Air Quality Assessment for the Western Bay of Plenty District Council

Assessment of Effects on the Environment

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Client: Western Bay of Plenty District Council

ABN: N/A

Prepared by

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16-Oct-2015

Job No.: 42075468

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Quality Information

Document	Air Quality Assessment for the Western Bay of Plenty District Council
Ref	42075468
Date	16-Oct-2015
Prepared by	Peter Stacey (Principal Air Quality Consultant)
Reviewed by	Andrew Curtis (Technical Practice Leader - Air Quality)

Revision History

Revision	Revision Date	Details	Authorised	
			Name/Position	Signature
1	24-Jul-2015	Draft for internal Discussion	**Andrew Curtis** Technical Practice Leader - Air Quality	
2	10-Sep-2015	Draft for Client Review	**Andrew Curtis** Technical Practice Leader - Air Quality	
3	16-Oct-2015	Final	**Andrew Curtis** Technical Practice Leader - Air Quality	

Table of Contents

Abbreviations

Abbreviation	Description
AEE	Assessment of Effects on the Environment
AWS	automatic weather station (operated by MetService)
BOPRC	Bay of Plenty Regional Council
E	east
EPA Vic	Environmental Protection Authority Victoria
FIDOL	Frequency, Intensity, Duration, Offensiveness and Location
GPG	good practice guide
km	length scale or distance (as 'kilometres')
m	length scale or distance (as 'metres')
MetService	Meteorological Service of New Zealand Limited
MfE	Ministry for the Environment
N	north
NE	north-east
NES	National Environmental Standards for Air Quality
NIWA	National Institute of Water and Atmospheric Science
NW	north-west
RAP	Regional Air Plan
RMA	Resource Management Act 1991
S	south
SAEPA	South Australia Environmental Protection Authority
SE	south-east
SR	Sensitive Receptor
SW	south-west
UTM	Universal Transverse Mercator
UV	Ultraviolet
WAS	Waste Activated Sludge
WBOPDC	Western Bay of Plenty District Council
WWTP	Waste Water Treatment Plant

1.0 Introduction

1.1 Project Overview

The Western Bay of Plenty District Council (WBOPDC) currently has consent (Resource Consent Numbers 02 4891 and 02 4889) to operate the Te Puke Waste Water Treatment Plant (WWTP) and discharge wastewater into the Waiari stream.

WBOPDC wishes to renew the existing resource consent which is set to expire in November 2016. In addition, WBOPDC seeks to obtain new Bay of Plenty Regional Council (BOPRC) resource consents for a 35-year term, to meet the future needs for the Western Bay of Plenty district and in particular, the current expected 30 % population increase by 2045.

1.2 Study Overview

This report assesses the potential odour impact at the nearest identified sensitive receptors resulting from the operation of the WWTP.

In order to determine the potential for odour nuisance effects in the surrounding community from the Project Site, AECOM undertook a field odour investigation on 30 June 2015 to identify the existing emission sources on the site and their potential to cause nuisance beyond the site boundary. In addition, this assessment also involved undertaking a review of the Project Site's odour complaints record and a qualitative assessment of odour from the plant.

The assessment undertaken in this report was carried out in accordance with the Ministry for the Environment's (MfE) Good Practice Guide for Assessing and Managing Odour in New Zealand (2003).

AECOM understands that plant will be progressively upgraded as the local population grows to accommodate increased wastewater inflows. These upgrades are not expected to have any significant influence on the odour discharged from the plant and are therefore not considered any further in this report.

1.3 Site Location

The Project Site is located at 18 Gordon Street and is legally described as lot 1 DPS 37512 CT 47C/150.

The WWTP is located at approximately Universal Transverse Mercator (UTM) zone 60, 441,640 m East and 5,818,099 m South.

The Project Site is located approximately 18 km to the southeast of the Tauranga and 1 km to the northeast of Te Puke town centre. The location of the Project Site is shown in Figure 1.

1.4 Odour Complaint History

No complaints relating to odour discharges from the plant have been received by either WBOPDC or BOPRC during the period 1998 to 2015 – the duration of the current consent.

Figure 1 Site Location

Map Source: Google Earth™ – Map Imagery Date 01 August 2007

2.0 Plant Description

2.1 Description of Plant Processes

The Te Puke Wastewater Treatment Plant Draft Operations Manual, prepared by Opus International Consultants Ltd (OPUS 2015), provides the following WWTP process description.

At the beginning of the treatment process the raw wastewater is pumped and gravity fed to the treatment plant. The raw wastewater is initially discharged into a wet well containing two submergible pumps working in duty standby arrangement. From the wet well the wastewater is pumped into a stainless steel box that allows the wastewater to be directed to a 3 mm screen compactor to remove large material. The screenings are collected in bags and sent to the landfill.

From the screen compactor the wastewater flow is split and then continues to two secondary treatment reactors. The secondary treatment involves two zones, an anoxic stage and an aerobic stage. The flow from the screen compactor initially enters the anoxic zone and then continues to the aerobic stage for further treatment. From the end of the aerobic zone, a portion of the flow is recycled back into the anoxic stage with the use of a submersible pump. The remaining flow continues by gravity to a splitter box.

