

**Environment and Transportation Department,
Block 2, Floor 6,
Civic Offices,
Dublin 8.**

30 November 2016.

**To Each Member of the
Environment Strategic Policy Committee**

Dublin Waste to Energy Ash Management Plan

Bottom Ash (IBA)

- IBA is a non-hazardous by-product of the Waste to Energy process.
- We understand that none of the c.450 Municipal Waste to Energy Plants in operation in Europe produce hazardous bottom ash.
- The IBA tonnage output from the Poolbeg plant (c. 132,000 tonnes) will equate to c. 22% of the waste tonnage input. The facility has IBA storage capacity of 10,000 tonnes.
- From day one the IBA will be sampled and sent to an independent accredited laboratory for analysis in accordance with the EPA licence and procedures, the results of which will be expected back in 4 – 6 days.
- Once the test results are received, the IBA from the facility will be moved in covered vehicles to the south docks for loading into ships for onward shipment to two facilities in Europe.
- The shipments will be between 3,000 – 4,000 tonnes each and the IBA will be moved to the docks during a 24 hour period.
 - It is noted that 10% of the IBA will be ferrous and non-ferrous metals which will be recovered for recycling at the destination facilities.
 - After the metal is removed the IBA aggregate is allowed to mature prior to being used in construction related applications.
- IBA is used throughout Europe in road construction, aggregate replacement, embankments and in block manufacturing. In the UK alone 86% of the IBA produced is used for these purposes.

Fly Ash (APCR)

- The fly ash will be automatically classified as hazardous waste.
- The tonnage produced (c. 27,000 tonnes) equates to c. 4.5% of the waste input tonnage.
- It will be removed from site in sealed containers by a licensed hazardous waste contractor to a licenced hazardous waste transfer facility.
- The fly ash will be removed on a daily basis in 24 tonne loads and will be stored at the licenced hazardous waste facility until sufficient volume is accumulated whereupon it will be shipped to Europe for recovery.



Comhairle Cathrach
Bhaile Átha Cliath
Dublin City Council

**Environment and Transportation Department,
Block 2, Floor 6,
Civic Offices,
Dublin 8.**

30th November 2016.

**To Each Member of the
Environment Strategic Policy Committee**

Dublin Waste to Energy (DWtE) Project

1. Construction Status

Construction remains on schedule for completion in Q3 2017.

1.1 Progress to Date

Progress in the key areas are summarised below:

Construction

- PM Group Limited, the civil designer and construction manager continue to manage and monitor all construction activity on site.
 - The main focus of PM Group and their subcontractors remains:
 - The completion of the building envelope, with building enclosure steel installation now complete and the cladding and roofing installation now reaching 60% and 82% complete respectively.
 - Finalising the installation of the two stacks for the air pollution control system,
 - The installation of the ramp to the tipping hall,
 - The completion of the internal road network, which will service the site.
- Hitachi Zosen Inova (HZI), the process systems designer continues to manage all process equipment installation and facility commissioning through to the commencement of operations. Work is progressing well on:
 - The installation of cable trays and routing of cable for the control and electrical systems.
 - The commissioning of mechanical and electrical subsystems.



Site Aerial View Looking Southeast November 2016 (Copyright PML)



Site Aerial View Looking Northeast October 2016 (Copyright PML)



Site Aerial view looking East October 2016 (Copyright PML)

2. Environmental Impact

Environmental monitoring and mitigation measures continued to be implemented during the construction phase of the DWtE facility and the construction phase environmental report for quarter 3 (Jul - Sept) 2016 is presented as Appendix 1 to this report.

Additionally the wildfowl monitoring report for winter 2015/2016 is presented as Appendix 2 to this report.

All reports are also available for download at the Dublin Waste to Energy Website.

3. Community Liaison

To date the CGLC has approved in principle 31 grant applications with a decision on 1 application still to be finalised. All grant applicants have been informed of the CGLC decisions. The CGLC will publish a list of the successful applicants on the Dublin Waste to Energy website and the CLGC website once Data Protection issues have been verified.

The GCLC has agreed that Dublin City Council will provide an internal assessor to report on the progress and value of the projects as they occur.

The CGLC are scheduled to meet on the 26th January 2017 to review progress on the drawdown of grants approved. They will also review the Projects Grant Scheme 2016 and discuss the Projects Grants Scheme for 2017.

4. Compliance with statutory consents

There are no non-compliance issues to report.

Dick Brady

Assistant Chief Executive.

Dublin Waste to Energy

Construction Phase Environmental Monitoring Report - Quarter 3 (July - September) 2016

| Signoff | Originator | Checked | Approver | Date |
|---------|------------|-------------|---------------|--------------------------------|
| Name | Ray Derrig | Ciaran Reay | Keith Elliott | 23 rd November 2016 |

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1 Introduction

An environmental monitoring programme has been implemented during the construction stage of the Dublin Waste to Energy (DWTE) Project. In conjunction with the monitoring, a number of controls and procedures have been implemented during construction activities to avoid, or minimise, potential adverse impacts to the environment and local community.

The monitoring programme assists in demonstrating compliance with the conditions and requirements laid out in An Bord Pleanála Order-29S.EF2022, Condition 13d; *“A scheme for monitoring noise, dust deposition and suspended solids in surface water run-offs and adjacent waters shall be prepared for the construction phase of the development. Details of the scheme shall be made available for inspection at the offices of Dublin City Council and at a local office in the Ringsend/Poolbeg area prior to the commencement of construction works. Monitoring shall be carried out during the construction phase and reports on the monitoring shall be made available for inspection at the offices in question on a 3 monthly basis. The reports shall compare monitored results with standards set out in the environmental impact statement or standards given in recognised national or international guidelines as relevant.”*

Construction of the DWTE facility recommenced in October 2014 and an environmental monitoring programme in accordance with the 'Dublin Waste to Energy - Construction Phase Monitoring Scheme' September 2009 has been implemented. The 3rd Quarterly Report 2016 on the Construction Phase Monitoring Scheme relates to environmental monitoring undertaken for the period of July to September 2016. The PM Group construction management team were present on site throughout the July to September 2016 monitoring period. The PM Group construction management team ensured construction works were undertaken to comply with environmental procedures for the site. Environmental monitoring with regards to noise, dust deposition and suspended solids in surface water commenced with construction works.

2 Local Environment

The main population centres of Ringsend, Irishtown and Sandymount are located approximately 1km from the boundary of the site.

The closest sensitive receptors to the site are the residential properties at Pigeon House Road which are located approximately 865m west of the site boundary. A map of sensitive locations and environmental monitoring points (noise, dust and surface water) are included in Figure 2.1.

The identified sensitive noise locations are N1 – N6 as follows:

- N1 - Rehab Institute
- N2 – Seafort Avenue
- N3 – Beach Avenue
- N4 – Leukos Road
- N5 – Pigeon House Road
- N6 – Walkway (Irishtown Nature Reserve)



Figure 2.1: Environmental Monitoring Locations

3 Noise

Monitoring of noise levels at sensitive locations is required during construction to assess compliance with the requirements of the Environmental Impact Statement (EIS) and An Bord Pleanála Order-29S.EF2022, Condition 13d. Refer to Figure 2.1 in Section 2 for the monitoring locations.

3.1 Noise Guidance & Standards

The noise monitoring was conducted in accordance with the following guidance:

- International Standard ISO 1996-1:2003 - Acoustics – Description, Measurement and assessment of Environmental Noise
- BS 4142:2014 - Methods for rating and assessing industrial and commercial sound
- BS 5228-1:2009 + A1:2014 – Code of practice for noise and vibration control on construction and open sites - Part 1: Noise.

3.2 Measurement Parameters

Noise is measured in terms of decibels (dB). The various measurement parameters and noise terminology are defined below.

- Decibel (dB)

Decibel (dB) is the standard unit for expressing the noise level (sound pressure level). It is calculated as a logarithm of the intensity of sound. It is derived from the logarithm of the ratio between the value of a quantity and a reference quantity. For sound pressure level the reference quantity is $20\mu\text{Pa}$ which is the threshold of normal hearing and equates to 0dB. At the upper end of the scale 140dB is the threshold of pain.

- A-weighted Decibel (dBA)

Decibels measured on a sound level meter incorporating a frequency weighting (A weighting) which differentiates between sound of different frequency (pitch) in a similar way to the human ear. This takes account of the fact that the human ear has different sensitivities to sound at different frequencies.

- L_{Aeq}

The equivalent continuous sound level – the sound pressure level of a steady sound having the same energy as a fluctuating sound over a specified measuring period. It can be considered similar to an average level. The L_{Aeq} value is the A-weighted Leq.

- L_{A90} and L_{A10} Values

The L_{A90} and L_{A10} values represent the A-weighted sound pressure levels exceeded for a percentage of the instrument measuring time. The L_{A90} represents the sound pressure level exceeded for 90% of the monitoring period and is a good indicator of the background noise level excluding peak noise events. L_{A10} indicates the sound pressure level exceeded for 10% of the monitoring period and is a good parameter for expressing event noise such as passing traffic.

- L_{AMax} (dBA)

The maximum instantaneous value recorded over the monitoring period including A-weighting

- Measurement Time

The noise monitoring will be undertaken over a 30min time interval which is a sufficient time to establish that the measured noise adequately represents the subject source of the noise.

3.3 Construction Noise Limits at Sensitive Locations

Ambient noise levels at the nearest sensitive locations (Sandymount and Ringsend areas) to the site have been established based on review of the Environmental Impact Statement, Dublin City Noise Map model and preconstruction noise monitoring. These ambient measurements at the noise sensitive locations are compared against the values identified in "British Standard 5228-1:2009+A1:2014: Code of practice for noise and vibration control on construction and open sites – Part 1:Noise " and maximum permissible noise levels at façade dwellings are recommended. The maximum noise levels are presented in Table 3.1 below.

Ambient noise level at sensitive locations is found to be similar or higher than those monitored at site boundary locations. The noise at sensitive receptors is affected by localised noise sources, mainly road traffic with any noise sources emitted from site difficult to define. For this reason site boundary noise monitoring will be the main noise source monitored as opposed to sensitive locations. The site boundary noise monitored is calculated to determine its contribution to local residential areas and compared to British Standard 5228-1:2009+A1:2014: Code of practice for noise and vibration control on construction and open sites – Part 1:Noise "

Table 3.1: Maximum Permissible Noise Levels at the Facade of Dwellings during Construction

| | Sensitive Locations | | | | | |
|--|---------------------|----------------|--------------|-------------|-------------------|-------------------------------|
| | Rehab Institute | Seafort Avenue | Beach Avenue | Leukos Road | Pigeon House Road | Walkway Irishtown Nature Park |
| Daytime Monday - Friday 0700hrs to 1900hrs Rating level, L_{Aeq} (1hr)dBA | 65 | 65 | 65 | 65 | 65 | 65 |
| Evenings and Weekends 1900hrs to 1100hrs Rating level, L_{Aeq} (1hr)dBA | 55 | 55 | 55 | 55 | 55 | 55 |
| Night time 2300hrs to 0700hrs Rating level, L_{Aeq} (1hr)dBA | 50 | 50 | 50 | 50 | 50 | 50 |

3.4 Noise Monitoring Results

Monitoring was undertaken at site boundaries and sensitive locations during construction works. The survey was carried out over the months July to September 2016. The surveys involved a 30 minute sample period taken at each of the noise monitoring locations.

3.4.1 Noise Calculations from Boundary Sampling Locations

Noise levels were monitored at the site boundary locations to enable the contribution of the July to September 2016 DWTE site activities to the noise levels at the sensitive receptors to be calculated (using the 'British Standard 5228-1:2009+A1:2014: Code of practice for noise and vibration control on construction and open sites – Part 1: Noise'). The calculated contribution was then compared to the noise levels monitored at the sensitive receptors to establish whether site activities were likely to be causing a significant negative impact at the sensitive receptors.

Monitored noise levels at the western and southern boundaries, as the closest boundaries to the sensitive receptors, were selected to be used in the calculation of noise levels at the sensitive receptors. On this basis, when both are available, the southern boundary is used to calculate the noise level contributions at the Rehab Institute, Seafort Avenue, Beach Avenue and Irishtown Nature Park with the western boundary used to calculate the noise level contributions at the Pigeon House Road and Leukos Road.

Using the BS 5228 Standard calculation, the highest contribution of noise calculated for the months of July to September 2016 at each of the sensitive locations are presented in Table 3.2.

