Luton Rising

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February 2023

London Luton Airport Expansion

Planning Inspectorate Scheme Ref: TR020001

Volume 5 Environmental Statement and Related Documents

5.02 Appendix 17.7 Outline Strategy Report for Groundwater, Ground Gas and Leachate Monitoring

Application Document Ref: TR020001/APP/5.02
APFP Regulation: 5(2)(a)

The Planning Act 2008

The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

London Luton Airport Expansion Development Consent Order 202x

5.02 ENVIRONMENTAL STATEMENT APPENDIX 17.7 OUTLINE STRATEGY REPORT FOR GROUNDWATER, GROUND GAS AND LEACHATE MONITORING

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Planning Inspectorate Scheme Reference:	TR020001
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Author:	Luton Rising

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Issue 01	February 2023	Application issue

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1 INTRODUCTION

1.1.1 This outline strategy report for groundwater, ground gas and leachate monitoring has been undertaken for Luton Rising (a trading name for London Luton Airport Limited) (the applicant). The monitoring will contribute to baseline data which is required to:

a. Support the application for a Development Consent Order (DCO) for the expansion of the airport and the subsequent construction works;

b. Meet the recommendations of the Outline Remediation Strategy (ORS) (Ref. 1) which is **Appendix 17.5** of the Environmental Statement (ES) **[TR020001/APP/5.02]**; and

c. Meet UK guidance.

1.1.2 The Proposed Development is shown on **Figure 1** of this document.

1.1.3 The former landfill covers approximately 40 hectares and has been subject to a number of ground investigations (GIs) over recent years. It is therefore proposed wherever possible, to utilise the existing groundwater, leachate and ground gas monitoring network.

1.1.4 The need for further monitoring is required for the following reasons:

a. To support the DCO application;

b. To contribute to a pre-construction baseline, to meet the requirement recorded in the ORS[1](Ref. 1) (**Appendix 17.5** of the ES **[TR020001/APP/5.02]**);

c. To compile a dataset to identify 'investigation' and 'action' levels as part of control measures required during remediation/earthworks, as identified in the ORS;

d. Continued measurement of leachate levels for the purpose of improving estimates of leachate volumes to assist with design of the leachate management system; and

e. To contribute to a record of measurement of ground gases, water level and water quality to confirm the findings of the recent investigations and assessment and demonstrate that the strategy derived from them continues to be relevant and appropriate.

1.1.5 Due to time constraints it is currently proposed to undertake two rounds of monitoring during the DCO application period as a pre-cursor to the full monitoring required.

1.1.6 An appointed lead contractor should continue baseline monitoring post DCO approval in the lead up to the landfill earthworks, and then continue baseline monitoring during earthworks and post construction works. This monitoring

[1] A detailed remediation strategy is to be prepared by the lead contractor in accordance secured by the DCO requirement which would build on the ORS.

strategy is indicative of the likely monitoring requirements for this phase of the works. Agreement from the regulators would be required.

1.1.7 This monitoring does not cover the requirements to support an application for the Deposit for Recovery (DfR) permit (environmental permit), to allow material re-use within the scheme. Additional monitoring for regulatory approval for that permit, would berequired.

2 BACKGROUND

2.1.1 The GIs undertaken to date gathered sufficient information to characterise the condition and chemistry of the landfill, the data was subject to a generic quantitative risk assessment (GQRA), **Appendix 17.2** (Ref. 2), detailed quantitative risk assessment (DQRA) for human health, **Appendix 17.3** (Ref. 3) and DQRA for controlled waters **Appendix 17. 4** (Ref. 4) of the ES **[TR020001/APP/5.02]**. The recommendations from the DQRA were addressed in the ORS (Ref. 1) **Appendix 17.5** of the ES **[TR020001/APP/5.02]**. The conclusions reached with regard to leachate, groundwater, ground gas and vapours are summarised in the following sections.

Leachate

2.1.2 Limited volumes of leachate/perched water were identified in the landfill waste and the quality is characteristic of aged waste (Ref. 2) which would indicate a limited source term, for continued generation of leachate. Continued monitoring is recommended, with control measures during earthworks, on a precautionary basis.

Groundwater

2.1.3 The assessment did not predict any major impacts to the chalk aquifer or abstraction boreholes, based on an assessment of the GI data and reasonably conservative assumptions about ground conditions and hydrogeology. Evidence of a weak leachate plume in groundwater down-gradient of the site was identified, however on-site groundwater monitoring provided little evidence that the landfill is currently causing significant contamination of the groundwater (Ref. 4).

Ground Gas

2.1.4 Assessment of the ground gas data for the landfill in its current baseline (undisturbed situation) indicates the gas protection for buildings should be designed on the basis of a characteristic situation 4 (CS4) classification. There was no evidence for off-site migration of landfill gases which could pose a risk to off-site receptors. The predicted long-term gas generation potential was considered to be low, although high concentrations of methane / carbon dioxide were recorded these were accompanied by low emission rates. The data indicates the waste is aged with low/very low rates of continuing biodegradation of residual organic matter (Ref. 3).

Vapour

2.1.5 The DQRA for human health (Ref. 3) (**Appendix 17.3** of the ES **[TR020001/APP/5.02]**) concluded there is no risk to human health from the recorded levels of soil vapours and a vapour membrane would not be required. However, it was also noted that in the DQRA that 'due to the variable nature of landfill and potential for variability in vapour generation over time, vapour monitoring should be continued; prior to, during and post earthworks to confirm this assessment'.

2.1.6 Continued monitoring of groundwater, leachate, ground gas and vapours is recommended in the DQRA (**Appendix 17.3** of the ES **[TR020001/APP/5.02]**) and this requirement has been included in the ORS (Ref. 1) (**Appendix 17.5** of the ES **[TR020001/APP/5.02]**).

3 SCOPE

3.1 Overview

Frequency of monitoring

3.1.1 The monitoring and sampling frequency is based on Environment Agency landfill guidance (Ref. 5) (Ref. 6).

3.1.2 The guidance advocates a risk-based approach to monitoring plans. The data obtained for the DQRA is considered sufficient to characterise landfill and groundwater conditions, as at least 12 months of monitoring data has already been obtained which meets the minimum period recommended in the guidance. However, further monitoring is required to obtain contemporary data to confirm conditions have not changed, to confirm that conditions do not change during the period prior to start of earthworks and to improve knowledge of seasonal variations.

3.1.3 The proposed frequency of monitoring for groundwater and leachate is based on the recommendation for an 'initial characterisation' period as identified in the guidance (Ref. 5). The proposed frequencies are less than those stated within the guidance as this monitoring is usually done prior to development of a landfill. The monitoring is relevant in this instance as it will be used to supplement existing monitoring data and to define existing groundwater conditions.

3.1.4 **Table 3.1** below shows the frequency of monitoring defined in the guidance and the proposed frequency for this monitoring proposal. This has been provisionally agreed with the Environment Agency:

Table 3.1: Proposed Monitoring Frequencies

Monitoring	Measurement	Guideline Frequency[1,2]	Proposed	No. of monitoring points
Landfill Leachate	Leachate level	Monthly	Six monthly	9
	Base of well	Six monthly	Six monthly	

Monitoring	Measurement	Guideline Frequency[1,2]	Proposed	No. of monitoring points
	Chemical composition	Six monthly	Six monthly	
Groundwater	Water level	Monthly	Quarterly	82
	Base of well	-	Quarterly	82
	Chemical composition	Site-specific[3]	Quarterly	27
	Non-aqueous phase liquid (NAPL)	-	Quarterly	82
Ground Gas	Spot monitoring	Monthly to six monthly	Quarterly[4]	45
	Continuous monitoring	-	3-months continuous	3
Vapour and bulk gases	Bulk gas and vapour composition	-	Quarterly[4]	11

Notes:
[1]LFTGN02 – Table 6.9 example monitoring scheme for a non-hazardous biodegradable landfill site posing a moderate to high risk to water receptors
[2]LFTGN03 – Table 5.4 typical monitoring frequencies for landfill gas
[3]Based on guidance within Section 6.4.2 of LGTN02 (Ref. 5)
[4]The proposed frequency lies between that recommended for landfill operational and aftercare phases as the risk from landfill gas is concluded to be low, but sufficient information is required to identify seasonal variation and confirm condition are relatively steady.

Testing requirements

3.1.5 The scope of the testing requirements has been developed based on the monitoring and analysis results from the previous GIs and more than 12 months of monitoring. This has provided the basis to rationalise the testing suites to focus on the contaminants of concern and those which are consistently identified at concentrations above the laboratory limit of detection (LoD). Detail and justification of the monitoring and testing schedules is presented in the following sections.

3.2 Ground gas

Continuous monitoring

3.2.1 The human health DQRA (Ref. 3) (**Appendix 17.3** of the ES **[TR020001/APP/5.02]**) concluded that the data from the continuous monitoring

provides a comprehensive dataset which gives a much greater understanding of ground gas behaviour.

3.2.2 It is proposed that a flexible approach will be adopted to the deployment of continuous ground gas monitors that will be deployed to obtain continuous information from areas of the landfill that previously demonstrated worst case gassing conditions. This will add to the baseline data.

3.2.3 The proposed monitoring locations have been identified based on results of previous gas monitoring, thickness of waste, waste type and era, to identify areas of landfill which are likely to have higher rates of gassing (worst case). This will also provide additional data for areas of landfill which will remain in situ post development, see **Figure 2** of this document. This information will add to the baseline on future gassing potential. Refer to DQRA and GQRA (**Appendices 17.2** and **17.3** of the ES **[TR020001/APP/5.02]**) for detail of waste types, thickness etc and how this influences landfill gas production (Ref. 2) (Ref. 3). The justification for identifying the locations is presented in **Table 3.2** three of these locations will be selected for the initial period of monitoring.

