



# BROMLEY ODOUR ASSESSMENT

July 2020 Odour Scout Monitoring Report

**31 July 2020**

# Contents

- 1 Introduction..... 3
- 2 Methodology..... 3
- 3 Results..... 5
  - 3.1 Day 1 – 21<sup>st</sup> July 2020 ..... 6
    - 3.1.1 Day 1 Summary .....11
  - 3.2 Day 2 – 22<sup>nd</sup> July 2020 .....11
    - 3.2.1 Day 2 Summary..... 14
  - 3.3 Day 3 – 23<sup>rd</sup> July 2020 ..... 14
    - 3.3.1 Day 3 Summary .....17
  - 3.4 Day 4 – 24<sup>th</sup> July 2020.....17
    - 3.4.1 Day 4 Summary..... 20
  - 3.5 Day 5 – 27<sup>th</sup> July 2020 ..... 20
    - 3.5.1 Day 5 Summary ..... 23
- 4 Closing..... 23

## 1 Introduction

Environment Canterbury is currently working with the Christchurch City Council under an Adaptive Management Plan (**AMP**) to significantly reduce odours discharged from the Living Earth and EcoDrop facilities in Bromley Christchurch by September 2020. This came about after a pilot study completed in March 2020 showed that about 70% of the odour issues in Bromley come from these two sites.

Environment Canterbury has contracted NZ Air Limited (**NZ Air**) to undertake monthly independent odour assessments within the Christchurch suburb of Bromley. This report presents the results for the five day field odour scout monitoring program undertaken in the month of July 2020. To provide consistency with previous studies, the methodology for the odour scout program is based on that undertaken by Watercare Services in preceding months (as described in Watercare Report titled “*Bromley – Odour Scout Report*” – June 2020 AQ-2020-122). NZ Air has also reported and interpreted the data in a similar format to that undertaken by Watercare.

This independent odour scout monitoring program is part of a wider odour study which is being undertaken as a part of the AMP process agreed between the Christchurch City Council and Environment Canterbury. The Bromley odour study contains three primary data feeds:

1. Observations made by the general public through the “Smelt it” mobile phone application.
2. Environment Canterbury’s enforcement team observations.
3. Monthly five day odour scout monitoring programs undertaken by an independent air quality consultancy.

Further information on the wider study can be found here:

<https://www.youtube.com/watch?v=raVLXwhHGTo>

## 2 Methodology

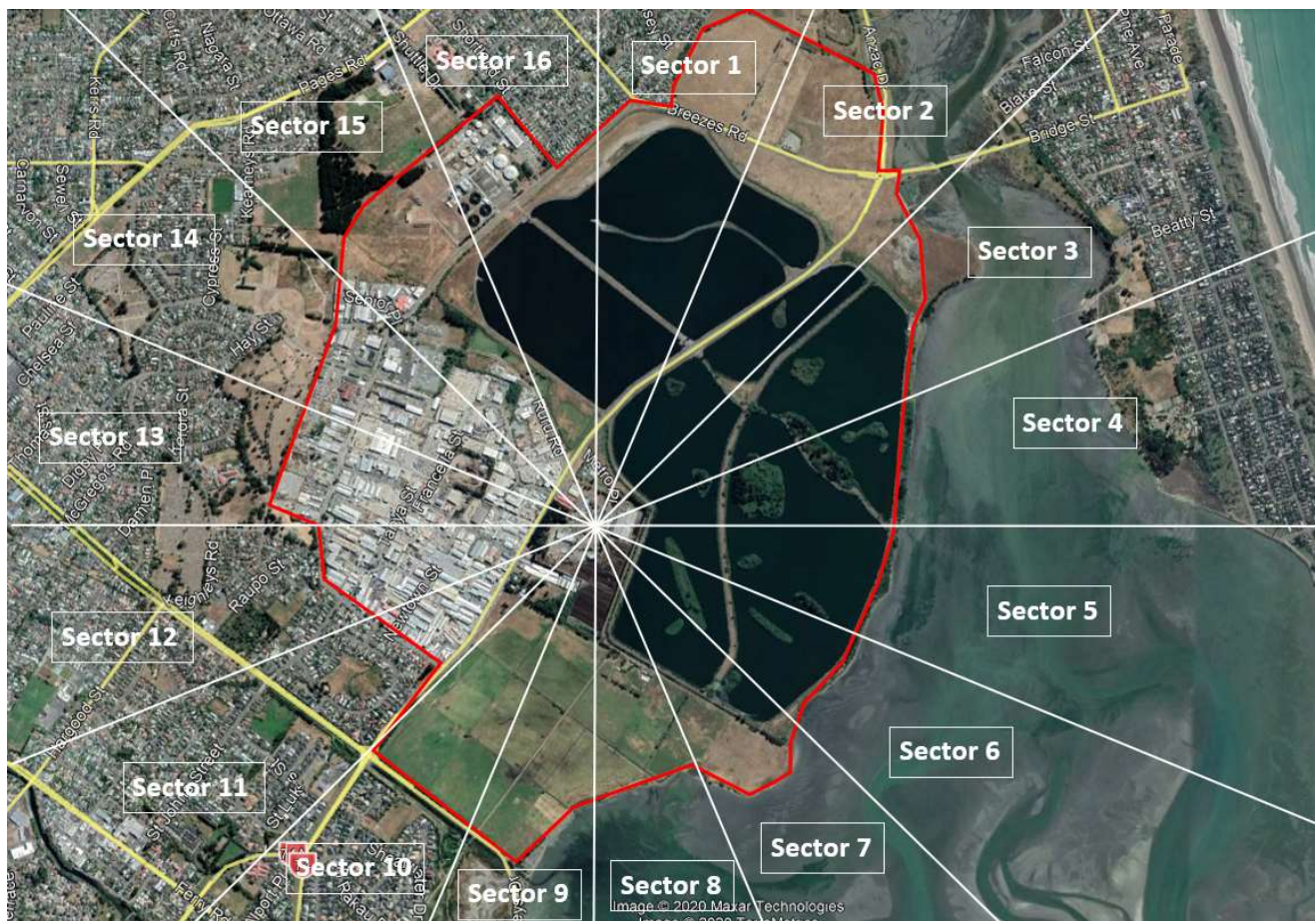
The NZ Air odour scout observations for July 2020 were made on the following dates:

- Tuesday 21<sup>st</sup> July
- Wednesday 22<sup>nd</sup> July
- Thursday 23<sup>rd</sup> July
- Friday 24<sup>th</sup> July
- Monday 27<sup>th</sup> July

The area surrounding the EcoDrop and Living Earth facilities was divided into 16 sectors (note that the centre of the Sector wheel is slightly different to that in the Watercare study due to the fact that the odour observations are focused on emissions from the EcoDrop and Living Earth facilities). The study area and sectors are illustrated in **Figure 1**.

The red line (presented in the Watercare reports) in **Figure 1** is the approximate boundary of the Bromley suburb. There is no residential zoned land within the red line, therefore the most sensitive areas to nuisance odour are outside the red line.

FIGURE 1 STUDY AREA AND SECTORS



Aerial Imagery sourced from Google Earth July 2020

During each day an upwind odour observation was made, upwind of the EcoDrop and Living Earth facilities (located at the centre of the sector wheel), followed by a series of downwind observations generally starting near the Bromley suburb boundary in the directly downwind sector. Observations are then made in a zig zag pattern moving towards the centre of the sector wheel. In this way the odour scout can determine the extent and intensity of any odour plume being emitted from the EcoDrop and/or Living Earth facilities. This methodology is based on the ‘dynamic downwind surveillance’ methodology described in the Draft Odour Surveillance Guidance produced by EPA Victoria<sup>1</sup>.

Where odour consistent with that discharged from the EcoDrop and/or Living Earth facilities is observed at the Bromley suburb boundary, the odour scout moves to the furthest downwind extent of the plume for the first observation. Starting at the furthest extent of the plume ensures that the scout is not desensitised to the odour early in the monitoring run.

