



ESB Engineering and Major Projects

MAYNOOTH – TURLOUGH HILL (Site ID 44)

Preliminary Environmental Site Assessment

602749 – R04 (02)

FEBRAURY 2020





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 located at Turlough Hill c. 200m off the R756 Wicklow Gap Road, within 9 km north west of Glendalough and the village of Laragh, and c. 15km south east of Hollywood Co. Wicklow (the site). The site of the leak has been assigned a site ID number 44.

A review of historical maps and aerial photos confirms that the site has confirms that the area of the site has been subject to development prior to 1995 with an ESB substation and pylon exclusion area 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 undeveloped bog land which is partially forested.

The site is the location of a leakage of cable fluid from a high voltage (HV) underground cable which occurred in September 2007. It is RSKs understanding that the fluid contained Linear Alkyl Benzene (LAB) and that the total fluid loss was approximately 294 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, the initial CSM has identified potential pollutant linkages with a risk class of **MODERATE/LOW** for risks to Kings River and the Wicklow Mountains SAC and SPA 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.

RSK recommends further assessment to investigate and quantify potential risk to Kings River and Wicklow Mountains SAC and SPA from the historic spill.

EPA Contaminated Land & Groundwater Risk Assessment Methodology	Report Reference	Report Date	Status	
STAGE 1: SITE CHARACTERISATION & ASSESSMENT				
1.1	PRELIMINARY SITE ASSESSMENT	602749 R04 (02)	03/02/2020	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 – R04 (02)

Title: Preliminary Environmental Site Assessment: Maynooth – Turlough Hill (Site I.D. 44)

Client: ESB Engineering and Major Projects

Date: 3rd February 2020

Office: Dublin

Status: **FINAL**

Document Production/Approval Record

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Approved by (consultant)	██████████		03/02/2020	Principal Consultant	10

RSK Ireland Limited (RSK) has prepared this report for the sole use of the client, showing reasonable skill and care, for the intended purposes as stated in the agreement under which this work was completed. The report may not be relied upon by any other party without the express agreement of the client and RSK. No other warranty, expressed or implied, is made as to the professional advice included in this report.

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.

No part of this report may be copied or duplicated without the express permission of RSK and the party for whom it was prepared.

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.

This work has been undertaken in accordance with the quality management system of RSK Ireland Ltd.



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.

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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 200m south west off the R756 Wicklow Gap Road, c. 9 km north-west of Laragh, Co. Wicklow. The site of the leak has been assigned a site ID number 44.

This report has been compiled by Aisling McParland BSc, PDip (Senior Consultant with 13 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 September 2007. It is RSKs understanding that the fluid contained in the cable is Linear Alkyl Benzene (LAB) and that the total fluid loss was approximately 294 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) 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 R756 Wicklow Gap Road, approximately 6 km to the north-west of Glendalough, Co. Wicklow. The site lies within the Wicklow National Park and Wicklow Mountains SPA and SAC. An unnamed stream which flows into The King's River is located c. 79 m downgradient to the south of the site.

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 Ordnance Survey of Ireland (OSI) geohive public viewer <http://map.geohive.ie/mapviewer.html> to identify any potential sources of historic contamination.

The earliest available online OSI map dating from 1837-1842 (Figure 3) shows that the site is undeveloped located on high ground at the Wicklow Gap. The site is positioned south of a road cutting through the landscape in north-west to south-easterly direction. A river is adjacent to the site to the south and travels in a north-westerly direction. Lough Nahanagan is located c. 1.5km south-east of the site and Vale of Glendasan c. 4km to the south-east of the site. The surrounding land use is undeveloped.

The OSI online map from 1888-1913 (Figure 4) shows no significant changes from previous epoch.

The OSI aerial photos from 1995 to 2012 (figures 5-7) have also been reviewed. The resolution of the photography is poor, however it is possible to see that the site has been developed as its current footprint. The 1995 aerial photo (figure 5) shows the site as located c. 200m south-west of the main road. The area to the immediate north and south-west is forested. Two tracks lead from the main road to two reservoirs 1.5km south-west of the site (Seven Churches and Lough Nahanagan). A parking area is situated to the south-west, c100m of the main road and a c.565m long footpath leads to the site. 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 2.3.

