



ESB Engineering and Major Projects

Donnybrook - Pembroke (Site ID 42)

Preliminary Environmental Site Assessment

602749 – R03 (01)

DECEMBER 2019





EXECUTIVE SUMMARY

Following the submission of a proposal of works (reference: 602749, dated October 2019), RSK Ireland Limited (RSK) was instructed by ESB International Ltd in October 2019 to carry out a Preliminary Environmental Site Assessment (PSA) at the site of an historic fluid filled cable leak at a location approximately 30m to the east of Eglinton Terrace, Donnybrook, Dublin 4 (the site). The site of the leak has been assigned a site ID number 42.

Historic information confirms that the area of the site has only recently been subject to development since 2012 with a works compound currently at the location and was previously undeveloped. The sites historic land uses are not considered to be significantly potentially contaminating. The surrounding land use is predominantly residential.

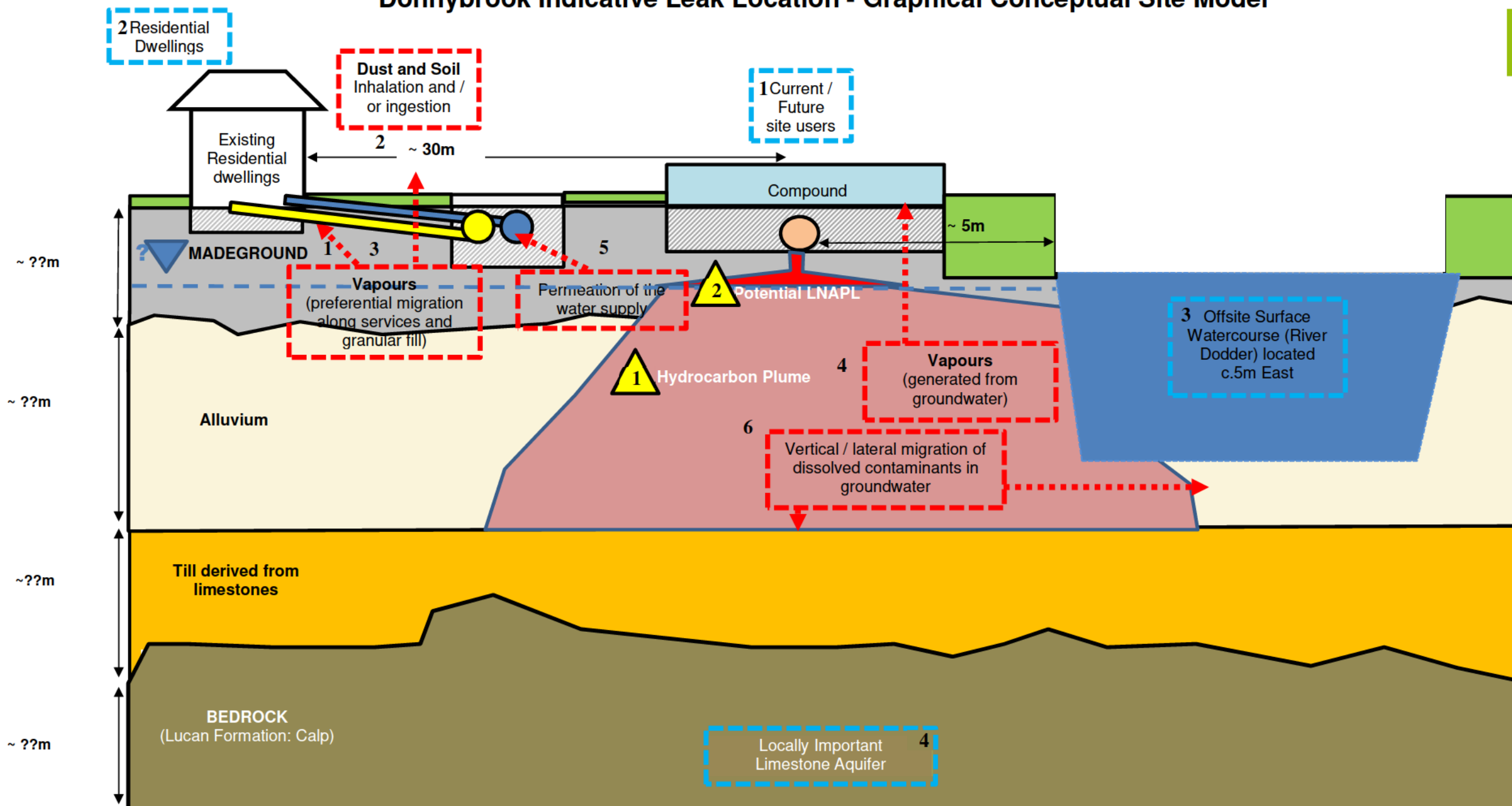
The site is the location of a leakage of cable fluid from a high voltage (HV) underground cable which occurred in February 2008. It is RSKs understanding that the fluid contained Linear Alkyl Benzene (LAB) and that the total fluid loss was approximately 460 litres.

The aim of the PSA is to assess potential impacts to human health and the environment from the leaked fluid, establish any potential environmental liabilities associated with contamination issues at the site due to leaked insulating fluids, to include a detailed source audit and desk-based hydrogeological assessment.

Following the completion of a risk evaluation for the identified pollutant linkages, a potential pollutant linkage with a risk class of **MODERATE** for risks to the River Dodder from lateral migration in groundwater has been identified. The initial CSM has identified potential pollutant linkages with a risk class of **LOW or VERY LOW** for all other identified potential pollution linkages

RSK recommends further assessment to investigate and quantify potential risks to the River Dodder from the historic spill.

Donnybrook Indicative Leak Location - Graphical Conceptual Site Model



Potential Sources	Potential Pathways	Potential Receptors
Hydrocarbon Plume	Preferential migration along services	Current / Future site users
Potential LNAPL	Dust and/or soil inhalation and/or ingestion	Residential dwellings
	Preferential migration through made ground (granular fill)	Bachelors Stream (<5m). River Dodder (c. 1.8km south)
	Vapour migration in groundwater	Locally Important Limestone Aquifer
	Permeation of the water supply	
	Vertical / lateral migration of dissolved contaminants in groundwater	

Key:

- Municipal Services
- Fluid Filled Cable
- Mains Water Service
- Gardens / soft landscaping
- Potential Perched Water Level
- Footpath
- Road
- Granular Fill



EPA Contaminated Land & Groundwater Risk Assessment Methodology	Report Reference	Report Date	Status
STAGE 1: SITE CHARACTERISATION & ASSESSMENT			
1.1	PRELIMINARY SITE ASSESSMENT ██████████	602749 R03 20/12/2019	FINAL
1.2	DETAILED SITE ASSESSMENT		
1.3	QUANTITATIVE RISK ASSESSMENT		
STAGE 2: CORRECTIVE ACTION FEASIBILITY & DESIGN			
2.1	OUTLINE CORRECTIVE ACTION STRATEGY		
2.2	FEASIBILITY STUDY & OUTLINE DESIGN		
2.3	DETAILED DESIGN		
2.4	FINAL STRATEGY & IMPLEMENTATION PLAN		
STAGE 3: CORRECTIVE ACTION IMPLEMENTATION & AFTERCARE			
3.1	ENABLING WORKS		
3.2	CORRECTIVE ACTION IMPLEMENTATION & VERIFICATION		
3.3	AFTERCARE		



RSK GENERAL NOTES

Project No.: 602749 – R03 (00)

Title: Preliminary Environmental Site Assessment: Donnybrook – Pembroke (Site I.D. 42)

Client: ESB Engineering and Major Projects

Date: 20th December 2019

Office: Dublin

Status: FINAL

Document Production/Approval Record

	Name	Signature	Date	Position	% Input
Prepared by (consultant)	██████████		20/12/19	Principal Consultant	90
Approved by (consultant)	██████████		20/12/19	Associate Director	10

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Where any data supplied by the client or from other sources have been used, it has been assumed that the information is correct. No responsibility can be accepted by RSK for inaccuracies in the data supplied by any other party. The conclusions and recommendations in this report are based on the assumption that all relevant information has been supplied by those bodies from whom it was requested.

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Where field investigations have been carried out, these have been restricted to a level of detail required to achieve the stated objectives of the work.



LIMITATIONS

All objectives and outlined scope of works contained within the proposal of works (proposal reference 602749, dated October 2019) have been achieved and completed.

The comments given in this report and the opinions expressed are based on the information reviewed. However, there may be conditions pertaining at the site that have not been disclosed by the investigation and therefore could not be taken into account.

This report is subject to the RSK Ireland Limited service constraints given in Appendix A.

