RECEIVING ENVIRONMENT REPORT

AIR ENVIRONMENT

Study Area

The Halverstown waste recovery facility is located approx. 4.5km to the south of Kilcullen village, approx. 1km to the west of the M9 motorway. The site is accessed via the existing entrance / access to Kilsaran's concrete production facility, located on the western side of the R448 Regional Road (the old N9 National Primary Road).

The application site was previously developed as a sand and gravel pit, and it hosts features typical of an extractive operation including stockpiles and silt storage / settlement areas. It is proposed to locate the waste recovery facility within the void created by sand and gravel extraction and on some agricultural lands located to the north-east of the excavated pit.

The site is located in a rural area with residential development generally consisting of one-off housing and ribbon development along the local road network. Land use in the area is mainly agricultural, with a small number of interspersed sand and gravel extraction facilities. The application site adjoins Kilsaran's existing concrete manufacturing facility to the north. A fully restored, former sand and gravel pit (previously operated by Kilsaran) is located to the north-west of the application site.

Baseline Study Methodology

The application site and surrounding area fall into Air Quality Zone D, categorised as rural locations throughout Ireland. No monitoring in the vicinity of the site is routinely undertaken for air pollutants regulated under the Air Quality Standards Regulations (S.I. No. 180 of 2011).

The closest air quality monitoring location to the proposed recovery facility, and in a similar Zone D area, is located in Emo, approximately 20km west of the application site. The closest PM_{10} monitoring in Zone D is carried in Kilkitt, County Monaghan. As such, it is considered the most appropriate dataset available for assessment of relevant baseline concentrations in the study area.

For rural areas, such as those surrounding the application site, the primary source of deposited dust would be local agricultural or rural based activities. As there are no major sources of deposited dust in close proximity to the proposed development, baseline levels of particulates would therefore be expected to be low.

Sources of Information

A desk study was carried out to examine all relevant information relating to air quality conditions around the application site. Met Eireann, the National Meteorological Service data was consulted in relation to the climate / weather data in respect of the study area. Information published on the EPA website in respect of air quality was reviewed.

Information published on its website by the National Parks and Wildlife Service (NPWS) (part of the Department of the Environment, Community and Local Government, DoECLG), in respect of designated ecological sites, protected habitats and species was also reviewed, together with Ordnance Survey maps and aerial photography.

Background Air Quality

Recent annual mean concentrations monitored at Kilkitt, County Monaghan (published on the EPA website) are presented in Table 1 below.

Table 1
Background PM_{10} Background Concentrations - Kilkitt

Year	Annual Mean (µg/m^3)	Number of Days >50µg/m^3
2015	9	2
2014	9	1

Table 1 indicates that PM_{10} concentrations monitored at the Kilkitt monitoring site are below the annual mean Air Quality Standards (AQS) of 40µg/m^3 and comply with the requirement that a 24-hour mean of 50µg/m^3 should not be exceeded more than 35 times in a calendar year.

Meteorology : Dispersion of Emissions

The most important climatological parameters governing the atmospheric dispersion of particles are as follows:

- wind direction : this determines the broad transport of the emission and the sector of the compass into which the emission is dispersed; and
- wind speed : this will affect ground level emissions by increasing the initial dilution of particles in the emission. It will also affect the potential for dust entrainment.

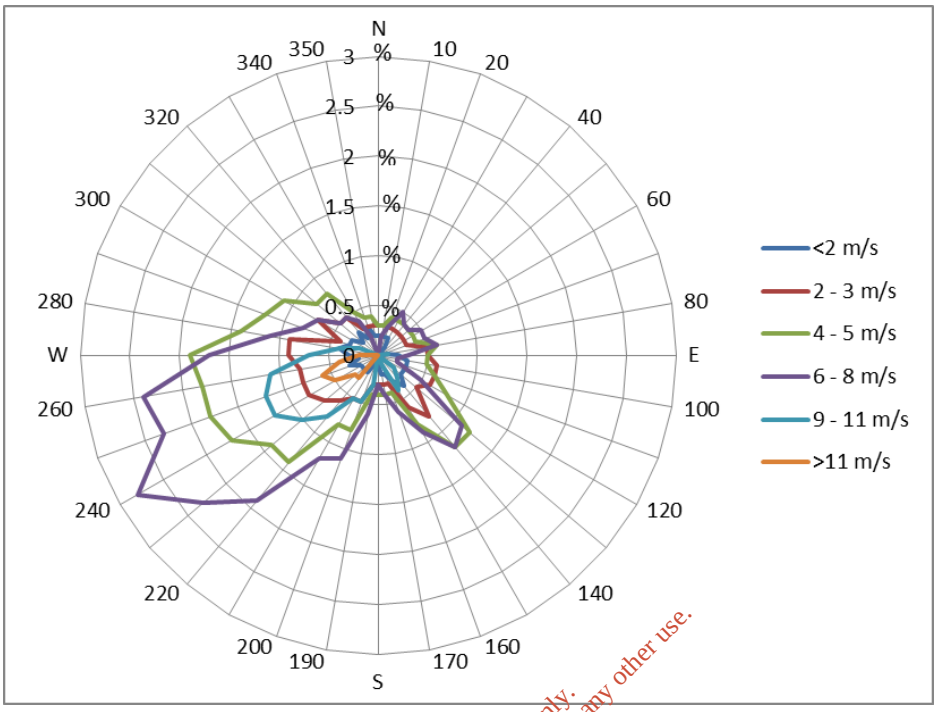
Rainfall is also an important climatological parameter in the generation of dust; sufficient amounts of rainfall can suppress dust at the source and eliminate the pathway to the receptor. Rainfall greater than 0.2mm per day is sufficient to suppress dust emissions.

