

# THE LONDON RESORT

## The London Resort Development Consent Order

BC080001

### Environmental Statement Volume 2: Appendices

#### Appendix 18.15 – Specification for groundwater and surface water monitoring

Document reference: 6.2.18.15

Revision: 00

December 2020

Planning Act 2008

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

Regulation 5(2)(a)

The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017

Regulation 12(1)

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Project The London Resort  
Subject Initial Water Quality Surveys Required  
Project no 0042936  
Date 17 July 2020

Revision	Description	Issued by	Date	Approved
01	For Issue – Surface Water Only	CC	25.06.2020	SP
02	Revised to include EA feedback	CC	02.07.2020	HM
03	Revised to include Groundwater monitoring	CC	17.07.2020	HM

## 1.1 Introduction

The following water quality tests are required for the London Resort project in order to inform the Water Framework Directive assessment, the ecological mitigations and the contamination remediation strategy. Sampling relates to surface water bodies and groundwater wells.

## 1.2 Water Quality Testing

Water quality testing is proposed to be undertaken using manual sample collection and laboratory analysis. The monitoring locations and the analytical parameters have been agreed with the Environment Agency.

Water quality testing will be undertaken on a monthly basis. This is intended to commence in July. For the purposes of the DCO submission, the relevant water related planning documentation will be submitted with up to 4 months of data. The testing will continue on a monthly basis until July 2021 to provide a full year of information which will be made available to the Environment Agency during this period and the design may be modified to reflect this.

A broad range of parameters will be tested for initially, and the testing suite refined over time. For surface water sampling locations, sediment sampling is also required. For groundwater locations, the sampling will be combined with depth monitoring.

## 1.3 Site Access

Some areas of the site are publicly accessible via footpaths, such as Black Duck and Botany Marshes, and the River Ebbsfleet. The core area of the site includes secure areas and access will need to be arranged via the Client.

The site includes a number of historic landfill sites. Note that leachate some monitoring of surface water bodies / leachate is already being undertaken on behalf of Lafarge.

Surface water monitoring locations suggested are approximate and can be adjusted based on access, provided the revised location is noted and used consistently for ongoing sample collection.

Ground water monitoring well locations are varied and some are located in secure areas where access will be arranged. Note locations and access constraints in Appendix B.

## 1.4 Groundwater sampling from existing installations

Groundwater samples shall be taken from the existing installations shown on the site plans (Appendix A) and briefly described on Table 1. That table include the NGR of each location which in conjunction with GPR can be used to find the wells on the ground. The locations of many of the wells are also illustrated on the photographic record (Appendix B). In accessing these wells in June 2020, the steel protective covers were secured with locked padlocks which were removed. Accordingly, as a part of this sampling exercise, the contractor is required to obtain and fit new padlocks to all installations. [combination padlocks preferred]

The sampling methodology shall be defined by the contractor in their sampling method statement. That method statement should take into account the British Standard [BS ISO 5667-11: 2009] and Schedule 1.17 of the UK Specification for Ground Investigation [Site Investigation Steering Group ICE 2012]

The sampling shall be carried out by an appropriately trained and experienced member of the Contractor's staff. Sample bottles and containers shall be supplied by the analytical laboratory as clean, free from any cracks, chips or fractures and appropriate for the proposed analyses.

At each sampling visit, the Contractor shall measure the groundwater level, determine whether free phase is present and take a sample of the groundwater, at each borehole location.

Groundwater monitoring wells shall be purged as described in the BS and UK Specification. Purging parameters should include pH, el conductivity, temperature and redox potential. If free phase is present, purging must not be carried out and the contractor should contact Buro Happold to discuss and agree a revised sampling procedure.

Most of the existing installations are already equipped with depth samplers (bailers) and these shall be used for sampling. The contractor should come to site with additional bailers to be installed in any of the wells where the original bailer is lost / missing. Depending upon the initial data, subsequent samples may be taken via low flow pumps (but will not be required on the initial visit).

The contractor should take sufficient sample in the appropriate containers to allow chemical analysis of all of the determinands listed in Appendix A. Samples in their containers should be securely packed in cool boxes with freezer pack and despatched to the laboratory of the day of sampling.