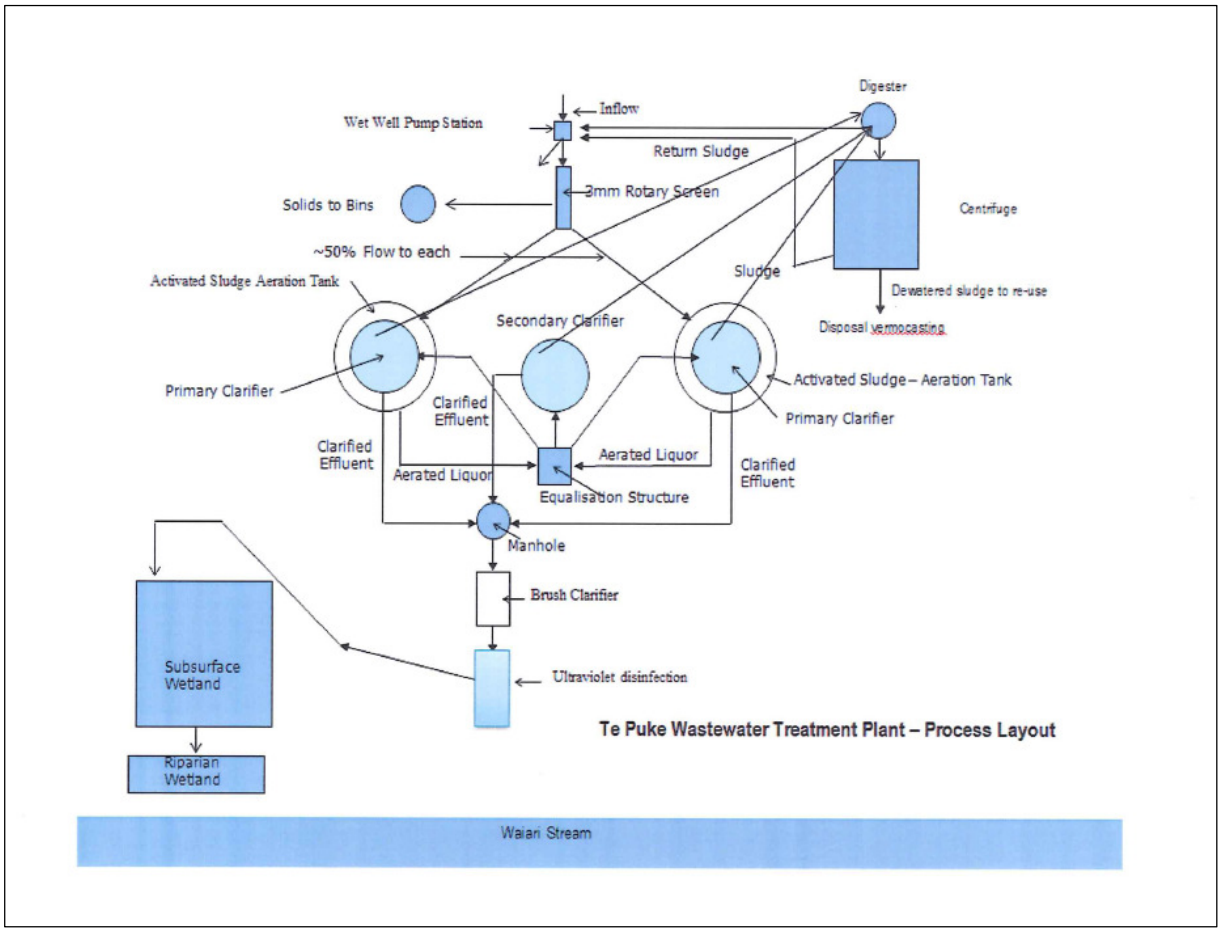
The effluent from the splitter box moves on to three site clarifiers for the separation of the liquid from solids. To maintain a constant population of micro-organisms in the secondary treatment reactor, a return activated sludge is circulated from the clarifiers back into the anoxic zone within the secondary treatment. The waste activated sludge (WAS) from the clarifier is directed to two aerobic digesters for further stabilisation.

From the digesters the waste sludge is dosed with a polymer and pumped to the centrifugation process for dewatering. The supernatant is transferred back into the receiving chamber and the anoxic zone within the secondary treatment. The biosolids transferred to the centrifugation process are separated into a dense cake containing solids which are transported to a worm farm in Kawerau, while the liquid stream “centrate” is returned back to the anoxic zone within the secondary treatment.

The treated effluent from the clarifiers is directed to a brush clarifier before it enters the ultra violet plant for disinfection. After the disinfection the effluent is directed to a constructed wetland for further removal of nutrients and solids before it is discharged into the Waiari Stream.

The Te Puke WWTP process layout is shown in Figure 2.

Figure 2 Te Puke WWTP Process Layout



2.2 Sources of Odour from the Plant

The following section identifies the processes which have the greatest potential to cause odour.

2.2.1 Screen

The screen is a minor source of odour due to the fresh state of the influent and small scale of the process. Generally odours from this source have a low level intensity, dank musty character (neutral to slightly unpleasant) odour. If material from the collection bin is not emptied frequently the strength of odours will increase, particularly during the summer months. The screenings are collected in a sealed plastic bag and therefore have limited potential to cause odour discharges. The screen and inlet works is shown in Figure 3.

Figure 3 Inlet Works

2.2.2 Secondary treatment reactors

The secondary treatment reactors have the potential to be an odour source, with odours from these sources likely to be of low intensity with a neutral to slightly unpleasant musty-dank character. However these sources are all aerated, with the exception of the relatively small anoxic zone, and have limited potential to cause significant odours, as long as the effluent remains aerated. A secondary treatment reactor is shown in Figure 4.

Figure 4 Secondary Treatment Reactors

2.2.3 Sludge Storage Tanks

The sludge storage tanks are aerated and therefore have limited potential to cause any significant odour. Odours from these tanks are likely to be of low intensity with a neutral to slightly unpleasant musty-dank character. The sludge storage tanks are shown in Figure 5.

Figure 5 Sludge Storage Tanks

2.2.4 Dewatering Plant (Centrifuge)

The odour associated with the dewatering plant is moderate to high intensity with a putrid rotten egg character that is considered to be unpleasant. This process is contained within a sealed building which minimises off-site odour. However air from this building is not treated in any way. The centrifuge used to separate the solids from the supernatant is shown in Figure 6.

Figure 6 Centrifuge

2.2.5 Transport of Biosolids Off-site

The biosolids from the centrifuge are collected in a truck which is parked in front of the dewatering plant building. AECOM understands that from time to time odours can be experienced around the truck and are especially noticeable in summer months. AECOM notes that while the truck is being loaded it is sealed with a tarpaulin (as shown in Figure 7), however when the load is transported off-site it is uncovered and has the potential to cause odour nuisance on its journey to the worm farm in Kawerau. It typically takes a week to fill the truck with biosolids before they are taken off-site for disposal.

Figure 7 Biosolids being loaded.

3.0 ASSESSMENT CRITERIA FOR ODOUR

The assessment contained in this report has considered the matters outlined in the following statutory documents:

- Resource Management Act 1991 (RMA);
- Operative Regional Air Plan; and
- District Plan.

3.1 National Assessment Criteria

Section 5(1) sets out the purpose of the RMA, which is "to promote the sustainable management of natural and physical resources".

Section 5(2)(c) provides for this to occur while "avoiding, remedying, or mitigating any adverse effects of activities on the environment".

Section 2 of the RMA defines 'environment' and 'amenity values' as follows:

"Environment

includes –

(a) ecosystems and their constituent parts, including people and communities; and

(b) all natural and physical resources; and

(c) amenity values; and

(d) the social, economic, aesthetic, and cultural conditions which affect the matters stated in paragraphs (a) to (c) of this definition or which are affected by those matters.