Table 2.3: 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 : 4.0 – 4.5 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 c. 200m south west of the R756 Wicklow Gap Road, within the Wicklow National Park and the Wicklow Mountains Special Area of Conservation (SAC) and Special Protected Area (SPA). The site is situated approximately 6km north-west of Glendalough, 8km northwest of the village of Laragh and is centred on Irish Grid reference O 06941 00407.

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

The indicative leak site (the site) is located c. 79m to the north of King's River (Figure 1). The leak site is located adjacent to an ESB sub-station. The site is within bog lands consisting of long wet grass within an exclusion zone around the pylons. No visual or olfactory evidence of hydrocarbon contamination was noted in the King's River at the time of the walkover.

The Turlough Hill Car Park is located c.100m from the main road and has a c. 565m footpath leading to the site. Paths lead from the main road to the two reservoirs situated c. 1.5m to the south-east of the site, Turlough Hill Reservoir (Seven Churches) and Lough Nahanagan.

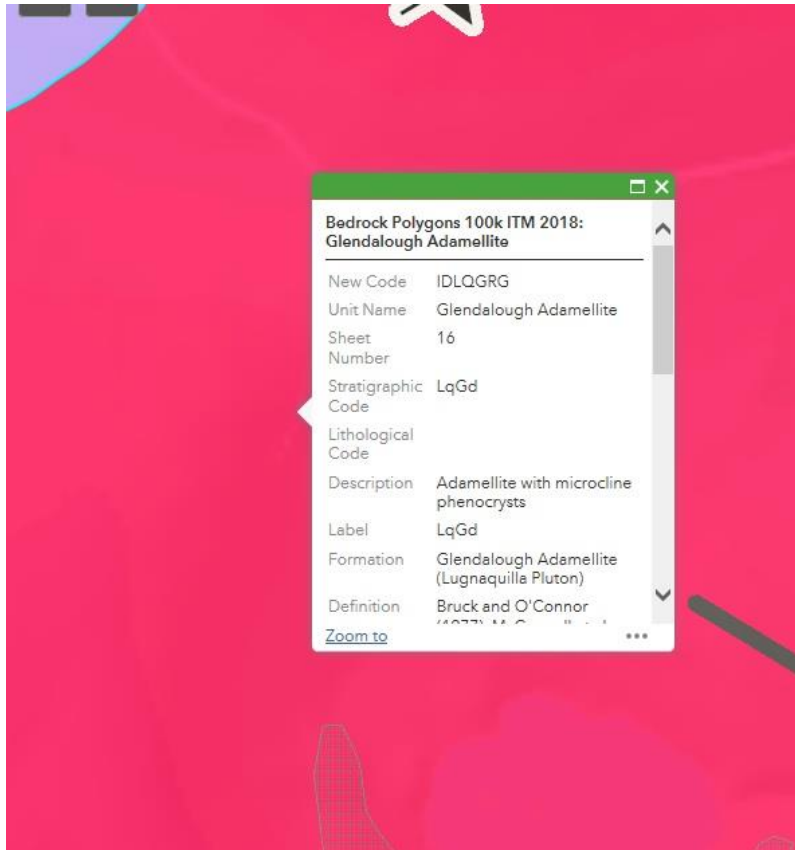
The site layout is shown on Figure 2. The area around the site is comprised primarily of national park and agricultural land uses.

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 Glendalough Adamellite, as shown in Figure 3.2 below. The Glendalough Adamellite comprises Adamellite with microcline phenocrysts.

Figure 3.2: Bedrock Geology Underlying Site



The superficial geology underlying is described as peat overlying till derived from granites. The GSI has published borehole and trial pit records on-line. Although there are no available borehole/trial pits records for the subject site.