Table 3.2: The Contribution of the DWTE Site Activities to Noise Levels at Sensitive Receptors

| Time | Month | Sensitive Locations | | | | | |
|--|-----------|-----------------------|----------------------|--------------------|-------------------|-------------------------|-----------------------------|
| | | Rehab Institute N1 | Seafort Avenue N2 | Beach Avenue N3 | Leukos Road N4 | Pigeon House Road N5 | Irishtown Nature Park N6 |
| Daytime Results level, $L_{Aeq}(30\text{ min})\text{dBA}$ | July | 36 | 35 | 33 | 34 | 35 | 49 |
| | August | 33 | 32 | 31 | 34 | 34 | 46 |
| | September | 31 | 31 | 29 | 34 | 35 | 44 |
| Evening Time Results level, $L_{Aeq}(30\text{ min})\text{dBA}$ | July | 25 | 24 | 23 | 28 | 28 | 38 |
| | August | 25 | 24 | 22 | 29 | 30 | 38 |
| | September | - | - | - | - | - | - |
| Nighttime Results level, $L_{Aeq}(30\text{ min})\text{dBA}$ | July | 15 | 15 | 13 | 25 | 25 | 29 |
| | August | 18 | 18 | 16 | 28 | 29 | 28 |
| | September | - | - | - | - | - | - |

3.5 Conclusion

As noise readings at sensitive locations are affected by local noise sources, the most accurate way to determine if noise is impacting the local residential areas is to use site boundary monitoring readings and calculate the contribution of this noise to the closest sensitive receptors. Noise levels at the western and southern site boundaries were monitored during the July to September 2016 period and their contribution to the closest residential sensitive receptors calculated. Most construction works occur during the daytime hours with limited construction occurring thereafter. Noise monitoring was undertaken at sensitive receptors (Sandymount and Ringsend areas) and site boundaries on similar days to allow comparison over the quarterly monitoring period.

Maximum permissible noise levels during construction are detailed in Table 3.1.

The sensitive locations are situated up to 1km away from site boundaries and noise contributions from site to local residential areas were calculated with the results provided in Table 3.2. The calculated noise level contributions are significantly lower than the maximum permissible noise levels. The greatest daytime noise level contribution from site activities at a residential sensitive receptor was 36dBA at Rehab Institute, with the greatest daytime noise level contribution at Irishtown Nature Park calculated to be 49dBA. The greatest evening time noise level contribution at a residential sensitive receptor was 30dBA at Pigeon House Road, with the greatest evening time noise level contribution at Irishtown Nature Park calculated to be 38dBA. The greatest night-time noise level contribution at a residential sensitive receptor was 29dBA at Pigeon House Road, with the greatest night-time noise level contribution at Irishtown Nature Park was calculated to be 32dBA.

Ambient noise levels at sensitive locations were found to be similar or higher than those monitored at site boundary locations. The highest noise level of 73.7dBA (Appendix A -Table 1.2) was monitored at Beech Avenue (N3) sensitive receptor during this reporting period. This is higher than the closest boundary location to this location (southern) which had lower readings at similar times. This indicates that noise levels at the sensitive receptors assessed during the July – September 2016 construction period are predominantly affected by localised noise sources, mainly road traffic.

On this basis, it can be concluded that the DWTE site activities undertaken are not resulting in exceedances of the construction noise limit values at sensitive receptors¹ during the assessed period.

Detailed noise monitoring data is included in Appendix A.

¹ Noise is measured using a logarithmic scale that ranges from 0 dBA to about 140 dBA and approximates the range of human hearing. However, due to the logarithmic nature of the decibel scale, the sound levels for different noise sources cannot be added directly for a combined sound level. For example, two adjacent sound sources with the same sound level have a composite noise level only 3 decibels greater than either source; two adjacent sound sources with sound levels that differ by 10 decibels have a composite noise level only 0.4 decibels greater than the louder source.

4 Dust Deposition

A scheme for monitoring dust deposition and direction has been developed for the construction phase of the development.

4.1 Monitoring Method

Monitoring was overseen by the Project Environmental Consultant and undertaken by independent laboratory in accordance with the 'Dublin Waste to Energy - Construction Phase Monitoring Scheme', September 2009. Dust monitoring locations D1 – D4 are shown in Figure 2.1.

There are no legislative regulations regarding fugitive dust during construction either in Ireland or the UK. The "Technical Instructions on Air Quality Control – TA Luft" 2002 emission value for dustfall of 350 mg/m²/day is therefore used as the maximum guideline level during construction.

4.2 Monitoring Results

4.2.1 Weather Conditions

The average weather conditions during the July to September 2016 monitoring period are given below (<http://www.wunderground.com>);

- July 2016
 - Average Precipitation: 0.6mm/day
 - Average Wind Speed: 18km/hr
 - Average Temperature: 16.0°C
 - Total Precipitation: 17.01mm
- August 2016
 - Average Precipitation: 1.1mm/day
 - Average Wind Speed: 19km/hr
 - Average Temperature: 15.0°C
 - Total Precipitation: 35.6mm
- September 2016
 - Average Precipitation: 1.2mm/day
 - Average Wind Speed: 19km/hr
 - Average Temperature: 14.0°C
 - Total Precipitation: 37.08mm

4.2.2 Dust Deposition – Bergerhoff Gauges

The dust deposition results from the Bergerhoff gauges are given in Tables 4.1 – 4.3. Refer to Figure 2.1 in Section 2 for the monitoring locations.

Table 4.1: Dust Deposition Results – July 2016

| Sample Locations | Date Deployed | Date Collected | Days Exposed | Dust Gauge Diameter (cm) | Dust Collected mg/gauge | Rate of Dust Deposition mg/m ² /day | TA Luft Limit mg/m ² /day (Annual Average) |
|------------------|---------------|----------------|--------------|--------------------------|-------------------------|--|---|
| 1 (West) | 09/06/2016 | 19/07/2016 | 40 | 9.5 | 36.5 | 128.7 | 350 |
| 2 (North) | 09/06/2016 | 19/07/2016 | 40 | 9.5 | 35.0 | 123.4 | 350 |
| 3 (East) | 09/06/2016 | 19/07/2016 | 40 | 9.5 | 48.7 | 171.8 | 350 |
| 4 (South) | 09/06/2016 | 19/07/2016 | 40 | 9.5 | 50.0 | 176.3 | 350 |

Table 4.2: Dust Deposition Results – August 2016

| Sample Locations | Date Deployed | Date Collected | Days Exposed | Dust Gauge Diameter (cm) | Dust Collected mg/gauge | Rate of Dust Deposition mg/m ² /day | TA Luft Limit mg/m ² /day (Annual Average) |
|------------------|---------------|----------------|--------------|--------------------------|-------------------------|--|---|
| 1 (West) | 19/07/2016 | 09/08/2016 | 21 | 9.5 | 15.0 | 100.8 | 350 |
| 2 (North) | 19/07/2016 | 09/08/2016 | 21 | 9.5 | 21.1 | 141.8 | 350 |
| 3 (East) | 19/07/2016 | 09/08/2016 | 21 | 9.5 | 41.0 | 275.4 | 350 |
| 4 (South) | 19/07/2016 | 09/08/2016 | 21 | 9.5 | 14.7 | 98.8 | 350 |

Table 4.3: Dust Deposition Results – September 2016

| Sample Locations | Date Deployed | Date Collected | Days Exposed | Dust Gauge Diameter (cm) | Dust Collected mg/gauge | Rate of Dust Deposition mg/m ² /day | TA Luft Limit mg/m ² /day (Annual Average) |
|------------------|---------------|----------------|--------------|--------------------------|-------------------------|--|---|
| 1 (West) | 09/08/2016 | 14/09/2016 | 36 | 9.0 | 77.4 | 338.0 | 350 |
| 2 (North) | 09/08/2016 | 14/09/2016 | 36 | 9.0 | 40.3 | 176.0 | 350 |
| 3 (East) | 09/08/2016 | 14/09/2016 | 36 | 9.0 | 122.1 | 533.1 | 350 |
| 4 (South) | 09/08/2016 | 14/09/2016 | 36 | 9.0 | * | * | - |

* Sample was affected by bird excrement

Table 4.4: Dust Deposition Results – Annual Average September 2015 – September 2016

| Sample Locations | Commencement Date | Completion Date | Days Exposed | Rate of Dust Deposition mg/m ² /day (Annual Average) | TA Luft Limit mg/m ² /day (Annual Average) |
|------------------|-------------------|-----------------|--------------|---|---|
| 1 (West) | 22/09/2015 | 14/09/2016 | 358 | 145.3 | 350 |
| 2 (North) | 22/09/2015 | 14/09/2016 | 358 | 132.2 | 350 |
| 3 (East) | 22/09/2015 | 14/09/2016 | 358 | 175.0 | 350 |
| 4 (South) | 18/08/2015 | 09/08/2016 | 357 | 107.2 | 350 |

4.3 Conclusion

The annual average readings (Table 4.4) for all monitoring locations are below the recommended "Technical Instructions on Air Quality Control – TA Luft" 2002 standard guideline of 350mg/m²/day over an annual period. The largest annual average reading of 175.0mg/m²/day on the easterly boundary location (D3) for dust deposition exists for the site over the past year.

The highest monthly reading of 533mg/m²/day was recorded in September 2016 on the easterly boundary (D3) from the twelve results over the three monthly periods. This reading was likely affected by localised construction to the monitoring location. A water bowser is operated to mitigate dust in dry weather conditions. All vehicles leaving the construction areas of the site pass through a wheel cleansing area prior to entering the local road network. A road sweeper continual cleans site hard surfaced roads and road networks linked to the site.

5 Surface Water

A scheme for monitoring suspended solids in surface waters adjacent to the site is placed for the construction phase of the project, as per the EIS requirements and in accordance with An Bord Pleanála Order-29S.EF2022. Refer to Figure 2.1 in Section 2 for the monitoring locations.

5.1 Monitoring Method

Monitoring was carried out by an independent laboratory technician and overseen by the project environmental consultant in accordance with 'Dublin Waste to Energy - Construction Phase Monitoring Scheme' September 2009.

5.2 Monitoring Results

Analysis of suspended solids in surface water at the four surface water monitoring locations was undertaken.

The suspended solids results for July to September 2016 are presented in Table 5.1.

Table 5.1: Surface Water Monitoring – Suspended Solids Results

| Parameter | Units | Date | Time | High Tide | Low Tide | SW(01) | SW(02)s | SW(02)d | SW(03)s | SW(03)d | SW(04) |
|-----------------------------------|-------|------------|---------------|---------------|---------------|-----------------------|------------------------|---------------------|------------------------|----------------------------|-----------------------|
| Location | | | | | | Cooling Water Channel | Fairway West (surface) | Fairway West (deep) | Fairway East (surface) | Fairway East - Pier (deep) | Irishtown Nature Park |
| Grid Reference Easting | | | | | | 6°11'54.95W | 6°12'17.0W | 6°12'17.0W | 6°11'54.0W | 6°11'54.0W | 6°12'02.01W |
| Grid Reference Northing | | | | | | 53°20'28.32N | 53°20'59.6N | 53°20'59.6N | 53°20'60.6N | 53°20'60.6N | 53°20'08.35N |
| Suspended Solids (July 2016) | mg/l | 19/07/2016 | 09:15 – 13:50 | 12:12 | 05:28 & 17:41 | 89 | 25 | 52 | 36 | 49 | 27 |
| Suspended Solids (August 2016) | mg/l | 09/08/2016 | 09:45 – 15:45 | 04:15 & 16:45 | 10:11 & 22:24 | 60 | 100 | 20 | 60 | 60 | 40 |
| Suspended Solids (September 2016) | mg/l | 14/09/2016 | 09:40 – 11:20 | 10:47 & 22:51 | 04:00 & 16:17 | 24 | 31 | 39 | 25 | 40 | 35 |

5.3 Conclusion

In the 3rd Quarter (July – September) 2016 period the suspended solids ranged from 24 – 100mg/l. The highest level of suspended solids was recorded upstream of the site on the River Liffey, SW(02) in August 2016 with a result of 100mg/l. Baseline monitoring from 2010 – May 2015 ranged from 1 - 508mg/l.

Construction works of the coffer dam for the cooling water pump station was being undertaken within this period.

During the construction period no elevated suspended solid readings were recorded when compared against preconstruction baseline readings and previous months. The levels recorded in 3rd Quarter 2016 were low levels compared to baseline monitoring from 2010 – May 2015 which ranged from 1 - 508mg/l and the monitoring range of <10– 129mg/l over the past year. Fluctuations in suspended solids occur due to the intertidal area, urbanised catchment being sampled and water traffic operating on the waterbody. Therefore variation is expected throughout all samples readings. Fluctuations in suspended solids are common with levels recorded up to 508mg/l over the preconstruction monitoring period. During the quarterly monitoring period no elevated suspended solid readings were recorded compared to previous readings.