Local Wind Speed and Direction Data

The closest weather station with sufficient records of wind direction and wind speed considered representative of conditions experienced at the application site is Baldonnel (Casement) Aerodrome Meteorological Station, which is located approximately 30 km to the northeast of the application site.

A windrose for the average conditions recorded at Baldonnel (Casement) Aerodrome, over a ten year period, is presented in Figure 1 overleaf. As can be seen, the predominant wind direction is from the southwestern quadrant.

Figure 1
Windrose for Baldonnell (Casement) Aerodrome Meteorology Station



Rainfall Data

Relevant rainfall data applicable to the site has been obtained from the Irish Meteorological Service website for the Baldonnel (Casement) Aerodrome station, approximately 30 km north-east of the application site. The annual average days with rainfall greater than 0.2 mm is 183 days per year. Natural dust suppression (from rainfall) is therefore considered to be effective for 50% of the year.

Existing Baseline Dust Levels

Site-specific dust monitoring is currently carried out at the existing waste recovery facility in compliance with Condition No. 23 of the existing planning permission for a smaller scale waste recovery facility (Kildare County Council Planning Ref. No. 15/189). Dust monitoring is also required by the corresponding waste facility permit (Ref. No WFP-KE-16-0085-01).

Details of existing dust emission levels arising at and around the existing permitted waste recovery facility are presented separately in Attachment 7-1-3-1 (Compliance Report).

NOISE ENVIRONMENT

Study Area

The Halverstonw waste recovery facility is located approx. 4.5km to the south of Kilcullen village, approx. 1km to the west of the M9 motorway. The site is accessed via the existing entrance / access to Kilsaran's concrete production facility, located on the western side of the R448 Regional Road (the old N9 National Primary Road).

The application site was previously developed as a sand and gravel pit, and it hosts features typical of an extractive operation including stockpiles and silt storage / settlement areas. It is proposed to locate the waste recovery facility within the void created by sand and gravel extraction and on some agricultural lands located to the north-east of the excavated pit.

The site is located in a rural area with residential development generally consisting of one-off housing and ribbon development along the local road network. Land use in the area is mainly agricultural, with a small number of interspersed sand and gravel extraction facilities. The application site adjoins Kilsaran's existing concrete manufacturing facility to the north. A fully restored, former sand and gravel pit (previously operated by Kilsaran) is located to the north-west of the application site.

Sources of Information

Baseline information was gathered through a combination of desk-based study, site visit, and technical assessments consistent with current standard methodologies and published best practice guidelines, in order to provide relevant data to allow an assessment of likely significant effects of the proposed development on sensitive receptors within the zone of influence.

Baseline Study Methodology

Environmental noise surveys were carried out to capture typical background noise levels at the noise-sensitive receptors closest to the application site. The methodology of the surveys and the results are set out below. The weather conditions during the survey periods were acceptable for noise monitoring, being generally dry with little or no wind.

The measurements were carried out using a Larson Davis 831 Type 1 sound level meter (serial number A0527). The sound level meter was calibrated before the measurements, and its calibration checked after, using a Larson Davis Cal200 field calibrator (serial number 6970). No calibration drifts were found to have occurred during surveys. All noise equipment had been calibrated to a traceable standard by UKAS (United Kingdom Accreditation Service) accredited laboratories within 12 months preceding the surveys.

