



TO: Mr Trevor Lam

FROM: Andrew Cantlay

COMPANY: The Odour Unit Pty Ltd

DATE: 19th August, 2009

JOB NO: N1521L

SUBJECT: Castle Hill Field Ambient Odour Assessments

Introduction

The Odour Unit Pty Ltd (TOU) was commissioned to carry out a series of field ambient odour assessments (FAOAs) the aim of which was to record and characterise odour detected in the area around Castle Hill Sewage Treatment Plant (STP).

The field odour surveys commenced in early August, 2009 and were carried out by a trained and calibrated (against reference gas n-butanol) assessor at individual locations around Castle Hill STP and the surrounding residential areas. The method and findings of the FAOAs are listed below.

In addition to the field-based work a desktop literature review was carried out to determine what odour complaint data was publicly available, if any, and to what extent related to the sewage treatment plant at Castle Hill. The findings of this review are summarized later in this document.

Field Ambient Odour Assessments

At present, no Australian Standard exists for field based ambient odour assessment surveys. Consequently, The Odour Unit utilises a method for assessing the ground level impacts of odour emissions using a truncated version of the German Standard VDI 3940 (1993) – 'Determination of Odorants in Ambient Air by Field Inspections'.

Field based ambient odour surveys are considered a valuable odour impact assessment tool as previous experience with ambient odour sampling and subsequent olfactometry testing suggests that accurate and useful ambient odour concentration data is difficult to obtain. Therefore, TOU has adopted a more practical approach based on the field measurement of odour intensity. With this

method, the TOU assessor firstly determined the wind direction and then assessed downwind locations attempting to cover as much territory as possible. The surrounding land use restricted the assessment locations to public roads, public recreational areas and public bush walking/access tracks.

The assessor spent a period of time at each assessment location in order to gauge the effects of any odour impact. At each location, wind velocity was measured empirically using the beaufort scale, while wind direction was determined using a compass. If an odour was detected at a location, the assessors attempted to characterise it. The general aim was to determine the extent of the impact of odours from the STP site and rank their intensity. The ranking scale for the German Standard VDI 3940 'Determination of Odorants in Ambient Air by Field Inspections' was used for the intensity assessments. The standard's ranking system is based on the following seven-point intensity scale.

VDI 3940 – Intensity Scale

- 0 Not Detectable
- 1 Very Weak
- 2 Weak
- 3 Distinct
- 4 Strong
- 5 Very Strong
- 6 Extremely Strong

The findings of the odour assessments are listed below in a series of log sheets (unprocessed data) and odour assessment plots which summarise what the assessor experienced, in terms of odour intensity, for each location assessed in the area surrounding Castle Hill STP.

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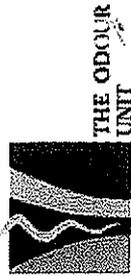
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Form 22 - Field Ambient Odour Assessment Log Sheet

DATE: 05/08/2009 ASSESSOR: Andrew Cantlay WEATHER CONDITIONS: Clear skies, calm- very light winds

GRID REF. POSITION	TIME	WIND DIRECTION	WIND VELOCITY m/s	ODOUR PRESENT Y/N	ODOUR CHARACTER	VDI 3940 INTENSITY SCALE 0-6	COMMENTS
1A	1600	CALM	<0.5	N	-	0	None.
1B	1604	CALM	<0.5	Y	Treated wastewater	1-2	The odour was detected intermittently adjacent to the southern fence-line of the STP.
1C	1610	CALM	<0.5	N	-	0	End of cul-de-sac.
1D	1613	CALM	<0.5	N	-	0	Cycleway west of the STP and the creek.
1E	1624	CALM	<0.5	Y	Possible chemical dosing	2	The odour was detected intermittently adjacent to the western fence-line of the STP.
1F	1633	CALM	<0.5	N	-	0	None.
1G	1639	CALM	<0.5	N	-	0	Along top walking track near houses on eastern side of STP.

