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# ESB Networks Historic Cable Fluid Losses: Preliminary Site Assessment

## Location 43: Carrickmines - Pottery Road 110 kV - 2008

*Prepared for*

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Project Number: GCU0257001

May 2020

FINAL

Project Title: ESB Networks Historic Cable Fluid Losses: Preliminary Site Assessment. Location 43: Carrickmines – Pottery Road 110 kV - 2008

Report Ref: GCU0257001/007

Status: Final

Client: ESB Networks  
Engineering & Major Projects  
One Dublin Airport Central  
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Document Production / Approval Record (final documents only)

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## EXECUTIVE SUMMARY

This report presents a preliminary site assessment (PSA) of the potential environmental impacts associated with the historic loss of cable fluid from a section of underground cable located adjacent to the M50 motorway in Carrickmines, Co. Dublin. ESB records indicate that 3,000 litres of cable fluid (linear alkyl benzenes) leaked into the ground from the subject section of cable over an unspecified period during 2008.

The PSA was performed with reference to the EPA's 2013 publication "*Guidance on the Management of Contaminated Land and Groundwater at EPA Licensed Sites*". The EPA's guidance document outlines a staged and risk-based approach to contaminated land and groundwater assessment, with the PSA being the first stage in the process. By its nature the PSA stage is precautionary and conservative, aiming to identify those potential "pollutant linkages" where more detailed assessment is required.

Generally, more detailed assessment is only necessary where the assessed risk to a potential receptor is moderate, high or very high. However, in cases where the potential receptor is particularly sensitive, more detailed assessment may be recommended even if the assessed risk is low.

The findings of the PSA for the subject loss of cable fluid can be summarised as follows:

- The leak location is in an area of open ground immediately north of Junction 15 of the M50 motorway. There is a halting site with a small number of permanent houses and mobile homes approximately 50m east of the leak location. The cable route is indicated to pass within a few metres of the southern boundary of the halting site.
- Topography in the area of the leak location is relatively flat, with ground levels dipping down gently from west to east. The cable route approximately follows the dip direction. Ground levels across the area of open ground surrounding the leak location appear to have been raised by a number of metres during the M50 motorway construction project.
- The bedrock geology underling the leak location is mapped by the GSI as granite. The overburden deposits overlying the bedrock are indicated by the GSI to comprise glacial till, which typically comprises silty clay with subordinate sand and gravel. Based on field observations, ground levels across the subject area appear to have been raised during the construction of the M50 motorway, and as a result, the natural overburden across the area of interest is likely to be overlain by several metres of fill material.
- The groundwater body (GWB) underlying the leak location is known as the "Wicklow" GWB. This GWB covers an area of approximately 600 km<sup>2</sup> covering south Co. Dublin and extending south-west to Donard in Co. Wicklow. The GSI classifies this GWB from a productivity perspective as a "poor" aquifer. Such aquifers are typically unproductive except for local zones. Groundwater flow direction in the area of interest can be expected to be generally towards the east or south-east;

- Vulnerability of the bedrock aquifer from a water quality standpoint is “high” in the area of interest, indicating that the bedrock is at relatively shallow depths;
- With the above migration pathways in mind, the Carrickmines Stream and the bedrock aquifer in the granite bedrock appear to be the two key environmental receptors potentially at risk of impact from the leak of cable fluid from this location. The potential for cable fluid (or some of its constituent compounds) to permeate buried water mains close to the leak location and impact water quality in the water mains also needs to be considered (noting that no evidence of the presence of water mains was noted during the walk-over survey completed during the PSA). However, the low solubility of these compounds and the low rate of permeation are such that they are unlikely to impact water quality in the pipes

A preliminary risk assessment was completed that considered the potential risk posed by the subject leak on the identified potential receptors. The findings of this preliminary risk assessment are summarised in the following table:

Receptor	Risk Category	Comment
Carrickmines Stream including dependent ecosystems	Moderate	<p>Medium/long term risk of pollution of Carrickmines Stream, which flows relatively close to and down-gradient of the leak location. However, it is uncertain that this will occur even over a longer period.</p> <p>There are understood to have been no reports to date of pollution of Carrickmines Stream linked to the subject loss of cable fluid.</p>
Water mains/ Water supply (if present close to the leak location)	Low	<p>Whilst the potential for organic compounds to permeate water mains is known (in particular plastic water pipes and the joints of other types of water pipes), the potential for linear alkyl benzenes to permeate water mains was not established during the PSA.</p> <p>The risk category assumes that cable fluid may be present as residual LNAPL in the water main trench and that there is potential for it to permeate water pipes, but not to the extent that it will impact water quality in the pipes.</p>
Bedrock aquifer	Low	<p>The bedrock is classified as a “poor” aquifer in terms of likely yield. The aquifer vulnerability rating is “high” in the area of the leak location. This means there are expected to be only a thin layer of silty clay soil protecting the aquifer from near-surface contamination close to the leak location.</p> <p>Even if the hydrocarbon compounds making up the cable fluid were to reach the aquifer, they have low solubilities and will biodegrade relatively quickly in aerobic groundwater.</p>

More detailed assessment of the risk to Carrickmines Stream and ecosystems dependent on this water body is required to refine the level of risk to these receptors. Further investigation of the risk to water mains and the bedrock aquifer is not considered necessary.

\* \* \* \* \*

## 1 INTRODUCTION

### 1.1 Project Background

Geosyntec Consultants Ltd (Geosyntec) is pleased to present the Electricity Supply Board (ESB) this Preliminary Site Assessment (PSA), which relates to the potential environmental impacts associated with the historic loss of cable fluid from a section of fluid-filled cable located in Carrickmines, Co. Dublin. The alignment of the subject section of cable and the approximate location of the historic loss of cable fluid is illustrated in ESB Drawing Number QD-354120-01-D460-001-032-002 (Figure 1).

The PSA was completed in accordance with Geosyntec proposal reference 190607 dated June 2019, which was authorised by the ESB on 1<sup>st</sup> July 2019. The PSA was led by Mr Graham Webb, who is an environmental engineer with over 25 years' relevant experience, and Mr Jim Wragg, who is a contaminant hydrogeologist with over 30 years' relevant experience.

ESB Networks operates and maintains a network of High Voltage (HV) underground cables of over 1,600 km across Ireland, of which approximately 205 km (175 km operational) are insulated by a cable fluid. The majority of these fluid-filled cables are located in urban settings across Dublin city and Cork city. The cable fluid acts as an electrical insulator and aids the conduction of heat away from the conductor allowing the cable to be operated more efficiently. The cables are vulnerable to third party interference or damage, and over time, cables can develop leaks due to defects developing in the cable sheath and in joints and terminations. When such leaks occur, there is potential for pollution to arise.

In the case of the section of fluid-filled cable that is the subject of this PSA, ESB records indicate that 3,000 litres of cable fluid leaked into the ground from the cable over an unspecified period of time during 2008.

### 1.2 Objective and Scope of Work

The primary objective of the PSA was to complete a preliminary assessment of the potential types, locations, extent and significance of environmental impacts associated with the subject historic cable fluid loss. The PSA was performed with reference to the EPA's 2013 publication "*Guidance on the Management of Contaminated Land and Groundwater at EPA Licensed Sites*". This PSA report is based on the EPA's guideline template report for PSAs, which is linked to the 2013 guidance.

The EPA's 2013 guidance document outlines a staged approach to contaminated land and groundwater assessment, with the PSA being the first stage in the process. During the PSA stage, the guidance requires the assessor to identify environmental "receptors" - including groundwater and surface water bodies and flora and fauna dependent on them as well as people - who are potentially at risk from the source of contamination, and to qualitatively assess the risk to each environmental receptor by considering the viability of each source-pathway-receptor "pollutant linkage". Those pollutant linkages where there is considered to be a moderate or high risk of impact from the source of contamination, or where the receptor

is particularly sensitive, are identified through this process. These pollutant linkages are then carried forward to the next stage of the process during which more detailed assessment can be completed. Given the above, the PSA stage of the process is precautionary and conservative in nature.

Generally, more detailed assessment is only necessary where the assessed risk to a potential receptor is moderate, high or very high. However, in cases where the potential receptor is particularly sensitive, more detailed assessment may be recommended even if the assessed risk is low.

The PSA for the subject loss of cable fluid was based on a desk study of publicly available information and information provided by the ESB, a walkover survey of the immediate vicinity of the cable within approximately 200 metres of the location of the historic loss of cable fluid, and a reconnaissance of the surrounding area.

Information for the desk study element of the PSA was obtained from the following sources:

- Ordnance Survey Ireland (OSI) website ([www.osi.ie](http://www.osi.ie)): historic maps, historic aerial images, recent “street-view” map;
- Environmental Protection Agency (EPA) websites ([www.epa.ie](http://www.epa.ie) and [www.catchments.ie](http://www.catchments.ie)): locations of EPA-licensed facilities, locations of Natura 2000 sites and National Heritage Areas (NHAs), information on groundwater and surface water quality, including Water Framework Directive (WFD) classifications;
- Geological Survey of Ireland (GSI) website ([www.gsi.ie](http://www.gsi.ie)): overburden and bedrock geology, information on groundwater resources and groundwater vulnerability;
- Office of Public Works (OPW) website ([www.opw.ie](http://www.opw.ie)): flood risk;
- National Waste Collection Permit Office (NWCPO) website ([www.nwcpo.ie](http://www.nwcpo.ie)): register of companies holding waste facility permits or certificates of registration issued by local authorities;
- ESB records outlining the location of the cable fluid loss, the volume of fluid lost and the period over which the fluid loss occurred;
- Safety Data Sheets (SDSs) provided by the ESB for the cable fluids understood to have been used in the subject cable at the time of the cable fluid loss.

The walkover survey and reconnaissance of the area surrounding the subject section of cable was completed by Mr Graham Webb of Geosyntec on 4<sup>th</sup> July 2019. A series of photographs taken at the time of the walkover survey and reconnaissance is included in Appendix A.

During the walkover survey and reconnaissance, information on the following aspects were recorded:

- The environmental setting, with regard to local topography, surface water drainage and the proximity of local surface water courses;

- Land use, in particular the proximity of residential properties and other potentially sensitive land uses close to the subject section of cable;
- The proximity of the subject section of cable to other below-ground infrastructure, such as water mains, gas mains and sewers;
- Distressed vegetation, which may be indicative of subsurface contamination.

Central to the PSA was the development of a preliminary Conceptual Site Model, which presents potential source-pathway-receptor (SPR) linkages identified during the PSA, and a preliminary assessment of the risk posed to identified human or environmental receptors from residual cable fluid potentially remaining in the vicinity of the subject section of cable.

## 2 DETAILS OF LOSS EVENT

### 2.1 Introduction

In the case of the section of fluid-filled cable that is the subject of this PSA, ESB records indicate that 3,000 litres of cable fluid leaked into the ground from the cable over an unspecified period of time during 2008.

The type of fluid understood to have been present in the cable is identified in ESB records as linear alkyl benzenes.