At the measurement positions, the following noise level indices were recorded:

- $L_{Aeq,\ T}$ is the A-weighted equivalent continuous noise level over the measurement period, and effectively represents an "average" value.
- $L_{A90,T}$ is the A-weighted noise level exceeded for 90% of the measurement period. This parameter is often used to describe the background noise.
- $L_{A10,\ T}$ is the A-weighted noise level exceeded for 10% of the measurement period. This parameter is often used to describe traffic noise.

Environmental noise surveys were undertaken by SLR Consulting Ireland staff at the nearest noise sensitive receptors to the application site on 10 June 2015. Noise measurements were undertaken

over 1 hour period during the daytime (07:00 to 19:00). The monitoring periods chosen are considered to give representative daytime noise levels at each noise sensitive location.

During the surveys, the sound level meter was located in free-field conditions (i.e. at least 3.5m from the nearest vertical reflecting surface, with the microphone approximately 1.5m above ground level).

All noise levels are recorded in 'A-weighted' decibels, dB(A). A-weighting is the process by which noise levels are corrected to account for the non-linear frequency response of the human ear. All noise levels are quoted in dB(A) relative to a sound pressure of 20µPa.

Field Survey / Monitoring

The noise monitoring locations used for the purposes of the baseline noise survey on 10 June 2015, shown in Figure 7-1-3-2A, comprise the following :

- N1: to the south east of the proposed facility;
- N2: to the north east of the proposed facility;
- N3: to the north west of the proposed facility;
- N4: to the west of the proposed facility.

The noise monitoring locations listed above are considered representative of the nearest noise sensitive locations (receptors) to the application site, as described below:

- Location N1 is representative of the residential properties located to south east of the proposed facility;
- Location N2 is representative of the residential properties located to the north east of the proposed facility;
- Location N3 is representative of the residential properties located to the north west of the proposed facility;
- Location N4 is representative of the residential properties located to the west of the proposed facility.

Noise monitoring results for the baseline noise survey on 10th June 2015 are provided in Table 2.

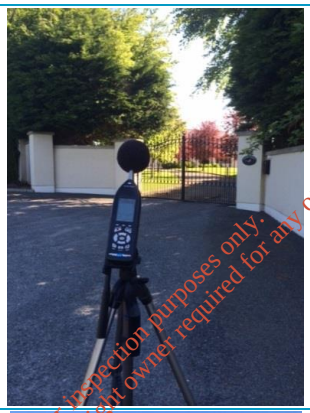
Table 2
Summary of Measured Noise Levels, Free Field dB

Location	Receptors	Date	Time	$L_{Aeq,T}$	L_{A10}	L_{A90}
N1	R1, R2, R3, R4, R32	10/06/15	8:04 - 9:04	75	80	52
N2	R5, R6, R7	10/06/15	9:10 - 10:10	54	56	41
N3	R24 – R29	10/06/15	10:37 - 11:37	47	50	37
N4	R31	10/06/15	11:51 - 12:52	64	64	39

The weather conditions at the time of the noise survey are described as sunny, with no cloud cover. Temperatures were 15 to 18^{0}C, wind speed was up to 2.1 m/s and wind direction was NE.

Details of noise monitoring locations are presented in Table 3 below:

Table 3
Summary of Noise Climate

Location	Photo	Noise Climate Description
N1		Measured baseline noise levels at N1 were mainly dominated by road traffic noise sources on the adjacent R448, natural noises, and farm animals' noises from surrounding fields when noise from the traffic abated. Recorded noise levels reflect the morning traffic on the R448.
N2		Measured baseline noise levels at N2 were mainly dominated by road traffic noise sources on the adjacent line, natural noises, and farm animals' noises from surrounding fields when noise from the traffic abated. Traffic noise from R448 also audible.
N3		Measured baseline noise levels at N3 were mainly dominated by natural noises, and farm animals' noises from surrounding fields. Car passed noise meter to access the farm.
N4		Measured baseline noise levels at N4 were mainly dominated by road traffic noise sources on the adjacent R418, natural noises, and farm animals' noises from surrounding fields when noise from the traffic abated.

On the basis of the data presented in Table 3 above and given that the site is located within 1 km of a motorway, it is concluded that all the locations may be designated as 'all other areas' in accordance with standards set out in the EPA's NG4 Guidance.

Existing Baseline Noise Levels

Site-specific noise monitoring is currently carried out at the existing waste recovery facility in compliance with Condition No. 22 of the existing planning permission for a smaller scale waste recovery facility (Kildare County Council Planning Ref. No. 15/189). Noise monitoring is also required by the corresponding waste facility permit (Ref. No WFP-KE-16-0085-01).