3.2.4 It is proposed to monitor these locations with continuous monitoring instruments for 3 months. Future monitoring scopes should be based on the results and a decision should be made as to whether the instrument is moved or a second period of monitoring should be started.

In situ spot monitoring

3.2.5 The continuous gas monitoring is to be supplemented by in situ monitoring across the wider landfill area. It is proposed to use the previously installed wells, the design and spacing of which meet current guidance i.e. CIRIA 665 (Ref. 7), Local Authority Ground Gas Guidance (Ref. 8) and Environment Agency landfill guidance (Ref. 5). Prior to commencement, a site visit will be completed to assess the integrity and accessibility of the existing wells.

3.2.6 Due to the mass of heterogenous waste the monitoring is recommended to add to the baseline data on current and future gassing potential as recommended in the ORS (Ref. 1) (**Appendix 17.5** of the ES **[TR020001/APP/5.02]**). The gas monitoring wells located in the area proposed for excavation will not be monitored. The number of locations on the boundary have been reduced to focus on those closest to the built development beyond the boundary, in line with EA guidance (Ref. 5). It is also proposed to monitor a number of wells outside of the landfill boundary to add to baseline data on potential for gas migration off-site.

3.2.7 The number of wells to be monitored will be 32 positions on the landfill, five boundary positions and eight positions off the landfill, based on the current gas assessment. The borehole schedule is presented at **Appendix A** – Monitoring schedule of this document and the suite of gases to be monitored is presented below.

3.2.8 The in situ and continuous monitoring will include the following determinants:

a. Carbon dioxide;

b. Carbon monoxide;
c. Methane;
d. Oxygen;
e. Hydrogen sulphide;
f. Barometric pressure;
g. Flow rate; and
h. Total volatile organic compounds (VOCs) (Photoionisation detector (PID) for in situ monitoring with a standard 10.6eV lamp).

Table 3.2: Proposed Continuous Gas Monitoring

Exploratory Hole	Location	Response Zone (m bgl)	Waste Era[2]	Waste type	Degradation of waste	Odour	Maximum Readings from Spot Monitoring (2018 GI)		
							Methane %	**Carbon Dioxide %**	**Flow rate l/hr**
AEC18-LF-BH217	LSCP	1.9-12.5	1947	Predominately industrial but also domestic and construction	Moderate degradation.	Hydrocarbon, musk and camphor odours	62.62	12.3	0.9
AEC18-LF-BH219	WVP	1.0-17.0	1980	Commercial & construction	Undegraded to moderate	No odours	26.62	22.4	0.1
AEC18-LF-BH203	WVP	1.0-11.5	1980	Construction, recent domestic and industrial	Undegraded to moderate degraded	Diesel / putrid/ vinegar odour associated with industrial waste	45.72	21.2	0.1
PFCPRC40 (SP)	WVP	3.0-15.05	1970-1980	Recent domestic	Moderate to undegraded	Hydrocarbon/ organic odours	31.83	24.2	5.7
AEC18-LF-BH213	WVP	1.0-17.5	1980	Combination of construction and industrial waste with some recent domestic	Moderately degraded	Musk (pungent), Putrid and hydrocarbon odours	59.0	24.7	0.1
AEC18-LF-BWS207	Boundary	2.0-5.0	N/A	Chalk	N/A	None	0.51	1.0	0.2

[2] Waste era is the approximate year(s) of deposition of the waste, identified from historical records and GI information. The waste eras are described in detail in the GQRA (Ref. 2) (**Appendix 17.2** of the ES **[TR020001/APP/5.02]**).

3.3 Vapour and bulk gas monitoring

3.3.1 Vapour/trace gas monitoring was previously undertaken at 24 locations and did not identify elevated concentrations above assessment criteria. The proposed monitoring is therefore to ensure that the assessment remains valid and to add to the baseline information and to inform 'investigation' and 'action' levels which will be set for future construction works to safeguard relevant receptors.

3.3.2 The locations for monitoring have been chosen based on elevated PID readings obtained during the 2018 ground investigation and/or evidence of contamination in the exploratory hole logs and to provide good spatial coverage of the landfill.

3.3.3 It is proposed to obtain samples from 11 monitoring wells quarterly, see **Appendix A** – Monitoring schedule for the schedule and **Figure 2** of this document, for the locations. The proposed analysis suites are provided below.

Vapour and bulk gas analysis suites

3.3.4 Although previous monitoring recorded some gases to be consistently below the LoD (alkanes and several VOCs), it is considered prudent to maintain the full suite of testing initially because the monitoring will be from new locations and will better define the baseline data set.

3.3.5 However, where concentrations are below the LoD, analysis of those gases and vapour contaminants could be removed from the scope of future monitoring rounds. The following suites are proposed, see **Appendix B** – Gas Analysis suite for detail of each suite:

a. Trace gases – VOCs + tentatively identified compounds (TICs);
b. Bulk gas suite;
c. Dioxins and furan suite; and
d. TPH suite.

3.4 Leachate

Monitoring

3.4.1 It is proposed to continue the leachate monitoring from the existing wells which provides a good spatial coverage and also includes the different landfilling eras; LW201-205, and LFBH06, 07,09 and 12A. Leachate levels are recommended to be recorded, and samples collected, on a six monthly basis. The longer period between monitoring allows greater thickness to accumulate which will aid sampling, therefore reduced monitoring frequency is considered appropriate. The suites of contaminants are presented below.

3.4.2 Leachate levels will be measured using a probe suitably resistant to leachate, prior to sampling. The leachate level shall be recorded relative to the top of the standpipe.

Analysis

3.4.3 Scope for leachate analysis has been based on the findings of the previous monitoring and assessment, those suites where determinands have been consistently below the limit of detection/ assessment criteria and were identified in the GQRA (Ref. 2) (**Appendix 17.2** of the ES **[TR020001/APP/5.02]**) as requiring no further assessment have been removed from the analysis suites. A list of proposed suites is presented below, detail of determinands in the suites is presented in **Appendix C** – Groundwater and leachate suites.

a. Suite A Heavy Metals
b. Suite B Total Phenols
c. Suite C Phenols
d. Suite D Chemical Oxygen Demand and Biological Oxygen Demand
e. Suite E General Inorganics
f. Suite F Total Petroleum Hydrocarbons Criteria Working Group
g. Suite G Speciated PAHs
h. Suite H Monoaromatics
i. Suite I Volatile Organic Compounds
j. Suite J Semi Volatile Organic Compounds
k. Suite L Herbicides
l. Suite M Pesticides
m. Suite P Perfluoroalkyl and Polyfluorakyl Substances (PFAS/PFOA)

3.5 Groundwater

Monitoring

3.5.1 Groundwater monitoring has previously been undertaken monthly for a period of 12 months in select boreholes installed during the 2018 GI. Wells installed as part of the GI in 2016 were monitored monthly in 2017 for a period of four months and then again in 2018 to 2019 for periods of between four and twelve months. The monitoring plan for the later GIs was based on EA Guidance for design and installation of the wells (Ref. 6) and monitoring (Ref. 5).

3.5.2 Groundwater levels will continue to be monitored quarterly to provide further evidence for flow direction, rate and trends. Groundwater levels will be measured using an interface probe prior to purging (this will allow determination of the presence of NAPL). The groundwater level shall be recorded relative to the top of the standpipe.

3.5.3 The findings of the DQRA for controlled waters (Ref. 4) (**Appendix 17.4** of the ES **[TR020001/APP/5.02]**) has not identified significant impacts to the groundwater beneath the landfill or down-gradient beyond the presence of a weak leachate plume. Continued monitoring of chemical quality is required to add to baseline data, as recommended in the ORS (Ref. 1) (**Appendix 17.5** of the ES

[TR020001/APP/5.02]), to aid identification of impact to the Principal aquifer due to the earthworks and provide a rationale for identifying 'investigation and 'action' levels.

3.5.4 It is proposed to continue to monitor the existing network; two boreholes up-gradient, thirteen on the landfill and twelve down-gradient. See **Appendix A** – Monitoring schedule of this document for the proposed schedule of monitoring wells and **Figure 3** of this document for the locations. Monitoring will be on a quarterly basis to record groundwater levels and obtain groundwater samples. Responses from the Environment Agency during consultations suggest pre-earthworks monitoring would be a requirement. However, a reduced number of analysis suites is proposed based on previous monitoring and assessment of results, see below.

Analysis

3.5.5 Samples will be obtained using low flow micro-purging and sampling techniques to obtain samples which are as far as possible, representative of the Chalk aquifer and minimise disturbance to the water column.

3.5.6 The groundwater analysis suite has been based on the findings of the previous monitoring, those suites where determinands have been consistently below the limit of detection/assessment criteria and were identified in the DQRA (Ref. 4) (**Appendix 17.4** of the ES **[TR020001/APP/5.02]**) as requiring no further assessment have been removed from the analysis suites. The suites include the priority contaminants as specified in LFGTN02 (Ref. 5) and contaminants of concern identified by Table 55 volume 2 of the DQRA. PFAS/PFOS have been retained in the suite although monitoring to date has not identified them above the drinking water standard (apart from an isolated occasion). The Environment Agency has identified these contaminants to be of particular concern due to the firefighting facility to the south of the landfill. Monitoring of these determinands will be continued to specifically address this concern.

3.5.7 The following suites are proposed:

a. Suite A Heavy Metals
b. Suite B Total Phenols
c. Suite C Phenols
d. Suite D Chemical Oxygen Demand and Biological Oxygen Demand
e. Suite E General Inorganics
f. Suite F Total Petroleum Hydrocarbons Criteria Working Group
g. Suite G Speciated PAHs
h. Suite H Monoaromatics
i. Suite I Volatile Organic Compounds
j. Suite J Semi Volatile Organic Compounds
k. Suite L Herbicides
l. Suite M Pesticides

m. Suite P Perfluoroalkyl and Polyfluorakyl Substances (PFAS/PFOA)

3.5.8 Full details of the suites are provided in **Appendix C** – Groundwater and leachate suites.

3.5.9 In addition, the following in-situ measurements will be taken using a flow cell:

a. pH;
b. Temperature;
c. Electrical conductivity;
d. Dissolved oxygen; and
e. Redox potential.