## 1.5 Surface Water monitoring locations

Surface water monitoring shall be undertaken through water and sediment sampling. Surface water grab samples shall be taken in accordance with BS EN ISO 5667-14. 2016 and transported to the analytical laboratory in cool boxes with frozen ice packs on the same day. The sampling methodology shall be defined by the contractor in their sampling method statement. Chemical analysis will be scheduled as described in Appendix A.

Grab / Spot samples of sediment will be taken at each of the surface water sampling locations. Samples will be taken in accordance with BS10175 and BS ISO 18400 and transported to the analytical laboratory in cool boxes with frozen ice packs on the same day. The sampling methodology shall be defined by the contractor in their sampling method statement. Chemical analysis will be scheduled as described in Appendix A.

The following surface water locations have been identified for surface water sampling.

1. 3 no. locations in or adjacent to the River Ebbsfleet
2. 3 no. locations in Black Duck Marsh
3. 3 no. locations in Botany Marsh
4. 2 no. locations within the main river
5. 2 no. locations in the Broadness Landfill perimeter channel
6. 1 no. location in the surface water body in the centre of the peninsula
7. 1 no. location in the surface water body adjacent to the HS1 tunnel box
8. 1 no. location in the surface water body in Bamber Pit

These locations can be seen in Appendix B.



## Appendix A: Analytical Parameters

The following represents the suite of parameters to be tested. Not all samples would be tested for all determinands, and some apply only to sediment, surface waters, or to groundwater. Over time, the list of parameters would be refined to focus in on specific indicators, and some of the more unusual determinands will not be tested for unless there is a specific reason to, such as pathogens.

**Table 1 Groundwater / surface water analytical parameters**

pH	Mercury
Conductivity	Arsenic
Dissolved Oxygen	Barium
BOD	Beryllium
Total Dissolved Solids	Boron
Hardness	Cadmium
Ammonia (NH <sub>4</sub> <sup>+</sup> )	Chromium
Ammonium (NH <sub>3</sub> )	Copper
Nitrate (NO <sub>3</sub> <sup>-</sup> )	Lead
Nitrite (NO <sub>2</sub> <sup>-</sup> )	Nickel
Cyanide	Selenium
Sulphate (SO <sub>4</sub> )	Vanadium
Chloride	Zinc
Naphthalene	Total Nitrogen
Acenaphthene	Total Phosphorus
Acenaphthylene	TPH (CWG)
Fluoranthene	Benzene
Anthracene	Toluene
Phenanthrene	Ethylbenzene
Fluorene	m,p-Xylene
Chrysene	o-Xylene
Pyrene	Sum of detected Xylenes
Benzo(a)anthracene	Sum of detected BTEX
Benzo(b)fluoranthene	Methyl tertiary butyl ether (MTBE)
Benzo(k)fluoranthene	PCB 7 congeners
Benzo(a)pyrene	Pesticides OCP / OPP combined suite
Dibenzo(a,h)anthracene	Tributyltin
Benzo(g,h,i)perylene	E. coli
Indeno(1,2,3-cd)pyrene	Total coliforms
Sum of UK DWS four <sup>1</sup>	Enterococci

<sup>1</sup> UK Drinking Water Standard – sum of the concentrations of benzo(b)fluoroanthene, benzo(k)fluoroanthene, benzo(ghi)perylene, and indeno(1,2,3-cd)pyrene.

## Appendix B: Surface water monitoring locations





London Resort  
Overall Site Plan - Outer Limits Boundary

- Legend**
- Boundaries**
- Order Limits Boundary
  - Surface water Monitoring Point



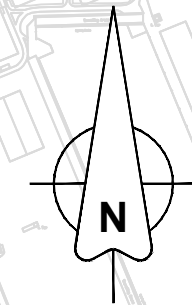
## Appendix C: London Resort record of monitoring wells – 30 June 2020