Details of existing noise emission levels arising at and around the existing permitted waste recovery facility are presented separately in Attachment 7-1-3-1 (Compliance Report).

GROUND / GROUNDWATER ENVIRONMENT

Study Area

The study area for the ground / groundwater baseline assessment report comprises three principal geographic areas:

- the proposed inert waste recovery facility;
- the existing site operations; and
- the immediate surrounding area within approximately 1km of the Kilsaran site boundary.

Sources of Information

The following sources of information were consulted in the preparation of the receiving environment baseline study for land (ground), soils and geology:

- Geological Survey of Ireland (www.gsi.ie);
- Teagasc soil and subsoil mapping for Irish Forestry Soils Project (www.epa.ie);
- Irish Geological Heritage Programme (www.gsi.ie);
- Ordnance Survey of Ireland (www.osi.ie); and

The following sources of information have been consulted in order to investigate the hydrogeology and hydrology of the area surrounding the application site:

- The Environmental Protection Agency for Ireland website (www.epa.ie) for maps and environmental information;
- Geological Survey of Ireland website (www.gsi.ie);
- Geology of Kildare-Wicklow, Sheet 16, (1995) 1:100,000 scale, Geological Survey of Ireland;
- Groundwater Protection Schemes (www.gsi.ie);
- Water Maps, Water Framework Directive online mapping (www.wfdireland.ie); and
- Trial Pits and Borehole Logs.

A site walkover survey was undertaken in December 2015 and April 2017 to undertake trial pit excavations, inspect the existing infrastructure / facilities and assess soil, geology and water features.

There are some exposures of natural sand and gravel materials at residual pit faces within the application site. There is a former settlement pond at the southern end of the site which is disused as there is no longer any extraction undertaken at the site. The former pond has now dried out. Details of the trial pit and borehole surveys undertaken at the application site are briefly presented herein and in more detail in Appendix 6.1 and 6.2 of the EIAR which accompanies this waste licence application.

Kilsaran has undertaken monthly groundwater monitoring at the application site since April 2017. It has also undertaken a survey of local residences and septic tank treatment systems at residences adjoining its lands.

Ground

Land-Use

The established land use at the application site comprises a former worked out sand and gravel pit and settlement pond, processing, block making and ancillary infrastructure. The site also includes an

area of existing agricultural land, located on the northern side of the access road, which is currently used for grazing.

The historical extraction of sand and gravel at the application site was a tied land-use activity being dependant on the local availability of aggregate reserves. The current agricultural activities at the site (principally grazing) are tied (in part) to the nature of underlying soils.

The occurrence of the existing void space following completion of sand and gravel extraction activities at the application site and its availability of this space / volume for subsequent backfilling and restoration using excess / waste soil and stone waste are interrelated or tied land uses to this location.

Soils Baseline

Teagasc soil mapping indicates that the soils in the vicinity of the application site comprise Rendzinas and Lithosols – these are described as shallow well drained mineral soils formed over calcareous limestone subsoil parent material. Lithosols typically form on free draining sands and gravels such as those which exist / previously existed at the application site.

The soils at the site have been stripped in the past to facilitate the extraction of the Sand & Gravel material at the site. The lands on the northern side of the site access road will be stripped to facilitate the restoration of the site with the inert material and will be stockpiled so that they can be reused in restoration.

Subsoils Baseline

Teagasc subsoil mapping indicates that the soils in the vicinity of the application site comprise sands and gravels derived from carboniferous limestone. Much of the subsoil which previously underlay the site has been removed and use for aggregate production and little extractable reserve remains at the site. The southern part of the site includes the former settlement pond which holds silt fines from historic aggregate washing processes.

Trial pits excavated at the application site in December 2015 encountered Made Ground including aggregates and silt in the silt pond area. The Made Ground overlies clayey gravels and sandy gravels, refer to Appendix 6-1 of the EIAR which accompanies this waste licence application for further detail. Three geological boreholes were also drilled at the application site in April 2017 for groundwater level monitoring purposes and summary details of the borehole / well construction logs are provided in Table 4 below. Full details are provided in Appendox 6-2 of the accompanying EIAR.

