



Wates Residential

HMS Daedalus

Walkover Gamma Survey

Project no. 810200

NOVEMBER 2018

RSK



RSK GENERAL NOTES

Project No.: 810200 (00)
Title: Gamma Walkover Survey: HMS Daedalus
Client: Wates Residential
Date: November 2018
Office: RSK, 172 Chester Road, Helsby, WA6 0AR
Status: Final

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1 INTRODUCTION

1.1 Commissioning

RSK Radiological Ltd (RSK) was commissioned by Wates Residential to carry out a walkover gamma survey of their Eastern parcel of land at HMS Daedalus (Figure 1). No intrusive works were requested. The survey was also to include a subsection of the client's Western parcel of land that was not covered during a previous walkover exercise. The project was carried out to an agreed brief as set out in RSK's proposal (Ref. T810200_L01 (00), dated 26 October 2018).

This report is subject to the RSK service constraints given in Appendix A and limitations that may be described through this document.

1.2 Objectives

The objective of the work is:

- to identify any potential radiological contamination that may be present at the surface or near-surface
- to provide assurance, which the client can communicate to the EHO that the site is absent of radiological risk or, if radiological contamination is present, that further investigation is warranted.

1.3 Scope of works

The scope of this assessment includes:

Pre-survey planning

- producing suitable monitoring protocols
- producing a robust methodology
- producing a site specific H&S plan and risk assessment.

Site survey

- completing a walkover survey of the whole Eastern parcel of land
- completing a walkover survey of a subsection of the Western parcel of land.

Interpretation and reporting

- site description including details of the surveyed areas
- site survey constraints
- statistical analysis of data to identify radiological areas of interest
- data review with conclusions to be communicated by the client to the EHO.

1.4 Existing reports

The following report detailing previous works at the site was made available for review:

- Aurora Health Physics Services Ltd, Radiation Walkover Survey At Daedalus, AHP/CMB/REP/17/01, 19 April 2017.

1.5 Limitations

In the Eastern site there are several points marked and photographed in Figure 2 that were not covered by the walkover, due to the ground being inaccessible or an object covering the surface.

The area that required surveying on the Western site did not have obvious indications of the boundary, consequently a larger area than required was surveyed to ensure all necessary ground was covered.

2 SITE DETAILS

2.1 Site location

Site location details are presented in in Table 1 and a location plan is displayed in Figure 1.

Table 1: Site location details

Site name	HMS Daedalus
Full site address and postcode	Daedalus Airfield, Lee-on-the-Solent, PO13 9YA
National Grid reference (centre of site)	Lat: 50.808771 Lon: -1.2023574

2.2 Site description

The survey was conducted on the Eastern parcel of land that is being developed by Wates Residential, with an area of approximately 2.61 ha (Figure 3). Additionally, a subsection of the Western parcel of land, which was not surveyed under previous contracts, was included in this survey exercise (Figure 4). Most of the Eastern parcel consisted of made ground typically containing soil mixed with variable sized fragments of brick, metal, glass, etc. Many areas featured a mixture of vegetation. Some survey areas consisted of concrete slabs, pathways and tarmac. Whilst existing buildings on site prevented survey work at those specific locations as they were not accessed, the survey did cover the immediate accessible area around the buildings.

The area surveyed from the Western parcel consisted of only made ground and did not contain the large pieces of brick, metal and glass found in the Eastern site.

2.3 Site history

Historically, this site operated as a Royal Navy Air Service base first being established in 1917 as a seaplane base during the First World War. In 1918 it became an RAF station, continuing its training purposes before being transferred to the Royal Navy in 1930s. Post Royal Navy use (1996 – 2014) several non-military organisations have made of the site.

Due to previous landfill practices at RAF bases during the ascribed time period, which included the burial of radium luminised articles, such as radium dials, there is a potential presence of Radium-226 (Ra-226) contamination in the local area.

3 METHODOLOGY

3.1 Survey equipment

The equipment selected for the survey was the handheld Georadis RT-30 SUPER IDENT monitor. The monitor uses a NaI detector providing the functions of radionuclide identification, gross gamma detection and dose rate. The data is constantly recorded and mapped as the surveyor traverses the site area using an external GPS datalogger connected to the monitor. Any areas of interest that indicate an elevated activity above the established background activity is highlighted and targeted measurements are taken in the field, to identify the specific radionuclide(s) present.

