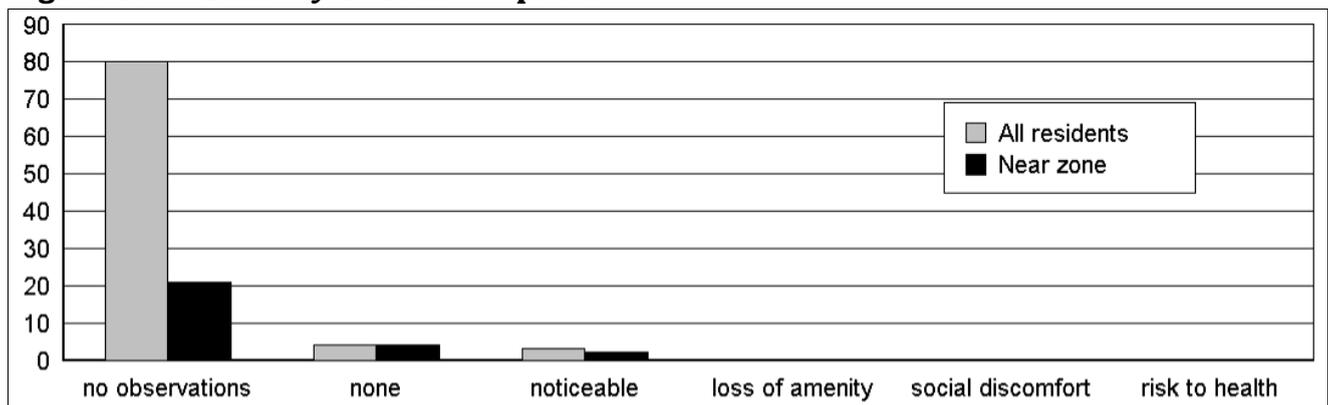
Once again, to assist comparisons, it is helpful to distinguish varying degrees of impact, based on respondents' descriptions.

Table 6: Spectrum of impact severity for odour effects

Level	Description	Comments
0	No observations reported	
1	No impact at all	<i>No impact; none</i>
2	Noticeable, but not unbearable	<i>It's unpleasant but doesn't really impact on me</i>
3	Loss of personal residential amenity; very unpleasant	<i>Can't enjoy outside and have to keep windows closed.</i>
4	Social discomfort or embarrassment	<i>Spoils the day outside, if we are having picnics etc.</i>
5	Impacts on personal health and well being	<i>Daughter's health was affected. Had to go to hospital.</i>

Four of the nine residents said that the odour has no impact on themselves or their household (level 1). Three others put the odour effect at level 2, indicating that it was “not a big issue”. One person also said that it was less noticeable than they had expected before the WWTP was built. The remaining two residents said that the odour in the past had changed their behaviour – one was forced to close their windows (this occurred only once), while the other person said they spent more time inside, but they noted that the odour was now gone (level 3). Thus, while two neighbours reported that a loss of amenity had occurred when the plant first began, this was no longer the case. Figure 6 shows the current impact experience, with the level 3 dropped out to reflect the fact that the odour has since disappeared for the respondents.

Figure 6: Severity of odour impacts



Summary evaluation

Odour was a more noticeable effect twelve months prior to the interview period. Although two neighbours initially experienced some loss of amenity, this is no longer the case. Off-site odours are experienced on rare occasions within 500-600 m of the plant boundary.

Noise effects

Experience of off-site noise from the operation of the WWTP appears to be very much limited to a small area surrounding the site. Ten per cent of residents surveyed reported noise effects, most of whom live adjacent to the wastewater treatment plant or over the road to the north east or south west.

Table 7: Percentage of residents (sampled) who experience noise effects from the Rolleston WWTP

Interview sample	% Unprompted + Prompted*	Comments
Whole sample	10	
Near	26	faint/low hum
Middle	9	hum trucks
Far	0	

