

# **Environmental Impact Assessment Report (EIAR)**

## **Volume 3 of 6: Environmental Assessment**

### **(Chapter 20) Risk of Major Accidents and or Disasters**

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## Acronyms and Abbreviations

Acronym	Meaning
BPS	Booster Pumping Station
BPT	Break Pressure Tank
CEMP	Construction Environmental Management Plan
CIRIA	Construction Industry Research and Information Association
DoEHLG	Department of Environment, Heritage and Local Government
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
EPA	Environmental Protection Agency
ESB	Electricity Supply Board
ESBN	Electricity Supply Board Networks
FCV	Flow Control Valve
GDA WRZ	Greater Dublin Area Water Resource Zone
ha	Hectare
HLPS	High Lift Pumping Station
IEMA	Institute of Environmental Management and Assessment
IFI	Inland Fisheries Ireland
kV	Kilovolt
MAND	Major accident and/or disaster
MI	Million litres
Mld	Million litres per day
RWI&PS	Raw Water Intake and Pumping Station
RWRMs	Raw Water Rising Mains
SWMP	Surface Water Management Plan
TPR	Termination Point Reservoir
WRZ	Water Resource Zone
WTP	Water Treatment Plant

## 20. Risk of Major Accidents and/or Disasters

### 20.1 Introduction

1. This chapter reports the assessment of the vulnerability of the Proposed Project to major accidents and/or disasters (MANDs) and also presents the potential for the Proposed Project to cause a MAND to the environment. It sets out the likelihood of these events, relevant mitigation and a conclusion on the likely significant environmental effects during both the Construction Phase and Operational Phase. The assessment follows the approach set out in Major Accidents and Disasters in Environmental Impact Assessment (EIA): A Primer (Institute of Environmental Management and Assessment (IEMA) and Arup 2020), hereafter referred to as 'the Primer', which is a document which aims to increase awareness of major accidents and disasters within EIA and its application. The Primer provides the following definitions:
  - 'A major accident is an event (for instance, train derailment or major road traffic accident) that threatens immediate or delayed serious environmental effects to human health, welfare and/or the environment and requires the use of resources beyond those of the client or its appointed representatives (i.e. contractors) to manage.
  - Major accidents can be caused by disasters resulting from both man-made and natural hazards.
  - A disaster is a man-made/external hazard (such as an act of terrorism) or a natural hazard (such as an earthquake) with the potential to cause an event or situation that meets the definition of a major accident.'
2. The assessment reported in this chapter has considered the mitigation that has been embedded into the design to avoid or reduce the risk of MANDs. Embedded mitigation is an intrinsic part of the Proposed Project design and therefore the assessment of effects assumes all embedded design measures are in place. Embedded mitigation relevant to this topic is included in Section 20.4 and Table 20.6.
3. Table 20.1 outlines the principal Proposed Project elements. A full description is provided in Chapter 4 (Proposed Project Description) of this Environmental Impact Assessment Report (EIAR).

**Table 20.1: Summary of Principal Project Infrastructure**

Proposed Project Infrastructure	Outline Description of Proposed Project Infrastructure*
<b>Permanent Infrastructure</b>	
Raw Water Intake and Pumping Station (RWI&PS) (Infrastructure Site) County Tipperary	<ul style="list-style-type: none"> <li>• The RWI&amp;PS would be located on a permanent site of approximately 4ha on the eastern shore of Parteen Basin in the townland of Garrynatineel, County Tipperary. In addition, approximately 1ha of land would be required on a temporary basis during construction.</li> <li>• The RWI&amp;PS has been designed to abstract enough raw water from the River Shannon at Parteen Basin to provide up to 300Mld of treated water by 2050.</li> <li>• The RWI&amp;PS site would include a bankside Inlet Chamber, the Raw Water Pumping Station Building, two Microfiltration Buildings, an Electricity Substation and Power Distribution Building, and Dewatering Settlement Basins. The tallest building on the RWI&amp;PS site would be the Microfiltration Buildings which would be 10.9m above finished ground level. Additionally, there would be a telemetry mast, the top of which would be 14m above finished ground level.</li> <li>• Power for the RWI&amp;PS would be supplied via an underground connection to the existing Birdhill 38 kV electricity substation.</li> <li>• A new permanent access road from the R494 would be constructed to access the proposed RWI&amp;PS site. This access road would be 5m in width and 670m in length.</li> <li>• The RWI&amp;PS site boundary would be fenced with a stock proof fence and a 2.4m high paladin security fence 5m inside the boundary. The site would be landscaped in line with the surrounding environment to reduce its visual impact.</li> </ul>