### 2.2 Properties of Cable Fluid

The properties of the linear alkyl benzenes understood to have been used in the subject section of cable over the period of the leak, based on information contained within the Safety Data Sheets provided by ESB, are as follows:

- Boiling point: 280°C
- Flash point: >135°C
- Flammability: Non flammable
- Explosive properties: Not explosive
- Vapour pressure: <0.02 kPa at 20°C
- Density: 0.86 g/cm<sup>3</sup> at 20°C
- Solubility in water: Negligible
- Kinematic Viscosity: 4.2 mm<sup>2</sup>/s

In their 2010 publication “*Classification of Hazardous and Non-Hazardous Substances in Groundwater*”, the EPA classifies all petroleum hydrocarbon compounds listed in the document, including linear alkyl benzenes, as hazardous in groundwater. However, this is on the basis that they are former List I substances and it is stated in the document that these classifications are “under review”. Based on the methodology outlined in the above-mentioned publication (which is based on the persistence, toxicity and potential to bioaccumulate of the substance in the environment) and publicly-available information on its properties, Geosyntec has concluded that linear alkyl benzenes should be classified as non-hazardous in groundwater.

### 2.3 Fate & Transport of Cable Fluid

The fate and transport of cable fluid entering the subsurface during and following the subject leak can be expected to be controlled by the following factors:

- The blend of linear alkyl benzene compounds that make up the cable fluid are less dense than water;
- The cable fluid has a low water solubility (< 1 mg/l);
- The compounds in the cable fluid are semi or non-volatile;
- The compounds present in the cable fluid can be expected to biodegrade but at rates that are controlled by the surface area of the fluid in the subsurface (i.e. in the form of a light non-aqueous phase liquid or LNAPL), its solubility where in contact with groundwater, the availability of electron acceptors and the presence of appropriate microbial populations.

Following creation of a breach in the cable structure, the conceptual model of the dispersion of the cable fluid into the subsurface at the subject location can be described as follows:

- As the cable fluid is less dense than water it will tend to migrate into the pore spaces in the sand bedding around the cable and downward under the force of gravity until it reaches either a water table or low permeability horizon, such as natural clay at the base of the cable trench (if present).
- The cable fluid will tend to spread laterally whilst:
  - There is a driving head provided by leakage of further cable fluid;
  - There is a path of relatively low resistance, e.g. the sand bedding around the cable, potentially permeable fill material in other service trenches that the cable trench intersects, or permeable horizons in the overburden.

The migration potential of the cable fluid released to the subsurface as a result of the subject leak is discussed in more detail in Section 4.

### 3 SITE ENVIRONMENTAL SETTING

#### 3.1 Proximity of Site to Designated Ecologically Sensitive Areas

The National Parks and Wildlife Service on-line mapping tool was consulted to check if the leak location lies close to ecologically sensitive areas. Based on the information reviewed there are no Special Areas of Conservation (SACs - as per the Habitats Directive), Special Protection Areas (SPAs - as per the Birds Directive), or Natural Heritage Areas (NHAs) within a 2 km radius of the leak location.

#### 3.2 Surrounding Land Use & Field Observations

The leak location is situated within an area of open ground to the north of Junction 15 of the M50 motorway near Carrickmines in Co. Dublin (Figure 1). The area of open ground is bounded to the north and west by the Luas Green Line (which is located approximately 100-150m from the leak location), to the south by the carriageway of the M50 motorway and to the east by a halting site, where there are a small number of permanent houses and mobile homes, the closest of which is approximately 50m east of the leak location. The cable route is indicated to pass within a few metres of the southern boundary of the halting site. The halting site is accessed from the west via Ballyogen Glen, along which there are a number of other residential properties.

The earliest historic map available from the OSI's website is dated 1837 - 1842 and shows the leak location to have been pasture land. A road that follows the former alignment of Ballyogen Road (prior to the M50 construction) is shown passing to the south of the leak location. "Meredith Lodge" is indicated at the location of the above-mentioned halting site. A small stream is indicated on the map flowing generally eastward approximately 30m south of the leak location.

The historic map dated 1888 - 1913 shows a similar layout in the vicinity of the leak location to that shown on the earlier map. Approximately 100m north of the leak location a railway line is evident; this is understood to be the Harcourt Street to Bray branch line, which opened in the 1850s and closed in the 1950s.

The earliest aerial image available from OSI's website (other than 19<sup>th</sup> century historical maps) is dated 2000. At this time the area around the leak location was still undeveloped pasture land. The halting site mentioned above is evident on this image with access off Ballyogen Road. A later aerial image dated 2005 - 2012 shows the leak location situated within an extensive area of construction that appears to be associated with the M50 motorway (this section of the motorway opened in 2005).

Based on information from the EPA's and NWCPO's websites there are no facilities in the vicinity of the leak location that operate under an Industrial Emissions licence, an Integrated Pollution Control licence, a Waste licence or a Waste Facility Permit.



### 3.3 Topography & Surface Water

The leak location lies at an elevation of approximately 75 metres above Ordnance Datum. Topography in the area of the leak location is relatively flat, with ground levels dipping down gently from west to east. The cable route approximately follows the dip direction. Ground levels across the area of open ground surrounding the leak location appear to have been raised by a number of metres during the M50 motorway construction project.

Carrickmines Stream is the closest surface water course to the leak location, coinciding with the small stream shown close to the leak location on historical OSI maps. Carrickmines Stream appears to be culverted in the vicinity of the leak location, although it is visible to the south of Ballyogen Grove approximately 200m east of the leak location.

Based on information on the EPA's website and also from historical maps, the line of the culvert runs close to the original stream and flows from west to east approximately 30m south of the leak location and it runs approximately parallel with the cable route to the east of the leak location. The stream discharges into the Shanganagh River approximately 3 km south-east of the area of interest, which in turn discharges to the Irish Sea in the vicinity of Loughlinstown, approximately 5 km from the leak location. The point where the Shanganagh River discharges to the Irish Sea is a proposed NHA (Dalkey Coastal Zone).

The Ballyogen Stream and Glenamuck North Stream are shown on EPA maps to flow generally north-eastwards under the motorway to the south of the leak location, and to join Carrickmines Stream approximately 100m east and downstream of the leak location. From the perspective of WFD classifications, the above streams fall under a single waterway labelled CARRICKMINES STREAM\_010 on EPA maps. This group of waterways is currently deemed to be "at risk" of not meeting WFD objectives, due to significant pressure from diffuse sources of urban run-off. Under the WFD water quality classification scheme, the status of the above waterways based on 2010-2015 monitoring data is "moderate".

According to the OPW's online flood maps the leak location is not in an area that is at risk of flooding.

### 3.4 Geology & Hydrogeology

The bedrock geology underling the leak location is mapped by the GSI as granite. The overburden deposits overlying the bedrock are indicated by the GSI to comprise glacial till, which typically comprises silty clay with subordinate sand and gravel.

The groundwater body (GWB) underlying the leak location is known as the "Wicklow" GWB. This GWB covers an area of approximately 600 km<sup>2</sup> covering south Co. Dublin and extending south-west to Donard in Co. Wicklow. The GSI classifies this GWB from a productivity perspective as a "poor" aquifer. Such aquifers are typically of low yield except for localised more highly fractured zones.

The vulnerability of the bedrock aquifer in the area of the leak location (from a water quality perspective) is classified by the GSI as "high" which suggests that the overlying glacial till is

relatively thin or locally absent and the bedrock is relatively shallow. Groundwater vulnerability in the bedrock aquifer in the vicinity of the leak location can be expected to have been reduced to a degree by the placement of fill material during construction of the M50 motorway.

A search of the GSI's online database indicates that the nearest recorded groundwater well to the leak location is located approximately 1.5 km to the south-east. The well was drilled to a depth of 61.3 m with depth to bedrock indicated to be 39.5 m. The reported yield of the well is "good" at 220 m<sup>3</sup>/d. This well is indicated on GSI maps to lie close to the boundary between the granite and an adjacent bedrock unit, which is more productive. The reported yield for this well indicates it may have intercepted the more productive bedrock.

The EPA is responsible for classifying GWBs in Ireland in terms of water quality and their ability to meet objectives set out in the WFD. Based on the most recent round of EPA monitoring (2010 - 2015), the status of the Wicklow GWB was categorised as "good" and it was categorised as "under review" with regard to meeting WFD objectives.

## 4 CONCEPTUAL SITE MODEL

### 4.1 Introduction

For the purposes of this PSA, it has been assumed that the top of the fluid filled cable is buried at a depth of 0.9 - 1.1m bgl within a backfilled trench that is around 1.2m deep. The trench backfill is assumed to comprise a 0.35 m deep sand layer (0.85m bgl) above which the trench is filled with selected excavated material (most likely silty clay).

It has been assumed that the cable within the area of interest was installed following completion of the earthworks associated with the M50 construction; as such it is expected to lie within the recent fill material that appears was deposited across the area of interest during the M50 construction project.

For the purposes of the PSA, strata adjacent to and below the cable trench in the vicinity of the leak have been assumed to comprise either:

- Medium to low permeability silty clay dominated fill material deposited during the M50 construction project (which is considered likely); or,
- Granular fill material deposited during the M50 construction project; or,
- Low permeability silty clay dominated glacial till.

It has been assumed that perched groundwater may periodically be present within the cable trench in the case that it passes through predominantly low permeability silty clay dominated fill material.

## 4.2 Source & Potential Migration Pathways

Assuming the presence of low permeability of fill or glacial till material in the vicinity of the leak location, cable fluid lost to ground in this case can be expected to have spread laterally within the permeable sand bedding within the cable trench. If the cable trench intersects more permeable material (e.g. lenses of more permeable sands or gravels, or another in-filled services trench) this could result in cable fluid migrating from the line of the cable trench and along a different route or routes.

We have developed a series of indicative estimates for the subject leak location under different ground condition scenarios, with regard to the extent of cable fluid migration. These estimates have assumed that the cable is installed within a 0.35m thick sand bedding and surround layer in a trench 1.1m wide cut into low permeability clay soils, which can be expected at the subject location.

- In the case where (i) the sand bedding is dry, (ii) the cable fluid saturation reaches 40% residual saturation of the pore space in the sand bedding, and (iii) the cable fluid does not migrate into the overlying back-fill material, the theoretical length of trench impacted by LNAPL migration is 97m. Given that the topography locally along the cable route slopes down generally towards the east, there appears to be potential for cable fluid to migrate preferentially in this direction along the line of the cable trench from the leak location;
- In the event that the base of the trench contains perched water then this would lower the LNAPL saturation in the sand layer surrounding the cable. This could result in LNAPL migration through the back-fill material above the sand bedding layer, if it is sufficiently permeable. The thickness of LNAPL-saturated soils will likely be less under this scenario than that outlined above, but the cable fluid may spread further. If a 40% residual cable fluid saturation is assumed in granular backfill material over a 0.2m thickness, this would lead to a theoretical length of trench impacted by cable fluid of 170m;
- The third scenario considered herein is where the cable trench near the leak point passes through an area of granular material. Here a more radial spreading of the cable fluid could occur. If a 0.2m deep soil zone is impacted with a LNAPL saturation of 40% then the theoretical radius of cable fluid LNAPL impact away from the release would be 8 metres. Based on the local topography, there is potential for the migration of cable fluid under this scenario to be preferentially towards the east;
- The cable fluid may have some semi-volatile components (linear alkyl benzenes) and as such will generate a modest vapour pressure. However, given the absence of potential confined spaces in the vicinity of the leak location, this is not considered a viable pathway;
- Cable fluid has the potential to migrate from the source to underneath confined spaced receptors (such as building cellars), either in LNAPL form or via migration in the dissolved phase in groundwater flow following dissolution from the LNAPL. As the cable route lies down-topographic gradient of the halting site, the potential for cable fluid to migrate towards the buildings on the halting site is low. As such, it is not considered necessary to assess this pathway in the subject case.