3.2 Survey methodology

The aim was for full coverage of the site by walkover gamma survey. This method will detect gamma emissions at or close to the ground surface at concentrations less than the current EPR 2016 (Amendment 2 of 2018) 1 Bq/g out of scope concentration for waste arising from remediation of historical Radium ground contamination. Contamination deeper below ground level will be detectable but only if concentrations are greater than this. The deeper in the ground that contamination occurs, the greater the activity concentration needs to be for some of the gamma emissions to reach the surface and be detected.

The walkover survey uses the following methodology:

1. walk multiple linear transects across the survey area at approximately 1m/s with the instrument at a pre-determined optimum height above the ground. The spacing of the transects was maintained at no greater than 1m, and high visibility waypoints were used to maintain this spacing.
2. the detector automatically records the required radiological data at 1 second intervals (i.e. dose rate and gross gamma count rate), and the GPS position at 30 second intervals.

The survey conducted across the site is intended to confirm the presence and extent of any potential radiological contamination detectable at ground level. The method detects the level of gamma radiation present (i.e. the gross gamma measurements) and defines where the spatial bounds of any contamination is, and the magnitude of each identified area.

3.3 Radiological controls

This work was performed in accordance with project specific Radiological Monitoring Protocol, 810200 – Daedalus, Lee-on-the-Solent Walkover Survey Radiological Monitoring Protocol. Table 1 displays the hold points used during the survey, in case radiological contamination was detected. The survey approach for personal radiological safety was one of a reassurance exercise, and hold points were set accordingly.

Table 2 – Radiological hold points

Hold Point - lower	Hold Point - upper
> 0.3 $\mu\text{Sv/h}$ (γ) contact dose rate (i.e. contact with the ground or with an artefact)	> 0.3 $\mu\text{Sv/h}$ (γ) ambient dose rate (i.e. at waist height); or > 0.5 $\mu\text{Sv/h}$ (γ) contact dose rate
Action	Action
<ul style="list-style-type: none"> • Continue work but avoid prolonged contact with the item or area • Report to the RPA at earliest convenience during the shift 	<ul style="list-style-type: none"> • Record the levels and extent of area affected • Suspend work and notify the RPA immediately • RPA to provide advice on course of action and review of risk assessment

4 RESULTS

4.1 Data analysis

During the survey no positive responses were identified that were directly attributable to the ground. Some positive responses were detected but were linked to building materials. To confirm there were no other areas which may be of interest requiring more detailed survey work, statistical analysis of the recorded data was performed. This exercise would identify very slight positive responses which may not be readily noticeable during the field work. In this context, slight positive responses would be those considered to be outside of the normal probability distribution of the data, and could be indicative of contamination deeper in the ground.

4.1.1 05/11/2018 Gamma data analysis

The 95% confidence level has been determined based on the expected standard deviation and the observed standard deviation for the data. There are a number of results outside the 95% confidence level, but no more than would be expected. These data points have been inspected by desktop exercise and the following conclusions drawn:

- there were approximately 20 data points in the upper 5%
- there is no pattern to the upper 5 percentile data points occurring
- each individual data point in the upper 5 percentile is commensurate with credible background levels.

4.1.2 06/11/2018 Gamma data analysis

There are a number of results outside the 95% confidence level, more than would be expected. The threshold cps value to be considered a positive response (outlined in the radiological protocol document) was 100 above background. The background recorded for the Eastern site ranged 88 – 142 cps, so a conservative threshold value of 188 was drawn. These data points have been inspected by desktop exercise and the following conclusions drawn:

- there are approximately 100 data points in the upper 5%
- these occur in areas of the Eastern site where existing buildings are present
- the upper 5% results up to the maximum observed of 208 cps are typical of certain types of brickwork commonly encountered on sites. All Targeted Gamma Measurements confirmed the presence of natural Thorium and Potassium-40, both of which are expected natural inclusions in building materials.

