



**RADISSON BLU RESORT & SPA, ST JULIAN'S  
ENVIRONMENTAL PERMIT (EP 0049/20)**

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**ENVIRONMENTAL MONITORING PROGRAMME**



**Version 2: November 2024**



**Report Reference:**

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## Quality Assurance

### Radisson Blu Resort & Spa, St Julian's - Environment Permit (EP 0049/20) Environmental Monitoring Programme November 2024

Report for: **Bay Point Hotel Ltd**

#### Revision Schedule

Rev	Date	Details	Written by:	Checked by:	Approved by:
00	Apr 2021	Draft to ERA	Joseph A. Borg	Adrian Mallia	Rachel Xuereb
01	Nov 2024	Revised	Cinthy Rlbero	Adrian Mallia	Rachel Xuereb

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# RADISSON BLU RESORT AND SPA – ENVIRONMENTAL MONITORING PROGRAMME

## INTRODUCTION

1. In 2020, Bay Point Hotel Ltd submitted a renewal application to the Environment & Resources Authority (ERA) for the Environmental Permit for the operations at the Radisson BLU Resort and Spa in St Julian’s. The ERA approved the EPA renewal on 10 July 2020 and the permit was issued on 21 October 2020 subject to conditions and an Improvement Programme. The permit is valid for 4 years and can be renewed.
2. A renewal application for EP 0049/20 was submitted to the ERA in April 2024 and is currently being processed. No changes have been proposed to the locations of the discharge points to the marine environment; however, the discharge points have been renumbered from the original permit (see below) and the hotel has also introduced a sand filter between the borehole pump and the RO to better filter the sea water. Every one or two weeks, depending on the need, they back wash this sand filter with the discharge going to the sea through the same discharge point of the RO brine water. This new discharge will be monitored as well.
3. The Improvement Programme of the original permit required the submission of a monitoring programme in line with Schedule 4 of the permit for discharge point labelled E3, which discharges reverse osmosis brine to the sea (**Figure 1**) as per Table 2.1.19 and in line with condition 2.1.32.
4. The hotel has four discharges leading to three discharge points as follows:
  - Discharge point E1 (now referred to as ED1) consists of the discharge of back wash water from the main pool and the indoor pool;
  - Discharge point E2 (now referred to as ED2) consists of the discharge of the back wash water from the lido pool;
  - Discharge point E3 (now referred to as ED3) consists of the discharge of brine reject from the Reverse Osmosis, whereas discharge point E3 discharges cooling water (sea water) from the chillers.
  - Discharge Point ED4 (added recently) consists of the discharge of back wash water from the sand filter. The final discharge point to sea is the same as ED3.
5. The permit gives the location of the discharge points as:

ED1	35°55'49.4"N and 14°29'27.7"E
ED2	35°55'43.7"N and 14°29'33.1"E
ED3 /ED4	35°55'48.7"N and 14°29'23.3"E

6. Schedule 4 of the EPA outlines the contents for the EMP, which include:
  - Assessment of changes in condition or health status of *Posidonia oceanica* meadows and other habitats of conservation interest and associates species;
  - Assessment of water quality parameters to support the assessment of ecological condition;
  - Observation of the establishment / extent of non-indigenous species in the vicinity of the discharge point
7. The monitoring programme is to identify:
  - The area to be monitored, including monitoring stations;
  - The monitoring methodologies to be used;
  - The frequency of monitoring; and
  - The water quality parameters to be monitored.
8. The EPA also requires the eventual monitoring (which will follow the approved EMP) to be undertaken in the first year of the permit validity and again prior to the expiry of the said permit. The final report is to include a comparison of the findings between the sets of results.
9. In addition to the marine environmental monitoring, pre-discharge monitoring is also to be carried out for the four discharges listed above. This monitoring will follow the requirements set out in Condition 2.1.22, which requires sampling to take place three times annually to reflect the seasonal and operational variation (i.e., winter, summer, and summer peak). Sampling is to include replicates.
10. The Environmental Monitoring Programme proposed in fulfilment of the Improvement Programme of the Radisson BLU Resort and Spa was formulated in April 2021 and submitted to ERA for approval. However, at the time, the Radisson BLU Resort and Spa in St Julian's was shut in view of the havoc created by the covid-19 pandemic. It was therefore recommended that following ERA's approval of the EMP, the first monitoring session will be undertaken once the Hotel re-opens for business following the easing of public health restrictions on tourism accommodation, and only once occupancy at the hotel reaches at least 70%.
11. The ERA gave its go ahead for the commencement of the monitoring exercise in August 2024, which was actually a few months prior to the expiry of the original permit.
12. This updated version of the EMP for the Radisson BLU Resort & Spa is being prepared for the renewal application for permit EP 0049/20 and addresses the requirements of ERA as set out in an email dated 11 November 2024.

**Figure 1: Location of discharge points**



## ENVIRONMENTAL MONITORING PROGRAMME

13. This Environmental Monitoring Programme has four sections.

### Monitoring of brine reject and cooling waters prior to discharge to sea

14. The quality of the water being discharged from the discharge points ED1 to ED4 shall be checked on a regular basis throughout the year to reflect the seasonal and operational variations. To do this, samples of the discharge water will be taken from a point prior to its discharge to the sea. The parameters to be monitored are as follows:

ED1 & ED2	pH, total residual chlorine, total suspended solids (TSS), temperature
ED3	pH, total dissolved solids (TDS), salinity, dissolved oxygen, temperature
ED4	Total suspended solids (TSS)

15. Readings for pH, salinity, dissolved oxygen, temperature and total dissolved solids are taken by means of calibrated YSI ProDSS multiparameter meter. Total residual chlorine is measured *in situ* by means of calibrated portable photometer, whereas the Total Suspended Solids (TSS) are analysed at an accredited laboratory.
16. Replicates will be taken, and sampling will be repeated at least three times annually for the duration of the permit. Since the temperature reading needs to be compared with ambient (seawater) temperature, seawater temperature readings will also be taken by means of a calibrated YSI ProDSS multiparameter meter.

### Assessment of state of health of *Posidonia oceanica* meadows and other habitats of conservation interest and their associated species

17. To assess changes in the condition or health status of *Posidonia oceanica* meadows and other habitats of conservation interest and their associated species located in close proximity to the discharge point, scientific SCUBA divers will undertake a benthic survey of habitats present within the proposed area of study (AoS) indicated in **Figure 2**. The survey will be undertaken through the use of shore-normal transects.
18. As the divers navigate underwater along the transects, information on the occurrence, spatial distribution and state / condition of the main marine benthic assemblages present will be collected. This will be supplemented by aerial imagery data. Characterisation of the benthic assemblages will be according to the EUNIS



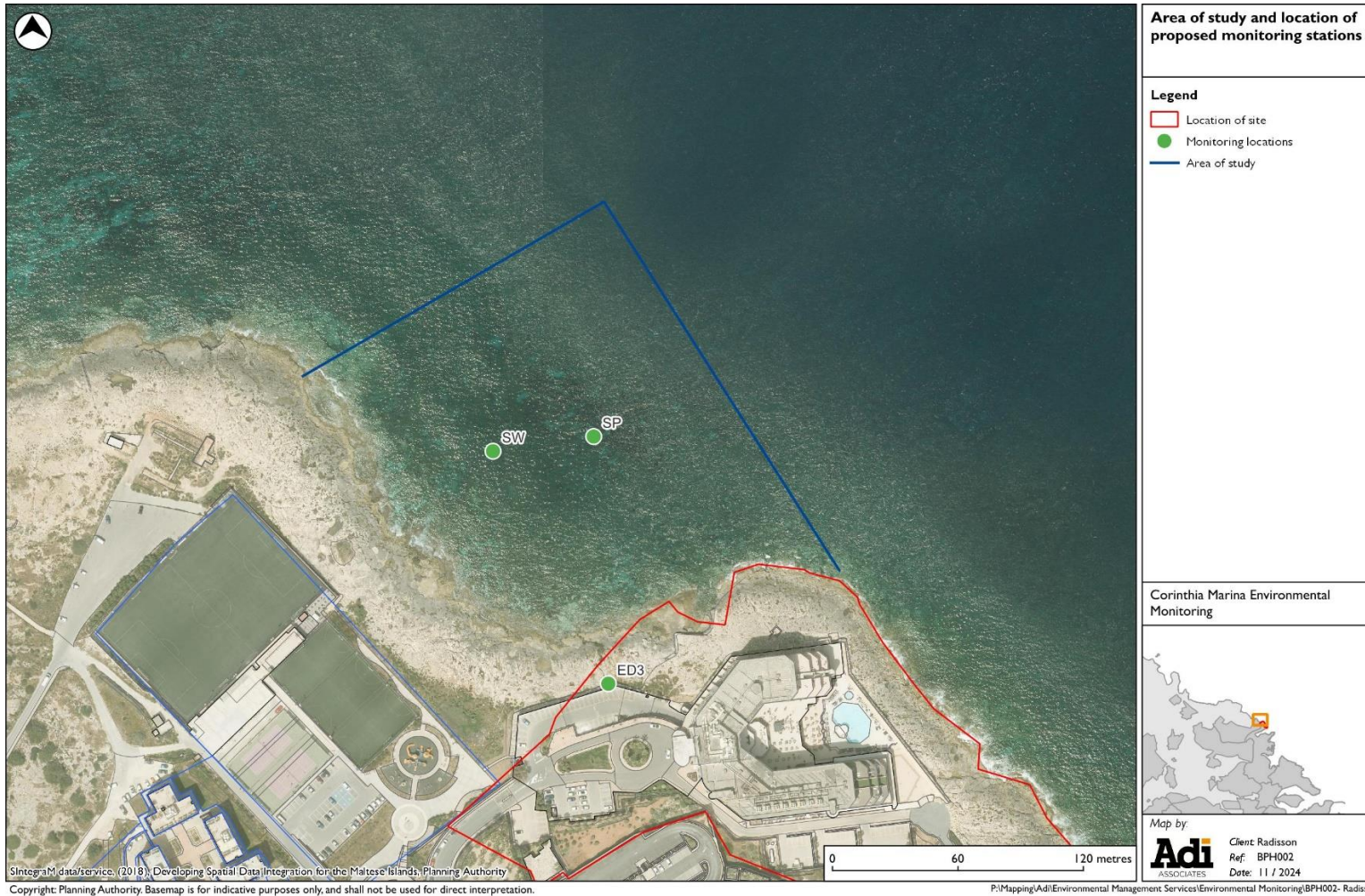
habitat classification scheme and the scheme given in Borg *et al.* (2013)<sup>1</sup>.