In addition to the above scenarios, the following potential migration pathways have been considered as part of the PSA, but they were not carried forward to the preliminary risk assessment because the source-pathway-receptor (SPR) linkage was not considered viable:

- Soil and dust ingestion from near surface soils;
- Dermal contact with near surface soils;
- Inhalation of fugitive dust from near surface soils; and
- Ingestion of soils via consumption of vegetables grown in near surface soils.

### 4.3 Potential Receptors

With the above migration pathways in mind, the Carrickmines Stream, flora and fauna dependent on this water body, and the bedrock aquifer in the granite bedrock appear to be the key environmental receptors potentially at risk of impact from the leak of cable fluid from this location.

The potential for cable fluid (or some of its constituent compounds) to permeate buried water mains close to the leak location and impact water quality in the water mains also needs to be considered (noting that no evidence of the presence of water mains was noted during the walk-over survey completed during the PSA). However, the low solubility of these compounds and the low rate of permeation are such that they are unlikely to impact water quality in the pipes.

Residents of the nearby halting site have not been considered potential receptors, on the basis that there is no viable exposure pathway linking the source to this group of potential receptors.

Groundworks contractors performing future tasks in the vicinity of the leak location could also be considered potential receptors (via direct contact, inhalation and ingestion pathways). However, it has been assumed that the potential risks posed to future groundworks contractors would be adequately mitigated through effective health and safety planning and work control procedures at the time the works are being carried out. As a result, groundworks contractors have not been considered potential receptors in the preliminary risk assessment presented in the following section.

## 5 PRELIMINARY RISK ASSESSMENT

The key potential source-pathway-receptor (SPR) linkages associated with the subject loss of cable fluid are presented in this section, together with a preliminary assessment of the risk posed to the identified receptors. The preliminary risk assessment is based on the methodology outlined in CIRIA C552 (2001) “*Contaminated Land Risk Assessment – A Guide to Good Practice*”. This methodology requires the classification of the magnitude of the **consequence** (severity) of a risk occurring, and the **probability** of a risk occurring. The risk assessment methodology is summarised in Tables 1 – 4 below.

The potential consequences of contamination risks occurring are classified in accordance with Table 1.

**Table 1: Classification of Consequence**

Classification	Definition of Consequence
Severe	<ul style="list-style-type: none"> <li>• Short-term (acute) risk to human health likely to result in significant harm.</li> <li>• Short-term risk of pollution of sensitive water resource.</li> <li>• Catastrophic damage to buildings/property.</li> <li>• A short-term risk to a particular ecosystem, or organism forming part of such ecosystem.</li> </ul>
Medium	<ul style="list-style-type: none"> <li>• Chronic damage to human health.</li> <li>• Pollution of sensitive water resources.</li> <li>• A significant change in a particular ecosystem, or organism forming part of such ecosystem.</li> </ul>
Mild	<ul style="list-style-type: none"> <li>• Pollution of non-sensitive water resources.</li> <li>• Significant damage to crops, buildings, structures and services.</li> <li>• Damage to sensitive buildings/structures/services or the environment.</li> </ul>
Minor	<ul style="list-style-type: none"> <li>• Harm, although not necessarily significant harm, which may result in a financial loss, or expenditure to resolve.</li> <li>• Non-permanent health effects to human health (easily prevented by means such as personal protective clothing etc.)</li> <li>• Easily repairable effects of damage to buildings, structures and services.</li> </ul>

The probability of contamination risks occurring are classified in accordance with Table 2.

**Table 2: Classification of Probability**

Classification	Definition of Probability
High Likelihood	Circumstances are such that an event appears very likely in the short-term or almost inevitable in the long-term; or there is already evidence that such an event has occurred.
Likely	Circumstances are such that such an event is not inevitable but is possible in the short-term and is likely over the long-term.
Low Likelihood	Circumstances are such that it is by no means certain that an event would occur even over a longer period, and it is less likely in the short-term.
Unlikely	Circumstances are such that it is improbable that an event would occur even in the very long-term.

For each viable SPR linkage, the potential risks are evaluated, as presented in Table 3.

Definitions of the risk categories, together with the investigatory and remedial actions that may be necessary in each case are presented in Table 4.

**Table 3: Risk Matrix**

		Severe	Medium	Mild	Minor
Probability	High likelihood	Very high risk	High risk	Moderate risk	Low risk
	Likely	High risk	Moderate risk	Moderate risk	Low risk
	Low likelihood	Moderate risk	Moderate risk	Low risk	Very low risk
	Unlikely	Low risk	Low risk	Very low risk	Very low risk

**Table 4: Definition of Risk Categories and Likely Actions Required**

Risk Category	Definition and likely actions required
Very high	<p>There is a high probability that severe harm could arise to a designated receptor from an identified hazard OR there is evidence that severe harm to a designated receptor is currently happening.</p> <p>This risk, if realised, is likely to result in a substantial liability.</p> <p>Urgent investigation (if not undertaken already) and remediation are likely to be required.</p>
High	<p>Harm is likely to arise to a designated receptor from an identified hazard.</p> <p>Realisation of the risk is likely to present a substantial liability.</p> <p>Urgent investigation (if not undertaken already) is required and remedial works may be necessary in the short term and are likely over the longer term.</p>
Moderate	<p>It is possible that harm could arise to a designated receptor from an identified hazard. However, it is relatively unlikely that any such harm would be severe. If any harm were to occur, it is more likely that the harm would be relatively mild.</p> <p>Investigation (if not already undertaken) is normally required to clarify the risk and to determine the potential liability. Some remedial works may be required in the longer term.</p>
Low	<p>It is possible that harm could arise to a designated receptor from an identified hazard, but it is likely that this harm, if realised, would at worst be mild.</p>
Very low	<p>There is a low possibility that harm could arise to a receptor. In the event of such harm being realised, it is not likely to be severe.</p>

The key potential SPR linkages associated with the subject loss of cable fluid are presented in Table 5 below, together with a preliminary assessment of the risk posed to the identified receptors in each case, in line with the above methodology.

Table 5: Preliminary Risk Assessment for Location 43

Source	Potential Pathway	Receptor	Consequence	Probability	Risk Category	Comment
Loss of cable fluid (linear alkyl benzenes) over an unspecified period during 2008 (estimated 3,000 litres).	Predominantly lateral migration of cable fluid from the leak location along the cable trench, and/or through granular lenses within the surrounding fill material.	Carrickmines Stream  Ecosystems dependent on this water body	Medium	Likely	Moderate	Medium/long term risk of pollution of Carrickmines Stream, which flows relatively close to and down-gradient of the leak location. However, it is uncertain that this will occur even over a longer period.  There are understood to have been no reports to date of pollution of Carrickmines Stream linked to the subject loss of cable fluid.
	Predominantly lateral migration of cable fluid from the leak location along the cable trench, and/or through granular lenses within the overburden, and subsequent migration into backfilled trenches containing water mains (if present). Permeation of constituents of the cable fluid through the walls or joints of the water mains.	Water mains/ Water supply	Medium	Unlikely	Low	Whilst the potential for organic compounds to permeate water mains is known (in particular plastic water pipes and the joints of other types of water pipes), the potential for linear alkyl benzenes to permeate water mains was not established during the PSA.  The risk category assumes that cable fluid may be present as residual LNAPL in the water main trench and that there is potential for it to permeate water pipes. However, the low solubility of linear alkyl benzenes and the expected low rate of permeation are such that they are unlikely to impact water quality in the pipes.



Table 5: Preliminary Risk Assessment for Location 43

Source	Potential Pathway	Receptor	Consequence	Probability	Risk Category	Comment
(as above)	Vertical migration of cable fluid via permeable lenses in the overburden and/or via granular material in in-filled services trenches to groundwater in the bedrock aquifer, followed by dissolution of cable fluid and generation of a dissolved-phase plume of alkyl benzenes in the bedrock aquifer.	Bedrock aquifer	Mild	Low Likelihood	Low	The bedrock is classified as a “poor” aquifer. Vulnerability rating is “high” in the area of the leak location. This means there are expected to be several metres of silty clay soil protecting the aquifer from near-surface contamination close to the leak location.  Even if the hydrocarbon compounds making up the cable fluid were to reach the aquifer, they have low solubilities and will biodegrade relatively quickly in aerobic groundwater.

## 6 CONCLUSIONS

The following conclusions have been drawn based on the information reviewed and observations made during this PSA:

- The leak location is in an area of disused open ground north of the M50 motorway in Carrickmines, Co. Dublin. Ground levels across the area of interest appear to have been raised by a number of metres during construction of the M50 motorway;
- The topography of the area in the vicinity of the leak location dips down gradually towards the east. The cable route approximately follows the dip direction;
- Carrickmines Stream is located approximately 30m south of the leak location and flows towards the east, generally parallel with the cable route;
- The key receptors potentially at risk of impact from the subject leak are considered to be Carrickmines Stream, ecosystems dependent on this water body, the bedrock aquifer underlying the area, and potentially water mains (if present) in the vicinity of the leak location;
- Following the preliminary risk assessment methodology outlined in CIRIA publication C552 (2001), the appropriate risk category for these potential receptors and the associated SPR linkages are considered to be:
  - Carrickmines Stream - Moderate
  - Water mains - Low
  - Bedrock aquifer - Low

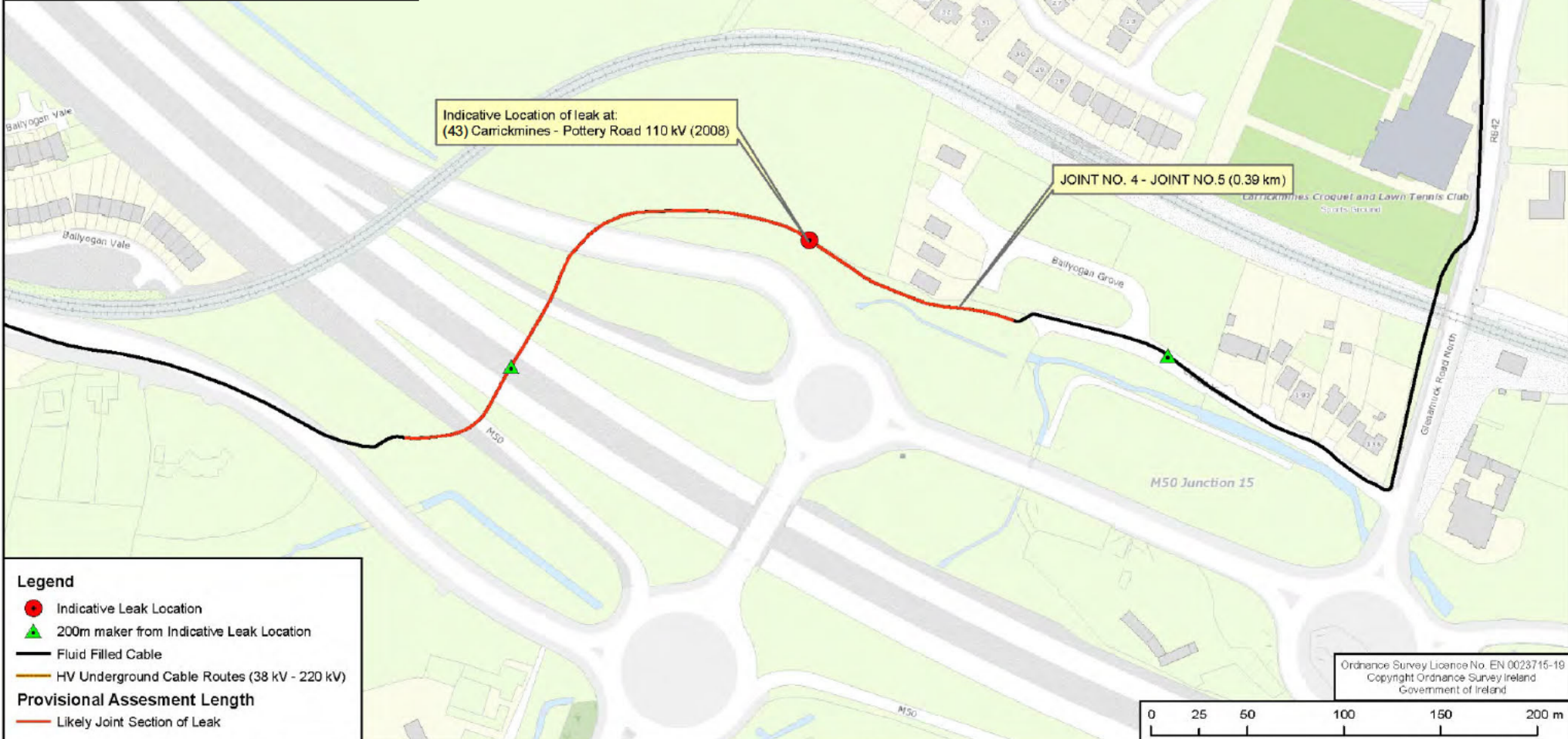
More detailed assessment of the risk to Carrickmines Stream and ecosystems dependent on this water body is required to refine the level of risk to this receptor. Further investigation of the risk to water mains and the bedrock aquifer is not considered necessary.

