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# Preliminary Site Assessment

Site 30 Francis Street - Inchicore 110 kV (July 2010)

Electricity Supply Board

Project number: PR-427640_ACM_RP_ENV_043_2

24 January 2020

## Quality Information

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The site reconnaissance consisted of a general external inspection of the site aimed at identifying potential sources of ground contamination affecting the site. An environmental compliance audit and/or detailed structural inspection of existing buildings were outside the project brief. Similarly, the site visit excluded detailed consideration of the ecological or archaeological aspects of the site, and if such are believed to be of potential significance then it is recommended that specialist advice is sought.

Any risks identified in this Report are perceived risks, based on the information reviewed during the desk study and therefore partially based on conjecture from available information. The study is limited by the non-intrusive nature of the work and actual risks can only be assessed following a physical investigation of the site.

It should be noted that the effects of ground and water borne contamination on the environment are constantly under review, and authoritative guidance values are potentially subject to change. The conclusions presented

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The opinions expressed in this report and the comments and recommendations given are based on a desk assessment of readily available information and an initial site reconnaissance by an AECOM employee. At this stage intrusive investigations have yet to be undertaken at site to establish actual ground and groundwater conditions and to provide data for an assessment of the geo-environmental status of the site.

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## ABBREVIATIONS

| | |
|---|---|
| AECOM | AECOM Ireland Limited |
| APEC | Area of Potential Environmental Concern |
| bgl | Below Ground Level |
| BH | Borehole |
| BTEX | Benzene, Toluene, Ethylbenzene and Xylene |
| CSM | Conceptual Site Model |
| ESB | Electricity Supply Board |
| EPA | Environmental Protection Agency |
| GSI | Geological Survey Ireland |
| IEL | Industrial Emissions Licence |
| IPC | Integrated Pollution Control |
| ITM | Irish Transverse Mercator |
| km | Kilometre |
| kV | Kilovolt |
| LAB | Linear Alkyl Benzene |
| m OD | Metres above Ordnance Datum |
| NHA | Natural Heritage Areas |
| NAPL | Non-Aqueous Phase Liquid |
| NPWS | National Park and Wildlife Service |
| NWCPO | National Waste Collection Permit Office |
| OECD | Organisation for Economic Co-operation and Development |
| OPW | Office of Public Works |
| OSI | Ordnance Survey Ireland |
| PAH | Polycyclic Aromatic Hydrocarbons |
| PCB | Polychlorinated Biphenyls |
| PCOC | Potential Constituents of Concern |
| pNHA | Proposed Natural Heritage Area |
| PSA | Preliminary Site Assessment |
| RFP | Request for Proposal |
| SAC | Special Area of Conservation |
| SDS | Safety Data Sheet |
| SIDS | Screening Information Datasets |
| SPA | Special Protection Area |
| TPH | Total Petroleum Hydrocarbons |
| WAC | Waste Acceptance Criteria |
| WFD | Water Framework Directive |

# EXECUTIVE SUMMARY

## Introduction

AECOM Ireland Limited (AECOM) completed a Preliminary Site Assessment (PSA) of a cable fluid leak location on the Grand Canal (Davitt Road), Dublin 12 (the site).

ESB Networks operates and maintains a network of High Voltage (HV) underground cables of over 1,600 kilometres (km) across Ireland, of which approximately 175 km are insulated by a cable fluid. The majority of the fluid filled cables are located in urban settings across Dublin City and Cork City. The remainder are located outside these areas with limited numbers of fluid filled cables in other counties.

The length of each cable route varies and cable routes frequently extend across county boundaries. The cable fluid acts as an electrical insulator and aids the conduction of heat away from the conductor allowing the cable to be run more efficiently. Fluid filled cables are largely located in urban/suburban areas and so are particularly vulnerable to third party interference or damage. Over time cables can develop leaks due to corrosion/fracture/defects in the cable sheath and in joints and terminations. When such leaks occur, there is potential for pollution to occur to surface water, groundwater, soils and ecology.

A leak was identified and repaired by Electricity Supply Board (ESB) at this location in July 2010. AECOM understands that the fluid type lost from the cable was a mixture of linear alkyl benzene (LAB) and mineral oil based products.

## Objective

The assessment reported herein comprises the first step of Stage 1: Site Characterisation & Assessment – Preliminary Site Assessment (PSA) and was carried out in accordance with *EPA Guidance on the Management of Contaminated Land and Groundwater at EPA Licensed Sites (July 2013),* and specifically the Guideline Template for Preliminary Site Assessment Report. This guidance draws on the *EPA Code of Practice (CoP), Code of Reference for Unregulated Waste Disposal Sites (2007*) and *UK Environment Agency, Model Procedures for the Management of Land Contamination, Contaminated Land Report (CLR) 11 (September 2004).*

In terms of the data requirement for PSA reports, both the EPA CoP and CLR 11 outline that the findings of this initial risk assessment stage are largely based on desk-study information and a site walkover to identify potential pollutant linkages, which are then evaluated using appropriate criteria.

As such, the objective of the PSA reported herein is to:

- Identify potential contamination sources (i.e. the cable fluid), pathways (i.e. breathing in vapours, movement through made ground / soil) and receptors (i.e. who/what will be affected) and the likely interactions between each element;
- Assess the potential severity of the hazard and the sensitivity of the receptor (ranging from minor to severe);
- Assess the likelihood that a risk will occur (ranging from unlikely to high likelihood); and
- Develop a preliminary conceptual site model (CSM) based on an overall assessment of each of these elements above.

The preliminary CSM will then be used to identify potential risks to human health (site users and/or nearby residents) and controlled waters (i.e. groundwater and surface water) which may be associated with a fluid leak from the identified location. It should be noted that this stage of the risk assessment process is based mostly on qualitative information sources and identification of a potential risk at this stage does not necessarily indicate the presence of a risk, but rather the need for further assessment.

A table cross referencing the template headings from the EPA Guidance Template and where the corresponding information is reported herein is presented in Appendix B.

## Assessment Findings

Based on the findings of the desktop study, the overall environmental sensitivity of the site is considered to be moderate. Identified sensitive receptors within 1 km of the site include:

- The Grand Canal located immediately north of the site, although this may be protected by low permeability clay (natural and/or engineered when the canal was constructed);

- The River Camac located approximately 1 km west of the site, although this may be protected by low permeability clay deposits which are likely to be encountered beneath the site; and
- The groundwater aquifer beneath the site, although this may also be protected by low permeability clay deposits which are likely to be encountered beneath the site.

It is estimated that 355 litres of cable fluid was released in July 2010. It is assumed, based on information provided to AECOM by ESB, that the fluid lost was a mixture of LAB and mineral oil based products. Due to its high biodegradability, lower volatility and low solubility, it is considered that LABs are of less concern for adverse environmental impact than mineral oil based products. Given that there is potential for a mixture of both types of cable fluids to have been used at this site, potential contaminants of concern have been identified.

A summary of the source audit findings is as follows:

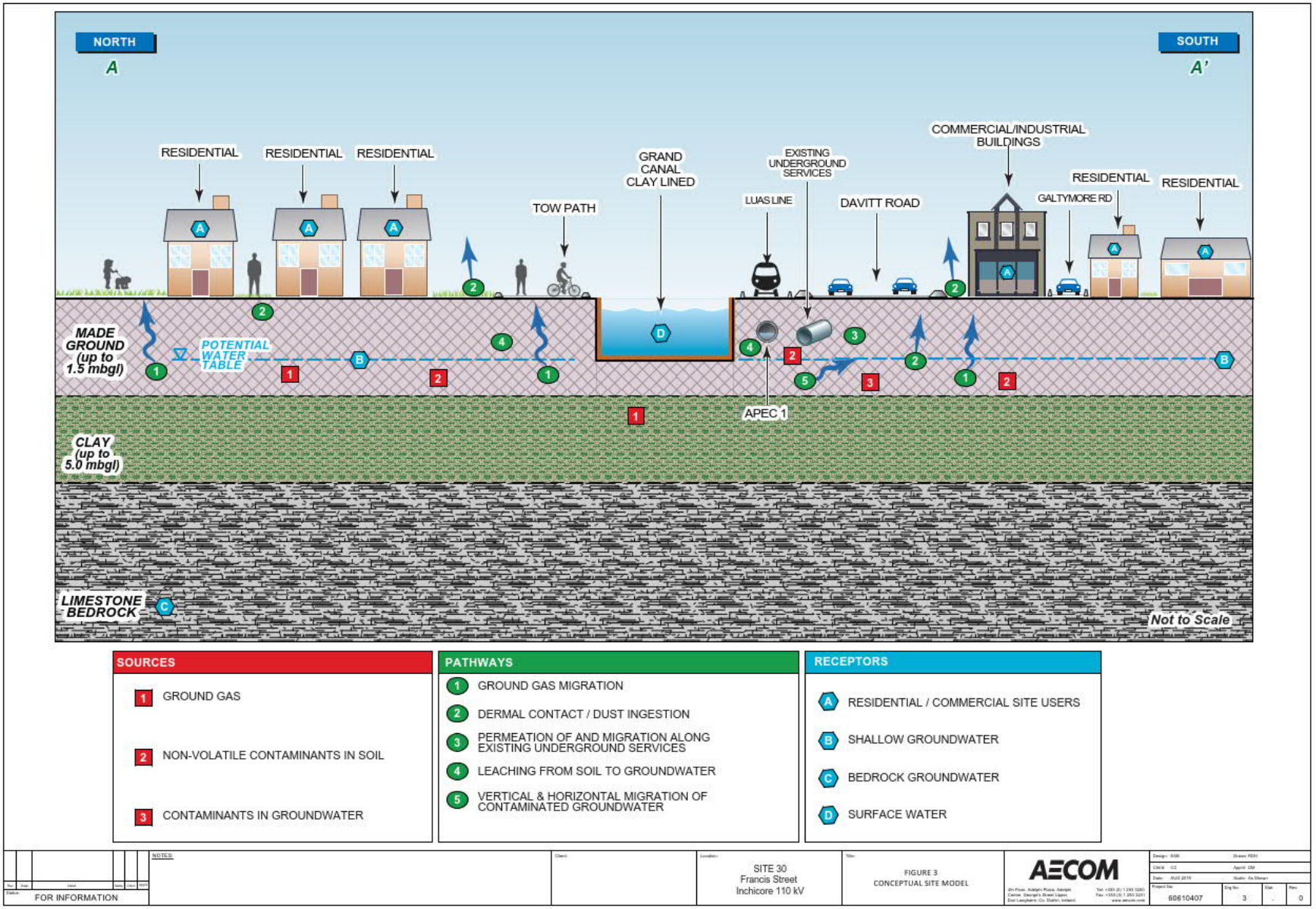
### Area of Potential Environmental Concern

| Number | APEC | Potential Contaminants of Concern | Potential Media Impacted |
|---|---|---|---|
| 1 | Leak at (30) Francis Street - Inchicore 110 kV (July 2010) | LABs<br>Total Petroleum Hydrocarbon (TPH)<br>Benzene, Toluene, Ethylbenzene, Xylene (BTEX) Compounds<br>Volatile Organic Compounds (VOCs)<br>Semi-Volatile Organic Compounds (SVOCs)<br>Polychlorinated Biphenyls (PCBs) | Soil<br>Groundwater<br>Soil Vapour<br>Ground Gas |