In addition to the above methodology for selecting observation sites, the odour scout also receives email alerts from the Smelt It app. Where possible the odour scout undertakes an odour observation at the location of the Smelt It app notification. These observations in response to the app notifications have been requested by Environment Canterbury to assist in validating observations by the public.

<sup>1</sup> EPA Victoria “Odour Surveillance Method Draft” December 2019



In addition to the above, if an odour is observed within the Bromley region whilst the odour scout is traveling between observations sites, an odour observation is made at the location. This provides a record of other odours that are present in the area.

Similar to the Watercare study, the methodology for making odour observations was based on the German reference method VDI 3940: 2006. The odour scout field observation methodology is also based on that described in Section 4 and Appendix 3 of the Ministry for the Environment Good Practice Guide for Assessing and Managing Odour (2016). At each odour observation location, the odour scout records the odour intensity (on a 0 – 6 scale) and character (from a list of 40 different odour descriptors) every 10 seconds for a period of 10 minutes. In addition to these observations, the following parameters are also recorded at each site:

- A unique sample site ID along with the GPS co-ordinates of the assessment location.
- The date and the time of the observation.
- The wind direction, as observed at ground level (in cardinal directions).
- The windspeed (in m/s as measured by a handheld anemometer).
- The cloud cover (in octas).
- The ambient temperature (as recorded on a handheld digital thermometer).
- The overall hedonic tone (on a scale of -4 to +4).

The field sheets used to record the observations at each monitoring location is included as **Appendix A**. The list of odour character descriptors, intensity scale descriptors, and hedonic tone scale descriptors are also included in **Appendix A**.

Where applicable the odour scout also records further information to provide context to the observation. For example, "a number of diesel trucks were passing by which resulted in a sporadic 'diesel fume' type odour during the observation", or "this observation was made directly downwind of a fish processing factory during business hours". This information has been incorporated into the observation summaries in **Section 3** of this report.

For each monitoring month, two odour scouts make independent observations at each monitoring location on one out of the five days. As odour perception is very subjective, and differs from one individual to another, undertaking side by side independent observations by multiple persons provides an increased level of quality assurance for the monthly results.

### 3 Results

To provide comparable results, NZ Air has calculated the "percentage odour character frequency" and "percentage odour intensity frequency" for each observation as described in the Watercare report.

An odour intensity of '1 – very weak' was categorised as when the odour scout could detect an odour, but the odour was not strong enough for a character to be assigned to the odour.

Each day's data is also presented pictorially over an aerial figure. Within the Figures:

- the location ID is the number in the square;
- the colour of the square indicates the hedonic tone; and
- the wind direction during the observation is illustrated by the dark blue arrow adjacent to the location ID.

Where there is a red 'R' next to the ID number the observation is a response to a Smelt It notification.

### 3.1 Day 1 – 21<sup>st</sup> July 2020

On this date two odour scouts (DVK and HJ) were used to make independent duplicate observations at each monitoring location. The results for each scout are presented in **Tables 1 and 2** and **Figures 2 and 3**.

TABLE 1 DVK OBSERVATIONS – 21/7/2020

Location ID	1	2	3	4	5	6	7	8	9	10	11
Sector	2	11	13	13	15	1	9	9	9	10	10
Upwind/downwind	Upwind	Downwind	Downwind	Downwind	Outside	Upwind	Downwind	Downwind	Downwind	Downwind	Downwind
Date and time	21/07/2020 9:24	21/07/2020 9:47	21/07/2020 10:19	21/07/2020 10:45	21/07/2020 11:40	21/07/2020 12:01	21/07/2020 12:46	21/07/2020 13:01	21/07/2020 13:31	21/07/2020 13:58	21/07/2020 14:25
Wind direction	NW - NE	E	E	E	NE	N	N	N	NNE	NE	NNE
Wind speed (m/s)	0	0 - 1.2	0 - 0.5	0	0.5 - 3.4	0.5 - 1.9	0.5 - 3.1	0.2 -2.4	1 - 2.7	0.1 - 1.5	0.7 - 1.2
Cloud cover (octa)	6	6	6	6	2	1	1	1	1	0	1
Temperature (Deg C)	18.1	15.3	15.4	15.6	17.9	18.9	19.8	21.9	23.6	17.9	19.3
Rain	none	none	none	none	none	none	none	none	none	none	none
Hedonic Tone	neutral	neutral	mildly pleasant	neutral	unpleasant	neutral	mildly unpleasant	Unpleasant	Unpleasant	neutral	neutral
Character Descriptor	Percentage of odour character detected										
No odour	92%	90%	72%	97%	60%	100%	83%	65%	23%	100%	98%
Perfumy	0%	0%	12%	0%	0%	0%	0%	0%	0%	0%	0%
Sweet	0%	0%	12%	0%	0%	0%	0%	0%	0%	0%	0%
Sea/marine	8%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Rubbish	0%	0%	0%	0%	0%	0%	3%	22%	0%	0%	0%
Compost	0%	0%	0%	0%	0%	0%	0%	0%	68%	0%	0%
Silage	0%	0%	0%	0%	0%	0%	10%	2%	2%	0%	0%
Sickening	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Musty, earthy, mouldy	0%	0%	0%	0%	0%	0%	3%	12%	5%	0%	0%
Like gasoline, solvent	0%	3%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Fishy	0%	0%	0%	0%	40%	0%	0%	0%	0%	0%	0%
Paint-like	0%	0%	3%	3%	0%	0%	0%	0%	0%	0%	2%
Other - Diesel fumes	0%	7%	2%	0%	0%	0%	0%	0%	0%	0%	0%
Intensity Descriptor	Percentage of intensity detected										
0 No odour	72%	67%	30%	87%	48%	83%	72%	0%	3%	73%	93%
1 Very weak	20%	23%	42%	10%	12%	17%	12%	35%	20%	27%	5%
2 Weak	8%	10%	23%	3%	22%	0%	15%	30%	58%	0%	2%
3 Distinct	0%	0%	5%	0%	15%	0%	2%	32%	18%	0%	0%
4 Strong	0%	0%	0%	0%	3%	0%	0%	3%	0%	0%	0%
5 Very strong	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
6 Extremely strong	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%