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**Figure 1 - Site Location No. 43**

Carrickmines, Co. Dublin	GCU0257001	
<b>Geosyntec</b> consultants	ESB	Figure <b>1</b>
Dublin, Ireland	October 2019	



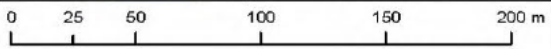
**Legend**

- Indicative Leak Location
- ▲ 200m maker from Indicative Leak Location
- Fluid Filled Cable
- HV Underground Cable Routes (38 kV - 220 kV)
- Likely Joint Section of Leak

**Provisional Assesment Length**

- Likely Joint Section of Leak

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2	2019/06	REFINEMENT OF SPATIAL DATA	TOR	TOR	J.F	A.M.C
1	2019/05	ADDITIONAL SPATIAL INFORMATION ADDED	TOR	TOR	J.F	A.M.C
0	2019/04	REQUEST FOR PROPOSAL	TOR	TOR	J.F	A.M.C
REV	DATE	REVISION DESCRIPTION	DRN	PROG	VER	APP

CLIENT APPROVAL  PLANNING  TENDER  CONSTRUCTION  AS-BUILT

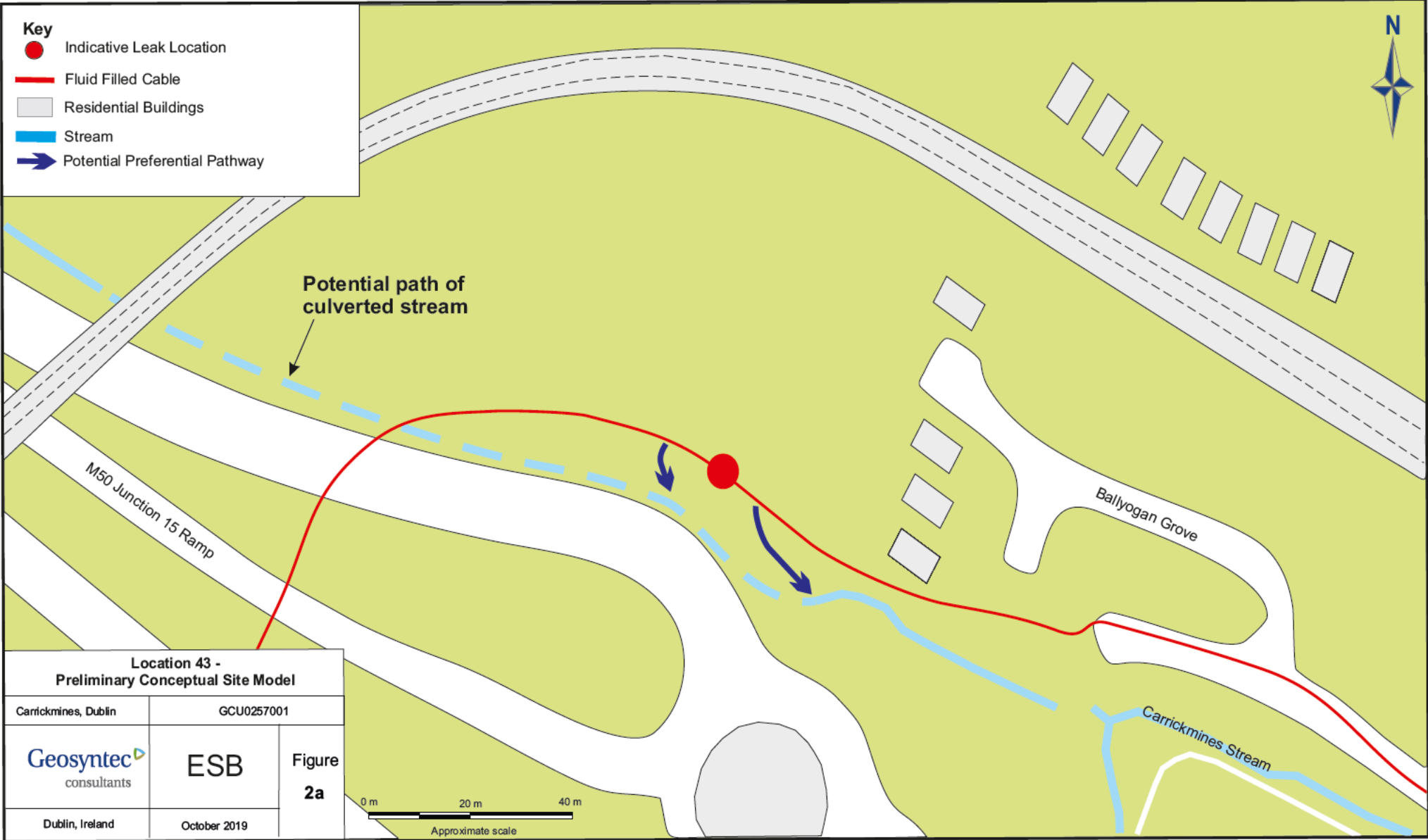
**ESB**  
Energy for generations

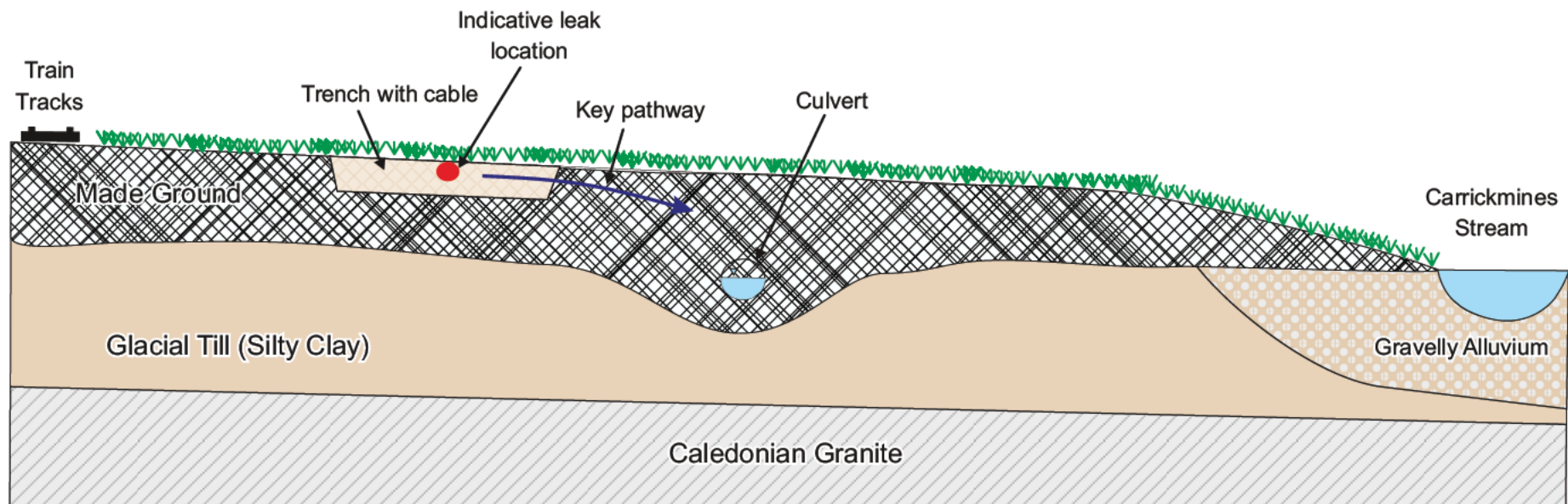
Engineering and Major Projects,  
One Dublin Airport Central,  
Dublin Airport, Cloughran,  
Co. Dublin, K67 XF72, Ireland.  
Tel: 353 1 703 8000 Web: www.esb.ie  
Engineering and Major Projects is a  
division of ESB.

CLIENT:	<b>ESB Networks</b>
PROJECT:	<b>P.R.A.</b>
CONTRACT:	

PRODUCTION UNIT:	<b>Civil &amp; Environmental Engineering</b>
DRAWING TITLE:	<b>Indicative Cable Fluid Leakage Locations &amp; Cable Sections (28) Carrickmines - Pottery Road 110 kV (2008)</b>

<small>ISSUED TO THE CLIENT FOR ALL INFORMATION AND TO BE USED FOR THE PROJECT ONLY. THE CLIENT IS RESPONSIBLE FOR THE ACCURACY OF THE INFORMATION PROVIDED. THE CLIENT IS NOT RESPONSIBLE FOR THE ACCURACY OF THE INFORMATION PROVIDED. THE CLIENT IS NOT RESPONSIBLE FOR THE ACCURACY OF THE INFORMATION PROVIDED.</small>									
DRAWN:	T.O'Rourke	PRODUCED:	T.O'Rourke	VERIFIED:	J. Fitzpatrick	APPROVED:	A.M. Casey	APPROVAL DATE:	28/06/2019
CLIENT REF.:	00-00	Revision:	2	NO. OF SHEETS:	1 of 1	SIZE:	A3	SCALE:	1:2,000
DRAWING NUMBER:		<b>QD-354120-01-D460-001-032-002</b>							





North-West

South-East

Location 43 - Preliminary Conceptual Site Model		
Carrickmines, Dublin	GCU0257001	
Geosyntec consultants	ESB	Figure 2b
Dublin, Ireland	October 2019	

Appendix A - Photolog

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**Photograph 1 – Vicinity of historic leak (looking east)**