Appendix A

Noise Data

Table 1.1: Construction Noise Monitoring Locations

| Noise Monitoring Location | Description |
|---|---|
| N1 – Rehab Institute | Outside front gate of Rehab, Roslyn Park |
| N2 – Seafort Avenue | Footpath adjacent to No. 33 Seafort Avenue |
| N3 – Beach Avenue | Footpath adjacent to the dividing wall of No. 10 and No. 11 Beach Avenue |
| N4 – Leukos Road | In front of DCC recycling facility |
| N5 – Pigeon House Road | Footpath immediately in front of the Coastguard Cottages |
| N6 – Walkway (Irishtown Nature Reserve) | Walkway south of the site connecting Sean Moore Park and Irishtown Nature Reserve |
| N7 – Western Site Boundary | Midway on the western site boundary |
| N8 – Northern Site Boundary | Midway on the northern site boundary |
| N9 – Eastern Site Boundary | Midway on the eastern site boundary |
| N10 – Southern Site Boundary | Midway on the southern site boundary |

Table 1.2 Continued: July Noise Monitoring Results

| Date | Location No. | Location | Duration (min) | Start Time | L _{Aeq} dB(A) | L _{Amax} dB(A) | LA90 dB(A) | L _{A10} dB(A) | Principal Noise Sources | Weather Conditions |
|----------------|--------------|----------|----------------|------------|------------------------|-------------------------|------------|------------------------|---|---------------------|
| 07th July 2016 | N7 | Western | 30 | 16:04 | 67.8 | 91.5 | 61.3 | 68.1 | - Cranes lifting materials - Internal mechanical and electrical installation | Dry, Clear, Calm |
| 07th July 2016 | N8 | Northern | 30 | 16:44 | 63.5 | 79.8 | 55.7 | 68.2 | - Cladding and steel erection | |
| 07th July 2016 | N9 | Eastern | 30 | 17:28 | 68.3 | 85.5 | 62.7 | 70.3 | - Mobile plant operating on ground - Trucks arriving with materials - Excavation of materials | |
| 07th July 2016 | N10 | Southern | 30 | 15:30 | 59.1 | 82.3 | 53.9 | 62.0 | - Piling - Handheld tools operating including grinding, consaws and drills - Hum from Wastewater Treatment Plant (WWTP) | Dry, Clear, Calm |
| 07th July 2016 | N7 | Western | 30 | 19:39 | 62.3 | 79.9 | 55.3 | 64.3 | - Cladding and steel erection - Internal mechanical installation | |
| 07th July 2016 | N10 | Southern | 30 | 19:05 | 59.3 | 78.1 | 52.3 | 61.3 | - Cranes and mobile lifting equipment operating - Hum from WWTP | |
| 14th July 2016 | N7 | Western | 30 | 11:17 | 67.0 | 83.7 | 56.8 | 66.7 | - Cranes and mobile lifting equipment operating | Dry, Clear, Calm |
| 14th July 2016 | N8 | Northern | 30 | 12:20 | 68.4 | 92.1 | 63.9 | 70.6 | - Diggers excavating material - Cladding and steel erection | |
| 14th July 2016 | N9 | Eastern | 30 | 12:57 | 68.4 | 92.1 | 63.9 | 70.6 | - Internal mechanical and electrical installation | |
| 14th July 2016 | N10 | Southern | 30 | 10:41 | 62.4 | 82.1 | 52.3 | 65.4 | - Handheld tools operating including grinding, consaws and drills - Hum from WWTP | |

Table 1.2 Continued: July Noise Monitoring Results

| Date | Location No. | Location | Duration (min) | Start Time | L _{Aeq} dB(A) | L _{AMax} dB(A) | LA90 dB(A) | L _{A10} dB(A) | Principal Noise Sources | Weather Conditions |
|----------------|--------------|----------|----------------|------------|------------------------|-------------------------|------------|------------------------|--|--------------------|
| 21st July 2016 | N7 | Western | 30 | 20:46 | 59.3 | 79.3 | 53.6 | 51.1 | - Cladding and steel erection - Internal mechanical installation - Cranes and mobile lifting equipment operating - Hum from WWTP | Dry, Clear, Calm |
| 21st July 2016 | N10 | Southern | 30 | 20:05 | 50.1 | 78.1 | 43.9 | 51.1 | | |
| 21st July 2016 | N7 | Western | 30 | 23:10 | 59.1 | 76.3 | 52.3 | 60.5 | | |
| 21st July 2016 | N10 | Southern | 30 | 23:45 | 47.1 | 68.3 | 45.1 | 48.9 | | |
| 22nd July 2016 | N7 | Western | 30 | 09:13 | 68.1 | 93.6 | 57.3 | 69.1 | - Cranes and mobile lifting equipment operating - Handheld tools operating including grinding, consaws and drills - Diggers excavating material - Cladding and steel erection - Internal mechanical and electrical installation - Hum from WWTP | Dry, Clear, Calm |
| 22nd July 2016 | N8 | Northern | 30 | 12:40 | 60.4 | 83.8 | 55.6 | 63.4 | | |
| 22nd July 2016 | N9 | Eastern | 30 | 13:56 | 67.7 | 88.5 | 65.4 | 68.7 | | |
| 22nd July 2016 | N10 | Southern | 30 | 10:00 | 69.8 | 95.8 | 57.1 | 72.6 | | |

Table 1.2 Continued: July Noise Monitoring Results

| Date | Location No. | Location | Duration (min) | Start Time | L _{Acq} dB(A) | L _A Max dB(A) | LA90 dB(A) | L _A 10 dB(A) | Principal Noise Sources | Weather Conditions |
|----------------|--------------|----------------|----------------|------------|------------------------|--------------------------|------------|-------------------------|---|--------------------|
| 27th July 2016 | N7 | Western | 30 | 08:25 | 68.9 | 79.9 | 61.9 | 69.3 | - Cranes and mobile lifting equipment operating | Dry, Cloudy, Calm |
| 27th July 2016 | N8 | Northern | 30 | 09:03 | 63.1 | 80.3 | 57.3 | 66.8 | - Grinding and bolting of steel - Diggers excavating material | |
| 27th July 2016 | N9 | Eastern | 30 | 09:45 | 69.8 | 82.3 | 64.8 | 70.5 | - Handheld tools operating including grinding, consaws and drills | |
| 27th July 2016 | N10 | Southern | 30 | 10:35 | 67.9 | 85.3 | 56.3 | 71.8 | - Cladding and steel erection - Internal mechanical and electrical installation - Road sweeper operating - Hum from WWTP | Dry, Cloudy, Calm |
| 27th July 2016 | N1 | Rehab | 30 | 12:10 | 66.1 | 82.3 | 53.6 | 68.6 | - Consistent road traffic was the prominent noise - No construction noise audible at any noise monitoring location | |
| 27th July 2016 | N5 | Pigeon Hs | 30 | 13:05 | 61.3 | 79.8 | 54.8 | 63.4 | - Dominant background noise from crane at Dublin Port - No construction noise audible at the noise monitoring location | |
| 27th July 2016 | N6 | Nature Reserve | 30 | 11:20 | 60.3 | 82.6 | 52.1 | 60.8 | - Hum from WWTP - Digger noise in distance | |

Table 1.2 Continued: August Noise Monitoring Results

| Date | Location No. | Location | Duration (min) | Start Time | L _{Aeq} dB(A) | L _{Amax} dB(A) | LA90 dB(A) | LA10 dB(A) | Principal Noise Sources | Weather Conditions |
|------------------|--------------|----------|----------------|------------|------------------------|-------------------------|------------|------------|---|-------------------------------|
| 05th August 2016 | N7 | Western | 30 | 08:42 | 64.0 | 88.6 | 59.0 | 66.0 | - Cladding and steel erection - Cranes lifting materials | Dry, Cloudy, Slight Breeze |
| 05th August 2016 | N8 | Northern | 30 | 09:22 | 60.1 | 78.9 | 54.8 | 63.1 | - Internal mechanical and electrical installation | |
| 05th August 2016 | N9 | Eastern | 30 | 10:05 | 69.9 | 86.5 | 66.3 | 70.5 | - Mobile plant operating on ground - Excavation and stockpiling of soils | |
| 05th August 2016 | N10 | Southern | 30 | 10:47 | 64.8 | 82.1 | 53.8 | 67.1 | - Handheld tools operating including grinding, consaws and drills - Hum from Wastewater Treatment Plant (WWTP) | |
| 05th August 2016 | N7 | Western | 30 | 19:05 | 63.8 | 81.3 | 56.1 | 65.1 | - Cladding and steel erection - Internal mechanical installation | Dry, Cloudy, Slight Breeze |
| 05th August 2016 | N10 | Southern | 30 | 19:45 | 58.9 | 77.8 | 52.1 | 62.1 | - Cranes and mobile lifting equipment operating - Hum from WWTP | |
| 05th August 2016 | N7 | Western | 30 | 23:10 | 58.3 | 77.1 | 51.8 | 61.9 | - Cladding and steel erection - Internal mechanical and electrical installation | Dry, Cloudy, Slight Breeze |
| 05th August 2016 | N10 | Southern | 30 | 23:53 | 50.1 | 76.8 | 46.3 | 53.8 | - Hum from WWTP | |
| 10th August 2016 | N7 | Western | 30 | 09:51 | 70.1 | 80.3 | 64.1 | 72.6 | - Cranes and mobile lifting equipment operating | Dry, Cloudy, Slight Breeze |
| 10th August 2016 | N8 | Northern | 30 | 10:45 | 60.3 | 81.8 | 55.1 | 61.3 | - Diggers excavating and stockpiling material - Cladding and steel erection | |
| 10th August 2016 | N9 | Eastern | 30 | 11:22 | 70.8 | 85.8 | 66.9 | 72.3 | - Internal mechanical and electrical installation | |
| 10th August 2016 | N10 | Southern | 30 | 09:15 | 68.9 | 81.5 | 63.7 | 70.1 | - Handheld tools operating including grinding, consaws and drills - Hum from WWTP | |

Table 1.2 Continued: August Noise Monitoring Results

| Date | Location No. | Location | Duration (min) | Start Time | L _{Aeq} dB(A) | L _A Max dB(A) | LA90 dB(A) | L _{A10} dB(A) | Principal Noise Sources | Weather Conditions |
|------------------|--------------|----------|----------------|------------|------------------------|--------------------------|------------|------------------------|--|----------------------------|
| 18th August 2016 | N7 | Western | 30 | 12:54 | 64.3 | 82.9 | 59.7 | 67.6 | - Cranes and mobile lifting equipment operating - Diggers excavating and stockpiling material | Dry, Cloudy, Slight Breeze |
| 18th August 2016 | N8 | Northern | 30 | 14:45 | 58.1 | 86.3 | 54.0 | 60.8 | - Cladding and steel erection - Internal mechanical and electrical installation | |
| 18th August 2016 | N9 | Eastern | 30 | 15:21 | 71.8 | 85.8 | 66.9 | 75.2 | - Handheld tools operating including grinding, consaw and drills - Hum from WWTP | |
| 18th August 2016 | N10 | Southern | 30 | 12:13 | 65.8 | 86.3 | 57.9 | 67.1 | | |
| 25th August 2016 | N7 | Western | 30 | 10:36 | 62.4 | 81.4 | 53.4 | 66.3 | - Cranes and mobile lifting equipment operating - Diggers excavating material | Dry, Cloudy, Slight Breeze |
| 25th August 2016 | N8 | Northern | 30 | 11:53 | 59.4 | 75.7 | 55.8 | 62.1 | - Handheld tools operating including grinding, consaws and drills - Cladding and steel erection | |
| 25th August 2016 | N9 | Eastern | 30 | 12:27 | 68.9 | 89.3 | 66.2 | 70.3 | - Internal mechanical and electrical installation - Road sweeper operating - Hum from WWTP | |
| 25th August 2016 | N10 | Southern | 30 | 09:51 | 60.4 | 80.4 | 52.3 | 64.5 | | |

Table 1.2 Continued: August Noise Monitoring Results

| Date | Location No. | Location | Duration (min) | Start Time | L _{Aeq} dB(A) | L _{AMax} dB(A) | L _{A90} dB(A) | L _{A10} dB(A) | Principal Noise Sources | Weather Conditions |
|------------------|--------------|----------------|----------------|------------|------------------------|-------------------------|------------------------|------------------------|---|---------------------------|
| 31st August 2016 | N7 | Western | 30 | 15:13 | 64.6 | 88.5 | 60.7 | 67.1 | - Cranes and mobile lifting equipment operating | Dry, Sunny, Slight Breeze |
| 31st August 2016 | N8 | Northern | 30 | 12:46 | 72.0 | 81.7 | 58.4 | 77.2 | - Diggers excavating material | |
| 31st August 2016 | N9 | Eastern | 30 | 13:27 | 67.4 | 89.6 | 62.7 | 68.9 | - Handheld tools operating including grinding, consaws and drills | |
| 31st August 2016 | N10 | Southern | 30 | 14:40 | 64.9 | 87.9 | 53.7 | 68.8 | - Cladding and steel erection | |
| 31st August 2016 | N1 | Rehab | 30 | 11:26 | 64.9 | 89.3 | 54.3 | 67.6 | - Internal mechanical and electrical installation | Dry, Sunny, Slight Breeze |
| 31st August 2016 | N3 | Beech Drive | 30 | 10:49 | 73.7 | 85.2 | 60.0 | 77.4 | - Hum from WWTP | |
| 31st August 2016 | N5 | Pigeon Hs | 30 | 10:13 | 63.3 | 83.1 | 56.5 | 64.3 | - Consistent road traffic was the prominent noise | |
| 31st August 2016 | N6 | Nature Reserve | 30 | 09:02 | 50.5 | 83.9 | 46.7 | 50.6 | - No construction noise audible at any noise monitoring location | |
| | | | | | | | | | - Dominant background noise from crane at Dublin Port | |
| | | | | | | | | | - No construction noise audible at the noise monitoring location | |
| | | | | | | | | | - Hum from WWTP | |
| | | | | | | | | | - Digger noise in distance | |