4 SUMMARY

4.1.1 Due to time constraints it is currently to undertake two rounds of monitoring during the DCO application period as a pre-cursor to the full monitoring required. This will validate the findings of previous assessments and contribute to a robust baseline data set as required by the remediation strategy. Once the specialist remediation contractor is appointed the data will assist them in establishing a rationale for environmental controls and inform their design of an appropriate monitoring regime to obtain the necessary permits for the earthworks.

4.1.2 The proposed monitoring is summarised in **Table 4.1** below:

Table 4.1: Proposed Monitoring Programme

Media	Monitoring Programme		
	Levels	Insitu Testing	Sampling
Groundwater	Quarterly water levels	Low flow parameters	Quarterly 27No. wells
Ground Gas	Quarterly groundwater level in 45 wells	Quarterly spot monitoring in 45 wells for Gas Suite. Continuous monitoring in 3No. wells	Quarterly vapour and bulk gas sampling from 11 wells (no spot monitoring from these wells)
Leachate	6-monthly - 9No. wells	-	6-monthly 9No. wells

REFERENCES

[1] Luton Rising. Remediation Strategy for Former Eaton Green Landfill. 2023
[2] Luton Rising. Land Contamination Generic Quantitative Risk Assessment Report. 2023.
[3] Luton Rising. Detailed Quantitative Risk Assessment Report: Human Health and Ground Gases. 2023.
[4] Luton Rising. Detailed Quantitative Risk Assessment Report: Controlled Waters. 2023.
[5] Environment Agency. Guidance on Monitoring of Landfill Leachate, Groundwater and Surface Water. LFTGN02. 2003.
[6] Environment Agency. Guidance on the design and installation of groundwater quality monitoring points. Science Report SC020093. 2006.
[7] Construction Industry Research and Information Association (CIRIA). Assessing risks posed by hazardous ground gases to buildings (C665). 2007.
[8] Chartered Institute of Environmental Health. The Local Authority Guide to Ground Gas. 2008.

GLOSSARY AND ABBREVIATIONS

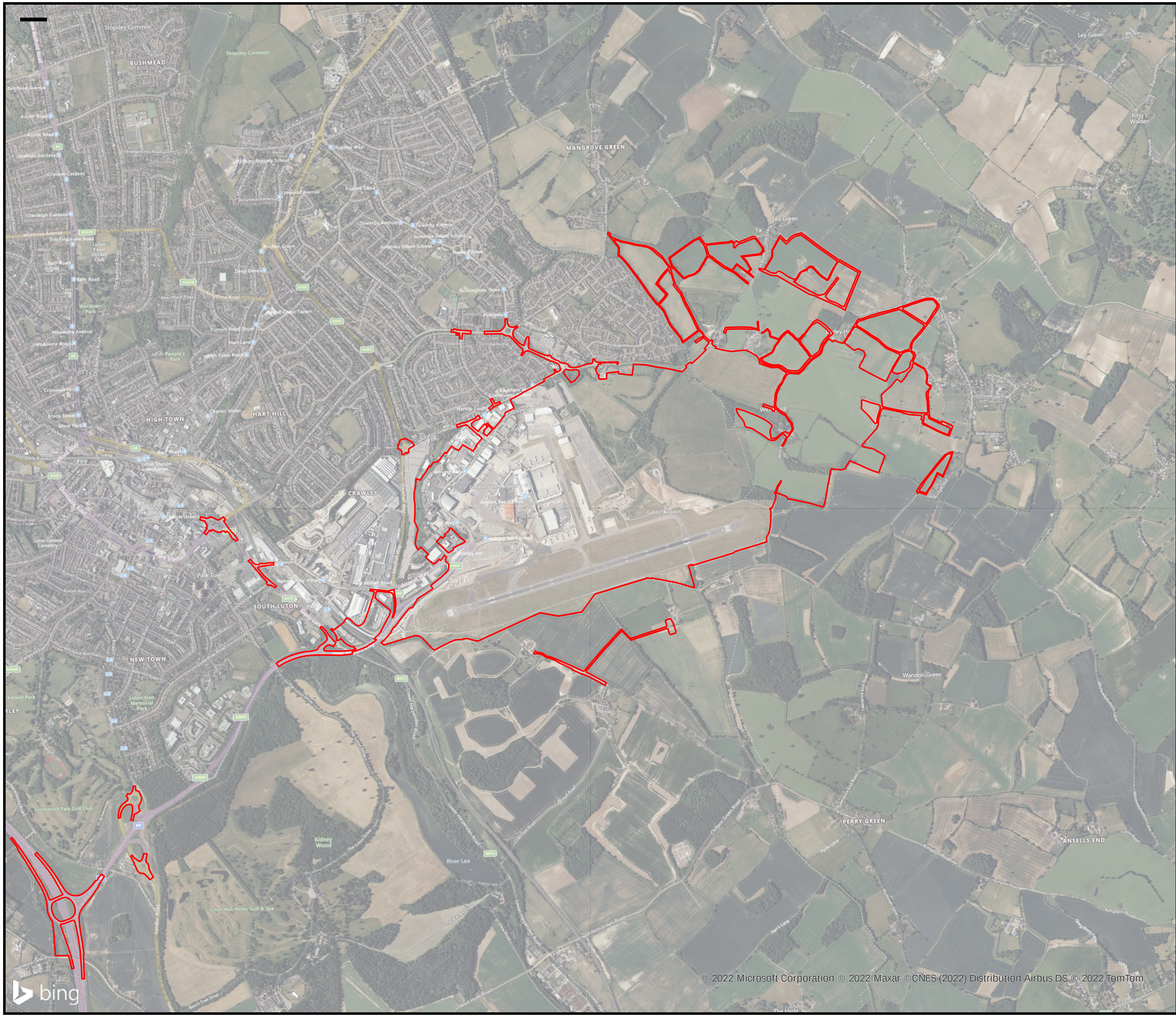
Term	Definition
Abbreviations	
BOD	Biochemical oxygen demand
COD	Chemical oxygen demand
CIRIA	Construction Industry Research and Information Association
CWS	County wildlife site
DCO	Development Consent Order
DQRA	Detailed Quantitative Risk Assessment
ES	Environmental Statement
GQRA	Generic Quantitative Risk Assessment
GI	ground investigation
LOD	Limit of Detection
LW	Licensed work
MTBE	Methyl tertiary butyl ether
NAPL	Non-aqueous phase liquid
PAH	polyaromatic hydrocarbons
PCDD	Polychlorinated dibenzo-para-doxins
PCDF	Polychlorinated dibenzofurans
PFAS	per- and poly-fluoroalkyl substances
PFOA	Per-fluoro-octane-acids
PFOS	Per-fluoro-octane-sulphates
PID	Photoionisation Detector
PPE	personal protective equipment
QRA	Quantitative Risk Assessment
TPH	total petroleum hydrocarbons
VOC	volatile organic compound
WVP	Wigmore Valley Park

Glossary	
Aquifer	An aquifer is an underground layer of water-bearing permeable rock, rock fractures or unconsolidated materials (gravel, sand, or silt).
Baseline	A description of the current state of the environment without implementation of the project.
Controlled waters	These are fully defined in section 104 of the Water Resources Act 1991. Controlled waters include, in summary: a. Relevant territorial waters which extend seaward for three miles from the low-tide limit from which the territorial sea adjacent to England and Wales is measured; b. Coastal waters from the low-tide limit to the high-tide limit or fresh-water limit of a river or watercourse;

Glossary	
	c. Inland freshwaters: natural and artificial lakes, ponds, reservoirs, rivers or watercourses above the fresh-water limit; d. Natural and artificial underground rivers and watercourses; and e. Surface water sewers, ditches and soakaways that discharge to surface or groundwater it also includes those that may be currently dry. Groundwaters – any waters contained in underground strata.
Development Consent Order (DCO)	A Development Consent Order (DCO) is the means of obtaining permission for developments categorised as Nationally Significant Infrastructure Projects. This includes energy, transport, water and waste projects.
Emission	A material that is expelled or released to the environment. Usually applied to gaseous or odorous discharges to the atmosphere.
Environment Agency	The Environment Agency is responsible for environmental protection and regulation in England and plays a central role in implementing the government's environmental strategy. The Environment Agency is the main body responsible for managing the regulation of major industry and waste, treatment of contaminated land, water quality and resources, fisheries, inland river, estuary and harbour navigations, and conservation and ecology. They are also responsible for managing the risk of flooding from main rivers, reservoirs, estuaries and the sea.
Environmental Statement (ES)	A statutory report produced by the developer including: a. A description of the project; b. A description of the likely significant effects of the project on the environment; c. A description of the features of the project and/or measures envisaged in order to avoid, prevent or reduce and, if possible, offset likely significant adverse effects on the environment; d. A description of the reasonable alternatives e. A non-technical summary; and f. Any additional information relevant to the characteristics of a project.
Groundwater	Groundwater is the water present beneath Earth's surface in rock and soil pore spaces and in the fractures of rock formations.
Impact	The change or action. Either beneficial or adverse.
In-situ	In the natural, original or appropriate position.