The preliminary conceptual site model (CSM) developed for the site looked at potential source-pathway-receptor linkages identified during the assessment works and identified a low to moderate potential risk to shallow groundwater due to potential impact to groundwater chemistry from the presence of NAPL and associated biodegradation products.

Risks associated with other potential source-pathway-receptor (SPR) linkages were considered to be low.

The risk assessment completed herein is preliminary in nature as it can only be based on an evaluation of qualitative data sources (i.e. not on intrusive site investigation works). Consequently, identification of potential risk does not necessarily indicate a risk to a receptor, rather that further assessment may be required to investigate assumptions made in the CSM and quantify whether a potential risk actually exists. Generally, where a low or very low risk has been identified further assessment may not be deemed necessary to assess a particular SPR linkage, although further assessment may be deemed to be required to investigate CSM assumptions where the potential risk is considered to be low or very low due to the sensitivity of the receptor.


NORTH
A
SOUTH
A'
RESIDENTIAL
RESIDENTIAL
RESIDENTIAL
TOW PATH
GRAND CANAL CLAY LINED
LUAS LINE
EXISTING UNDERGROUND SERVICES
DAVITT ROAD
COMMERCIAL/INDUSTRIAL BUILDINGS
GALTYMORE RD
RESIDENTIAL
RESIDENTIAL
MADE GROUND (up to 1.5 mbgl)
POTENTIAL WATER TABLE
APEC 1
CLAY (up to 5.0 mbgl)
LIMESTONE BEDROCK
Not to Scale
SOURCES
1 GROUND GAS
2 NON-VOLATILE CONTAMINANTS IN SOIL
3 CONTAMINANTS IN GROUNDWATER
PATHWAYS
1 GROUND GAS MIGRATION
2 DERMAL CONTACT / DUST INGESTION
3 PERMEATION OF AND MIGRATION ALONG EXISTING UNDERGROUND SERVICES
4 LEACHING FROM SOIL TO GROUNDWATER
5 VERTICAL & HORIZONTAL MIGRATION OF CONTAMINATED GROUNDWATER
RECEPTORS
A RESIDENTIAL / COMMERCIAL SITE USERS
B SHALLOW GROUNDWATER
C BEDROCK GROUNDWATER
D SURFACE WATER
NOTES:
FOR INFORMATION
SITE 30
Francis Street
Inchicore 110 kV
FIGURE 3
CONCEPTUAL SITE MODEL
AECOM
60610407

## EPA Contaminated Land and Groundwater Risk Assessment Methodology

### Table1. EPA Methodology

| Stage | Methodology | Report Reference | Report Date | Status |
|---|---|---|---|---|
| ***Stage 1: Site Characterisation and Assessment*** | | | | |
| 1.1 | Preliminary Site Assessment | PR-427640_ACM_RP_ENV_043 | 24 January 2020 | Final |
| 1.2 | Detailed Site Assessment | | | |
| 1.3 | Quantitative Risk Assessment | | | |
| ***Stage 2: Corrective Action and Feasibility Design*** | | | | |
| 2.1 | Outline Corrective Action Strategy | | | |
| 2.2 | Feasibility Study and Outline Design | | | |
| 2.3 | Detailed Design | | | |
| 2.4 | Final Strategy and Implementation Plan | | | |
| ***Stage 3: Corrective Action Implementation and Aftercare*** | | | | |
| 3.1 | Enabling Works | | | |
| 3.2 | Corrective Action Implementation and Verification | | | |
| 3.3 | Aftercare | | | |

*Source: EPA Guidance on the Management of Contaminated Land at EPA Sites*

# 1. Introduction

AECOM Ireland Limited (AECOM) is pleased to present this preliminary site assessment (PSA) completed on behalf of Electricity Supply Board (ESB) for a site on Davitt Road, Dublin 12, Ireland (the site).

This report was commissioned by ESB under a request for proposal (RFP) issued on 26 June 2019 (Ref. Qd-354120-01R460_002-001-001) and carried out in accordance with AECOM proposal reference: PR-427640_ACM_PL_ENV_001_3, dated 03 July 2019. AECOM understand that ESB has undertaken these works on behalf of ESB Networks.

## 1.1 Project Background

ESB Networks operates and maintains a network of High Voltage (HV) underground cables of over 1,600 kilometres (km) across Ireland, of which approximately 175 km are insulated by a cable fluid. The majority of the fluid filled cables are located in urban settings across Dublin City and Cork City. The remainder are located outside these areas with limited numbers of fluid filled cables in other counties.

The length of each cable route varies and cable routes frequently extend across county boundaries. The cable fluid acts as an electrical insulator and aids the conduction of heat away from the conductor allowing the cable to be run more efficiently. Fluid filled cables are largely located in urban/suburban areas and so are particularly vulnerable to third party interference or damage. Over time cables can develop leaks due to corrosion/fracture/defects in the cable sheath and in joints and terminations. When such leaks occur, there is potential for pollution to occur to surface water, groundwater, soils and ecology.

A leak was identified and repaired by ESB at the site in July 2010. AECOM understands that the fluid type lost from the cable was a mixture of linear alkyl benzene (LAB) and mineral oil based products.

The site location is presented in Figure 1 and the site layout showing the site is presented in Figure 2.

## 1.2 Project Objective

The assessment reported herein comprises the first step of Stage 1: Site Characterisation & Assessment – Preliminary Site Assessment (PSA) and was carried out in accordance with *EPA Guidance on the Management of Contaminated Land and Groundwater at EPA Licensed Sites (July 2013),* and specifically the Guideline Template for Preliminary Site Assessment Report. This guidance draws on the *EPA Code of Practice (CoP), Code of Reference for Unregulated Waste Disposal Sites (2007*) and *UK Environment Agency, Model Procedures for the Management of Land Contamination, Contaminated Land Report (CLR) 11 (September 2004).*

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As such, the objective of the PSA reported herein is to:

- Identify potential contamination sources (i.e. the cable fluid), pathways (i.e. breathing in vapours, movement through made ground / soil) and receptors (i.e. who/what will be affected) and the likely interactions between each element;
- Assess the potential severity of the hazard and the sensitivity of the receptor (ranging from minor to severe);
- Assess the likelihood that a risk will occur (ranging from unlikely to high likelihood); and
- Develop a preliminary conceptual site model (CSM) based on an overall assessment of each of these elements above.

The preliminary CSM will then be used to identify potential risks to human health (site users and/or nearby residents) and controlled waters (i.e. groundwater and surface water) which may be associated with a fluid leak from the identified location. It should be noted that this stage of the risk assessment process is based mostly on qualitative information sources and identification of a potential risk at this

stage does not necessarily indicate the presence of a risk, but rather the need for further assessment.

A table cross referencing the template headings from the EPA Guidance Template and where the corresponding information is reported herein is presented in Appendix B.

# 2. Scope of Work

To achieve the above objective, the following scope of work was undertaken:

- A site walkover by AECOM staff (completed on 26 July 2019);
- A desktop review of site history to identify areas of potential environmental concern (APEC);
- A desktop review of publicly available information regarding the site's environmental setting and sensitivity, including:
  - Geological Survey of Ireland (GSI) Groundwater Public Viewer Maps (https://dcenr.maps.arcgis.com/apps/MapSeries), accessed 30 July 2019
  - EPA Geoportal Site (https://gis.epa.ie/EPAMaps), accessed 30 July 2019
  - EPA Incidents Database (https://www.epa.ie/newsandevents/incidents/recent/), accessed 30 July 2019
  - Ordnance Survey of Ireland (OSI) (http://geohive.ie), accessed 30 July 2019
  - Glucksman Map Library, Trinity College Dublin, accessed 06 August 2019
  - Office of Public Works (OPW) Flood Maps (http://www.floodinfo.ie), accessed 30 July 2019
  - National Parks and Wildlife Service (NPWS) (http://webgis.npws.ie/npwsviewer/), accessed 30 July 2019
  - National Waste Collection Permit Office (NWCPO) website (http://www.nwcpo.ie/), accessed 30 July 2019
- A review of information provided by ESB in the RFP; and
- Data assessment and reporting.

# 3. Environmental Setting

## 3.1 Topography

The site is located on the tow path adjacent to the Grand Canal along the Davitt Road and Luas walkway, Dublin 12 (ITM 712419.68 733085.14) at an elevation of approximately 30 m above ordnance datum (m OD). The surrounding topography slopes away from the Davitt Road to the north, but in general is relatively flat.

## 3.2 Geology

The Teagasc Soils Map indicates the site locality comprises urban sediment. Immediately underlying the site and along the route of the Grand Canal to the east and west of the site, the Quaternary geology is classified as urban. The surrounding areas to the north and south are classified as till derived from the underlying limestone bedrock.