**Photograph 2 – Area west of leak location (looking east)**





**Photograph 3 – Cable route west of Ballyogen Grove (looking west)**



**Photograph 4 – View west along Ballyogen Grove**

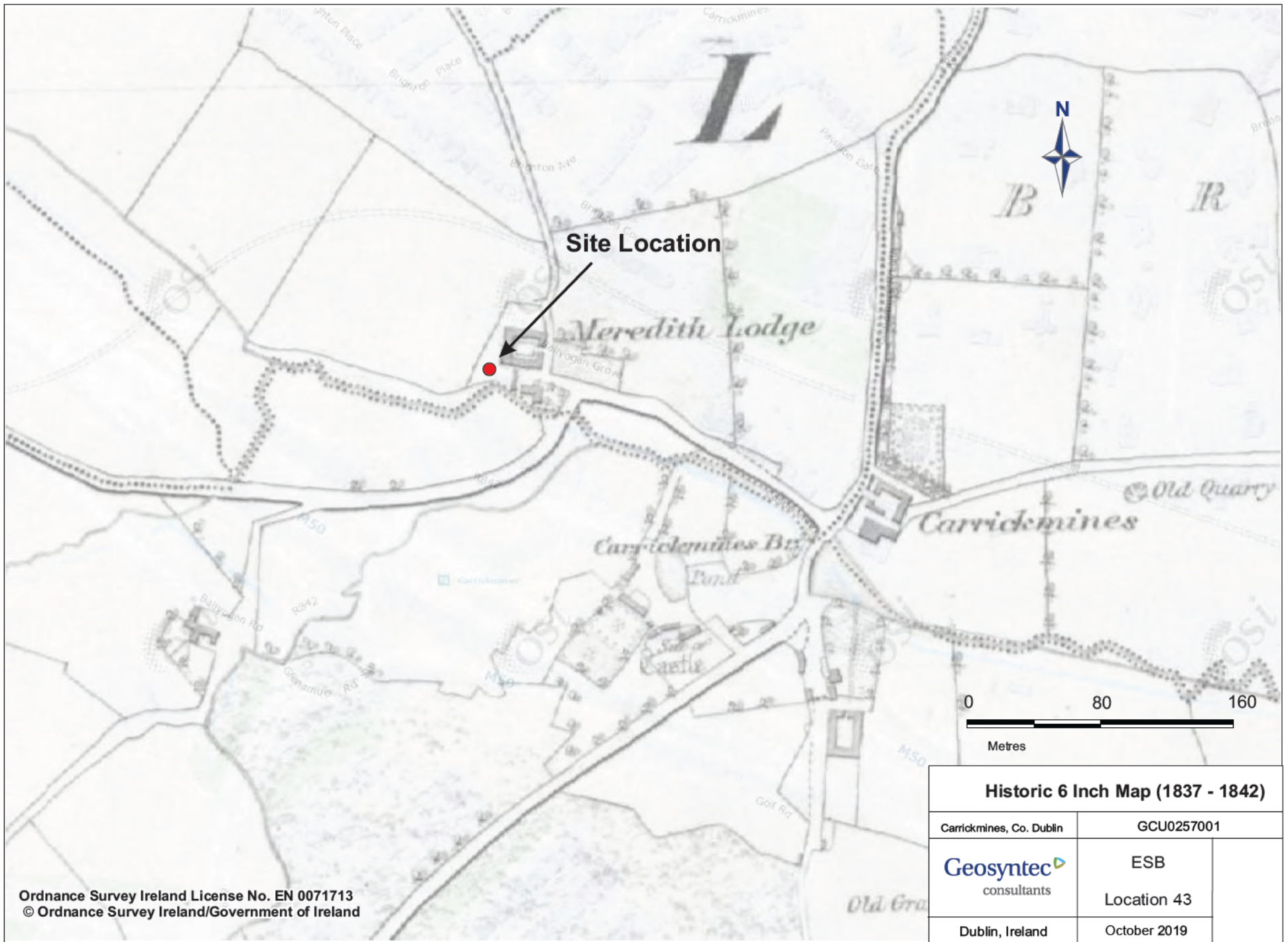


**Photograph 5 – Stream adjacent to Ballyogen Grove  
(no visual evidence of impact observed)**

Appendix B – Historical Maps and Aerial Images

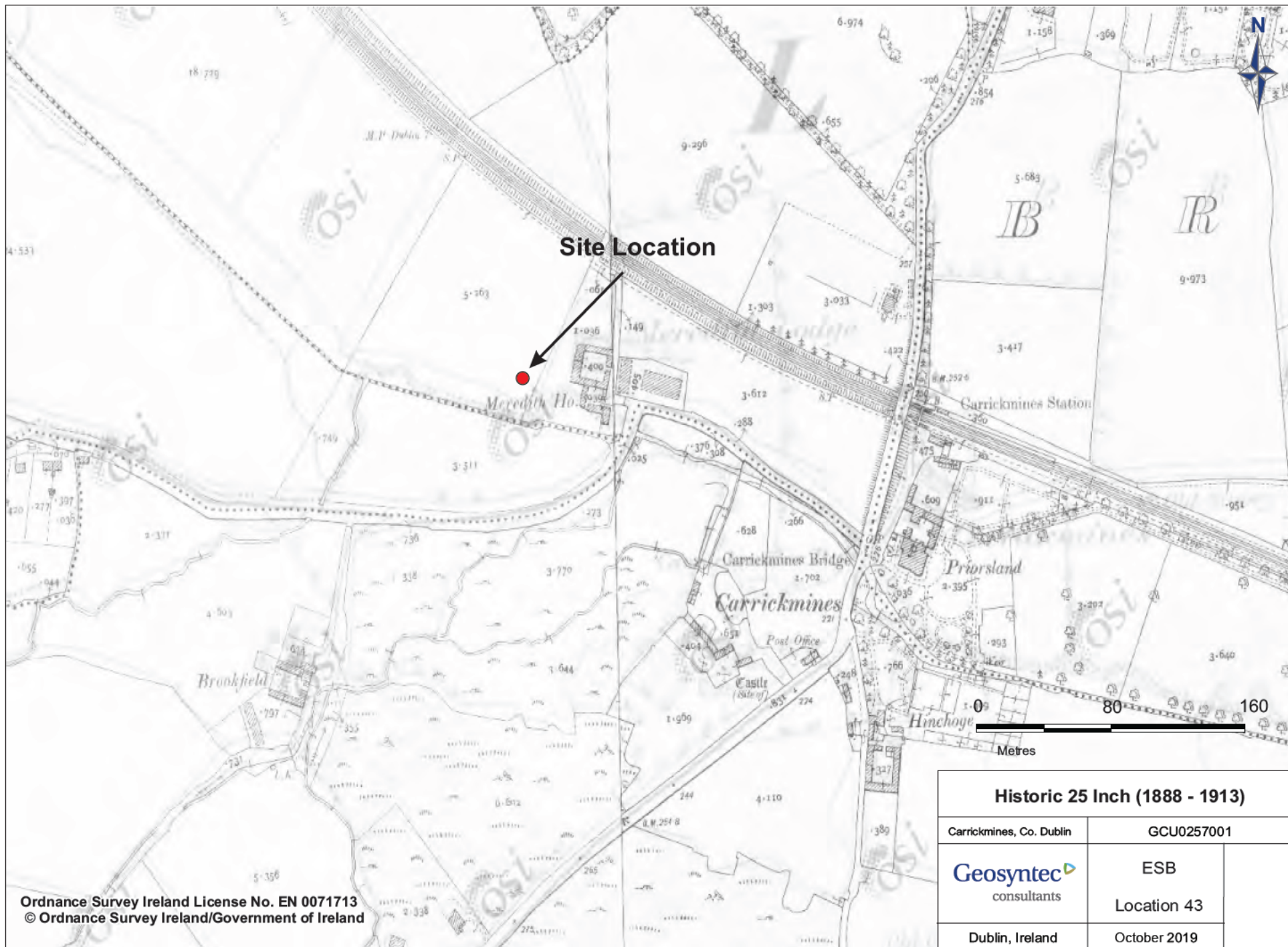
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Historic 6 Inch Map (1837 - 1842)	
Carrickmines, Co. Dublin	GCU0257001
Geosyntec consultants	ESB Location 43
Dublin, Ireland	October 2019



Historic 25 Inch (1888 - 1913)	
Carrickmines, Co. Dublin	GCU0257001
Geosyntec consultants	ESB Location 43
Dublin, Ireland	October 2019

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Site Location

0 80 160  
Metres

**Present Day Aerial image**

Carrickmines, Co. Dublin	GCU0257001
<b>Geosyntec</b> consultants	ESB
	Location 43
Dublin, Ireland	October 2019

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Appendix C - Safety Data Sheet for Cable Fluid

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**Safety Data Sheet**

according to Regulation (EC) No 1907/2006

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**SECTION 1: Identification of the substance/mixture and of the company/undertaking****1.1. Product identifier**

T 3788

CAS No: 67774-74-7

EC No: 267-051-0

**1.2. Relevant identified uses of the substance or mixture and uses advised against****Use of the substance/mixture**

ES1 - Industrial use of intermediates.

Sector of uses [SU]:

SU3: Industrial uses: Uses of substances as such or in preparations at industrial sites

Environmental release categories [ERC]:

ERC 6a: Use of intermediate

Process categories [PROC]:

PROC 2: Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions

ES2 - Formulation &amp; (re)packing of substances and mixtures - Industrial uses

Sector of uses [SU]:

SU3: Industrial uses: Uses of substances as such or in preparations at industrial sites

Environmental release categories [ERC]:

ERC 2: Formulation into mixture (mixtures)

Process categories [PROC]:

PROC 1: Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions

PROC 2: Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions

PROC 3: Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment condition

PROC 4: Mixing or blending in batch processes

PROC 5: Mixing or blending in batch processes

PROC 8a: Transfer of substance or mixture (charging and discharging) at non-dedicated facilities

PROC 8b: Transfer of substance or mixture (charging and discharging) at dedicated facilities

PROC 9: Transfer of substance or mixture into small containers (dedicated filling line, including weighing)

PROC 15: Use as laboratory reagent.

ES03 - Use in cable oil - industrial use

Sector of uses [SU]:

SU3: Industrial uses: Uses of substances as such or in preparations at industrial sites

Environmental release categories [ERC]:

ERC 5: Use at industrial site leading to inclusion into/onto article

ERC 7: Use of functional fluid at industrial site

Process categories [PROC]:

PROC 13: Treatment of articles by dipping and pouring

**Uses advised against**

none

**1.3. Details of the supplier of the safety data sheet**

Company name: H&amp;R ChemPharm (UK) Limited

Street: Dudley Road

Place: GB-DY4 8EH Tipton, West Midlands

Telephone: +441215220100

Telefax: +441215220116

e-mail: info.uk@hur.com

Responsible Department: Technical/Commercial Enquiries



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**1.4. Emergency telephone number:** +44(0)2078580111

**SECTION 2: Hazards identification****2.1. Classification of the substance or mixture****Regulation (EC) No 1272/2008**

Hazard categories:

Aspiration hazard: Asp. Tox. 1

Hazard Statements:

May be fatal if swallowed and enters airways.

**2.2 Label element****Regulation (EC) No. 1272/2008****Signal word:** Danger**Pictograms:****Hazard statements**

H304 May be fatal if swallowed and enters airways.

**Precautionary statements**

P301+P310 IF SWALLOWED: Immediately call a POISON CENTER/doctor.

P331 Do NOT induce vomiting.

P501 Dispose of contents/container to local/regional/national/international regulations.

**2.3. Other hazards**

This substance does not meet the PBT/vPvB criteria of REACH, Annex XIII.

**SECTION 3: Composition/information on ingredients****3.1. Substances****Hazardous components**

CAS No	Chemical name	Quantity		
	EC No	Index No	REACH No	
	Classification according to Regulation (EC) No. 1272/2008 [CLP]			
67774-74-7	Benzene, C10-13-alkyl derivs.			100 %
	267-051-0			
	Asp. Tox. 1; H304			

Full text of H and EUH statements: see section 16.