FIGURE 2 DVK OBSERVATIONS – 21/7/2020

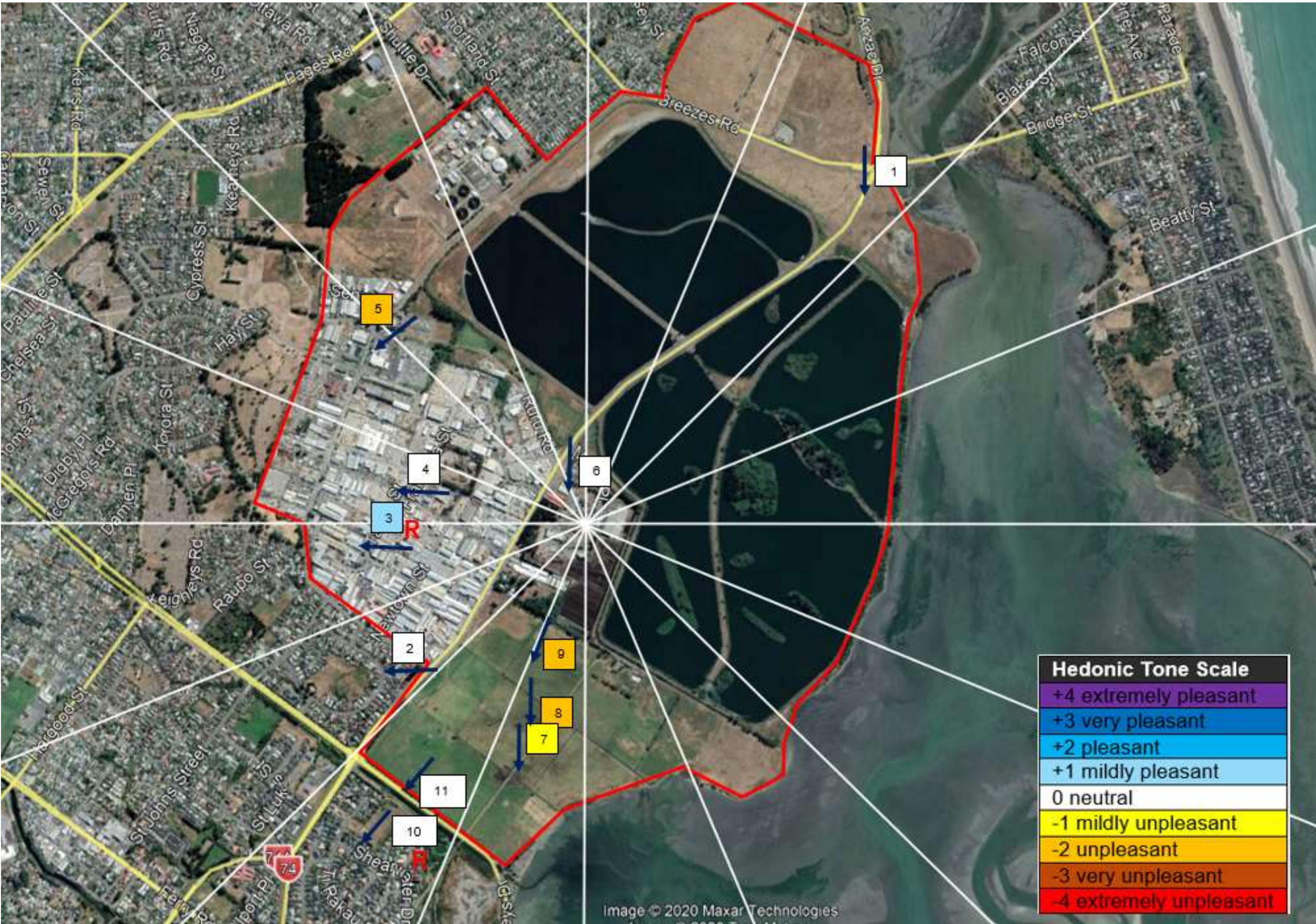


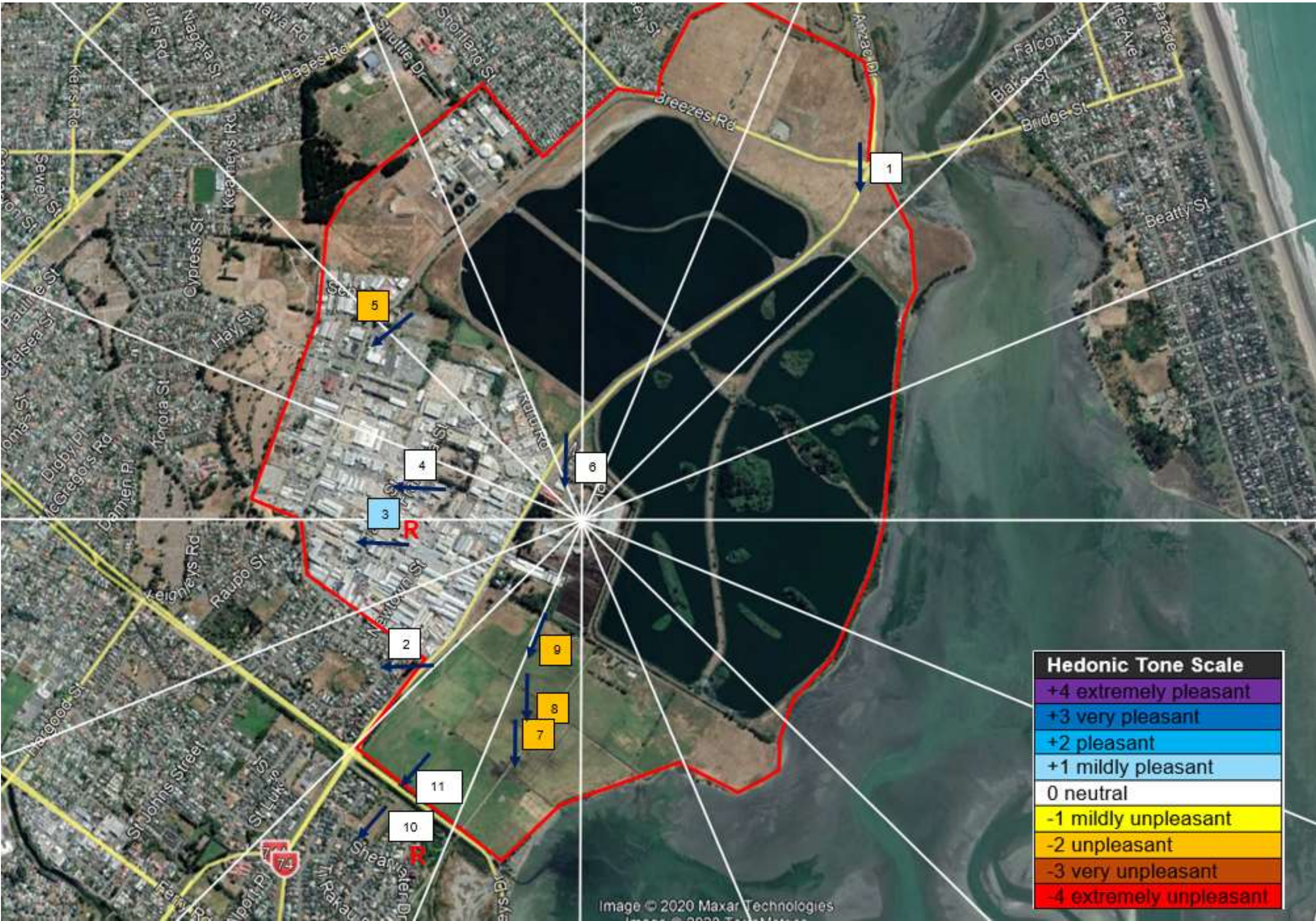


TABLE 2 HJ OBSERVATIONS – 21/7/2020

Location ID	1	2	3	4	5	6	7	8	9	10	11
Sector	2	11	13	13	15	1	9	9	9	10	10
Upwind/downwind	Upwind	Downwind	Downwind	Downwind	Outside	Upwind	Downwind	Downwind	Downwind	Downwind	Downwind
Date and time	21/07/2020 9:24	21/07/2020 9:50	21/07/2020 10:19	21/07/2020 10:45	21/07/2020 11:40	21/07/2020 12:01	21/07/2020 12:46	21/07/2020 13:01	21/07/2020 13:31	21/07/2020 13:58	21/07/2020 14:26
Wind direction	NW - NE	NE	E	E	NE	N - NNW	N	N	N	NE	NNE
Wind speed (m/s)	0	0 - 1.2	0 - 0.5	0	0.5 - 3.4	0.5 - 1.9	0.5 - 3.1	0.2 -2.4	1 - 2.7	0.1 - 1.5	0.2 - 1.2
Cloud cover (octa)	6	6	6	6	2	1	1	1	1	0	1
Temperature (Deg C)	18.1	15.3	15.4	15.6	17.9	18.9	19.8	21.9	23.6	17.9	19.3
Rain	none	none	none	none	none	none	none	none	none	none	none
Hedonic Tone	neutral	neutral	mildly pleasant	neutral	mildly unpleasant - unpleasant	neutral	Unpleasant	Unpleasant	Unpleasant	neutral	neutral
Character Descriptor	Percentage of odour character detected										
No odour	100%	100%	67%	100%	37%	93%	70%	42%	0%	100%	100%
Fragrant	0%	0%	8%	0%	0%	0%	0%	0%	0%	0%	0%
Sea/marine	0%	0%	0%	0%	0%	7%	0%	0%	0%	0%	0%
Rubbish	0%	0%	3%	0%	0%	0%	0%	0%	0%	0%	0%
Compost	0%	0%	0%	0%	0%	0%	23%	58%	98%	0%	0%
Musty, earthy, mouldy	0%	0%	13%	0%	0%	0%	12%	0%	0%	0%	0%
Like gasoline, solvent	0%	0%	8%	0%	0%	0%	0%	0%	0%	0%	0%
Fishy	0%	0%	0%	0%	63%	0%	0%	0%	0%	0%	0%
Intensity Descriptor	Percentage of intensity detected										
No odour	88%	93%	10%	93%	15%	70%	33%	0%	0%	87%	100%
Very weak	12%	7%	57%	7%	22%	23%	37%	25%	0%	13%	0%
Weak	0%	0%	33%	0%	42%	7%	28%	17%	40%	0%	0%
Distinct	0%	0%	0%	0%	22%	0%	2%	33%	58%	0%	0%
Strong	0%	0%	0%	0%	0%	0%	0%	25%	2%	0%	0%
Very strong	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Extremely strong	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%