CONTENTS

1	INTRODUCTION	1
1.1	Project Contractual Basis and Personnel Involved.....	1
1.2	Background Information.....	1
1.3	Project Objectives	1
1.4	Scope of Work	2
2	SOURCE AUDIT FINDINGS – PRODUCTION AND OPERATIONAL HISTORY	3
2.1	Current Site Activities	3
2.2	Previous Site Operations	3
2.3	Chemicals of Potential Concern	3
3	SITE ENVIRONMENTAL SETTING	5
3.1	General Introduction	5
3.2	Regional Geology and Hydrogeology	5
3.2.1	Geology	5
3.3	Hydrogeology.....	6
3.3.1	Aquifer characteristics.....	6
3.3.2	Groundwater abstractions.....	7
3.4	Hydrology	7
3.4.1	Surface watercourses.....	7
3.4.3	Site Drainage	8
3.4.4	Flood Risk	8
3.5	EPA Licensed IPPC / Waste Facilities / Section 4 Discharges.....	8
3.7	Local Authority Information.....	9
4	CONCEPTUAL SITE MODEL	10
4.1	Summary: Initial Conceptual Model	10
4.1.1	Summary of potential contaminant sources.....	10
4.1.2	Sensitive receptors	10

4.1.3	Summary of plausible pathways	10
4.1.4	Potentially complete pollutant linkages.....	11
4.2	Risk Evaluation.....	12
5	SUMMARY, CONCLUSIONS AND RECOMMENDATIONS.....	14
6	REFERENCES	15

TABLES

Table 2.1:	Contaminants of potential concern
Table 4.1:	Potential sources and types of contamination
Table 4.2:	Risk estimation for potentially complete pollutant linkages

FIGURES

In Text

Executive Summary – Initial Site Conceptual Model Diagram

Figure 3.1: Bedrock geology underlying site

Figure 3.2: Groundwater vulnerability

Appended

Figure 1: Site location

Figure 2: Site layout plan

Figure 3: Historical Map 1837 – 1842

Figure 4: Historical Map 1888 – 1913

Figure 5: Aerial Photo 1995

APPENDICES

Appendix A: Service constraints

Appendix B: Photographs

Appendix C: Risk assessment methodology

Appendix D: Material safety Data sheets

1 INTRODUCTION

1.1 Project Contractual Basis and Personnel Involved

Following the submission of a proposal of works (reference: 602749, dated October 2019), RSK Ireland Limited (RSK) was instructed by ESB International Ltd in October 2019 to carry out a Preliminary Environmental Site Assessment (PSA) at the site of an historic fluid filled cable leak at a location approximately 30m to the east of Eglinton Terrace, Donnybrook, Dublin 4 (the site). The site of the leak has been assigned a site ID number 42.

This report has been compiled by Paul Feely BSc, MSc, FGS (Principal Consultant with 15 years of experience) with the site walkover having been completed by Ryan Murphy BSc, MSc (Consultant with 2 years of experience).

This report is subject to the RSK service constraints given in Appendix A.

1.2 Background Information

The site is the location of a leakage of cable fluid from a high voltage (HV) underground cable which occurred in early February 2008. It is RSKs understanding that the fluid contained in the cable is Linear Alkyl Benzene (LAB) and that the total fluid loss was approximately 460 litres. It is also RSKs understanding that no previous investigations or monitoring has been undertaken at the subject site. The site location is shown on Figure 1.

The aim of the preliminary site assessment (PSA) is to assess potential impacts to human health and the environment from the leaked fluid, establish any potential environmental liabilities associated with contamination issues at the site due to leaked insulating fluids, undertake a detailed source audit and desk-based hydrogeological assessment.

1.3 Project Objectives

RSK will assess potential impacts associated with legacy cable fluid loss at the site. The PSA will determine the potential risks to human health and the environment at the leak location and potential areas of impact. The risk-based approach applied will be consistent with Irish regulations as well as the best practice document Guidance on the Management of Contaminated Land and Groundwater at EPA Licenced site. In addition, risks will be assessed in accordance with CIRIA C552 and the outcome of the risk assessment will be used to determine any further actions that may be required to further inform the risk assessment.

The objectives of this assessment are to:

- Design a conceptual site model (CSM) for the site based on a review of historical information, environmental setting and a site walkover; and,

- Obtain and review sufficient information regarding ground conditions from which risks to end-users and the environment can be assessed.

1.4 Scope of Work

A scope of work has been devised to meet the objectives set out in section 1.3. The scope of works for the assessment included:

- A desk-based assessment to include a review of geological, hydrogeological and hydrological information and historical plans and completion of a site walkover;
- Review of information held by the Ordnance Survey of Ireland (OSI), Geological Survey of Ireland (GSI), Office of Public Works (OPW), Environmental Protection Agency (EPA), Trinity College Dublin (TCD) and Local Authority (Dublin City Council); and,
- Produce an initial Conceptual Site Model (CSM) to identify and assess any potential pollution linkages assuming the ongoing commercial land use.

2 SOURCE AUDIT FINDINGS – PRODUCTION AND OPERATIONAL HISTORY

2.1 Current Site Activities

The site of the historic cable leak is located in the vicinity of a footpath adjacent to the River Dodder and located approximately 30m to the west of Eglinton Terrace, Donnybrook, Dublin 4.

2.2 Previous Site Operations

A review of the site history was undertaken by assessing the available historical maps and aerial photos available from the ordinance survey of Ireland (OSI) geohive public viewer <http://map.geohive.ie/mapviewer.html>.

The earliest available online OSI map dating from 1837-1842 (Figure 3) shows that the site is located adjacent and to the west of the River Dodder as part of an agricultural field. The surrounding land use is mixed residential and agricultural use. A gravel pit is located approximately 50m to the south and a number of gravel pits are present in the surrounding area to the east and north. A Fair Green is located immediately to the south of the gravel pit. A mill is shown 50m to the north west. A surface water feature is located approximately 100m to the west with an adjacent windmill. Donnybrook village is located approximately 175m to the south west.

The OSI online map from 1888-1913 (Figure 4) shows that the site is in an increasingly urbanised setting. Donnybrook has expanded and is now located approximately 100m to the south west of the site. The gravel pit to the south is no longer present and the Fair Green is now immediately to the south of the site. The mill, windmill and surface water feature, previously identified to the west and north west, are no longer present. A tramway is present approximately 200m to the south west.

The OSI aerial photos from 1995 to 2012 have also been reviewed. The resolution of the photography is poor, and it is not possible to identify building or property use. The surrounding land use appears to be predominantly residential. In general, little change is noted during this period in the site and surrounding area. The 1995 aerial photo (Figure 5) shows the site in the northern corner of a field, possibly used for sports. Eglinton Terrace is present 30m to the west. Sports pitches are noted approximately 150m to the south. There is little change noted between 1995 and 2012.

2.3 Chemicals of Potential Concern

As previously mentioned, the site is the location of a historical leak of insulating fluid from a HV cable. Therefore, the main chemicals/contaminants of potential concern (COPC) at the site are the hydrocarbons comprising the insulating fluid which leaked. The fluid used to insulate the cables comprised Linear Alkyl Benzene (LAB).

LAB is a clear, colourless liquid with a mild petroleum odour. The European Chemicals Bureau produced a European Risk Assessment report with regards to LAB in 1999 ⁽²⁾. The risk assessment concluded that there was a high margin of safety with regards to indirect human exposure via the environment, that LAB is not carcinogenic and is not toxic nor harmful. The overall result of the risk assessment was that *'there is at present no need for further information and/or testing of for risk reduction measures beyond those which are being applied already'*.

The identified COPC are outlined in Table 2.1.

Table 2-1: Contaminants of potential concern

Potential Sources	COPC
HV Cable insulating fluid leak 2010	Linear Alkyl Benzene (LAB) Poly Aromatic Hydrocarbons (PAH), Total Petroleum Hydrocarbons (TPH) and Semi-Volatile Organic Compounds (SVOCs)

The properties of LAB as identified in the material safety data sheet (Appendix D) are outlined below;

LAB;

- Physical State : Liquid
- Colour : Colourless
- Odour : Odourless
- Boiling Point/range : 278 – 316 0C
- Flash Point (Close Cup) (0C.) : 140
- Vapour Density : 8.4 (Air = 1)
- Vapour Pressure @ 25 0C : 0.01 mmHg
- Evaporation Rate : NA
- Specific Gravity : 0.866 (Water = 1)
- pH : NA
- Solubility in Water : Insoluble
- Kinematic viscosity (@ 20°C: 4.0-4.2 mm²/s

It should be noted that anecdotal information suggests that dissolved phase LAB has previously been identified in surface water samples recovered from surface waters adjacent to LAB spill locations and therefore the anecdotal information indicates that LAB may have at least limited solubility potential under certain conditions.

3 SITE ENVIRONMENTAL SETTING

3.1 General Introduction

The site is located adjacent to the River Dodder in Herbert Park, Donnybrook, Dublin 4. The site is located approximately 5km south of Dublin City Centre and is centred on Irish Grid reference O 17735 31728.

A site walkover survey was carried out by RSK on 5th November 2019. The site walkover consisted of observations made 250 meters both north and south along the indicative leak cable line. The findings are summarized below. The site walkover photographs are included in Appendix B.

The Indicative leak site (the site) is located less than 5 meters to the west of the River Dodder where it meanders at Bective Rugby Club (Figure 1). The site is surfaced by hard standing concrete within a works compound. All plant in the compound appeared to be stored appropriately and with no evidence of leaks or spills noted. No visual or olfactory evidence of hydrocarbon contamination was noted in the River Dodder at the time of the walkover.

Herbert Park is a large public park adjacent to north west of the site which consists of playing pitches, walkways and a playground. Herbert Park and Home Villas housing estates are also in close proximity (c.50m) to the north west of the site. A number of residential premises to the north west of the site (c.150m) have grassed / vegetated private gardens.

Lands further to the west of the site are predominantly residential. Houses bound Herbert Park to the west. Eglinton Terrace is located approximately 30m to the west of the site

Immediately to the east of the site is the River Dodder which flows in a northern direction until it meets the River Liffey and eventually enters the Irish Sea at Dublin Port. Further east and beyond the River Dodder are a mix of residential dwellings and playing pitches. Merion Cricket club is located 150m from the site and Brookfield housing estate is located c.200m east from the site. A number of residential premises to the east of the site (c.200 have grassed / vegetated private gardens.

Bective Rugby Club, Bective Lawn Tennis Club and Energia Park stadium are all located to the south of the site.

The site layout is shown on Figure 2. The area around the site is comprised primarily of parkland, sports grounds and residential land uses.