The GSI Bedrock Geology Map (scale 1:100,000) indicates the site is underlain by marine basinal facies, a dark fine-grained limestone and shale of the Lucan formation. No geological features are noted within the surrounding area.

A number of geotechnical records are located within the vicinity of the site. Southwest of the site, adjacent to the banks of the Grand Canal the stratigraphic sequence was recorded as overburden to 3.96 meters below ground level (m bgl) directly overlying bedrock. A site investigation northwest of the site recorded topsoil to approximately 0.4 m bgl, overlying fill to approximately 1.4 m bgl, which was underlain by clay to a maximum depth of 5 m bgl where the investigation terminated.

## 3.3 Hydrology

### 3.3.1 Surface Water Features

The site lies within the lower catchment of the River Liffey and Dublin Bay, which covers an area of 1,624 km$^2$.

The closest surface water body to the site is the Grand Canal (a proposed Natural Heritage Area (pNHA), Site Code 002104) located immediately north of the leak location. The canal flows to the east and discharges to the River Liffey Estuary approximately 5.6 km northeast of the site, which flows into South Dublin Bay (an SAC). This comprises the following protected sites:

- South Dublin Bay Special Area of Conservation (SAC) (Site Code 000210);
- South Dublin Bay and River Tolka Special Protection Area (SPA) (Site Code 004024); and
- South Dublin Bay proposed Natural Heritage Area (pNHA) (Site Code 000210).

As impervious materials are generally used to line canals during construction, it is not considered likely that the Grand Canal is in hydrological continuity with groundwater in the area.

The Camac River flows from south to north and is the closest natural waterbody to the site; located approximately 1 km west of the site. The Camac River crosses (by culvert) the Grand Canal immediately east of the Blackhorse Bridge and discharges to the River Liffey approximately 1.9 km northeast of the site.

Given their proximity to the site, both the Grand Canal and the Camac River are considered to be sensitive surface water receptors.

### 3.3.2 Surface Water Quality

The Grand Canal, which bounds the site to the north, is referred to as an Artificial Water Body (AWB) by the EPA under the Water Framework Directive (WFD). Waterways Ireland assess the biological quality of the Grand Canal, which along the section adjacent to the site during the period 2015 – 2017 was classified as 'Good' quality[1].

The most significant natural surface water feature in the wider area is the Camac River. The most recent reported EPA water quality status of the Camac River (monitoring station below Blackhorse Bridge) is a Q Value of 3 and a rating 'Poor'. The WFD ecological status of the Camac River is characterised as being at risk of not meeting its WFD objectives.

The most significant surface water feature in the wider area is the River Liffey Estuary. The WFD status of both the upper and lower sections of the estuary (classified as a Transitional Water Body) is classified as 'Moderate' and characterised as being at risk of not meeting its WFD objectives.

### 3.3.3 Flooding

According to OPW Flood Maps, the site does not lie within the "River – Low Probability", "River – Medium Probability" or "River – High Probability" modelled extent of land that might be flooded by rivers in a moderate to very extreme event.

Parts of the surrounding area located within a 1 km radius to the west and east of the site lie within the "River – Low Probability", "River – Medium Probability" and "River – High Probability" indicating that flooding by rivers may occur during moderate to very extreme event in these areas.

The site is not in close proximity to the extent of land affected by coastal flood events.

## 3.4 Hydrogeology

### 3.4.1 Aquifer Classification

According to the GSI, the bedrock aquifer beneath the site is classified as a Locally Important Aquifer. The bedrock underlying the site is moderately productive in local zones. The soil permeability in the

[1] EPA, *Water Quality in 2017, An Indicators Report*, 2018

surrounding area is low; consequently the groundwater recharge in this aquifer is estimated by the GSI to be approximately 70 millimetres/year (mm/yr).

Regional groundwater flow direction is likely to be to the north and west towards the River Liffey and Camac River. A more detailed site assessment would be required to assess the local groundwater flow regime.

According to the GSI wells and springs database, there are no recorded wells or springs located within 1 km of the site. In addition, the site is not mapped as being located within a Source Protection Area for either a public water supply or a group water supply scheme.

### 3.4.2 Groundwater Vulnerability

The GSI National Groundwater Vulnerability Mapping identified that groundwater vulnerability associated with the site is "Moderate". However, some spatial variation in groundwater vulnerability is seen in the greater surrounding area of the site, with area of high to extreme vulnerability noted in the vicinity of the site.

### 3.4.3 Groundwater Quality

Groundwater beneath the site is part of the Dublin Groundwater Body (IE_EA_G_008) which, according to the EPA website, is classified as having 'Good' status and is characterised as being not at risk.

## 3.5 Natural Habitats and Protected Species

The Grand Canal is located immediately north of the site and is a pNHA.

The River Liffey is located approximately 1.2 km north of the site. The River Liffey flows easterly into South Dublin Bay (an SAC, SPA and pNHA). Site Codes for each of these protected areas are provided in Section 3.3.1.

There are no other protected areas within 1 km of the site.

## 3.6 Regulatory Database Search

### 3.6.1 National Waste Collection Permit Office

The National Waste Collection Permit Office (NWCPO) website was reviewed to identify authorised waste facilities within the jurisdiction of Dublin City Council near the site. The NWCPO website indicated that there are a number of Waste Permitted Facilities within 1 km of the site as summarised in Table 2 below.

**Table 2. Dublin City County Council Waste Facilities within 1 km of the Site**

| Authorisation Number | Facility Name | Location | Waste Activity |
|---|---|---|---|
| WFP-DC-09-0008-02 | Martin Services (Industrial) Limited | Unit 11 Bluebell Business Park Bluebell Dublin 12 | Wastes whose collection and disposal is not subject to special requirements in order to prevent infection (for example dressings, plaster casts, linen, disposable clothing, diapers) |
| WFP-DC-11-0025-02 | Rehab Enterprises Limited | The Rehab Building Kylemore Road Ballyfermot Dublin 10 | Photographic film, mixed packaging and waste electronic equipment |

### 3.6.2 Storm Water Discharges

Eleven Irish Water storm water overflow discharge locations have been identified within 1 km of the site, as summarised in Table 3 below.

**Table 3. Storm Water Discharges**

| Emission ID | Name | Register No. |
|---|---|---|
| TPEFF0700D0034SW024 | Ringsend | D0034-01 |
| TPEFF0700D0034SW077 | Ringsend | D0034-01 |
| TPEFF0700D0034SW032 | Ringsend | D0034-01 |
| TPEFF0700D0034SW073 | Ringsend | D0034-01 |
| TPEFF0700D0034SW075 | Ringsend | D0034-01 |
| TPEFF0700D0034SW076 | Ringsend | D0034-01 |
| TPEFF0700D0034SW055 | Ringsend | D0034-01 |
| TPEFF0700D0034SW057 | Ringsend | D0034-01 |
| TPEFF0700D0034SW059 | Ringsend | D0034-01 |
| TPEFF0700D0034SW104 | Ringsend | D0034-01 |
| TPEFF0700D0034SW100 | Ringsend | D0034-01 |

### 3.6.3 EPA Licensing

The EPA database of Industrial Emissions (IE) and Integrated Pollution Control (IPC) and Waste licences was consulted and no active licensed facilities were identified within 1 km of the site.

According to the EPA website, there are no Section 4 discharges[2] to water within 1 km of the site and there have been no reported environmental incidents within 1 km of the site since at least 2010.

## 3.7 Environmental Sensitivity

The overall environmental sensitivity of the site is considered to be moderate. Identified sensitive receptors within 1 km of the site include:

- The Grand Canal located immediately north of the site, although this may be protected by low permeability clay (natural and/or engineered when the canal was constructed);
- The River Camac located approximately 1 km west of the site, although this may be protected by low permeability clay deposits which are likely to be encountered beneath the site; and
- The groundwater aquifer beneath the site, although this may also be protected by low permeability clay deposits which are likely to be encountered beneath the site.

# 4. Source Audit Findings

## 4.1 Site Description

The site is located adjacent to the Grand Canal along the Davitt Road and Luas tracks Dublin City. The leak site was located on a 400 m long section of a 110 kV cable running from Francis Street to Inchicore. The cable was installed in 1964 and the location of the leak (at cable joint No. 1 – UG0822) is located beneath the tow path along the Davitt Road and Luas tracks. It is estimated that loss of fluid from the cable occurred in July 2010 with an estimated fluid volume loss of 355 litres during that period.

No evidence of impact from the cable fluid release was noted during the site walkover. Construction works were observed directly on the banks of the canal during the site walkover and the water levels in the canal were reduced.

[2] Section 4 discharges to water to support the characterisation of waterbodies for the 2nd Cycle of River Basin Management Planning. This dataset takes in account, among other datasets, the Section 4s dataset developed in 2005 as Point Source Pressures for the Article 5 Characterisation and Risk Assessment Report for the Water Framework Directive 2000/60/EC; (European Communities (Water Policy) Regulations 2003 (SI 722 of 2003)).

## 4.2 Surrounding Land Use

Land use in the immediate vicinity of the site is mixed commercial and residential. Land use in the vicinity of the site is summarised in Table 4 below.

**Table 4 Adjacent Land Use**

| Site Boundary | Land Use |
|---|---|
| North | The Grand Canal is located immediately north of the site, beyond which are low density residential houses with gardens. The Goldenbridge Graveyard is located 240m northwest from the location of the leak. |
| East | Land use to the east of the site is predominantly commercial with large warehouses. Residential properties with gardens are also present. Good Counsel GAA club is located 300m to the east of the site. |
| South | The Marble Arch pub is located immediately south of the site and is surrounded by residential housing. |
| West | Commercial units and light industry units are located on Davitt Road to the west. |

## 4.3 Historic Site Review

A review of historical maps and aerial photographs available from OSI, Glucksman Map Library (Trinity College Dublin) and Google Earth was carried out. A summary of the findings is presented in Table 5.