FIGURE 3 HJ OBSERVATIONS – 21/7/2020





### 3.1.1 Day 1 Summary

At the start of Day 1 (Locations 1 -4) there was very slight to calm wind conditions and therefore the wind direction was variable. DVK observed very infrequent weak sea/marine odours at the upwind location (Location 1) during this early morning run, HJ did not detect any odour strong enough to provide a character to the odour (i.e. no odours above an intensity of 1).

At Location 2 weak solvent/diesel fumes odours were detected by DVK as a result of vehicles driving past the observation location.

The observations at Location 3 (Tanya Street) were made in response to a Smelt It app notification, where the complainant had observed odour rated at an intensity of 4, characterised as 'compost, silage, herbal, cut grass'. HJ and DVK scouted along Tanya Street. During the sweep intermittent weak odours consistent with the character described in the Smelt It app notification were detected along a small portion of Tanya Street. The Location 3 10 minute assessment was made at the location where the most intense/frequent odour was initially detected. However, an odour consistent with odour neutralising/masking sprays (a sweet/perfumy/fragrant odour), was detected by DVK and HJ during the observation. HJ did record some infrequent weak odours characterised as musty earthy/rubbish at this location.

Whilst travelling in the Bromley area, DVK and HJ noticed a fishy odour approximately 30 m downwind from the Aroma seafood processing facility. At this location, Location 5, DVK observed frequent 'fishy' odours with an intensity ranging between 0 – no odour to 4 - strong. HJ observed frequent 'fishy' odours with an intensity ranging between 0 – no odour to 3 – distinct.

Location 6 was the upwind observation for the second run (afternoon run). At this location mostly no odour was detected, HJ detected some odour characterised as 'sea marine'. During the afternoon the sun came out, the ambient temperature increased, and the wind speed increased slightly (light winds up to ~3 m/s). The wind direction also changed to be a more consistent northerly – north east.

After the upwind observation, DVK and HJ undertook a series of observations (Locations 7 – 9) downwind of the EcoDrop/Living Earth facilities. A compost/earthy, musty odour plume was observed to extend approximately 500 m downwind of the Living Earth southern boundary. The odour intensity increased closer to the source, at approximately 130 m south of the Living Earth boundary odours of an intensity of up to 4 – strong were detected.

The Location 10 observation was a response to a Smelt It notification, no odour was detected during the observation at Sweet Waters Place. However immediately after the observation was made a very brief compost/musty, earthy odour was detected by both HJ and DVK approximately 10 m to the north of the observation location.

Overall, the duplicate odour observations between HJ and DVK were similar in intensity and character at all locations over the course of the day. There were slight differences at some locations which are within the expected range of variance between different individuals.

### 3.2 Day 2 – 22<sup>nd</sup> July 2020

On this date only one odour scout (HJ) was used to make observations throughout the day. The results for this day's observations are presented in **Table 3** and **Figure 4**.



TABLE 3 HJ OBSERVATIONS – 22/7/2020

Location ID	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Sector	9	2	2	3	3	2	2	15	3	16	1	2	8	3
Upwind/downwind	Upwind	Downwind	Downwind	Downwind	Downwind	Downwind	Downwind	Downwind	Downwind	Downwind	Downwind	Downwind	Upwind	Downwind
Date and time	22/07/2020 9:02	22/07/2020 9:25	22/07/2020 9:47	22/07/2020 10:10	22/07/2020 10:31	22/07/2020 11:00	22/07/2020 11:25	22/07/2020 11:56	22/07/2020 12:16	22/07/2020 12:36	22/07/2020 13:10	22/07/2020 13:35	22/07/2020 13:51	22/07/2020 14:16
Wind direction	SSW	SSW	SSW	SW	SW	SSW	SW - SSW	SW	SW	SW	SW	SW	SW	SW
Wind speed (m/s)	19 - 6.1	3.6 - 6	3.4 - 4.7	2 - 5.4	3 - 6.2	31. - 5.5	2.4 - 5	1.4 - 3.6	0 - 2.1	1.6 - 3.2	2 - 3.6	2.6 - 5.2	0.5 - 1.4	2.1 - 4
Cloud cover (octa)	6	6	6	6	6	5	5	4	4	5	3	3	2	2
Temperature (Deg C)	11.9	11.9	10.5	11.5	11.8	11.3	11	12.2	13.2	13.9	14.7	14.7	14.5	15.9
Rain	none	none	none	none	none	none	none	none	none	none	none	none	none	none
Hedonic Tone	neutral	neutral	mildly unpleasant	neutral	neutral	mildly unpleasant	mildly unpleasant	neutral	neutral	neutral	neutral	neutral	neutral	neutral
Character Descriptor	Percentage of odour character detected													
No odour	100%	93%	67%	97%	93%	37%	68%	100%	98%	100%	98%	100%	100%	100%
Sea/marine	0%	0%	0%	3%	7%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Rubbish	0%	0%	13%	0%	0%	28%	17%	0%	0%	0%	0%	0%	0%	0%
Compost	0%	3%	0%	0%	0%	28%	15%	0%	2%	0%	0%	0%	0%	0%
Silage	0%	3%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Sewer odour	0%	0%	20%	0%	0%	7%	0%	0%	0%	0%	2%	0%	0%	0%
Intensity Descriptor	Percentage of intensity detected													
No odour	100%	68%	13%	77%	55%	0%	0%	0%	80%	97%	72%	92%	100%	100%
Very weak	0%	25%	53%	20%	38%	37%	68%	65%	18%	3%	27%	8%	0%	0%
Weak	0%	7%	33%	3%	7%	63%	32%	35%	2%	0%	2%	0%	0%	0%
Distinct	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Strong	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Very strong	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Extremely strong	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%



FIGURE 4 HJ OBSERVATIONS – 22/7/2020





### 3.2.1 Day 2 Summary

Day 2 was dominated by SSW – SW winds with variable speeds between a light breeze and a strong wind. Initially it was cool (~12 deg C) and overcast then later in the day the sun came out and the temperature warmed up a little (~15 deg C).

Intermittent weak rubbish/sewer odour was detected at Location 14, the odour scout suspected that the odour was more associated with the wastewater settling ponds rather than from EcoDrop.

Intermittent weak rubbish and compost odour was detected at Locations 17 and 18 which are approximately 1,400 m from the nearest boundary of EcoDrop.

Later in the day almost no odour was detected along Metro Place (Location 20) directly adjacent to, and downwind of, EcoDrop.

HJ responded to a Smelt It notification at Location 22, for a short time a very weak sewer odour was detected, but other than this there was no odour observed.

### 3.3 Day 3 – 23<sup>rd</sup> July 2020

On this date only one odour scout (HJ) was used to make observations throughout the day. The results for this day's observations are presented in **Table 4** and **Figure 5**.