**SECTION 4: First aid measures****4.1. Description of first aid measures****General information**

In case of accident or unwellness, seek medical advice immediately (show directions for use or safety data sheet if possible).

**After inhalation**

In case of accident by inhalation: remove casualty to fresh air and keep at rest. In all cases of doubt, or when symptoms persist, seek medical advice.



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**After contact with skin**

After contact with skin, wash immediately with plenty of water and soap. Take off immediately all contaminated clothing. In case of skin irritation, consult a physician.

**After contact with eyes**

Rinse immediately carefully and thoroughly with eye-bath or water. In case of troubles or persistent symptoms, consult an ophthalmologist.

**After ingestion**

Do NOT induce vomiting. Rinse mouth thoroughly with water. Let water be drunken in little sips (dilution effect). Observe risk of aspiration if vomiting occurs. Never give anything by mouth to an unconscious person or a person with cramps. When in doubt or if symptoms are observed, get medical advice.

**4.2. Most important symptoms and effects, both acute and delayed**

If swallowed or in the event of vomiting, risk of entering the lungs.

**4.3. Indication of any immediate medical attention and special treatment needed**

Treat symptomatically.

**SECTION 5: Firefighting measures****5.1. Extinguishing media****Suitable extinguishing media**

Sand. Foam. Carbon dioxide (CO<sub>2</sub>). Extinguishing powder. In case of major fire and large quantities: Water spray jet. Water mist.

**Unsuitable extinguishing media**

Full water jet

**5.2. Special hazards arising from the substance or mixture**

Burning produces heavy smoke.

Can be released in case of fire: Carbon monoxide Carbon dioxide (CO<sub>2</sub>) Sulphur dioxide (SO<sub>2</sub>) Nitrogen oxides (NO<sub>x</sub>)

**5.3. Advice for firefighters**

In case of fire and/or explosion do not breathe fumes. In case of fire: Wear self-contained breathing apparatus.

**Additional information**

Collect contaminated fire extinguishing water separately. Do not allow entering drains or surface water. Co-ordinate fire-fighting measures to the fire surroundings.

**SECTION 6: Accidental release measures****6.1. Personal precautions, protective equipment and emergency procedures**

Wear personal protection equipment (refer to section 8).

Ventilate affected area.

Special danger of slipping by leaking/spilling product.

**6.2. Environmental precautions**

Do not allow to enter into surface water or drains. Prevent spread over a wide area (e.g. by containment or oil barriers). Do not allow to enter into soil/subsoil.

**6.3. Methods and material for containment and cleaning up**

Absorb with liquid-binding material (e.g. sand, diatomaceous earth, acid- or universal binding agents).

Treat the recovered material as prescribed in the section on waste disposal.

Clean contaminated articles and floor according to the environmental legislation.

**6.4. Reference to other sections**

No information available.

**SECTION 7: Handling and storage**

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**7.1. Precautions for safe handling****Advice on safe handling**

Wear suitable protective clothing. ( See section 8. )  
Avoid formation of oil dust.

**Advice on protection against fire and explosion**

Usual measures for fire prevention. Keep away from sources of ignition - No smoking.  
Fire class B

**Further information on handling**

Do not breathe vapour/aerosol.  
Avoid contact with eyes and skin.  
Advices on general occupational hygiene: See section 8.

**7.2. Conditions for safe storage, including any incompatibilities****Requirements for storage rooms and vessels**

Keep container tightly closed in a cool, well-ventilated place. Only use containers specifically approved for the substance/product.

**Advice on storage compatibility**

Do not store together with: Gas. Explosives. Radioactive substances. Infectious substances

**Further information on storage conditions**

Temperature control required. Protect from light. Keep container tightly closed. Do not allow contact with air.

**7.3. Specific end use(s)**

refer to chapter 1.

**SECTION 8: Exposure controls/personal protection****8 1 Control parameter****DNEL/DMEL values**

CAS No	Substance	Exposure route	Effect	Value
67774-74-7	Benzene, C10-13-alkyl derivs.			
Worker DNEL, long-term		inhalation	systemic	7 mg/m <sup>3</sup>
Worker DNEL, long-term		inhalation	local	7 mg/m <sup>3</sup>
Worker DNEL, long-term		dermal	systemic	9,6 mg/kg bw/day
Consumer DNEL, long-term		inhalation	systemic	1,8 mg/m <sup>3</sup>
Consumer DNEL, long-term		inhalation	local	1,8 mg/m <sup>3</sup>
Consumer DNEL, long-term		dermal	systemic	4,8 mg/kg bw/day
Consumer DNEL, long-term		oral	systemic	0,5 mg/kg bw/day

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**PNEC values**

CAS No	Substance	Value
Environmental compartment		
67774-74-7	Benzene, C10-13-alkyl derivs.	
Freshwater		0,001 mg/l
Freshwater (intermittent releases)		0 mg/l
Marine water		0 mg/l
Freshwater sediment		1,65 mg/kg
Marine sediment		0,165 mg/kg
Micro-organisms in sewage treatment plants (STP)		14,2 mg/l
Soil		0,329 mg/kg

**Additional advice on limit values**

Air limit values::

Possibility of exposure to Aerosol

Limit value = 5 mg/ m<sup>3</sup> - Source: ACGIH**8.2. Exposure controls****Appropriate engineering controls**

Provide adequate ventilation.

**Protective and hygiene measures**

Clean skin thoroughly after working.

Do not put any product-impregnated cleaning rags into your trouser pockets.

When using do not eat, drink or smoke.

**Eye/face protection**

Safety goggles with side protection. In case of increased risk add protective face shield. DIN EN 166

**Hand protection**

Use safety gloves of following materials: NBR (nitrile) / neopren / viton (permeationslevel 5 - 6), Cat. II according to norm EN 347/EN 388.

The quality of the protective gloves resistant to chemicals must be chosen as a function of the specific working place concentration and quantity of hazardous substances.

For special purposes, it is recommended to check the resistance to chemicals of the protective gloves mentioned above together with the supplier of these gloves.

**Skin protection**

Oil-resistant and hardly inflammable protective clothing.

**Respiratory protection**

With correct and proper use, and under normal conditions, breathing protection is not required.

Respiratory protection necessary at:

-aerosol or mist formation

-exceeding exposure limit values

Suitable respiratory protection apparatus: Respiratory equipment in case of nebulosity or aerosol: Use a mask with a filter type A2, A2/P2 or ABEK.

The filter class must be suitable for the maximum contaminant concentration (gas/vapour/aerosol/particulates) that may arise when handling the product. If the concentration is exceeded, self-contained breathing apparatus must be used.

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**Environmental exposure controls**

No information available.

**SECTION 9 Physical and chemical properties****9.1. Information on basic physical and chemical properties**

Physical state: Liquid  
Colour: colourless  
Odour: characteristic

**Test method**

pH-Value: No information available.

**Changes in the physical state**

Melting point: -39 °C  
Initial boiling point and boiling range: >260 °C  
Sublimation point: No information available.  
Softening point: No information available.  
Pour point: > -60 °C ASTM D 97-66  
Flash point: >130 °C ASTM D 93  
Sustaining combustion: No data available

**Flammability**

Solid: No information available.  
Gas: No information available.

**Explosive properties**

none

Lower explosion limits: No information available.  
Upper explosion limits: No information available.  
Ignition temperature: No information available.

**Auto-ignition temperature**

Solid: No information available.  
Gas: No information available.

Decomposition temperature: No information available.

**Oxidizing properties**

none

Vapour pressure: 0,013 hPa ASTM D 323  
(at 25 °C)Vapour pressure: No information available.  
(at 50 °C)Density: 0,85-0,88 g/cm<sup>3</sup> ASTM D 1298

Bulk density: No information available.

Water solubility: Immiscible

**Solubility in other solvents**

No information available.

Partition coefficient: No information available.

Viscosity / dynamic: No information available.

Viscosity / kinematic: 4,0-4,5 mm<sup>2</sup>/s ASTM D 445  
(at 40 °C)

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Flow time: No information available.  
Vapour density: No information available.  
Evaporation rate: No information available.  
Solvent separation test: No information available.  
Solvent content: No information available.

**9.2. Other information**

Solid content: No information available.

**SECTION 10 Stability and reactivity****10.1. Reactivity**

No information available.

**10.2. Chemical stability**

Stable at ambient temperature.

**10.3. Possibility of hazardous reactions**

No hazardous reactions known.

**10.4. Conditions to avoid**

No information available.

**10.5. Incompatible materials**

Oxidising agent, strong

**10.6. Hazardous decomposition products**

No hazardous decomposition products known.

**SECTION 11: Toxicological information****11.1. Information on toxicological effects****Toxicokinetics, metabolism and distribution**

No information available.

**Acute toxicity**

Based on available data, the classification criteria are not met.

CAS No	Chemical name				
	Exposure route	Dose	Species	Source	Method
67774-74-7	Benzene, C10-13-alkyl derivs.				
	oral	LD50 > 5000 mg/kg	Rat	ECHA Dossier	EEC Directive 67/548
	dermal	LD50 > 2000 mg/kg	Rat	ECHA Dossier	OECD Guideline 402

**Irritation and corrosivity**

Based on available data, the classification criteria are not met.

**Sensitising effects**

Based on available data, the classification criteria are not met.  
May cause sensitisation especially in sensitive humans.

**Carcinogenic/mutagenic/toxic effects for reproduction**

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Based on available data, the classification criteria are not met.

Reproductive toxicity:

Method: OECD Guideline 416 (Two-Generation Reproduction Toxicity Study)

Species: Rat

Result: NOEL = 50 mg/kg (P0), 50 mg/kg (F1), 50 mg/kg (F2); Literature information: ECHA Dossier

Developmental toxicity/teratogenicity: Method: OECD Guideline 414 (Prenatal Developmental Toxicity Study);

Species: Rat; Result: NOAEL = 125 mg/kg (embryotoxicity); Literature information: ECHA Dossier; Reproductive toxicity:

**STOT-single exposure**

Based on available data, the classification criteria are not met.

**STOT-repeated exposure**

Based on available data, the classification criteria are not met.

**Apiration hazard**

May be fatal if swallowed and enters airway (Benzene, C10-13 alkyl deriv.)

**Practical experience****Other observations**

Frequent contact specially if dried out may cause skin and eye irritations.

**SECTION 12: Ecological information****12.1. Toxicity**

If this product contains phenol, dodecyl, branched (EC No. 310-154-3), this product is not to be classified as dangerous for the environment. Raw materials containing this substance have not been classified by our suppliers as hazardous to the environment on the basis of test data, expert judgement or analogy assessments.

CAS No	Chemical name						
	Aquatic toxicity	Dose	[h]   [d]	Species	Source	Method	
67774-74-7	Benzene, C10-13-alkyl derivs.						
	Acute algae toxicity	ErC50 mg/l	>0,1*	72 h	Desmodesmus subspicatus	ECHA Dossier	*The substance is not soluble in water. - OECD Guideline 201
	Acute crustacea toxicity	EC50 mg/l	> 0,041*	48 h	Daphnia magna	ECHA Dossier	*The substance is not soluble in water. - EU Method C.2
	Fish toxicity	NOEC 8* mg/l	>0,0577	21 d	Danio rerio	ECHA Dossier	*The substance is not soluble in water. - OECD Guideline 203
	Crustacea toxicity	NOEC mg/l	>0,007*	21 d	Daphnia magna	ECHA Dossier	*The substance is not soluble in water.