Table 4
Summary Borehole Details

Borehole ID	Borehole Depth	Depth to Groundwater	Description
BH1	19m	11m	Glacial Till
BH2	19m	11m	Made Ground and Sand & Gravel
BH3	16m	8.9m	Made Ground and Glacial Till
BH4	9m	4m	Sand & Gravel and Glacial Till

Bedrock Geology Baseline

There are no bedrock exposures at the application site. The GSI 1:100,000 Geology Map Sheet 16 (1994) indicates that the former pit / application site at Halverstown is underlain by the Silurian age

Carrighill Formation, part of the Kilcullen Group. The Carrighill Formation is described as fine grained greywacke siltstones and shale. The greywackes in this formation are distinctive as they have a calcareous matrix. The GSI karst database indicates that there are no karst features within the application site or elsewhere in the immediate vicinity thereof.

Geological Heritage Baseline

The Geological Survey of Ireland (GSI) Irish Geological Heritage (IGH) Programme of audited sites was reviewed (www.gsi.ie) to establish if any geological heritage issues were present at or around the former pit / application site at Halverstown. The Kildare County Development Plan (2017-2023) was also reviewed to identify designated / prospective County Geological Sites. These reviews indicate there are no designated geological heritage sites at the application site or in the immediate vicinity thereof.

Groundwater Baseline

Hydrological Setting

The application site at Halverstown is located within the River Barrow catchment and the South Eastern River Basin District, close to the boundary / watershed with the adjoining River Liffey catchment / Eastern River Basin District - the channel of the River Liffey is located 4.4 km to the north of the application site (at Kilcullen).

There are no surface water courses at the application site or immediately adjacent to it. The closest surface watercourse, the headwaters of a small stream which flows to the River Barrow, is located approximately 1.5km to the south. No surface water is abstracted from local streams or rivers for use at the application site.

Flood mapping prepared by the Office of Public Works (OPW) (www.floodmaps.ie) indicates that there are no recorded flooding incidents in the vicinity of the site at Halverstown and Preliminary Flood Risk Assessment (PFRA) maps indicates that while there is no risk of fluvial (river) flooding at the site, some pluvial (surface water) flooding may arise at localised depressions within the site.

Aquifer Characteristics

The application site is located on the Usk gravel aquifer which is classified as a Locally Important Sand/Gravel aquifer (Lg). The Usk gravel aquifer is a recognised groundwater body (GWB) for the purposes of the Water Framework Directive (WFD). It is identified as a locally important aquifer as its plan extent is less than 10km^2, thereby limiting the amount of recharge available to meet abstraction needs compared to larger, regionally important aquifers.

The calcareous greywacke siltstone and shale bedrock (Carrighill Formation) underlying the application site is designated a Poor Aquifer (PU) which is generally unproductive in terms of groundwater supply.

It is likely that the gravel aquifer is in continuity with the underlying bedrock aquifer although this will be limited to the upper weathered zone of the bedrock as it is classified as a poor aquifer and is generally unproductive for supply purposes.

The GSI description of Irish Aquifer categories describes typical characteristics of Sand /Gravel aquifers. Groundwater flows through the pore spaces between sand and gravel grains, and the permeability is mainly determined by the grain size (larger grains give larger pore spaces), and the 'sorting' of the material (the more uniform, the higher the permeability). There is a relatively uniform distribution of groundwater, good aquifer storage and long groundwater flow paths, typically limited by the aquifer's extent.

Groundwater Vulnerability

The GSI has developed a groundwater vulnerability classification for Ireland. The groundwater vulnerability at a particular point can be determined based on the natural geological and hydrogeological characteristics at that point. The vulnerability therefore depends on the nature of the subsoils (permeability), the type of recharge (point or diffuse) and the thickness of the unsaturated zone (depth to groundwater).

Across the sand and gravel pit footprint, all overburden cover has been removed and sand and gravel is exposed. Aquifer vulnerability mapping published by the GSI indicates that the vulnerability of the aquifer across the application site is High (H). This rating reflects the fact that the site is underlain by relatively high permeability sand and gravel deposits and suggests that the depth of cover is greater than 3m above the groundwater table. This is confirmed by groundwater level monitoring at the application site - refer to Table 6 below .

The high permeability of the sands and gravels means there is little protection to the aquifer from potential contamination by human activities at the ground surface. Locally, the groundwater vulnerability beneath the former settlement lagoons will most likely be Moderate (M), as the silt therein is of relatively low permeability and is between 5m and 10m deep.

Rainfall and Climate Baseline

The Average Annual Rainfall (AAR) in the area around Halverstown is c. 929 mm/yr. for the period 1981-2010 (Met Éireann, 2016). The monthly average rainfall values for the period 1981-2010 are shown in Table 5 below.