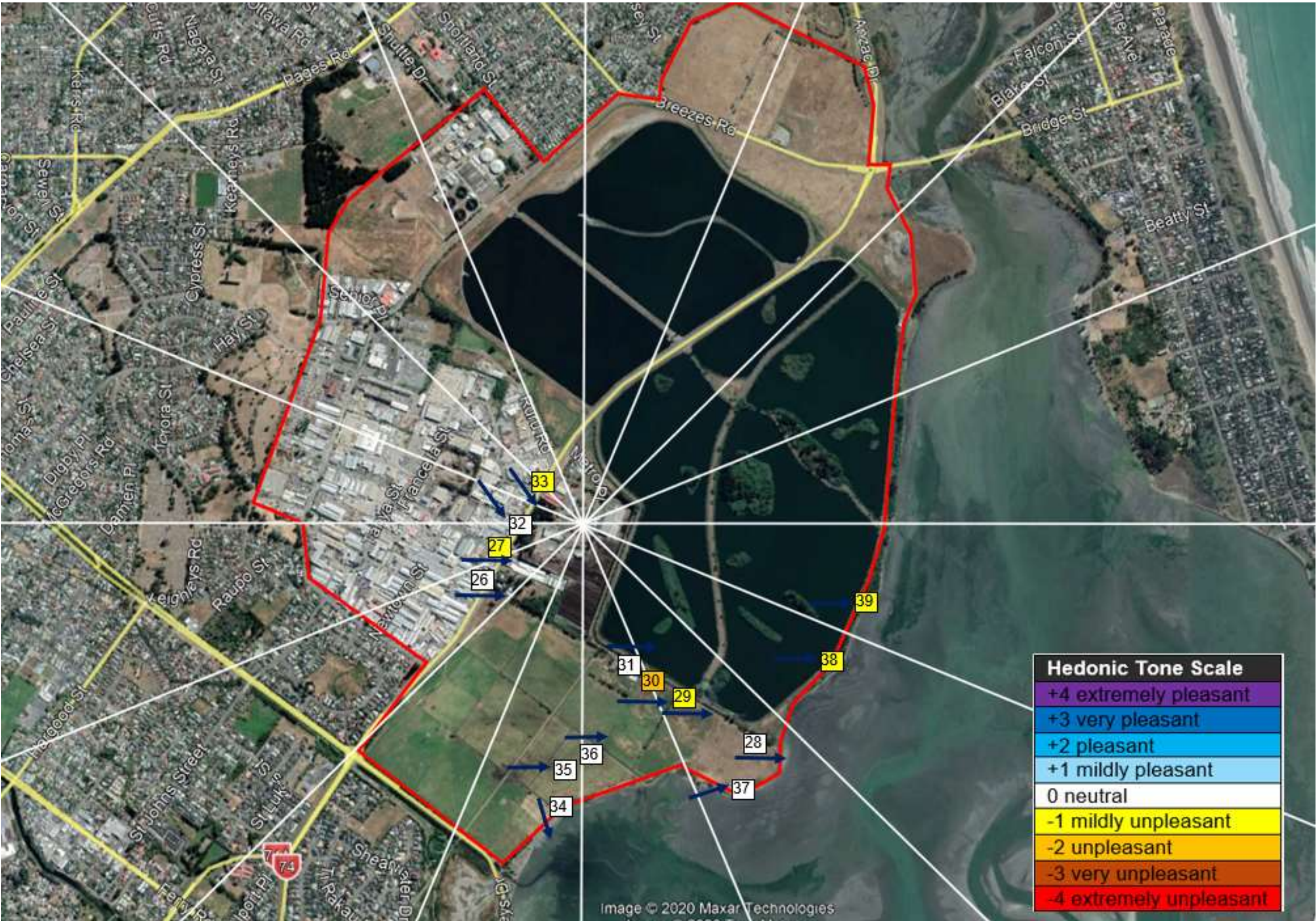


TABLE 4 HJ OBSERVATIONS – 23/7/2020

Location ID	26	27	28	29	30	31	32	33	34	35	36	37	38	39
Sector	11	12	7	7	8	8	12	14	9	9	8	7	6	5
Upwind/downwind	Upwind	Upwind	Downwind	Downwind	Downwind	Downwind	Upwind	Upwind	Downwind	Downwind	Downwind	Downwind	Downwind	Downwind
Date and time	23/07/2020 8:15	23/07/2020 8:35	23/07/2020 9:10	23/07/2020 9:35	23/07/2020 9:51	23/07/2020 10:07	23/07/2020 10:45	23/07/2020 11:08	23/07/2020 11:48	23/07/2020 12:08	23/07/2020 12:25	23/07/2020 12:47	23/07/2020 13:08	23/07/2020 13:32
Wind direction	W	W	W	W	W	W	NW	NW	NNW	W	W	WSW	W	W
Wind speed (m/s)	0 - 0.2	0 - 0.2	0.0 - 0.5	0 - 0.2	0	0	0 - 0.2	0 - 0.2	0 - 0.3	0 - 0.4	0 - 0.2	0 - 0.2	0	0 - 0.2
Cloud cover (octa)	4	5	6	6	7	7	8	8	8	8	8	8	8	8
Temperature (Deg C)	10.6	11	8.6	8.5	10.7	10.7	10.3	10	9.5	9.2	9.2	9	9.5	9.6
Rain	none	none	none	none	none	none	none	none	none	none	none	none	none	none
Hedonic Tone	neutral	mildly unpleasant	neutral	mildly unpleasant	mildly unpleasant - unpleasant	neutral	neutral	mildly unpleasant	neutral	neutral	neutral	neutral	neutral - mildly unpleasant	neutral - mildly unpleasant
Character Descriptor	Percentage of odour character detected													
No odour	100%	60%	97%	42%	12%	97%	100%	77%	80%	100%	100%	100%	87%	83%
Fragrant	0%	0%	0%	2%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Perfumy	0%	0%	0%	2%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Herbal, green, cut grass	0%	0%	0%	0%	0%	3%	0%	0%	0%	0%	0%	0%	0%	0%
Rubbish	0%	0%	2%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Compost	0%	0%	2%	38%	88%	0%	0%	13%	2%	0%	0%	0%	0%	0%
Musty, earthy, mouldy	0%	0%	0%	17%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Like gasoline, solvent	0%	40%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Sulphidic	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	7%	8%
Sewer odour	0%	0%	0%	0%	0%	0%	0%	10%	0%	0%	0%	0%	7%	8%
Intensity Descriptor	Percentage of intensity detected													
No odour	100%	15%	90%	7%	0%	92%	100%	0%	58%	93%	100%	100%	55%	47%
Very weak	0%	45%	7%	35%	12%	5%	0%	40%	22%	7%	0%	0%	32%	37%
Weak	0%	35%	3%	53%	43%	3%	0%	37%	20%	0%	0%	0%	13%	17%
Distinct	0%	5%	0%	5%	30%	0%	0%	23%	0%	0%	0%	0%	0%	0%
Strong	0%	0%	0%	0%	15%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Very strong	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Extremely strong	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%



FIGURE 5 HJ OBSERVATIONS – 23/7/2020





### 3.3.1 Day 3 Summary

Day 3 was dominated by very light/calm conditions, mostly the wind drift was from the west. It was an overcast, cold day (~10 deg C). Due to these very light/calm wind conditions any odour plumes present are likely to be poorly dispersed.

Near the Caltex station on Dyers Road mildly unpleasant gasoline/solvent like odours were detected at an upwind location (Location 27).

Compost odour was detected at Locations 29 and 30 which are approximately 500 m and 330 m (respectively) from the nearest boundary of Living Earth. At Location 29 the odour was characterised as having a mildly unpleasant hedonic tone and the odour intensity ranged from 0 – no odour through to 3 – distinct. At Location 30 the odour was characterised as having a mildly unpleasant - unpleasant hedonic tone and the odour intensity ranged from 1 – very weak through to 4 – strong. The compost odour plume appears to have been fairly localised around Locations 29 and 30, other nearby observations did not detect compost like odour.

At an upwind monitoring location (Location 33) directly adjacent to the Living Earth site, some compost/sewer like odour was detected, which could indicate that there was another source of odour of this character in the area, or it could be a result of the calm wind conditions.