Amenity values

those natural or physical qualities and characteristics of an area that contribute to people's appreciation of its pleasantness, aesthetic coherence, and cultural and recreational attributes."

Since offensive odours can be considered to cause effects on amenity values, people and communities, they need to be managed under the RMA. Since the compounds that cause odour effects are air contaminants, their discharge is therefore controlled under section 15 of the RMA. Under section 15(1) of the RMA, discharges from industrial or trade premises are only allowed if they are authorised by a rule in a regional plan, a resource consent, or regulations. If the activity is prohibited under the plan, then no resource consent can be obtained.

3.2 Regional Assessment Criteria

The Project Site falls under the jurisdiction of the BOPRC and WBOPDC.

3.2.1 Bay of Plenty Regional Air Plan

The Bay of Plenty Regional Air Plan (RAP) dated 15 December 2003 was prepared by the BOPRC under section 64 of the First Schedule to the RMA and become operative on 25 September 2003 (BOPRC 2003).

The rules contained in the RAP that are relevant to this project are as follows:

Rule 19 Discretionary Activity – Specified Activities

The discharge of contaminants into air from the following activities is a discretionary activity:

w (ii) Commercial composting, treatment or disposal of waste, but excluding sewage pumping stations and on-site effluent treatment systems permitted under the On-site Effluent Treatment Regional Plan;

The air discharges from the WWTP are therefore considered to be a discretionary activity which requires a resource consent.

Rule 17 Permitted Activity – General Activities
All other discharges of contaminants into air which are not subject to an express rule in this regional air plan shall be a permitted activity subject to compliance with the following conditions. If the conditions cannot be complied with the activity shall be a discretionary activity.

(b) The discharge must not result in objectionable or offensive odour or particulates beyond the boundary of the subject property or into water;

Regional Plan Odour Assessment Guidance

When investigating complaints concerning odour the RAP sets out the following guidance:

Odour as defined under Issue 4 of this plan. Every person has an individual response to smells and the perception of an odour is often related to the individual's background, experience and sensitivity. For example the smell of silage may remind someone of his or her farming background but to another person the smell may be very offensive. These factors make odour a contentious and subjective issue and difficult to measure.

For odour, the approach will be as follows:

1. A Council Officer who has experience in odour complaints will make an assessment of the situation. This assessment will take into account the FIDOL factors which are:

- ***Frequency** of occurrence;*
- ***Intensity** of the odour;*
- ***Duration** of exposure to the odour;*
- ***Offensiveness** of the odour; and*
- ***Location** of the discharge (refer 5.6.5(a)1).*

2. If the discharge is deemed to be offensive or objectionable by the Council Officer, the discharger will be asked to take whatever action is necessary to avoid, remedy or mitigate the effects of the discharge on the environment.

3. If the discharger disputes the Council Officer's assessment or the problem is ongoing, then a number of approaches may be taken, including one of more of the following:

- *An assessment by another Council Officer;*
- *Asking people living and working in the subject area to keep a diary which notes details of any offensive or objectionable odours;*
- *Promoting the use of community working groups and other means of consultation between the affected community and the discharger;*
- *Using the services of an independent consultant to carry out an investigation and/or community survey;*
- *Undertaking an odour assessment using an olfactometer, or other appropriate technology.*

3.2.2 District Plan Rules

The operation of a WWTP is considered to be a discretionary activity under the WBOPDC district plan (WBOPDC 2012):

4C.4.3.1 Discretionary Activities – Rural Zones and Industrial Zones

(a) Council shall consider each application on its merits having regard to (but not restricted to) the current, recognised New Zealand Guidelines and Industry Codes of Practice such as pig farming, poultry farming and the utilisation of sewage and effluent on land.

(b) Council shall also consider the following information supplied by the applicant:

(i) An assessment of the effects of the proposal and alternatives for:

- *raw materials to be used;*

- *methods of waste handling and disposal;*
- *process plant and buildings;*
- *instrumentation and control systems;*
- *ancillary plant buildings;*
- *by-products handling and disposal;*
- *odour treatment;*
- *containment measures to reduce wind dispersal.*

(ii) Description of local topographical, meteorological and land use data;

(c) As a condition of consent Council may require an annual monitoring report from the applicant that monitors and reports on complaints.

(d) Future activities about the site

When considering proposals for activities or to rezone land from Rural to Future Urban or Residential, Council shall protect the lawfully established existing land uses in the locality and the separation distances that are required by adopted Codes of Practice to avoid, remedy or mitigate the adverse effects of odour and effluent aerosols from such uses.

(e) Certification

Council may require any Discretionary or Non-Complying resource consent applications in any zone to provide as part of the resource consent documentation evidence from an appropriately qualified independent person that the proposal shall mitigate any potential odour problems.

Council shall consider odour management associated with human and animal effluent, activities involving animal and fish or parts thereof, fertiliser, paint varnish and chemical manufacture including the cleaning of containers, and solid waste storage and disposal.

3.3 Buffer Distances

There is no buffer distance criteria promulgated by New Zealand regulatory authorities for WWTPs. However some regulatory authorities and air quality consultants have typically adopted buffer distances set out by the South Australia Environmental Protection Authority (SA EPA) and Environmental Protection Authority Victoria (EPA Vic) in the following documents:

- Guidelines for Separation Distances (SA EPA 2007)
- Environmental Protection Authority Victoria, Guideline, Recommended Separation Distances for Industrial Residual Air Emissions (EPA Victoria 2013)

Both of these authorities recommend a buffer distance of between 200 and 300 m for a WWTP serving a population of between 5,000 - 10,000. The proposed plant will be designed to serve a population of approximately 10,000 by 2045 and therefore AECOM considers a minimum buffer distance of 300 m to be appropriate. This is supported by the lack of odour complaints, WBOPDC have no recorded odour complaints for the Te Puke WWTP, and suitable meteorological conditions, as described in Section 4.4.

4.0 Assessment Methodology

4.1 Qualitative Assessment Methodology (FIDOL)

Complaints are likely to occur when odours become detectable and recognisable. However, there are many situations when the release of a potentially odorous compound does not result in an odour nuisance effect. It is the subjective judgement of an odour's hedonic tone that enables the decision to be made as to whether it is a nuisance or not. The factors that contribute to an odour nuisance effect include the frequency (F) of odour impact, the intensity (I), the duration of exposure (D), the offensiveness (O) and the location (L), which is consistent with the RAP.