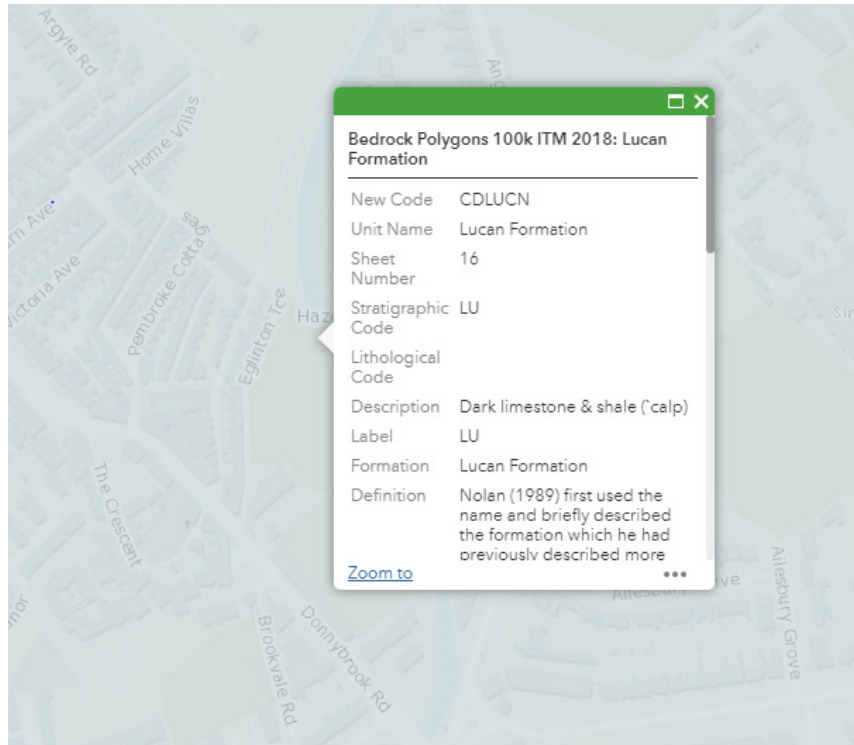
3.2 Regional Geology and Hydrogeology

3.2.1 Geology

Information from the Geological Survey of Ireland (GSI) online mapping public viewer <https://dcenr.maps.arcgis.com/apps/MapSeries/index.html?appid=a30af518e87a4c0ab2fbde2aaac3c228> indicates that the solid geology underlying the site is Calp, of the Lucan

Formation, as shown in Figure 3.1 below. The Lucan formation comprises dark grey to black limestone and shale.

Figure 3.1 Bedrock Geology Underlying Site



The superficial geology underlying is described as made ground overlying alluvium which in turn overlies till derived from limestone.

The GSI has published borehole and trial pit records on-line. Although there are no available borehole/trial pits records for the subject site.

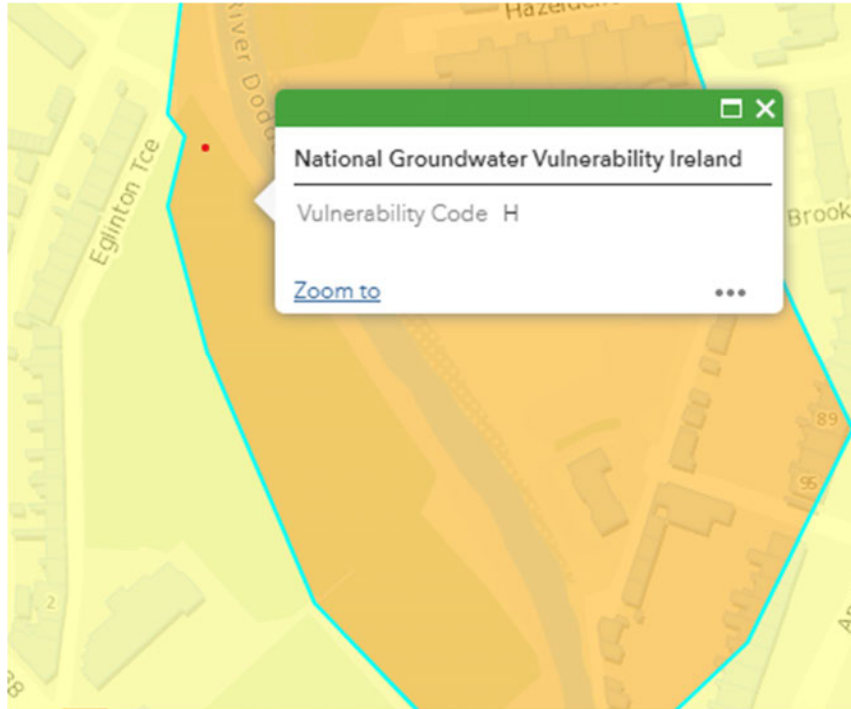
3.3 Hydrogeology

3.3.1 Aquifer characteristics

Information from the GSI Groundwater public viewer website <http://spatial.dcenr.gov.ie/imf/imf.jsp?site=Groundwater> indicates that the underlying bedrock is categorised as a locally important aquifer, that is an aquifer which is productive only in local zones. It is anticipated that perched groundwater may be encountered in more permeable horizons within any made ground and superficial deposits.

Groundwater vulnerability is classified as High at the site (see Figure 3.2 below). The EPA categorise the groundwater body as not at risk and water framework directive (WFD) monitoring (2010-2015) ranks the water quality as good.

Figure 3.2 Groundwater Vulnerability at the Site



3.3.2 Groundwater abstractions

The GSI public viewer indicates that there are no groundwater abstractions within 1km of the site. The closest groundwater abstraction is located approximately 1.5km southwest of the site. The well use is described as “other”. Yields are 95.9 m³/day. The site is not located in a source protection area.

3.4 Hydrology

3.4.1 Surface watercourses

EPA mapping (available at <https://gis.epa.ie/EPAMaps/>) has been reviewed to identify potential receptor surface watercourses. The nearest surface watercourse is the Dodder river which flows in a south to north direction less than 5m to the east of the site. The EPA indicate that water quality in the Tolka as reported in the River Waterbody WFD Status (2010 – 2015) is “moderate” at this location.

3.4.2 River Basin Management Plan

River Basin Management Plans (RBMPs) have been published for all River Basin Districts in Ireland in accordance with the requirements of the Water Framework Directive. The Water Maps viewer (available at <http://www.wfdireland.ie/maps.html>) is an integral part of the River Basin Management Plan and provides access to information at

individual waterbody level and at Water Management Unit level for all the River Basin Districts in Ireland.

The waterbody area underlying the site is the Dodder Lower, its status is described as “poor”, however it is noted to be at risk. The objective for the Dodder Lower is to restore at least “good” status by 2027.

3.4.3 Site Drainage

The site is under a compacted gravel surface. No surface water drains or gullies were noted during the walkover and it is assumed that there is no site drainage system at this location. It is therefore assumed that water from precipitation will most likely percolate into the sub-surface and/or runoff to the neighbouring vegetated areas and/or the Dodder. Drawings have been requested from Dublin City Council (7th November 2019) and we are awaiting a response at the time of reporting.

3.4.4 Flood Risk

The Office of Public works (OPW) interactive flood maps, available at <https://www.floodinfo.ie/map/floodmaps/>, records that the site was most recently affected by a flood at Anglesea Road on 24th October 2011. Figure 7 shows the extents of the flood.

A review of the site was undertaken by assessing the available flood event maps provided by the OPW. The maps refer to flood event probabilities in terms of a percentage Annual Exceedance Probability, or ‘AEP’. This represents the probability of a flood event occurring in any given year. These probabilities may also be expressed as odds (e.g. 100 to 1) of the event occurring in any given year. The latest maps, dated November 2010, indicates that the site has a 1% Fluvial AEP event risk i.e. a 1 in a 100 year event. The fluvial flood event map is presented as Figure 6.

Please note that this flood event map has been generated for a large area of Dublin City Centre. To most accurately quantify the risk, a site-specific Flood Risk Assessment (FRA) could be undertaken if deemed necessary.

3.5 EPA Licensed IPPC / Waste Facilities / Section 4 Discharges

Information from the EPA website <https://gis.epa.ie/EPAMaps/> indicates that there are no IPPC, licensed waste facilities or section 4 discharges located within 1 km of the site.

3.6 Sensitive land uses

A 2km buffer zone for sensitive land uses has been used as RSK considers it reasonable to assume that significant impact is unlikely to receptors where surface water or groundwater migration is a potential pathway at this distance.

A search carried out using the National Parks and Wildlife website (<http://www.npws.ie/>) for the presence of any designated sites identified South Dublin Bay Special Area of Conservation (SAC), South Dublin Bay and River Tolka Estuary Special Protection Area (SPA) and South Dublin Bay proposed Natural Heritage Area (pNHA) all located 1.9 km east of the site. In addition the Grand Canal pNHA is located approximately 1.7 km to

the north west. Proposed Natural Heritage Areas (pNHAs) were published on a non-statutory basis in 1995; they have not been statutorily proposed or designated but are of significance for wildlife and habitats.

3.7 Local Authority Information

RSK have requested information from Dublin City Council on 7th November 2019 regarding any pertinent environmental issues that they are aware of on or adjacent to the subject site, however no response was issued from the Council at the time of reporting.

4 CONCEPTUAL SITE MODEL

4.1 Summary: Initial Conceptual Model

The information presented in Sections 2 and 3 has been used to compile an initial conceptual model. The identified potential sources of contamination, associated contaminants and receptors have been considered with plausible pathways that may link them. The resulting potential pollutant linkages are considered in Section 4.1.4.

4.1.1 Summary of potential contaminant sources

Potential sources and contaminants of concern are summarised in Table 4.1 below.