At monitoring Locations 38 and 39 a sulphidic/sewer type odour was detected, this is likely a result of the adjacent mudflats in this area.

### 3.4 Day 4 – 24<sup>th</sup> July 2020

On this date only one odour scout (HJ) was used to make observations throughout the day. The results for this day's observations are presented in **Table 5** and **Figure 6**.

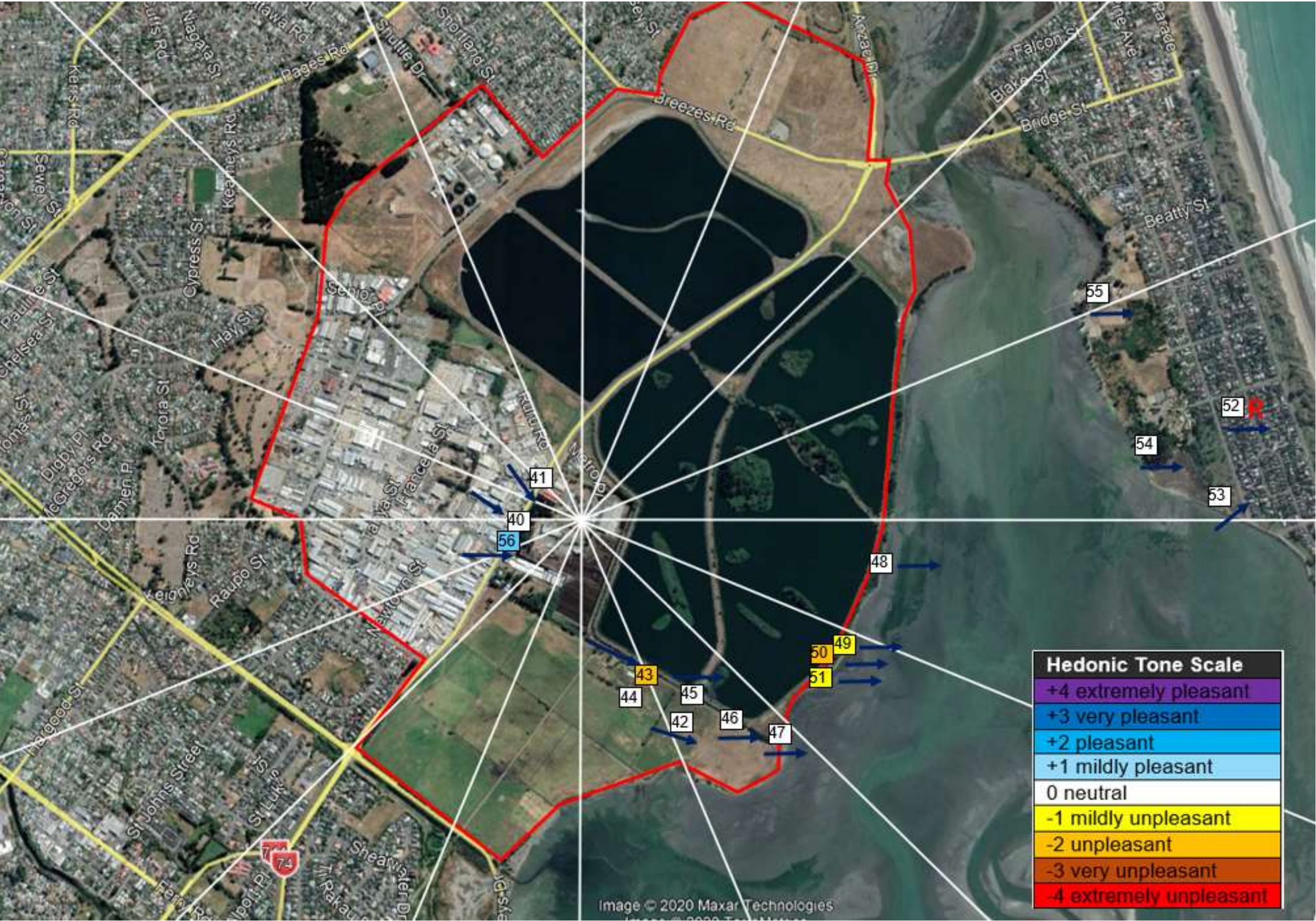


TABLE 5 HJ OBSERVATIONS – 24/7/2020

Location ID	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56
Sector	12	14	8	8	8	7	7	7	5	5	6	6	4	4	4	3	12
Upwind/downwind	Upwind	Upwind	Downwind	Downwind	Downwind	Downwind	Downwind	Downwind	Downwind	Downwind	Downwind	Downwind	Downwind	Downwind	Downwind	Downwind	Downwind
Date and time	24/07/2020 8:05	24/07/2020 8:21	24/07/2020 9:01	24/07/2020 9:25	24/07/2020 9:40	24/07/2020 10:05	24/07/2020 10:21	24/07/2020 10:39	24/07/2020 11:04	24/07/2020 11:19	24/07/2020 11:34	24/07/2020 11:48	24/07/2020 8:05	24/07/2020 12:40	24/07/2020 12:58	24/07/2020 13:30	24/07/2020 13:52
Wind direction	NW	NW	WNW	WNW	-	W	W	W	W	W	W	W	W	SW	W	W	W
Wind speed (m/s)	0	0 - 0.4	0	0	0	0 - 0.1	0 - 0.1	0.4 - 0.7	0 - 0.1	0	0	0	0	0 - 0.1	0 - 0.2	0	0 - 0.3
Cloud cover (octa)	1	1	0	0	0	0	0	0	0	0	0	1	1	1	1	1	2
Temperature (Deg C)	1.2	2.1	2.5	3.2	3.6	4.2	4.5	5.1	6.4	7.5	7.8	7.9	8.1	10.2	10.4	9.8	11.2
Rain	none	none	none	none	none	none	none	none	none	none	none	none	none	none	none	none	none
Hedonic Tone	neutral	neutral	neutral	unpleasant	neutral	neutral	neutral	neutral	neutral	mildly unpleasant	unpleasant	mildly unpleasant	neutral	neutral	neutral	neutral	mildly pleasant
Character Descriptor	Percentage of odour character detected																
No odour	100%	97%	98%	17%	92%	100%	100%	100%	100%	88%	60%	75%	100%	97%	100%	100%	80%
Fragrant	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	2%
Perfumy	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	2%
Sea/marine	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	3%	0%	0%	0%
Herbal, green, cut grass	0%	3%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	8%
Bark-like, birch bark	0%	0%	0%	0%	5%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Soapy	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	8%
Rubbish	0%	0%	0%	42%	2%	0%	0%	0%	0%	7%	18%	13%	0%	0%	0%	0%	0%
Compost	0%	0%	2%	42%	2%	0%	0%	0%	2%	5%	18%	12%	0%	0%	0%	0%	0%
Sulphidic	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	3%	0%	0%	0%	0%	0%	0%
Intensity Descriptor	Percentage of intensity detected																
No odour	100%	90%	90%	0%	60%	100%	100%	100%	100%	52%	25%	0%	100%	93%	100%	100%	37%
Very weak	0%	7%	8%	17%	32%	0%	0%	0%	0%	37%	35%	75%	0%	3%	0%	0%	43%
Weak	0%	3%	2%	40%	8%	0%	0%	0%	0%	12%	30%	25%	0%	3%	0%	0%	20%
Distinct	0%	0%	0%	38%	0%	0%	0%	0%	0%	0%	10%	0%	0%	0%	0%	0%	0%
Strong	0%	0%	0%	5%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Very strong	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Extremely strong	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%



FIGURE 6 HJ OBSERVATIONS – 24/7/2020





#### 3.4.1 Day 4 Summary

Day 4 was a cold frosty morning with calm wind conditions for the whole day. Mostly the air drift was observed from the west. It was a sunny cold day, starting at 1 deg C and only getting to 11 deg C by mid afternoon.