The FIDOL factors are explained in greater detail below:

- Frequency; relates to how often an individual is exposed to odour. Factors determining this include the frequency that the source releases odour (including its source type, characteristics and the rate of emission of the compound or compounds); prevailing meteorological conditions; and topography.
- Intensity: is the perceived strength of the odour or the odour detection capacity of individuals to the various compound(s). An increase in intensity of odour will increase the potential for odour complaints. Subjective measurements are made on a scale of 1 to 6 and qualitative measurements are in odour units (OU or OU/m3).
- Duration: is the amount of time that an individual is exposed to odour. Combined with frequency, this indicates the exposure to odour. The duration of an odour, like its frequency, is related to the source type and discharge characteristics, meteorology and location. The longer the odour detection persists in an individual location, the greater the level of complaints that may be expected, particularly if the odours are unpleasant or obnoxious.
- Offensiveness: is a subjective rating of an odour's pleasantness and relates closely to hedonic tone. Offensiveness is related to the sensitivity of the 'receptors' to the odour emission, i.e. whether the odorous compound is more likely to cause nuisance, such as the sick or elderly, who may be more sensitive.
- Location: is the type of land use and the nature of human activities in the vicinity of an odour source. The same process in a different location may produce more or less odour depending on local topography and meteorological conditions. It is also important to note that in some locations certain odours may be more acceptable than in others (e.g. the expectation that rural smells will occur as part of the rural environment and industrial smells will occur in industrial areas).

AECOM has assessed each of these factors to determine if off-site odours are likely to be offensive or objectionable.

4.2 Sensitive Receptors

In the context of this odour assessment, the term 'sensitive receptor' includes any persons, locations or systems that may be susceptible to changes in abiotic factors as a consequence of the discharges to air (namely odour) from the Project Site. Typical locations for sensitive receptors include:

- Residential properties;
- Retirement villages;
- Hospitals or medical centres;
- Schools;
- Libraries; and,
- Public outdoor locations (e.g. parks, reserves, sports fields, beaches).

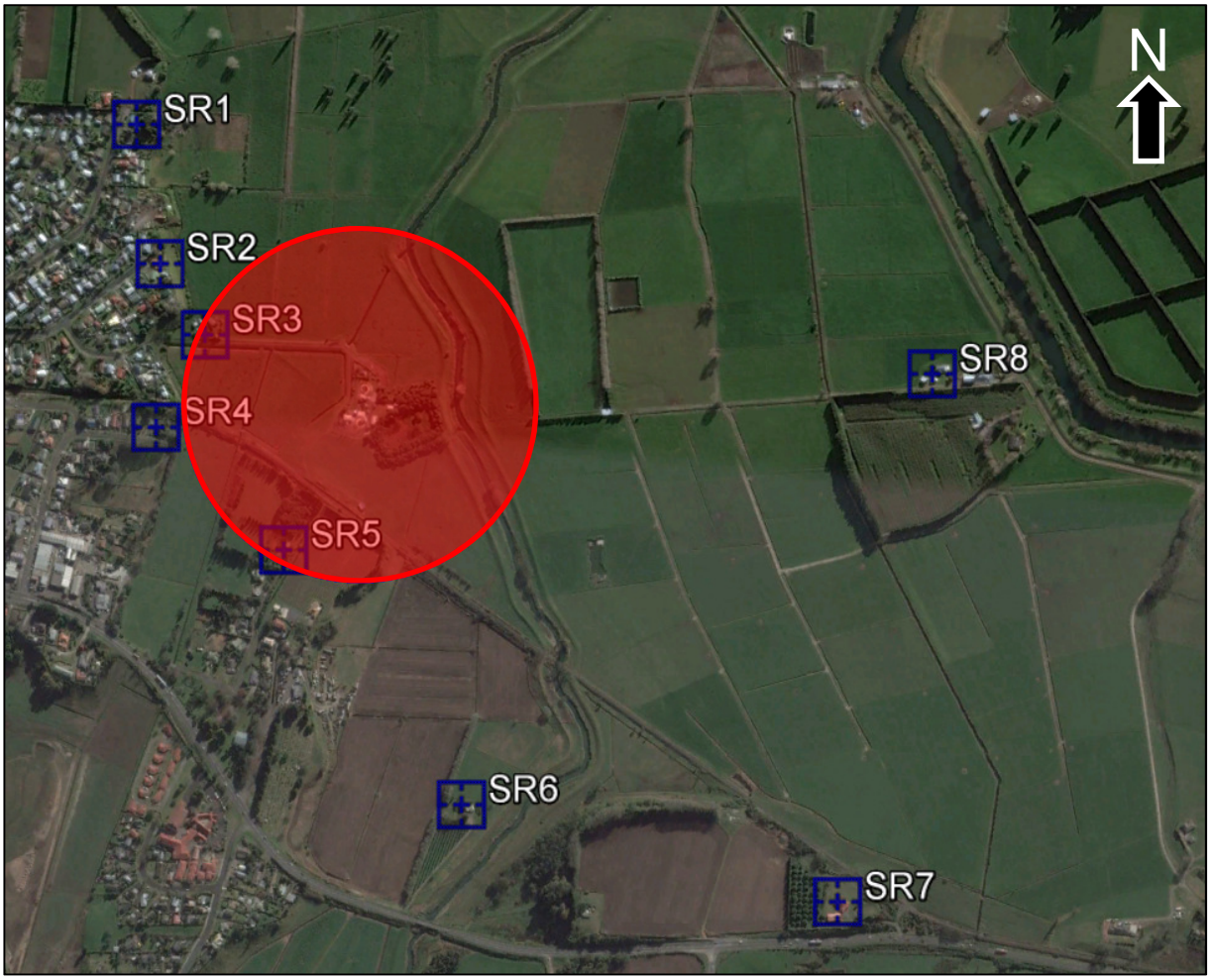
A desk-study was undertaken to identify discrete receptors deemed sensitive to odour as a result of discharges to air from the Project Site. AECOM has not included all of the residential locations as discrete receptors for practical purposes, but has instead selected a number of locations to be representative of them.

The nearest potentially affected sensitive receptors are summarised in Table 1. Figure 8 shows the location of the potentially affected sensitive receptors identified (SR1 – SR8) in this assessment. The figure also shows a 300 m buffer zone centred on the plant, shown as a red shaded circle.