Table 4.1: Potential sources and types of contamination

Potential sources	Contaminants of concern
On-site	
Historic leak of HV cable insulating fluids	LAB insulating oil and potential breakdown products

4.1.2 Sensitive receptors

Sensitive receptors at the site include:

- Current / future site users.
- Neighbouring site users and surrounding areas.
- Surface waters.
- Groundwater in bedrock.
- Sensitive land uses

Please note that construction workers have not been identified in the conceptual model as receptors because risks are considered to be managed through health and safety procedures as required in the Safety, Health and Welfare at Work (Construction) Regulations 2013.

4.1.3 Summary of plausible pathways

The plausible pathways are summarised below:

- Migration of hydrocarbon vapours in any permeable soils or along existing service runs from natural deposits or made ground.
- Vertical and lateral migration via groundwater.
- Preferential migration of contaminants in groundwater via underground service corridors.
- Permeation of water supply pipes.

- Inhalation of hydrocarbon vapours.
- Direct contact via soil and dust ingestion/inhalation from near surface soils and dermal contact with near surface soils.

4.1.4 Potentially complete pollutant linkages

The outline conceptual model and an estimate of the risk associated with each linkage is summarised in Table 4.2 below. The risk classification has been undertaken in accordance with CIRIA C552 (Rudland et al., 2001), a summary of which is included in Appendix C.

Table 4.2: Risk estimation for potentially complete pollutant linkages

Potential source	Possible pathway	Potential receptor	Likelihood	Severity	Risk and justification
<u>Onsite</u> Contamination associated with historic leakage of HV cable insulating fluid containing LAB.	Inhalation of hydrocarbon vapours	Current / future site users & occupants of adjacent sites	Unlikely	Medium	Low The insulating fluid has a low volatility. The vapour pressure of LAB is 0.013 hPa @ 25°C There are no buildings built over the cable route reducing risks to residential and commercial human health receptors. In addition, the spillage occurred over 11 years ago, and the most volatile fractions of the fluid are likely to have partitioned and dissipated.
	Direct dermal contact or ingestion of hydrocarbons	Current / future site users & occupants of adjacent sites	Unlikely	Medium	Low The area of the insulating oil leak is under hard standing within a works compound. Areas of soft landscaping adjacent to public pathways and on private property are unlikely to be impacted.
	Permeation of water supply pipes	Current / future site users & occupants of adjacent sites	Unlikely	Medium	Low It is considered unlikely that water supply pipes are present at this location as the leak site is not located adjacent to residential properties, public footpaths or public highways. Where water pipes may be present, water will be moving rapidly and at high pressure in water supply pipes making it unlikely that permeation of the pipes will occur in significant or harmful concentrations.

Potential source	Possible pathway	Potential receptor	Likelihood	Severity	Risk and justification
	Vertical and lateral migration	Underlying locally important aquifer	Low likelihood	Mild	<p>Low</p> <p>The underlying alluvium is described as gravelly and may therefore be quite permeable, however vertical migration will be impeded by the underlying till.</p> <p>In addition, as detailed in section 3.3.2 there are no abstractions identified within 1km of the site.</p>
	Vertical and Lateral migration	River Dodder	Likely	Medium	<p>Moderate</p> <p>It is likely that perched groundwater at the site is in continuity with the River Dodder. It is considered possible that free phase LAB, dissolved phase LAB and/or dissolved phase breakdown products of LAB may be impacting the River Dodder. However, the leak occurred over 11 years ago, and it is unlikely that significant quantities of free phase and dissolved phase are potentially being released presently.</p>
	Vertical migration and Lateral migration in groundwater and surface waters	Sensitive land uses within 2km of site	Unlikely	Mild	<p>Very Low</p> <p>South Dublin Bay SAC and pNHA and South Dublin Bay and River Tolka Estuary SPA are located 1.9km to the east of the site. The Grand Canal pNHA is located 1.7km to the north west of the site and no plausible pathways via groundwater and or surface water from the site are considered to exist.</p>

4.2 Risk Evaluation

Only potential source contamination related to the historic leak of HV cable insulating fluid containing LAB oil has been considered.

The initial CSM has identified a potential pollutant linkage with a risk class of **MODERATE** for risks to the River Dodder from lateral migration in groundwater. The



initial CSM has identified potential pollutant linkages with a risk class of **LOW** for all other identified pollution linkages.

5 SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Historic information confirms that the area of the site has only recently been subject to development since 2012 with a works compound currently at the location and has previously been undeveloped. The sites historic land uses are not considered to be significantly potentially contaminating. The surrounding land use is predominantly residential.

The site is the location of a leakage of cable fluid from a high voltage (HV) underground cable which occurred in February 2008. It is RSKs understanding that the fluid contained Linear Alkyl Benzene (LAB) and that the total fluid loss was approximately 460 litres.

The aim of the PSA is to assess potential impacts to human health and the environment from the leaked fluid, establish any potential environmental liabilities associated with contamination issues at the site due to leaked insulating fluids, to include a detailed source audit and desk-based hydrogeological assessment.

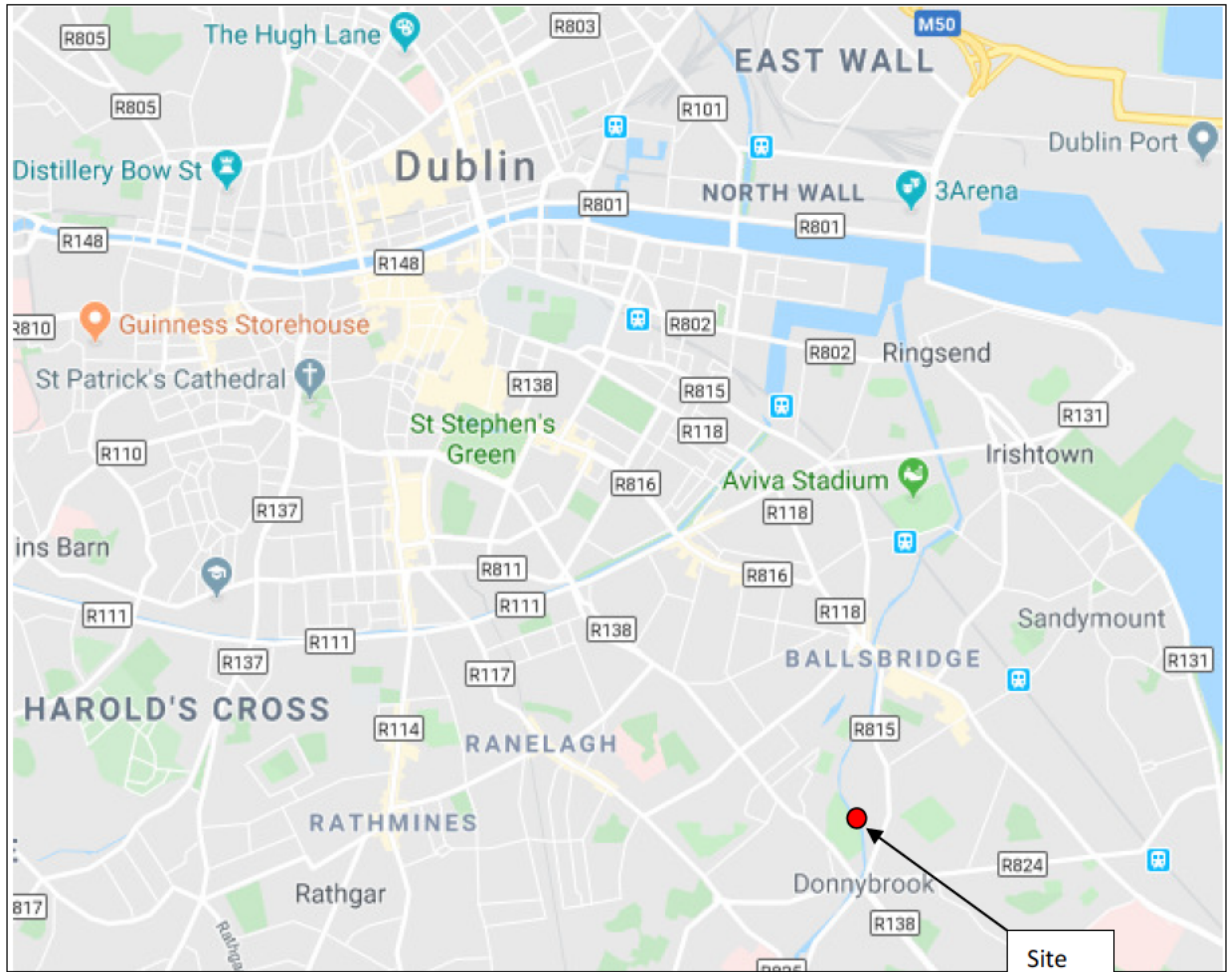
Following the completion of a risk evaluation for the identified pollutant linkages, a potential pollutant linkage with a risk class of **MODERATE** for risks to the River Dodder from lateral migration in groundwater has been identified. The initial CSM has identified potential pollutant linkages with a risk class of **LOW or VERY LOW** for all other identified pollution linkages

RSK recommends further assessment to investigate and quantify potential risks to the River Dodder from the historic spill.

6 REFERENCES

1. Petroleum Products in Drinking Water, Background Document for development of WHO guidelines for Drinking-water quality, 2008
2. European Chemicals Bureau. European Union Risk Assessment Report for Benzene C₁₀₋₁₃ Alkyl Derivs, June 1997
3. CIRIA, C552, Contaminated Land Risk Assessment. A Guide to Good Practice , 2001.