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GRID REF. POSITION	TIME	WIND DIRECTION	WIND VELOCITY m/s	ODOUR PRESENT Y/N	ODOUR CHARACTER	VDI 3940 INTENSITY SCALE 0-6	COMMENTS
1H	1645	CALM	<0.5	N	-	0	None.
1I	1651	CALM	<0.5	N	-	0	Lower track adjacent to eastern fence line.
1C	1720	CALM	<0.5	N	-	0	None.
5A	1721	CALM	<0.5	N	-	0	None.
2A	1722	CALM	<0.5	N	-	0	None.
2B	1725	040-060	0.5-3.9	N	-	0	None.

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GRID REF. POSITION	TIME	WIND DIRECTION	WIND VELOCITY m/s	ODOUR PRESENT Y/N	ODOUR CHARACTER	VDI 3940 INTENSITY SCALE 0-6	COMMENTS
2D	1726	040-060	0.5 - 3.9	N	-	0	None.
3B	1728	040-060	0.5 - 3.9	N	-	0	None.
3A	1729	040-060	0.5 - 3.9	N	-	0	None.
5B	1731	040-060	0.5 - 3.9	N	-	0	None.

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Form 22 - Field Ambient Odour Assessment Log Sheet

DATE: 11/08/2009 ASSESSOR: Andrew Cantlay WEATHER CONDITIONS: Overcast/cloudy, calm- very light winds

GRID REF. POSITION	TIME	WIND DIRECTION	WIND VELOCITY m/s	ODOUR PRESENT Y/N	ODOUR CHARACTER	VDI 3940 INTENSITY SCALE 0-6	COMMENTS
4A	0731	CALM	<0.5	N	-	0	None.
4B	0732	CALM	<0.5	N	-	0	None.
4C	0734	CALM	<0.5	N	-	0	None.
1A	0741	CALM	<0.5	Y	Sewage	2	The odour was detected briefly. Assessor standing in line with stack/vent.
1B	0745	CALM	<0.5	Y	Treated wastewater	1 - 2	The odour was detected intermittently adjacent to the southern fence line of the STP.
1I	0750	CALM	<0.5	N	-	0	None.
1J	0752	CALM	<0.5	N	-	0	None.

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GRID REF. POSITION	TIME	WIND DIRECTION	WIND VELOCITY m/s	ODOUR PRESENT Y/N	ODOUR CHARACTER	VDI 3940 INTENSITY SCALE 0-6	COMMENTS
1K	0754	CALM	< 0.5	N	-	0	None.
6A	0802	CALM	< 0.5	N	-	0	None.
6B	0804	CALM	< 0.5	N	-	0	None.
7B	0806	CALM	< 0.5	N	-	0	None.
8A	0809	CALM	< 0.5	N	-	0	None.
7A	0811	CALM	< 0.5	N	-	0	None.
7C	0820	CALM	< 0.5	N	-	0	None.

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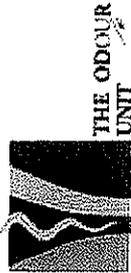
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GRID REF. POSITION	TIME	WIND DIRECTION	WIND VELOCITY m/s	ODOUR PRESENT Y/N	ODOUR CHARACTER	VDI 3940 INTENSITY SCALE 0-6	COMMENTS
7D	0822	CALM	< 0.5	N	-	0	None.
7E	0824	CALM	< 0.5	N	-	0	None.
7F	0826	CALM	< 0.5	N	-	0	None.
11A	0832	CALM	< 0.5	N	-	0	None.
7G	0836	CALM	< 0.5	N	-	0	None.
7F	0838	320 - 340	0.5 - 3.9	Y	Sewage	1 - 2	None.
7E	0840	320 - 340	0.5 - 3.9	Y	Sewage	1 - 2	None.

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GRID REF. POSITION	TIME	WIND DIRECTION	WIND VELOCITY m/s	ODOUR PRESENT Y/N	ODOUR CHARACTER	VDI 3940 INTENSITY SCALE 0-6	COMMENTS
10A	0842	CALM	<0.5	N	-	0	None.
10B	0846	CALM	<0.5	N	-	0	None.
12A	0850	CALM	<0.5	N	-	0	None.
12B	0851	CALM	<0.5	N	-	0	None.
1A	0858	CALM	<0.5	N	-	0	None.