Proposed Project Infrastructure	Outline Description of Proposed Project Infrastructure*
<p>Raw Water Rising Mains (RWRMs) (Pipeline) County Tipperary</p>	<ul style="list-style-type: none"> <li>• The RWRMs would consist of two 1,500mm underground pipelines made from steel that would carry the raw water approximately 2km from the RWI&amp;PS to the Water Treatment Plant (WTP) at Incha Beg, County Tipperary. The water would be pumped from the pumping station at the RWI&amp;PS to the WTP.</li> <li>• Twin RWRMs have been proposed so that one RWRM can be taken out of service for cleaning and maintenance while still providing an uninterrupted flow of raw water through the other RWRM.</li> <li>• The RWRMs would include Line Valves, a Lay-By, Air Valves and Cathodic Protection.</li> <li>• A 20m wide Permanent Wayleave would provide Uisce Éireann with operational access to the RWRMs.</li> </ul>
<p>Water Treatment Plant (WTP) (Infrastructure Site) County Tipperary</p>	<ul style="list-style-type: none"> <li>• The WTP would be located on a permanent site of approximately 31ha at Incha Beg, County Tipperary, 2.6km north-east of the village of Birdhill, and 2km east of the proposed RWI&amp;PS. In addition, approximately 2.5ha of land would be required on a temporary basis during construction.</li> <li>• The WTP would treat the raw water received from the RWI&amp;PS via the RWRMs. Once treated, the High Lift Pumping Station (HLPS) would deliver the treated water onwards from the WTP to the Break Pressure Tank (BPT) at Knockanacree, County Tipperary, via the Treated Water Pipeline.</li> <li>• The WTP would comprise of a series of tanks and buildings including the Raw Water Balancing Tanks, Water Treatment Module Buildings, Sludge Dewatering Buildings, Sludge Storage Buildings, Clear Water Storage Tanks and HLPS, an Electricity Substation and Power Distribution Building, and the Control Building. The tallest building on the WTP site would be the Water Treatment Module Buildings which would be up to 15.6m above finished ground level. Additionally, there would be a telemetry mast, the top of which would be 14m above finished ground level.</li> <li>• There would also be a potential future water supply connection point at the junction between the permanent access road and the R445.</li> <li>• Power for the WTP would be supplied via an underground connection to the existing Birdhill 38 kV electricity substation. Solar panels would be placed on the roofs of the Chemical Dosing Manifold Building, the Water Treatment Module Buildings, Clear Water Storage Tanks and Sludge Storage Buildings, and at a number of locations on the ground to supplement the mains power supply.</li> <li>• A new permanent access road from the R445 would be constructed and would be 6m in width and 640m in length.</li> <li>• The WTP site boundary would be fenced with a stock proof fence and a 2.4m high palisade security fence 5m inside the boundary. The site would be landscaped in line with the surrounding environment to reduce its visual impact.</li> </ul>
<p>Treated Water Pipeline from the WTP to the BPT (Pipeline) County Tipperary</p>	<ul style="list-style-type: none"> <li>• The Treated Water Pipeline from the WTP to the BPT would consist of a single 1,600mm underground steel pipeline which would be approximately 37km long. The water would be pumped through this section of the Treated Water Pipeline by the HLPS.</li> <li>• The Treated Water Pipeline would include Line Valves, Washout Valves, Air Valves, Manways, Cathodic Protection and Lay-Bys.</li> <li>• A 20m wide Permanent Wayleave would provide Uisce Éireann with operational access to the pipeline (this Wayleave has been extended to approximately 30m at some Line Valves to provide access between the Lay-Bys and Line Valves). There would be an additional 10m wide Permanent Wayleave at certain locations for operational access to smaller pipes connecting Washout Valves with permanent discharge locations.</li> </ul>