19. The spatial distribution of marine benthic habitats recorded from the study areas will be reproduced on a map. Particular attention will be given to the occurrence and spatial distribution of *P. oceanica* meadows, such that the map for this habitat type that will be produced from the survey may be used for comparison against data collected in future to assess any changes in the occurrence and distribution of the seagrass habitat. Photographs of representative species and habitats will be taken where relevant and used to illustrate the report, as appropriate.
20. Data on the occurrence of scientifically important and/or protected species, and on key species relevant to characterisation of the habitat and for monitoring purposes will be collected and presented. Particular reference will be made to any species recorded from the AoS that are listed in the Red Data Book for the Maltese Islands, and species and/or biotope/habitat types that are listed in the relevant Maltese nature protection legislation, relevant nature protection treaties and the EU Nature Protection Acquis. The reported findings will include statements on whether the study areas support any biological characteristics of particular conservation and/or scientific importance, as well as protected, endangered, rare, unique, endemic, high-quality, keystone, invasive/deleterious, or otherwise important species, habitats, ecological assemblages, and ecological conditions.

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<sup>1</sup> Borg, J.A., Knittweis, L. & Schembri, P.J. (2013) Compilation of an interpretation manual for marine habitats within the 25 NM Fisheries Management Zone around the Republic of Malta. [MEPA tender reference: T2/2013]. MEPA, Malta; 218pp.

**Figure 2: Map showing proposed area of study and location of proposed monitoring stations**



**Note: SW = seawater sampling station**

**SP = *Posidonia oceanica* monitoring station**

21. To assess changes in the condition or health status of the *P. oceanica* meadows in close proximity to the discharge point, non-destructive *in situ* measurements of the following standard seagrass parameters will be made:
- Three outer leaves (which will ensure inclusion of all adult leaves) will be collected from each of ten shoots at Station SP (see **Figure 2**);
  - Three replicate measurements of seagrass shoot density will be made at Station SP (see **Figure 2**);
  - In the laboratory, the following estimates will be made:
    - Length of each adult leaf from each shoot;
    - Percentage necrosis of the adult leaves in each shoot;
    - Dry weight of the adult leaves in each shoot;
    - Dry weight of epiphytes from the adult leaves in each shoot.
  - The location of the tentatively identified Station SP (**Figure 2**) will be confirmed or revised following completion of the benthic survey since it is necessary to ascertain the suitability or otherwise of the proposed station position in the field.

**Assessment of water quality parameters to support the assessment of ecological conditions**

22. To assess water quality parameters to support ecological condition, two replicate samples of seawater will be collected from Station SW (**Figure 2**) and analysed for the following parameters at an accredited laboratory:
- pH;
  - Nitrates;
  - Dissolved phosphates; and
23. Two replicate *in situ* measurement of the following parameters will also be made at Station SW (**Figure 2**) using a YSI hand held meter:
- Salinity;
  - Total Dissolved solids;
  - Dissolved Oxygen;
  - Chlorophyll *a*; and
  - Temperature.
24. **Table I** includes the analysis procedure for each parameter to analysed and where

the analysis is to take place – i.e., an accredited laboratory or in-situ during water sampling. The accreditation certificate of the nominated laboratory abroad, i2, can be viewed in **Annex I**.

**Table I: Analysis Procedure**

Parameter	Analysis Procedure	Location of Analysis
pH	Potentiometric	i2 Laboratory
TDS	Measurements to be tested in-situ using a YSI ProDSS multiparameter meter.	In-situ
Nitrates	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08	i2 Laboratory
Phosphates	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton, analysis by discreet analyser	i2 Laboratory
Chlorophyll <i>a</i>	Measurements to be tested in-situ using a YSI ProDSS multiparameter meter.	In-situ
Salinity	Measurements to be tested in-situ using a YSI ProDSS multiparameter meter.	In-situ
Dissolved Oxygen	Measurements to be tested in-situ using a YSI ProDSS multiparameter meter.	In-situ
Temperature	Measurements to be tested in-situ using a YSI ProDSS multiparameter meter.	In-situ

### **Observation of the establishment / extent of non-indigenous species in the vicinity of the discharge point that might be affecting the status of the natural habitat types**

25. To assess the establishment/extent of non-indigenous species in the vicinity of the discharge point that might be affecting the status of the natural habitat types in the area, scientific SCUBA divers will undertake a site survey to identify and map any non-indigenous species present in the vicinity of the discharge point.
26. The methodology to be used for this aspect of the monitoring programme is the same as that for the assessment of the state of health of *Posidonia oceanica* meadows and other habitats of conservation interest; however, in this case, particular attention will be paid to the presence or establishment / extent of non-indigenous species within the study area, including in the vicinity of the discharge point, that might be affecting the status of the habitat types present.

### **Monitoring Frequency**

27. The monitoring frequency is largely governed by the conditions set in the environment permit, namely:
  - For the pre-discharge monitoring of reject waters, sampling will take place from each discharge point at least three times each year for the duration of the permit.

The sampling sessions will reflect the seasonal and operational variability (e.g., winter, summer, and summer peak occupancy). Replicate samples will be taken at each sampling session. Ambient seawater temperature readings will also be taken on the day of the sampling session

- For the benthic survey, assessment of *P. oceanica* parameters, and the observations on the non-indigenous species: the first session was undertaken in October 2024 prior to the expiry of the original permit. This will be repeated in the first year of the validity of the renewed environmental permit, and a follow-up session prior to expiry of the renewed permit. The second session will include a comparison with the findings from the first session.
- For the assessment of water quality to support ecological condition: the first session was undertaken in October 2024 prior to the expiry of the original permit. Again, this will be repeated in the first year of the validity of the renewed environmental permit, and a follow-up session prior to expiry of the renewed permit. The second session will include a comparison with the findings from the first session.