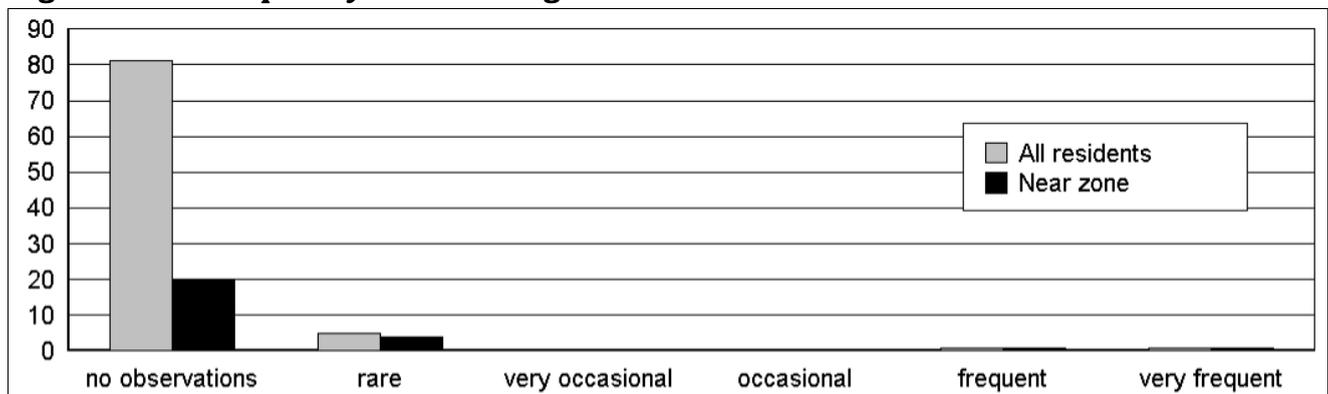
What effect do they notice? Source of the effect?

Six of the residents said they hear a low humming noise from the plant motors, while the other two people reported louder noise from trucks and “banging” from building. All of the respondents attributed the noise to the operation of the facility.

Timing; frequency; trends?

Four of the people who reported a humming noise said they hear it only while outside their house during the daytime, and the other two said they hear it inside their house, mainly at night, if it is quiet and still. Of these six residents, two notice the noise several times a week or daily (frequency levels 4 and 5), and the others notice it only rarely (level 1) - see Figure 7.

Figure 7: Frequency of observing noise effects



Two residents reported other types of noise; one said they have heard banging and building noises, while the other noticed the noise of trucks entering and leaving the WWTP.

Perceptions about trends in frequency of the observations were varied - from noticing it more frequently, to “about the same”, to “don’t notice it any more”.

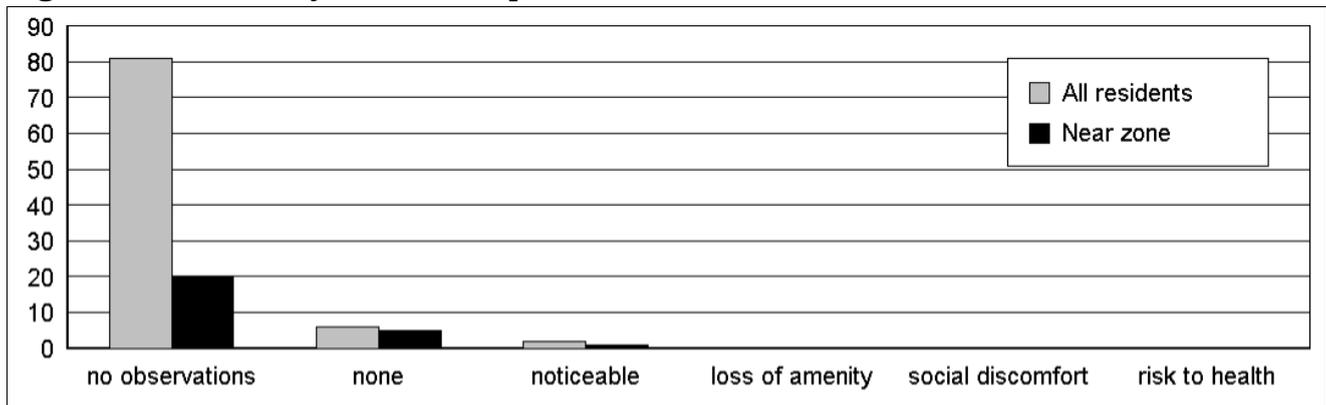
Mitigation attempts?

The report on the assessment of environmental impacts of the plant expected that the growth of the screening vegetation would help to reduce noise impacts. As this does not seem to be a major concern for the residents, it does not appear to be something that the current operator has had to consider.

Impacts

Most of the respondents said that the noise does not impact upon their lives (level 1), while two rated it as level 2 “noticeable but not unbearable” - see Figure 8.

Figure 8: Severity of noise impacts



Summary evaluation

The main noise noticed from the operation of the WWTP is a low level, humming noise. IT is experienced on rare occasions at distances up to 400 m from the WWTP boundary, but never causes any significant negative impacts for neighbours.