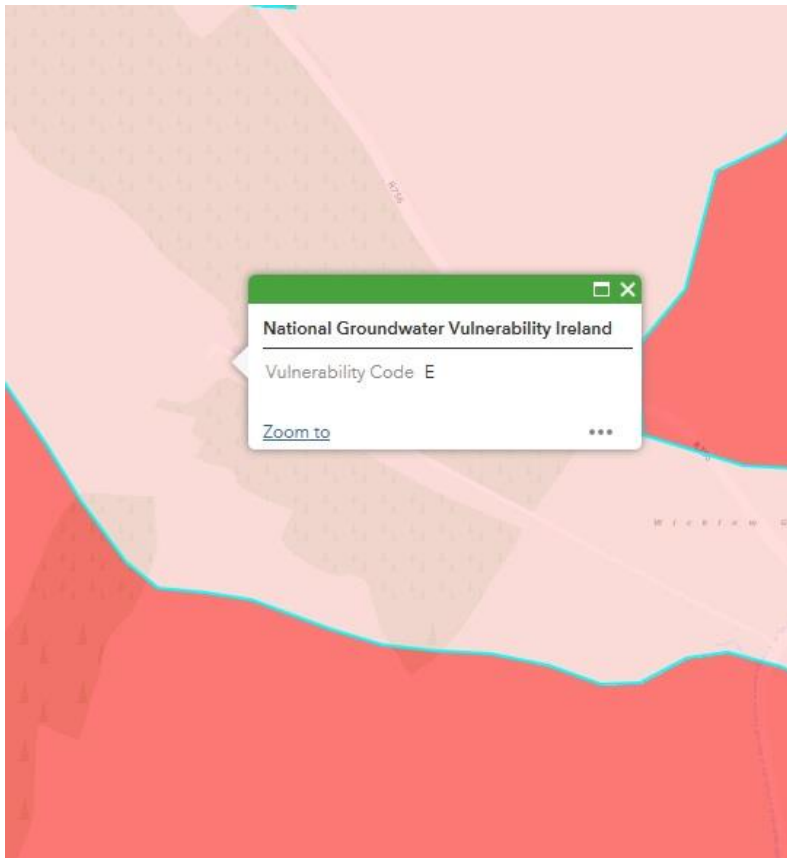
3.3 Hydrogeology

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 poor aquifer, that is an aquifer which is generally unproductive except for 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 Extreme 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 moderate.

Figure 3.3: Groundwater Vulnerability at the Site



Groundwater abstractions

The GSI public viewer indicates that there are no groundwater abstractions within 1km of the site.

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 King's River (a tributary of the River Liffey) which flows in a north-westerly direction c. 79m south-west of the site. The EPA indicate that water quality in King's River 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 river waterbody area underlying the site is the King's Upper, its status is described as "good" and is noted probably not to be at risk. The objective for the King's Upper is to achieve "protected" status by 2027.

3.4.3 Site Drainage

The site consists of a bog land surface. No surface water drains or gullies were noted at the site 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 King's River. Drawings have been requested from Wicklow County 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, can be found at <https://www.floodinfo.ie/map/floodmaps/>. No flood maps are available for the subject site. No past Flood events are recorded within 5km of the site.

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 the site to be within the Wicklow Mountains Special Area of Conservation (SAC) and Special Protected Area (SPA), and the Wicklow National Park. In addition, Glenealo Valley Nature Reserve is located c. 385m to the south of the site.

3.7 Local Authority Information

RSK have requested information from Wicklow County 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
Onsite 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 12 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 the pylon exclusion zone. Risks from direct contact are considered to be unlikely.
	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 Glendalough Adamellite is low permeable and vertical migration will be further 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	King's River	Low likelihood	Medium	<p>Moderate/Low</p> <p>It is likely that perched groundwater at the site is in continuity with the King's River. It is considered possible that free phase LAB, dissolved phase LAB and/or dissolved phase breakdown products of LAB may be impacting the King's River. However, the leak occurred over 12 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	Highly Likely	Minor	<p>Moderate/Low</p> <p>The site is located within Wicklow Nature Reserve and the Mountains are classified as SAC and SPA. The Glenealo Valley Nature Reserve is located c. 385m to the south of the site. However, the leak occurred over 12 years ago, and it is unlikely that significant quantities of free phase and dissolved phase are potentially being released presently.</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 potential pollutant linkages with a risk class of **MODERATE/LOW** for risks to Kings River and the Wicklow Mountains SAC and SPA 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 been subject to development prior to 1995 with an ESB substation and pylon exclusion area 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 undeveloped National Park.

The site is the location of a leakage of cable fluid from a high voltage (HV) underground cable which occurred in September 2007. It is RSKs understanding that the fluid contained Linear Alkyl Benzene (LAB) and that the total fluid loss was approximately 294 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, the initial CSM has identified potential pollutant linkages with a risk class of **MODERATE/LOW** for risks to Kings River and the Wicklow Mountains SAC and SPA 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.