## **Annex I: Accreditation Certificate for i2 Analytical Ltd**

# Schedule of Accreditation

issued by

## United Kingdom Accreditation Service

2 Pine Trees, Chertsey Lane, Staines-upon-Thames, TW18 3HR, UK

 <p><b>4041</b></p> <p>Accredited to <b>ISO/IEC 17025:2017</b></p>	<b>I2 Analytical Ltd</b> <b>Issue No: 107 Issue date: 31 August 2022</b>	
	<b>7 Woodshots Meadow</b> <b>Croxley Park</b> <b>Croxley Green</b> <b>Hertfordshire</b> <b>WD18 8YS</b>	<b>Contact: Dr Claire Stone</b> <b>Tel: +44 (0)1923 225404</b> <b>Fax: +44(0) 1923 237404</b> <b>E-Mail: c.stone@i2analytical.com</b> <b>Website: www.i2analytical.com</b>
Testing performed by the Organisation at the locations specified below		

### Locations covered by the organisation and their relevant activities

#### Laboratory locations:

Location details		Activity	Location code
<b>Address</b> 7 Woodshots Meadow Croxley Park Croxley Green Hertfordshire WD18 8YS	<b>Local contact</b> Dr Claire Stone	Environmental Analysis  Asbestos – All Support Functions	A
<b>Address</b> Sp. z o.o. ul. Pionerów 39 41-711 Ruda Śląska Poland	<b>Local contact</b> Mrs Marzena Babik  Tel: 00 48 323 426 011 Fax: 00 48 323 426 012 E-Mail: m.babik@i2analytical.com	Environmental Analysis Environmental Sampling Atmospheric Pollutant testing Aggregates: Physical Tests Soils: Mechanical & Physical tests Fuel Technology  Health and Hygiene Asbestos – Support Functions: <ul style="list-style-type: none"> <li>• <i>Quality Audit</i></li> <li>• <i>Administration</i></li> <li>• <i>Contract Review</i></li> <li>• <i>Scheduling</i></li> <li>• <i>Personnel</i></li> <li>• <i>Equipment</i></li> <li>• <i>Measurement</i></li> <li>• <i>Traceability</i></li> <li>• <i>Reporting</i></li> </ul>	B
<b>Address</b> Unit 8 Delta Court Sky Business Park Hayfield Lane Finningley Doncaster DN9 3GN	<b>Local contact</b> Dr Claire Stone  Tel: +44 (0) 1923 225404	Sample storage, Preparation and administration Aggregates: Sampling from Stockpiles Soils: Mechanical & Physical tests	C



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**Issue No: 107 Issue date: 31 August 2022**

Testing performed by the Organisation at the locations specified

Location details	Activity	Location Code
<p><b>Address</b> 8 Harrowden Road Brackmills Northampton Northamptonshire NN4 7EB</p> <p><b>Local contact</b> Dr Claire Stone  Tel: 44 (0) 1923 225404</p>	<p>Sample storage, and Preparation and administration Aggregates: Sampling from Stockpiles; Physical Testing Soils Mechanical and Physical testing</p>	D
<p><b>Address</b> 40 Carron Place East Kilbride Glasgow G75 0YL</p> <p>Local contact Dr Claire Stone  Tel: 44 (0) 1923 225404</p>	<p>Sample receipt, Storage and Customer Service. Environmental and Geotechnical Samples Aggregates; Physical tests Bituminous mixtures; Physical Tests Road pavement surfaces; Physical tests Soils; physical tests</p>	F
<p><b>Address</b> Unit E5 Larkfield Trading Estate New Hythe Road Kent ME20 6SW</p> <p>Local contact Dr Claire Stone  Tel: 44 (0) 1923 225404</p>	<p>Customer Service, Sample storage, and Preparation and administration Aggregates: Physical Testing Soils Physical testing Concrete Hardened</p>	G
<p><b>Address</b> Maxted House 13 Maxted Road Hemel Hempstead Hertfordshire HP2 7DX</p> <p>Local contact Dr Claire Stone  Tel: 44 (0) 1923 225404</p>	<p>Customer Service</p>	E
<p><b>Address</b> Suite 2.17 Empress Business Centre 380 Chester Road Manchester M16 9EA</p> <p>Local contact Dr Claire Stone  Tel: 44 (0) 1923 225404</p>	<p>Customer Service</p>	H



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	<p><b>I2 Analytical Ltd</b> <b>Issue No: 107    Issue date: 31 August 2022</b></p>
<p>Testing performed by the Organisation at the locations specified</p>	

**Site activities performed away from the locations listed above:**

Location details	Activity	Location code
<p>All locations suitable for the activities listed</p> <p><b>Local contact</b> Dr Claire Stone</p> <p>Tel: 44 (0) 1923 225404</p>	<p>Testing: Soils; physical tests; Concrete - Fresh</p>	<p>Site</p>



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Testing performed by the Organisation at the locations specified

DETAIL OF ACCREDITATION

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
SOILS	<u>Chemical Tests</u> Inorganic Analysis: pH	Documented In-House Methods  L005M using pH meter	A
SOILS	<u>Chemical Tests</u> Inorganic Analysis: pH	Documented In-House Method to meet the requirements of the Environment Agency MCERTS Performance Standard - chemical testing of soil  L005M using pH meter	A
WATERS	<u>Chemical Tests</u> Inorganic Analysis: pH	L005M using pH meter	A
- Surface and potable waters			
Process Water (De-Ionised water), potable (non-regulatory), Groundwater, Surface Water, prepared leachate, landfill leachate, final sewage effluent	Biological Oxygen Demand (BOD)	L086A using Dissolved Oxygen Probe	A
Process Water (DI), potable (non-regulatory), Groundwater, Surface Water, prepared leachate, landfill leachate, final sewage effluent	Chemical Oxygen Demand (COD)	L065A Colorimetry	A
Process Water (DI), potable (non-regulatory), Groundwater, Surface Water, prepared leachate, landfill leachate, final sewage effluent	Electrical Conductivity Total Dissolved Solids (TDS) - by Calculation	L031A using EC Probe	A



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Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
<b>Analysis at Site B</b>			
ASBESTOS IN BULK MATERIALS including materials and products suspected of containing asbestos	<u>Health and Hygiene</u>  Identification of: Amosite Chrysotile Crocidolite Fibrous Actinolite Fibrous Anthophyllite Fibrous Tremolite	Health and Safety Executive - Asbestos: The Analysts' Guide (HSG 248) – 2021  Documented In-House Method A001B using stereo-microscopy, polarised light optical microscopy and dispersion staining based on HSG 248	B
ASBESTOS IN SOILS – The Identification of Asbestos fibres in bulk samples of Soil, <i>specifically: Soil Sediment</i>	Identification of: Amosite Chrysotile Crocidolite Fibrous Actinolite Fibrous Anthophyllite Fibrous Tremolite	Documented In-House Method A0001B using stereo-microscopy, polarised light optical microscopy and dispersion staining based on HSG 248	B
ASBESTOS IN SOILS – The Identification and Quantification of Asbestos fibres in bulk samples of Soil, <i>specifically: Soil</i>	Identification and Quantification of Asbestos content of: Amosite Chrysotile Crocidolite Fibrous Actinolite Fibrous Anthophyllite Fibrous Tremolite	Documented In-House Method A006B for identification using stereo-microscopy, polarised light optical microscopy and dispersion staining based on HSG 248. Documented In-House Method A006B for quantification of asbestos.	B
ASBESTOS IN SOILS (Dustiness)	Measurement of Dustiness	Documented In-House Method A007B based on BS EN15051-2:2013 +1:2016 “Measurement of the dustiness of bulk materials; Part 2: Rotating drum method” and HSG 248	B
SOILS	<u>Chemical Tests</u>  Inorganic Analysis:  pH  pH  Electrical Conductivity  Loss on Ignition (LOI) at 450°C	    L005B using pH electrode  L099 using Automated pH meter  L031B using automated EC meter  L047B using gravimetry	    B  B  B  B



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**Testing performed by the Organisation at the locations specified**

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
SOILS (cont'd)	<u>Chemical Tests</u> (cont'd) Inorganic Analysis: (cont'd) Metals: Arsenic Barium Beryllium Boron (total) Cadmium Chromium Cobalt Copper Iron Lead Manganese Mercury Molybdenum Nickel Selenium Tin Vanadium Zinc Antimony Sulphur (Total) Water-soluble boron Aluminium Calcium Potassium Magnesium Sodium Phosphorus	L038B using ICP-OES	B
	Water-soluble Sulphate (16hr extract)	L038B using ICP-OES	B
	Water-soluble Sulphate (1hr extract)	L038B using ICP-OES	B
	Total sulphate	L038B using ICP-OES	B
	Hexavalent Chromium	L080B by segmented flow autoanalyser	B
	Calorific Value	Documented In-House Method L013B based upon : BS EN 15400:2011 and BS EN ISO 18125:2017-07 using Bomb Calorimetry	B



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Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
SOILS (cont'd)	<u>Chemical Tests</u> (cont'd)		
	Inorganic Analysis: (cont'd)		
	Monohydric phenols	L080B using continuous flow analyser	B
	Total cyanide Free Cyanide Complex Cyanide (By Calculation)	L080B using continuous flow analyser	B
	Sulphide	L010B using ISE	B
	Water Soluble Chloride Ammonia	L082B using Discrete Analyser	B
	Elemental Sulphur	L021B using HPLC	B
	Organic Matter Total Organic Carbon (by Calculation)	L009B using Potentiometric Detection	B
	Fraction Organic Carbon by Calculation (Expressed as fraction of TOC)	L009B using Potentiometric Titration	B
	Total organic carbon Organic matter	L023B using Titration	B
	Fraction Organic Carbon by Calculation (Expressed as fraction of TOC)	L023B using Titration	B
	Petroleum Range Organics (C6-C12) (C6-C10) C6-C8 C8-C10 Banded aliphatic Fractions: C5-C6 C6-C8 C8-C10 Banded aromatic Fractions C5-C7 C7-C8 C8-C10	L088 using headspace GCMS	B