**Table 5 Historic Map and Aerial Photograph Review**

| Year | Description |
|---|---|
| **1829 to 1841 (OSI)** | The site and immediate surrounding area appears to be predominantly agricultural. The Grand Canal is immediately north of the site and the lock along the canal to the east. Mount Shannon Mills is located to the south of the site and Harcourt Mills are located to the east of the site. |
| **1898 to 1913 (OSI)** | No significant changes have occurred. |
| **1908 (1:2,500) Trinity Maps** | The site remains surrounded by predominately agricultural land. Mount Shannon Mills remains to the west of the site; however Harcourt Mills to the immediate west (south of the first lock) has been redeveloped into a brick works. The brick works has associated clay pit, kiln and chimneys. |
| **1935 (1:1,250) Trinity Maps** | The site remains surrounded by predominately agricultural land. An increase in residential development has occurred to the north of the site and immediately south, with a number of small cottages noted. Mount Shannon Mills has been replaced by a Paint and Varnish Factory while the brick works remains to the east. |
| **1994 (1:1000) Trinity Maps** | A large increase in commercial units and factories is shown, with Davitt Road present adjacent to the site. To the east of the site, commercial units include; Dublin Cooperation Cleansing Department, SCR Motor Garages and Knights Cleaning contractors. West of the site includes HGW Paint and Varnish Manufacturers. High density residential buildings characterise the north of the site. |
| **1995 (OSI)** | Development of the surrounding area is shown on the 1995 aerial photograph. High density residential buildings are to the north of the site with commercial units and residential buildings to the south of the site. |
| **2000 (OSI)** | No significant changes |
| **2005 (OSI)** | The Luas tracks now run parallel to the Grand Canal, no significant changes to the residential and commercial areas. |
| **2012 (Google Earth)** | No changes appeared to have occurred since 2005. |

## 4.4 Potential Sources

### 4.4.1 Cable Fluid Source

Information on the potential fluids released was provided in the ESB RFP document. Typically, fluid filled cables are installed in trenches approximately 1.2 m deep, 1.1 m wide and the depth to the top of the cable is typically 0.9 m – 1 m. The cables are typically surrounded by 0.35 m of sand and then the trench is backfilled with either clause 804 fill or trench arisings.

Based on information from the GSI, it is likely that the cable on this site is installed within sand and backfilled with made ground, therefore leaked fluid is likely to have migrated through either the sand surround or made ground (if sufficient permeability).

It is estimated that 355 litres of cable fluid was released in July 2010.

It is assumed, based on records and Safety Data Sheets (SDS) provided to AECOM by ESB, that the fluid lost was a mixture of the following cable fluid products:

- 'T 3788' manufactured by H&R ESP Ltd of Milton Keynes in the UK;
- 'Masse 106' produced by Felten & Guilleaume Energietechnik AG in Germany; and
- Shell Diala Cable Oil.

T 3788 is a low viscosity blend of linear alkyl benzenes (LABs) (CAS # 67774-74-7). Shell Diala Cable Oil has the same CAS # as T 3788, so is essentially the same product but made by a different manufacturer. The SDS for Masse 106 does not give its CAS # or details of its composition but states that it is a blend of highly refined mineral oils and additives.

#### 4.4.1.1 Linear Alkyl Benzenes

*Physical and Chemical Properties*

LABs have side alkyl chains of 10-13 carbon atoms in length attached to a benzene ring. The alkyl chain may be attached to the benzene ring at any position except the terminal (end) position. As LABs are a mixture, their precise physio-chemical properties are dependent upon the components of the mixture, but they are generally colourless, oily liquids, less dense than water, with very low aqueous solubility and low volatility. Their potential spreading in the ground will therefore be similar to other light non-aqueous phase liquids (LNAPL) but with very little mass loss due to volatilisation or dissolution.

Information relating to the nature and toxicity of linear alkyl benzenes has been primarily sourced from the following documents:

- Safety Data Sheet (SDS) for T 3788;
- European Union Risk Assessment Report, Benzene, C10-13 alkyl derivatives, 20 June 1997; and
- Organisation for Economic Co-operation and Development (OECD) Screening Information Datasets (SIDS) Initial Assessment Reports for High Production Volume Chemicals, United Nations Environment Programme, Chemicals Branch, May 2002.

The table below summarises the basic physical and chemical properties of LABs.

**Table 6 Linear Alkyl Benzene Physical and Chemical Properties**

| Property | Description |
|---|---|
| Molecular Weight | 239-243 g/mol |
| Melting Point | <-70$^{o}$C |
| Boiling Point | 251-320$^{o}$C @ 1 atm (OECD) |
| Vapour Pressure @ 25$^{o}$C | 6.5 x $10^{-5}$ kPa (OECD) |
| Aqueous Solubility | 0.041 mg/L (OECD) |
| Henry's Law Constant | 9.34 x $10^{-4}$ atm-m$^3$/mol (OECD) |

| Property | Description |
|---|---|
| Density | 0.86 @ 20ºC |
| Flash Point | 140ºC |
| Explosive Properties | None |

LAB (C12) has a calculated octanol-water partition coefficient (Koc) of $2.2x10^4$ and is classified by the EU risk assessment as a high adsorptive substance.

*Degradation*

The OECD SIDS (2002) review concluded that LABs undergo "rapid primary biodegradation in natural waters and complete mineralisation by micro-organisms under aerobic conditions". A measured half-life in water of four to nine days was reported. Microorganisms in sewage sludge and soil were reported to rapidly and completely biodegrade LABs. Anaerobic biodegradation was inferred to occur, but at a slow rate.

Degradation in soil is expected to occur but to be slower than in surface water due to the much slower mixing and the limited availability of oxygen. Where oxygen is available, aerobic degradation would occur at the fringes of a body of LNAPL in the soil/groundwater, producing elevated carbon dioxide levels in the soil and potentially elevated alkalinity in the groundwater. In the absence of oxygen, anaerobic degradation may occur by methanogenesis or by reduction of sulphate, nitrate, ferric iron ($Fe^{3+}$) and manganese ($Mn^{3+}$). These processes could lead to reducing conditions in the groundwater, with depleted concentrations of sulphate ($SO_4^-$) and nitrate ($NO_3^-$) and increased concentrations of dissolved methane ($CH_4$), ferrous iron ($Fe^{2+}$) and dissolved manganese ($Mn^{2+}$). Such conditions would be expected to occur close to the LNAPL body and locally downgradient. With increased distance from the LNAPL, mixing with the surrounding groundwater and aeration from seasonal fluctuations and groundwater recharge would gradually allow ambient (most likely oxidised) conditions to be re-established.

*Toxicity*

According to the OECD review, LABs were assessed to be not acutely toxic to human health. Data from repeat exposure, reproductive and genotoxicity studies also indicated a low potential for toxic effects. The OECD concluded that "Linear alkyl benzenes do not present any significant acute or sub-chronic health effects by various exposure routes. LAB is not teratogenic (i.e. causing birth defects) and does not produce selective reproductive toxicity."

Laboratory studies have shown that repeated exposure to LABs may be irritating to the skin, and the SDS recommends the use of gloves when handling LABs. The low vapour pressure of LABs limits the potential for exposure via inhalation, and this is not expected to be a significant exposure route at normal temperatures.

Eco-toxicity studies reviewed by the OECD found no acute toxic effects on aquatic species tested at concentrations up to and exceeding solubility limits. The only exception to this was for the water flea Daphnia magna. No data was available regarding terrestrial eco-toxicity studies.

Due to its high biodegradability and rapid metabolism, the OECD concluded that LABs were of little concern for adverse environmental impact. The OECD and EU reviews of LABs both concluded that LABs were a low priority for further investigation.

#### 4.4.1.2 Masse 106 Mineral Oil

Information on Masse 106 has been obtained from a Safety Data Sheet (SDS) dated 1995 provided by ESB.

*Physical and Chemical Properties*

Masse 106 is understood to be a blend of highly refined mineral oils and additives. The SDS does not provide information on the identity of the mineral oils or additives, or on their proportions within the oil.

The SDS states that containers of Masse 106 should be kept tightly closed and in a well-ventilated space and that it should be used only in well-ventilated areas. This suggests that Masse 106 may contain volatile components.

The table below summarises information from the SDS for Masse 106.

**Table 7 Masse 106 Physical and Chemical Properties**

| Property | Description |
|---|---|
| Vapour Pressure @ 20°C | <0.01 hPa |
| Aqueous Solubility | negligible |
| Density | 888 kg/$m^3$ |
| Flash Point | 145°C |
| Flammability range | 0.6% volume to 6.5% volume |
| Kinematic viscosity@ 40°C | 8.5 $mm^2/s$ |

Based on these properties, Masse 106 would behave as a relatively viscous LNAPL in the ground. The SDS states that if the product enters soil it will be adsorbed to soil particles and not be mobile.

*Degradation*

The SDS for Masse 106 indicates that it is not readily biodegradable. Nevertheless, as it is expected to be comprised mainly of petroleum hydrocarbon compounds, gradual degradation is expected to occur, especially in water. The rate of biodegradation is likely to depend on the availability of oxygen and of favourable geochemical conditions. As with LABs and with other petroleum hydrocarbons, where oxygen is available, aerobic degradation would be expected to occur at the fringes of a body of LNAPL in the soil/groundwater, producing elevated carbon dioxide levels in the soil and potentially elevated alkalinity in the groundwater. In the absence of oxygen, anaerobic degradation may occur by methanogenesis or by reduction of sulphate, nitrate, ferric iron ($Fe^{3+}$) and manganese ($Mn^{3+}$). These processes could lead to reducing conditions in the groundwater, with depleted concentrations of sulphate ($SO_4^-$) and nitrate ($NO_3^-$) and increased concentrations of dissolved methane ($CH_4$), ferrous iron ($Fe^{2+}$) and dissolved manganese ($Mn^{2+}$). Such conditions would be expected to occur close to the LNAPL body and locally downgradient. With increased distance from the LNAPL, mixing with the surrounding groundwater and aeration from seasonal fluctuations and groundwater recharge would gradually allow ambient (most likely oxidised) conditions to be re-established.