Early in the morning there was no appreciable odour detected at the upwind locations (Locations 40 and 41).

A survey of the paddocks in the closest accessible downwind location was undertaken. At one location (Location 43) unpleasant rubbish and compost type odour with intensities ranging from 0 – no odour to 4 – strong were observed. This location is approximately 300 m from the nearest Living Earth boundary. However, this rubbish and compost type odour appeared to be quite localised as adjacent monitoring locations did not detect much odour.

Later in the morning mildly unpleasant – unpleasant compost/rubbish odour was detected at three downwind locations (Locations 49 – 51). These locations are approximately 1,000 m from the Living Earth/EcoDrop facility boundaries. The intensity of these odours ranged from 0 – no odour to 3 – distinct.

In response to a Smelt It notification, an odour observation (Location 52) was conducted at 45 Halsey Street. No odour was detected at this location. This was the only notification from the Smelt It app which recorded objectionable odour during the Day 4 survey.

At the end of the survey another upwind observation was made on Dyers Road (Location 56), mildly pleasant weak odours of a fragrant, perfumy, herbal green cut grass, soapy character were observed.

#### 3.5 Day 5 – 27<sup>th</sup> July 2020

On this date only one odour scout (HJ) was used to make observations throughout the day. The results for this day's observations are presented in **Table 6** and **Figure 7**.

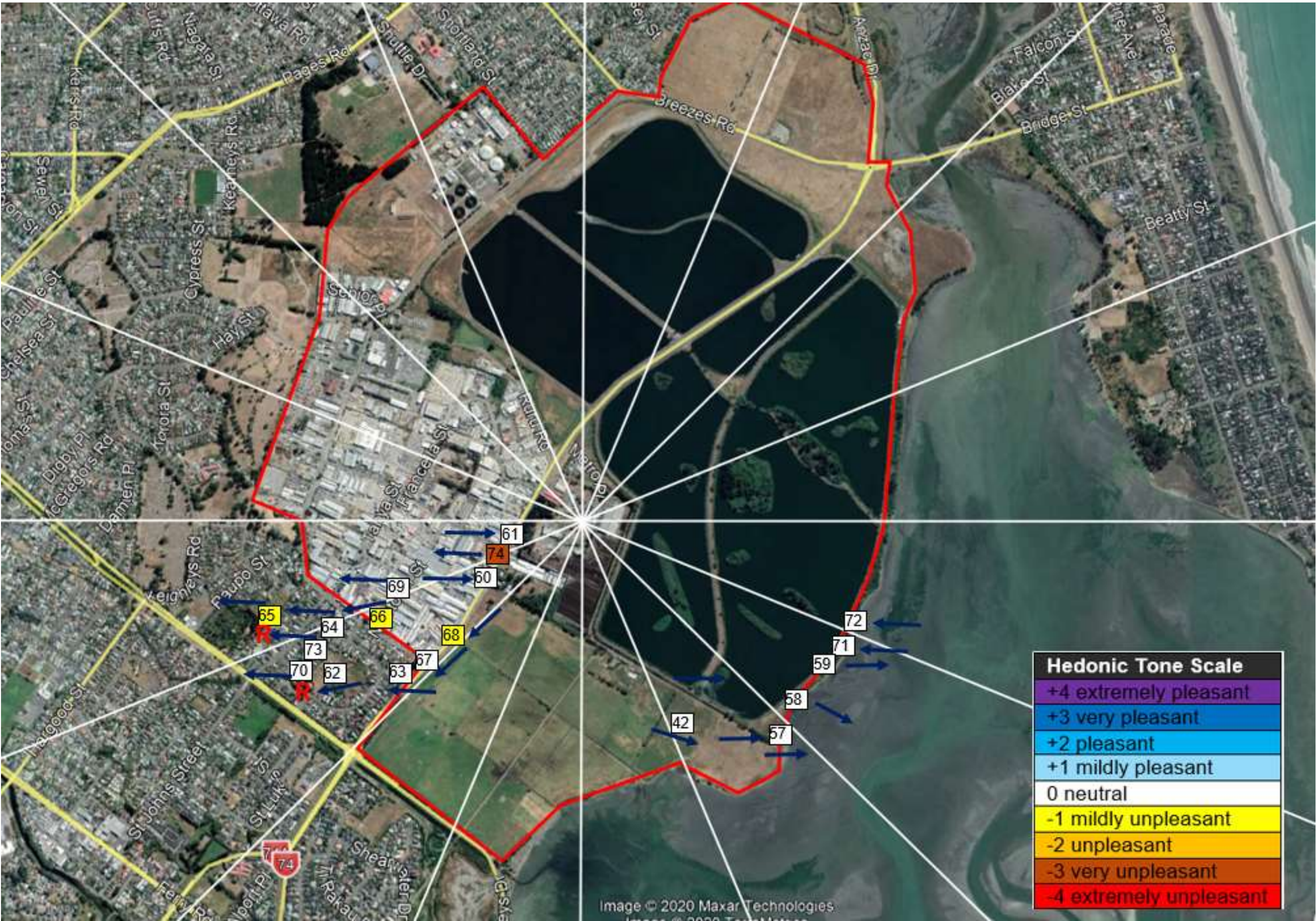


TABLE 6 HJ OBSERVATIONS – 27/7/2020

Location ID	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74
Sector	7	7	6	11	12	11	11	11	12	11	11	11	12	11	6	5	11	12
Upwind/downwind	Downwind	Downwind	Downwind	Upwind	-	Downwind	Downwind	Downwind	Downwind	Downwind	Downwind	Downwind	Downwind	Downwind	Upwind	Upwind	Downwind	Downwind
Date and time	27/07/2020 9:15	27/07/2020 9:32	27/07/2020 9:51	27/07/2020 10:21	27/07/2020 9:15	27/07/2020 11:02	27/07/2020 11:23	27/07/2020 11:40	27/07/2020 11:57	27/07/2020 12:01	27/07/2020 12:23	27/07/2020 12:37	27/07/2020 12:59	27/07/2020 13:17	27/07/2020 13:52	27/07/2020 14:10	27/07/2020 14:37	27/07/2020 14:54
Wind direction	W	W - SW	W	W	W - E	ENE	E	E	E	ENE	NE	NE	E	E	E	E	E	E
Wind speed (m/s)	0.5 - 0.8	0 - 0.4	0 - 0.1	0 - 0.1	0 - 0.2	0.2 - 0.9	0 - 0.6	0.2 - 0.6	0.2 - 0.7	0.2 - 0.5	0 - 0.8	0.9 - 1.5	0.2 - 0.8	1 - 2.7	1.5 - 2.9	1.7 - 3.1	0.2 - 0.9	0 - 0.1
Cloud cover (octa)	3	3	2	2	2	2	2	1	1	1	1	1	1	1	2	2	2	2
Temperature (Deg C)	6.5	7.2	7.1	8.1	7.2	8.4	8.6	8.6	8.6	9.5	10.2	10.2	10.5	10.2	10.2	10.5	11.1	11.1
Rain	none	none	none	none	none	none	none	none	none	none	none	none	none	none	none	none	none	none
Hedonic Tone	neutral	neutral	neutral	neutral	neutral	neutral	neutral	neutral	mildly unpleasant	mildly unpleasant	neutral	mildly unpleasant	neutral	neutral	neutral	neutral	neutral	unpleasant - very unpleasant
Character Descriptor	Percentage of odour character detected																	
No odour	100%	97%	90%	97%	68%	100%	100%	95%	80%	37%	97%	72%	97%	88%	97%	100%	87%	0%
Bakery (fresh bread)	0%	0%	0%	3%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Sea/marine	0%	0%	5%	0%	0%	0%	0%	0%	0%	0%	0%	3%	0%	0%	3%	0%	0%	0%
Herbal, green <sup>11</sup> , cut grass	0%	0%	0%	0%	0%	0%	0%	0%	2%	0%	0%	0%	0%	5%	0%	0%	0%	0%
Burnt, Smoky	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	3%	0%	0%	0%	0%	0%	0%
Chemical	0%	0%	0%	0%	0%	0%	0%	0%	0%	32%	0%	0%	0%	0%	0%	0%	0%	0%
Rubbish	0%	2%	0%	0%	17%	0%	0%	2%	8%	0%	2%	10%	2%	0%	0%	0%	7%	50%
Compost	0%	2%	0%	0%	15%	0%	0%	3%	2%	0%	2%	10%	2%	0%	0%	0%	7%	50%
Like gasoline, solvent	0%	0%	0%	0%	0%	0%	0%	0%	0%	32%	0%	0%	0%	7%	0%	0%	0%	0%
Sulphidic	0%	0%	5%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Intensity Descriptor	Percentage of intensity detected																	
No odour	100%	92%	72%	92%	52%	100%	100%	75%	65%	10%	77%	5%	92%	80%	92%	100%	72%	0%
Very weak	0%	5%	18%	5%	17%	0%	0%	20%	17%	27%	20%	68%	5%	8%	5%	0%	15%	0%
Weak	0%	3%	10%	3%	15%	0%	0%	5%	17%	30%	3%	27%	3%	12%	3%	0%	13%	10%
Distinct	0%	0%	0%	0%	17%	0%	0%	0%	2%	30%	0%	0%	0%	0%	0%	0%	0%	53%
Strong	0%	0%	0%	0%	0%	0%	0%	0%	0%	3%	0%	0%	0%	0%	0%	0%	0%	35%
Very strong	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	2%
Extremely strong	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%