Proposed Project Infrastructure	Outline Description of Proposed Project Infrastructure*
<p>Break Pressure Tank (BPT) (Infrastructure Site) County Tipperary</p>	<ul style="list-style-type: none"> <li>The BPT would be located on a permanent site of approximately 7ha in the townland of Knockanacree, County Tipperary. In addition, approximately 0.8ha of land would be required on a temporary basis during construction.</li> <li>The BPT would be located at the highest point of the pipeline. It marks the end of the Treated Water Pipeline from the WTP to the BPT and the start of the Treated Water Pipeline from the BPT to the Termination Point Reservoir (TPR) in the townland of Loughtown Upper, at Peamount, County Dublin. It would act as a balancing tank and would be required to manage the water pressures in the entire Treated Water Pipeline during flow changes, particularly during start-up and shut-down.</li> <li>The BPT site would include the BPT and a Control Building. The BPT would be a concrete tank divided into three cells covered with an earth embankment. The BPT tanks would be 5m in height and partially buried below finished ground levels. The Control Building would be 7.5m over finished ground level. Additionally, there would be a telemetry mast, the top of which would be 14m above finished ground level.</li> <li>Access to the BPT site would be via a new permanent access road from the L1064 which would be 5m wide and 794m in length.</li> <li>Power for the BPT would be supplied via an underground connection from the existing overhead power line. Solar panels would be placed on the south facing side of the control building roof, on the BPT and at ground level to the south of the site to supplement the mains power supply.</li> <li>The BPT site boundary would be bounded by the existing hedgerow / tree line with a 2.4m high palisade security fence around the permanent infrastructure. The site would be landscaped in line with the surrounding environment to reduce its visual impact.</li> </ul>
<p>Treated Water Pipeline from the BPT to the TPR (Pipeline) Counties Tipperary, Offaly, Kildare and Dublin (within the administrative area of South Dublin County Council)</p>	<ul style="list-style-type: none"> <li>The Treated Water Pipeline from the BPT to the TPR would consist of a single 1,600mm underground steel pipeline, approximately 133km long.</li> <li>The water would normally travel through the Treated Water Pipeline by gravity; however, flows greater than approximately 165Mld would require additional pumping from the Booster Pumping Station (BPS) in the townland of Coagh Upper, County Offaly.</li> <li>The Treated Water Pipeline would include Line Valves, Washout Valves, Air Valves, Manways, Cathodic Protection, Lay-Bys and potential future connection points.</li> <li>A 20m wide Permanent Wayleave would provide Uisce Éireann with operational access to the pipeline (this Wayleave has been extended to approximately 30m at some Line Valves to provide access between the Lay-Bys and Line Valves). There would be an additional 10m wide Permanent Wayleave at certain locations for operational access to smaller pipes connecting Washout Valves with permanent discharge locations.</li> </ul>
<p>Booster Pumping Station (BPS) (Infrastructure Site) County Offaly</p>	<ul style="list-style-type: none"> <li>The BPS would be located on a permanent site of approximately 2.6ha in the townland of Coagh Upper, County Offaly. It would be located approximately 30km downstream from the BPT. In addition, approximately 3ha of land would be required on a temporary basis during construction.</li> <li>The BPS would be required when the demand for water causes the flow through the pipeline to exceed approximately 165Mld.</li> <li>The BPS site would consist of a single-storey Control Building with a basement below. It would have a finished height of 7.6m above finished ground level. There would also be a separate Electricity Substation and Power Distribution Building. Additionally, there would be a telemetry mast, the top of which would be 14m above finished ground level.</li> <li>Power to the BPS would be supplied from an existing 38 kV electricity substation at Birr, through cable ducting laid within the public road network. There would be ground mounted solar panels on the southern side of the BPS site to supplement the mains power supply.</li> <li>The site would be accessed directly from the L3003.</li> <li>The BPS site boundary would be fenced with a stock proof fence and a 2.4m high palisade security fence between 5m -12m inside the boundary. The site itself would be landscaped in line with the surrounding environment to reduce its visual impact.</li> </ul>