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Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
SOILS (cont'd)	<u>Chemical Tests</u> (cont'd)		
	Total petroleum hydrocarbons (C <sub>10</sub> -C <sub>40</sub> ) with banding: - C12-C35 - C10-C25 - C25-C40 - C10-C12 - C12-C16 - C16-C21 - C21-C35 - C35-C40 - C10-C20 - C21-C40	L076 using GC-FID	B
	Banded Pentane-Extractable Petroleum Hydrocarbons, as specified:	L076B using solid phase separation and GC-FID	B
	Banded Aliphatic Fraction: C8-C10 C10-C12 C12-C16 C16-C21 C21-C35 C35-C40 C16-C35		
	Banded Aromatic Fraction: C8-C10 C10-C12 C12-C16 C16-C21 C21-C35		
	Banded Aliphatic Fraction (By calculation) C5-C35 C5-C40	L088 using HSGCMS and L076 using GCFID	B
Banded Aromatic Fraction (By Calculation) C5-C35			
Total Pentane-Extractable Petroleum Hydrocarbons, C8-C35	L076B using solid phase separation and GC-FID	B	



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Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
SOILS (cont'd)	<u>Chemical Tests</u> (cont'd)		
	Polynuclear aromatic hydrocarbons: Acenaphthene Acenaphthylene Anthracene Benzo(a)anthracene Benzo(b)fluoranthene Benzo(k)fluoranthene Benzo(a)pyrene Benzo(ghi)perylene Chrysene Dibenzo(ah)anthracene Fluoranthene Fluorene Indeno(123-cd)pyrene Naphthalene Phenanthrene Pyrene Total PAH (sum of EPA 16)	L064B using GC-MS	B
	Semi-volatile organic compounds, specifically: Phenol 2-Chlorophenol Bis(2-chloroethyl)ether 1,3-Dichlorobenzene 1,2-Dichlorobenzene 1,4-Dichlorobenzene Bis(2-chloroisopropyl)ether 2-Methylphenol Hexachloroethane Nitrobenzene Isophorone 2-Nitrophenol 2,4-Dimethylphenol Bis(2-chloroethoxy)methane 1,2,4-Trichlorobenzene 2,4-Dichlorophenol Hexachlorobutadiene 2,4,6-Trichlorophenol 2,4,5-Trichlorophenol 2-Chloronaphthalene Dimethylphthalate 2,6-Dinitrotoluene 2,4-Dinitrotoluene Dibenzofuran	L064B using GC-MS	B



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Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
SOILS (cont'd)	<u>Chemical Tests (cont'd)</u>	L064B using GC-MS	B
	Semi-volatile organic compounds: (cont'd) 4-Chlorophenyl phenyl ether Diethylphthalate 4-Nitroaniline Azobenzene Bromophenyl phenyl ether Hexachlorobenzene Carbazole Dibutylphthalate Anthraquinone Butylbenzylphthalate		
	Volatile Organic Compounds, specifically: Chloromethane Bromomethane 1,1,2-Trichloro-1,2,2-trifluoroethane MTBE 1,1-Dichloroethane <i>cis</i> -Dichloroethene 2,2-Dichloropropane Chloroform 1,1,1-Trichloroethane 1,1-Dichloropropene Carbon tetrachloride 1,2-Dichloroethane Trichloroethene 1,2-Dichloropropane Dibromomethane Bromodichloromethane <i>cis</i> -1,3-Dichloropropene 1,3-Dichloropropane <i>trans</i> -1,3-Dichloropropene 1,1,2-Trichloroethane 1,1,2,2-Tetrachloroethane Dibromochloromethane 1,2-Dibromoethane Chlorobenzene 1,1,1,2-Tetrachloroethane Styrene Isopropylbenzene Bromobenzene <i>N</i> -Propylbenzene 2-Chlorotoluene	L073B using Head Space GC-MS (HS/GCMS)	B





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Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
SOILS (cont'd)	<u>Chemical Tests (cont'd)</u> Volatile Organic Compounds, specifically: (cont'd) 1,3,5-Trimethylbenzene 4-Chlorotoluene <i>tert</i> -Butylbenzene 1,2,4-Trimethylbenzene <i>sec</i> -Butylbenzene <i>p</i> -Isopropyltoluene 1,3-Dichlorobenzene 1,4-Dichlorobenzene Butylbenzene 1,2-Dichlorobenzene 1,2-Dibromo-3-chloropropane 1,2,4-Trichlorobenzene Hexachlorobutadiene Naphthalene 1,2,3-Trichlorobenzene Benzene Toluene Ethylbenzene ( <i>m+p</i> )-Xylenes <i>o</i> -Xylene Total BTEX (By calculation)	L073B using Head Space GC-MS (HS/GCMS)	B
	Polychlorinated Biphenyls: PCB Congener 28 PCB Congener 52 PCB Congener 101 PCB Congener 118 PCB Congener 138 PCB Congener 153 PCB Congener 180 Total of the seven PCB congeners listed above	L027 using GCMS	B



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Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
SOILS (cont'd)	<u>Chemical Tests</u> (cont'd)	Documented In-House Method to meet the requirements of the Environment Agency MCERTS Performance Standard - chemical testing of soil	
	Speciated Phenols, specifically: Resorcinol Catechol Phenol 2,3,5-Trimethylphenol 2-Isopropylphenol Total Cresols: (Sum of: 2-Methylphenol, 4-Methylphenol and 3-Methylphenol)	L030 using HPLC	B
	Total Xylenols and Ethylphenols: (Sum of: 3,4-Dimethylphenol, 2,6-Dimethylphenol, 4-Ethylphenol and 2,4-Dimethylphenol) Total Naphthols: (Sum of: 1-Naphthol and 2-Naphthol)	L030 using HPLC	B
	pH	L005B using pH meter	B
	pH	L099 using Automated pH meter	B
	Electrical Conductivity	L031B using automated EC meter	B
	Loss on Ignition (LOI) at 450 °C	L047B using gravimetry	B
	Water-soluble Sulphate (16hr extract) Water-soluble Sulphate (1hr extract) Total sulphate (acid soluble)	L038B using ICP-OES	B



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Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
SOILS (cont'd)	<u>Chemical Tests</u> (cont'd)	Documented In-House Method to meet the requirements of the Environment Agency MCERTS Performance Standard - chemical testing of soil	
	Hexavalent Chromium	L080B by segmented flow autoanalyser	B
	Sulphide	L010B using ISE	B
	Metals: Barium Beryllium Chromium Cobalt Copper Lead Manganese Molybdenum Nickel Vanadium Zinc Arsenic Boron Cadmium Iron Mercury Selenium Tin	L038B using ICP-OES	B
	Sulphur (Total)	L038B using ICP-OES	B
	Water-soluble boron	L038B using ICP-OES	B
	Monohydric phenols	L080B using continuous flow analyser	B
	Total cyanide Free Cyanide Complex Cyanide (By Calculation)	L080B using continuous flow analyser	B
	Water Soluble Chloride Ammonia	L082B using Discrete Analyser	B



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Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
SOILS (cont'd)	<u>Chemical Tests</u> (cont'd)	Documented In-House Method to meet the requirements of the Environment Agency MCERTS Performance Standard - chemical testing of soil	
	Elemental Sulphur	L021B using HPLC	B
	Organic Matter Total Organic Carbon (by Calculation)	L009B using Potentiometric Detection	B
	Fraction Organic Carbon by Calculation (Expressed as fraction of TOC)	L009B using Potentiometric Titration	B
	Total organic carbon Organic matter	L023B using Titration	B
	Fraction Organic Carbon by Calculation (Expressed as fraction of TOC)	L023B using Titration	B
	Total petroleum hydrocarbons (C <sub>10</sub> -C <sub>40</sub> ) with banding: - C12-C35 - C10-C25 - C25-C40 - C10-C12 - C12-C16 - C16-C21 - C21-C35 - C35-C40 - C10-C20 - C21-C40	L076 using GC-FID	B
	Banded Pentane-Extractable Petroleum Hydrocarbons, as specified:	L076B using solid phase separation and GC-FID	B
	Banded Aliphatic Fraction: C8-C10 C10-C12 C12-C16 C16-C21 C21-C35 C35-C40 C16-C35		