FIGURES



Prepared For: ESB Engineering and Major Projects

Project: Site # 42 – Donnybrook - Pembroke

Drawing Title: Figure 1 Site Location



Source: Google
Date: 13/11/2019



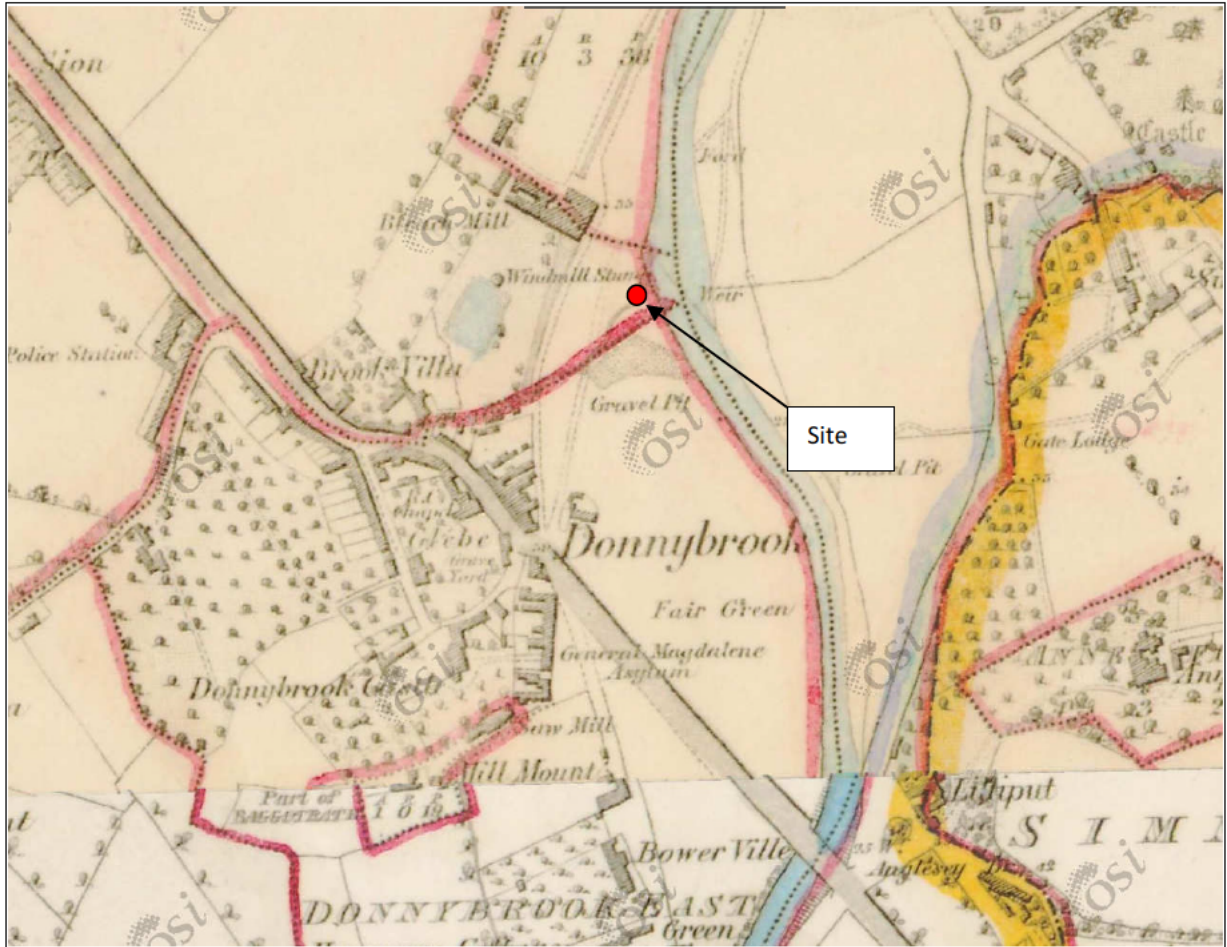
Prepared For: ESB Engineering and Major Projects

Project: Site # 42 – Donnybrook – Pembroke

Drawing Title: Figure 2 Site Layout Plan

RSK

Source: ESB Networks
Date: 08/08/2019



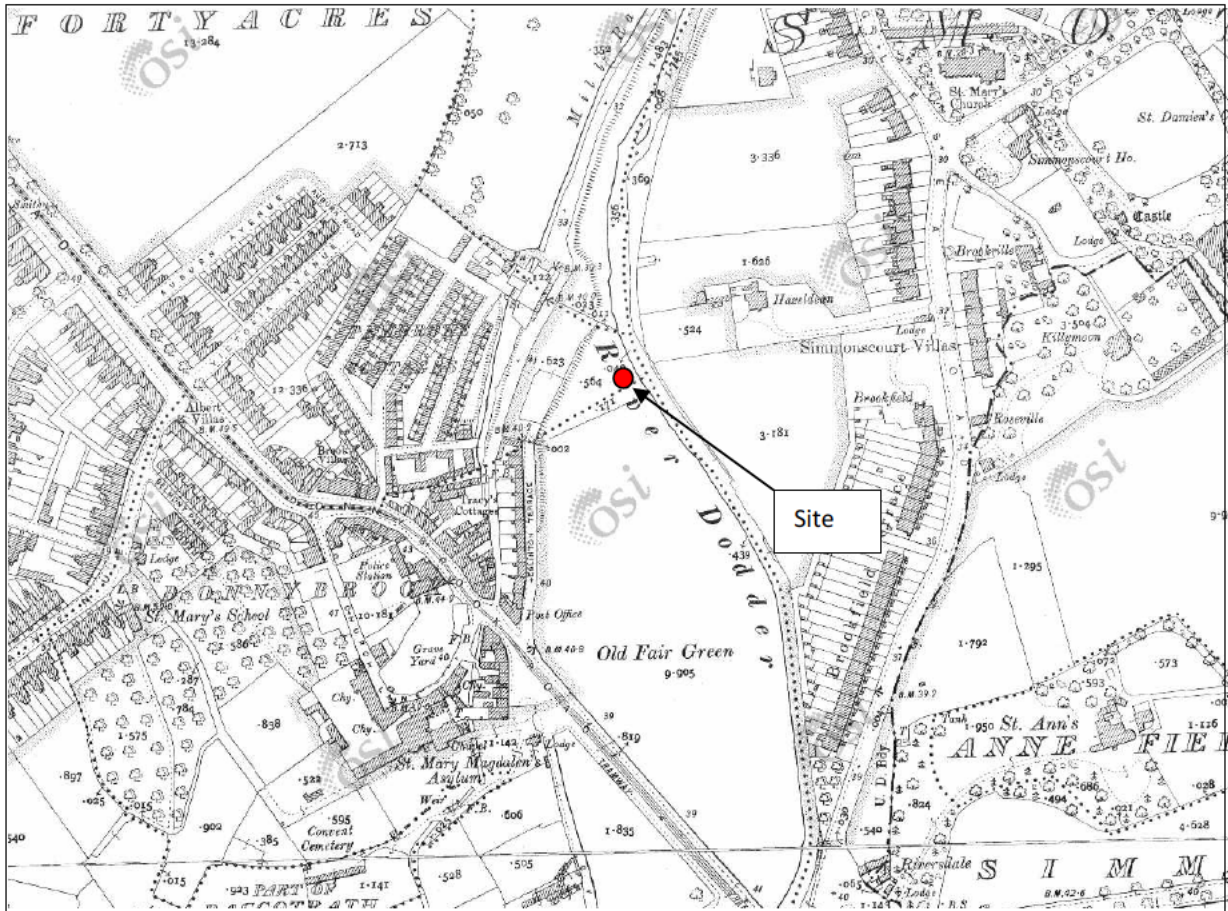
Prepared For: ESB Engineering and Major Projects

Project: Donnybrook - Pembroke

Drawing Title: Figure 3 - OSI Historic Map 1837-1842

RSK

Source: OSI (accessed via GeoHive)
Date: 06/11/2019



Prepared For: ESB Engineering and Major Projects

Project: Site # 42 - Donnybrook - Pembroke

Drawing Title: Figure 4 OSI Historic Map 1888-1913

Source: GeoHive
Date: 06/11/2019



Prepared For: ESB Engineering and Major Projects

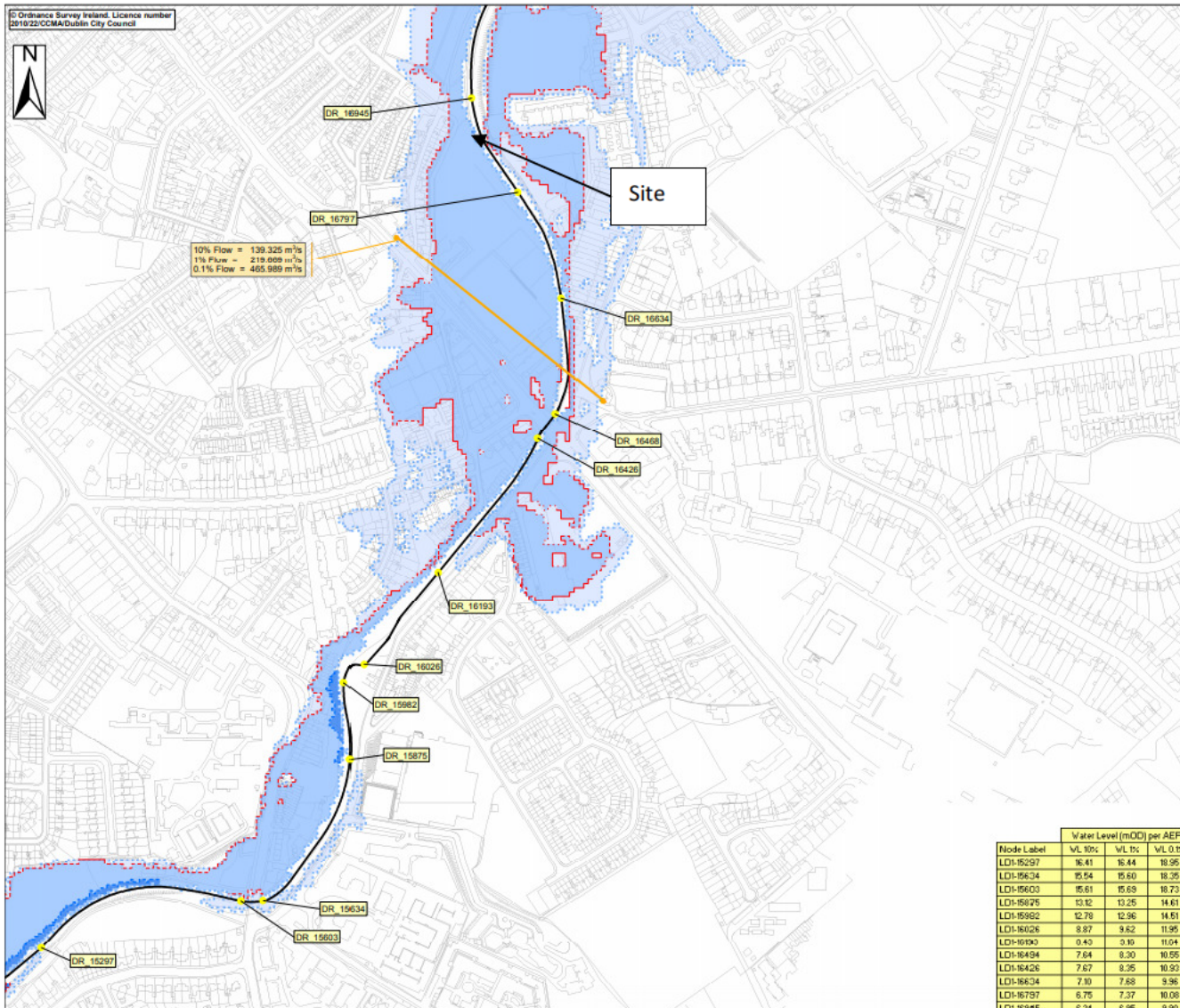
Project: Site # 42 - Donnybrook - Pembroke