Table 1 Potentially Affected Sensitive Receptors

Reference	Receptor Type	Address	Zone 60		Distance (m) / Direction from Project Site
			Easting (m) UTM	Northing (m) UTM	
SR1	Residential	49 Harris Street	441241	5818577	600 (NW)
SR2	Residential	2 Lee Street	441291	5818342	400 (NW)
SR3	Residential	12 Gordon Street	441373	5818224	280 (NW)
SR4	Residential	42 King Street	441295	5818064	330 (W)
SR5	Residential	34 Landscape Road	441522	5817864	270 (S)
SR6	Residential	109 State Highway 2	441842	5817444	700 (S)
SR7	Residential	State Highway 2	442490	5817305	1,180 (SE)
SR8	Residential	128 Kenana Road	442615	5818208	980 (E)

Figure 8 Sensitive Receptor Locations



Map Source: Google Earth™ – Map Imagery Date 15 June 2015

4.3 Field Odour Investigation

A subjective field odour investigation (or odour survey) was carried out at the Project Site on 30 June 2015 by an odour assessor using the FIDOL factors to determine an odour impact rating for several different locations across the site and beyond the site boundary. The investigations were carried out in accordance with the guidance contained in MfE (2003) to determine the significance of off-site odour from the site.

4.4 Wind Speed and Direction[1]

The nearest Automated Weather Station (AWS) relative to the Project Site is located in a kiwi fruit orchard just outside of Te Puke, approximately 4.5 km from the Project Site. AECOM reviewed the data collected at this site during the five-year period 01 January 2008 and 31 December 2013 and determined that due to its sheltered location the meteorological data was not representative of conditions experienced at the project site, which is relatively open in all directions with no significant features obstructing wind flows. AECOM therefore used the meteorological data from the AWS located at Tauranga airport (the next closest AWS) to assess the effects of odour from the Project site. The AWS is operated by the Meteorological Service of New Zealand Limited (MetService). The AWS is located at UTM zone 60, 428877 m E 5830223 m N, and is approximately 18 km to the northwest of the Project Site.

[1] Meteorological data was obtained from the National Institute of Water and Atmospheric Research's (NIWA) Climate Database.

Analysis of hourly wind data for the Tauranga AWS for the five-year period 1 January 2008 and 31 December 2012 indicates that winds from all directions are experienced at the AWS site, however, the predominant winds are from the west, west southwest and south west. The data capture during this monitoring period was excellent at >99%.

The wind rose for the Tauranga AWS for the period 1 January 2008 to 31 December 2012 is presented in Figure 9 and seasonal wind roses are presented in Figure 10. A review of the data for the period 2008-2012 showed that there was very little inter-annual variation in wind direction. This analysis is presented in Table 2.

The seasonal wind roses indicate that:

- In summer, the prevailing wind directions are from the north, west, west southwest and southwest
- In autumn, the prevailing wind direction is from the southwest and west southwest
- In winter, the prevailing wind directions are from the west, west southwest and southwest; and,
- In spring, the prevailing wind directions are from the west and west southwest.

In other words, the seasonal wind roses indicate little variation from the annual prevailing wind directions, which are generally west to southwest.

The strongest winds originate from the west and west southwest. The average wind speeds recorded between 2008 and 2012 at the Tauranga AWS was 3.9 m/s, as shown in Table 3. Note that the term ‘calms’ refers to wind speeds of less than 0.5 m/s. The table indicates that the average frequency of calms over the 5-year monitoring period was 1.1 percent (%). Based on AECOM’s experience, it is these light wind conditions which have the greatest potential to cause odour nuisance effects due to reduction in the dispersion and dilution of the odour plume. Therefore, based on these meteorological data alone, the ‘worst-case’ year for odour dispersion at the Project Site is likely to have been 2008. Calm wind conditions have been discussed in more detail in the following section. However, overall the frequency of calm conditions is considered to be moderate to low.