Glossary	
Leachate	A liquid that forms within waste accumulations such as landfills that contain increased concentrations of contaminants, specifically heavy metals, ammoniacal nitrogen and organic compounds. It is therefore hazardous and either must be indefinitely contained within the landfill or collected and suitably disposed of.
Limit of Detection (LOD)	The lowest contaminant concentration that can be detected by the apparatus used, usually dependent on the resolution of the equipment.
Made Ground	An area of land that has been man-made, generally through the reclamation of marshes, lakes, or shorelines. An artificial fill is used, consisting of materials, refuse, etc.
Non-Aqueous Phase Liquid (NAPL)	Organic compounds that have very low water solubility, for example, chlorinated compounds and PAHs.
Non-hazardous waste	Waste that is not covered under Article 2 (c) of the Landfill Directive (1999/31/EC), i.e. neither classed as hazardous nor as inert.
Proposed Development	The proposed expansion of Luton Airport with new terminal and stands and associated developments (as described in **Chapter 4** of the ES **[TR/020001/5.01]**).
Receptor (sensitive)	A component of the natural, created, or built environment such as human
Surface water	Water that collects on the surface of the ground.
Waste	Waste is defined in Article 3(1) of the European Waste Framework Directive 2008/98/EC (OJL 312/3) as any substance or object which the holder discards or intends or is required to discard. The term 'holder' is defined under article 3(6) as 'the waste producer or the natural or legal person who is in possession of the waste'. The waste 'producer' is defined under article 3(5) as 'anyone whose activities produce waste (original waste producer) or anyone who carries out pre-processing, mixing or other operations resulting in a change in the nature or composition of the waste'. Waste can be further classified as hazardous, non-hazardous or inert.
Water quality	Water quality refers to the chemical, physical, and biological characteristics of water based on the standards of its usage.

FIGURES



All structure positions are indicative. The proposed works will be subject to detailed design development. The changes will be within limits of deviation specified in the Development Consent Order.

Legend

Order Limits

Revision History	Drawn	Checked / Approved	Date	Rev.
First Issue	AB	RB / TB	26/09/22	P02

Luton Rising
Our airport. Our community. Our planet.

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London Luton Airport Expansion Development Consent Order

Drawing Title

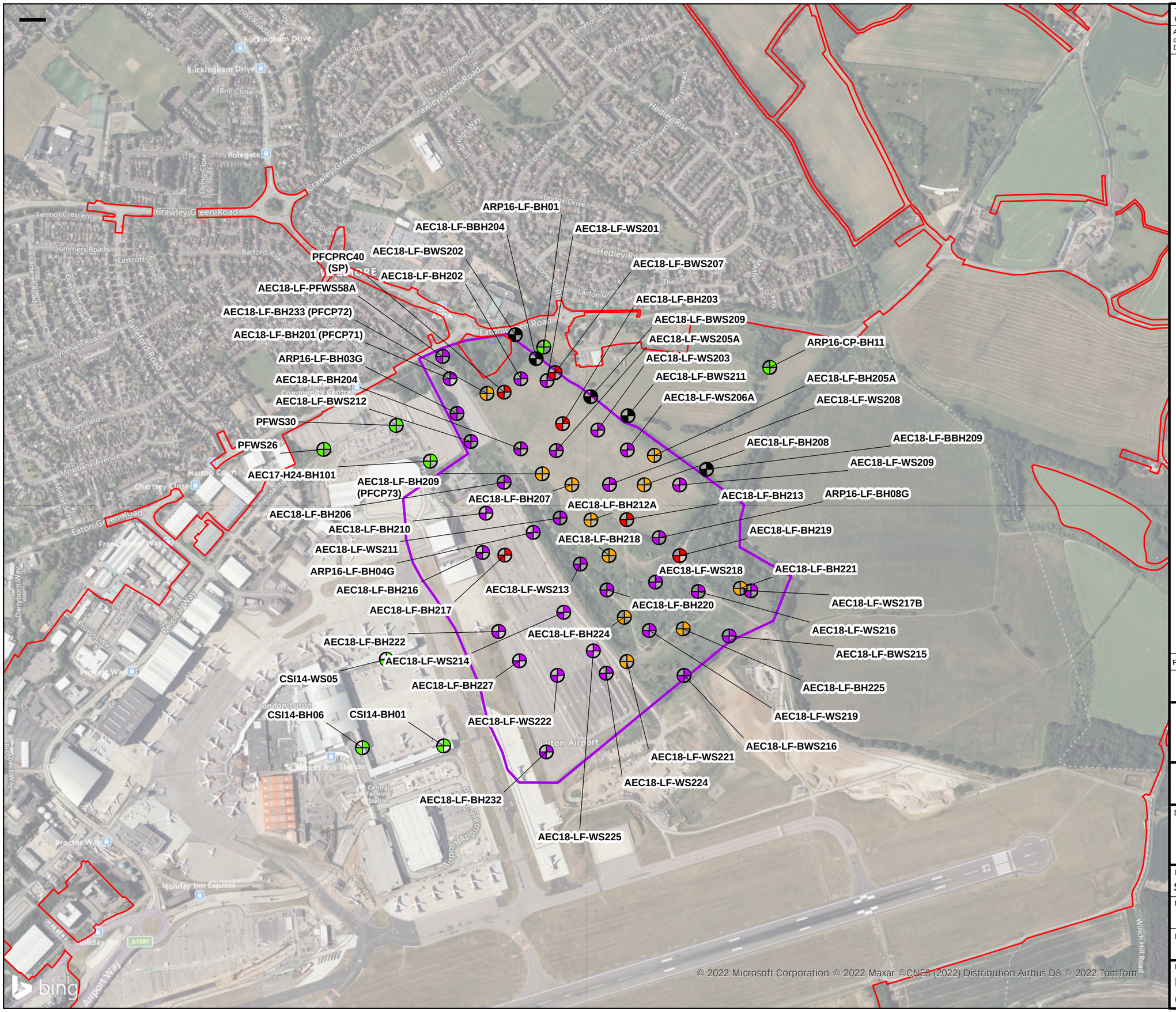
Figure 1 Site Location

Purpose of issue				Suitability	
SUITABLE FOR INFORMATION				S2	
Drawn	Checked	Approved	Date	Scale	Size
AB	RB	TB	26/09/22	1:25,000	A3

DCO Application Ref.	APFP Regulation	DCO Document Ref.
TR020001	(APFP 5(2)(a))	TR020001/APP/5.03

Drawing Number	Revision
LLADCO-3C-ARP-00-00-DR-YE-0270	P02

Project - Phase - Originator - Asset/Zone - Sub Asset - Type- Discp. - Number



All structure positions are indicative. The proposed works will be subject to detailed design development. The changes will be within limits of deviation specified in the Development Consent Order.

Legend

- Order Limits
- Interpreted Landfill Boundary

Monitoring Locations

- Continuous Gas Monitoring
- Off Landfill
- Boundary Monitoring
- Spot Monitoring
- Trace Gas

First Issue	AB	RB TB	26/09/22	P02
Revision History	Drawn	Checked Approved	Date	Rev.

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London Luton Airport Expansion Development Consent Order

Drawing Title

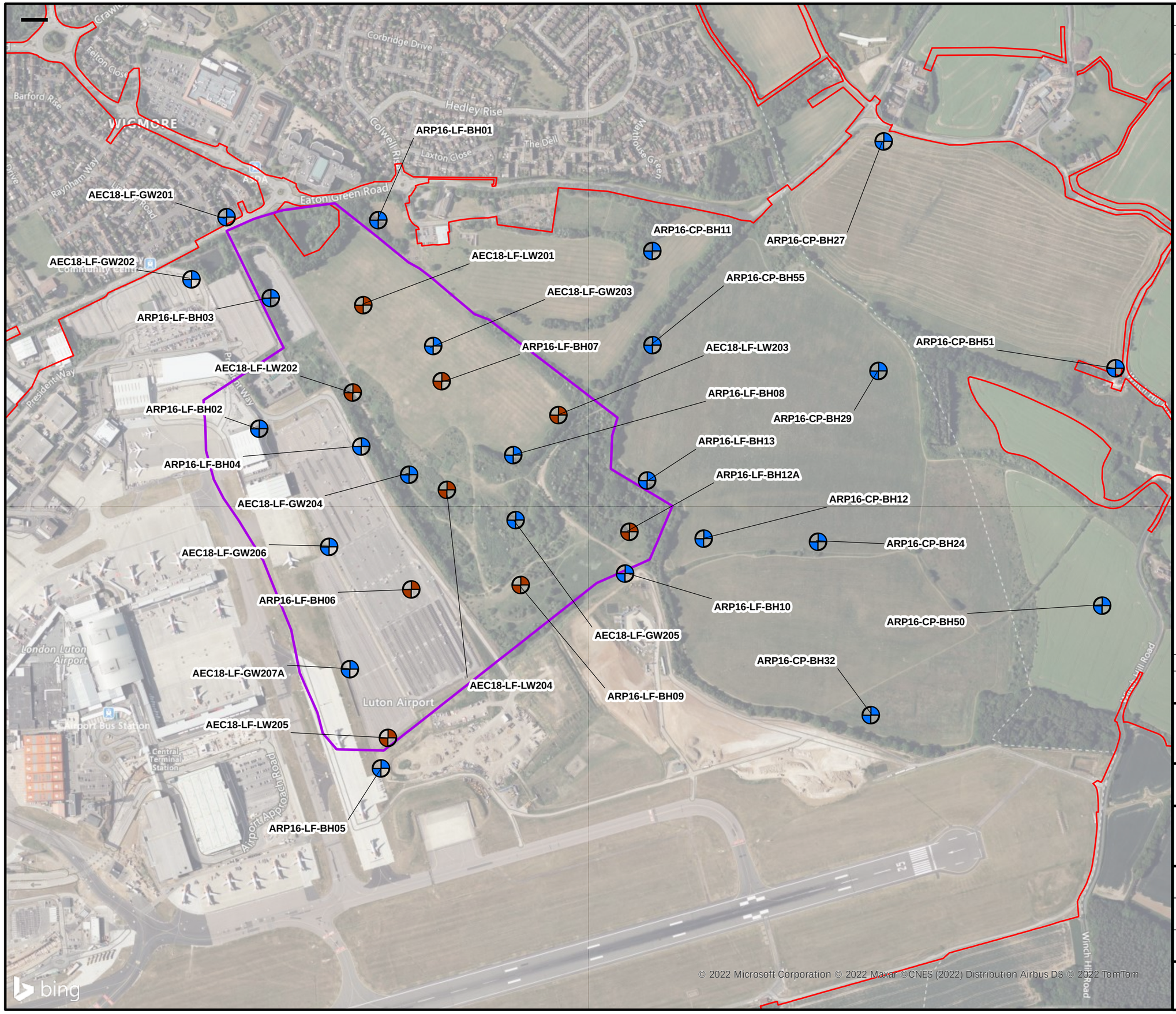
Figure 2
Proposed Ground Gas monitoring positions

Purpose of issue				Suitability	
SUITABLE FOR INFORMATION				S2	
Drawn	Checked	Approved	Date	Scale	Size
AB	RB	TB	26/09/22	1:7,500	A3

DCO Application Ref.	APFP Regulation	DCO Document Ref.
TR020001	(APFP 5(2)(a))	TR020001/APP/5.03

Drawing Number	Revision
LLADCO-3C-ARP-00-00-DR-YE-0271	P02

Project - Phase - Originator - Asset/Zone - Sub Asset - Type- Discp. - Number



All structure positions are indicative. The proposed works will be subject to detailed design development. The changes will be within limits of deviation specified in the Development Consent Order.