RSK recommends further assessment to investigate and quantify potential risk to Kings River and Wicklow Mountains SPA and SAC 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



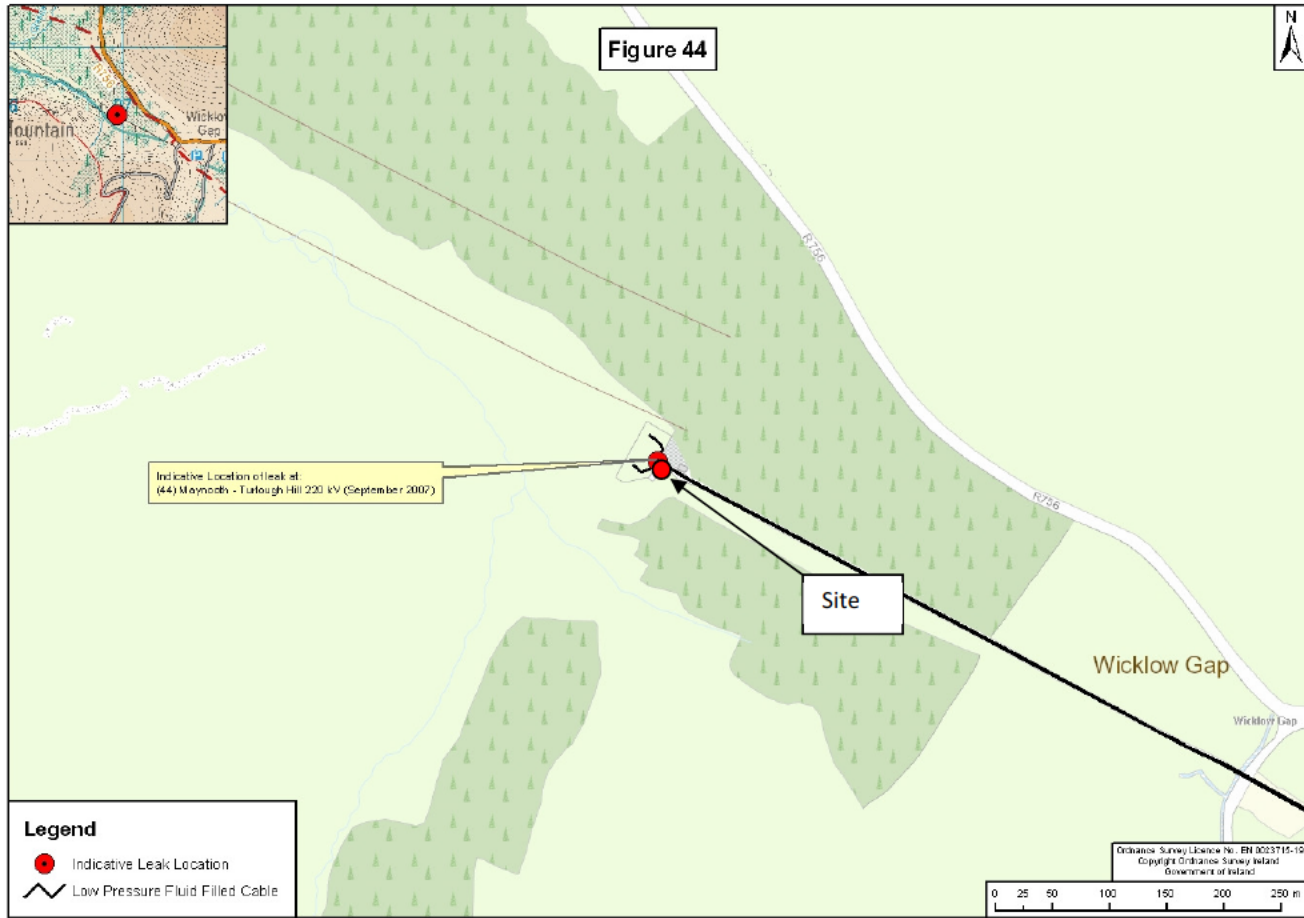
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Project: Site # 44 – Maynooth – Turlough Hill