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Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
SOILS (cont'd)	<u>Chemical Tests</u> (cont'd)	Documented In-House Method to meet the requirements of the Environment Agency MCERTS Performance Standard - chemical testing of soil	
	Banded Pentane-Extractable Petroleum Hydrocarbons, as specified:	L076B using solid phase separation and GC-FID	B
	Banded Aromatic Fraction: C8-C10 C10-C12 C12-C16 C16-C21 C21-C35	L076B using solid phase separation and GC-FID	B
	Total Pentane-Extractable Petroleum Hydrocarbons, C8-C35		
	Petroleum Range Organics (C6-C10) C6-C8 C8-C10	L088 using headspace GCMS	B
	Banded aliphatic Fractions: C5-C6 C6-C8 C8-C10	L088 using headspace GCMS	B
	Banded aromatic Fractions C5-C7 C7-C8 C8-C10		
	Banded Aliphatic Fraction (By calculation) C5-C35 C5-C40	L088 using HSGCMS and L076 using GCFID	B
	Banded Aromatic Fraction (By Calculation) C5-C35		





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SOILS (cont'd)	<u>Chemical Tests</u> (cont'd)	Documented In-House Method to meet the requirements of the Environment Agency MCERTS Performance Standard - chemical testing of soil	B
	L064B using GC-MS		
	Semi-volatile organic compounds (CTD): Dibenzofuran 4-Chlorophenyl phenyl ether Diethylphthalate 4-Nitroaniline Azobenzene Bromophenyl phenyl ether Hexachlorobenzene Carbazole Dibutylphthalate Anthraquinone Volatile Organic Compounds, specifically: Chloromethane Bromomethane 1,1,2-Trichloro-1,2,2-trifluoroethane MTBE 1,1-Dichloroethane <i>cis</i> -Dichloroethene 2,2-Dichloropropane Chloroform 1,1,1-Trichloroethane 1,1-Dichloropropene Carbon tetrachloride 1,2-Dichloroethane Trichloroethene 1,2-Dichloropropane Dibromomethane Bromodichloromethane <i>cis</i> -1,3-Dichloropropene 1,3-Dichloropropane <i>trans</i> -1,3-Dichloropropene 1,1,2-Trichloroethane 1,1,2,2-Tetrachloroethane Dibromochloromethane Chlorobenzene 1,1,1,2-Tetrachloroethane Styrene Isopropylbenzene Bromobenzene 2-Chlorotoluene	L073B using Head Space GC-MS (HS/GCMS)	B



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Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
SOILS (cont'd)	<u>Chemical Tests (cont'd)</u>  Volatile Organic Compounds, specifically: (cont'd) 1,3,5-Trimethylbenzene 4-Chlorotoluene <i>tert</i> -Butylbenzene <i>sec</i> -Butylbenzene 1,4-Dichlorobenzene Butylbenzene 1,2-Dichlorobenzene 1,2,4-Trichlorobenzene Hexachlorobutadiene Benzene Toluene Ethylbenzene ( <i>m+p</i> )-Xylenes <i>o</i> -Xylene Total BTEX (By calculation)	Documented In-House Method to meet the requirements of the Environment Agency MCERTS Performance Standard - chemical testing of soil  L073B using Head Space GC-MS (HS/GCMS)	B
	Polychlorinated Biphenyls: PCB Congener 28 PCB Congener 52 PCB Congener 101 PCB Congener 118 PCB Congener 138 PCB Congener 153 PCB Congener 180 Total of the seven PCB congeners listed above	L027 using GCMS	B
RECYCLED WASTE Trommel Fines	Loss on Ignition at 440°C	Documented in house method ref L011B – using Gravimetric Analysis in accordance with HMRC Excise Notice LFT1 27 March 2015	B





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Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
WATERS - surface water, groundwater, potable (non-regulatory) and prepared leachate)	<u>Chemical Tests</u>  pH	L005B using pH electrode	B
Surface water, groundwater, potable (non-regulatory) and prepared leachate), final sewage effluent and Landfill Leachate	Biochemical Oxygen Demand	L086B by DO meter	B
		L086B by automated robot (Skalar) with LDO probes based on BS ISO 17289:2014	B
	Alkalinity Chloride Nitrite Thiocyanate	L082 using discrete analyser	B
Surface water, groundwater, potable (non-regulatory) and prepared leachate), Landfill Leachate and final sewage effluent	Sulphate Boron	L039B using ICP-OES	B
	Hardness	L045 by calculation	B
	Metals (total & dissolved): Aluminium Antimony Arsenic Barium Beryllium Cadmium Calcium Chromium Cobalt Copper Iron Lead Magnesium Manganese Mercury Molybdenum Nickel Phosphorus	L039B using ICP-OES	B



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Surface water, groundwater, potable (non-regulatory) and prepared leachate), Landfill Leachate and final sewage effluent	<u>Chemical Tests</u> (cont'd) Metals (total & dissolved)CTD: Potassium Selenium Sodium Tin Vanadium Zinc	L039B using ICP-OES	B
Landfill Leachate and final sewage effluent	Silver (total & dissolved)	L039B using ICP-OES	B
WATERS – Process Water	Metals (total and Dissolved): Aluminium Copper Iron Sulphate Zinc	L039B using ICP-OES	B
WATERS - surface water, groundwater, potable (non-regulatory) and prepared leachate	Metals: Cadmium Arsenic Selenium Beryllium Cobalt Copper Molybdenum Tin Zinc Nickel Vanadium Antimony Chromium Lead Manganese Barium Phosphorous Iron Sodium Magnesium Potassium	Metals Analysis by In house method L012B using ICPMS analysis	B
WATERS - surface water and potable water (non-regulatory)	Mercury	Metals Analysis by In house method L012B using ICPMS analysis	B



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	<u>Chemical Tests (cont'd)</u>		
WATERS - surface water, groundwater and prepared leachate	Boron	Metals Analysis by In house method L012B using ICPMS analysis	B
WATERS - surface water, potable (non-regulatory and prepared leachate	Aluminium	Metals Analysis by In house method L012B using ICPMS analysis	B
WATERS - surface water, groundwater, potable (non-regulatory) and prepared leachate	Mercury	In house method L085B using Atomic Fluorescence Spectroscopy	B
Surface water, groundwater, potable (non-regulatory) and prepared leachate, final sewage effluent and landfill leachate	Monohydric phenols Total cyanide Cyanide (free) Complex cyanide (by Calculation)	L080B using continuous flow analyser	B
Surface water, groundwater, potable (non-regulatory) and prepared leachate, final sewage effluent and landfill leachate	Chemical Oxygen Demand (COD)	Hach DR/890 Colorimeter by in house method L065	B
WATERS - Surface water, groundwater and potable (non-regulatory) Water, final sewage effluent and landfill leachate	Ammonia Phosphate	L082 using discrete analyser	B
- Surface water, groundwater and potable (non-regulatory) Water, final sewage effluent landfill leachate and prepared Leachate	Hexavalent Chromium	L080B by segmented flow autoanalyser	B
Surface water, groundwater and potable (non-regulatory) water	Fluoride	L033 by ion selective electrode	B



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Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
WATERS (cont'd)	<u>Chemical Tests</u> (cont'd)		
Surface water, groundwater, potable (non-regulatory) water and prepared leachates final sewage effluent and landfill leachate	Fluoride	L033B by Metrohm Analyser with ion selective electrode	B
Surface water, groundwater and potable (non-regulatory) water final sewage effluent and landfill leachate	Nitrate	L078 by spectrophotometry	B
Surface water, groundwater and potable (non-regulatory) water final sewage effluent and landfill leachate	Calcium	In house method L12B using ICPMS analysis	B
Surface water, groundwater and potable (non-regulatory) water final sewage effluent and landfill leachate	Total Organic Carbon (TOC) Dissolved Organic Carbon (DOC)	L037B by TOC analyser	B
Surface and groundwater, potable (non-regulatory) water, Sewage Effluent, Landfill Leachate and prepared Leachates	pH	L099 using Automated pH meter	B
Surface water, groundwater, potable (non-regulatory) water, Sewage Effluent, and prepared Leachates	Electrical Conductivity Total Dissolved Solids (By Calculation)	L031B using automated EC meter	B
- Surface water, groundwater and potable (non-regulatory) water (cont'd)	Volatile Organic Compounds, specifically: Chloromethane Bromomethane Chloroethane 1,1,2-Trichloro-1,2,2-trifluoroethane 1,1-Dichloroethylene MTBE <i>trans</i> -Dichloroethylene 1,1-Dichloroethane <i>cis</i> -Dichloroethylene 2,2-Dichloropropane Chloroform 1,1,1-Trichloroethane	L073B using Head Space GC-MS (HS/GCMS)	B