**12.2. Persistence and degradability**

The product is slightly soluble in water. It can be largely eliminated from the water by abiotic processes, e.g. mechanical separation.

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CAS No	Chemical name	Method	Value	d	Source
67774-74-7	Benzene, C10-13-alkyl derivs.	Evaluation			
	OECD Guideline 301 F	64%	28	ECHA Dossier	
	Easily biodegradable (concerning to the criteria of the OECD)				

**12.3. Bioaccumulative potential**

No indication of bioaccumulation potential.

**Partition coefficient n-octanol/water**

CAS No	Chemical name	Log Pow
67774-74-7	Benzene, C10-13-alkyl derivs.	6,4

**BCF**

CAS No	Chemical name	BCF	Species	Source
67774-74-7	Benzene, C10-13-alkyl derivs.	35		Environmental Toxicology

**12.4. Mobility in soil**

No information available.

**12.5. Results of PBT and vPvB assessment**

This substance does not meet the PBT/vPvB criteria of REACH, Annex XIII.

**12.6. Other adverse effects**

No information available.

**SECTION 13 Disposal****13.1. Waste treatment methods****Advice on disposal**

Dispose of waste according to applicable legislation. Consult the appropriate local waste disposal expert about waste disposal. Non-contaminated packages may be recycled. The allocation of waste identity numbers/waste descriptions must be carried out according to the EEC, specific to the industry and process.

**Waste disposal number of contaminated packaging**

150110 WASTE PACKAGING; ABSORBENTS, WIPING CLOTHS, FILTER MATERIALS AND PROTECTIVE CLOTHING NOT OTHERWISE SPECIFIED; packaging (including separately collected municipal packaging waste); packaging containing residues of or contaminated by hazardous substances; hazardous waste

**Contaminated packaging**

Handle contaminated packages in the same way as the substance itself.

**SECTION 14: Transport information****Land transport (ADR/RID)**

<b>14.1. UN number:</b>	No dangerous good in sense of this transport regulation.
<b>14.2. UN proper shipping name:</b>	No dangerous good in sense of this transport regulation.
<b>14.3. Transport hazard class(es):</b>	No dangerous good in sense of this transport regulation.
<b>14.4. Packing group:</b>	No dangerous good in sense of this transport regulation.

**Inland waterways transport (ADN)**

<b>14.1. UN number:</b>	No dangerous good in sense of this transport regulation.
<b>14.2. UN proper shipping name:</b>	No dangerous good in sense of this transport regulation.
<b>14.3. Transport hazard class(es):</b>	No dangerous good in sense of this transport regulation.



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<b>14.4. Packing group:</b>	No dangerous good in sense of this transport regulation.
<b>Marine transport (IMDG)</b>	
<b>14.1. UN number:</b>	No dangerous good in sense of this transport regulation.
<b>14.2. UN proper shipping name:</b>	No dangerous good in sense of this transport regulation.
<b>14.3. Transport hazard class(es):</b>	No dangerous good in sense of this transport regulation.
<b>14.4. Packing group:</b>	No dangerous good in sense of this transport regulation.
<b>Air transport (ICAO-TI/IATA-DGR)</b>	
<b>14.1. UN number:</b>	No dangerous good in sense of this transport regulation.
<b>14.2. UN proper shipping name:</b>	No dangerous good in sense of this transport regulation.
<b>14.3. Transport hazard class(es):</b>	No dangerous good in sense of this transport regulation.
<b>14.4. Packing group:</b>	No dangerous good in sense of this transport regulation.
<b>14.5. Environmental hazards</b>	
ENVIRONMENTALLY HAZARDOUS:	no
<b>14.6. Special precautions for user</b>	
Information for safe handling see chapter 7	
Information for personal protective equipment see chapter 8	
<b>14.7. Transport in bulk according to Annex II of Marpol and the IBC Code</b>	
not relevant	

**SECTION 15: Regulatory information****15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture****EU regulatory information**

2010/75/EU (VOC):	No information available
2004/42/EC (VOC):	No information available.
Information according to 2012/18/EU (SEVESO III):	Not subject to 2012/18/EU (SEVESO III)

**Additional information**

Observe in addition any national regulations!

**National regulatory information**

Employment restrictions:	Observe restrictions to employment for juvenils according to the 'juvenile work protection guideline' (94/33/EC).
Water contaminating class (D):	1 - slightly water contaminating

**Additional information**

none

15.2 Chemical Safety Assessment  
not applicable.**15.2. Chemical safety assessment**

For this substance a chemical safety assessment has been carried out.

**SECTION 16: Other information****Changes**

Rev. : 1,0 - 08.05.2018

**Abbreviations and acronyms**

ADR: Accord européen sur le transport des marchandises dangereuses par Route

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CAS Chemical Abstracts Service  
DNEL: Derived No Effect Level  
IARC: INTERNATIONAL AGENCY FOR RESEARCH ON CANCER  
IMDG: International Maritime Code for Dangerous Goods  
IATA: International Air Transport Association  
IATA-DGR: Dangerous Goods Regulations by the "International Air Transport Association" (IATA)  
ICAO: International Civil Aviation Organization  
ICAO-TI: Technical Instructions by the "International Civil Aviation Organization" (ICAO)  
GHS: Globally Harmonized System of Classification and Labelling of Chemicals  
GefStoffV: Gefahrstoffverordnung (Ordinance on Hazardous Substances, Germany)  
LOAEL: Lowest observed adverse effect level  
LOAEC: Lowest observed adverse effect concentration  
LC50: Lethal concentration, 50 percent  
LD50: Lethal dose, 50 percent  
NOAEL: No observed adverse effect level  
NOAEC: No observed adverse effect level  
NTP: National Toxicology Program  
N/A: not applicable  
OSHA: Occupational Safety and Health Administration  
PNEC: predicted no effect concentration  
PBT: Persistent bioaccumulative toxic  
RID: Règlement international concernant le transport des marchandises dangereuses par chemin de fer (Regulations Concerning the International Transport of Dangerous Goods by Rail )  
SARA: Superfund Amendments and Reauthorization Act  
SVHC: substance of very high concern  
TRGS Technische Regeln fuer Gefahrstoffe  
TSCA: Toxic Substances Control Act  
VOC: Volatile Organic Compounds  
VwVwS: Verwaltungsvorschrift wassergefaehrdender Stoffe  
WGK: Wassergefaehrungsklasse

**Relevant H and EUH statements (number and full text)**

H304                      May be fatal if swallowed and enters airways.

**Further Information**

Classification according to Regulation (EC) No 1272/2008 [CLP] - Classification procedure:

Health hazards: Calculation method. ; H304: On basis of test data.

Environmental hazards: Calculation method.

Physical hazards: On basis of test data.

The above information describes exclusively the safety requirements of the product and is based on our present-day knowledge. The information is intended to give you advice about the safe handling of the product named in this safety data sheet, for storage, processing, transport and disposal. The information cannot be transferred to other products. In the case of mixing the product with other products or in the case of processing, the information on this safety data sheet is not necessarily valid for the new made-up material.

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**Identified uses**

No	Short title	LCS	SU	PC	PROC	ERC	AC	TF	Specification
1	Industrial use of intermediates.	-	0	-	2	6a	-	-	
2	Formulation & (re)packing of substances and mixtures - Industrial uses	F	0	-	1, 3, 4, 5, 8a, 8b, 9, 15	2	-	-	

LCS: Life cycle stages

PC: Product categories

ERC: Environmental release categories

TF: Technical functions

SU: Sectors of use

PROC: Process categories

AC: Article categories

**Material Safety Data Sheet****1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND COMPANY/UNDERTAKING**

**Material Name** : Shell Diala Cable Oil  
**Uses** : Insulating oil.  
**Product Code** : 001D8369  
  
**Manufacturer/Supplier** : Shell UK Oil Products Limited  
 PO BOX 3  
 Ellesmere Port  
 CH65 4HB  
 United Kingdom  
  
**Telephone** : +44 (0) 151-350-4000  
**Fax** : +44 (0) 151-350-4000  
**Email Contact for MSDS** : If you have any enquiries about the content of this MSDS please email lubricantSDS@shell.com  
  
**Emergency Telephone Number** : +44-(0) 151-350-4595

**2. HAZARDS IDENTIFICATION**

**EC Classification** : Harmful.  
  
**Health Hazards** : Repeated exposure may cause skin dryness or cracking.  
 Harmful: may cause lung damage if swallowed.  
  
**Signs and Symptoms** : If material enters lungs, signs and symptoms may include coughing, choking, wheezing, difficulty in breathing, chest congestion, shortness of breath, and/or fever. The onset of respiratory symptoms may be delayed for several hours after exposure. Defatting dermatitis signs and symptoms may include a burning sensation and/or a dried/cracked appearance. Ingestion may result in nausea, vomiting and/or diarrhoea.  
  
**Safety Hazards** : Not classified as flammable but will burn.  
**Environmental Hazards** : Not classified as dangerous for the environment.

**3. COMPOSITION/INFORMATION ON INGREDIENTS**

**Preparation Description** : Alkyl benzene.

**Hazardous Components**

Chemical Identity	CAS	EINECS	Symbol(s)	R-phrases(s)	Conc.
Benzene, C10-C13 alkyl derivatives	67774-74-7	267-051-0	Xn	R65; R66	90.00 - 100.00 %

**Additional Information** : Refer to chapter 16 for full text of EC R-phrases.

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**4. FIRST AID MEASURES**

- Inhalation** : No treatment necessary under normal conditions of use. If symptoms persist, obtain medical advice.
- Skin Contact** : Remove contaminated clothing. Flush exposed area with water and follow by washing with soap if available. If persistent irritation occurs, obtain medical attention.
- Eye Contact** : Flush eye with copious quantities of water. If persistent irritation occurs, obtain medical attention.
- Ingestion** : If swallowed, do not induce vomiting; transport to nearest medical facility for additional treatment. If vomiting occurs spontaneously, keep head below hips to prevent aspiration. If any of the following delayed signs and symptoms appear within the next 6 hours, transport to the nearest medical facility: fever greater than 101° F (37° C), shortness of breath, chest congestion or continued coughing or wheezing.
- Advice to Physician** : Treat symptomatically. Potential for chemical pneumonitis. Consider: gastric lavage with protected airway, administration of activated charcoal. Call a doctor or poison control center for guidance.

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**5. FIRE FIGHTING MEASURES**

Clear fire area of all non-emergency personnel.

- Specific Hazards** : Hazardous combustion products may include: A complex mixture of airborne solid and liquid particulates and gases (smoke). Carbon monoxide. Unidentified organic and inorganic compounds.
- Suitable Extinguishing Media** : Foam, water spray or fog. Dry chemical powder, carbon dioxide, sand or earth may be used for small fires only.
- Unsuitable Extinguishing Media** : Do not use water in a jet.
- Protective Equipment for Firefighters** : Proper protective equipment including breathing apparatus must be worn when approaching a fire in a confined space.

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**6. ACCIDENTAL RELEASE MEASURES**

Avoid contact with spilled or released material. For guidance on selection of personal protective equipment see Chapter 8 of this Material Safety Data Sheet. See Chapter 13 for information on disposal. Observe the relevant local and international regulations.