Table 5
Monthly Rainfall Averages (mm) 1981-2010 for Halverstown

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	AAR
87	63	70	61	64	68	69	84	81	100	93	89	929

Mean annual Potential Evapotranspiration in the Kildare region is estimated to be c. 450 mm/yr. (Collins and Cummins, 1996). Recharge (P-PE) therefore is estimated to be c. 479 mm/yr.

Recharge Mechanisms

Rainfall onto the application area infiltrates into the ground where there is an unsaturated zone and percolates into the underlying groundwater system. There is no surface water management system at the site as incident rainfall percolates directly to the ground. The water table beneath the site is below existing ground level – refer to Table 6 below.

The GSI National Groundwater Recharge Map indicates for areas covered by vegetation the effective rainfall in the area surrounding the application site is about 475 mm/year. Recharge mapping assumes a recharge coefficient of up to 85% (i.e. 85% of the effective rainfall would percolate to the water table as groundwater recharge) indicating an average groundwater recharge of 404 mm/year for vegetated sand and gravels surrounding the application site.

Across the existing worked out pit, where soils and vegetation has been removed, there is currently no evapotranspiration occurring and the majority of annual rainfall will recharge to the underlying Sand/Gravel aquifer.

Dewatering

The application site is dry, with existing floor levels above the existing groundwater level. As such, there is no requirement for ongoing or future dewatering. Water supply requirements for the existing / adjoining site, for staff welfare facilities and concrete production facilities, are supplied from an onsite borehole, though daily abstraction volumes are low.

Groundwater Levels and Flow

Four groundwater monitoring boreholes (GW01 to GW04) were installed at the application site in April 2017. The locations of the monitoring wells are presented in Figure 7-1-3-2B. Groundwater level monitoring has been undertaken on a monthly basis in the monitoring wells since April 2017, and is reproduced in Table 6 below.

Table 6
Groundwater Level Data for Halverstown (mOD)

Date	GW01	GW02	GW03	GW04
Ground Level	126.65	127.48	123.76	119.22
24/04/2017	115.30	116.28	111.66	114.68
04/05/2017	115.14	114.63	114.67	114.36
02/06/2017	115.39	114.04	114.59	113.96
09/08/2017	114.37	113.20	113.81	113.16
19/09/2017	114.25	112.84	113.97	112.75
04/10/2017	114.31	112.76	114.18	112.68
21/11/2017	114.50	113.01	114.42	112.97
22/12/2017	115.29	114.03	114.74	112.94
17/01/2018	115.66	112.97	114.87	112.10
13/02/2018	116.18	115.72	115.66	115.66

The groundwater levels at the site indicate that it is located at a topographic high between GW01 and GW03 and suggest that groundwater flows to the north and south – refer to Figure 7-1-3-2B.

Groundwater Quality

Groundwater quality in the existing on-site monitoring wells was monitored by Kilsaran representatives on 21 November 2017. Wells GW1, GW2 and GW3 were sampled, comprising one upgradient well (GW1) and two downgradient wells (GW2 and GW3). The samples were tested for standard physio chemical parameters as well as a wider range of parameters including VOC's Hydrocarbons and Pesticides. The full certified laboratory results are included in Appendix 7-1 of the EIAR which accompanies this waste licence application. The physio-chemical results are reproduced in Table 7 below.

Kilsaran representatives took a representative groundwater sample from each of the wells and forwarded them for testing at the Fitz Scientific Laboratory in Drogheda. Each well was purged of three well volumes to remove the stagnant water in the well before the collection of the samples.

Table 6
Baseline Groundwater Quality Results (November 2017)

Parameter	Unit	GW Threshold Values[1]	GW01	GW02	GW03
Ammonia	mg/l as N		0.08	0.37	0.04
Ammonia	mg/l as NH3	0.2[2]	0.1	0.45	0.05
Antimony	µg/l		<4	<4	<4
Arsenic	µg/l	7.5	1	1	1
Barium	µg/l		74	65	119
Boron	µg/l	750	20	35	92
Cadmium	µg/l	3.75	1	2	<1
Chloride	µg/l	187.5	9	43	15
Chromium	µg/l	37.5	<3	<3	<3
Chromium (VI)	µg/l		<10	<10	<10
Conductivity at 20°C	µscm^{-1}	1,875	530	590	1,057
Copper	µg/l	1,500	1	4	5
Cyanide (free)	µg/l	37.5	<5	<5	<5
Cyanide (total)	mg/l	0.0375	<0.009	<0.009	<0.009
Fluoride	mg/l		0.11	0.13	0.06
Iron	µg/l		347	2,818	369
Lead	µg/l	18.75	4	15	3
Mercury	µg/l	0.75	0.08	<0.04	<0.04
Nickel	µg/l	15	4	12	4
Nitrate	mg/l as N	37.5	0.41	4.54	9.95
pH	pH units		7.4	7.5	7.2
Phenols (Total)	µg/l		<0.1	<0.1	<0.1
Phosphate (Ortho)	mg/l		<0.01	<0.01	<0.01
Sulphate	mg/l	187.5	10	8	242
Sulphide	mg/l		0.013	<0.01	<0.01
TPH (C10-C40)	µg/l		<1	<1	<1