4.2 Data review

The gross gamma results suggest that there is some structure on the ground, due to being more variable than would be expected if all survey areas were soil/earth. This fits with the site description in subsection 2.2. The ambient background radiation levels across the both sites were found to be typical of the UK and did not indicate any elevated readings



due to enhanced naturally occurring radioactive inclusions in the ground. Gamma spectrometry was undertaken in the field with the hand-held device. The only identified radionuclides were Potassium-40 (K-40) and Thorium-232 (Th-232), which were found in the ground and building materials. Elevated levels of these radionuclides were also present within the bricks of existing buildings on the Eastern site. All the positive responses identified during the survey are attributed to the enhanced natural radionuclide inclusions within the brickwork of the above ground building structures.

The variability in the gross gamma data show that the results are commensurate with that expected from construction materials and earth. Furthermore, there is no evidence that the identified radionuclides are anything other than natural and are within levels which would expect to be encountered as natural background radiation. No Ra-226 or any other artificial gamma-emitting radionuclides were detected throughout the survey.

The results of the walkover survey can be seen in Figures 5 and 6 for the Eastern site and the Western site respectively.

5 CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

There was no Ra-226 or any other artificial gamma-emitting radionuclide detected in the surveyed area. The only identified radionuclides were naturally occurring K-40 and Th-232, found in earth and building materials. Numerous positive responses were detected, but these were found to originate from naturally occurring inclusions in the building materials, particularly brickwork, which are not subject to radioactive substances regulation and do not pose a radiological hazard.

5.2 Recommendations

No area of the site is considered to warrant further radiological investigation.

FIGURES



Western Site Location

Eastern Site Location

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Client	WATES RESIDENTIAL
Project Title	DAEDALUS GAMMA SURVEY
Drawing Title	SITE LOCATION PLAN

Drawn	Date	Checked	Date	Approved	Date	Project No.	Drawing File
AP	12.11.18	LC	12.11.18	LC	12.11.18	810200	810200-L01(00)D001A
Scale	Orig Size	Dimensions				Drawing No.	Rev.
1:50000	A4	—				FIGURE 1	A



LEGEND:

Site survey boundary



REV.	A	14.11.18	FIRST ISSUE	HD	LC	LC
			DESCRIPTION	BY	CHD.	APR.
Dimensions		Projection		Scale		Orig Size
m				NTS		A3



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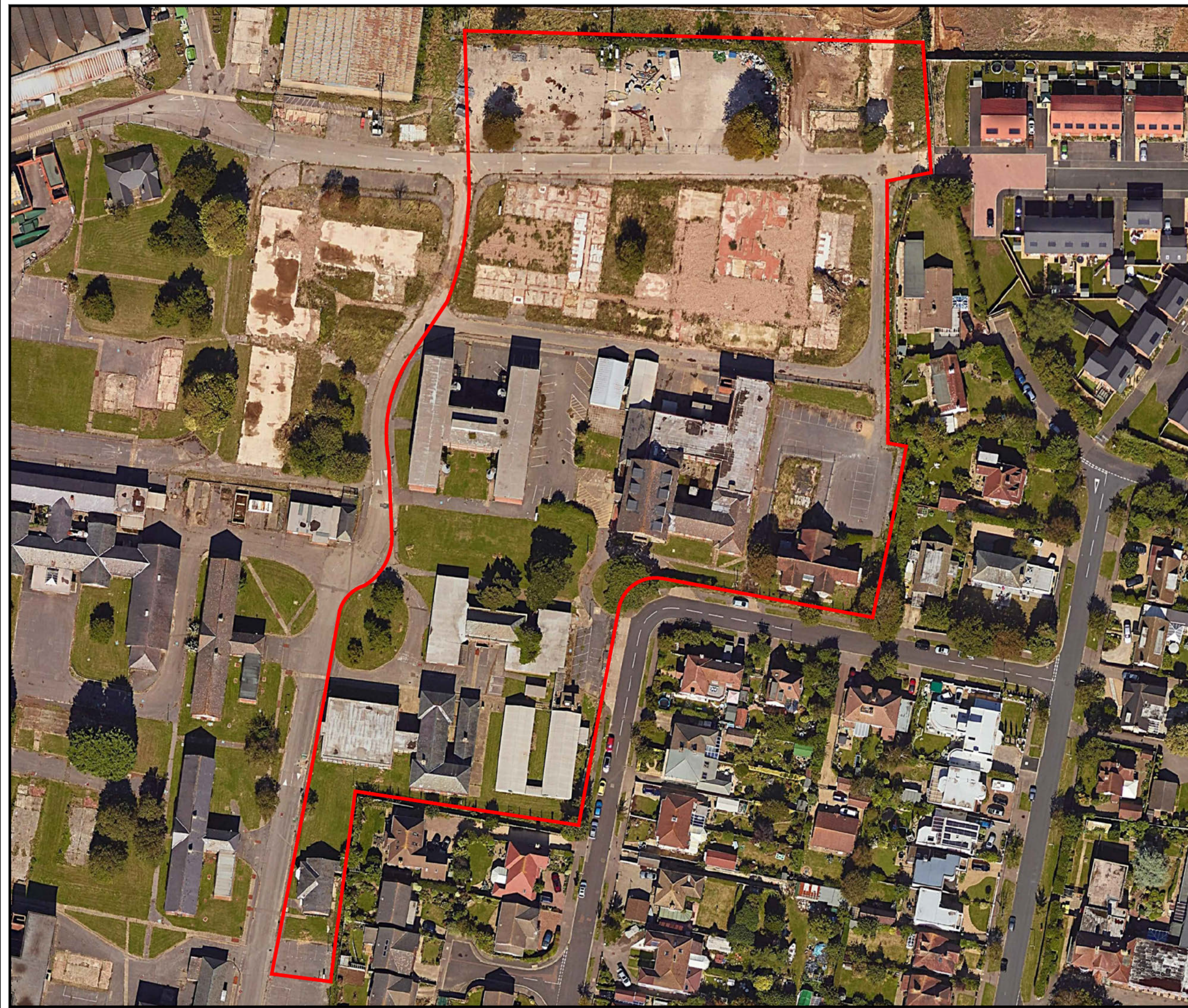
CLIENT
WATES RESIDENTIAL