Table 1.2 Continued: September Noise Monitoring Results

| Date | Location No. | Location | Duration (min) | Start Time | L _{Aeq} dB(A) | L _A Max dB(A) | LA90 dB(A) | L _A 10 dB(A) | Principal Noise Sources | Weather Conditions |
|---------------------|--------------|----------|----------------|------------|------------------------|--------------------------|------------|-------------------------|---|----------------------------|
| 07th September 2016 | N7 | Western | 30 | 09:06 | 68.0 | 88.4 | 62.0 | 69.6 | - Internal mechanical and electrical installation | |
| 07th September 2016 | N8 | Northern | 30 | 09:43 | 60.8 | 78.8 | 55.1 | 63.4 | - Cladding and steel erection - Cranes lifting materials | |
| 07th September 2016 | N9 | Eastern | 30 | 10:20 | 69.1 | 83.9 | 65.1 | 70.2 | - Mobile plant operating on ground - Excavation and stockpiling of soils | |
| 07th September 2016 | N10 | Southern | 30 | 10:45 | 67.5 | 85.8 | 61.6 | 69.3 | - Handheld tools operating including grinding, consaws and drills - Hum from Wastewater Treatment Plant (WWTP) | Dry, Cloudy, Slight Breeze |
| 16th September 2016 | N7 | Western | 30 | 11:24 | 67.2 | 93.9 | 60.1 | 69.1 | - Internal mechanical and electrical installation | |
| 16th September 2016 | N8 | Northern | 30 | 12:00 | 61.7 | 81.0 | 55.4 | 63.5 | - Cladding and steel erection - Cranes lifting materials | |
| 16th September 2016 | N9 | Eastern | 30 | 12:33 | 69.2 | 83.3 | 65.3 | 70.8 | - Mobile plant operating on ground - Excavation and stockpiling of soils | |
| 16th September 2016 | N10 | Southern | 30 | 10:50 | 58.0 | 85.2 | 53.9 | 60.1 | - Handheld tools operating including grinding, consaws and drills - Hum from Wastewater Treatment Plant (WWTP) | Dry, Cloudy, Slight Breeze |

Table 1.2 Continued: September Noise Monitoring Results

| Date | Location No. | Location | Duration (min) | Start Time | L _{Aeq} dB(A) | L _{AMax} dB(A) | LA90 dB(A) | L _{A10} dB(A) | Principal Noise Sources | Weather Conditions |
|---------------------|--------------|----------|----------------|------------|------------------------|-------------------------|------------|------------------------|--|-------------------------------|
| 22nd September 2016 | N7 | Western | 30 | 11:12 | 70.5 | 88.0 | 63.9 | 72.8 | - Diggers excavating and stockpiling material - Cranes and mobile lifting equipment operating | Dry, Sunny, Slight Breeze |
| 22nd September 2016 | N8 | Northern | 30 | 11:49 | 58.8 | 80.3 | 55.9 | 60.8 | - Cladding and steel erection - Internal mechanical and electrical installation | |
| 22nd September 2016 | N9 | Eastern | 30 | 12:30 | 70.0 | 90.5 | 67.0 | 71.8 | - Handheld tools operating including grinding, consaw and drills | |
| 22nd September 2016 | N10 | Southern | 30 | 10:36 | 70.0 | 83.4 | 65.2 | 72.9 | - Hum from WWTP | |
| 30th September 2016 | N7 | Western | 30 | 09:06 | 68.7 | 85.6 | 63.4 | 70.3 | - Cladding and steel erection - Internal mechanical and electrical installation | Dry, Cloudy, Slight Breeze |
| 30th September 2016 | N8 | Northern | 30 | 09:45 | 60.1 | 83.4 | 57.4 | 64.5 | - Diggers excavating and stockpiling material - Cranes and mobile lifting equipment operating | |
| 30th September 2016 | N9 | Eastern | 30 | 10:26 | 69.6 | 85.3 | 65.6 | 71.6 | - Handheld tools operating including grinding, consaw and drills | |
| 30th September 2016 | N10 | Southern | 30 | 11:06 | 65.5 | 83.2 | 58.1 | 67.2 | - Hum from WWTP | |

Table 1.3: July - September Daytime Noise Level Calculation Monitoring Results "(BS 5228-1:2009:+A1:2014 Code of practice for noise and vibration control on construction and open sites – Part 1:Noise (Section F.2.2))"

| Date | Time | Site Boundary | Noise Level dB(A) (L _{aeq} 30 min) | Distance between boundary monitoring location and noise source location (m) | Distance between receptor location and noise source location (m) | | | | | | | | Screening adjustment dB(A) | Calculated Noise level at closest Sensitive receptors (Noise Level dB(A) (L _{aeq} 30 min)) | | | |
|------------|-------|---------------|---|---|--|---------|-------|--------|-----------------------|-----------------|-----------------|---------|----------------------------|---|-------|--------|-----------------------|
| | | | | | Rehab Institute | Seafort | Beach | Leukos | Irishtown Nature Park | Pigeon House Rd | Rehab Institute | Seafort | | | Beach | Leukos | Irishtown Nature Park |
| 07/07/2016 | 16:04 | Western | 67.8 | 20 | | | | | 900 | | 865 | 10 | | | | | 30 |
| 07/07/2016 | 15:30 | Southern | 59.1 | 30 | 870 | 941 | 1127 | | 900 | 191 | | 10 | 25 | 24 | 23 | | 38 |
| 14/07/2016 | 11:17 | Western | 67.0 | 30 | | | | | 900 | | 865 | 10 | | | | | 33 |
| 14/07/2016 | 10:41 | Southern | 62.4 | 20 | 870 | 941 | 1127 | | 900 | 191 | | 10 | 25 | 24 | 22 | | 38 |
| 22/07/2016 | 09:13 | Western | 68.1 | 20 | | | | | 900 | | 865 | 10 | | | | | 30 |
| 22/07/2016 | 10:00 | Southern | 69.8 | 30 | 870 | 941 | 1127 | | 900 | 191 | | 10 | 36 | 35 | 33 | | 49 |
| 27/07/2016 | 08:25 | Western | 68.9 | 30 | | | | | 900 | | 865 | 10 | | | | | 35 |
| 27/07/2016 | 10:35 | Southern | 67.9 | 30 | 870 | 941 | 1127 | | 900 | 191 | | 10 | 34 | 33 | 31 | | 47 |
| 05/08/2016 | 08:42 | Western | 64.0 | 30 | | | | | 900 | | 865 | 10 | | | | | 30 |
| 05/08/2016 | 10:47 | Southern | 64.8 | 30 | 870 | 941 | 1127 | | 900 | 191 | | 10 | 31 | 30 | 28 | | 44 |
| 10/08/2016 | 09:51 | Western | 70.1 | 25 | | | | | 900 | | 865 | 10 | | | | | 34 |
| 10/08/2016 | 09:15 | Southern | 68.9 | 25 | 870 | 941 | 1127 | | 900 | 191 | | 10 | 33 | 32 | 31 | | 46 |
| 18/08/2016 | 12:54 | Western | 64.3 | 15 | | | | | 900 | | 865 | 10 | | | | | 24 |
| 18/08/2016 | 12:13 | Southern | 65.8 | 25 | 870 | 941 | 1127 | | 900 | 191 | | 10 | 30 | 29 | 28 | | 43 |
| 25/08/2016 | 10:36 | Western | 62.4 | 30 | | | | | 900 | | 865 | 10 | | | | | 28 |
| 25/08/2016 | 09:51 | Southern | 60.4 | 30 | 870 | 941 | 1127 | | 900 | 191 | | 10 | 26 | 25 | 24 | | 39 |
| 31/08/2016 | 15:13 | Western | 64.6 | 15 | | | | | 900 | | 865 | 10 | | | | | 24 |
| 31/08/2016 | 14:40 | Southern | 64.9 | 20 | 870 | 941 | 1127 | | 900 | 191 | | 10 | 27 | 26 | 25 | | 40 |
| 07/09/2016 | 09:06 | Western | 68.0 | 20 | | | | | 900 | | 865 | 10 | | | | | 30 |
| 07/09/2016 | 10:45 | Southern | 67.5 | 20 | 870 | 941 | 1127 | | 900 | 191 | | 10 | 30 | 29 | 27 | | 43 |
| 16/09/2016 | 11:24 | Western | 67.2 | 20 | | | | | 900 | | 865 | 10 | | | | | 29 |
| 16/09/2016 | 10:50 | Southern | 58.0 | 15 | 870 | 941 | 1127 | | 900 | 191 | | 10 | 18 | 17 | 15 | | 31 |
| 22/09/2016 | 11:12 | Western | 70.5 | 15 | | | | | 900 | | 865 | 10 | | | | | 30 |
| 22/09/2016 | 10:36 | Southern | 70.0 | 15 | 870 | 941 | 1127 | | 900 | 191 | | 10 | 30 | 29 | 27 | | 43 |
| 30/09/2016 | 09:06 | Western | 66.7 | 30 | | | | | 900 | | 865 | 10 | | | | | 34 |
| 30/09/2016 | 11:06 | Southern | 65.5 | 30 | 870 | 941 | 1127 | | 900 | 191 | | 10 | 31 | 31 | 29 | | 44 |

Table 1.3: Continued: July - September Evening Time Noise November noise Level Calculation Monitoring Results "(BS 5228-1:2009.+A1:2014 Code of practice for noise and vibration control on construction and open sites – Part 1: Noise (Section F.2.2))"

| Date | Time | Site Boundary | Noise Level dB(A) (L _{aeq} 30 min) | Distance between boundary monitoring location and noise source location (m) | Distance between receptor location and noise source location (m) | | | | | | | Screening adjustment dB(A) | Calculated Noise level at closest sensitive receptors (Noise Level dB(A) (L _{aeq} 30 min)) | | | |
|------------|-------|---------------|--|---|---|---------|-------|--------|-----------------------------|--------------------|--------------------|----------------------------------|--|---------|-------|--------|
| | | | | | Rehab Institute | Seafort | Beach | Leukos | Irishtown Nature Park | Pigeon House Rd | Rehab Institute | | | Seafort | Beach | Leukos |
| 07/07/2016 | 19:39 | Western | 62.3 | 30 | | | | | 900 | | | | 865 | 10 | 28 | 28 |
| 07/07/2016 | 19:05 | Southern | 59.3 | 30 | | 870 | 941 | 1127 | | 191 | | | | 10 | 23 | 38 |
| 21/07/2016 | 20:46 | Western | 59.3 | 30 | | | | | 900 | | | | 865 | 10 | 25 | 25 |
| 21/07/2016 | 20:05 | Southern | 50.1 | 40 | | 870 | 941 | 1127 | | 191 | | | | 10 | 18 | 32 |
| 05/08/2016 | 19:05 | Western | 63.8 | 30 | | | | | 900 | | | | 865 | 10 | 29 | 30 |
| 05/08/2016 | 19:45 | Southern | 58.9 | 30 | | 870 | 941 | 1127 | | 191 | | | | 10 | 24 | 38 |

Table 1.3: Continued: July – September Night-time Noise Level Calculation Monitoring Results "(BS 5228-1:2009:+A1:2014 Code of practice for noise and vibration control on construction and open sites – Part 1:Noise (Section F.2.2))"

| Date | Time | Site Boundary | Noise Level dB(A) (L _{aeq} 30 min) | Distance between monitoring location and noise source location (m) | Distance between receptor location and noise source location (m) | Screening adjustment dB(A) | Calculated Noise level at closest Sensitive receptors (Noise Level dB(A) (L _{aeq} 30 min)) | | | | | |
|------------|-------|---------------|---|--|--|----------------------------|---|---------|-------|--------|---------------------|-----------------|
| | | | | | | | Rehab Institute | Seafort | Beach | Leukos | Instown Nature Park | Pigeon House Rd |
| 21/07/2016 | 23:10 | Western | 59.1 | 30 | | 10 | | | | 25 | | |
| 21/07/2016 | 23:45 | Southern | 47.1 | 40 | 870 | 10 | 870 | 941 | 1127 | 900 | 191 | 865 |
| | | | | | | | | | | | | 25 |
| | | | | | | | | | | | | |