Proposed Project Infrastructure	Outline Description of Proposed Project Infrastructure*
<p>Flow Control Valve (FCV) (Infrastructure Site) County Kildare</p>	<ul style="list-style-type: none"> <li>The FCV controls the flows in the Treated Water Pipeline from the BPT to the TPR. It would be a small permanent site of approximately 0.5ha in the townland of Commons Upper in County Kildare. In addition, approximately 0.6ha of land would be required on a temporary basis during construction.</li> <li>It would consist of three 700mm diameter FCVs and three flow meters installed in parallel with the Line Valve and housed within an underground chamber.</li> <li>Access to the FCV site would be directly off the L1016 Commons Road Upper.</li> <li>Power supply to the FCV site would be provided from the existing low voltage network via a combination of overhead lines and buried cables. There would be ground mounted solar panels on the north-eastern side of the site to supplement the mains power supply.</li> <li>Kiosks at the FCV site would house the Programmable Logic Controller, telemetry and power supply for the Line Valve. There would also be a telemetry mast, the top of which would be 14m above finished ground level.</li> <li>The site boundary would be fenced with a stock proof fence and a 2.4m high palisade security fence 5m inside the boundary.</li> </ul>
<p>Termination Point Reservoir (TPR) (Infrastructure Site) County Dublin (within the administrative area of South Dublin County Council)</p>	<ul style="list-style-type: none"> <li>The TPR would be located on a permanent site of approximately 8.3ha adjacent to an existing treated water reservoir in the townland of Loughtown Upper, at Peamount, County Dublin (within the administrative area of South Dublin County Council) and would have capacity for 75ML of treated water supply. In addition, approximately 1.1ha of land would be required on a temporary basis during construction.</li> <li>It would be located at the downstream end of the Treated Water Pipeline from the BPT to the TPR and would be the termination point for the Proposed Project. It would be at this location that the Proposed Project would connect to the existing water supply network of the Greater Dublin Area Water Resource Zone (GDA WRZ).</li> <li>The TPR would consist of an above-ground storage structure, associated underground Scour Water and Overflow Water tanks and a Chlorine Dosing Control Building. The TPR would be a concrete tank divided into three cells and covered with an earth embankment. The top of the TPR would be 11.2m above finished ground level. The Chlorine Dosing Control Building would be 8.4m over finished ground level. Additionally, there would be a telemetry mast, the top of which would be 14m above finished ground level.</li> <li>Power for the TPR would be supplied via an underground connection to the existing electricity substation at Peamount Reservoir. There would be solar panels on top of a portion of the northern cell of the TPR to supplement the mains power supply.</li> <li>A new permanent access road from the R120 would be constructed and would be 5m wide and 342m in length.</li> <li>The TPR site would be bounded by the existing hedgerow to the west and existing fence to the east with a 2.4m high palisade security fence around the permanent infrastructure. The site itself would be landscaped in line with the surrounding environment to reduce its visual impact.</li> </ul>
<b>Proposed 38 kV Uprate Works – Power Supply to RWI&amp;PS and WTP</b>	
<p>Proposed 38 kV Uprate Works Ardnacrusha – Birdhill (Power Supply) Counties Clare, Limerick and Tipperary</p>	<ul style="list-style-type: none"> <li>The proposed 38 kV Uprate Works would be necessary to deliver adequate electrical power to the RWI&amp;PS and WTP.</li> <li>The proposed works would include the uprating of the existing Ardnacrusha – Birdhill Line and the replacement of polesets/structures with an underground cable along a section of the Ardnacrusha – Birdhill – Nenagh Line.</li> <li>There would also be works at the existing Birdhill 38 kV electricity substation including the provision of a new 38 kV modular Gas Insulated Switchgear Modular Building, new electrical equipment and lighting, together with new fencing and associated works.</li> </ul>
<b>Temporary Infrastructure – Required for Construction Phase Only</b>	
<p>Construction Working Width Counties Tipperary, Offaly, Kildare and Dublin (within the administrative area of South Dublin County Council)</p>	<ul style="list-style-type: none"> <li>A Construction Working Width would be temporarily required for the construction of the RWRMs and the Treated Water Pipeline, and the subsequent reinstatement of the land.</li> <li>The Construction Working Width would generally be 50m in width but would be locally wider near features such as crossings, access and egress points from the public road network, Construction Compounds and Pipe Storage Depots.</li> </ul>