Exploratory hole	OS grid reference	Response zone		Depth of well (m bgl)	Depth to water (m bgl)	Comments
		Depth range	Strata			
BH101	560528.1 176118.8	24.50 – 40.50	Chalk	>30.0	4.24	Located just off track. Easily accessible (no gated / locked access etc). Raised well located within concrete manhole ring.
WS101	560945.0 176278.9	1.30 – 6.00	Made Ground (CKD)	5.90	3.62	Located topographically up slope of track. Easily accessible (no gated / locked access etc). Raised well located within concrete manhole ring.
WS102	560674.2 176217.1	1.30 – 5.22	Made Ground (CKD)	4.97	3.51	Located in densely vegetated area. Possible to locate by GPS. Raised well located within concrete manhole ring.
BH201	560202.1 175846.7	1.40 – 6.50	Made Ground (CKD)	5.92	3.27	Located topographically up-slope of track. Easily accessible (no gated / locked access etc). Raised well located within concrete manhole ring.
BH202	560333.2 175813.1	20.50 – 31.50	Chalk	>30.0	3.35	Located just off track. Easily accessible (no gated / locked access etc.) Raised well located within concrete manhole ring.
BH203	560370.3 175261.8	8.70 – 11.50	River Terrace Deposits	11.35	2.94	Accessed via public footpath or locked gate from Manor Way. Footpath is perpendicular to Manor Way, roughly in line with drains. Raised well located within concrete manhole ring.
BH204	560198.5 175256.3	6.80 – 12.20	River Terrace Deposits	11.80	2.97	Accessed via compound storing concrete panels. Freely accessible during site walkover but potential for area to be locked / secured. Exploratory hole located upslope of main yard area, beyond bushes / vegetation. Raised well located within concrete manhole ring.
WS202	560621.9 175869.8	2.80 – 11.00	Made Ground (CKD)	10.30	7.95	Locked / gated access beyond intersection of path with drains. Located in densely vegetated area. Possible to locate using GPS. Well is downslope (SE) of the damaged well on the hilltop. Raised well located within concrete manhole ring.
WS203	560435.9 175753.6	1.30 – 4.00	Made Ground (CKD)	4.05	1.37	Locked / gated access beyond intersection of path with drains. Easy access beyond the gate entry. Well located off a path to the south of the parking area. Raised well located within concrete manhole ring.
WS204	560318.8 175576.6	1.50 – 8.90	Made Ground (CKD)	8.90	Dry	Well located on topographic high off a grassed path. Easily accessible (no gated / locked access etc).

Exploratory hole	OS grid reference	Response zone		Depth of well (m bgl)	Depth to water (m bgl)	Comments
		Depth range	Strata			
						Raised well located within concrete manhole ring.
WS301	Not Surveyed			N/A	N/A	Not visited
BH501	560342.9 174836.3	12.50 – 19.50	Chalk	N/A	N/A	Wells located in secured area of former quarry. No access gained during site visit as area was secured. Access is via Craylands Lane. Access through two gates required: one immediately off Craylands Lane and another at the top of the track.
BH502	560135.4 174870.5	11.00 – 19.50	Made Ground - Chalk	N/A	N/A	Wells located in secured area of former quarry. No access gained during site visit as area was secured. Access is via Craylands Lane. Access through two gates required: one immediately off Craylands Lane and another at the top of the track.
BH703	561557.1 173367.0	7.00 – 9.50	River Terrace Deposits	N/A	N/A	Well located within secured area with structures associated with CTRL / HS1. No access gained. Location accessed via unnamed road leading from A2260.
BH704	561641.4 172996.5	1.20 – 4.70	Alluvium	4.70	4.64	Access via and parking on unnamed access road leading to Springhead Nurseries. Well located on a public footpath, access by foot only. Raised well located within concrete manhole ring.
BH705	561618.7 172723.4	3.70 – 19.50	Chalk	18.90	2.79	Well located in yard area of Springhead Nurseries. Located in an area currently used for informal storage (fridges etc). Permission for access and sampling will need to be granted by Springhead Nurseries. Well cover flush with ground surface.
BH706	561557.8 172815.6	8.50 – 29.30	Chalk	28.85	6.42	Well located in vegetated area beyond hedges and wooden fencing on A2 slip road. Footpath / space to pull over parallel to slip road. One area of fencing has been disassembled – well is located beyond here. Can be located using GPS. Raised well located within concrete manhole ring. Vegetation growing within manhole ring – tools may be required to cut this back.
BH707	561428.9 172862.1	10.50 – 19.50	Chalk	19.08	11.20	Well located in vegetated area beyond hedges and wooden fencing on stretch of road between two A260 roundabouts. Footpath / space to pull over parallel to road. Access by climbing wooden fencing. Can be located using GPS. Raised well located within concrete manhole ring. Vegetation growing within manhole ring – tools may be required to cut this back.
BH708	561299.3 172747.4	10.00 – 29.95	Chalk	N/A	N/A	Well located within complex road interchange. Not visited.