DUBLIN WASTE TO ENERGY FACILITY

WILDFOWL MONITORING
WINTER 2015 / 16

SEPTEMBER 2016

REPORT PREPARED FOR
DUBLIN WASTE TO ENERGY LIMITED
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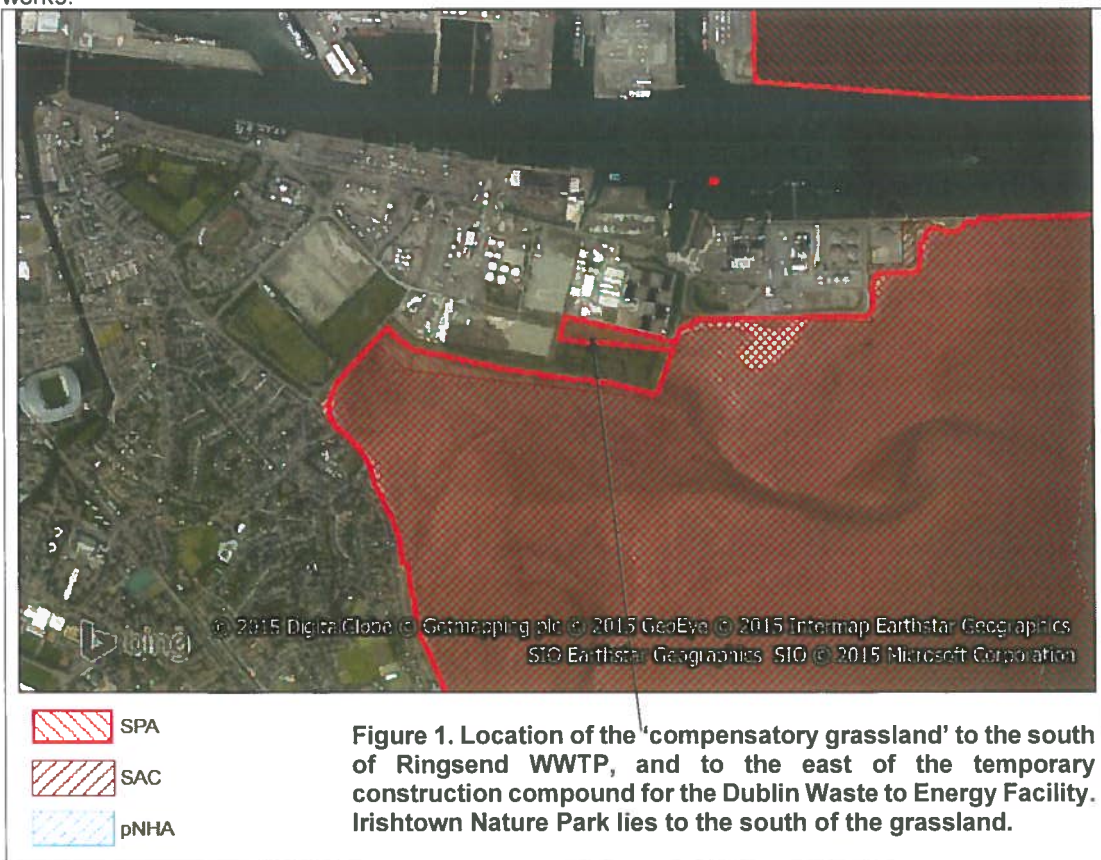
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1. INTRODUCTION.

Planning approval for the Dublin Waste to Energy Facility was granted by An Bord Pleanála in November 2007, subject to a number of conditions. This report has been prepared in compliance with Condition 13 (b), which includes a requirement for waterfowl monitoring as follows:

“Monitoring of the use by wild fowl of the grass lands located south of the wastewater treatment plant shall be carried out for a period of at least 1 year prior to the enclosure and use of the temporary construction area, during construction works and for a period of at least three years following the commissioning of the plant. Reports on the monitoring shall be prepared at least twice yearly following the commencement of construction works. Copies of the reports shall be available for inspection by the public at the offices of the local authority and at an office in the Ringsend/Poolbeg area.”

The grassland area referred to in Condition 13 (b) was provided as a winter feeding area for Light-bellied Brent Geese *Branta bernicla hrota*, under condition No. 10 of the 1997 certification for the Dublin Bay Project extension to Ringsend Waste Water Treatment Plant (WWTP). It lies to the east of the temporary construction compound for the Dublin Waste to Energy Facility, to the south of Ringsend WWTP, and to the north of Irishtown Nature Park. The area is shown in Figure 1 below, and is known variously as Goose Green, the DCC Brent Field Ringsend (Benson, 2009), and as the compensatory grassland. This report presents the results of the waterfowl monitoring carried out between September 2015 and April 2016, covering the winter season during which Brent Geese in particular use the grassland area referred to in Condition 13 (b), and in order to comply with the requirement to prepare reports at least twice yearly following the commencement of construction works.



The National Parks and Wildlife Service (NPWS) of the Department of Arts, Heritage and the Gaeltacht proposed to extend the boundary of a Special Protection Area (SPA) designated under the Birds Directive (79/409/EEC; 2009/147/EC) to include this grassland, in a notification dated 23 May 2008 relating to South Dublin Bay and River Tolka Estuary SPA (Site Code 004024). The extended boundary was confirmed in S.I. 212 of 2010.

2. MONITORING METHODOLOGY.

Detailed wildfowl counts, and counts of goose droppings which provide a metric of goose grazing intensity, were scheduled to cover the period when Light-bellied Brent Geese feed on grassland, because this is the species which makes most seasonal use of grassland areas, and the grassland referred to in Condition 13 (b) was provided specifically for geese. The detailed monitoring season was initially defined as extending from mid-November to mid-April, based on observations during the 1990s and early to mid 2000s. Since 2008, first goose use of the compensatory grassland has been recorded between 3rd and 20th November. Checks of the grassland for waterbird¹ use are carried out during the summer and autumn also, with checks of intertidal areas to assess autumn arrival of Light-bellied Brent Geese in Dublin Bay.

Following the completion of winter monitoring in April 2015, the compensatory grassland was checked for the presence of wildfowl and waterbirds during the summer and autumn. Checks of intertidal areas in South Dublin Bay for Light-bellied Brent Geese commenced on 9th September 2015 and continued at approximately two weekly intervals.

The compensatory grassland was walked on 22th September, 12th October, and on 3rd November 2015 to check for goose feeding signs (droppings). Light-bellied Brent Geese started to visit the compensatory grassland on 3rd November 2015, when 3 geese and fresh droppings were found. Direct waterbird counts and transect counts of goose droppings on all monitored grasslands (compensatory grassland, Ringsend Park, Irishtown Stadium, and Sean Moore Park) started on 12th November for the 2015/16 winter season.

Waterfowl were counted from vantage points using binoculars and a telescope. In addition to the grassland located south of the wastewater treatment plant and adjoining the DWTE site and temporary construction compound, the following grassland areas were included in the monitoring programme: Ringsend Park, Irishtown Stadium, and Sean Moore Park. The rationale for including the three additional grassland areas is that they are also used by Brent geese, and there is frequent movement of geese between all four grassland areas arising from disturbance due to sports and recreational use as well as construction work in different areas. It would be difficult to interpret counts from the compensatory grassland on its own, since variation in use could arise from factors other than DWTE construction disturbance, and it would be useful for these to be identifiable. The amenity grassland area beside the Ringsend Waste Water Treatment Works storm water tanks (on the northern side of Pigeon House Road) has been checked for the presence of Brent geese since January 2014.

Goose use of the four grassland areas (the compensatory grassland, Ringsend Park, Irishtown Stadium, and Sean Moore Park) was also assessed indirectly by counts of droppings along transects, so that grazing intensity could be assessed in the different areas, and with regard to

¹ 'waterbird' is a collective term for swans, geese, ducks, wading birds, gulls and terns, and other groups that depend on wetland habitats. Some, but not all, of these groups use the grassland subject to condition 13(b).

distance from the DWTE site and construction compound. In general, counts were scheduled for periods of dry weather to minimise washing out of goose droppings by rainfall. Dropping density was calculated per metre² to facilitate comparison between areas. Transects were laid out using measurements and landmarks within the compensatory grassland as shown in Figure 2 below.

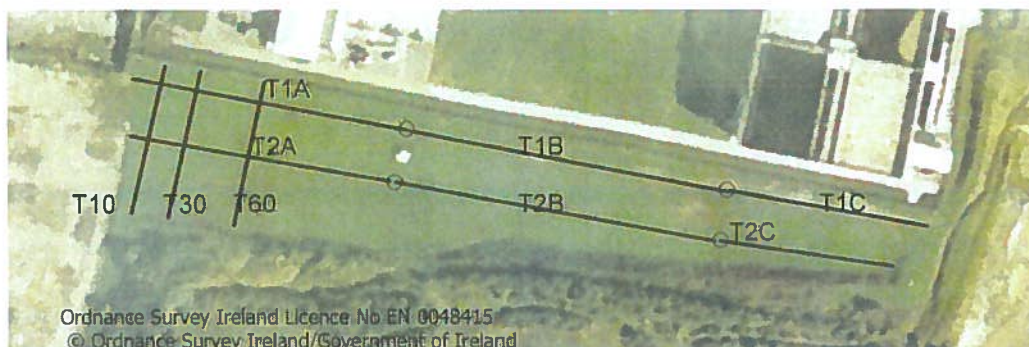


Figure 2. Transect layout on the compensatory grassland

Transect 1 lies 10 metres away from the boundary fence between the compensatory grassland and Ringsend WWTP. Transect 2 lies parallel to transect 1. Both transects are divided into three sections A, B and C, as indicated by circles on Figure 2. The transects are equidistant from the mounded inspection access to the submarine pipeline, visible as a white area which is the landmark for transect sections A/B. Transect 10 lies 10 metres from the western edge of the compensatory grassland, T30 and T60 are 30 and 60 metres from the western edge of the grassland respectively.

Within the other grassland areas monitored, single transects were monitored in each of the eastern and western pitches at Sean Moore Park, in Irishtown Stadium, and in Ringsend Park, with transect lines along the length of the pitch at 10 metres towards the side from a goal post.

3. CONSTRUCTION AND OTHER ACTIVITIES AFFECTING GRASSLANDS IN THE AREA.

3.1. Compensatory grassland management.

During the first wildfowl monitoring season for the Dublin Waste to Energy Facility in 2007/08, goose use varied substantially between different areas of the compensatory grassland, in response to variations in grass cover, and to the proximity of scrub encroaching towards the grassland which geese tend to avoid. Disturbance due to human and dog activity within the grassland area was also a factor. A management plan addressing these issues was prepared for Dublin City Council, in consultation with NPWS, and was implemented in 2008.

Routine mowing and maintenance work was carried out during the summer and autumn of 2015. Top-dressing of the grassland with fertiliser was carried out by Dublin City Council Parks Department in late September. Grass continued to grow during mild late autumn weather and the compensatory grassland was mown in late October. Dublin City Council Parks Department also carried out repairs to the fencing.

3.2. Other activities in the compensatory grassland.

No engineering works were noted in the compensatory grassland during the 2015/16 season. Dog walking within the grassland continued to occur. Dog tracks were observed, and a dog walker appeared to be bringing up to ten dogs to run on the compensatory grassland on most days, approaching from the west, and later from the south after the temporary construction compound, breaches in fencing continue to be problematic.

Some engineering works took place at Ringsend Waste Water Treatment Plant, in addition to routine operations.

3.3. Dublin Waste to Energy Facility activities.

Further to a commencement notice issued to Dublin City Council, construction work on the Dublin Waste to Energy Facility commenced on 14th December 2009. Work was suspended temporarily in May 2010. The Project Agreement regarding the Dublin Waste to Energy Facility was signed on Friday 19th September 2014. Site clearance and setup commenced in October. Piling works at the approved project site, using Continuous Augered Piles (CFA Piles), commenced during the week starting 20th October, initially with one piling rig and subsequently with three rigs. Piling and foundation works continued through the winter season. Construction of above ground structures commenced in March 2015. The temporary construction compound was enclosed in January 2015, with work on the eastern boundary closest to the compensatory grassland taking place during the week commencing 12th January. A setback of at least 20 metres wide from the eastern edge of the compound was provided, as required under Condition 13(b). Construction of above ground structures, cladding, and installation of equipment has continued through 2015 and 2016.



18.12.2015



20.09.2016

Plate 1. Dublin Waste to Energy Facility under construction

3.4. Other grasslands in the Ringsend area.

The running track at Irishtown Stadium was partially re-surfaced during the summer of 2014, and completed in 2015. Kite hawks were deployed in November 2015 to deter geese from feeding on the pitch, but these became ineffective and were removed.

4. WILDFOWL COUNTS.

4.1. Light-bellied Brent Geese.

4.1.1 Overall population and numbers in Dublin Bay

A peak count of 1,543 Light-bellied Brent Geese was recorded in South Dublin Bay at dawn on 16th February 2016. The threshold for international importance for this predominantly Irish wintering population was raised in 2012 (Wetlands International, 2013), following a sustained increase in numbers; the 1% level is currently 400 birds (formerly 260 birds). However the population has declined recently following two poor breeding seasons in 2013 and 2014; a total of 31,985 geese were recorded in the southern part of the wintering range (excluding Iceland) in November 2014. Breeding success was higher in 2015, and a total population count of 37,192 birds was recorded in October 2015 (I-WeBS News 2015, 2016). Peak counts in Dublin Bay in previous years are given in Table 1.

| | Dublin Bay | South Dublin Bay |
|---------|-------------------------------|------------------|
| 2015/16 | I-WeBS data not yet available | 1,543 |
| 2014/15 | 5,135* | 1,367 |
| 2013/14 | 3,717* | 1,310 |
| 2012/13 | 6,134* | 2,693* |
| 2011/12 | 4,102* | 1,950 |
| 2010/11 | 4,745 | 1,730 |
| 2009/10 | 5,536* | 1,870 |
| 2008/09 | 4,445* | 1,425* |
| 2007/08 | 3,819* | 510* |

Table 1. Peak counts of Light-bellied Brent Geese in Dublin Bay and in South Dublin Bay.