Drawing Title: Figure 1 Site Location



Source: Google
Date: 14/11/2019



Prepared For: ESB Engineering and Major Projects

Project: Site # 44 - Maynooth - Turlough Hill

Drawing Title: Figure 2 Site Layout Plan

RSK

Source: ESB Networks
Date: 14/11/2019



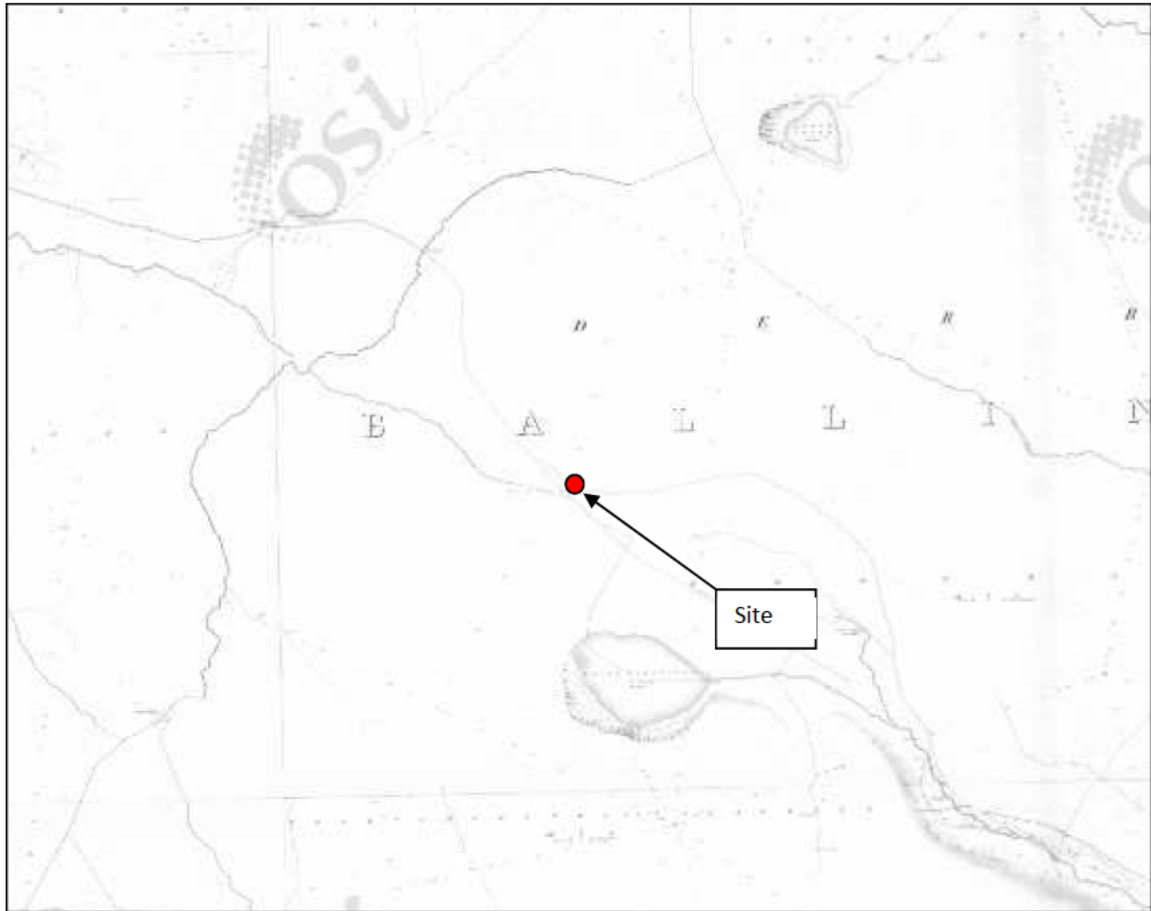
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Project: Site # 44 - Maynooth – Turlough Hill

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

RSK

Source: GeoHive
Date: 14/11/2019



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Project: Site # 44 - Maynooth - Turlough Hill

Drawing Title: Figure 4 - OSI Historic Map 1888-1913



Source: GeoHive
Date: 14/11/2019



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Project: Site # 44 - Maynooth – Turlough Hill

Drawing Title: Figure 5 GSI Aerial Photo 1995

RSK

Source: GeoHive
Date: 14/11/2019



Prepared For: ESB Engineering and Major Projects

Project: Site # 44 - Maynooth - Turlough Hill

Drawing Title: Figure 6 - GSI Aerial Photo 2000

RSK

Source: GeoHive
Date: 14/11/2019



Prepared For: ESB Engineering and Major Projects

Project: Site # 44 - Maynooth - Turlough Hill

Drawing Title: Figure 7 - GSI Aerial Photo 2005-2012

RSK

Source: GeoHive
Date: 14/11/2019



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:
(44) Maynooth – Turlough Hill

Site walkover

Photo No.
1

Date:
Nov 2019

Direction Photo taken:

Northwest

Description:

View of Turlough Hill Car Park c.100m marker from indicative leak location.