Legend

- Order Limits
- Interpreted Landfill Boundary
- Leachate Wells
- Groundwater Wells

Revision History	Drawn	Checked / Approved	Date	Rev.
First Issue	AB	RB / TB	26/09/22	P02

Luton Rising
Hart House Business Centre
Kimpton Road, Luton, LU2 0LA
www.lutonrising.org.uk

Our airport. Our community. Our planet.

London Luton Airport Expansion Development Consent Order

Drawing Title

Figure 3 Groundwater and Leachate Monitoring positions

Purpose of issue	Suitability
SUITABLE FOR INFORMATION	S2

Drawn	Checked	Approved	Date	Scale	Size
AB	RB	TB	26/09/22	1:10,000	A3

DCO Application Ref.	APFP Regulation	DCO Document Ref.
TR020001	(APFP 5(2)(a))	TR020001/APP/5.03

Drawing Number	Revision
LLADCO-3C-ARP-00-00-DR-YE-0272	P02

Project - Phase - Originator - Asset/Zone - Sub Asset - Type- Discp. - Number

APPENDIX A – MONITORING SCHEDULE

Exploratory Hole	Depth (m bgl)	Response Zone (m bgl)	Strata	Location	Easting	Northing	Frequency Period	Sampling	Monitoring
AEC18-LF-BH203	13.5	1.0-11.5	Waste	Landfill, E WVP	512414.28	222035.56	3 months, then review		Continuous Gas Monitoring
AEC18-LF-BH213	24.0	1.0-17.5	Waste	Landfill, east WVP	512550.58	221831.97	3 months, then review		Continuous Gas Monitoring
AEC18-LF-BH217	14.0	1.90-12.50	Waste	Landfill, west central, LSCP	512291.62	221756.59	3 months, then review		Continuous Gas Monitoring
AEC18-LF-BH219	19.5	1.0-17.0	Waste	Landfill, CWS	512662.91	221755.55	3 months, then review		Continuous Gas Monitoring
AEC18-LF-BWS207	5	2.0-5.0	CHALK	Off-Landfill, WVP	512398.37	222143.94	3 months, then review		Continuous Gas Monitoring
PFCPRC40	28.0	3.0-16.0	Waste	Landfill			3 months, then review		Continuous Gas Monitoring
AEC18-LF-BH205A	7.5	1.0-5.5	Waste	Landfill, east boundary WVP	512609.13	221968.26	Quarterly	Bulk Gas and Vapour	Groundwater level
AEC18-LF-BH207	21	3.0-18.0	Waste	Landfill, centre WVP	512434.05	221905.99	Quarterly	Bulk Gas and Vapour	Groundwater level
AEC18-LF-BH208	13.5	1.0-11.0	Waste	Landfill, east WVP	512581.6	221905.82	Quarterly	Bulk Gas and Vapour	Groundwater level
AEC18-LF-BH209 (PFCP73)	16.95	2.0-13.0	Waste	Landfill, north central WVP	512371.07	221929.14	Quarterly	Bulk Gas and Vapour	Groundwater level
AEC18-LF-BH212A	24.01	0.8-18.0	Waste	Landfill, central WVP	512475.47	221831.47	Quarterly	Bulk Gas and Vapour	Groundwater level
AEC18-LF-BH218	16.5	1.0-12.0	Waste	Landfill, CWS	512512.90	221755.55	Quarterly	Bulk Gas and Vapour	Groundwater level
AEC18-LF-BH221	12	0.5-10.0	Waste	Landfill, CWS	512791.46	221686.24	Quarterly	Bulk Gas and Vapour	Groundwater level
AEC18-LF-BH224	10.5	1.0-8.0	Waste	Landfill, CWS	512545.34	221624.82	Quarterly	Bulk Gas and Vapour	Groundwater level
AEC18-LF-BH225	24.45	1.0-11.5	Waste	Landfill, CWS	512670.22	221600.31	Quarterly	Bulk Gas and Vapour	Groundwater level
AEC18-LF-BH233 (PFCP72)	19.95	1.0 – 13.0	Waste	Landfill WVP	512253.63	222099.68	Quarterly	Bulk Gas and Vapour	Groundwater level
ARP16-LF-BH04G	6.0	1.0-6.0	Waste	Landfill, central	512352	221805	Quarterly	Bulk Gas and Vapour	Groundwater level

Exploratory Hole	Depth (m bgl)	Response Zone (m bgl)	Strata	Location	Easting	Northing	Frequency Period	Sampling	Monitoring
AEC18-LF-WS221	5.0	0.5-5.0	Waste	Landfill, CWS, south	512550.68	221530.84	Quarterly	Bulk Gas and Vapour	Groundwater level
AEC18-LF-BH201 (PFCP71)	9.45	1.0-6.0	Waste	Landfill (TUI) , NW	512175.23	222130.8	Quarterly		Ground Gas Monitoring (Spot) Groundwater Level
PFWS58A		0.8-2.3	Landfill	WVP landfill, northern boundary			Quarterly		Ground Gas Monitoring (Spot) Groundwater Level
AEC18-LF-BH204	31.84	1.0-14.0	Waste	Landfill, N central WVP	512325.41	221982.08	Quarterly		Ground Gas Monitoring (Spot) Groundwater Level
AEC18-LF-BH210	10.6	2.0-10.0	Waste	LSCP Landfill, NW	512251.55	221845.66	Quarterly		Ground Gas Monitoring (Spot) Groundwater Level
AEC18-LF-BH216	9.8	2.90-8.0	Waste	Landfill, west LSCP	512244.54	221762.27	Quarterly		Ground Gas Monitoring (Spot) Groundwater Level
AEC18-LF-BH220	22.95	0.5-9.0	Waste	Landfill, CWS	512508.35	221682.85	Quarterly		Ground Gas Monitoring (Spot) Groundwater Level
AEC18-LF-BH222	8.5	0.9-7.5	Made Ground/ Waste	Landfill LSCP	512278.00	221594.39	Quarterly		Ground Gas Monitoring (Spot) Groundwater Level
AEC18-LF-BH227	7.2	0.5-5.50	Made Ground	Landfill LSCP	512322.64	221532.42	Quarterly		Ground Gas Monitoring (Spot) Groundwater Level
AEC18-LF-BH232	7.2	1.0-6.5	Made Ground/ Waste	Landfill, LSCP	512379.74	221339.07	Quarterly		Ground Gas Monitoring (Spot) Groundwater Level
AEC18-LF-BH202	10.5	2.0-9.0	Waste	Landfill, NE WVP	512325.64	222130.73	Quarterly		Ground Gas Monitoring (Spot) Groundwater Level
AEC18-LF-BWS212	5	0.5 – 4.5	Waste	Landfill, TUI, northwest boundary	512219.69	221997.70	Quarterly		Ground Gas Monitoring (Spot) Groundwater Level

Exploratory Hole	Depth (m bgl)	Response Zone (m bgl)	Strata	Location	Easting	Northing	Frequency Period	Sampling	Monitoring
AEC18-LF-BWS215	5	0.5-4.1	Waste	Landfill, CWS, southern boundary	512767.87	221585.14	Quarterly		Ground Gas Monitoring (Spot) Groundwater Level
AEC18-LF-BWS216	5	0.5-5.0	Landfill	CWS, Landfill, southern boundary	512672.09	221501.42	Quarterly		Ground Gas Monitoring (Spot) Groundwater Level
ARP16-LF-BH08G	6.0	1.0-6.0	Waste	Landfill, E	512619	221794	Quarterly		Ground Gas Monitoring (Spot) Groundwater Level
ARP16-LF-BH03G	6.0	1.0-6.0	Waste	Landfill – NW Boundary	512190	222057	Quarterly		Ground Gas Monitoring (Spot) Groundwater Level
AEC18-LF-WS201	5	0.5-3.5	Waste	Landfill, WVP, northeast	512381.33	222127.03	Quarterly		Ground Gas Monitoring (Spot) Groundwater Level
AEC18-LF-WS203	5	0.5-5.0	Waste	Landfill WVP, east central	512488.95	222021.94	Quarterly		Ground Gas Monitoring (Spot) Groundwater Level
AEC18-LF-WS205A	5.0	1.0-5.0	Waste	Landfill, WVP, central north	512400.97	221978.40	Quarterly		Ground Gas Monitoring (Spot) Groundwater Level
AEC18-LF-WS206A	5.0	1.0-5.0	Waste	Landfill, WVP, east	512551.74	221979.78	Quarterly		Ground Gas Monitoring (Spot) Groundwater Level
AEC18-LF-WS208	3.9	1.0-3.9	Waste	Landfill, WVP, central east	512513.95	221906.38	Quarterly		Ground Gas Monitoring (Spot) Groundwater Level
AEC18-LF-WS209	5.0	1.0-5.0	Waste	Landfill WVP, southeast	512662.89	221905.61	Quarterly		Ground Gas Monitoring (Spot) Groundwater Level
AEC18-LF-WS211	5.0	1.0-5.0	Waste	Landfill, CWS, central	512408.90	221835.46	Quarterly		Ground Gas Monitoring (Spot) Groundwater Level
AEC18-LF-WS213	2.75	0.5-2.75	Waste	Landfill, CWS, central	512451.97	221737.74	Quarterly		Ground Gas Monitoring (Spot)