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Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
<p>WATERS (cont'd)</p> <p>- Surface water, groundwater and potable (non-regulatory) water (cont'd)</p>	<p><u>Chemical Tests</u> (cont'd)</p> <p>Volatile Organic Compounds, specifically: (cont'd)</p> <p>1,1-Dichloropropene Carbon tetrachloride 1,2-Dichloroethane Trichloroethylene 1,2-Dichloropropane Dibromomethane Bromodichloromethane <i>cis</i>-1,3-Dichloropropene 1,3-Dichloropropane <i>trans</i>-1,3-Dichloropropene 1,1,2-Trichloroethane <i>n</i>-Propylbenzene 2-Chlorotoluene 1,3,5-Trimethylbenzene 4-Chlorotoluene <i>tert</i>-Butylbenzene 1,2,4-Trimethylbenzene <i>sec</i>-Butylbenzene <i>p</i>-Isopropyltoluene 1,3-Dichlorobenzene 1,4-Dichlorobenzene Butylbenzene 1,2-Dichlorobenzene 1,2-Dibromo-3-chloropropane 1,2,4-Trichlorobenzene Hexachlorobutadiene Naphthalene 1,2,3-Trichlorobenzene 1,1,2,2-Tetrachloroethane Tetrachloroethylene Dibromochloromethane 1,2-Dibromoethane Chlorobenzene 1,1,1,2-Tetrachloroethane Styrene Bromoform Isopropylbenzene Bromobenzene</p>	<p>L073B using Head Space GC-MS (HS/GCMS)</p>	<p>B</p>



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Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
WATERS (cont'd) - Surface water, groundwater and potable (non-regulatory) water and prepared leachates	<u>Chemical Tests</u> (cont'd) Benzene Toluene Ethylbenzene ( <i>m+p</i> )-Xylenes <i>o</i> -Xylene Total BTEX (By calculation)	L073B using Head Space GC-MS (HS/GCMS)	B
	Total Petroleum Hydrocarbons (C10-C40) and (C12-C35)	L070B using GC-MS	B
	Polyaromatic Hydrocarbons: Naphthalene Acenaphthene Acenaphthylene Fluorene Phenanthrene Anthracene Fluoranthene Pyrene Benz(a)anthracene Polyaromatic Hydrocarbons: Chrysene Benzo(b)fluoranthene Benzo(k)fluoranthene Benz(a)pyrene	L102B using GCMS	B
Waters -Surface, Ground and potable (non-regulatory)	Indeno(1,2,3-cd)pyrene Dibenz(a,h)anthracene Benzo(g,h,i)perylene  Total PAH (Sum of 16 individuals)	L102B using GCMS	B
- Surface water, groundwater and potable (non-regulatory) water and prepared leachates (cont'd)	Petroleum Range Organics (C6-C12) (C6-C10) C6-C8 C8-C10 Banded aliphatic Fractions: C5-C6 C6-C8 C8-C10 Banded aromatic Fractions C5-C7 C7-C8 C8-C10	L088 using headspace GCMS	B



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Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
WATERS (cont'd)	<u>Chemical Tests</u> (cont'd)		
- Surface water, groundwater and potable (non-regulatory) water, prepared leachates, final sewage effluent and landfill leachate	Anions, specifically: Fluoride Chloride Nitrite Bromide Nitrate Phosphate Sulphate	L008B using Ion Chromatography	B
Surface water, groundwater and potable (non-regulatory) water and prepared leachates	Bromate	L008B using Ion Chromatography	B
Potable water (non regulatory), surface water, groundwater, final sewage effluent, process water (closed system heating and cooling waters), landfill leachate	Total Suspended Solids at 105°C	L004B By gravimetric analysis	B
	Total Dissolved Solids at 180°C	L004B By gravimetric analysis	B
	Volatile Suspended Solids at 550°C	L004B By gravimetric analysis	B
- Surface water, groundwater and potable (non-regulatory) water and prepared leachates	Total petroleum hydrocarbons (C10-C40) and (C12-C35) with banding:	L101 using GC/GC FID	B



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Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
<p>WATERS (cont'd)</p> <p>- Surface water, groundwater and potable (non-regulatory) water and prepared leachates (cont'd)</p> <p>- Surface water, groundwater and potable (non-regulatory) water and prepared leachates</p> <p>- Surface water, groundwater and potable (non-regulatory) water and prepared leachates</p>	<p><u>Chemical Tests</u> (cont'd)</p> <p>Banded Aliphatic Fraction: C10-C12 C12-C16 C16-C21 C21-C35</p> <p>Banded Aromatic Fraction: C10-C12 C12-C16 C16-C21 C21-C35</p> <p>Banded Aliphatic Fraction (By calculation) C5-C35</p> <p>Banded Aromatic Fraction (By Calculation) C5-C35</p> <p>Speciated Phenols, specifically: Resorcinol Catechol Phenol 2,3,5-Trimethylphenol 2-Isopropylphenol</p> <p>Total Cresols: (Sum of: 2-Methylphenol, 4-Methylphenol and 3-Methylphenol)</p> <p>Total Xylenols and Ethylphenols: (Sum of: 3,4-Dimethylphenol, 2,6-Dimethylphenol, 4-Ethylphenol and 2,4-Dimethylphenol)</p> <p>Total Naphthols: (Sum of:1-Naphthol and 2-Naphthol)</p>	<p>L088 using HSGCMS and L101B using GC/GC FID</p> <p>L030 using HPLC</p>	<p>B</p> <p>B</p>





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AIR  Ambient Air and Soil Vapour (in pre-collected in Summa Gas Cannisters)	<u>Chemical Tests</u>  Volatile Organic Compounds:  1,1,1-trichloroethane 1,1,2,2-tetrachloroethane 1,1,2-trichloroethane 1,1-dichloroethane 1,1-dichloroethene 1,2,4-trichlorobenzene 1,2,4-trimethyl benzene 1,2-dibromoethane 1,2-dichlorobenzene 1,2-dichloroethane 1,2-dichloropropane 1,3,5-trimethyl benzene 1,3-butadiene 1,3-dichlorobenzene 1,4-dichlorobenzene 1,4-dioxane 2-hexanone (MBK) 4-ethyl toluene acetone acrolein benzene benzyl chloride bromodichloromethane bromoform bromomethane carbon disulphide carbon tetrachloride chlorobenzene chloroethane chloroform chloromethane cis-1,2-dichloroethene cis-1,3-dichloropropene cyclohexane dibromochloromethane dichloromethane dichlorodifluoromethane dichlorotetrafluoroethane ethanol ethyl acetate ethyl benzene	In house method L106B based on TO-15 using Thermal desorption and GCMS detection methodology	B



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Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
AIR (cont'd)  Ambient Air and Soil Vapour (in pre-collected in Summa Gas Cannisters)	<u>Chemical Tests</u> (cont'd)  Volatile Organic Compounds (cont'd):  heptane hexachlorobutadiene hexane isopropyl alcohol m/p-xylene MEK methyl methacrylate MIBK MTBE naphthalene o-xylene propene styrene tetrachloroethene THF toluene trans-1,2-dichloroethene trans-1,3-dichloropropene trichloroethene trichlorofluoromethane trichlorotrifluoroethane vinyl acetate vinyl chloride	In house method L106B based on TO-15 using Thermal desorption and GCMS detection methodology	B
Ambient Air and Soil Vapour (in pre-collected in Summa Gas Cannisters)	Petrol Range Organics including banding:  Benzene toluene ethyl benzene m/p-xylene o-xylene >C5-C6 >C6-C8 >C8-C10 >C10-C12 >C5-C10 >C6-C10 >C6-C12 Total >C5-C12 Total	In house method L107B based on TO-15 using Thermal desorption and GCMS detection methodology	B



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AIR (cont'd)  Ambient Air and Soil Vapour (in pre-collected in Tedlar Bags)	<u>Chemical Tests</u> (cont'd)  Bulk Gases:  hydrogen ethylene propane propylene i-butane n-butane propadiene ethane acetylene t-2-butene 1-butene i-butylene c-2-butene i-pentane n-pentane methane 1,3-butadiene methyl-acetylene carbon monoxide t-2-pentene 1-pentene 2-methyl-2-butene c-2-pentene	In house method L108B using GCFID detection	B
WORKPLACE & AMBIENT AIR MONITORING  Dust - Airbourne	<u>Analysis of:</u>  Total Inhalable and Respirable Aerrosols	MDHS 14/4 Documented in house method AIR18	B



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Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
POLLUTANTS AND EFFLUENTS: ATMOSPHERIC Diffuse pollutants from workplace atmospheres	<u>Chemical Tests</u>		
Fliters (GFA 25mm and 37mm)	Metals: Arsenic, Beryllium, Cadmium, Cobalt, Chromium, Copper, Iron, Mercury, Magnesium, Manganese, Molybdenum, Nickel, Phosphorus, Lead, Antimony, Tin, Thallium and Vanadium	In House Method AIR -020 based on NIOSH 7300 using ICP-OES	B
Fliters (GFA 25mm)	Metals: Selenium	In House Method AIR -020 based on NIOSH 7300 using ICP-OES	B
Fliters (GFA 37mm)	Metals: Potassium	In House Method AIR -020 based on NIOSH 7300 using ICP-OES	B
Fliters (MCE QMA, and PVC) 25mm and 37mm)	Metals: Aluminium, Arsenic, Boron, Barium, Beryllium, Calcium, Cadmium, Cobalt, Chromium, Copper, Iron, Mercury, Potassium, Magnesium, Manganese, Molybdenum, Sodium, Nickel, Phosphorus, Lead, Antimony, Selenium, Tin, Titanium, Thallium, Vanadium	In House Method AIR -020 based on NIOSH 7300 using ICP-OES	B
Fliters (MCE, QMA and PVC) (37mm)	Metals: Zinc	In House Method AIR -020 based on NIOSH 7300 using ICP-OES	B