*Toxicity*

The 1995 SDS for Masse 106 states that the components of the preparation are not expected to impart hazardous properties to the product. Whilst this suggests the product is not hazardous, it is noted that standards for hazard assessment and SDS production have evolved since 1995 and therefore the information cannot be relied upon with full confidence in relation to current standards for hazard assessment.

The SDS indicates that Masse 106 is expected to be practically non-toxic to aquatic organisms.

In relation to human toxicity, the SDS gives the following information:

- It is expected to be slightly irritant, so all forms of skin contact should be minimised. It is not expected to be a skin sensitiser.
- Respiratory protection is not normally required but it should be used only in well-ventilated spaces. It is based on mineral oils and other components not known to be carcinogenic.

#### 4.4.1.3 Conclusion

Based on the above, underground leakage of LABs is not likely to lead to significant issues from dissolved hydrocarbons or vapours. Although the components of Masse 106 are not known and its aqueous solubility is stated on the SDS as “negligible”, it is unclear what this means in the context of dissolution of components from a NAPL. Based on the requirement for it to be used only in well-ventilated spaces, it appears that Masse 106 contains some relatively volatile components.

The main concern from LABs and a concern also for mineral oils such as Masse 106 is the potential for them to migrate and spread as a LNAPL, downwards through unsaturated soil that is present and then laterally in the vicinity of the groundwater table. The extent of LNAPL migration will depend on the properties of the surrounding soil and on the saturation and pressure distribution within the LNAPL. These in turn would depend on the quantity of cable fluid lost and the timescale over which the leakage occurred.

Vapour impacts are considered to be unlikely from LABs but could be of concern for Masse 106.

Degradation of the cable fluid may lead to the generation of ground gas (including carbon dioxide and methane) and affect groundwater chemistry in the vicinity and locally downgradient of the LNAPL.

Given that a mixture of LABs and a mineral oil based cable fluid have been used in the past, potential contaminants of concern associated with mineral oil based fluids would include the following:

- Total Petroleum Hydrocarbons (TPH);
- Benzene, toluene, ethylbenzene and xylene (BTEX) compounds;
- Volatile organic compounds (VOCs);
- Semi volatile organic compounds (SVOCs); and
- Polychlorinated biphenyls (PCBs).

### 4.4.2 Potential Off-Site Sources of Contamination

Based on a review of historic maps and the current site setting, land use surrounding the site has been principally residential and commercial. The following potential off-site sources of contamination have been identified as part of the assessment works completed:

- Fill materials (understood to be up to 1.5 m bgl) present in the surrounding area;
- Historic industrial land uses in the vicinity of the site, including a brick works and paint factory;
- Goldenbridge Graveyard; and
- Fuel / chemicals (e.g. for back-up generators) present in commercial buildings around the site.

## 4.5 Source Audit Summary

Based on the assessment works completed, the primary APEC for this site comprises the leak location identified by ESB. This is presented in Figure 2 and a description is provided in Table 8.

**Table 8 Area of Potential Environmental Concern**

| Number | APEC | Potential Contaminants of Concern | Potential Media Impacted |
|---|---|---|---|
| 1 | Leak at (30) Francis Street - Inchicore 110 kV (July 2010) | LABs<br>TPH<br>BTEX<br>VOCs<br>SVOCs<br>PCBs | Soil<br>Groundwater<br>Soil Vapour<br>Ground Gas |

Other potential off-site sources have also been identified based on the type of activity. However, no information is available for these sites therefore the only APEC assessed herein is the leak site beneath Davitt Road.

# 5. Conceptual Site Model

A preliminary Conceptual Site Model (CSM) has been developed identifying potential contaminant sources, contaminant migration pathways and potential receptors.

In the context of land contamination, there are three essential elements to any risk:

1. A **source** – a substance that is in, on or under the land and has the potential to cause harm or to cause pollution of controlled waters;
2. A **receptor** – in general terms, something that could be adversely affected by a contaminant, such as people, an ecological system, property, or a water body; and
3. A **pathway** – a route or means by which a receptor can be exposed to, or affected by, a contaminant.

Each of these elements can exist independently, but they create a risk only where they are linked together, so that a particular contaminant affects a particular receptor through a particular pathway. This kind of linked combination of contaminant–pathway–receptor is described as a pollutant linkage. The preliminary CSM was developed to describe viable source-pathway-receptor (SPR) linkages for the site, which are presented in Table 13 below.

By considering potential SPR linkages, an assessment of the human health and controlled water risks is made with reference to the significance and degree of the risk. The risk assessment has been undertaken with reference to BS10175-2011 + A2 2017 and CIRIA Document C552: 'Contaminated Land Risk assessment - A Guide to Good Practice' (2001).

The preliminary risk assessment completed for this site is based on consideration of whether a potential source of contamination can reach a receptor, and hence whether it is of major or minor significance. Considering that assessment works are still at preliminary stage and no intrusive investigation work has been completed, development of the preliminary CSM and assessment of potential risk is based on information provided by ESB on the nature of the leak, and on the AECOM site reconnaissance and desk based study. As such, only a qualitative assessment can be made around potential risks to receptors. This means that identification of potential risk does not necessarily indicate a risk to a receptor, rather that further assessment may be required to investigate assumptions made in the CSM and quantify whether a potential risk actually exists.

## 5.1 Qualitative Risk Assessment Methodology

A qualitative risk assessment has been carried out by assessing the severity of the potential consequence, taking into account both the potential severity of the hazard and the sensitivity of the target, based on the categories given in Table 9 below.

**Table 9 Potential Hazard Severity Definition**

| Category | Definition |
|---|---|
| Severe | Acute risks to human health, catastrophic damage to buildings/property, major pollution of controlled waters. |
| Medium | Chronic risk to human health, pollution of sensitive controlled waters, significant effects on sensitive ecosystems or species, significant damage to buildings or structures. |
| Mild | Pollution of non-sensitive waters, minor damage to buildings or structures. |
| Minor | Requirement for protective equipment during site works to mitigate health effects, damage to non-sensitive ecosystems or species. |

The likelihood of an event (probability) takes into account both the presence of the hazard and target and the integrity of the pathway and has been assessed based on the categories given in Table 10 below.

### Table 10 Probability of Risk Definition

| Category | Definition |
|---|---|
| High likelihood | Pollutant linkage may be present, and risk is almost certain to occur in long term, or there is evidence of harm to the receptor. |
| Likely | Pollutant linkage may be present, and it is probable that the risk will occur over the long term. |
| Low likelihood | Pollutant linkage may be present, and there is a possibility of the risk occurring, although there is no certainty that it will do so. |
| Unlikely | Pollutant linkage may be present, but the circumstances under which harm would occur are improbable. |

The potential severity of the risk and the probability of the risk occurring have been combined in accordance with the following matrix in order to give a level of risk for each potential hazard as shown in the table below.

### Table 11 Level of Risk for Potential Hazard Definition

| | Potential Severity | | | |
|---|---|---|---|---|
| Probability of Risk | Severe | Medium | Mild | Minor |
| High | Very high | High | Moderate | Low/Moderate |
| Likely | High | Moderate | Low/Moderate | Low |
| Low | Moderate | Low/Moderate | Low | Very low |
| Unlikely | Low/Moderate | Low | Very low | Very low |

A description of the levels of risk outlined in Table 11 is provided in the following table:

**Table 12 Description of the Classified Risks and Likely Action Required**

| Level of Risk | Description |
|---|---|
| Very High Risk | 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.<br>This risk, if realised, is likely to result in substantial liability.<br>Urgent investigation and remediation are likely to be required. |
| High Risk | Harm is likely to arise to a designated receptor from an identified hazard.<br>Realisation of the risk is likely to present a substantial liability.<br>Urgent investigation is required and remedial works may be necessary in the short term and are likely over the long term. |
| Moderate Risk | It is possible that harm could arise to a designated receptor from an identified hazard. However, it is either relatively unlikely that any such harm would be severe, or if any harm were to occur it is more likely that the harm would be relatively mild, if realised. |
| Low Risk | 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 normally be mild. |
| Very Low Risk | 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. |

## 5.2 Preliminary CSM Assumptions

Based on the findings of the desktop study and information provide in the RFP by ESB, the following assumptions were made in development of the CSM:

- The fluid assumed (based on records provided) to have leaked from the cable is a mixture of LAB and a mineral oil based cable fluid;
- The geology beneath the site is assumed to comprise approximately 1.5 m of made ground underlain by clay up to a depth of 5 m bgl. Limestone bedrock is assumed to be present at a depth of approximately 5 m bgl;
- Groundwater is assumed to be present at relatively shallow depths within the made ground;
- It is assumed that the Grand Canal adjacent to the site is lined with an impermeable material such as clay, as was commonly used from the 1700s to early 20$^{th}$ Century to prevent leakage from the canal and thus loss of water level restricting navigation;
- It is assumed that is no direct connection between the site and surface water bodies;
- Other below ground utilities including mains water are assumed to be present in the vicinity of the site; and
- It is assumed that industrial/commercial and residential buildings adjacent to the site have no basements.

The preliminary CSM is presented graphically in Figure 3.