Exploratory Hole	Depth (m bgl)	Response Zone (m bgl)	Strata	Location	Easting	Northing	Frequency Period	Sampling	Monitoring
									Groundwater Level
AEC18-LF-WS214	3.56	0.5-3.56	Waste	Landfill LSCP, west	512416.71	221635.30	Quarterly		Ground Gas Monitoring (Spot) Groundwater Level
AEC18-LF-WS216	5.0	1.0-5.0	Waste	Landfill, CWS, southeast	512702.24	221679.35	Quarterly		Ground Gas Monitoring (Spot) Groundwater Level
AEC18-LF-WS217B	4.5	1.0-4.5	Waste	Landfill, CWS, southeast corner	512814.13	221680.86	Quarterly		Ground Gas Monitoring (Spot) Groundwater Level
AEC18-LF-WS218	5.0	0.5-4.8	Waste	Landfill, CWS, south	512611.64	221699.51	Quarterly		Ground Gas Monitoring (Spot) Groundwater Level
AEC18-LF-WS219	5.0	0.5-2.4	Waste	Landfill, CWS, south	512598.16	221596.74	Quarterly		Ground Gas Monitoring (Spot) Groundwater Level
AEC18-LF-WS222	5.0	1.0-5.0	Waste	Landfill, LSCP, southwest	512403.27	221501.58	Quarterly		Ground Gas Monitoring (Spot) Groundwater Level
AEC18-LF-BH206	12	1.0-8.0	Waste	Landfill, NW WVP	512290.13	221911.11	Quarterly		Ground Gas Monitoring (Spot) Groundwater Level
AEC18-LF-WS224	5.0	1.0-5.0	Waste	Landfill, LSCP, southwest	512506.86	221506.06	Quarterly		Ground Gas Monitoring (Spot) Groundwater Level
AEC18-LF-WS225	4.9	1.0-4.9	Waste	Landfill, LSCP, southwest	512479.51	221553.48	Quarterly		Ground Gas Monitoring (Spot) Groundwater Level
AEC18-LF-BBH204	20.87	4.0 to 20.5	CHALK	Off Landfill WVP	512358.05	222173.54	Quarterly		Ground Gas Monitoring (Spot) Groundwater Level
AEC18-LF-BWS202	5	1.0-5.0	CHALK	Off-Landfill, WVP	512313.95	222224.23	Quarterly		Ground Gas Monitoring (Spot) Groundwater Level

Exploratory Hole	Depth (m bgl)	Response Zone (m bgl)	Strata	Location	Easting	Northing	Frequency Period	Sampling	Monitoring
AEC18-LF-BWS209	5	2.0-5.0	CHALK	Off- Landfill, WVP	512473.98	222092.82	Quarterly		Ground Gas Monitoring (Spot) Groundwater Level
AEC18-LF-BWS211	5	0.5-5.0	Clay with Flints	Off-Landfill, WVP	512552.99	222052.33	Quarterly		Ground Gas Monitoring (Spot) Groundwater Level
AEC18-LF-BBH209	20.5	3.0 to 20.5	CHALK	Off Landfill, WVP,	512719.81	221938.82	Quarterly		Ground Gas Monitoring (Spot) Groundwater Level
AEC17-H24-BH101	20.0	0.5-1.0	Made Ground	Off-Landfill, TUI car Park	512133.398	221956.055	Quarterly		Ground Gas Monitoring (Spot) Groundwater Level
PFWS26	7.45	2.5-7.0	CHALK	Off-Landfill, airport car park	511907.4	221981.0	Quarterly		Ground Gas Monitoring (Spot) Groundwater Level
PFWS30	3.75	2.75-3.75	CLAY/ CHALK	Off-landfill, airport car park	512061.2	222031.8	Quarterly		Ground Gas Monitoring (Spot) Groundwater Level
CSI14-BH01	30.0	0.5-1.5	Made Ground/ CLAY	Off-Landfill, Terminal 1	West	512161.8	Quarterly		Ground Gas Monitoring (Spot) Groundwater Level
CSI14-BH06	30.0	0.5-1.5	CLAY	Off-Landfill Terminal 1	West	511989.3	Quarterly		Ground Gas Monitoring (Spot) Groundwater Level
CSI14-WS05	1.5	0.5-1.5	Made Ground	Off-Landfill Terminal 1	West	512040.2	Quarterly		Ground Gas Monitoring (Spot) Groundwater Level
ARP16-LF-BH01	58.5	27.5-57.5	CHALK	Off-Landfill, WVP	512374.3	222198.1	Quarterly		Ground Gas Monitoring (Spot) Groundwater Level
CP-BH11	39.0	29.0 - 39.0	CHALK	Off-Landfill, WVP	512854.1	222154.9	Quarterly		Ground Gas Monitoring (Spot) Groundwater Level
ARP16-LF-BH02	58.0	30.0-58.0	CHALK	Landfill, W	512174	221830	Quarterly	Groundwater	Groundwater level

Exploratory Hole	Depth (m bgl)	Response Zone (m bgl)	Strata	Location	Easting	Northing	Frequency Period	Sampling	Monitoring
									Low Flow parameters
ARP16-LF-BH03	55.0	25.0-55.0	CHALK	Landfill, NW boundary	512189	222058	Quarterly	Groundwater	Groundwater level Low Flow parameters
ARP16-LF-BH04	59.0	25.0-59.0	CHALK	Landfill, central	512353	221803	Quarterly	Groundwater	Groundwater level Low Flow parameters
ARP16-LF-BH08	57.0	25.0-57.0	CHALK	Landfill, E	512619	221794	Quarterly	Groundwater	Groundwater level Low Flow parameters
AEC18-LF-GW203	63	28.50-63.0	CHALK	Landfill, E	512474.87	221980.89	Quarterly	Groundwater	Groundwater level Low Flow parameters
AEC18-LF-GW204	64	29.0-64.0	CHALK	Landfill, central	512456.67	221733.68	Quarterly	Groundwater	Groundwater level Low Flow parameters
AEC18-LF-GW205	63	28.0-63.0	CHALK	Landfill, SE	512620.69	221690.89	Quarterly	Groundwater	Groundwater level Low Flow parameters
AEC18-LF-GW206	65	27.0-64.5	CHALK	Landfill, W	512300.76	221626.96	Quarterly	Groundwater	Groundwater level Low Flow parameters
AEC18-LF-GW207A	62	22.0-62.0	CHALK	Landfill, SW	512341.80	221414.61	Quarterly	Groundwater	Groundwater level Low Flow parameters
ARP16-LF-BH10	56.0	25.0-56.0	CHALK	Off landfill	512819	221592	Quarterly	Groundwater	Groundwater level Low Flow parameters
ARP16-CP-BH11	39.0		CHALK	Off landfill	512854	222155	Quarterly	Groundwater	Groundwater level Low Flow parameters
ARP16-CP-BH12	39.0	15.0-41.1	CHALK	Off-Landfill, Agricultural land	512854	222155	Quarterly	Groundwater	Groundwater level Low Flow parameters

Exploratory Hole	Depth (m bgl)	Response Zone (m bgl)	Strata	Location	Easting	Northing	Frequency Period	Sampling	Monitoring
ARP16-LF-BH13	35.0	20.0-35.0	CHALK	Off landfill	512854	221755	Quarterly	Groundwater	Groundwater level Low Flow parameters
ARP16-CP-BH24	41.1	20.0-42.58	CHALK	Off-Landfill, Agricultural land	512955	221655	Quarterly	Groundwater	Groundwater level Low Flow parameters
ARP16-CP-BH27	53.7	30.7-53.7	CHALK	Off landfill	513155	222355	Quarterly	Groundwater	Groundwater level Low Flow parameters
ARP16-CP-BH29	44.3	20.0-44.3	CHALK	Off Landfill	513254	221555	Quarterly	Groundwater	Groundwater level Low Flow parameters
ARP16-CP-BH32	41.0	20.3-41.0	CHALK	Off-Landfill, Agricultural land	513254	221355	Quarterly	Groundwater	Groundwater level Low Flow parameters
ARP16-CP-BH50	23.5	9.5-23.5	CHALK	Off-Landfill, Agricultural land	513254	221555	Quarterly	Groundwater	Groundwater level Low Flow parameters
ARP16-CP-BH51	32.0	15.0-32.0	CHALK	Off Landfill	513688	221696	Quarterly	Groundwater	Groundwater level Low Flow parameters
ARP16-CP-BH55	52.7	29.0-52.7	CHALK	Off Landfill	512858	221991	Quarterly	Groundwater	Groundwater level Low Flow parameters
LF-BH01	57.5	27.5-57.5	CHALK	Off landfill	512374	222198	Quarterly	Groundwater	Groundwater level Low Flow parameters
ARP16-LF-BH05	58.0	25.0-58.0	CHALK	Off landfill	512400	221243	Quarterly	Groundwater	Groundwater level Low Flow parameters
AEC18-LF-GW201	52	2.5-10.2	CHALK	Upgradient	512108.64	222197.14	Quarterly	Groundwater	Groundwater level Low Flow parameters
AEC18-LF-GW202	54	22.5 – 54.0	CHALK	Upgradient,	512049.79	222084.55	Quarterly	Groundwater	Groundwater level