FIGURE 7 HJ OBSERVATIONS – 27/7/2020





### 3.5.1 Day 5 Summary

Day 5 started off with calm wind conditions with westerly air flows. A little after 9 am the wind shifted to a light easterly. It was a sunny day with relatively cool temperatures.

Early in the morning, observations were made downwind and upwind of the EcoDrop and Living Earth facilities (Locations 58 – 60). No substantive odour was detected during these observations.

During the observation at Location 61, the wind direction changed half way through the 10 minute observation and a weak – distinct compost/rubbish odour was detected coming from the direction of the Living Earth/EcoDrop sites.

The majority of the remaining observations for the day were made within Sectors 11 and 12 (southwest of the Living Earth/EcoDrop sites) downwind of the prevailing east/northeast winds that occurred over the afternoon. On two occasions (Locations 65 and 70) the odour scout responded to Smelt It app notifications. At Location 65 (Seascape Gardens) the odour scout recorded mildly unpleasant compost/rubbish odour.

At Location 66 (near Newton Street in the industrial area) mildly unpleasant chemical/gasoline/solvent odour was detected at intensities ranging from 0 – no odour to 4 – strong.

At Location 68 (on Dyers Road approximately 400 m from the Living Earth site boundary) mildly unpleasant rubbish and compost odour was detected at intensities ranging from 0 – no odour to 2 – weak.

Towards the end of the sampling day, a final observation was made on the downwind Living Earth boundary (Location 74). At this location very unpleasant rubbish and compost odour was detected at intensities ranging from 2 – weak to 5 – very strong.

## 4 Closing

This report presents the results of a five day odour scout monitoring program undertaken by NZ Air in July 2020 on behalf of Environment Canterbury.

## A. Appendix A – Field sheets and parameter descriptors



## Odour Diary Record Sheet

<b>Name:</b>				<b>Sample site:</b>					
<b>Date (dd/mm/yy):</b>				<b>Sample Start Time (hh:mm):</b>				<b>Rain (Circle one):</b> None / Misty / Drizzle / Steady / Torrential	
<b>Wind direction (coming from)<sup>3</sup>:</b>				<b>Wind Strength<sup>4</sup>:</b>					
<b>Hedonic Tone<sup>5</sup>:</b>				<b>Cloud Cover:</b>				<b>Temperature:</b>	
<b>Approximate Plume Width<sup>6</sup>:</b>				<b>Approximate Plume Length<sup>6</sup>:</b>					

Sample number	Odour Intensity Level (1-6) <sup>2</sup>	Odour descriptor (1-40) <sup>1</sup>		Sample number	Odour Intensity Level (1-6) <sup>2</sup>	Odour descriptor (1-40) <sup>1</sup>		Sample number	Odour Intensity Level (1-6) <sup>2</sup>	Odour descriptor (1-40) <sup>1</sup>
0:10				3:30				6:50		
0:20				3:40				7:00		
0:30				3:50				7:10		
0:40				4:00				7:20		
0:50				4:10				7:30		
1:00				4:20				7:40		
1:10				4:30				7:50		
1:20				4:40				8:00		
1:30				4:50				8:10		
1:40				5:00				8:20		
1:50				5:10				8:30		
2:00				5:20				8:40		
2:10				5:30				8:50		
2:20				5:40				9:00		
2:30				5:50				9:10		
2:40				6:00				9:20		
2:50				6:10				9:30		
3:00				6:20				9:40		
3:10				6:30				9:50		
3:20				6:40				10:00		

Odour samples every 10 seconds. The time between the 10 seconds is disregarded (interval method). Breath normally rather than sniffing.

If odour descriptor is 40 then please describe:

### 3 Wind Direction Orientation Aid



### Measuring Cloud Cover

Okta No.	Description
0	Clear Sky
1	Sunny
2	Mostly sunny
3	
4	Half the sky is covered in cloud
5	
6	Mostly cloudy
7	Considerable cloudiness
8	Overcast
F	Fog / Mist

### 1 Odour Character Discriptors

1	Fragrant	21	Like blood, raw meat
2	Perfumy	22	Rubbish
3	Sweet	23	Compost
4	Fruity	24	Silage
5	Bakery (fresh bread)	25	Sickening
6	Coffee-like	26	Musty, earthy, mouldy
7	Spicy	27	Sharp, pungent, acid
8	Meaty (cooked, good)	28	Metallic
9	Sea/marine	29	Tar-like
10	Herbal, green, cut grass	30	Oily, fatty
11	Bark-like, birch bark	31	Like gasoline, solvent
12	Woody, resinous	32	Fishy
13	Medicinal	33	Putrid, foul, decayed
14	Burnt, smoky	34	Paint-like
15	Soapy	35	Rancid
16	Garlic, onion	36	Sulphidic
17	Cooked vegetables	37	Dead animal
18	Chemical	38	Faecal (like manure)
19	Etherish, anaesthetic	39	Sewer odour
20	Sour, acrid, vinegar	40	Other(record description)

### 4 Wind Strength Scale

Beaufort Force	Descriptor	Specification on land
0	Calm	Smoke rises vertically.
1	Very Light	Direction of wind shown by smoke drift but not by wind vanes.
2	Light breeze	Wind felt on face, leaves rustle, ordinary wind vane moved by wind.
3	Gentle breeze	Leaves and small twigs in constant motion, wind extends light flag.
4	Moderate breeze	Wind raises dust and loose paper, small branches move.
5	Fresh breeze	Small trees in leaf start to sway, crested wavelets on inland waters.
6	Strong breeze	Large branches in motion, whistling in telegraph wires, umbrellas used with
7	Near gale	Whole trees in motion, inconvenient to walk against wind.
8	Gale	Twigs break from trees, difficult to walk.
9	Strong gale	Slight structural damage occurs, chimney pots and slates removed.
10	Storm	Trees uprooted, considerable structural damage occurs.
11	Violent storm	Widespread damage.
12	Hurricane	Widespread damage.

### 2 Odour Intensity Scale

Intensity Level	Odour intensity
1	Very Weak
2	Weak
3	Distinct
4	Strong
5	Very strong
6	Extremely Strong

### 5 Hedonic Tone

Rating	Descriptor
-4	Extremely unpleasant
-3	Very unpleasant
-2	Unpleasant
-1	mildly unpleasant
0	Neutral
1	Mildly pleasant
2	Pleasant
3	Very Pleasant
4	Extremely Pleasant

Record hedonic tone at the end of the survey as an overall impression