PROJECT
DAEDALUS GAMMA SURVEY

TITLE
SITE CONSTRAINTS PLAN

JOB No.: 810200 DRAWING FILE: 810200-L01(00)D002A

BY:	DATE:	CONTRACT NO.	FIGURE 2	REV:
HD	14.11.18			A



LEGEND:

— Site survey boundary



REV.	A	12.11.18	FIRST ISSUE	AP	LC	LC
			DESCRIPTION	BY	CHD.	APR.
Dimensions	m		Projection	Scale	Orig Size	
				NTS	A3	



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PROJECT	DAEDALUS GAMMA SURVEY					
TITLE	EASTERN SITE SURVEY AREA					
JOB No.:	810200		DRAWING FILE:	810200-L01(00)D003A		
BY:	DATE:	CONTRACT NO.	FIGURE 3	REV:		
AP	12.11.18			A		



LEGEND:

— Site survey boundary



REV.	DATE	DESCRIPTION	BY	CHD.	APR.
A	12.11.18	FIRST ISSUE	AP	LC	LC
Dimensions		Projection	Scale	Orig Size	
m			NTS	A3	



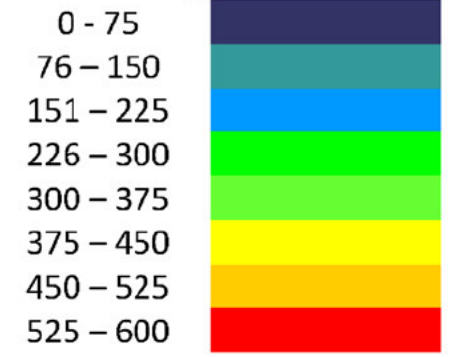
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PROJECT	DAEDALUS GAMMA SURVEY				
TITLE	WESTERN SITE SURVEY AREA				
JOB No.:	810200		DRAWING FILE: 810200-L01(00)D004A		
BY:	DATE:	CONTRACT NO.:	FIGURE 4	REV:	A
AP	12.11.18				



LEGEND:

Counts per second



REV.	DATE	DESCRIPTION	BY	CHD.	APR.
A	14.11.18	FIRST ISSUE	HD	LC	LC
Dimensions		Projection	Scale	Orig Size	
m			NTS	A3	