Proposed Project Infrastructure	Outline Description of Proposed Project Infrastructure*
<p>Construction Compounds Counties Tipperary, Offaly, Kildare and Dublin (within the administrative area of South Dublin County Council)</p>	<ul style="list-style-type: none"> <li>• Eight Construction Compounds would be temporarily required to facilitate the works to construct the Proposed Project. Five Construction Compounds would be located along the route of the Treated Water Pipeline at the following Infrastructure Sites: RWI&amp;PS, WTP, BPT, BPS and TPR, with an additional three Construction Compounds located at Lisgarriff (County Tipperary), Killananny (County Offaly) and Drummond (County Kildare). Construction Compounds would act as a hub for managing the works including plant/material/worker movement, general storage, administration and logistical support.</li> <li>• The Principal Construction Compound at the WTP would require 30ha of land during construction.</li> <li>• The other three Principal Construction Compounds would require land temporarily during construction ranging between approximately 12ha and 16ha.</li> <li>• The four Satellite Construction Compounds at the other permanent Infrastructure Sites (excluding the FCV) would require land during construction ranging between approximately 3ha and 12ha.</li> </ul>
<p>Pipe Storage Depots Counties Tipperary, Offaly and Kildare</p>	<ul style="list-style-type: none"> <li>• Nine Pipe Storage Depots would be temporarily required to supplement the Construction Compounds and would serve the installation of pipe between the WTP and the TPR.</li> <li>• Pipe Storage Depots would take direct delivery of the pipe for storage before onward journey to the required location along the Construction Working Width.</li> <li>• The Pipe Storage Depots would vary in size and require land temporarily during construction generally ranging between approximately 2ha and 7ha but with one site being larger at 11ha.</li> </ul>

\* Note all land take numbers in this table are affected by rounding to one decimal place.

- The construction of the Proposed Project is anticipated to run from 2028 through 2032, with the first operational year anticipated to be 2033.
- This chapter should be read in conjunction with the following chapters and their appendices, which expand upon aspects of the Proposed Project:
  - Chapter 4 (Proposed Project Description)
    - Appendix A4.1 (Operational Strategy)
  - Chapter 5 (Construction & Commissioning)
    - Appendix A5.1 (Construction Environmental Management Plan (CEMP), including Annex A: Surface Water Management Plan (SWMP))
    - Appendix A5.2 (Commissioning Strategy)
    - Appendix A5.3 (Methods of Working in Peat)
  - Chapter 8 (Biodiversity)
  - Chapter 9 (Water)
    - Appendix A9.4 (Flood Risk Assessment)
  - Chapter 10 (Soils, Geology & Hydrogeology)
  - Chapter 18 (Material Assets).
- Figures which are referenced in the text are provided in Volume 5 of this EIAR.
- This assessment has been undertaken and reported by a team of competent experts. Refer to Chapter 2 (The Environmental Impact Assessment Process) for a description of the qualifications and expertise of the specialists that have inputted to this chapter.