Summary of responses

The following two tables (8 and 9) 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 8: Summary table of responses from residential neighbours (N = 89)

Effect reported	% Unprompted	% Unprompted + Prompted
Visual effect	16	20
Odours	12	12
Noise	5	10

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

Table 9: Spatial distribution of observations reported

Effect reported	% Unprompted + Prompted			
	Total sample (N = 89)	'Near' (N = 26)	'Middle' (N = 22)	'Far' (N = 41)
Visual	20	48	20	0
Odour	12	27	18	0
Noise	10	26	9	0

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

In exploring the longer-term effects of the Rolleston 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.

Their comments generally reflect the relatively short period of intensive residential settlement in this area.

Residents Comments - New Land Use and Residential Developments

Most residents said that there had been no change to the land use or residential developments near their property, which is not surprising since most of the residents in the New Rolleston area had moved there after the residential areas nearby had been completed (the average number of years of residence was 4.0 years). People who commented on new land uses generally spoke about the change from rural sections to new sub divisions and residential developments. A couple of comments were made about the new community areas such as the sports ground, commercial buildings and the community centre (refer to Section on Host Community). One resident south of the WWTP site mentioned that a new farm with alpacas and horses was established about four years ago nearby.

Of the 37 people interviewed, who had taken up residence in Rolleston since the WWTP had begun operation, 24 said they were aware of the presence of the WWTP nearby when they purchased their property, while 13 were not aware of it.

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

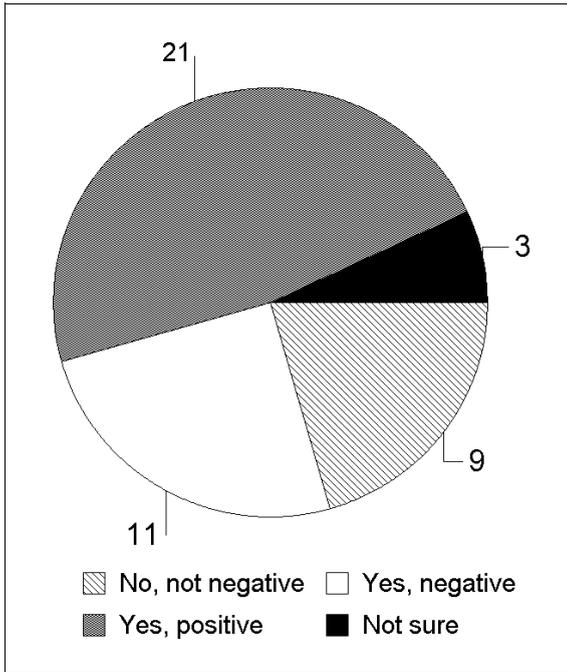
Analysis of responses to the question on whether or not the presence of the WWTP has influenced the development of the community indicated an absolute majority who believe the facility has either not had any negative influence or, indeed, has had a positive influence. Figure 9 shows the results, with non-responses removed.

The responses reflect an underlying division between those who value rural amenity and those who value suburban amenity.

Of those who expressed the view that the WWTP has had a negative influence, most commented about the change in the area from a more rural lifestyle to a more developed area. Three were concerned about the property values near to the WWTP.

Of those who expressed the view that the WWTP has had a positive influence, people spoke about the development that has resulted because the WWTP is there, and about their preference for the WWTP over septic tanks, because the WWTP is cleaner, costs less, and is more convenient.

Figure 9: WWTP’s influence on community development



Appendix I: Reticulation Problems

Seven residents in the vicinity of Lowes Road reported odour effects from another source - the reticulation system had not been operating correctly. According to council staff and the WWTP operator, these odours were caused by insufficient use of the system. The low level of use was not enough to flush the pipes properly, causing the wastewater to stagnate and result in an offensive odour. This odour was detectable through vents in Lowes Road, possibly around vents in some manholes as well as the vents required by the building conditions to be installed on each property. These residents notice the smell both inside and outside their houses. To avoid this problem, the system is now flushed weekly. The residents reported that they still notice an odour occasionally although they said it is not as bad as it used to be.

Related to this problem was reports of “toilet problems”, also mainly by residents in Lowes Road. These residents notice a “*whiff up the toilet bowl*”, that was usually associated with a drop in the water level in the bowl. To alleviate the severity of the smell, residents said that they flush the toilet. The problem occurs when the water seal breaks in the s-bend of the toilet, causing the water level to drop and allowing odour from the reticulation system to permeate into the household. The council staff were unsure as to why this problem occurs at Rolleston. While experienced by only a small proportion of the respondents, it caused both them and their neighbours great concern, and does not appear to be changing.

View of Rolleston WWTP



View of fixed-set irrigation at Rolleston WWTP