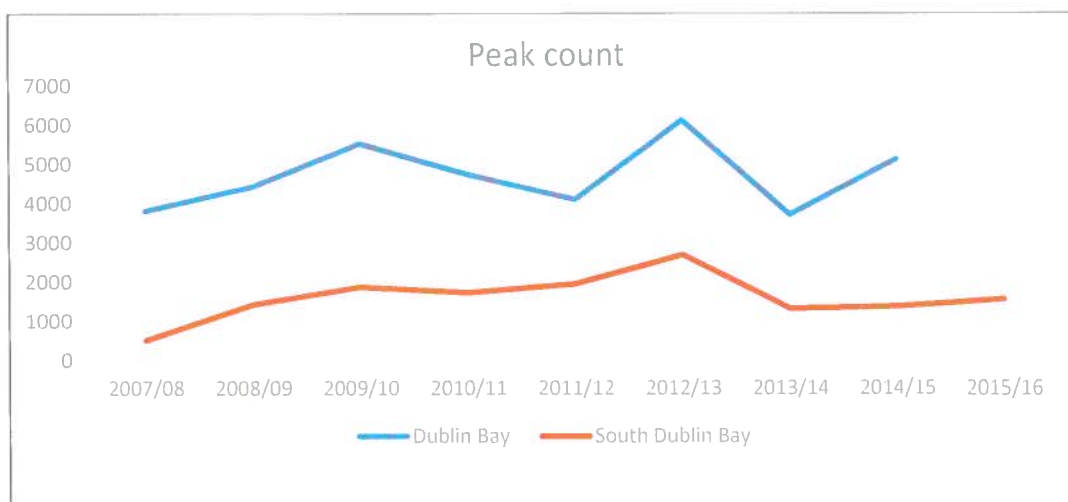


Figure 3. Peak counts in Dublin Bay and South Dublin Bay

Note: * Data were supplied by the Irish Wetland Bird Survey (I-WeBS), a joint scheme of BirdWatch Ireland and the National Parks and Wildlife Service of the Department of Arts, Heritage & the Gaeltacht. Other counts not indicated with an asterix are data recorded as part of the monitoring programme for the Dublin Waste to Energy Facility. The highest count in these two datasets is given.

4.1.2. South Dublin Bay and monitored grasslands

Brent Geese were first recorded feeding in intertidal habitats in South Dublin Bay on 22nd September 2015, when 14 birds were observed feeding on the *Zostera* bed near Merrion Gates. Autumn counts are included in Table 2. Peak counts in each winter season since the commencement of the monitoring programme are included in Table 3. Most geese were recorded feeding on the *Zostera* bed near Merrion Gates initially, but geese also fed on green macroalgae *Enteromorpha* spp. growing in low tide channels, in sheltered areas to the south of the Poolbeg peninsula, and in the developing salt marsh east of Merrion Gates, as *Zostera* stocks became depleted. There was a low standing crop of green macroalgae in intertidal habitats in Dublin Bay during the early autumn of 2015, following poor summer weather, though green macroalgal cover did increase through September and early October.

| Date | Grasslands | | | | | | Intertidal sand and mudflats |
|------------------------------|------------------------|----------------------|----------------------|-------------------|---------------|------------------|------------------------------|
| | Compensatory Grassland | Sean Moore Park East | Sean Moore Park West | Irishtown Stadium | Ringsend Park | WWTW storm tanks | South Dublin Bay |
| 22.09.15 | | | | | | | 14 |
| 12.10.15 | | | | | | | 262 |
| 20.10.15 | | | | | | | 255 |
| 3.11.15 | 3 | | | | | | 92 |
| 12.11.15 | 92 | | | | | | - |
| 26.11.15 | 240 | | 3 | | | | 438 * |
| 18.12.15 | 80 | | | 182 | | | 640 ** |
| 06.01.15 | 19 | 21 | | | 16 | | 993 * |
| 11.01.16 | 260+ *** | - | - | - | - | - | - |
| 05.02.16 | 9 | 127 | 142 | 62 | | 45 | 1,472* |
| 09.02.16 | 107 | - | - | - | - | - | - |
| 16.02.16 | 164 | | | 160 | | | 1,543* |
| 25.02.16 | 40 | 4 | | 186 | | | - |
| 01.03.16 | 160 | - | - | - | - | - | - |
| 18.03.16 | | | | 158 | | 77 | 1,320** |
| 24.03.16 | 126 | - | - | - | - | - | - |
| 25.03.16 | 180 | - | - | - | - | - | - |
| 08.04.16 | | | | | | | |
| 19.04.16 | 80 | - | - | - | - | - | - |
| Peak Count in 2015/16 | 260+ | 127 | 142 | 186 | 16 | 77 | 1,543 |

Table 2. Peak counts of Light-bellied Brent Geese from September 2015 to April 2016.

Notes: Counts of the intertidal sand and mudflats in South Dublin Bay carried out as part of this monitoring programme include *dawn and **dusk roost counts. Dawn and dusk roost counts are generally higher than day time counts in mid-winter, when geese are feeding on grassland sites in the greater Dublin area during the day. Counts are not additive, because of goose movement between areas. *** indicates late afternoon count estimates of the compensatory grassland from photographs taken from a high point within the DWTE construction compound. Blank cells indicate that no Light-bellied Brent Geese were present when individual sites were checked, dashes indicate that sites were not checked on the date indicated.

| Date | Grasslands | | | | | | Intertidal sand and mudflats |
|---------|------------------------|----------------------|----------------------|-------------------|---------------|------------------|------------------------------|
| | Compensatory Grassland | Sean Moore Park East | Sean Moore Park West | Irishtown Stadium | Ringsend Park | WWTW storm tanks | South Dublin Bay |
| 2015/16 | 260+ | 127 | 142 | 186 | 16 | 77 | 1,543 |
| 2014/15 | 331 | 16 | 9 | 180 | | 126 | 1,367 roost count |
| 2013/14 | 411 | 225 | | 220 | 575 | 67 | 1,310 roost count |
| 2012/13 | 351 | 600 | 223 | 47 | 680 | nc | 2,693 roost count* |
| 2011/12 | 336 | 29 | 14 | 346 | 205 | nc | 1,950 roost count |
| 2010/11 | 410 | 90 | 101 | 450 | 283 | nc | 1,730 roost count |
| 2009/10 | 349 | 950 | 600 | 338 | 480 | nc | 1,870 roost count |
| 2008/09 | 440 | 55 | 10 | 199 | | nc | 1,425* |
| 2007-08 | 34 | 600 | 350 | 366 | | nc | 510* |

Table 3. Peak counts of Light-bellied Brent Geese in each area, in each year of the monitoring programme to date

*I-WeBS counts. * Data were supplied by the Irish Wetland Bird Survey (I-WeBS), a joint scheme of BirdWatch Ireland and the National Parks and Wildlife Service of the Department of Arts, Heritage & the Gaeltacht. Counts not indicated with an asterix are data recorded as part of the monitoring programme for the Dublin Waste to Energy Facility. The highest count in these two datasets is given.

Light-bellied Brent Geese started to visit the compensatory grassland from 3rd November 2015, when 3 geese were recorded, and continued regular use from then; this grassland use was earlier in the winter season than usual and may have been linked to the relatively low availability of green macroalgae in South Dublin Bay in 2015. Use of other grasslands in the Ringsend area was first recorded on 26th November (Table 1).

The peak count of Light-bellied Brent Geese on the compensatory grassland was 260+, recorded on 11th January 2016. The grassland was checked on 16 dates between 3rd November 2015 and 19th April 2016; geese were recorded feeding on the grassland on 14 dates. Average flock size through the winter was 111 geese. Flock size tended to increase during the day and the largest flocks were often recorded in the afternoon.

Peak counts of Light-bellied Brent Geese recorded on other grasslands in the Ringsend area were 186 on Irishtown Stadium, 142 on Sean Moore Park, 16 on Ringsend Park, and 77 on the grassland at the Ringsend WWTW storm tanks.

Light-bellied Brent Goose use of the grasslands as indicated by the density of droppings/m² provides a more reliable index of overall feeding use than direct counts of birds. Monitoring of

dropping density along transects commenced on 12th November 2015, and continued through the winter of 2015/16. These data are given in Section 5 of this report.



Plate 1. Brent geese on the compensatory grassland on 26th November 2015. The DWTE temporary construction compound can be seen in the background.



Plate 2. Closely grazed grassland on 25th February 2016.

4.2. Other waterbird species.

Three wader species were recorded in small numbers on the compensatory grassland between September 2015 and April 2016: Oystercatcher, Black-tailed Godwit, and Curlew (Table 4). Little Egret and Black-headed Gulls were recorded on a single occasion.

| Date | Compensatory grassland | Sean Moore Park | Irishtown Stadium | Ringsend Park |
|-------------------------------|--|--|--|--|
| 22.9.15 | 2 Oystercatcher | | | |
| 12.11.15 | 58 Oystercatcher 1 Little Egret | | | 12 Black-headed Gulls |
| 26.11.15 | 26 Oystercatcher 2 Black-tailed Godwit | 34 Oystercatcher | 2 Oystercatcher 1 Black-headed Gull | 10 Black-headed Gulls |
| 18.12.15 | | 43 Oystercatcher 23 Black-headed Gull | 2 Oystercatcher | 8 Oystercatcher 19 Black-headed Gulls 1 Herring Gull |
| 06.01.16 | 1 Curlew 9 Oystercatcher 2 Black-headed Gull | 59 Oystercatcher | 34 Oystercatcher 20 Black-headed Gull 13 Herring Gull 3 Great Black-backed Gull | 5 Oystercatcher 8 Herring Gull |
| 05.02.15 | 39 Oystercatcher | 70 Oystercatcher 41 Black-headed Gull | 5 Oystercatcher 11 Black-headed Gull 3 Herring Gull | 5 Oystercatcher 28 Black-headed Gull |
| 16.02.16 | 2 Oystercatcher | 42 Oystercatcher 6 Black-headed Gull | 28 Oystercatcher 12 Black-headed Gull | 18 Oystercatcher 31 Black-headed Gull |
| 25.02.16 | 8 Oystercatcher 1 Curlew | 14 Oystercatcher 14 Black-headed Gull | 13 Oystercatcher 9 Black-headed Gull 5 Herring Gull | |
| 18.03.16 | | | | |
| 08.04.16 | | | | |
| Peak counts in 2015/16 | 1 Little Egret 58 Oystercatcher 2 Black-tailed Godwit 1 Curlew 2 Black-headed Gull | 70 Oystercatcher 41 Black-headed Gull | 34 Oystercatcher 20 Black-headed Gull 13 Herring Gull 3 Great Black-backed Gull | 18 Oystercatcher 31 Black-headed Gull 8 Herring Gull |

Table 4. Waterbird species other than geese recorded on grasslands in the Ringsend area between September 2015 and April 2016. Blank cells indicate that no waterbirds were present when individual sites were checked.

All of the waterbird species using grasslands in the Ringsend area were recorded in small numbers, in comparison with the numbers recorded in intertidal habitats in Dublin Bay and South Dublin Bay (Tables 5 and 6). Oystercatcher and Black-headed Gull were the most frequently recorded species on grassland.