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CLIENT
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PROJECT
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TITLE
EASTERN SITE GAMMA HEAT MAP

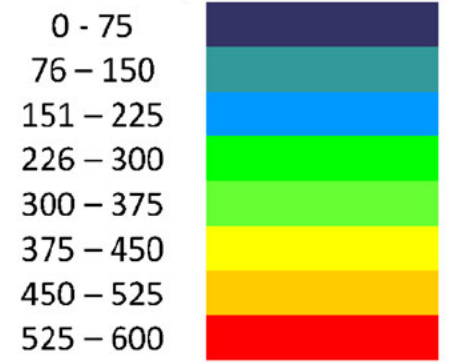
JOB No.: 810200
DRAWING FILE: 810200-L01(00)D005A

BY:	DATE:	CONTRACT NO.	FIGURE 5	REV:
HD	14.11.18			A



LEGEND:

Counts per second



REV.	DATE	DESCRIPTION	BY	CHD.	APR.
A	14.11.18	FIRST ISSUE	HD	LC	LC
Dimensions		Projection	Scale	Orig Size	
m			NTS	A3	



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CLIENT
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PROJECT
DAEDALUS GAMMA SURVEY

TITLE
WESTERN SITE GAMMA HEAT MAP

JOB No.:	DRAWING FILE:
810200	810200-L01(00)D006A

BY:	DATE:	CONTRACT NO.	FIGURE 6	REV:
HD	14.11.18			A



APPENDIX A

SERVICE CONSTRAINTS

1. This report and the site investigation carried out in connection with the report (together the "Services") were compiled and carried out by RSK Environment Limited (RSK) for Wates Residential (the "client") in accordance with the terms of a contract [RSK Group Standard Terms and Conditions] between RSK and the "client". The Services were performed by RSK with the skill and care ordinarily exercised by a reasonable environmental consultant at the time the Services were performed. Further, and in particular, the Services were performed by RSK taking into account the limits of the scope of works required by the client, the time scale involved and the resources, including financial and manpower resources, agreed between RSK and the client.
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4. It is RSK's understanding that this report is to be used for the purpose described in the introduction to the report. That purpose was a significant factor in determining the scope and level of the Services. Should the purpose for which the report is used, or the proposed use of the site change, this report may no longer be valid and any further use of or reliance upon the report in those circumstances by the client without RSK's review and advice shall be at the client's sole and own risk. Should RSK be requested to review the report after the date of this report, RSK shall be entitled to additional payment at the then existing rates or such other terms as agreed between RSK and the client.
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7. The Services are based upon RSK's observations of existing physical conditions at the Site gained from a visual inspection of the site together with RSK's interpretation of information, including documentation, obtained from third parties and from the client on the history and usage of the site, unless specifically identified in the Services or accreditation system (such as UKAS ISO 17020:2012 clause 7.1.6):
 - a. the Services were based on information and/or analysis provided by independent testing and information services or laboratories upon which RSK was reasonably entitled to rely
 - b. the Services were limited by the accuracy of the information, including documentation, reviewed by RSK and the observations possible at the time of the visual inspection
 - c. the Services did not attempt to independently verify the accuracy or completeness of information, documentation or materials received from the client or third parties, including laboratories and information services, during the performance of the Services.

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8. The intrusive environmental site investigation aspects of the Services is a limited sampling of the site at pre-determined locations based on the known historic / operational configuration of the site. The conclusions given in this report are based on information gathered at the specific test locations and can only be extrapolated to an undefined limited area around those locations. The extent of the limited area depends on the properties of the materials adjacent and local conditions, together with the position of any current structures and underground utilities and facilities, and natural and other activities on-site. In addition, chemical analysis was carried out for a limited number of parameters [as stipulated in the contract between the client and RSK] [based on an understanding of the available operational and historical information,] and it should not be inferred that other chemical species are not present.
9. Any site drawing(s) provided in this report is (are) not meant to be an accurate base plan, but is (are) used to present the general relative locations of features on, and surrounding, the site. Features (intrusive and sample locations etc) annotated on-site plans are not drawn to scale but are centred over the approximate location. Such features should not be used for setting out and should be considered indicative only.