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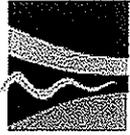
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Form 22 - Field Ambient Odour Assessment Log Sheet

DATE: 13/08/2009 ASSESSOR: Andrew Cantlay WEATHER CONDITIONS: Sunny, clear skies, calm

GRID REF. POSITION	TIME	WIND DIRECTION	WIND VELOCITY m/s	ODOUR PRESENT Y / N	ODOUR CHARACTER	VDI 3940 INTENSITY SCALE 0-6	COMMENTS
4C	1558	CALM	<0.5	N	-	0	None.
1A	1601	CALM	<0.5	N	-	0	None.
1B	1606	CALM	<0.5	Y	Treated wastewater	1 - 2	The odour was detected briefly adjacent to the southern fence line of the STP.
1H	1610	CALM	<0.5	N	-	0	None.
1G	1615	CALM	<0.5	N	-	0	None.
1K	1636	CALM	<0.5	Y	Treated wastewater	2	None.
1K	1638	CALM	<0.5	Y	Treated wastewater	3	Detected adjacent to fence.

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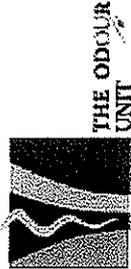
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GRID REF. POSITION	TIME	WIND DIRECTION	WIND VELOCITY m/s	ODOUR PRESENT Y/N	ODOUR CHARACTER	VDI 3940 INTENSITY SCALE 0-6	COMMENTS
IJ	1644	CALM	<0.5	N	Treated wastewater	2	The odour was detected adjacent to the eastern fence-line.
II	1647	CALM	<0.5	N	-	0	None.
12B	1659	CALM	<0.5	N	-	0	None.
12A	1702	CALM	<0.5	N	-	0	None.
10B	1706	CALM	<0.5	N	-	0	None.
7E	170	CALM	<0.5	N	-	0	None.
7D	1713	CALM	<0.5	Y	Treated wastewater	2	None.

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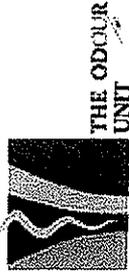
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GRID REF. POSITION	TIME	WIND DIRECTION	WIND VELOCITY m/s	ODOUR PRESENT Y / N	ODOUR CHARACTER	VDI 3940 INTENSITY SCALE 0-6	COMMENTS
7C	1716	CALM	< 0.5	N	-	0	None.
6B	1719	CALM	< 0.5	N	-	0	None.
7B	1720	CALM	< 0.5	N	-	0	None.
8A	1724	CALM	< 0.5	N	-	0	None.
6A	1727	CALM	< 0.5	N	-	0	None.
13A	1731	CALM	< 0.5	Y	Treated wastewater	1	The odour was detected near a vent/stack.
13B	1733	CALM	< 0.5	Y	Treated wastewater	2-3	None.

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GRID REF. POSITION	TIME	WIND DIRECTION	WIND VELOCITY m/s	ODOUR PRESENT Y/N	ODOUR CHARACTER	VDI 3940 INTENSITY SCALE 0-6	COMMENTS
1F	1736	CALM	< 0.5	N	-	0	None.
1E	1738	CALM	< 0.5	N	-	0	None.

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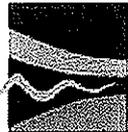
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GRID REF. POSITION	TIME	WIND DIRECTION	WIND VELOCITY m/s	ODOUR PRESENT Y/N	ODOUR CHARACTER	VDI 3940 INTENSITY SCALE 0-6	COMMENTS
4A	0724	CALM	<0.5	N	-	0	None.
4B	0725	CALM	<0.5	N	-	0	None.
4C	0728	CALM	<0.5	Y	Sewage	1	The odour was detected briefly.
1A	0731	CALM	<0.5	Y	Sewage	2	None.
1L	0733	CALM	<0.5	Y	Sewage	3 - 4	The odour peaked at strong but was mostly distinct. The odour was detected just before crossing the creek heading north towards the STP.
1B	0739	CALM	<0.5	Y	Treated wastewater	2 - 3	The odour was detected intermittently adjacent to the southern fence line of the STP.
1E	0743	CALM	<0.5	N	-	0	None.