DUBLIN WASTE TO ENERGY FACILITY

| Year | Compensatory grassland | Sean Moore Park | Irishtown Stadium | Ringsend Park |
|------------------------|---|--|--|--|
| Peak counts in 2015/16 | 1 Little Egret 58 Oystercatcher 2 Black-tailed Godwit 1 Curlew 2 Black-headed Gull | 70 Oystercatcher 41 Black-headed Gull | 34 Oystercatcher 20 Black-headed Gull 13 Herring Gull 3 Great Black-backed Gull | 18 Oystercatcher 31 Black-headed Gull 8 Herring Gull |
| Peak counts in 2014/15 | 44 Oystercatcher 3 Black-tailed godwit 1 Curlew 2 Redshank 3 Black-headed gulls | 21 Oystercatcher 22 Black-headed gulls | 20 Oystercatcher 25 Black-headed gulls | 2 Oystercatcher 62 Black-headed gulls |
| Peak counts in 2013/14 | 47 Oystercatcher 3 Black-tailed godwit 2 Redshank | 41 Oystercatcher 4 Redshank | 25 Oystercatcher 20 Black-headed gull 4 Herring gull | 18 Oystercatcher 80 Black-headed gull |
| Peak counts in 2012/13 | 11 Oystercatcher 12 Redshank 3 Mallard | 9 Oystercatcher 18 Redshank 150 Black-headed Gulls | 9 Oystercatcher 21 Black-headed Gulls 1 Herring Gull | 1 Oystercatcher 97 Black-headed Gulls 5 Common Gulls |
| Peak counts in 2011/12 | 64 Oystercatcher 15 Black-tailed Godwit 2 Curlew 11 Redshank | 30 Oystercatcher 8 Black-headed Gulls | 17 Oystercatcher 1 Common Gull 66 Black-headed Gulls 2 Herring Gulls | 9 Oystercatcher 37 Black-headed Gulls |
| Peak counts in 2010/11 | 21 Oystercatcher 11 Black-tailed Godwit 1 Curlew 7 Redshank 12 Black-headed Gulls | 11 Oystercatcher 9 Black-tailed Godwit 11 Redshank | 10 Oystercatcher 39 Black-headed Gulls | 6 Oystercatcher 77 Black-headed Gulls |
| Peak counts in 2009/10 | 51 Oystercatcher 1 Lapwing 14 Black-tailed Godwit 1 Curlew 4 Redshank 2 Black-headed Gulls | 56 Oystercatcher 5 Redshank 22 Black-headed Gulls | 16 Oystercatcher 280 Black-headed Gulls 1 Herring Gull 1 Lesser Black-backed Gull | 9 Oystercatcher 140 Black-headed Gulls |
| Peak counts in 2008/09 | 29 Oystercatcher 74 Black-tailed Godwit 1 Curlew 13 Redshank | 37 Oystercatcher 9 Black-headed Gulls | 18 Oystercatcher | 16 Oystercatcher 11 Black-headed Gulls |
| Peak counts in 2007/08 | 15 Oystercatcher 5 Black-tailed Godwit 5 Redshank | 71 Oystercatcher 31 Black-headed Gulls | 41 Oystercatcher 24 Black-headed Gulls 3 Common Gulls | 13 Oystercatcher 68 Black-headed Gulls |

Table 5. Peak counts of waterbird species other than geese recorded on grasslands in the Ringsend area in each year of the monitoring programme.

DUBLIN WASTE TO ENERGY FACILITY

| | Peak count Dublin Bay * | Peak count South Dublin Bay * | Peak count Compensatory Grassland | Threshold for international importance |
|----------------------------|----------------------------|-------------------------------------|---|--|
| Oystercatcher | 3,678 | 1,712 | 44 | 8,200 |
| Black-tailed Godwit | 970 | 290 | 3 | 610 |
| Curlew | 1,430 | 135 | 1 | 8,400 |
| Redshank | 2,113 | 797 | 2 | 3,900 |
| Black-headed Gull | 2,793 | 1,495 | 3 | 20,000 |

Table 6. Peak counts of waterbird species recorded on the compensatory grassland during the monitoring programme in 2014/15, compared with I-WeBS peak counts in Dublin Bay and South Dublin Bay in 2014/15.

Note: I-WeBS data for 2015/16 are not yet available

* Data were supplied by the Irish Wetland Bird Survey (I-WeBS), a joint scheme of BirdWatch Ireland and the National Parks and Wildlife Service of the Department of Arts, Heritage & the Gaeltacht. I-WeBS data for 2014/15 are not available yet for comparison.

5. GOOSE USE OF GRASSLANDS

Light-bellied Brent Goose use of the grasslands as indicated by the density of droppings/m² provides a more reliable index of overall feeding use than direct counts of birds. Monitoring of dropping density along transects commenced on 12th November 2016, and continued through the winter of 2014/15 until 8th April 2016. The winter of 2015/16 was generally mild but with frequent storms and heavy rainfall events, there were no periods of snow cover on the grasslands, unlike the winter of 2010/11 when snow cover extended for some 25 days. April 2016 was cold with northerly winds for much of the month. Average goose use of all monitored grasslands in each year of the monitoring programme is shown in Table 6 and Figure 4.

| Grassland area | Transect | 2007/08 | 2008/09 | 2009/10 | 2010/11 | 2011/12 | 2012/13 | 2013/14 | 2014/15 | 2015/16 |
|------------------------|---------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| Compensatory Grassland | All transects | 0.66 | 3.14 | 6.18 | 1.55 | 2.36 | 2.88 | 3.69 | 4.38 | 3.08 |
| Sean Moore Park | East pitch | 1.94 | 0.86 | 1.97 | 0.33 | 0.32 | 3.14 | 0.88 | 0.31 | 0.28 |
| | West pitch | 2.19 | 0.27 | 0.85 | 0.34 | 0.13 | 1.74 | 0.69 | 0.14 | 0.18 |
| Irishtown Stadium | | 3.78 | 3.83 | 5.05 | 2.96 | 4.21 | 4.56 | 5.82 | 4.50 | 4.36 |
| Ringsend Park | | 0.49 | 0.96 | 1.22 | 1.26 | 1.01 | 2.03 | 0.79 | 0.17 | 0.20 |

Table 6. Light-Bellied Brent goose grazing pressure (droppings/m²) averaged across all transects, in each winter season of the monitoring programme.

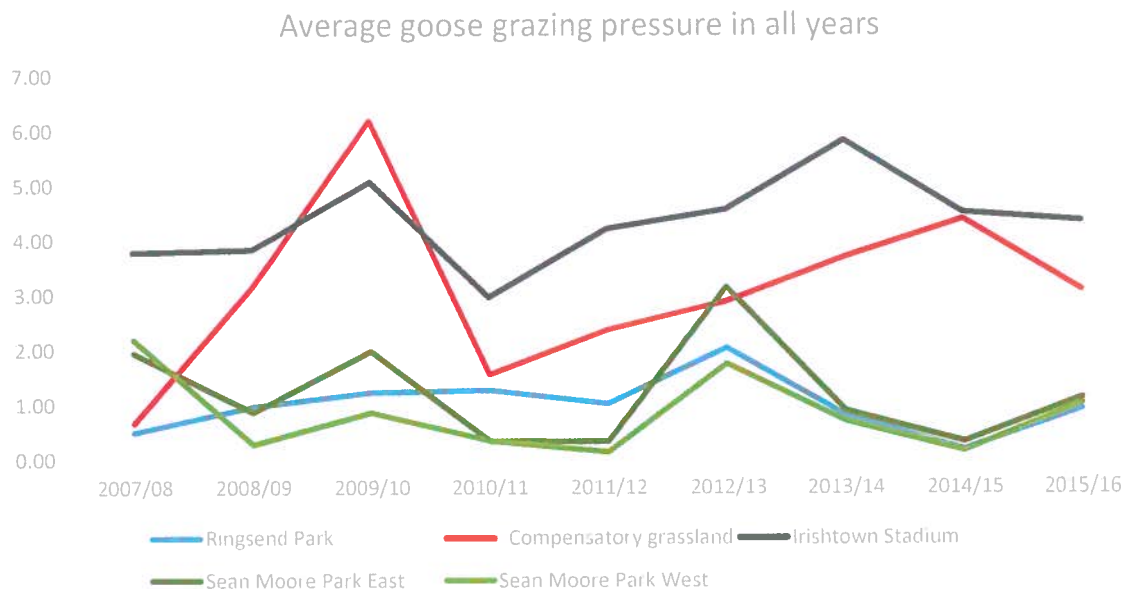


Figure 4. Light-Bellied Brent goose grazing pressure (droppings/m²) averaged across all transects, in each winter season of the monitoring programme.

Use of the compensatory grassland was lower in 2015/16 than in the previous two seasons, and at 3.08 droppings/m² was equivalent to the 3.10 droppings/m² monitoring programme average use for this site (Table 7).

Light-bellied Brent Goose overall grazing intensity has been higher in Irishtown Stadium than in the other monitored grasslands (compensatory grassland, Sean Moore Park and Ringsend Park) in the Ringsend area in eight of the last nine years (Table 6, Figure 4). In the years since management of the compensatory grassland was improved in 2008, the compensatory grassland and Irishtown Stadium have been the most intensively used of the monitored Ringsend grasslands. This is reflected in the mean dropping density averaged over all years of the monitoring programme: with an overall average of 4.34 goose droppings/m² in Irishtown Stadium, compared with a mean density of 3.10 droppings/m² in the compensatory grassland (Table 7). Excluding the pre-grassland management winter season of 2007/08, mean grazing intensity was 3.41 droppings/m² on the compensatory grassland. In 2015/16, overall goose grazing intensity was higher on Irishtown Stadium, with a seasonal average of 4.34 droppings/m². In the compensatory grassland, overall grazing intensity across all transects was 3.08 droppings/m² in 2015/16, equivalent to the monitoring programme average use for this site. Use of individual transects is considered in section 5.1.

| Grassland area | Transect | Mean density all years | Standard deviation |
|------------------------|---------------|------------------------|--------------------|
| Compensatory Grassland | All transects | 3.10 | 1.6 |
| Sean Moore Park | East pitch | 1.11 | 1.01 |
| | West pitch | 0.73 | 0.75 |
| Irishtown Stadium | | 4.34 | 0.81 |
| Ringsend Park | | 0.90 | 0.58 |

Table 7. Mean density of goose droppings/m² recorded on the Ringsend grasslands averaged over all years 2007/08, 2008/09, 2009/10, 2010/11, 2011/12, 2012/13, 2013/14, 2014/15, and 2015/16. Standard deviations are also given.

Sean Moore Park and Ringsend Park have been less intensively used by the geese during the monitoring programme to date (Tables 6 and 7, Figure 4).

5.1. Grazing intensity on individual transects

The mean density of goose droppings on all grassland transects on each survey date is given in Table 8, these data are presented graphically in Figure 5. Grazing intensity in the compensatory grassland transects averaged over the 2015/16 season varied from 1.37 on transect T1C, to 4.88 on transect T2B (see Figure 2). Mean densities of goose droppings on all transects, averaged over each season of the monitoring programme, are given in Table 9, together with mean density since 2008, and are shown graphically in Figure 6 (page 18). These data indicate that goose grazing intensity has been consistently higher on transects T1A, T1B, T2A and T2B than on the other transects on the compensatory grassland, both during and prior to construction of the Dublin Waste to Energy Facility. Goose grazing intensity was higher on two of the transects on the compensatory grassland, T2A and T2B, than on the Irishtown Stadium transect in 2015/16.

| Grassland area | Transect | 12.11 2015 | 26.11. 2015 | 18.12. 2015 | 06.01. 2016 | 05.02. 2016 | 16.02. 2016 | 25.02. 2016 | 16.03. 2016 | 08.04. 2016 | 2015/16 Season mean |
|---------------------------|------------|---------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|---------------------------|
| Compensatory Grassland | T1A | 0.16 | 5.04 | 1.76 | 0.44 | 7.28 | 5.74 | 2.53 | 2.09 | 4.42 | 3.27 |
| | T1B | 0.60 | 5.48 | 1.48 | 0.46 | 8.02 | 3.67 | 3.18 | 4.89 | 4.30 | 3.56 |
| | T1C | 0.0 | 3.79 | 0.41 | 0.27 | 2.26 | 1.30 | 0.27 | 2.00 | 2.05 | 1.37 |
| | T2A | 0.32 | 6.30 | 3.45 | 2.24 | 9.06 | 6.40 | 3.23 | 3.85 | 7.50 | 4.71 |
| | T2B | 1.25 | 6.56 | 2.93 | 2.04 | 9.50 | 5.40 | 5.89 | 4.05 | 6.30 | 4.88 |
| | T2C | 0.0 | 2.22 | 0.31 | 0.08 | 7.09 | 2.94 | 1.84 | 2.45 | 2.06 | 2.11 |
| | T10 | 0.0 | 3.74 | 1.06 | 0.42 | 5.31 | 2.06 | 0.94 | 1.10 | 2.08 | 1.86 |
| | T30 | 0.23 | 4.39 | 1.90 | 1.76 | 5.39 | 3.38 | 1.94 | 3.70 | 4.86 | 3.06 |
| Sean Moore Park | T60 | 0.67 | 4.18 | 1.68 | 1.06 | 6.00 | 4.36 | 2.16 | 2.03 | 4.45 | 2.95 |
| | East pitch | 0.0 | 0.58 | 0.16 | 0.77 | 0.24 | 0.18 | 0.18 | 0.13 | 0.24 | 0.28 |
| | West pitch | 0.0 | 0.35 | 0.28 | 0.36 | 0.04 | 0.28 | 0.2 | 0.03 | 0.15 | 0.18 |
| Irishtown Stadium | | 0.0 | 0.52 | 2.16 | 0.96 | 5.31 | 7.89 | 3.8 | 7.06 | 5.55 | 4.36 |
| Ringsend Park | | 0.0 | 0.03 | 0.0 | 0.34 | 0.13 | 1.15 | 0.06 | 0.08 | 0.10 | 0.20 |

Table 8. Mean density of goose droppings/m² recorded on all transects on each survey date in winter 2015/16, and average density on each transect throughout the winter season (Season mean).