## Table 13 Conceptual Site Model

| Source | Pathway | Receptor | Severity | Likelihood | Potential Risk | Discussion |
|---|---|---|---|---|---|---|
| LAB / Volatile TPH and VOC concentrations in soils | Inhalation of vapours which have migrated from the ground to above ground buildings and basements. | Site users in an industrial/commercial/low to high density residential scenario. | Medium | Unlikely | Low | Based on records provided, a mixture of LAB and mineral oil is assumed to be the cable fluid used. The low vapour pressure of LABs limits the potential for exposure via inhalation, and this is not expected to be a significant exposure route at normal temperatures. However, given that the fluid lost is a mixture, there is a potential for vapours to be generated from the mineral oil fraction.<br>Based on the volume of cable fluid released (355 litres), duration of time over which it was released (< 1 month) and time elapsed since the leak was repaired (9 years), it is considered that there is a low risk from the inhalation of vapours from potential mineral oil-based products present beneath the site in this scenario. Further assessment would be required to fully evaluate these scenarios. |
| NAPL and non-volatile TPH, VOC, SVOC and PCB concentrations in soils | Soil and dust ingestion from near surface soils.<br>Dermal contact with near surface soils.<br>Inhalation of fugitive dust from near surface soils.<br>Ingestion of soils via consumption of vegetables grown in near surface soils. | Site users in an industrial/commercial/low to high density residential with plant uptake scenario. | Medium | Unlikely | Low | Given the likely depth to the cable, surface soils are unlikely to be affected and exposure via this pathways is not considered likely. |
| | | Intrusive site workers. | Minor | Likely | Low | Workers carrying out intrusive works adjacent to the site may come into contact with mineral oil based NAPL and impacted soil, meaning there will be a requirement to wear personal protective equipment to mitigate against potential impacts. Given the relatively low toxicity of LABs (assessed to be not acutely toxic), exposure to LABs is not considered to represent a significant risk. |
| NAPL and TPH, VOC, SVOC and PCB concentrations in soils | Migration of ground gas generated from the degradation of the cable fluid to above ground buildings. | Site users in an industrial/commercial/low to high density residential scenario. | Medium | Unlikely | Low | If a significant source of NAPL (LAB or mineral oil) is present on groundwater, there is potential for ground gas to be generated from degradation processes. However, given the time elapsed since the leak occurred (9 years) and the relatively small volume of fluid released at this location (355 litres), it is unlikely that ground gas is being generated in significant quantities and potential risk from this pathway is considered to be low. |

| Source | Pathway | Receptor | Severity | Likelihood | Potential Risk | Discussion |
|---|---|---|---|---|---|---|
| NAPL and TPH, VOC, SVOC and PCB concentrations in soils | Permeation of LAB NAPL through plastic water supply pipes. | Site users in an industrial/commercial/low to high density residential with plant uptake scenario. | Medium | Unlikely | Low | Public water mains likely to be present in the vicinity of the leak, servicing commercial and residential properties, however given the relatively low volume of cable fluid released (355 litres) over 9 years ago, it is not considered likely that a sufficient volume of NAPL could be present to impact water mains.<br>ESB has consulted with Irish Water (statutory body responsible for water supply) regarding the potential risk for cable fluid present in the vicinity of water supply pipes. Following review of their records, AECOM understands that Irish Water do not have concerns regarding impact of water supplies from cable fluid leaks. It is therefore considered that the potential risk of a pollutant linkage being present is low. As a precaution, investigation works should be carried out as part of future assessment works to further assess this source-pathway-receptor linkage. |
| NAPL and TPH, VOC, SVOC and PCB concentrations in soils | Migration of potential contaminants along preferential flow pathways such as underground services and permeable backfill around the electricity cable. | Nearby surface water bodies including the Camac River and Grand Canal. | Medium | Unlikely | Low | It is understood that the leak (355 litres) at this location was repaired in 2010. Given that there is no evidence of impact in the Grand Canal or Camac River during the site walkover and no reported incidents of oil release, it is likely that NAPL released from the cable has stabilised over the 9-year period since the leak was repaired. In addition, given the relatively low volume of fluid released, the risk to nearby surface waters is considered to be low. Further assessment would be required to fully assess potential risk to nearby surface water bodies. |
| NAPL and TPH, VOC, SVOC and PCB concentrations in soils | Migration of potential contaminants along preferential flow pathways such as underground services and permeable backfill around the electricity cable. | Site users in an industrial/commercial/low to high density residential with plant uptake scenario. | Medium | Unlikely | Low | Likely to be a high concentration of services present in the vicinity of the leak given the urban setting. If the soil / made ground around the leak is generally clay, the leaking fluid will likely have migrated mainly along any permeable backfill around the cable. In addition, the volume of fluid released was relatively low. Consequently, the potential for migration over significant distances is considered to be low. |
| NAPL | Migration in saturated and unsaturated soil. | Groundwater beneath the site. | Medium | Low Likelihood | Low / Moderate | Extent of NAPL migration will depend on the characteristics of the receiving soil. However, given the volume of cable fluid released (355 litres) and duration since the leak was repaired (9 years) the potential risk of NAPL being present is considered to be low to moderate. Further assessment would be required to fully assess this potential risk. |

| Source | Pathway | Receptor | Severity | Likelihood | Potential Risk | Discussion |
|---|---|---|---|---|---|---|
| Dissolved phase leaching from NAPL or from soils containing elevated concentrations of TPH, VOCs, SVOCs and PCBs | Leaching from soil to groundwater.<br>Vertical and horizontal migration of contaminants through groundwater.<br>Horizontal migration of contaminants through groundwater to nearby surface water receptors. | Groundwater in superficial deposits beneath the site. | Medium | Low Likelihood | Low / Moderate | Considering the relatively low volume of cable fluid released and the 9-year period since the cable was repaired, it is considered that the risk of shallow groundwater being significantly impacted is low to moderate. Further assessment would be required to quantify any impact from the presence dissolved phase contamination in groundwater. |
| LAB, TPH, VOC, SVOC and PCB concentrations in groundwater | | Groundwater in limestone bedrock aquifer beneath the site. | Medium | Unlikely | Low | Information on the local geology indicates the presence of underlying stiff clay, which would reduce vertical migration of groundwater to the bedrock aquifer. Further assessment would be required to fully evaluate this potential risk. |
| | | Nearby surface water bodies including the Camac River and Grand Canal. | Medium | Unlikely | Low | The potential risk to surface water bodies is considered low given the relatively low volumes leaked over 9 years ago. The Grand Canal is likely lined with impermeable material. No evidence of impact from the cable fluid release was noted during the site walkover, with strong vegetation growth observed along the canal banks. Further assessment would be required to fully evaluate this potential risk. |

# 6. Conclusions

AECOM completed a Preliminary Site Assessment of the site located on the south bank of the Grand Canal on Davitt Road, Dublin 12 The objective of the works was to identify potential risks to human health and controlled waters that may be associated with a fluid leak from the identified location.

Based on the findings of the desktop study, the overall environmental sensitivity of the site is considered to be moderate. Identified sensitive receptors within 1 km of the site include:

- The Grand Canal located immediately north of the site, although this may be protected by low permeability clay (natural and/or engineered when the canal was constructed);
- The River Camac located approximately 1 km west of the site, although this may be protected by low permeability clay deposits which are likely to be encountered beneath the site; and
- The groundwater aquifer beneath the site, although this may also be protected by low permeability clay deposits which are likely to be encountered beneath the site.

It is estimated that 355 litres of cable fluid (Linear Alkyl Benzene (T 3788)) was released in July 2010. It is assumed, based on information provided to AECOM by ESB, that the fluid lost was a mixture of LAB and mineral oil based products. Due to its high biodegradability, lower volatility and low solubility, it is considered that LABs are of less concern for adverse environmental impact than mineral oil based products. Given that there is potential for a mixture of both types of cable fluids to have been used at this site, potential contaminants of concern have been identified. A summary of the source audit findings is as follows:

**Table 14 Area of Potential Environmental Concern**

| Number | APEC | Potential Contaminants of Concern | Potential Media Impacted |
|---|---|---|---|
| 1 | Leak at (30) Francis Street – Inchicore 110 kV (July 2010) | LABs<br>TPH<br>BTEX<br>VOCs<br>SVOCs<br>PCBs | Soil<br>Groundwater<br>Soil Vapour<br>Ground Gas |

The preliminary CSM developed for the site looked at potential source-pathway-receptor linkages identified during the assessment works and identified a low to moderate potential risk to shallow groundwater due to potential impact to groundwater chemistry from the presence of NAPL and associated biodegradation products.

Risks associated with other potential source-pathway-receptor linkages were considered to be low.

The risk assessment completed herein is preliminary in nature as it can only be based on an evaluation of qualitative data sources (i.e. not on intrusive site investigation works). Consequently, identification of potential risk does not necessarily indicate a risk to a receptor, rather that further assessment may be required to investigate assumptions made in the CSM and quantify whether a potential risk actually exists. Generally, where a low or very low risk has been identified further assessment may not be deemed necessary to assess a particular SPR linkage, although further assessment may be deemed to be required to investigate CSM assumptions where the potential risk is considered to be low or very low due to the sensitivity of the receptor.

# Figures


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**Project Title:**

ESB CABLE ALLIGNMENT - SITE 30
FRANCIS STREET - INCHICORE (110kV)

**Client:**

ESB

**LEGEND**

Leak location

0 1 2 Km

**Notes:**

**AECOM Internal Project No:**

60610407

**Drawing Title:**

FIG.1 - SITE LOCATION MAP

**Drawing No:**

| Drawn: | Chk'd: | App'd: | Date: |
|---|---|---|---|
| RE | DM | SF | 29.11.19 |



Filename: Z:\UK\IE\DBL2\Jobs\PR-427640_ESB_Cable_Allignment\400_Technical\430_TechnicalArea_XX\40_Site 30 Francis Street - Inchicore\Figures\GIS\Site Location.mxd


Filename: Z:\UK\IE\DBL2\Jobs\PR-427640_ESB_Cable_Allignment\400_Technical\430_TechnicalArea_XU440_Site 30 Francis Street - Inchicore\Figures\GIS\Site Location.mxd



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**Project Title:**

ESB CABLE ALLIGNMENT - SITE 30
FRANCIS STREET - INCHICORE (110kV)