Figure 9 Wind rose at Tauranga AWS for 1/01/08 to 31/12/12

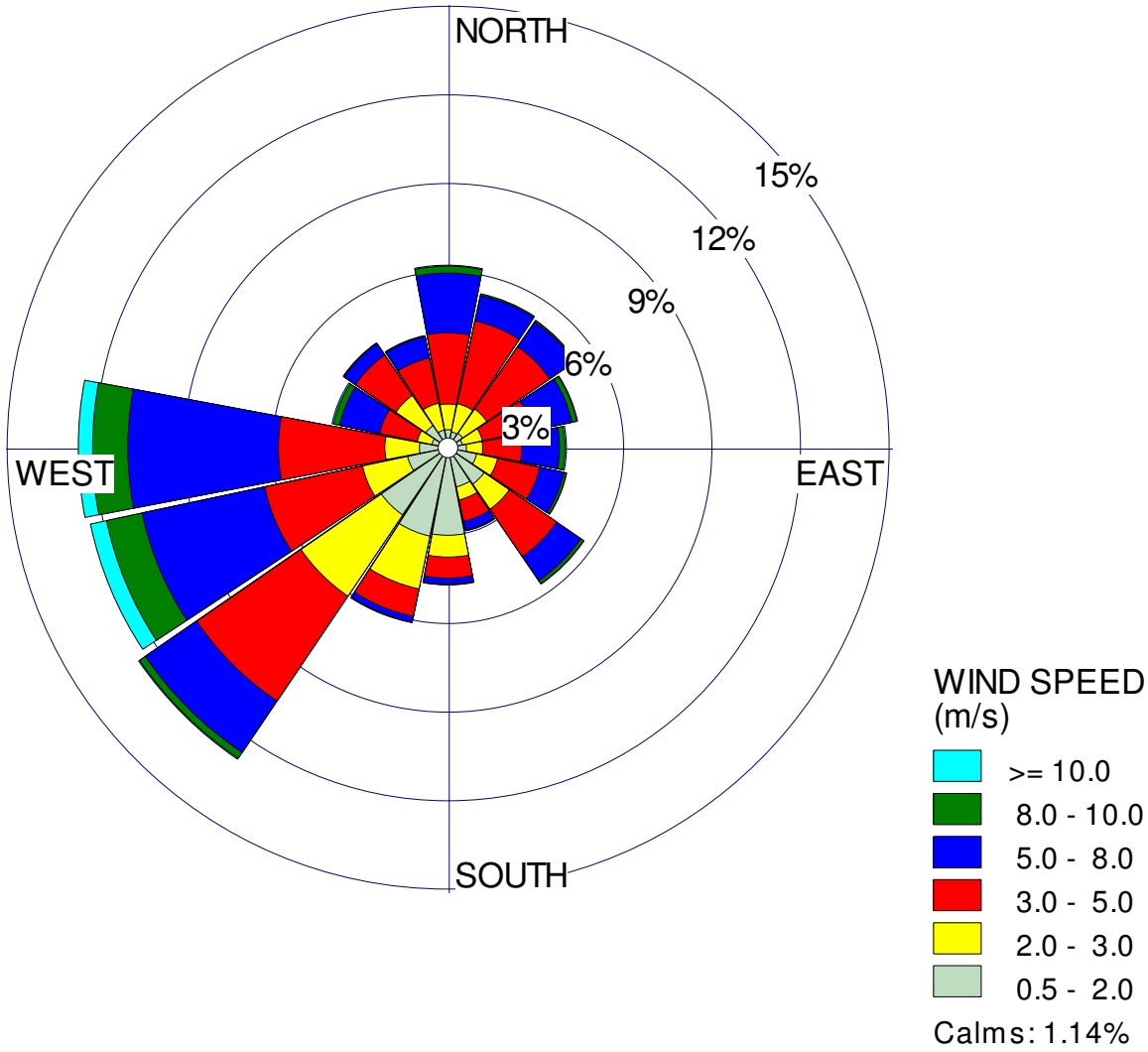
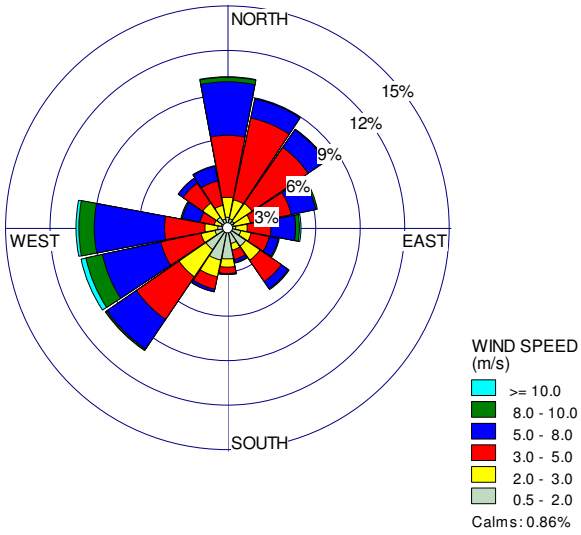
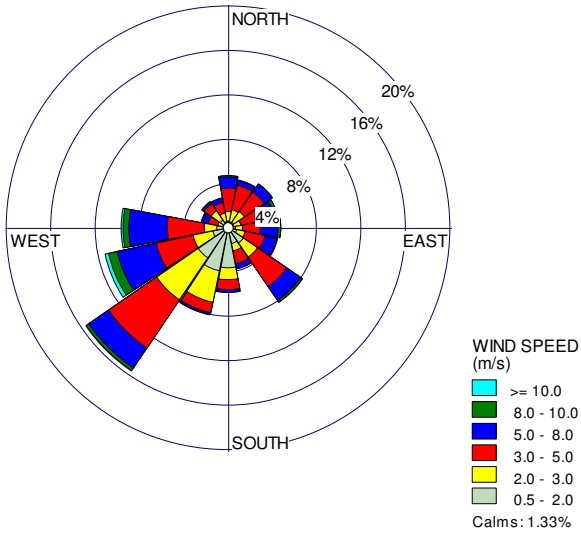


Figure 10 Seasonal Wind roses – Tauranga AWS for 1/01/08 to 31/12/12

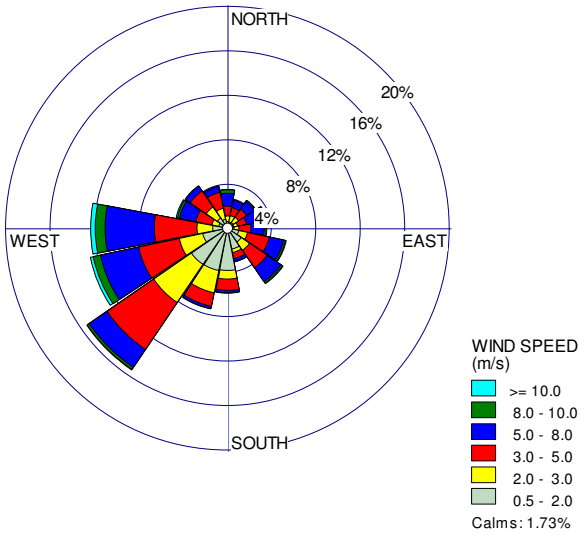
Summer



Autumn



Winter



Spring

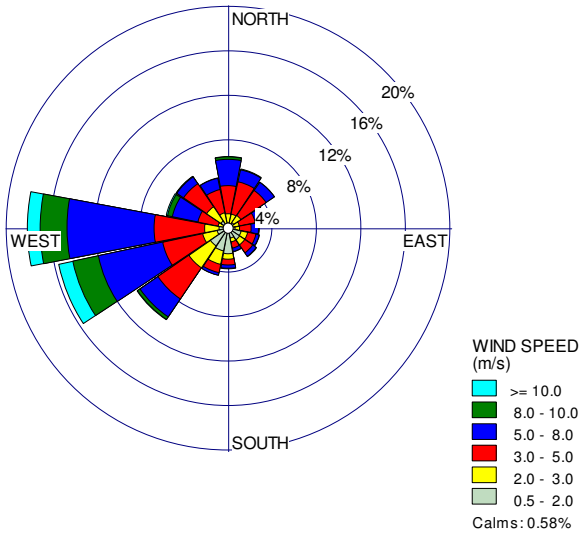


Table 2 Wind Speed Frequency Distribution at Tauranga AWS for 1/01/08 to 31/12/12

Wind Speed Class (m/s)	2008 (%)	2009 (%)	2010 (%)	2011 (%)	2012 (%)	All Data (%)
Calms	2.6	0.4	0.7	1.2	0.8	1.1
0.5 – 2.0	16.2	19.6	22.7	21.6	22.0	20.5
2.0 – 3.0	17.2	17.7	18.3	16.8	17.0	17.5
3.0 – 5.0	33.5	31.9	31.0	32.7	31.9	32.4
5.0 – 8.0	24.8	24.6	21.7	21.8	22.0	23.1
8.0 – 10	4.0	3.9	3.7	3.9	3.8	3.9
>10.0	0.9	1.3	1.2	1.4	1.7	1.3

Table 3 Annual Average Wind Speed at Tauranga AWS for 1/01/08 to 31/12/12

Year	Meteorological Parameter		
	Annual Average Wind Speed (m/s)	Percentage Calms (%)	Maximum Wind Speed (m/s)
2008	3.9	2.6	15.4
2009	3.9	0.4	14.9
2010	3.8	0.7	14.9
2011	3.8	1.2	14.6
2012	3.9	0.8	14.6
All Data	**3.9**	**1.1**	**15.4**

5.0 Odour Assessment

5.1 Field Odour Investigation

A site visit was carried out by AECOM staff on 30 June 2015. AECOM arrived on site at approximately 11 am and met with the plant operator. The weather conditions during the site visit were dry, partly overcast, with occasional light to moderate winds originating from the west. The wind speed at the site was estimated to be between 5 m/s and 8 m/s, based on Beaufort Scale 4. At the time of the site visit the plant was operating normally.