[1] S.I. No. 9 of 2010. European Communities Environmental Objectives (Groundwater) Regulations, 2010.
[2] Ammonia NH3 is calculated from Ammoniacial Nitrogen by the testing laboratory.

Parameter	Unit	GW Threshold Values[1]	GW01	GW02	GW03
Vanadium	µg/l		2	4	2
VOC	µg/l		<5	<5	<5
Zinc	µg/l		3	25	1

The groundwater quality results were screened against the Groundwater Threshold Values from the groundwater regulations[1]. The threshold values for groundwater are for the assessment of the general quality of groundwater in a groundwater body in terms of whether its ability to support human uses has been significantly impaired by pollution.

The groundwater quality results from the three wells indicate that the groundwater is generally of good quality with levels generally below the threshold values, except for Ammonia in Well GW2 and Sulphate in Well GW3. The ammonia level in GW2 most likely reflects land use practises and in particular land spreading in surrounding agricultural lands. Sulphate in GW3 exceeds the threshold value for groundwater and is significantly higher than the values recorded in GW1 or GW2. However, the concentration of sulphate is below the current drinking water standard[3] of 250 mg/l.

Groundwater Abstractions

The GSI national well database (www.gsi.ie) shows a number of private wells within the vicinity of the site. GSI groundwater mapping also indicates that the application site at Halverstown does not lie within a groundwater supply source protection zone.

There is an existing groundwater abstraction borehole located at the application site for existing concrete production and staff welfare facilities, refer to Figure 7-1-3-2B. A survey of local residences undertaken by Kilsaran representatives identified that they are connected to a mains water supply.

Effluent Treatment System

There is an existing septic tank and percolation area at the established on-site facilities at Halverstown, refer to Figure 7-1-3-2B. The survey of local residences undertaken by Kilsaran representatives also identified that they have their own individual septic tanks for waste water treatment purposes.

Existing Waste Permit Facility

There is currently no requirement to undertake site-specific groundwater monitoring in the planning permission for the existing waste recovery facility at Halverstown (Kildare County Council Planning Ref. No. 15/189) or in the corresponding waste facility permit (Ref. No WFP-KE-16-0085-01), nor are there any specific restrictions or limits on emissions to groundwater.

[3] S.I. No. 122 of 2014 European Union (Drinking Water) Regulations, 2014.

NOTES

1. ORDNANCE SURVEY IRELAND LICENCE NO. SU 0000719 (C) ORDNANCE SURVEY & GOVERNMENT OF IRELAND

LEGEND

- LICENCE APPLICATION AREA (c. 17.5 Ha.)
- R — LOCAL RECEPTORS
- 500 METER OFFSET
- 1 KM OFFSET
- N — NOISE MONITORING LOCATION