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Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
ATMOSPHERIC POLLUTANTS AND EFFLUENTS - STACK GAS SAMPLES	<u>Chemical Tests</u>	National, European, International and Environment Agency specified standards including MIDs and Documented In-House work instructions to meet the requirements of the Environment Agency (MCERTS) Performance Standard for laboratories carrying out testing of samples from stack emissions monitoring	
Sorbent tubes (Activated carbon)	Siloxanes:  hexamethyldisiloxane hexamethylcyclotrisiloxane octamethyltrisiloxane octamethylcyclotetrasiloxane decamethyltetrasiloxane decamethylcyclopentasiloxane dodecamethylpentasiloxane dodecamethylcyclohexasiloxane	PD CEN/TS 13649:2014 using solvent extraction and GC MS analysis (Air-03)	B
SRF (Solid Recovered fuel) and RDF (Refuse Derived Fuel) and Solid Biofuel	Sample Preparation and Moisture Content	Documented in house method L015 based on BS EN 15413:2011, BS EN ISO 14780:2017-07, BS EN 15414-3:2011 and BS EN ISO 18134-3:2015-11 using gravimetry	B



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	<u>Chemical Tests (cont'd)</u>		
SRF (Solid Recovered fuel) and RDF (Refuse Derived Fuel) and Soild Biofuel	Moisture Content	Documented in house method L015 based on BS EN 15413:2011, BS EN ISO 14780:2017-07, BS EN 15414-3:2011 and BS EN ISO 18134-3:2015-11 using gravimetry	B
SRF (Solid Recovered fuel) and RDF (Refuse Derived Fuel) and Soild Biofuel	Ash Content	Documented in house method L018B based on BS EN 15403: 2011 and BS EN ISO 18122: 2015 using Gravimetry	B
SRF (Solid Recovered fuel) and RDF (Refuse Derived Fuel) and Soild Biofuel	Biomass and Non-biomass content	Documented in house method L022B based on EN 15440: 2011 using selective dissolution method	B
SRF (Solid Recovered fuel) and RDF (Refuse Derived Fuel) and Soild Biofuel	<u>Sulphur</u> Fluorine Chlorine Bromine	Documented In-House Method L008B based upon BS EN 15408:2011 and BS EN ISO 16994:2016-10 using Ion Chromatography	B
SRF (Solid Recovered fuel) and RDF (Refuse Derived Fuel) and Soild Biofuel	<u>Metals:</u> Aluminium Arsenic Cadmium Cobalt Chromium Copper Mercury Manganese Nickel Lead Antimony Tin Vanadium Zinc	Documented in house method L038B based on BS EN 15411:2011, BS EN ISO 16968:2015 and BS EN ISO 16967:2015 using ICP-OES	B
SRF (Solid Recovered fuel) and RDF (Refuse Derived Fuel) and Soild Biofuel	<u>Metals Oxides:</u> SiO <sub>2</sub> , Al <sub>2</sub> O <sub>3</sub> , Fe <sub>2</sub> O <sub>3</sub> , CaO, MgO, Na <sub>2</sub> O, K <sub>2</sub> O, TiO <sub>2</sub> , SO <sub>3</sub> , P <sub>2</sub> O <sub>5</sub> , MnO <sub>2</sub> , BaO, SrO	Documented in house method L038B based on BS EN 15411:2011, BS EN ISO 16968:2015 and BS EN ISO 16967:2015 using ICP-OES	B



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SRF (Solid Recovered fuel) and RDF (Refuse Derived Fuel) and Solid Biofuel	<u>Chemical Tests (cont'd)</u>		
	Calorific value	Documented In-House Method L013B based upon : BS EN 15400:2011 and BS EN ISO 18125:2017-07 using Bomb Calorimetry	B
Soils	<u>Sampling</u>		
	Soil Sampling	In Compliance with ISO 10381-4:2003 and ISO 10381-5:2005	B
Rivers and Streams	Water Sampling	In Compliance with ISO 5667-6:2014	B
Underground Water	Water Sampling	In Compliance with ISO 5667-11:2009	B
SOILS for civil engineering purposes	<u>Geotechnical Testing</u>		
	Sample Preparation	In house method G043	B,C,D,G, F
	Sampling earthworks materials - from stockpiles - laid materials - excavations	Documented In-House Method SS05 - Sampling Earthworks	Site
	Moisture content - oven drying method	BS 1377-2:1990	B,C,D,G, F
	Liquid limit - cone penetrometer	BS 1377-2:1990	B
	Liquid limit - cone penetrometer - one point	BS 1377-2:1990	B
	Plastic limit	BS 1377-2:1990	B, D
	Plasticity index	BS 1377-2:1990	B
	Particle density - gas jar	BS 1377-2:1990	B
	Linear Shrinkage	BS 1377-2:1990	B
	Particle size distribution - wet sieving	BS 1377-2:1990	B, D
	Particle size distribution - dry sieving	BS 1377-2:1990	B, D



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SOILS for civil engineering purposes (cont'd)	<u>Geotechnical Testing</u> (cont'd)		
	Particle size distribution - sedimentation - hydrometer method	BS 1377-2:1990	B
	Dry density/moisture content relationship (2.5 kg rammer)	BS 1377-4:1990	B, D
	Dry density/moisture content relationship (4.5 kg rammer)	BS 1377-4:1990	B, D
	Dry density/moisture content relationship(vibrating hammer)	BS 1377-4:1990	B, D
	Moisture condition value(MCV)	BS 1377-4:1990	B, D, Site
	MCV - natural moisture content	BS 1377-4:1990	B, D, Site
	MCV/moisture content relation	BS 1377-4:1990	B, D
	California Bearing Ratio (CBR)	BS 1377-4:1990	B, D
	Swelling of soaked CBR specimen	BS1377-4:1990	B, D
	Undrained shear strength - triaxial compression without measurement of pore pressure	BS 1377-7:1990	B
	Undrained shear strength - triaxial compression with multistage loading and without measurement of pore pressure	BS 1377-7:1990	B
	Shear strength by direct shear (small shearbox apparatus)	BS1377-7:1990	B
Effective shear strength – consolidated-undrained triaxial compression test with measurement of pore pressure	BS1377-8:1990	B	
Effective shear strength – consolidated-drained triaxial compression test with measurement of volume change	BS 1377- 8:1990	B	





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SOILS for civil engineering purposes (cont'd)	<u>Geotechnical Testing</u> (cont'd)		
	Effective shear strength – consolidated drained multistage triaxial compression test with measurement of volume change	Documented in House method G084	B
	Effective shear strength – consolidated undrained multistage triaxial compression test with measurement of pore pressure	Documented in House method G084	B
	Saturation Moisture of Chalk	BS 1377-2:1990	B
	One-dimensional consolidation properties	BS 1377-5:1990, clause 3	B
	Determination of Swelling and collapse Characteristics	BS 1377-5:1990, clause 4	B
	In-situ density - sand replacement method (small pouring cylinder)	BS 1377-9:1990	Site
	In-situ density - sand replacement method (large pouring cylinder)	BS 1377-9:1990	Site
	In-situ density - core cutter method	BS 1377-9:1990	Site
	In-situ California Bearing Ratio (CBR)	BS 1377-9:1990	Site
Vertical deformation and strength characteristics by the plate loading test	BS 1377-9:1990	Site	
Calculation of nominal CBR value using the plate bearing test	Design Manual for Roads and Bridges, IAN 73/06 Design of Pavement Foundations, Rev 1: 2009	Site	