## 20.2 Methodology

### 20.2.1 Scope and Context

8. The assessment of MANDs considers the occurrence of extreme and highly unlikely incidences. As such, while this chapter draws on baseline information relevant to other environmental topic chapters in the EIAR, it considers scenarios that would not reasonably be covered by the other environmental topic assessments. The assessment focuses on the risk of extreme incidences and the potential for significant environmental effects as a result of those extreme incidences. A significant environmental effect in relation to a major accident is defined in the Primer as an event that '*could include the loss of life, permanent injury and temporary or permanent destruction of an environmental receptor which cannot be restored through minor clean-up and restoration*' (IEMA and Arup 2020).
9. The Primer (IEMA and Arup 2020) recognises that a signposting approach can be an efficient way of making use of existing data and processes to avoid duplicating any risk quantification and management already being undertaken. Therefore, this chapter has drawn on existing regulatory requirements that need to be met when designing, building and operating the Proposed Project. It also draws on existing design standards and risk management tools to highlight the measures already in place to manage project risks through design, construction and operation (embedded mitigation).
10. The elements of the Proposed Project incorporate technologies and measures that are designed to reduce the occurrence of accidents. These embedded measures are inherent to the Proposed Project design and have been described throughout this EIAR and the Natura Impact Statement prepared in respect of the Proposed Project. Specific mitigation measures identified in the topic chapters of the EIAR are also relevant to the assessment of MANDs, and these are incorporated into the design or with regard to construction phase risks are included in Appendix A5.1 (CEMP).
11. The risk of MANDs may be present at either the Construction Phase or Operational Phase of the Proposed Project and the assessment has considered all stages of the Proposed Project including testing and commissioning. The methodology for this risk assessment was as follows:
  - Identify MANDs (i.e. unplanned incidents) that the Proposed Project may be vulnerable to or which may occur due to the Proposed Project
  - Assess the consequent impacts of such incidents in relation to the environmental, social and economic receptors that may be affected and whether the effects are likely to be significant
  - Identify existing and proposed mitigation measures to prevent or mitigate the likely significant adverse effects of such events on the environment.
12. The Proposed Project would deliver nationally important strategic infrastructure with individual elements designed with a lifespan of 80 to 100 years. The strategic importance of the Proposed Project for water supply in the Eastern and Midlands Region is such that there is no plan to decommission these structures and Uisce Éireann is committed to maintaining and repairing them into the future. On this basis it is not likely that the structures will be decommissioned and therefore, decommissioning of the Proposed Project has not been considered further in this assessment.

### 20.2.2 Relevant Guidelines, Policy and Legislation

13. Article 3 of the EIA Directive requires the assessment of expected effects of MANDs within EIA. Article 3(2) of the Directive states that this '*shall include the expected effects deriving from the vulnerability of the project to risks of major accidents and/or disasters that are relevant to the project concerned*'.
14. This chapter identifies how the potential for MANDs relevant to the Proposed Project have been identified and how those risks have been managed. For the purpose of this assessment, the following definitions have been adopted:

- Risk – The likelihood of an impact occurring, combined with the effect or consequence(s) of the impact on a receptor if it does occur (IEMA and Arup 2020)
  - Significance – Medium and high risks (see Table 20.5) are significant adverse effects.
15. There is no set approach or guidance document that specifies how an assessment of MANDs should be carried out. The methodology applied for this assessment adopts a risk based approach, based on the provisions of the EIA Directive and other relevant legislation; guidance in the Primer (IEMA and Arup 2020); Environmental Protection Agency (EPA) and European Commission guidance on EIARs; other published risk assessment methodologies; and professional judgement. The development of the risk assessment methodology has been undertaken with regard to the following guidance, which is considered appropriate for the Proposed Project:
- Guidelines on the Information to be Contained in EIARs (EPA 2022)
  - Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment (Department of Housing, Planning & Local Government 2018)
  - Environmental Impact Assessment of Projects – Guidance on the preparation of the Environmental Impact Assessment Report (European Commission 2017)
  - Major Accidents and Disasters in EIA: A Primer (IEMA and Arup 2020)
  - National Risk Assessment 2024 – Overview of Strategic Risks (Department of the Taoiseach 2024)
  - National Risk Assessment for Ireland 2023 (Department of Defence 2023)
  - Guidance on Assessing and Costing Environmental Liabilities (EPA 2014)
  - A Guide to Risk Assessment in Major Emergency Management, Guidance Document 1 (Department of Environment, Heritage and Local Government<sup>1</sup> (DoEHLG) 2010)
  - Strategic Emergency Management National Structures and Framework (Department of Defence 2020)
  - A Framework for Major Emergency Management (Department of Housing, Local Government and Heritage 2021).
16. The assessment has been undertaken in accordance with relevant legislation, including:
- The EIA Directive
  - Safety, Health and Welfare at Work (Construction) Regulations 2013 – S.I. No. 291 of 2013
  - Safety, Health and Welfare at Work Act 2005 – No. 10 of 2005 (as amended)
  - Building Regulations (Part A Amendment) Regulations 2012 – S.I. No. 138 of 2012
  - Safety, Health and Welfare at Work (General Application) Regulations 2007 – S.I. No. 299 of 2007 (as amended).
17. Any references to legislation in this chapter include any amendments thereto.

### **20.2.3 Risk Assessment Methodology**

18. The assessment is set out in three stages:

- Identification and screening
- Risk classification
- Risk evaluation.

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<sup>1</sup> The Department of the Environment, Heritage and Local Government is now the Department of Housing, Planning and Local Government, and the environment is now covered under the Department of Communications, Climate Action and Environment.

### 20.2.3.1 Identification and Screening

19. The EIAR Scoping Methodology Report (Uisce Éireann 2023) identified a list of potential MANDs during the Construction Phase and Operation Phase following an initial screening assessment. Risk events were screened out of the assessment at the Scoping Stage according to the following criteria:

- MANDs where no ‘source-pathway-receptor’ linkage exists to result in a MAND (e.g. a fuel spill occurring at a fuel depot that is not located near to a watercourse and for which there is no pathway from source to receptor)
- MANDs where risk events are not applicable to the geographical location and environmental setting of the Proposed Project, e.g. volcanic activity, earthquakes and risk of nuclear accidents
- MANDs that have already been assessed in other areas of this EIAR, for example flood risk for the water supply infrastructure sites assessed in Chapter 9 (Water) and supporting Appendix A9.4 (Flood Risk Assessment)
- MANDs associated with Construction Phase and Operational Phase activities that fall within the scope of health and safety legislation and associated obligations, for example risks associated with working at height / recreational users of Parteen Basin approaching the intake structure
- MANDs that have a low likelihood/low consequence, as they do not meet the criteria to be brought forward for further consideration (i.e. they do not meet the definition of a MAND), for example the risk of traffic accidents on the road network causing delays to Construction or Operational Phase vehicles.

20. Table 20.2 presents the MANDs that were scoped into the assessment and which are the subject of this chapter. Since the publication of the EIAR Scoping Methodology Report, additional MANDs were considered relevant to the Proposed Project, and therefore included in the scope for assessment. These additional MANDS are: impacts of failure during commissioning due to failure of valves (construction), impact of flooding of excavations (construction), impacts from an accident during ground treatment (construction), and impacts on existing assets specifically Fort Henry Embankment (construction and operation).

**Table 20.2: Summary of Scope of Assessment – Major Accidents and/or Disasters**

Project Phase	Potential Impacts Scoped In
Construction (including commissioning)	<ul style="list-style-type: none"> <li>• Impacts of power failure and/or damage to power infrastructure</li> <li>• Impacts of accidental release to surface water</li> <li>• Impacts of ground instability including specifically peat instability</li> <li>• Impacts of invasive species and biosecurity risks</li> <li>• Impacts if unknown contaminated land is encountered</li> <li>• Impact of flooding of excavations</li> <li>• Impacts of an accident during ground treatment</li> <li>• Impacts of failure of valves or pipe during commissioning</li> <li>• Impacts of construction on existing assets including specifically Fort Henry Embankment.</li> </ul>
Operation	<ul style="list-style-type: none"> <li>• Impacts of power failure and/or damage to power infrastructure</li> <li>• Impacts of pipe failure releasing water</li> <li>• Impacts of fire or storm damage to infrastructure</li> <li>• Impact of interruption to water supply services as a result of cyber-attack</li> <li>• Impact of extreme weather conditions, including prolonged drought or prolonged flooding</li> <li>• Impacts of operation on existing assets including specifically Fort Henry Embankment.</li> </ul>