## Appendix D: Site Plans showing groundwater wells

DO NOT SCALE



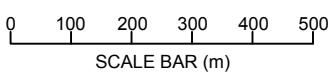
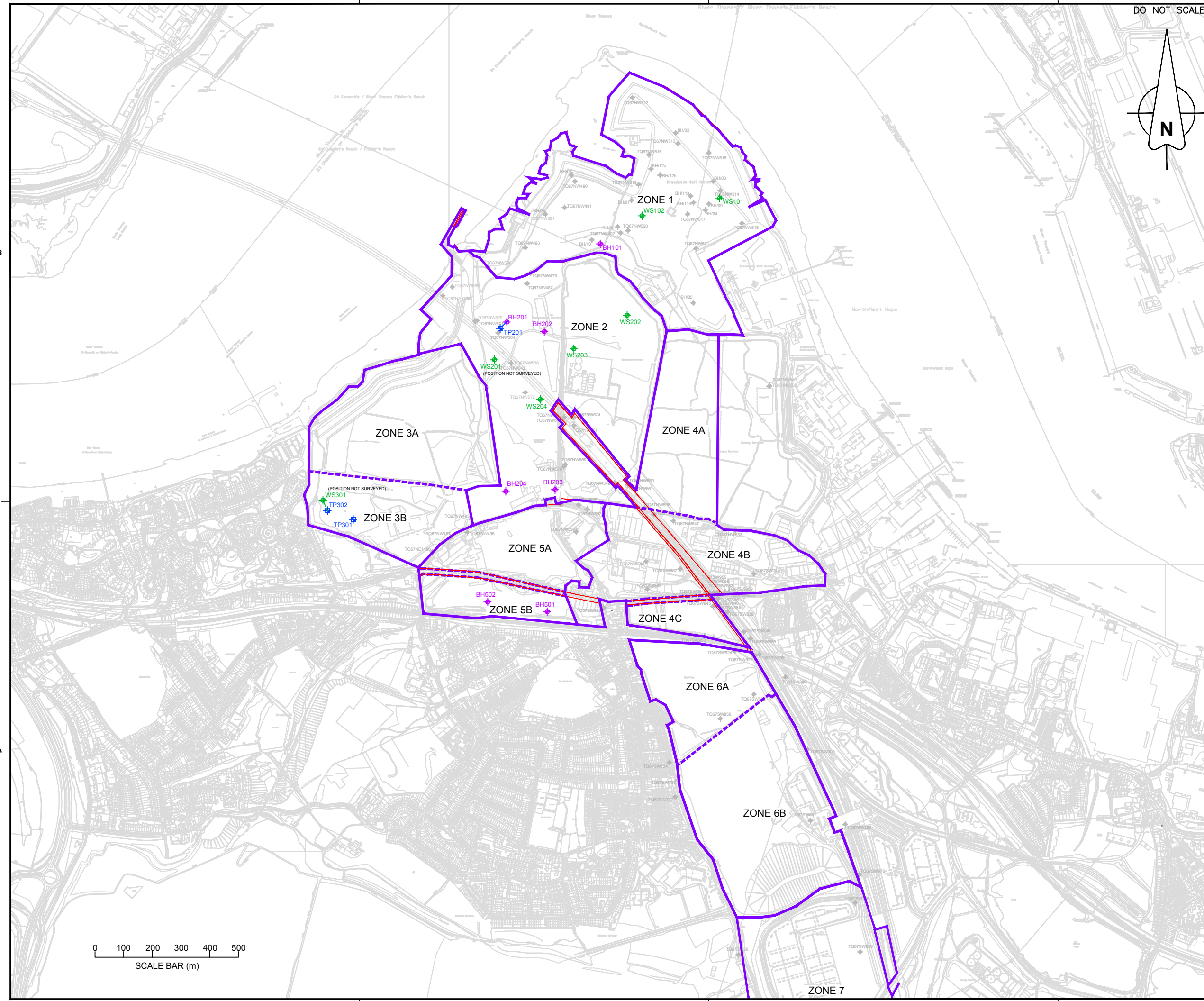
# ATKINS