Drawing Title: Figure 5 GSI Aerial Photo 1995

The logo for RSK, consisting of the letters 'RSK' in a bold, green, sans-serif font.

Source: GeoHive
Date: 06/11/2019

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10% Flow = 139.325 m³/s
1% Flow = 219.069 m³/s
0.1% Flow = 465.989 m³/s

Site

Location Plan:



Legend:

- 10 % AEP Flood Extent (1 in 10 chance in any given year)
- 1 % AEP Flood Extent (1 in 100 chance in any given year)
- 0.1 % AEP Flood Extent (1 in 1000 chance in any given year)
- Defended Area
- High Confidence (<+20m) (10% AEP)
- Medium Confidence (<+40m) (10% AEP)
- Low Confidence (<+60m) (10% and 0.1% AEP)
- High Confidence (<+20m) (1% AEP)
- Medium Confidence (<+40m) (1% AEP)
- Low Confidence (<+60m) (1% AEP)
- River Centreline
- Node Point
- Node Label (refer to table)
- Flow reporting location
- Peak flow during design flood extent

USER NOTE:
USERS OF THESE MAPS SHOULD REFER TO THE DETAILED DESCRIPTION OF THEIR DERIVATION, LIMITATIONS IN ACCURACY AND GUIDANCE AND CONDITIONS OF USE PROVIDED AT THE FRONT OF THIS BOUND VOLUME. IF THIS MAP DOES NOT FORM PART OF BOUND VOLUME IT SHOULD NOT BE USED FOR ANY PURPOSE.

Client:

Project:
DODDER CATCHMENT FLOOD RISK ASSESSMENT AND MANAGEMENT STUDY

Map:
PRESENT DAY DODDER

Map Type: FLOOD EXTENT

Source: FLUVIAL FLOODING

Map Area: URBAN AREA

Scenario: CURRENT

Drawn By: A.A.B Date: 26 November 2010

Checked By: A.J. Date: 26 November 2010

Approved By: A.G.B Date: 26 November 2010

Node Label	Water Level (mOD) per AEP		
	v/L 10%	v/L 1%	v/L 0.1%
LDI-15297	6.41	6.44	6.95
LDI-15634	15.54	15.60	16.35
LDI-15603	15.61	15.69	16.73
LDI-15876	13.12	13.25	14.61
LDI-15982	12.70	12.96	14.61
LDI-16020	3.87	3.82	11.98
LDI-16193	0.43	0.19	11.04
LDI-16420	7.64	8.30	10.55
LDI-16426	7.67	8.25	10.93
LDI-16634	7.10	7.88	9.96
LDI-16797	6.75	7.37	10.08
LDI-16945	6.34	6.95	9.90

Figure No.:
DR/EXT/UA/CURS/101

Map Series: Page 8 of 12

Drawing Scale: 1 : 5,000 Plot Scale: 1:1 @ A3

RPS Consulting Engineers

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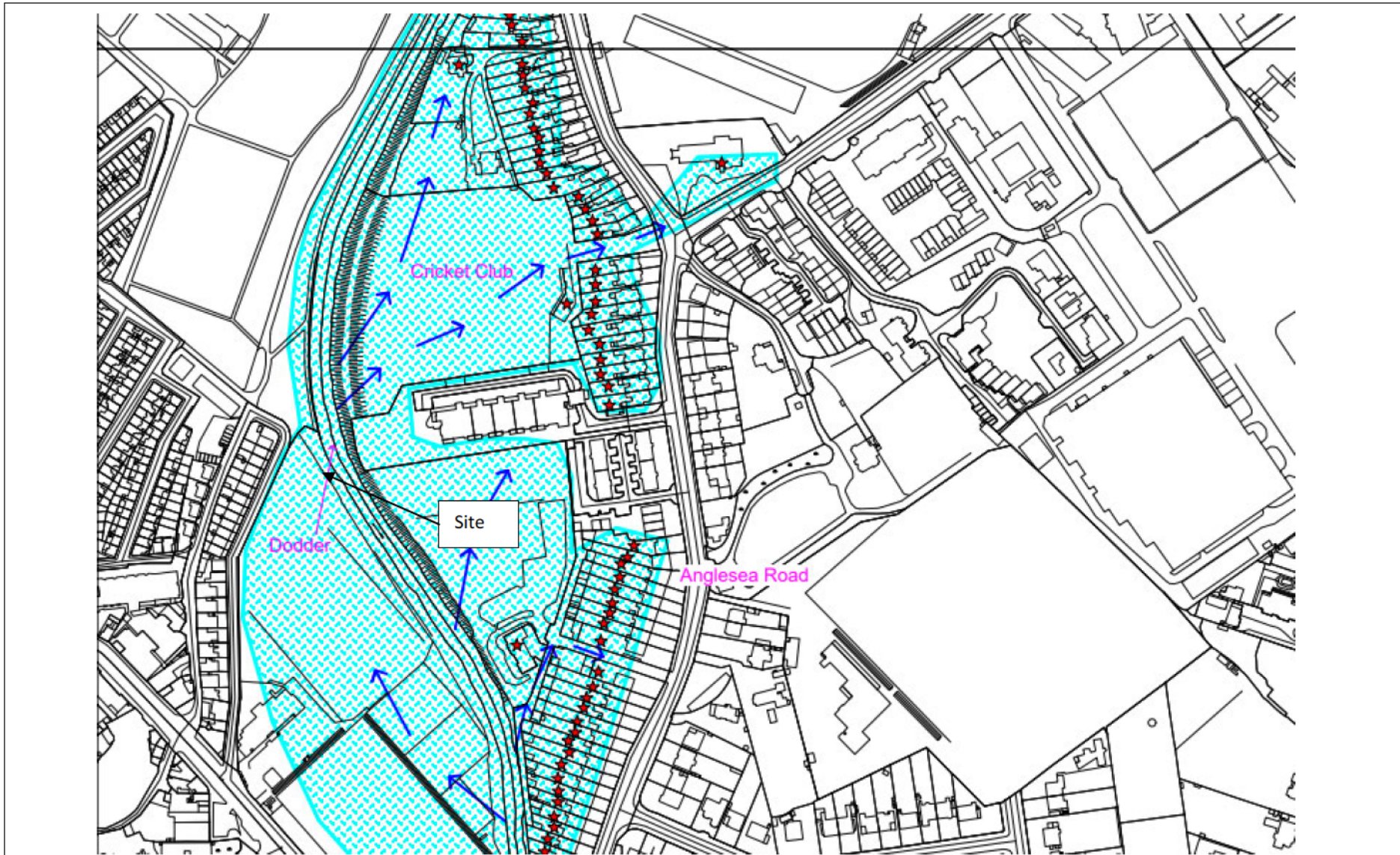