Photo No.
2

Date:
Nov 2019

Direction Photo taken:

Southeast

Description:

The Wicklow Mountain National Park walking trail c.200m marker from indicative leak location. View of Camaderry mountain to the southeast.





PHOTOGRAPHIC LOG

Client Name:
ESB Networks

Site Location:
(44) Maynooth – Turlough Hill

Site walkover

Photo No.
3

Date:
Nov 2019

Direction Photo taken:

Northwest

Description:

400m marker from indicative leak location. The land use is an access path to and from the exclusive pylon zone. Predominantly a bog land.



Photo No.
4

Date:
Aug 2019

Direction Photo taken:
Northwest

Description:

200m marker southeast of the site. Predominantly a bog land.





PHOTOGRAPHIC LOG

Client Name:
ESB Networks

Site Location:
(44) Maynooth – Turlough Hill

Site walkover

Photo No.
5

Date:
Nov 2019

Direction Photo taken:

North

Description:

View of the substation immediately south of the site. The area is surfaced by hard standing concrete and surrounded by Pylons to the north.



Photo No.
6

Date:
Nov 2019

Direction Photo taken:

North

Description:

View of the indicative leak location and pylons. The site is exclusive due to secure fencing surrounding the pylons. No visual or olfactory evidence of contamination was recorded in this location.





PHOTOGRAPHIC LOG

Client Name: ESB Networks	Site Location: (44) Maynooth – Turlough Hill	Site walkover
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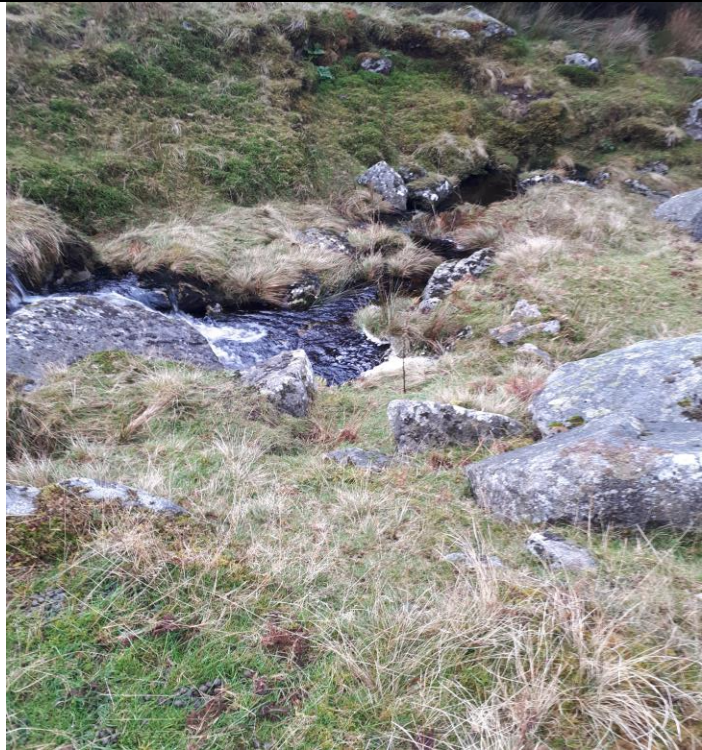
Photo No. 7	Date: Nov 2019
Direction Photo taken: Northwest	

Description:
View to the north west of the indicative leak location. Predominantly a bog land with pylons and overhead cables running in a north west direction. An assumed tributary of the Kings River is also present in this location. This stream is flowing in a downhill gradient in a north west direction.



Photo No. 8	Date: Nov 2019
Direction Photo taken: Northwest	

Description:
View of the King's River flowing in a downhill gradient in a north west direction. The indicative leak location is c.100m south east from this location. No visual or olfactory evidence of contamination was recorded at this location.



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.