### LEGEND:

- AS-BUILT EXPLORATORY HOLES (2015)**
- ◆ **BH101** BOREHOLE WITH STANDPIPE
  - ◆ **WS201** WINDOW SAMPLE WITH STANDPIPE
  - ◆ **TP301** TRIAL PIT
- HISTORICAL EXPLORATORY HOLES**
- ◆ **TG07NW52** HISTORICAL EXPLORATORY HOLE

### NOTE:

1. AS-BUILT EXPLORATORY HOLE POSITIONS TAKEN FROM GEOTECHNICAL ENGINEERING LIMITED'S SURVEY ON 03 JULY 2015. ZONES 7 - 9 CAN BE FOUND ON DRAWING NUMBER 5134008-PHASE2-FIGURE002.
2. EXPLORATORY HOLES WS201 AND WS301 WERE TERMINATED EARLY DUE TO REFUSAL ON HARD STRATUM. THEIR POSITIONS WERE NOT SURVEYED, BUT ARE SHOWN AS APPROXIMATE ON THIS DRAWING.
3. BASE MAP REPRODUCED BY PERMISSION OF ORDNANCE SURVEY ON BEHALF OF HMSO. © CROWN COPYRIGHT. ALL RIGHTS RESERVED. ORDNANCE SURVEY LICENCE NUMBER 0100040692.



Rev.	Description	By	Date	Chk'd	Auth

FOR INFORMATION		Rev	Date	Authorised
Purpose of issue		A	15.07.15	JA

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Client  
LONDON RESORT COMPANY HOLDINGS

Project  
PARAMOUNT PARK ENTERTAINMENT RESORT

Title  
AS-BUILT GROUND INVESTIGATION PLAN DRAWING 1 OF 2

Original Scale	Drawn	Checked	Authorised	
1:12500	ATP/JP	TR	JA	A3
	Date 14.07.15	Date 15.07.15	Date 15.07.15	

Drawing Number	Rev
5134008-PHASE2-FIGURE001	A







## Appendix E: Site photographs showing groundwater wells

## LRCH – Monitoring Wells: Site visit 30.06.2020



CMS monitoring well on footpath entrance to site



BH 204. Storage of tunnel rings for Thames Tideway in background



BH 204 – inside manhole ring



BH204



Footpath entry to Site



BH 203. Adjacent to site



## LRCH – Monitoring Wells: Site visit 30.06.2020



CMS monitoring well on footpath towards HS1



CMS monitoring well at leachate pumping station



WS203. Leachate compound in background



Leachate compound with CMS Enviro staff



WS204



WS204 – Lake in background



## LRCH – Monitoring Wells: Site visit 30.06.2020



WS201



BH201



BH202



BH202



WS202



Old destroyed well near WS202



## LRCH – Monitoring Wells: Site visit 30.06.2020



BH101



Tracks / roadways near BH101



View across Zone 1



View across Zone 1



WS102 looking NE



WS102



## LRCH – Monitoring Wells: Site visit 30.06.2020



WS101



WS101



Locked security gate to Zone 5b (BH 501 & BH502)



View across Zone 5B



Padlock on security gate to Zone 5B



Security gate at road leading to Zone 5B



## LRCH – Monitoring Wells: Site visit 30.06.2020



BH 705 in yard of Springhead Nursery



BH 705 in yard of Springhead Nursery



BH 705 in yard of Springhead Nursery



BH 704



BH 704 on footpath to east of Nursery



BH 704 on footpath to east of Nursery



## LRCH – Monitoring Wells: Site visit 30.06.2020



BH 707



BH 707



BH 707 – inside manhole ring



BH 708



BH 708



Secure compound containing BH 704