Exploratory Hole	Depth (m bgl)	Response Zone (m bgl)	Strata	Location	Easting	Northing	Frequency Period	Sampling	Monitoring
									Low Flow parameters
AEC18-LF-LW201	18.0	Sump 15.0-16.0 Response 2.0-15.0	Waste	Landfill, WVP, north central	512351.10	222049.31	Six-monthly	Leachate	Leachate level
AEC18-LF-LW202	12.0	Sump 10-11 Response 1.0-10.0	Waste/made ground	Landfill, CWS, north central	512336.03	221896.73	Six-monthly	Leachate	Leachate level
AEC18-LF-LW203	13.5	Sump 11.0-12.0 Response 1.0-11.0	Waste	Landfill, WVP, south east	512696.34	221865.44	Six-monthly	Leachate	Leachate level
AEC18-LF-LW204	13.5	Sump 11.5-12.5 Response 1.5-11.5	Waste	Landfill, WVP, central	512504.40	221730.81	Six-monthly	Leachate	Leachate level
AEC18-LF-LW205	6.0	Sump 5.0-6.0 Response 2.0-5.0	Waste	Landfill, LSCP, southwest boundary	512411.00	221296.45	Six-monthly	Leachate	Leachate level
ARP16-LF-BH06	13.0	1.0-12.0	Waste	Landfill, SW	512446	221556	Six-monthly	Leachate	Leachate level
ARP16-LF-BH07	21.0	1.0-16.0	Waste	Landfill, central	512491	221920	Six-monthly	Leachate	Leachate level
ARP16-LF-BH09	14.0	1.0-13.0	Waste	Landfill, south	512637	221568	Six-monthly	Leachate	Leachate level
ARP16-LF-BH12A	11.0	1.0-10.0	Waste	Landfill southeast	512825	221665	Six-monthly	Leachate	Leachate level

APPENDIX B – GAS ANALYSIS SUITE

Results should be reported in ppbv and μg/m^3

Determinand
Ground gases
Carbon Dioxide
Carbon Monoxide
Hydrogen sulphide
Methane
Nitrogen
Oxygen
Ethane
Propane
Butane
Pentane
Hexane
Heptane
Ethene
Trace gases
1,1,1,2-Tetrachloroethane
1,1,1-Trichloroethane
1,1,2,2-Tetrachloroethane
1,1,2-Trichloroethane
1,1-Dichloroethane
1,1-Dichloroethene (1,1 DCE)
1,1-Dichloropropene
1,2,3-Trichlorobenzene
1,2,3-Trichloropropane
1,2,4-Trichlorobenzene
1,2,4-Trimethylbenzene
1,2-Dibromo-3-chloropropane
1,2-Dibromoethane
1,2-Dichlorobenzene
1,2- Dichloroethene
1,2-Dichloroethane

Determinand
1,2-Dichloropropane
1,3,5-Trimethylbenzene
1,3-Butadiene
1-Butanethiol (n-butyl mercaptan)
1-Pentene
1-Propanethiol (Propyl mercaptan)
2-butoxy ethanol
1,3-Dichlorobenzene
1,3-Dichloropropane
1,4-Dichlorobenzene
2,2-Dichloropropane
2-Chlorotoluene
4-Chlorotoluene
4-Isopropyltoluene
Arsenic (as As)
Acetaldehyde
Benzene
Bromobenzene
Bromochloromethane
Bromodichloromethane
Bromoform
Bromomethane
Butyric acid
Carbon Disulphide
Carbon Tetrachloride
Chlorobenzene
Chloroethane
Chloroform
Chloromethane
cis-1,2-Dichloroethene
cis-1,3-Dichloropropene

Determinand
Dibromochloromethane
Dibromomethane
Dichlorodifluoromethane (F-12)
Dichloromethane (DCM)
Dimethyl disulphide
Dimethyl sulphide
Ethanethiol (ethyl mercaptan)
Ethyl butyrate
Ethylbenzene
Furan (1,4-epoxy-1,3-butadiene)
Formaldehyde
Hexachlorobutadiene
Mercury
Methanethiol
Isopropylbenzene
m&p - Xylenes
Methyl tertiary butyl ether
Naphthalene
n-Butylbenzene
o-Xylene
Propylbenzene
PCDDs and PCDFs
Sec-Butylbenzene
Styrene
Tert-Butylbenzene
Tetrachloroethene (PCE)
Tetrachloromethane
Toluene
Trans-1,2-Dichloroethene
trans-1,3-Dichloropropene
Trichloroethene (TCE)
Trichlorofluoromethane (F-11)

Determinand
Trimethylbenezene
Vinyl Chloride
Volatile Gases TICs
Total VOC

APPENDIX C – GROUNDWATER AND LEACHATE SUITES

Determinand	Detection level required µg/l (unless stated otherwise)
SUITE A – Heavy Metals	
Antimony	1
Arsenic	1
Barium	0.05
Beryllium	1
Boron	1
Cadmium	0.1
Chromium (hexavalent)	1
Chromium (III)	1
Chromium- total	1
Copper	1
Lead	1
Manganese	10
Mercury	0.01
Molybdenum	1
Nickel	10
Selenium	1
Vanadium	1
Zinc	1
SUITE B- Total Phenols	
Total Phenols	0.5
SUITE C- Phenols	
Phenol	0.5
Cresols	0.5
Xylenols	0.5
Resorcinol	0.5
SUITE D – Water samples oxygen demand	
BOD	1 mg O2/l
COD	1 mg O2/l
SUITE E- General Inorganics	
pH value	0.1 pH units
Hardness	2 mg/l
Alkalinity	2 mg/l
Bromide	1
Bromate	1
Cyanide - total	5
Total Cyanide - ferro and ferri-cyanide	5
Cyanide - free	5
Cyanide - thiocyanates	30
Sulphate	1000 µg SO4/l
Sulphide	100 µg S/l

Determinand	Detection level required µg/l (unless stated otherwise)
Calcium	10
Iron	10
Magnesium	30
Ammoniacal nitrogen	15
Sodium	10
Potassium	10
Chloride	2 mg/l
Total suspended solids	5 mg/l
Nitrate	100
Nitrite	10
Total oxidised nitrogen	0.1 mg/l
Fluoride	10
SUITE F- TPH CWG	
TPH CWG Ali >C12-C16	5
TPH CWG Ali >C16-C35	5
TPH CWG Ali >C35-C44	5
TPH CWG Aro >C6-C7	1
TPH CWG Aro >C7-C8	1
TPH CWG Aro >C8-C10	1
TPH CWG Aro >C10-C12	5
TPH CWG Aro >C12-C16	5
TPH CWG Aro >C16-C21	5
TPH CWG Aro >C21-C35	5
TPH CWG Aro >C35-C44	5
SUITE G –Speciated PAHs	
Acenaphthene	0.01
Acenaphthylene	0.01
Anthracene	0.01
Benzo(a)anthracene	0.01
Benzo(a)pyrene	0.01
Benzo(b)fluoranthene	0.01
Benzo(ghi)perylene	0.002
Benzo(k)fluoranthene	0.01
Chrysene	0.01
Dibenzo(ah)anthracene	0.01
Fluoranthene	0.01
Fluorene	0.01
Indeno(123-cd)pyrene	0.002
Naphthalene	0.01
Phenanthrene	0.01
Pyrene	0.01
PAH (total 16)	0.01
SUITE H – Monoaromatics	

Determinand	Detection level required µg/l (unless stated otherwise)
BTEX – Benzene	0.01
BTEX - Toluene	0.01
BTEX - Ethyl Benzene	0.01
BTEX - m & p Xylene	0.01
BTEX - o Xylene	0.01
MTBE (Methyl Tertiary Butyl Ether)	0.01
SUITE I – Volatile Organic compounds	
Dichlorodifluoromethane	1
Chloromethane	1
Chloroethane	1
Bromomethane	1
Vinyl Chloride	1
Trichlorofluoromethane	1
trans 1,2-Dichloroethene	1
Dichloromethane	1
Carbon Disulphide	1
1,1-Dichloroethene	1
1,1-Dichloroethane	1
cis 1,2-Dichloroethene	1
Bromochloromethane	1
Chloroform	0.1
2,2-Dichloropropane	1
1,2-Dichloroethane	1
1,1,1-Trichloroethane	0.1
1,1-Dichloropropene	1
Benzene	1
Carbon Tetrachloride	0.1
Dibromomethane	1
1,2-Dichloropropane	1
Bromodichloromethane	1
Trichloroethene	1
cis 1,3-Dichloropropene	1
trans 1,3-Dichloropropene	1
1,1,2-Trichloroethane	0.1
Toluene	1
1,3-Dichloropropane	1
Dibromochloromethane	1
1,2-Dibromoethane	0.4
Tetrachloroethene	1
1,1,1,2-Tetrachloroethane	1
Chlorobenzene	1
Ethylbenzene	1
m & p Xylene	1

Determinand	Detection level required µg/l (unless stated otherwise)
Bromoform	1
Styrene	1
1,1,2,2-Tetrachloroethane	1
o-Xylene	1
1,2,3-Trichloropropane	1
Isopropylbenzene	1
Bromobenzene	1
2-Chlorotoluene	1
n-propylbenzene	1
4-Chlorotoluene	1
1,2,4-Trimethylbenzene	1
4-Isopropyltoluene	1
1,3,5-Trimethylbenzene	1
1,2-Dichlorobenzene	1
1,4-Dichlorobenzene	1
sec-Butylbenzene	1
tert-Butylbenzene	1
1,3-Dichlorobenzene	1
n-butylbenzene	1
1,2-Dibromo-3-chloropropane	1
1,2,4-Trichlorobenzene	0.01
1,2,3-Trichlorobenzene	0.01
Hexachlorobutadiene	0.005
Tetrachloroethylene	0.1
Trichloroethylene	0.1
1,3,5-Trichlorobenzene	0.01
2,6-Chloronitrotoluene	1
4,2-Chloronitrotoluene	1
4,3-Chloronitrotoluene	1
2,4-Chloronitrotoluene	1
2,5-Chloronitrotoluene	1
SUITE J – Semi-Volatile Organic compounds	
2,4,5-Trichlorophenol	1
2,4,6-Trichlorophenol	1
2,4-Dichlorophenol	0.1
2,4-Dimethylphenol	1
2,4-Dinitrotoluene	1
2,6-Dinitrotoluene	1
2-Chloronaphthalene	1
2-Chlorophenol	0.1
2-Methylnaphthalene	1
2-Methylphenol	1
2-Nitrophenol	1