During the visit, a subjective field odour investigation was undertaken by AECOM staff at various locations around and beyond the site boundary, in accordance with the guidance for field odour investigations contained in MfE (2003). AECOM undertook an odour survey at Locations A to H (see following section) between 12:40 pm and 2:00 pm.

Meteorological data collected by the Tauranga AWS between 12:30 pm and 2:00 pm was analysed and during this period the wind direction was from the west with a speed ranging between 5 and 6 m/s.

5.1.1 Field Odour Investigation Locations

The field odour investigation was carried out at various upwind and downwind locations on or beyond the site boundary:

- Location A: Southwest Boundary of the Project Site
- Location B: West Boundary of the Project Site
- Location C: North Boundary of the Project Site
- Location D: East Boundary of the Project Site
- Location E: Southeast Boundary of the Project Site
- Location F: Waiari Stream
- Location G: WWTP Access Road
- Location H: 12 Gordon Street

The location of the odour surveys are shown in Figure 11.

Figure 11 Field Odour Investigation Site Boundary Locations for 30/06/2015

Map Source: Google Earth™ – Map Imagery Date 15 June 2015

5.1.2 Field Odour Investigation Findings

Where odour associated with the WWTP was detectable the odour was classified as being “very weak” and having a waste water/sewer odour character (neutral to slightly unpleasant). Odour associated with wastewater treatment was only ever detected downwind of the plant on the eastern boundary of the site (at locations C and D) and was transient in nature. Waste water/sewer odour was not detected more than 20 m from the site.

The majority of the odours experienced during the site visit were related to rural farming activities, with odours characterised as either “compost”, “silage” and “burnt, smoky”, the later odour was associated with a domestic fireplace/backyard burning which was producing large quantities of white smoke.

No objectionable or offensive odours were detected at any location around the site.

Description of Odours Experienced

The odour described by the assessor at locations A to H was as follows:

- Location A: **Upwind of the Project Site -** No discernible odour from Project Site. Only “very weak” to “weak”, fragrant/fruity odours which were transient in nature.
- Location B: **Upwind of the Project Site -** No discernible odour from Project Site. Only “very weak” to “weak”, fragrant/fruity and silage odours which were transient in nature.
- Location C: **Downwind of the Project Site -** Wastewater/sewer/musty odours “very weak” in intensity and transient in nature.
- Location D: **Downwind of the Project Site -** Wastewater/sewer/musty odours “very weak” in intensity and transient in nature.
- Location E: **Downwind of the Project Site -** No discernible odour from Project Site. Smoky odours “very weak” to “weak” in intensity and transient in nature.
- Location F: **Downwind of the Project Site -** No discernible odour from Project Site. Smoky and cut grass odours “very weak” in intensity and transient in nature.
- Location G: **Upwind of the Project Site -** No discernible odour from Project Site. Smoky odours “very weak” to “weak” in intensity and transient in nature.
- Location H: **Upwind of the Project Site -** No discernible odour from Project Site. No other odours detected.

5.2 Odour Assessment of the Te Puke WWTP (FIDOL Assessment)

It is generally accepted that odours associated with wastewater treatment are considered unpleasant by the general population, and therefore the plant and odour treatment systems need to be operated appropriately in order to minimise any air discharges.

However it is AECOM's experience that even with all appropriate mitigation measures in place there is the potential that from time to time odours may be detectable off-site. Consequently, AECOM considers that it is appropriate to use the FIDOL assessment tool to determine whether there is the potential for these odours to be offensive and objectionable.

5.2.1 Frequency

Based on the amount of time that the WWTP has been operating and the lack of odour complaints, WBOPDC have no recorded odour complaints for the Te Puke WWTP, it is considered that there is a low frequency for off-site odour to be offensive or objectionable. While using complaints as a means of determining the frequency of off-site odours may not necessarily be the most reliable method, it provides some indication, and given that the frequency of complaints is so low, it is unlikely that significant nuisance is being caused and complaints not being made.

The potential frequency will also be affected by the coincidence of low wind speeds, higher wastewater volumes, such as which occur in the summer months, ambient temperature and activities on site that have the potential to generate odour.

Table 4 provides data on the frequency of wind speeds measured at Tauranga AWS for the period 01 January 2008 to 31 December 2008. As discussed in Section 4 there are two (2) properties located within the 300 m buffer distance. SR3 is located to the west, and SR5 to the south. Based on the meteorological data presented in Table 4, the frequency of low wind speed (which have the greatest potential to cause off-site odour effects) for each receptor is:

- SR3 – 2.4%, including calms
- SR5 – 2.7%, including calms

AECOM considers that a frequency of 0-5% to be low, 5-10% to be moderate and >10% to be high.

Therefore based on the above data, the frequency of low wind speed conditions which can carry odour in a relatively undiluted manner towards neighbouring residences within the 300 m buffer zone is considered to be low.