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SOILS for civil engineering purposes (cont'd)	<u>Geotechnical Testing</u> (cont'd)		
	Dynamic Cone Penetration	Design Manual for Roads and Bridge, CS229 Data for Pavement Assessment, Rev 0: 2020	Site
	Calculation of nominal CBR value using the dynamic cone penetrometer test (DCP)	Design Manual for Roads and Bridge, CS229 Data for Pavement Assessment, Rev 0: 2020	Site
	Hand shear vane	Guideline for handheld shear vane test: New Zealand Geotechnical Society Inc, August 2001	Site
	Permeability constant head in a rigid wall permeameter	BS EN ISO 17892-11:2019	B
	Permeability - Filtration Coefficient for 1x10 <sup>-3</sup> to 1 x 10 <sup>-6</sup> m/s USBCS (0.01<D <sub>20</sub> <2.00mm)	Hydrogeologia Ogolna: 1990 by Z. Pazdro and B. Kozerski	B
	Shear strength by direct shear (large shearbox apparatus)	BS 1377-7:1990	B
	Determination of effective angle of internal friction and effective cohesion of earthworks materials (using 300 mm shearbox)	Specification for Highway Works, HMSO November 2016 Clause 636	B
	MCV/moisture content relation	BS 1377-4:1990	B
	In-situ bulk density - nuclear method - absolute tests - compliance tests	BS 1377-9:1990	Site
	In-situ moisture density - nuclear method - absolute tests - compliance tests	BS 1377-9:1990	Site
In-situ density - dielectric method	Documented In-House Method SS17	Site	
Relative compaction	BS 1377-1:2016	Site	
Percentage air voids (V <sub>a</sub> )	BS 1377-1:2019	Site	



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Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
Hydraulically Bound and Stabilized materials for Civil Engineering Purposes            AGGREGATES	<u>Geotechnical Testing</u> (cont'd)		
	Moisture Condition Value (MCV)	BS EN 13286-46:2003	D,Site
	Laboratory reference density and water content - proctor compaction	BS EN 13286-2:2010	B, D
	Laboratory reference density and water content - vibrating hammer	BS EN 13286-4:2003	B, D
	Moisture condition value (MCV)	BS EN 13286-46:2003	B
	California bearing ratio, immediate bearing index and linear swelling	BS EN 13286-47:2012	B, D
	Sampling aggregates - from stockpiles	BS EN 932-1:1997	Site
	Particle size distribution - sieving method	EN 933-1:2012 BS EN 933-1:2012	B, D
	Water Content	EN 1097-5:2008 BS EN 1097-5:2008	B,C,D,G, F
	Sample Reduction by quartering	EN 932-2:1999 BS EN 932-2:1999	B,C,D,G, F
	Sample reduction using a riffle box	EN 932-2:1999 BS EN 932-2:1999	B,C,D,G, F
	Uniformity Coefficient	BS EN ISO 14688-2: 2018	B
Coefficient of Curvature	BS EN ISO 14688-2: 2018 +A1: 2013	B	
Resistance to fragmentation by the Los Angeles test method	EN 1097-2:2020 BS EN 1097-2:2020	B	



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AGGREGATES (cont'd)	<u>Geotechnical Testing</u> (cont'd)		
	Classification test for the constituents of coarse recycled Aggregates	EN 933-11:2009 BS EN 933-11:2009	B
	Particle shape – Flakiness Index	BS EN 933-3:2012	B
	Particle shape – Shape Index	BS EN 933-4:2008	B
	Percentage of crushed and broken surfaces in coarse aggregate	BS EN 933-5:1998	B
	Resistance to wear (Micro-Deval)	BS EN 1097-1:2011	B
	Loose Bulk Density and voids	BS EN 1097-3:1998	B
	Particle density and water absorption - wire basket method for aggregate particles between 31.5 and 63 mm	BS EN 1097-6:2013	B
	Particle density and water absorption - pycnometer method for aggregate particles between 4 mm and 31.5 mm	BS EN 1097-6:2013	B
	Particle density and water absorption - pycnometer method for aggregate particles between 0.063 mm and 4 mm	BS EN 1097-6: 2013	B
	Methods for determination of aggregate crushing value	BS 812-110:1990	B
	Methods for determination of ten per cent fines value	BS 812-111:1990	B
	Magnesium Sulphate test	BS EN 1367-2:2009	B



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Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
GEOTECHNICAL INVESTIGATION and TESTING - Laboratory testing of soil	<u>Geotechnical Testing</u> (cont'd)		
	Sample Preparation	In house method G043	B,C,D,G, F
	Water Content	BS EN ISO 17892-1:2014	B,C,D,G, F
	Bulk Density – immersion in fluid method	BS EN ISO 17892-2:2014	B
	Bulk Density – Linear measurement method	BS EN ISO 17892-2:2014	B
	Determination of particle density - fluid pycnometer method	BS EN ISO 17892-3:2015	B
	Determination of particle size distribution - Sieving method	BS EN ISO 17892-4:2016	B, D
	Determination of particle size distribution - Hydrometer method	BS EN ISO 17892-4:2016	B
	Determination of liquid limit (fall cone method)	BS EN 17892-12:2018	B
	Determination of liquid limit (one-point fall cone method)	BS EN 17892-12:2018	B
	Determination of plastic limit	BS EN 17892-12:2018 +A1:2021	B, D
	Determination of plasticity limit	BS EN 17892-12:2018	B
	Incremental loading oedometer test	BS EN ISO 17892-5:2017	B
	Unconsolidated undrained triaxial test	BS EN ISO 17892-8:2018	B
Consolidated triaxial compression tests on water saturated soils	BS EN ISO 17892-9:2018	B	
Direct Shear Tests – Small Shearbox	BS EN ISO 17892-10:2018	B	



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Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
Rock and Natural Stone	<u>Geotechnical Testing</u> (cont'd)		
	Determination of point load strength and anisotropy indices	The Complete ISRM Suggested Methods – Rock Characterization Testing and Monitoring 1974 – 2006, Editors: R Ulusay & J A Hudson	B
Concrete - Hardened	Determination of Uniaxial Compressive Strength	ISRM Commission on Testing Methods, Suggested Method for Determining Uniaxial Compressive Strength 1985	B
	Compressive strength of cubes - including curing	BS EN 12390-1:2021, BS EN 12390-2:2019, BS EN 12390-3:2019	G
Bituminous Mixtures for roads and other paved areas	Density	BS EN 12390-7:2019	G
	Soluble binder content by difference, using bottle rotation machine and pressure filter	BS EN 12697-1: 2020	F
	Particle size distribution	BS EN 12697-2:2015+A1:2019	F
	Maximum density - volumetric procedure	BS EN 12697-5: 2018	F
	Bulk density dry - saturated surface dry (SSD) - sealed specimen	BS EN 12697-6:2020	D, F
	Air voids content (Vm)	BS EN 12697-8:2018	D, F
	Temperature measurement by contact measuring device - in a lorry - of material after it has been laid and before rolling - in a heap	BS EN 12697-13:2017	Site
Bituminous Mixtures for Road and other Paved Areas	Temperature measurement by infrared measuring device - in a paver	BS EN 12697-13:2017	Site
	Sampling - from the material around the augers of the paver,	BS EN 12697-27:2017	Site



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Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
Bituminous Mixtures for Road and other Paved Areas	<u>Geotechnical Testing</u> (cont'd)		
	Sampling of laid and compacted materials by coring	BS EN 12697-27:2017	Site
	Preparation of samples for determining binder content, water content and grading	BS EN 12697-28:2020	D,F,Site
	Laboratory compaction of bituminous mixtures by vibratory compaction	BS EN 12697-32:2019	F
	Determination of the thickness of a bituminous pavement	BS EN 12697-36: 2003	F
	Hot Sand Test	BS EN 12697-37:2003	F
Bituminous Road Surfacing	Rate of Spread of Coated Chippings	BS 598-1:2011	Site
	In-Situ Density – Nuclear Method	BS 594987:2015+A1:2017 and Documented In-House Method SS16	Site
Pavement Surfaces	In-Situ Density – Dielectric Method	BS 594987:2015+A1:2017 and Documented In-House Method SS15	Site
	Pavement surface macrotexture depth using a volumetric patch technique	BS EN 13036-1:2010	Site
	Texture depth by the sand-patch method	BS 598-105:2000	Site
	Surface regularity using a rolling straight-edge	Specification for Highway Works HMSO February 2016, Clause 702, TRRL Supplementary Report 290:1977	Site
	Core Logging	Design Manual for Roads and Bridges, CS 229 Revision 0, March 2020	F
	3m Transverse Straight Edge	BS EN 13036 – 7 - 2003	Site



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	<u>Geotechnical Testing</u> (cont'd)		
Unbound and Hydraulically bound Materials	Degree of Pulverization	BS EN 13286-48 – 2005	Site
Bituminous Mixtures	Preparation of samples for determining binder content, water content and grading	BS EN 12697-28: 2020	B
	Soluble binder content by recovery, using bottle rotation machine, bucket centrifuge type 1 and volume calculation	BS EN 12697-1: 2020	B
Bituminous Mixtures	Particle size distribution	BS EN 12697-2:2015+A1:2019	B
Concrete - Fresh	Sampling - composite sample - spot sample	BS EN 12350-1:2009	Site
	Slump Test	BS EN 12350-2:2019	Site
	Making and curing specimens for strength tests	BS EN 12390-2:2019	Site
	Air Content – pressure guage method	BS EN 12350-7:2019	Site
END			