**Client:**

ESB

**LEGEND**

Leak location

Fluid Filled Cable

0 40 80 m

**Notes:**

**AECOM Internal Project No:**

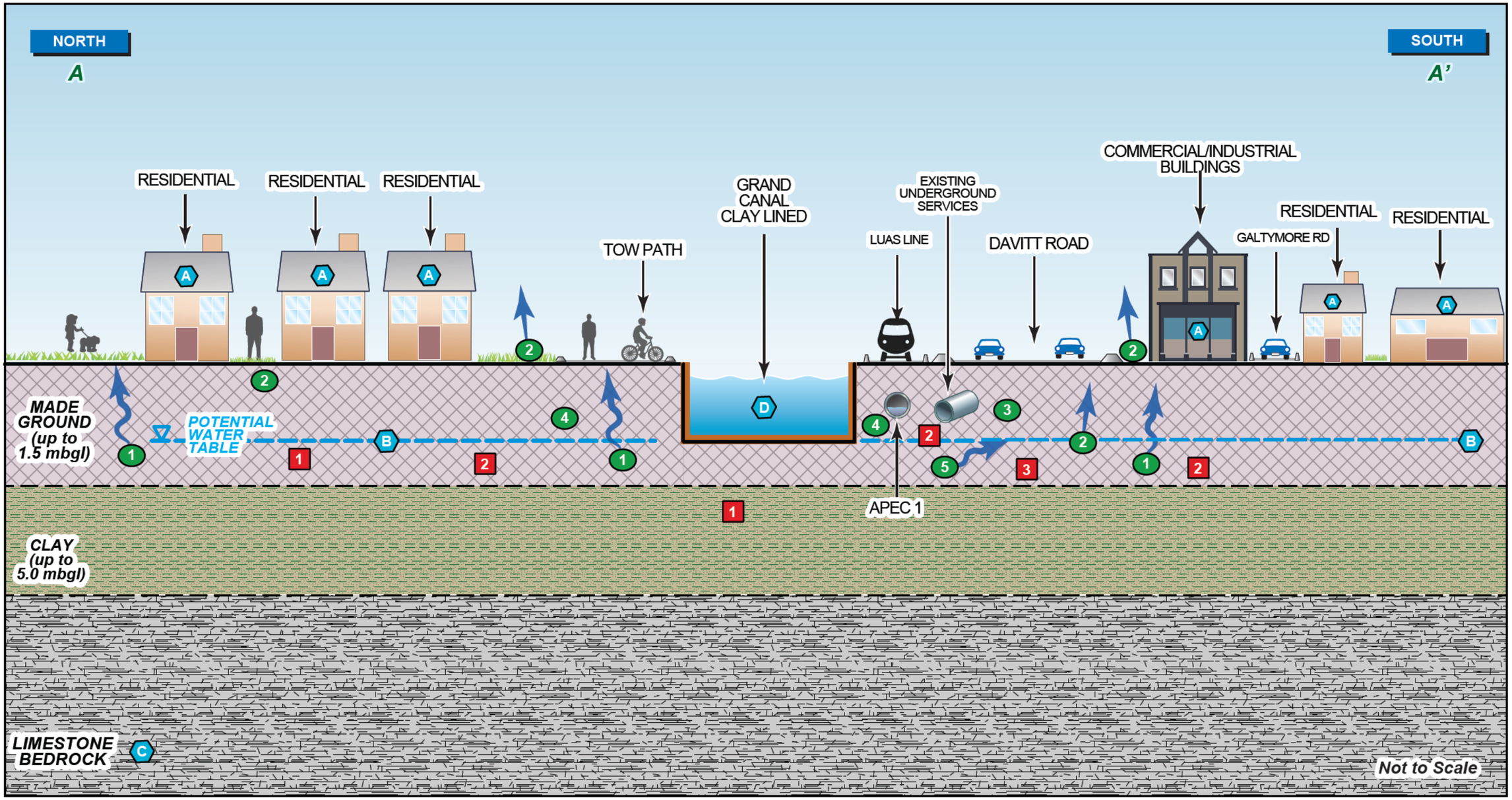
60610407

**Drawing Title:**

FIG.2 - SITE LAYOUT PLAN

**Drawing No:**

| Drawn: | Chk'd: | App'd: | Date: |
|---|---|---|---|
| RE | DM | SF | 29.11.19 |




## SOURCES

1. GROUND GAS
2. NON-VOLATILE CONTAMINANTS IN SOIL
3. CONTAMINANTS IN GROUNDWATER

## PATHWAYS

1. GROUND GAS MIGRATION
2. DERMAL CONTACT / DUST INGESTION
3. PERMEATION OF AND MIGRATION ALONG EXISTING UNDERGROUND SERVICES
4. LEACHING FROM SOIL TO GROUNDWATER
5. VERTICAL & HORIZONTAL MIGRATION OF CONTAMINATED GROUNDWATER

## RECEPTORS

- A — RESIDENTIAL / COMMERCIAL SITE USERS
- B — SHALLOW GROUNDWATER
- C — BEDROCK GROUNDWATER
- D — SURFACE WATER

| Rev | Date | Detail | Made | Chk'd | App'd |
|---|---|---|---|---|---|

Status: FOR INFORMATION

NOTES:

Client

Location: SITE 30 Francis Street Inchicore 110 kV

Title: FIGURE 3 CONCEPTUAL SITE MODEL

AECOM
4th Floor, Adelphi Plaza, Adelphi Centre, George's Street Upper, Dun Laoghaire, Co. Dublin, Ireland.
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| | | | |
|---|---|---|---|
| Design ESB | | Drawn RDH | |
| Chk'd CC | | App'd DM | |
| Date AUG 2019 | | Scale As Shown | |
| Project No. 60610407 | Drg No. 3 | Stat. . | Rev 0 |

# Appendix A Site Photographs

AECOM

# PHOTOGRAPHIC LOG

| **Client Name:** ESB | **Site Location:** Site 30: Francis Street - Inchicore | **Project No.** PR-427640 |
|---|---|---|

Date:
26 July 2019

**Description**
The Grand Canal located directly north of the APEC and running east and west along the cable route. Residential Housing is located on the northern side of the Canal.

**Date:**
26 July 2019

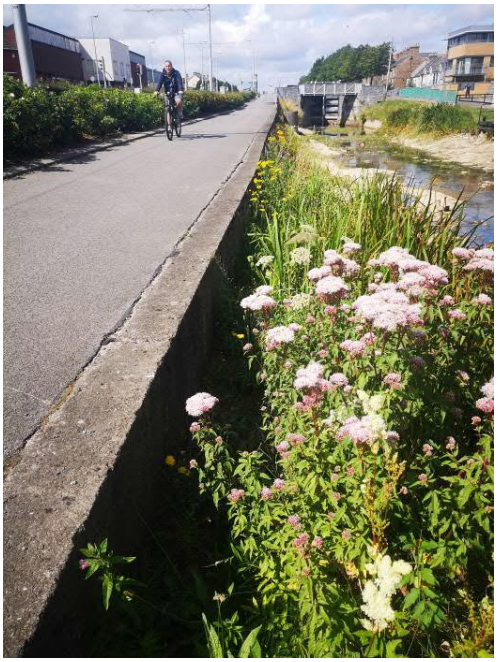

**Description:**
Red Line Luas tracks and the Marble Arch Pub located on the southern side of the APEC along the Davitt Road.

AECOM

# PHOTOGRAPHIC LOG

| **Client Name:** ESB | **Site Location:** Site 30: Francis Street - Inchicore | **Project No.** PR-427640 |
|---|---|---|

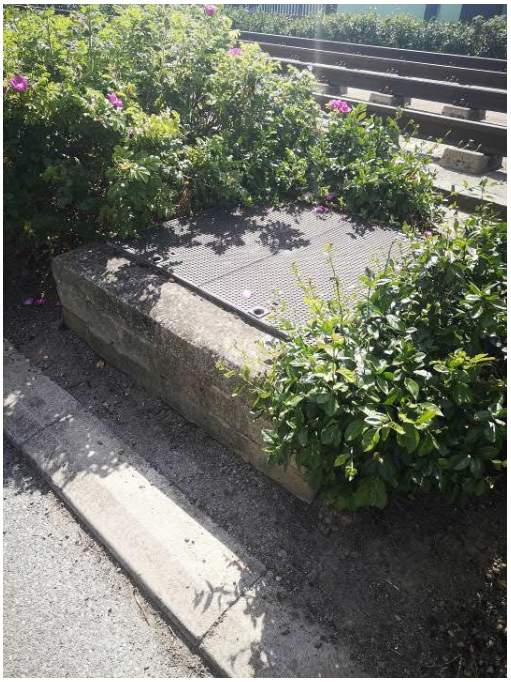
Date: 26 July 2019



**Description**

Tow path looking west from the APEC. The Grand Canal runs along the APEC and the ESB cables are beneath the tow path.

Date: 26 July 2019



**Description:**
Services located immediately south of the APEC and along Luas track.

AECOM

# PHOTOGRAPHIC LOG

| **Client Name:** ESB | **Site Location:** Site 30: Francis Street - Inchicore | **Project No.** PR-427640 |
|---|---|---|

Date: 26 July 2019

**Description**

Tow path looking east from the APEC. The Grand Canal on the left runs along the APEC and the ESB cables are beneath the tow path.

Date: 26 July 2019

**Description:**
Construction works at the eastern boundary of the site. Showing reduced water levels in the canal, presumed to be associated with construction works.