0 100 200 300 400m 600 800 1000

Metres
1:10,000

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KILSARAN CONCRETE

Proposed Waste Recovery Facility
Halverstown, Co. Kildare

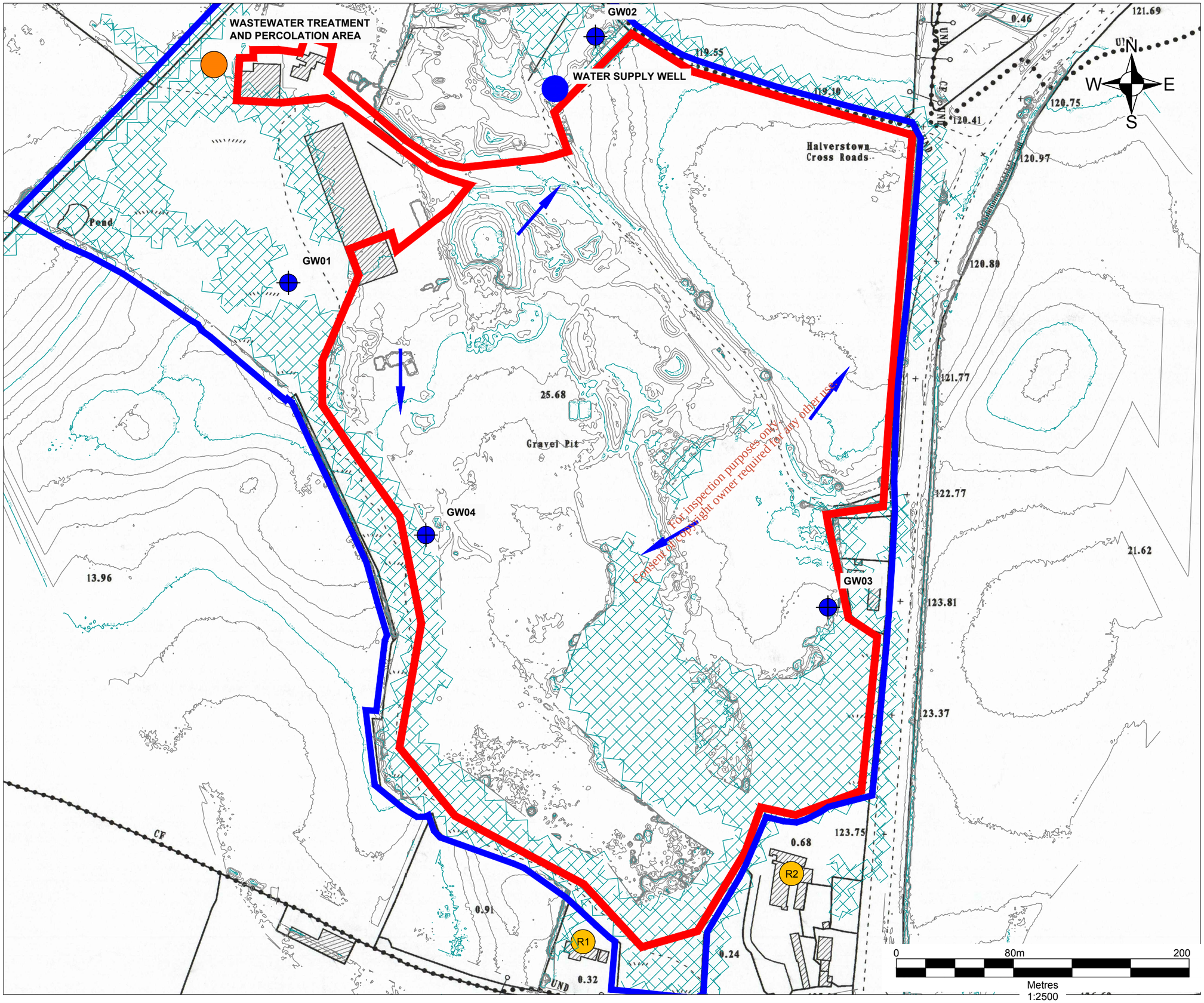
LOCAL RECEPTORS

FIGURE 7-1-3-2A

Scale 1:10,000 @ A3

Date JANUARY 2019

501.00036.00054.FIG_7-1-3-2A.dwg



NOTES

1. ORDNANCE SURVEY IRELAND LICENCE NO. SU 0000719 (C) ORDNANCE SURVEY & GOVERNMENT OF IRELAND.
2. BASED ON ORDNANCE SURVEY MAPPING 1:2,500 (3778-C, 3778-D & 3836-B) AND 25 INCH (KE028-15).
3. SITE CONTOURS BASED ON AERIAL SURVEY CARRIED OUT IN NOVEMBER 2016 BY SLR CONSULTING IRELAND.

LEGEND

- KILSARAN LAND OWNERSHIP BOUNDARY (c. 26.5 Ha)
- LICENCE APPLICATION AREA (c. 17.5 Ha.)
- GROUNDWATER MONITORING WELL
- SITE SUPPLY WELL
- WASTE WATER TREATMENT AND PERCOLATION AREA
- INFERRED GROUNDWATER FLOW DIRECTIONS

GROUNDWATER LEVELS (21.11.2017)

GW01 = 114.5 mOD
GW02 = 113.01 mOD
GW03 = 114.42 mOD
GW04 = 112.97 mOD

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KILSARAN CONCRETE

Proposed Waste Recovery Facility
Halverstown, Kilcullen, Co. Kildare

SITE LAYOUT AND GROUNDWATER MONITORING LOCATIONS

FIGURE 7-1-3-2B

Scale	Date
1:2,500 @ A3	JANUARY 2019

501.00036.00054.FIG_7-1-3-2B.dwg