Determinand	Detection level required µg/l (unless stated otherwise)
4-Bromophenyl phenyl ether	1
4-Chloro-3-methylphenol	0.1
Bis(2-chloroisopropyl)ether	1
4-Methylphenol	1
4-Nitrophenol	1
Bis(2-chloroethyl)ether	1
Bis(2-chloroethoxy)methane	1
Bis(2-ethylhexyl)phthalate	1
Butylbenzyl phthalate	1
Carbazole	1
Dibenzofuran	1
n-Dibutylphthalate	1
n-Dioctylphthalate	1
n-Nitroso-n-dipropylamine	1
Diethyl phthalate	1
Dimethyl phthalate	1
Hexachlorobenzene	0.001
Pentachlorophenol	0.075
Phenol	1
Hexachloroethane	1
Nitrobenzene	1
Isophorone	1
Hexachlorocyclopentadiene	1
Perylene	1
MTBE	10
SUITE L – Water samples herbicides	
2,3,6-TBA	0.02
2,4-D	0.02
2,4-DB	0.02
2,4,5-T	0.02
2,4,5-TP; (Fenoprop); (Silvex)	0.02
4-CPA	0.02
Benazolin	0.02
Bentazone	0.02
Bromacil	0.02
Bromoxynil	0.02
Clopyralid	0.02
Dicamba	0.02
2,4-DP; (Dichlorprop)	0.02
Diclofop	0.02
Flamprop	0.02
Flamprop-isopropyl	0.02
Fluroxypyr	0.02

Determinand	Detection level required µg/l (unless stated otherwise)
Ioxynil	0.02
MCPA	0.02
MCPB	0.02
MCPP; (Mecoprop)	0.02
PCP; (Pentachlorophenol)	0.02
Picloram	0.02
Triclopyr	0.02
Carbetamide	0.075
Chlorbufam	0.1
Chloroxuron	0.1
Chlorpropham	0.1
Chlortoluron	0.075
Diflubenzuron	0.1
Dimefuron	0.1
Diuron	0.075
Ethiofencarb	0.1
Isoproturon	0.075
Linuron	0.1
Methabenzthiazuron	0.1
Metoxuron	0.1
Monolinuron	0.1
Monuron	0.1
Pencycuron	0.1
Phenmedipham	0.5
Pirimicarb	0.1
Propham	0.1
Trifluralin	0.01
SUITE M – Water samples pesticides	
Ametryn	0.1
Atraton	0.1
Atrazine	0.03
Prometon	0.1
Prometryn	0.1
Propazine	0.075
Simazine	0.03
Simetryn	0.1
Terbuthylazine	0.1
Terbutryn	0.1
Dichlorvos	0.001
Mevinphos	0.005
alpha-Hexachlorocyclohexane (HCH)	0.001
Diazinon	0.001
gamma-Hexachlorocyclohexane (HCH / Lindane)	0.001

Determinand	Detection level required µg/l (unless stated otherwise)
Heptachlor	0.01
Heptachlor Epoxide	0.01
Aldrin	0.003
beta-Hexachlorocyclohexane (HCH)	0.005
Methyl Parathion	0.01
Malathion	0.001
Fenitrothion	0.001
Parathion (Ethyl Parathion)	0.01
o,p-DDE	0.002
Endosulphan I	0.005
Endosulphan II	0.005
Endosulphan Sulphate	0.005
p,p-DDE	0.002
p,p-TDE (DDD)	0.002
p,p-DDT	0.002
p,p-Methoxychlor	0.01
Dieldrin	0.003
o,p-TDE (DDD)	0.002
o,p-Methoxychlor	0.01
o,p-DDT	0.002
Endrin	0.0005
Ethion	0.1
Azinphos-methyl	0.001
Cyfluthrin	0.1
Cyhalothrin	0.1
Cypermethrin	0.075
Deltamethrin	0.1
Fenvalerate	0.1
Permethrin	0.075
Azinphos-ethyl	0.02
Chlorfenvinphos	0.001
Dimethoate	0.01
Fenthion	0.01
delta-Hexachlorocyclohexane (HCH)	0.001
Isodrin	0.003
cis-Permethrin	0.001
trans-Permethrin	0.001
demeton-s-methyl	0.05
SUITE P – PFAS	
Perfluorobutanoic acid (PFBA; HFBA)	1ng/l
Perfluoropentanoic acid (PFPA, PFPeA)	1 ng/l
Perfluorohexanoic acid (PFHxA)	1 ng/l
Perfluoroheptanoic acid (PFHpA)	1 ng/l

Determinand	Detection level required µg/l (unless stated otherwise)
Perfluorooctanoic acid (PFOA)	1 ng/l
Perfluorononanoic acid (PFNA)	1 ng/l
Perfluorodecanoic acid (PFDA)	1 ng/l
Perfluoroundecanoic acid (PFUnA; PFUdA)	1 ng/l
Perfluorododecanoic acid (PFDoA)	1 ng/l
Perfluorotridecanoic acid (PFTrDA; PFTriA)	1 ng/l
Perfluorotetradecanoic acid (PFTeA; PFTreA; PFTeDA)	1 ng/l
Perfluorohexadecanoic acid (PFHxDA)	1 ng/l
Perfluorooctadecanoic acid (PFODA)	1 ng/l
Perfluorobutane sulfonic acid (PFBS)	1 ng/l
Perfluoropentane sulfonic acid (PFPeS)	1 ng/l
Perfluorohexane sulfonic acid (PFHxS)	1 ng/l
Perfluoroheptane sulfonic acid (PFHpS)	1 ng/l
Perfluorooctane sulfonic acid (PFOS)	1 ng/l
Perfluorononane sulfonic acid (PFNS)	1 ng/l
Perfluorodecane sulfonic acid (PFDS)	1 ng/l
Perfluoroundecane sulfonic acid (PFUnDS)	1 ng/l
Perfluorododecane sulfonic acid (PFDoS)	1 ng/l
Perfluorotridecane sulfonic acid (PFTrDS; PFTriS)	1 ng/l
Hexafluoropropylene oxide dimer acid (Gen X) (HFPO-DA (Gen X))	1 ng/l
Hexafluoropropylene oxide trimer acid (HFPO-TA)	1 ng/l
4,8-Dioxa-3H-perfluorononanoic acid (DONA;ADONA)	1 ng/l
2H,2H,3H,3H-Perfluorooctanoic acid (5:3 FTCA)	1 ng/l
6:2 Fluorotelomer phosphate diester (6:2 diPAP)	1 ng/l
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (F-53B Major) (6:2 Cl-PFESA; 9Cl-P F3ONS)	1 ng/l
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (F-53B Minor) (8:2 Cl-PFESA; 11Cl-PF3OUdS)	1 ng/l
4:2 Fluorotelomer sulfonic acid (4:2 FTSA; 4:2 FTS)	1 ng/l
6:2 Fluorotelomer sulfonic acid (6:2 FTSA; 6:2 FTS)	1 ng/l
8:2 Fluorotelomer sulfonic acid (8:2 FTSA; 8:2 FTS)	1 ng/l
10:2 Fluorotelomer sulfonic acid (10:2 FTSA)	1 ng/l
Perfluorobutylsulfonamide (perfluorobutane sulfonamide) (FBSA)	1 ng/l
Perfluorohexanesulfonamide (FHxSA)	1 ng/l
Perfluorooctanesulfonamide (FOSA; PFOSA)	1 ng/l
N-methylperfluorooctanesulfonamide (MeFOSA; NMeFOSA)	1 ng/l
N-Ethylperfluorooctanesulfonamide (EtFOSA; NEtFOSA)	1 ng/l
2-(N-Methylperfluorooctanesulfonamido)acetic acid (NMeFOSAA; MeFOSAA)	1 ng/l
2-(N-Ethylperfluorooctanesulfonamido)acetic acid (NEtFOSAA; EtFOSAA)	1 ng/l

Determinand	Detection level required µg/l (unless stated otherwise)
N-Methyl-N-(2- hydroxyethyl)perfluorooctanesulfonamide (MeFOSE)	1 ng/l
N-Ethyl-N-(2-hydroxyethyl)perfluorooctanesulfonamide (EtFOSE)	1 ng/l
Perfluoro[(2-ethyloxy-ethoxy)acetic acid], ammonium salt (EEA-NH4)	1 ng/l
Perfluorobutylethlyene (PFBE)	1 ng/l
3,3,4,4,5,5,6,6,7,7,8,8,8-Tridecafluorooctyl methacrylate	1 ng/l
1-Propanamine, 1,1,2,2,3,3,3-heptafluoro-N,Nbis(1,1,2,2,3,3,3-heptafluoropropyl)- [Perfluamine]	1 ng/l
Carboxymethyldimethyl-3-[[(3,3,4,4,5,5,6,6,7,7,8,8,8-tridecafluorooctyl)sulfonyl]amino]propylammonium hydroxide (6:2 FTAB)	1 ng/l
N-[3-(Dimethylamino)propyl]-3,3,4,4,5,5,6,6,7,7,8,8,8-tridecafluorooctanesulfonamide N-oxide (FTSSAAm)	1 ng/l