Source: OPW
Date: 06/11/2019

Prepared For: ESB Engineering and Major Projects

Project: Site # 42 Jonnybrook - Pembroke

Drawing Title: Figure 6 Fluvial Flood Event Map



Source: OPW
Date: 06/11/2019



APPENDIX A

SERVICE CONSTRAINTS

RSK ENVIRONMENT LIMITED SERVICE CONSTRAINTS

1. This report (the "Services") was compiled and carried out by RSK Ireland Limited (RSK) for ESB International Ltd (the "client") in accordance with the terms of a contract between RSK and the "client", dated October 2019. 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.
2. Other than that expressly contained in paragraph 1 above, RSK provides no other representation or warranty whether express or implied, in relation to the Services.
3. Unless otherwise agreed the Services were performed by RSK exclusively for the purposes of the client. RSK is not aware of any interest of or reliance by any party other than the client in or on the Services. Unless expressly provided in writing, RSK does not authorise, consent or condone any party other than the client relying upon the Services. Should this report or any part of this report, or otherwise details of the Services or any part of the Services be made known to any such party, and such party relies thereon that party does so wholly at its own and sole risk and RSK disclaims any liability to such parties. **Any such party would be** well advised to seek independent advice from a competent environmental consultant and/or lawyer.
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 hereof, RSK shall be entitled to additional payment at the then existing rates or such other terms as agreed between RSK and the client.
5. The passage of time may result in changes in site conditions, regulatory or other legal provisions, technology or economic conditions which could render the report inaccurate or unreliable. The information and conclusions contained in this report should not be relied upon in the future without the written advice of RSK. In the absence of such written advice of RSK, reliance on the report in the future shall be at the client's own and sole risk. Should RSK be requested to review the report in the future, RSK shall be entitled to additional payment at the then existing rate or such other terms as may be agreed between RSK and the client.
6. The observations and conclusions described in this report are based solely upon the Services which were provided pursuant to the agreement between the client and RSK. RSK has not performed any observations, investigations, studies or testing not specifically set out or required by the contract between the client and RSK. RSK is not liable for the existence of any condition, the discovery of which would require performance of services not otherwise contained in the Services. For the avoidance of doubt, unless otherwise expressly referred to in the introduction to this report, RSK did not seek to evaluate the presence on or off the site of asbestos, electromagnetic fields, lead paint, heavy metals, radon gas or other radioactive or hazardous materials.
7. The Services are based upon RSK's observations of existing physical conditions at the Site gained from a walk-over survey 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. The Services are also based on information and/or analysis provided by independent testing and information services or laboratories upon which RSK was reasonably entitled to rely. The Services clearly are limited by the accuracy of the information, including documentation, reviewed by RSK and the observations possible at the time of the walk-over survey. Further RSK was not authorised and 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. RSK is not liable for any inaccurate information or conclusions, the discovery of which inaccuracies required the doing of any act including the gathering of any information which was not reasonably available to RSK and including the doing of any independent investigation of the information provided to RSK save as otherwise provided in the terms of the contract between the client and RSK.
8. 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.



APPENDIX B PHOTOGRAPHS



PHOTOGRAPHIC LOG

Client Name:
ESB Networks

Site Location:
(42) Donnybrook - Pembroke

Site walkover

Photo No.
1

Date:
Nov 2019

Direction Photo taken:

North

Description:

Playing fields in Herbert Park adjacent (west) to the River Dodder, c.100m marker from the site.



Photo No.
2

Date:
Nov 2019

Direction Photo taken:

South East

Description:

Playground in Herbert Park adjacent (west) to the River Dodder, c.90m marker from the site.





PHOTOGRAPHIC LOG

Client Name:
ESB Networks

Site Location:
(42) Donnybrook - Pembroke

Site walkover

Photo No.
3

Date:
Nov 2019

Direction Photo taken:

South

Description:

Works compound adjacent (west) to the River Dodder restricting access to the site, c.50m marker from the site.



Photo No.
4

Date:
Aug 2019

Direction Photo taken:

North

Description:

The River Dodder flowing in a northern direction, c.150m marker from the site.





PHOTOGRAPHIC LOG

Client Name:
ESB Networks

Site Location:
(42) Donnybrook - Pembroke

Site walkover

Photo No.
5

Date:
Nov 2019

Direction Photo taken:

East

Description:

The River Dodder bounded by residential units with rear back gardens, c.100m marker from the site.



APPENDIX C

RISK ASSESSMENT METHODOLOGY

CLR11 outlines the framework to be followed for risk assessment in the UK. The framework is designed to be consistent with UK legislation and policies including planning. Under CLR11, three stages of risk assessment exist: preliminary, generic quantitative and detailed quantitative. An outline conceptual model should be formed at the preliminary risk assessment stage that collates all the existing information pertaining to a site in text, tabular or diagrammatic form. The outline conceptual model identifies potentially complete (termed possible) pollutant linkages (source–pathway–receptor) and is used as the basis for the design of the site investigation. The outline conceptual model is updated as further information becomes available, for example as a result of the site investigation.

Production of a conceptual model requires an assessment of risk to be made. Risk is a combination of the likelihood of an event occurring and the magnitude of its consequences. Therefore, both the likelihood and the consequences of an event must be taken into account when assessing risk. RSK has adopted guidance provided in CIRIA C552 for use in the production of conceptual models.

The likelihood of an event can be classified on a four-point system using the following terms and definitions based on CIRIA C552:

- Highly likely: the event appears very likely in the short term and almost inevitable over the long term or there is evidence at the receptor of harm or pollution
- Likely: it is probable that an event will occur or circumstances are such that the event is not inevitable, but possible in the short term and likely over the long term
- Low likelihood: circumstances are possible under which an event could occur, but it is not certain even in the long term that an event would occur and it is less likely in the short term
- Unlikely: circumstances are such that it is improbable the event would occur even in the long term.

The severity can be classified using a similar system also based on CIRIA C552. The terms and definitions relating to severity are:

- Severe: short term (acute) risk to human health likely to result in ‘significant harm’ as defined by the Environment Protection Act 1990, Part IIA. Short-term risk of pollution of sensitive water resources. Catastrophic damage to buildings or property. Short-term risk to an ecosystem or organism forming part of that ecosystem (note definition of ecosystem in ‘Draft Circular on Contaminated Land’, DETR 2000)
- Medium: chronic damage to human health (‘significant harm’ as defined in ‘Draft Circular on Contaminated Land’, DETR 2000), pollution of sensitive water resources, significant change in an ecosystem or organism forming part of that ecosystem (note definition of ecosystem in ‘Draft Circular on Contaminated Land’, DETR 2000)

- Mild: pollution of non-sensitive water resources. Significant damage to crops, buildings, structures and services ('significant harm' as defined in 'Draft Circular on Contaminated Land', DETR 2000). Damage to sensitive buildings, structures or the environment
- Minor: harm, not necessarily significant, but that could result in financial loss or expenditure to resolve. Non-permanent human health effects easily prevented by use of personal protective clothing. Easily repairable damage to buildings, structures and services.

Once the likelihood of an event occurring and its severity have been classified, a risk category can be assigned using the table below.

		Consequences			
		Severe	Medium	Mild	Minor
Probability	Highly likely	Very high	High	Moderate	Moderate/Low
	Likely	High	Moderate	Moderate/Low	Low
	Low likelihood	Moderate	Moderate/Low	Low	Very Low
	Unlikely	Moderate/Low	Low	Very Low	Very Low

Definitions of these risk categories are as follows together with an assessment of the further work that may be required:

- Very high: there is a high probability that severe harm could occur or there is evidence that severe harm is currently happening. This risk, if realised, could result in substantial liability; urgent investigation and remediation are likely to be required.
- High: harm is likely to occur. Realisation of the risk is likely to present a substantial liability. Urgent investigation is required. Remedial works may be necessary in the short term and are likely over the long term.
- Moderate: it is possible that harm could arise, but it is unlikely that the harm would be severe and it is more likely that the harm would be relatively mild. Investigation is normally required to clarify the risk and determine the liability. Some remedial works may be required in the longer term.
- Low: it is possible that harm could occur, but it is likely that if realised this harm would at worst normally be mild.
- Very low: there is a low possibility that harm could occur and if realised the harm is unlikely to be severe.



APPENDIX D

MATERIAL SAFETY DATA SHEETS



MATERIAL SAFETY DATA SHEET

1: IDENTIFICATION OF THE SUBSTANCE / PREPARATION AND OF THE COMPANY / UNDERTAKING

Product Name: T 3788
Application: Hollow-core Energy Cable Saturant
Company: H&R ESP Ltd.
Address: Matrix House
North 4th Street
Milton Keynes, MK9 1NJ
United Kingdom

Telephone: +44 (0)1908 351 111 Fax: +44 (0)1908 351122

2: COMPOSITION / INFORMATION ON INGREDIENTS

Composition: Low viscosity compound based on a blend of linear alkyl benzenes that have side alkyl chains of 10 – 13 carbon atoms in length.

Synonyms: Linear Alkyl Benzenes
Alkyl C10-C13, benzenes
Benzene, C10-13-alkyl-deriv.
Detergent Alkylate

Composition	EINECS number	CAS number	Symbol letters	Risk numbers	Concentration range
C10 – C13 Linear Alkyl Benzenes	267-051-0	67774-74-7	Not regulated		100%

All constituents of this product are listed in EINECS (European Inventory of Existing Commercial Chemical Substances) or ELINCS (European List of Notified Chemical Substances) or are exempt.

3: HAZARDS IDENTIFICATION

Classification of preparation: This product is not classified as a dangerous substance / preparation in accordance with The Chemicals (Hazard Information and Packaging for Supply) Regulations 2002 (CHIP3).

Physical and Chemical Properties: Not classified as flammable, but will burn. Avoid contact with strong oxidisers.

Health Effects

Skin:

Contact with the skin may cause irritation. Prolonged or repeated skin contact may cause drying of the skin, progressing to dermatitis. Symptoms may include itching, discolouration, swelling and blistering.

Eyes:

Contact with the eyes may cause irritation. Symptoms may include reddening, swelling and impaired vision.

Ingestion:

Ingestion of small amounts may cause nausea and vomiting.

Inhalation:

Due to low volatility, this product should not present an inhalation hazard under ambient conditions. Exposure to vapour or mineral oil mists may irritate the mucous membranes and cause dizziness, headaches and nausea.

Environmental Effects

No specific hazards under normal use conditions.

4: FIRST AID MEASURES

Inhalation:

Remove from further exposure. If respiratory irritation, dizziness, nausea, or unconsciousness occurs, seek immediate medical assistance and call a doctor. If breathing has stopped, administer artificial respiration.

Skin contact:

Remove contaminated clothing and wash affected skin with soap and water. If persistent irritation occurs, obtain medical attention. If high pressure injection injuries occur, obtain medical attention immediately.