Table 4 Wind Speed Frequency Distribution at Tauranga Aerodrome AWS for the period 01 January 2008 to 31 December 2012

Directions / Wind Classes (m/s)	0.5 - 2.0	2.0 – 3.0	3.0 - 5.0	5.0 – 8.0	8.0 - 10.0	>= 10.0	Total (%)
N	0.7	0.9	2.4	2.0	0.2	0.0	6.2
NNE	0.6	1.0	2.9	0.9	0.1	0.0	5.4
NE	0.6	1.0	2.6	1.0	0.1	0.0	5.3
ENE	0.5	0.7	1.7	1.4	0.2	0.0	4.5
E	0.7	0.6	1.3	1.3	0.2	0.1	4.0
ESE	1.0	0.7	1.5	0.8	0.1	0.0	4.1
SE	1.5	1.0	1.9	1.0	0.1	0.0	5.6
SSE	1.4	0.5	0.7	0.3	0.0	0.0	2.9
S	3.0	0.7	0.7	0.2	0.0	0.0	4.7
SSW	3.1	1.8	0.9	0.2	0.0	0.0	6.1
SW	2.8	3.3	4.3	2.1	0.2	0.0	12.7
WSW	1.4	1.6	3.4	4.2	1.2	0.6	12.4
W	1.0	1.2	3.6	5.1	1.2	0.5	12.5
WNW	0.6	0.5	1.3	1.4	0.2	0.1	4.0
NW	0.9	1.2	1.7	0.5	0.0	0.0	4.3
NNW	0.7	0.9	1.6	0.7	0.0	0.0	3.9
Sub-Total	20.5	17.5	32.4	23.1	3.9	1.3	98.7
Calms							1.1
Missing/Incomplete							0.1
Total							100

5.2.2 Intensity

Odour associated with WWTPs generally falls into two categories. There will generally always be a low intensity odour detectable (within 20-30 m) downwind of the site, however the odour is at such a low level that it is not considered to be offensive or objectionable. Of all the potential odour discharges from the WWTP, those associated with the collection and off-site transport of biosolids have the greatest potential to cause odour nuisance. These types of odours typically have a high intensity and are often considered to be offensive and objectionable.

The intensity is also related to the wind conditions and the resulting level of dilution that occurs between the source and the receptor. In essence the stronger the wind, the more dilution will occur, and the lower the intensity. It is generally accepted that odour nuisance only occurs when wind speeds are less than 3 m/s.

5.2.3 Duration

As discussed previously, there will always be underlying odours associated with the WWTP, however these generally have very low intensity and are only detectable onsite or close to the site boundary.

Odours associated with transportation of biosolids will typically occur once a week, for less than 30 minutes at a time (the time it takes to raise the tarpaulin skirt and drive the truck off-site).

If the plant malfunctions odours may occur for longer. However these are likely to be rare and short in duration and would typically last as long as it takes for plant maintenance personnel to fix the fault (typically 1-4 hours).

5.2.4 Offensiveness

When detected off-site, odours associated with WWTP are generally considered to be offensive, and odours associated with the Te Puke WWTP are no different. Odours that are particularly offensive are those associated with the sludge if it becomes anaerobic. However in this case the sludge is constantly aerated and therefore there is limited potential for this to occur, the only exception is if there is a fault with the plant which prevents the blowers from operating for any significant period of time (> 4 hours). The biosolids from the dewatering plant also have the potential to create offensive odours as they are stored in a truck for up to a week with anaerobic conditions developing during this period.

If the wastewater is kept aerobic it will generally have a soapy/musty odour and should not be considered offensive.

5.2.5 Location

To a large extent location is possibly the most important of the factors, due to the fact that even if odours are generated there is little potential for effect if there are no receptors located downwind of the source. In this regard, AECOM considers that the location of the WWTP is close to a number of sensitive receptors located which surround the site. In particular AECOM considers that SR3 and SR5 that have the greatest potential to be affected as they are located within the 300 m buffer zone. However as these are located upwind of the site, refer Figure 9, AECOM considers that there is limited potential for odour nuisance to occur at these locations. For the sensitive receptors located beyond 300 m of the site, based on the local meteorological conditions, lack of odour complaints, WBOPDC have no recorded odour complaints for the Te Puke WWTP, and that 300 m has been recommended by governmental agencies as an appropriate buffer distance, AECOM considers that there is limited potential for odour nuisance to occur at these locations.

5.2.6 FIDOL Conclusion

Taking all of the factors into account, AECOM does not consider that off-site odours from the Te Puke WWTP are typically offensive or objectionable. This is supported by the lack of odour nuisance complaints and suitable meteorological conditions. AECOM does however accept that if the plant becomes overloaded or if the plant fails, there may be occasions when odour is detectable off-site that could be considered offensive or objectionable. In addition AECOM recommends that some modifications are made to plant processes to further reduce the potential for odour nuisance. These are discussed in the following Section.

6.0 Proposed Mitigation Measures

AECOM understands that the truck that transports the biosolids off-site to be disposed of is not covered. To reduce the potential for odour nuisance from this source, AECOM recommends that the load is covered with a tight-fitting tarpaulin. While this modification to the plant is not essential in terms of ensuring that off-site odour nuisance does not occur, it is a prudent measure with minimal cost, which will reduce the potential for off-site odours from this source.

7.0 Conclusions

AECOM has assessed the potential for odour nuisance from the plant using the FIDOL assessment tool. Taking all of the factors into account, AECOM does not consider that off-site odours from the normal operation of the Te Puke WWTP will be offensive or objectionable. This is supported by the lack of odour complaints recorded by WBOPDC, frequency of meteorological conditions which have the potential to cause odour nuisance and the buffer distance around the plant. AECOM does however recommend that biosolids loads are covered to further reduce the potential for off-site odour.

8.0 Report Limitations

AECOM has prepared this Assessment of Effects report on discharges to air in accordance with the usual care and thoroughness of the consulting profession for the WBOPDC for use in a statutory process from the BOPRC under the Resource Management Act 1991 for activities undertaken at the Te Puke WWTP.

Except as specifically stated in this section, AECOM does not authorise the use of this Report by any third party except as provided for by the Resource Management Act 1991.

Nor does AECOM accept any liability for any loss, damage, cost or expenses suffered by any third party using this report for any purpose other than that stated above.

It is based on generally accepted practices and standards at the time it was prepared. No other warranty, expressed or implied, is made as to the professional advice included in this Report.

It is prepared in accordance with the scope of work and for the purpose outlined in the contract 14/1080 dated 28 April 2015.

Where this Report indicates that information has been provided to AECOM by third parties, AECOM has made no independent verification of this information except as expressly stated in this Report. AECOM assumes no liability for any inaccuracies in or omissions to that information.

This Report was prepared during August and September 2015 and is based on the conditions encountered and information reviewed at the time of preparation. AECOM disclaims responsibility for any changes that may have occurred after this time.

9.0 References

Bay of Plenty Regional Council, Bay of Plenty Regional Air Plan, 15 December 2003.

Environmental Protection Authority Victoria, Guideline, Recommended Separation Distances for Industrial Residual Air Emissions, March 2013

Ministry for the Environment, Good Practice Guide for Assessing and Managing Odour in New Zealand, June 2003

Opus International Consultants Ltd, Te Puke Wastewater Treatment Plant Draft Operations Manual, January 2015

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Western Bay of Plenty District Council, District Plan 24 May 2012.