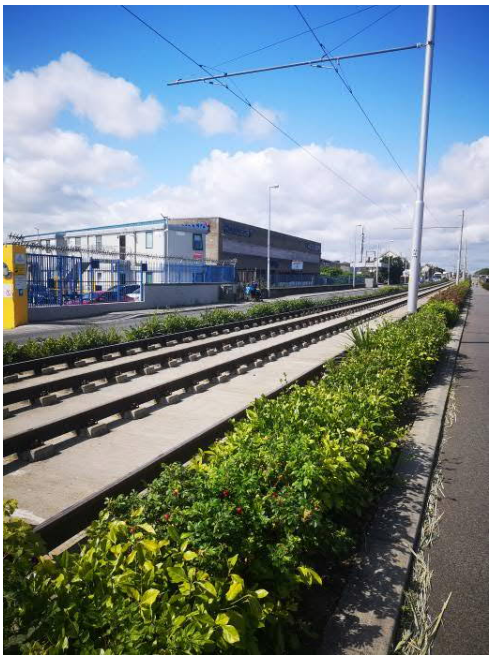
AECOM

# PHOTOGRAPHIC LOG

| **Client Name:** ESB | **Site Location:** Site 30: Francis Street - Inchicore | **Project No.** PR-427640 |
|---|---|---|

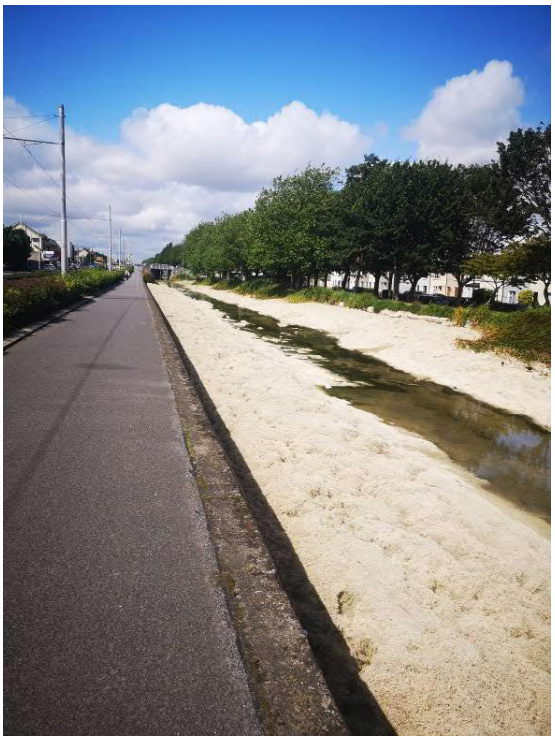
Date:
26 July 2019

**Description**
Light industrial units to north of Cable Route.



Date:
26 July 2019

**Description:**
View west along the Grand Canal from the eastern boundary of the site along the cable route.

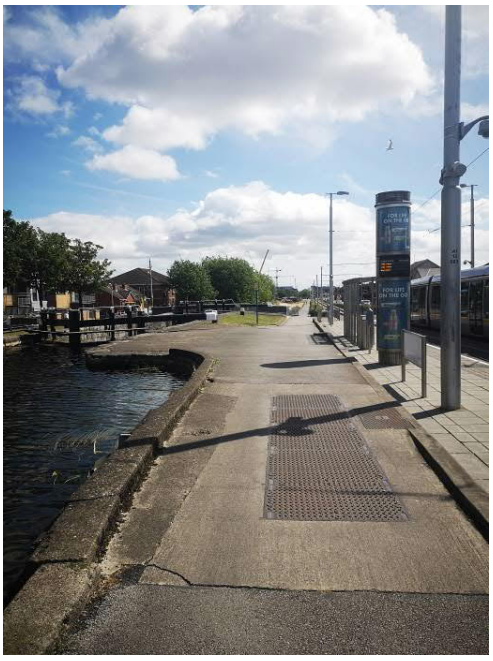


AECOM

# PHOTOGRAPHIC LOG

| **Client Name:** ESB | **Site Location:** Site 30: Francis Street - Inchicore | **Project No.** PR-427640 |
|---|---|---|

Date:
26 July 2019



**Description**
West of the APEC along the cable route, the second Lock along the Grand Canal, with the tow pass and the Goldenbridge Luas Stop

Date:
26 July 2019

**Description:**
Second lock to the west of the APEC.

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# PHOTOGRAPHIC LOG

| **Client Name:** ESB | **Site Location:** Site 30: Francis Street - Inchicore | **Project No.** PR-427640 |
|---|---|---|

Date:
26 July 2019

**Description**
Residential housing with construction works north of the APEC location.

Date:
26 July 2019

**Description:**

AECOM

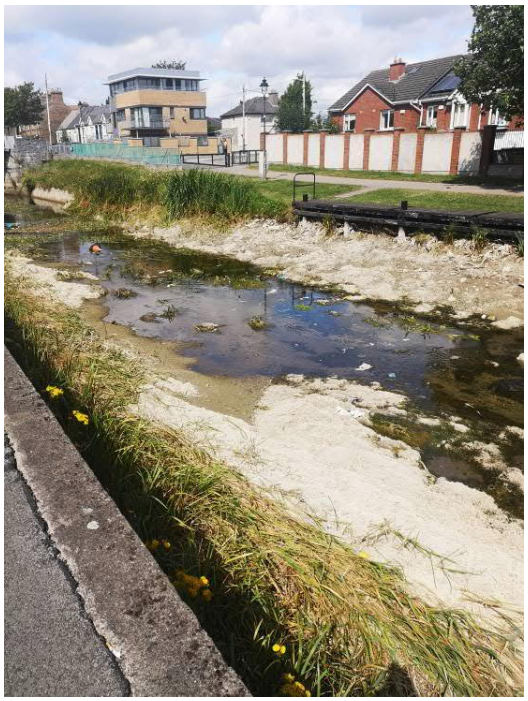
# PHOTOGRAPHIC LOG

| **Client Name:** ESB | **Site Location:** Site 30: Francis Street - Inchicore | **Project No.** PR-427640 |
|---|---|---|

Date:
26 July 2019

**Description**
Residential housing north of the site.

Date:
26 July 2019



**Description:**
Grand Canal at western boundary of the site showing general litter.

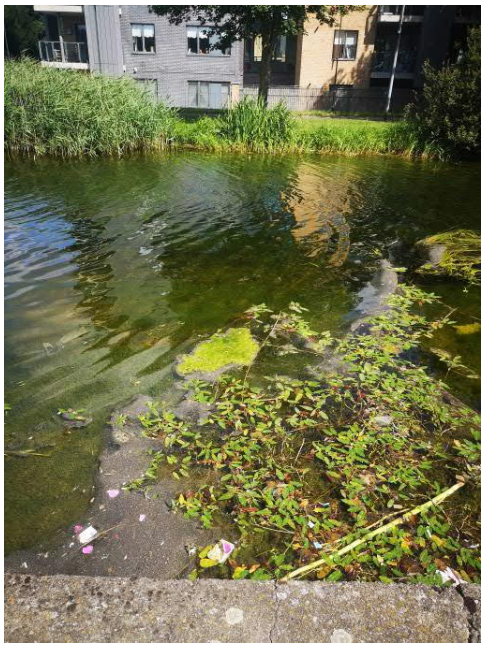
AECOM

# PHOTOGRAPHIC LOG

| **Client Name:** ESB | **Site Location:** Site 30: Francis Street - Inchicore | **Project No.** PR-427640 |
|---|---|---|

Date: 26 July 2019

**Description**
Vegetation and litter within the Grand Canal along the site boundary.



Date: 26 July 2019

**Description:**
Eastern route of the Grand Canal opposite the cable line.

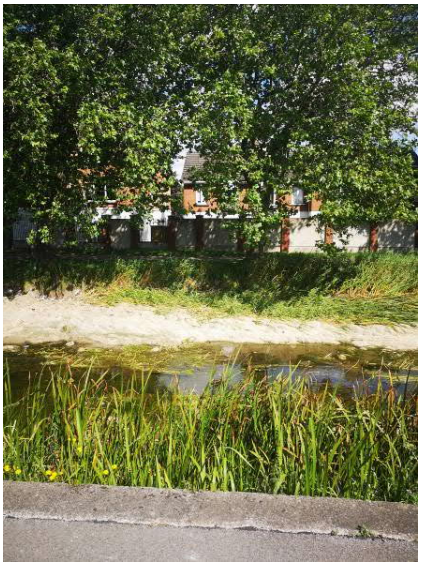
AECOM

# PHOTOGRAPHIC LOG

| **Client Name:** ESB | **Site Location:** Site 30: Francis Street - Inchicore | **Project No.** PR-427640 |
|---|---|---|

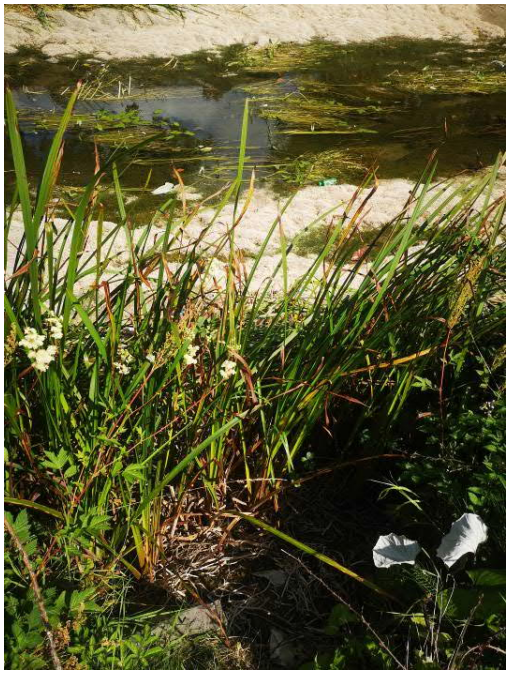
Date: 26 July 2019

**Description**
Apartments located on northern side of Grand Canal opposite APEC location.



Date: 26 July 2019

**Description:**
Vegetation along the Grand Canal bank adjacent to the APEC.



# Appendix B PSA Template Report Table of Contents Cross Reference

| EPA Template Table of Contents | Production Area Preliminary Site Assessment Report |
|---|---|
| Executive Summary | Executive Summary |
| 1. Introduction | Section 1 |
| 1.1 Project Contractual Basis & Personnel Involved | Section 1 |
| 1.2 Background Information | Section 1.1 |
| 1.3 Project Objectives | Section 1.2 |
| 1.4 Scope of Works | Section 2 |
| 2. Source Audit Findings | Section 4 |
| 2.1 Current Site Operations | Section 4.1 to Section 4.2 |
| 2.2 Previous Site Operations | Section 4.3 |
| 2.3 Chemicals of Potential Concern | Section 4.4 |
| 3. Site Environmental Setting | Section 3 |
| 3.1 General Introduction | Section 3 |
| 3.2 Regional Geology and Hydrogeology | Section 3.2 and Section 3.4 |
| 3.3 Site Geology and Hydrogeology | Section 3.2 and Section 3.4 |
| 3.4 Summary of Previous Site Sampling and Monitoring Data | Not Applicable |
| 4. Summary and Conclusions | Section 6 |
| 4.1 Summary and Conclusions | Section 6 |
| 4.2 Recommended Way Forward | Separate Cover Letter |
| 5. References | Throughout Text |