- Protective measures** : Avoid contact with skin and eyes. Use appropriate containment to avoid environmental contamination. Prevent from spreading or entering drains, ditches or rivers by using sand, earth, or other appropriate barriers.
- Clean Up Methods** : Slippery when spilt. Avoid accidents, clean up immediately. Prevent from spreading by making a barrier with sand, earth or other containment material. Reclaim liquid directly or in an absorbent. Soak up residue with an absorbent such as clay, sand or other suitable material and dispose of properly.
- Additional Advice** : Local authorities should be advised if significant spillages

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cannot be contained.

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**7. HANDLING AND STORAGE**

- General Precautions** : Use local exhaust ventilation if there is risk of inhalation of vapours, mists or aerosols. Properly dispose of any contaminated rags or cleaning materials in order to prevent fires. Use the information in this data sheet as input to a risk assessment of local circumstances to help determine appropriate controls for safe handling, storage and disposal of this material.
- Handling** : Avoid prolonged or repeated contact with skin. Avoid inhaling vapour and/or mists. When handling product in drums, safety footwear should be worn and proper handling equipment should be used.
- Storage** : Keep container tightly closed and in a cool, well-ventilated place. Use properly labelled and closeable containers. Storage Temperature: 0 - 50°C / 32 - 122°F  
The storage of this product may be subject to the Control of Pollution (Oil Storage) (England) Regulations. Further guidance maybe obtained from the local environmental agency office.
- Recommended Materials** : For containers or container linings, use mild steel or high density polyethylene.
- Unsuitable Materials** : PVC.
- Additional Information** : Polyethylene containers should not be exposed to high temperatures because of possible risk of distortion. Exposure to this product should be reduced as low as reasonably practicable. Reference should be made to the Health and Safety Executive's publication "COSHH Essentials".

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**8. EXPOSURE CONTROLS/PERSONAL PROTECTION**

If the American Conference of Governmental Industrial Hygienists (ACGIH) value is provided on this document, it is provided for information only.

**Occupational Exposure Limits**

- Exposure Controls** : The level of protection and types of controls necessary will vary depending upon potential exposure conditions. Select controls based on a risk assessment of local circumstances.  
Appropriate measures include: Adequate ventilation to control airborne concentrations. Where material is heated, sprayed or mist formed, there is greater potential for airborne concentrations to be generated.
- Personal Protective Equipment** : Personal protective equipment (PPE) should meet recommended national standards. Check with PPE suppliers.
- Respiratory Protection** : No respiratory protection is ordinarily required under normal conditions of use. In accordance with good industrial hygiene practices, precautions should be taken to avoid breathing of material. If engineering controls do not maintain airborne

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	concentrations to a level which is adequate to protect worker health, select respiratory protection equipment suitable for the specific conditions of use and meeting relevant legislation. Check with respiratory protective equipment suppliers. Where air-filtering respirators are suitable, select an appropriate combination of mask and filter. Select a filter suitable for combined particulate/organic gases and vapours [boiling point >65 °C (149 °F)] meeting EN141.
<b>Hand Protection</b>	: Where hand contact with the product may occur the use of gloves approved to relevant standards (e.g. Europe: EN374, US: F739) made from the following materials may provide suitable chemical protection: PVC, neoprene or nitrile rubber gloves. Suitability and durability of a glove is dependent on usage, e.g. frequency and duration of contact, chemical resistance of glove material, glove thickness, dexterity. Always seek advice from glove suppliers. Contaminated gloves should be replaced. Personal hygiene is a key element of effective hand care. Gloves must only be worn on clean hands. After using gloves, hands should be washed and dried thoroughly. Application of a non-perfumed moisturizer is recommended.
<b>Eye Protection</b>	: Wear safety glasses or full face shield if splashes are likely to occur. Approved to EU Standard EN166.
<b>Protective Clothing</b>	: Skin protection not ordinarily required beyond standard issue work clothes. It is good practice to wear chemical resistant gloves.
<b>Monitoring Methods</b>	: Monitoring of the concentration of substances in the breathing zone of workers or in the general workplace may be required to confirm compliance with an OEL and adequacy of exposure controls. For some substances biological monitoring may also be appropriate.
<b>Environmental Exposure Controls</b>	: Minimise release to the environment. An environmental assessment must be made to ensure compliance with local environmental legislation.

**9. PHYSICAL AND CHEMICAL PROPERTIES**

Appearance	: Colourless. Liquid at room temperature.
Odour	: Slight hydrocarbon.
pH	: Not applicable.
Initial Boiling Point and Boiling Range	: > 280 °C / 536 °F estimated value(s)
Pour point	: < -60 °C / -76 °F Data not available
Flash point	: Typical 140 °C / 284 °F (PMCC / ASTM D93)
Upper / lower Flammability or Explosion limits	: Typical 1 - 10 %(V)
Auto-ignition temperature	: > 320 °C / 608 °F
Vapour pressure	: < 0.5 Pa at 20 °C / 68 °F (estimated value(s))
Density	: Typical 857 kg/m <sup>3</sup> at 20 °C / 68 °F
Water solubility	: Negligible.
n-octanol/water partition coefficient (log Pow)	: > 6 (based on information on similar products)
Kinematic viscosity	: Typical 4.2 mm <sup>2</sup> /s at 40 °C / 104 °F
Vapour density (air=1)	: > 1 (estimated value(s))
Evaporation rate (nBuAc=1)	: Data not available

**Material Safety Data Sheet****10. STABILITY AND REACTIVITY**

<b>Stability</b>	: Stable.
<b>Conditions to Avoid</b>	: Extremes of temperature and direct sunlight.
<b>Materials to Avoid</b>	: Strong oxidising agents.
<b>Hazardous Decomposition Products</b>	: Hazardous decomposition products are not expected to form during normal storage.

**11. TOXICOLOGICAL INFORMATION**

<b>Basis for Assessment</b>	: Information given is based on data on the components and the toxicology of similar products.
<b>Acute Oral Toxicity</b>	: Expected to be of low toxicity: LD50 > 5000 mg/kg , Rat Aspiration into the lungs when swallowed or vomited may cause chemical pneumonitis which can be fatal.
<b>Acute Dermal Toxicity</b>	: Expected to be of low toxicity: LD50 > 5000 mg/kg , Rabbit
<b>Acute Inhalation Toxicity</b>	: Not considered to be an inhalation hazard under normal conditions of use.
<b>Skin Irritation</b>	: Expected to be slightly irritating. Repeated exposure may cause skin dryness or cracking.
<b>Eye Irritation</b>	: Expected to be slightly irritating.
<b>Respiratory Irritation</b>	: Inhalation of vapours or mists may cause irritation.
<b>Sensitisation</b>	: Not expected to be a skin sensitiser.
<b>Repeated Dose Toxicity</b>	: Not expected to be a hazard.
<b>Mutagenicity</b>	: Not considered a mutagenic hazard.
<b>Carcinogenicity</b>	: Components are not known to be associated with carcinogenic effects.
<b>Reproductive and Developmental Toxicity</b>	: Not expected to be a hazard.
<b>Additional Information</b>	: Used oils may contain harmful impurities that have accumulated during use. The concentration of such impurities will depend on use and they may present risks to health and the environment on disposal. ALL used oil should be handled with caution and skin contact avoided as far as possible.

**12. ECOLOGICAL INFORMATION**

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.

<b>Acute Toxicity</b>	: Poorly soluble mixture. May cause physical fouling of aquatic organisms. Expected to be practically non toxic: LL/EL/IL50 > 100 mg/l (to aquatic organisms) (LL/EL50 expressed as the nominal amount of product required to prepare aqueous test extract).
<b>Mobility</b>	: Liquid under most environmental conditions. Floats on water. If it enters soil, it will adsorb to soil particles and will not be mobile.
<b>Persistence/degradability</b>	: Expected to be inherently biodegradable.
<b>Bioaccumulation</b>	: Has the potential to bioaccumulate.
<b>Other Adverse Effects</b>	: Product is a mixture of non-volatile components, which are not



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expected to be released to air in any significant quantities. Not expected to have ozone depletion potential, photochemical ozone creation potential or global warming potential.

**13. DISPOSAL CONSIDERATIONS**

- Material Disposal** : Recover or recycle if possible. It is the responsibility of the waste generator to determine the toxicity and physical properties of the material generated to determine the proper waste classification and disposal methods in compliance with applicable regulations. Do not dispose into the environment, in drains or in water courses.
- Container Disposal** : Dispose in accordance with prevailing regulations, preferably to a recognised collector or contractor. The competence of the collector or contractor should be established beforehand.
- Local Legislation** : Disposal should be in accordance with applicable regional, national, and local laws and regulations.  
EU Waste Disposal Code (EWC): 13 03 08 synthetic insulating and heat transmission oils. Classification of waste is always the responsibility of the end user.  
Hazardous Waste (England and Wales) Regulations 2005.

**14. TRANSPORT INFORMATION****ADR**

This material is not classified as dangerous under ADR regulations.

**RID**

This material is not classified as dangerous under RID regulations.

**ADNR**

This material is not classified as dangerous under ADNR regulations.

**IMDG**

This material is not classified as dangerous under IMDG regulations.

**IATA (Country variations may apply)**

This material is not classified as dangerous under IATA regulations.

**15. REGULATORY INFORMATION**

The regulatory information is not intended to be comprehensive. Other regulations may apply to this material.

- EC Classification : Harmful.  
EC Symbols : Xn Harmful.  
EC Risk Phrases : R65 Harmful: may cause lung damage if swallowed.  
R66 Repeated exposure may cause skin dryness or cracking.  
EC Safety Phrases : S62 If swallowed, do not induce vomiting: seek medical advice immediately and show this container or label.

**Material Safety Data Sheet****Chemical Inventory Status**

EINECS	:	All components listed or polymer exempt.
TSCA	:	All components listed.
Classification triggering components	:	Contains alkyl benzene derivatives.
Other Information	:	Environmental Protection Act 1990 (as amended). Health and Safety at Work Act 1974. Consumers Protection Act 1987. Control of Pollution Act 1974. Environmental Act 1995. Factories Act 1961. Carriage of Dangerous Goods by Road and Rail (Classification, Packaging and Labelling) Regulations. Chemicals (Hazard Information and Packaging for Supply) Regulations 2002. Control of Substances Hazardous to Health Regulations 1994 (as amended). Road Traffic (Carriage of Dangerous Substances in Packages) Regulations. Merchant Shipping (Dangerous Goods and Marine Pollutants) Regulations. Road Traffic (Carriage of Dangerous Substances in Road Tankers in Tank Containers) Regulations. Road Traffic (Training of Drivers of Vehicles Carrying Dangerous Goods) Regulations. Reporting of Injuries, Diseases and Dangerous Occurrences Regulations. Health and Safety (First Aid) Regulations 1981. Personal Protective Equipment (EC Directive) Regulations 1992. Personal Protective Equipment at Work Regulations 1992.

**16. OTHER INFORMATION**

## R-phrases(s)

R65	Harmful: may cause lung damage if swallowed.
R66	Repeated exposure may cause skin dryness or cracking.

<b>MSDS Version Number</b>	:	1.0
<b>MSDS Effective Date</b>	:	16.09.2010
<b>MSDS Revisions</b>	:	A vertical bar ( ) in the left margin indicates an amendment from the previous version.
<b>MSDS Regulation</b>	:	Regulation 1907/2006/EC
<b>MSDS Distribution</b>	:	The information in this document should be made available to all who may handle the product.
<b>Disclaimer</b>	:	This information is based on our current knowledge and is intended to describe the product for the purposes of health, safety and environmental requirements only. It should not therefore be construed as guaranteeing any specific property of the product.