Eye contact:

Flush eye with copious quantities of water. If persistent irritation occurs, obtain medical attention.

Ingestion:

Wash out mouth with water and obtain medical attention. DO NOT INDUCE VOMITING.

5: FIRE FIGHTING MEASURES

Suitable extinguishing media:

Carbon dioxide (CO₂), dry chemical, foam or water spray.

Unsuitable extinguishing media:

Do not use water jets.

Special exposure hazards:

Combustion is likely to give rise to a complex mixture of airborne solid and liquid particulates and gases, including carbon monoxide, and unidentified organic and inorganic compounds.

Special protective equipment:

Proper protective equipment including breathing apparatus must be worn when approaching a fire in a confined space.

6: ACCIDENTAL RELEASE MEASURES

<u>Personal Precautions:</u>	Spilt product presents a significant slip hazard. Remove any sources of heat.
<u>Environmental Precautions:</u>	Prevent from spreading or entering into drains, sewers and watercourses by using inert absorbent material or other appropriate barriers. Inform local authorities if this cannot be prevented.
<u>Methods for cleaning up:</u>	Absorb liquid with inert absorbent material. Sweep up and remove to a suitable, clearly marked container for disposal in accordance with local and national regulations

7: HANDLING AND STORAGE

<u>Handling:</u>	Do not eat, drink or smoke whilst using this product. To avoid the possibility of skin disorders repeated or prolonged contact with products of this type must be avoided. It is essential to maintain a high standard of personal hygiene.
<u>Storage:</u>	Store in a cool place away from sources of heat and out of direct sunlight to avoid pressure build up. Do not store near oxidisers.

Handling and Storage Materials and Coatings

<u>Suitable:</u>	Carbon steel, baked epoxy or Phenolic coatings, aluminium.
<u>Unsuitable:</u>	Natural rubber, Butyl rubber

8: EXPOSURE CONTROLS / PERSONAL PROTECTION

<u>Occupational Exposure Limits:</u>	Not established.
<u>Engineering control measures:</u>	Use of local exhaust ventilation is recommended whenever this product is used in a confined space, is heated above ambient temperatures, or is agitated.
<u>Hygiene measures:</u>	Wash hands before eating, drinking, smoking and using the toilet. Gloves should be washed before being removed.
<u>Respiratory Protection:</u>	Normally not required if adequate ventilation is in place. Where concentrations in air may exceed the limits given in this section, it is recommended to use a half mask respirator to protect from over exposure by inhalation. Suitable filter material depends on the amount and type of chemicals being handled, but filter material suitable for organic vapours may be considered for use.
<u>Hand Protection:</u>	When handling this product it is recommended to wear chemical resistant gloves. Suggested materials for protective gloves include: PVC, Neoprene or similar.
<u>Eye Protection:</u>	Wear eye protection such as safety glasses, chemical goggles, or face shield if engineering controls or work practices are not adequate to prevent eye contact. Have suitable eye wash water available.

Skin Protection:

Wear impervious protective clothing to prevent skin contact. Selection of protective clothing may include gloves, apron, boots, and complete facial protection depending on operations conducted.

9: PHYSICAL AND CHEMICAL PROPERTIES

General Information

Appearance: Clear, colourless liquid
Odour: Mild petroleum odour

Health, safety and environmental information

pH: Not determined
Boiling point/range: 280 °C
Flash point: >135 °C
Flammability: Non flammable
Explosive properties: Not explosive
Oxidising properties: Not applicable
Vapour pressure at 20 °C: <0.02 kPa
Density: 0.86 g/cm³ at 20 °C typical
Solubility in water: Insoluble
Kinematic Viscosity at 20 °C: 4.0 – 4.5 cSt (4.0 – 4.5 mm²/s) typical
Vapour density (Air=1): >1
Evaporation rate: Not determined

Other information

Pour point: -60 °C typical
Expansion coefficient: 0.0007 /°C typical
Neutralisation value: 0.03 mg KOH g⁻¹ maximum

10: STABILITY AND REACTIVITY

Chemical stability:

This material is considered stable under normal ambient and anticipated storage and handling conditions of temperature and pressure and will not polymerise.

Conditions to avoid:

Temperatures above 140 °C

Materials to avoid:

Strong oxidising agents, such as liquid chlorine, concentrated oxygen, sodium hypochlorite, calcium hypochlorite, peroxides etc, as this may present an explosion hazard.

Hazardous decomposition products:

Carbon monoxide and irritant fumes may be generated if this product is burned in an enclosed space.

11: TOXICOLOGICAL INFORMATION

<u>Basis for assessment:</u>	Toxicological data have not been determined specifically for this product. Information given is based on a knowledge of the components and the toxicology of similar products.
<u>Acute toxicity:</u>	Oral LD50 expected to be >5000 mg/kg (rat) Inhalation LC50/4hr expected to be >1.8 mg/l (rat) Dermal LD50 expected to be >2000 mg/kg (rabbit)
<u>Corrosivity/irritation:</u>	
<u>Eye:</u>	May be slightly irritant
<u>Skin:</u>	May be slightly irritant
<u>Respiratory tract:</u>	If mists are inhaled, slight irritation of the respiratory tract may occur
<u>Skin sensitisation:</u>	Not expected to be a skin sensitiser
<u>Repeated-dose toxicity:</u>	Prolonged and/or repeated contact may lead to irritation and possibly dermatitis, especially under conditions of poor personal hygiene.
<u>Mutagenicity:</u>	Not expected to be a mutagen.
<u>Carcinogenicity:</u>	Not expected to be a carcinogen.
<u>Reproductive toxicity:</u>	The preparation has not been assessed at all for this end-point, so its hazardous property in this regard is not known.

12: ECOLOGICAL INFORMATION

<u>Basis for assessment:</u>	Ecotoxicological data have not been determined specifically for this product. Information given is based on a knowledge of the components and the ecotoxicology of similar products.
<u>Ecotoxicity:</u>	Poorly soluble mixture. Product is not expected to be ecotoxic to fish/daphnia/algae, or sewage bacteria. This preparation is expected to be removed in a wastewater treatment facility
<u>Mobility:</u>	Liquid under most environmental conditions. Floats on water. If it enters soil, it will adsorb to soil particles and will not be mobile.
<u>Persistence and degradability:</u>	Readily biodegradable. Soils degradation – half life approx. 15 days. Natural waters degradation – half life approx. 4 – 9 days.
<u>Bioaccumulative potential:</u>	May have the potential to bioaccumulate

13: DISPOSAL CONSIDERATIONS

Disposal must be in accordance with local and national legislation.

<u>Unused Product:</u>	Dispose of through an authorised waste contractor to a licensed site. May be incinerated.
<u>Used/Contaminated Product:</u>	Dispose of through an authorised waste contractor to a licensed site. May be incinerated.
<u>Packaging:</u>	Dispose of through an authorised waste contractor. May be steam cleaned and recycled.

14: TRANSPORT INFORMATION

This product is not classified as dangerous for transport.

15: REGULATORY INFORMATION

Classification/Symbol: Not Regulated

This preparation is not classified as Dangerous according to EU Directives

This safety data sheet is intended to assist in compliance with the following UK legislation:

- Chemicals (Hazard Information and Packaging for Supply) Regulations 2002
- Control of Substances Hazardous to Health Regulations 2002.
- Health and Safety at Work, etc. Act 1974.
- Environmental Protection Act 1990
- Environmental Protection (Duty of Care) Regs. 1991
- COSHH essentials: Easy steps to control chemicals. Control of Substances Hazardous to Health Regulations

Further Guidance

The following guidance notes are available from HMSO or HSE.

Occupational exposure limits (EH 40). Effects of mineral oil on the skin (SHW 397).

Preventing dermatitis at work (INDG 233)

A step by step guide to COSHH assessment (HSG 97)

Assessing and managing risks at work from skin exposure to chemical agents (HSG 205)

The selection, use and maintenance of respiratory protective equipment: A practical guide (HSG 53)

Relevant EC Directives:

- Dangerous Substances Directive (DSD)
- Dangerous Preparations Directive (DPD)
- Safety Data Sheets Directive (SDSD)
- Health & Safety Framework Directive

16: OTHER INFORMATION

This data sheet was prepared in accordance with Commission Directive 2001/58/EC and SI 2002 No. 1689 (CHIP 3)

Key References:

- Chemicals (Hazard Information and Packaging for Supply) Regulations 2002
- The compilation of safety data sheets. Approved Code of Practice (third edition)
- Approved supply list (7th Edition). Information approved for the classification and labelling of substances and preparations dangerous for supply. Chemicals (Hazard Information and Packaging for Supply) Regulations 2002
- Approved classification and labelling guide. Chemicals (Hazard Information and Packaging for Supply) Regulations 2002. Guidance on regulations (Fifth edition).
- EH40/2005 Workplace Exposure Limits 2005
- COSHH essentials: Easy steps to control chemicals. Control of Substances Hazardous to Health Regulations
- European Inventory of Existing Commercial Substances (EINECS)

The data and advice given apply when the product is sold for the stated application or applications. The product is not sold as suitable for any other application. Use of the product for applications other than as stated in this sheet may give rise to risks not mentioned in this sheet. You should not use the product other than for the stated application or applications without seeking advice from us.

If you have purchased the product for supply to a third party for use at work, it is your duty to take all necessary steps to secure that any person handling or using this product is provided with the information in this sheet.

If you are an employer, it is your duty to tell your employees and others who may be affected of any hazards described in this sheet and of any precautions that should be taken.

We believe, in good faith and to the best of our knowledge that the preceding information is accurate. However, we give no guarantee or warranty in this respect. The information provided herein may not be adequate for all individuals and/or all situations. The purchaser/user of the product remains responsible for storing, using or dealing with the product safely and in accordance with all applicable laws and regulations.