| Grassland area | Transect | 07/08 | 08/09 | 09/10 | 10/11 | 11/12 | 12/13 | 13/14 | 14/15 | 15/16 | Mean 2008/09 to 15/16 | Standard deviation 2008/09 to 15/16 |
|---------------------------|------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-----------------------------|--|
| Compensatory Grassland | T1A | 0.04 | 2.39 | 6.19 | 1.90 | 2.44 | 3.20 | 4.73 | 4.89 | 3.27 | 3.23 | 1.84 |
| | T1B | 0.09 | 2.04 | 5.54 | 1.55 | 2.27 | 4.67 | 5.76 | 6.44 | 3.56 | 3.55 | 2.19 |
| | T1C | 0.02 | 0.63 | 4.49 | 0.89 | 0.54 | 4.00 | 1.46 | 3.66 | 1.37 | 1.90 | 1.68 |
| | T2A | 2.14 | 5.55 | 6.84 | 1.70 | 4.27 | 2.54 | 4.34 | 5.43 | 4.71 | 4.17 | 1.73 |
| | T2B | 0.80 | 6.14 | 9.63 | 1.88 | 2.65 | 4.38 | 4.29 | 6.00 | 4.88 | 5.32 | 2.45 |
| | T2C | 0.05 | 2.01 | 5.73 | 1.75 | 1.73 | 2.92 | 3.06 | 3.74 | 2.11 | 2.57 | 1.58 |
| | T10 | 0.49 | 3.27 | 5.26 | 1.45 | 2.21 | 1.04 | 2.12 | 2.09 | 1.86 | 2.20 | 1.39 |
| | T30 | 1.09 | 2.52 | 5.52 | 1.52 | 2.69 | 1.63 | 3.84 | 3.28 | 3.06 | 2.79 | 1.36 |
| Sean Moore Park | T60 | 1.24 | 3.69 | 6.39 | 1.29 | 2.45 | 1.55 | 3.62 | 3.86 | 2.95 | 3.00 | 1.64 |
| | East pitch | 1.94 | 0.86 | 1.97 | 0.33 | 0.32 | 3.14 | 0.88 | 0.31 | 0.28 | 1.11 | 1.01 |
| | West pitch | 2.19 | 0.27 | 0.85 | 0.34 | 0.13 | 1.74 | 0.69 | 0.14 | 0.18 | 0.73 | 0.75 |
| Irishtown Stadium | | 3.78 | 3.83 | 5.05 | 2.96 | 4.21 | 4.56 | 5.82 | 4.50 | 4.36 | 4.34 | 0.81 |
| Ringsend Park | | 0.49 | 0.96 | 1.22 | 1.26 | 1.01 | 2.03 | 0.79 | 0.17 | 0.20 | 0.96 | 0.58 |

Table 9. Mean density of goose droppings/m² recorded on all transects in 2007/08, 2008/09, 2009/10, 2010/11, 2011/12, 2012/13, 2013/14, 2014/15, and 2015/16. Means and standard deviations for all years from 2008/09 to 2015/16 are also given (final column).

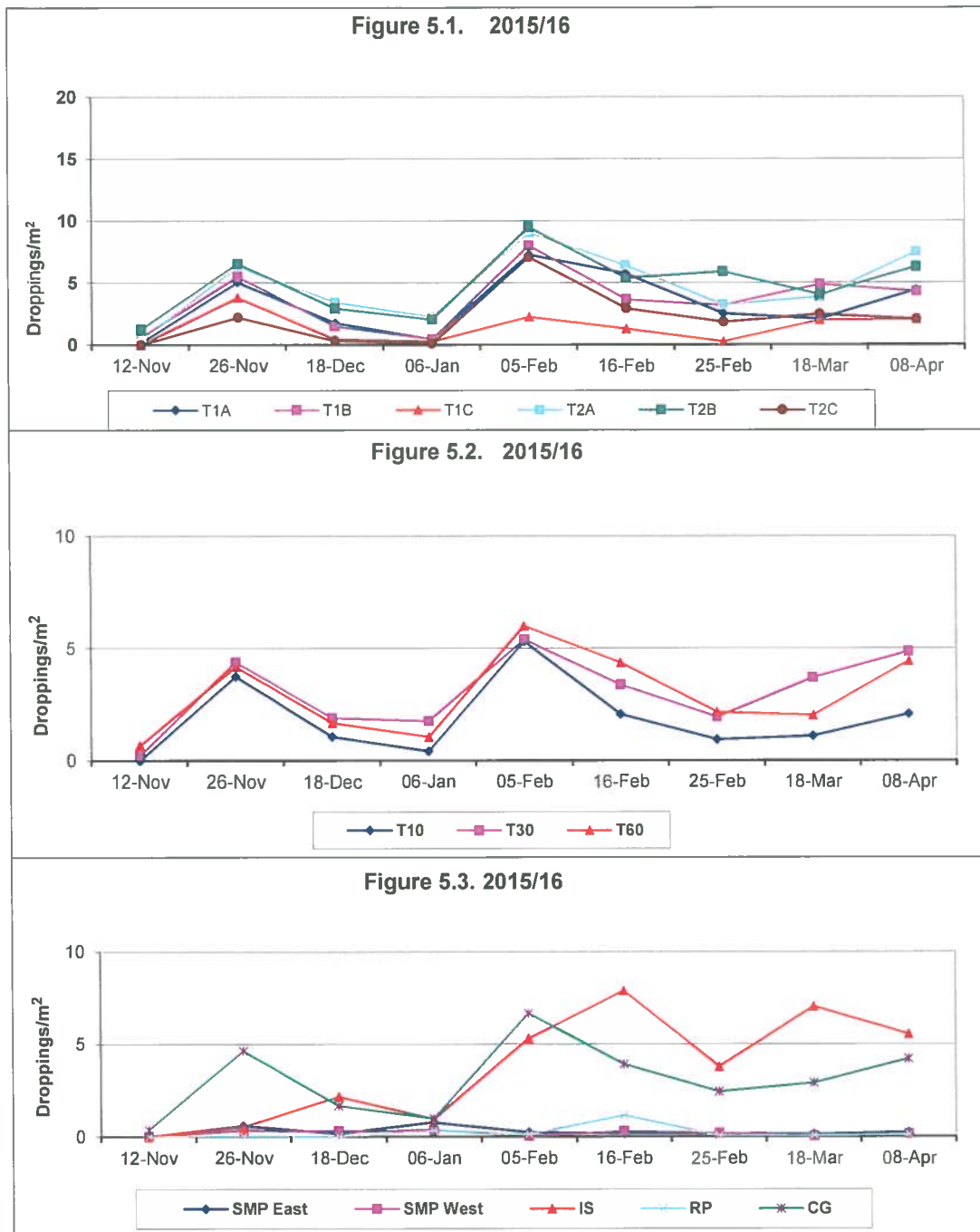


Figure 5. Mean density of goose droppings/m² recorded on compensatory grassland transects: (5.1) T1 and T2, (5.2) T10, T30 and T60, and (5.3) a comparison of the Compensatory Grassland (CG, mean of all transects) with the other grasslands in the Ringsend area, in 2015/16.

6. SUMMARY OF WATERBIRD USE OF THE COMPENSATORY GRASSLAND.

The Project Agreement was signed on Friday 19th September 2014. Site clearance and setup commenced in October. Piling works at the approved project site, using Continuous Augered Piles (CFA Piles), commenced during the week starting 20th October, initially with one piling rig and subsequently with three rigs. Piling and foundation works continued through the winter season. Construction of above ground structures commenced in March 2015, and continued with cladding and installation of equipment through 2015 and 2016.

Light-bellied Brent Geese were first recorded feeding in intertidal habitats in South Dublin Bay on 22nd September 2015, when 14 birds were observed feeding on the *Zostera* bed near Merrion Gates. There was a relatively low standing crop of green macroalgae in intertidal habitats in Dublin Bay during the early autumn of 2015 following poor summer weather, though green macroalgal cover did increase through September and early October.

Brent Geese started to feed on the compensatory grassland on 3rd November 2015, and a peak count of 260+ was recorded on 11th January 2016. Feeding use had been recorded on all transects by 26th November 2015. Use of the compensatory grassland was lower in 2015/16 than in the previous two seasons, but remained equivalent to the monitoring programme average use of this site.

In the years since management of the compensatory grassland was improved in 2008, the compensatory grassland and Irishtown Stadium have been the most intensively used of the monitored Ringsend grasslands. Goose grazing intensity has been consistently higher on transects T1A, T1B, T2A and T2B than on the other transects on the compensatory grassland, both during and prior to construction of the Dublin Waste to Energy Facility. Goose grazing intensity was higher in 2015/16 on two transects on the compensatory grassland, T2A and T2B, than on the Irishtown Stadium transect.

All of the waterbird species recorded on the compensatory grassland make feeding use of grassland habitats as well as intertidal habitats. Redshank, Curlew and Black-tailed Godwit generally use wet grassland, or temporarily flooded grassland which does occur within the compensatory grassland. Oystercatchers use dry grasslands as well as wet grasslands.

7. REFERENCES

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The Irish Wetland Bird Survey (I-WeBS) is a joint scheme of BirdWatch Ireland and the National Parks and Wildlife Service of the Department of Arts, Heritage & the Gaeltacht.

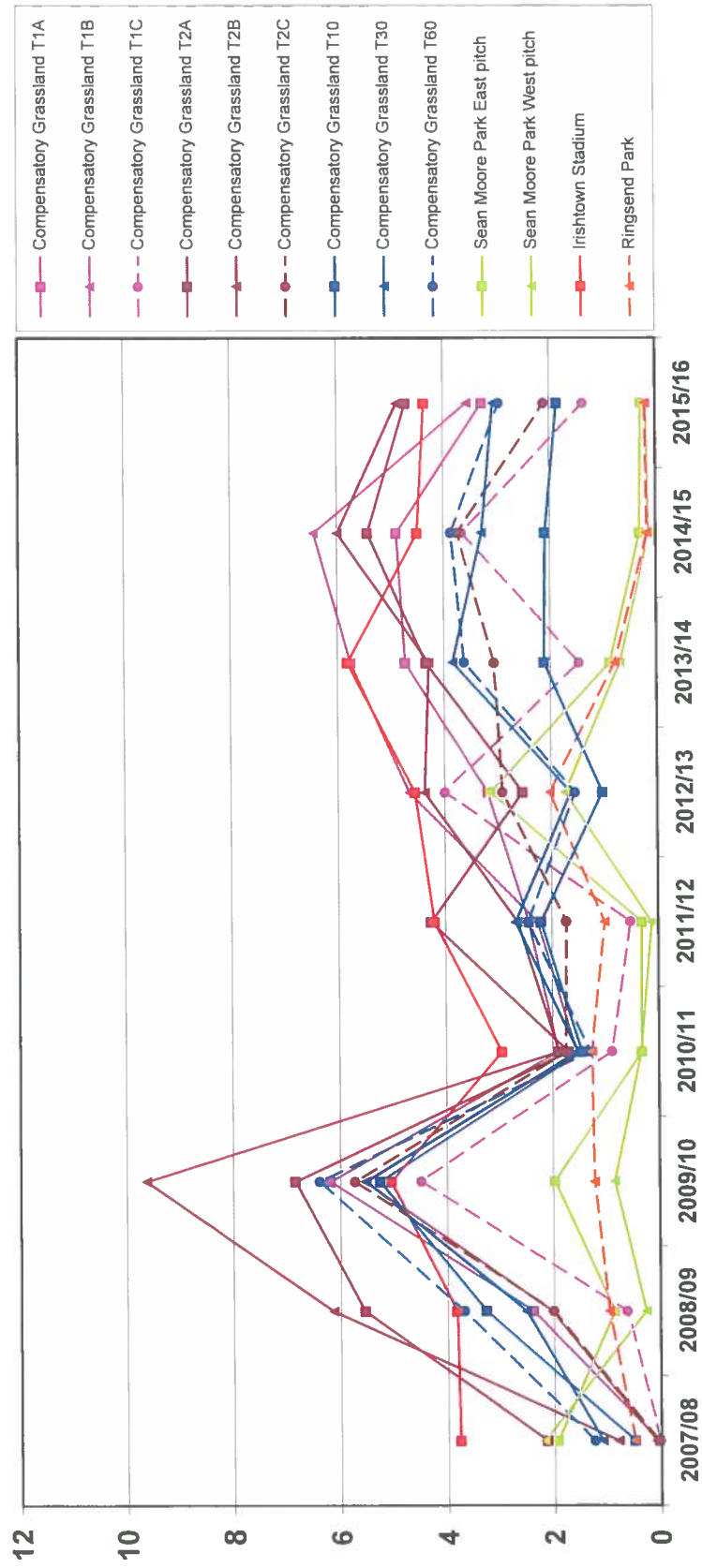


Figure 6. Mean density of goose droppings/m² recorded on the transects in 2007/08, 2008/09, 2009/10, 2010/11, 2011/12, 2012/13, 2013/14, 2014/15 and 2015/16.

Note: data are averaged for each transect across all survey dates in each season.