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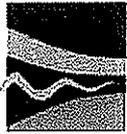
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GRID REF. POSITION	TIME	WIND DIRECTION	WIND VELOCITY m/s	ODOUR PRESENT Y/N	ODOUR CHARACTER	VDI 3940 INTENSITY SCALE 0-6	COMMENTS
1D	0753	CALM	<0.5	N	-	0	None.
14C	0758	CALM	<0.5	N	-	0	None.
14B	0800	CALM	<0.5	N	-	0	None.
14A	0802	CALM	<0.5	N	-	0	None.
4B	0804	CALM	<0.5	N	-	0	None.
4C	0805	CALM	<0.5	N	-	0	None.
15A	0807	CALM	<0.5	N	-	0	None.

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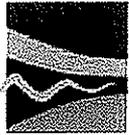
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GRID REF. POSITION	TIME	WIND DIRECTION	WIND VELOCITY m/s	ODOUR PRESENT Y/N	ODOUR CHARACTER	VDI 3940 INTENSITY SCALE 0-6	COMMENTS
15B	0810	CALM	<0.5	N	-	0	None.
15C	0812	CALM	<0.5	N	-	0	None.
15D	0813	CALM	<0.5	N	-	0	None.
15E	0816	CALM	<0.5	N	-	0	None.
15I	0818	CALM	<0.5	N	-	0	None.
15J	0822	CALM	<0.5	N	-	0	None.
15M	0825	CALM	<0.5	N	-	0	None.

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GRID REF. POSITION	TIME	WIND DIRECTION	WIND VELOCITY m/s	ODOUR PRESENT Y/N	ODOUR CHARACTER	VDI 3940 INTENSITY SCALE 0-6	COMMENTS
15L	0826	CALM	<0.5	N	-	0	None.
15K	0828	CALM	<0.5	N	-	0	None.
15H	0834	CALM	<0.5	N	-	0	None.
15G	0838	CALM	<0.5	N	-	0	None.
15F	0840	CALM	<0.5	N	-	0	None.
4A	0852	CALM	<0.5	N	-	0	None.
3A	0853	240 - 250	0.5 - 3.9	N	-	0	None.

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GRID REF. POSITION	TIME	WIND DIRECTION	WIND VELOCITY m/s	ODOUR PRESENT Y/N	ODOUR CHARACTER	VDI 3940 INTENSITY SCALE 0-6	COMMENTS
3B	0854	CALM	< 0.5	N	-	0	None.
2D	0855	CALM	< 0.5	N	-	0	None.
2B	0857	240 - 250	0.5 - 3.9	N	-	0	None.
2A	0858	240 - 250	0.5 - 3.9	N	-	0	None.
5A	0859	240 - 250	0.5 - 3.9	N	-	0	None.
1C	0901	240 - 250	0.5 - 3.9	N	-	0	None.
1B	0906	CALM	< 0.5	N	Treated wastewater	2	The odour was detected intermittently adjacent to the southern fence line of the STP.

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GRID REF. POSITION	TIME	WIND DIRECTION	WIND VELOCITY m/s	ODOUR PRESENT Y / N	ODOUR CHARACTER	VDI 3940 INTENSITY SCALE 0-6	COMMENTS
IH	0909	CALM	<0.5	N	-	0	None.
IG	0911	CALM	<0.5	N	-	0	None.
IK	0916	CALM	<0.5	N	-	0	None.

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Form 22 - Field Ambient Odour Assessment Log Sheet

DATE: 18/08/2009 ASSESSOR: Andrew Cantlay WEATHER CONDITIONS: Sunny, very light/light winds

GRID REF. POSITION	TIME	WIND DIRECTION	WIND VELOCITY m/s	ODOUR PRESENT Y/N	ODOUR CHARACTER	VDI 3940 INTENSITY SCALE 0-6	COMMENTS
16A	1304	240 - 250	0.5 - 3.9	N	-	0	None.
16B	1308	240 - 250	0.5 - 3.9	N	-	0	None.
16C	1312	240 - 250	0.5 - 3.9	N	-	0	None.
16D	1314	240 - 250	0.5 - 3.9	N	-	0	None.
16E	1318	240 - 250	0.5 - 3.9	N	-	0	None.
16F	1320	240 - 250	0.5 - 3.9	N	-	0	None.
16G	1323	240 - 250	0.5 - 3.9	N	-	0	None.