### 20.2.3.2 Risk Classification

21. A risk based approach was used for assessing the likely significant effects from MANDs. The MANDs that were scoped into the assessment were evaluated with regard to the likelihood of occurrence and the consequence of the potential impact. The rating criteria adopted for the assessment follows that used in A Guide to Risk Assessment in Major Emergency Management, Guidance Document 1 (DoEHLG 2010). Risk assessment and management is typically based on risk tolerability, with the focus on risk being 'as low as reasonably practicable'. This chapter uses this term to describe where risks are already managed to a level where the risk is balanced against the trouble, time and money needed to control it (IEMA and Arup 2020).
22. The classification and rating of likelihood and consequence, as taken from A Guide to Risk Assessment in Major Emergency Management, Guidance Document 1 (DoEHLG 2010), are provided in Table 20.3 and Table 20.4.

**Table 20.3: Classification of Likelihood**

Rating	Classification	Likelihood Description
1	Extremely Unlikely	<ul style="list-style-type: none"> <li>May occur only in exceptional circumstances; once every 500 or more years.</li> </ul>
2	Very Unlikely	<ul style="list-style-type: none"> <li>Is not expected to occur; no recorded incidents or anecdotal evidence; and/or very few incidents in associated organisations, facilities or communities; and/or little opportunity, reason or means to occur</li> <li>May occur once every 100 to 500 years.</li> </ul>
3	Unlikely	<ul style="list-style-type: none"> <li>May occur at some time; and/or few, infrequent, random recorded incidents or little anecdotal evidence; some incidents in associated or comparable organisations worldwide; some opportunity, reason or means to occur</li> <li>May occur once every 10 to 100 years.</li> </ul>
4	Likely	<ul style="list-style-type: none"> <li>Likely to or may occur; regular recorded incidents and strong anecdotal evidence</li> <li>Will probably occur once every 1 to 10 years.</li> </ul>
5	Very Likely	<ul style="list-style-type: none"> <li>Very likely to occur; high level of recorded incidents and/or strong anecdotal evidence</li> <li>Will probably occur more than once a year.</li> </ul>

**Table 20.4: Classification of Consequence**

Rating	Classification	Impact	Consequence Description
1	Minor	Life, Health, Welfare	Small number of people affected; no fatalities and small number of minor injuries with first aid treatment.
		Environment	No contamination, localised effects.
		Infrastructure	<0.5M Euros.
		Social	Minor localised disruption to community services or infrastructure (<6 hours).
2	Limited	Life, Health, Welfare	Single fatality; limited number of people affected; a few serious injuries with hospitalisation and medical treatment required. Localised displacement of a small number of people for 6-24 hours. Personal support satisfied through local arrangements.
		Environment	Simple contamination, localised effects of short duration.
		Infrastructure	0.5M-3M Euros.
		Social	Normal community functioning with some inconvenience.
3	Serious	Life, Health, Welfare	Significant number of people in affected area impacted with multiple fatalities (<5), multiple serious or extensive injuries (20), significant hospitalisation. Large number of people displaced for 6-24 hours or possibly beyond; up to 500 evacuated. External resources required for personal support.
		Environment	Simple contamination, widespread effects of short duration.
		Infrastructure	3M-10M Euros.
		Social	Community only partially functioning, some services available.

Rating	Classification	Impact	Consequence Description
4	Very Serious	Life, Health, Welfare	5 to 50 fatalities, up to 100 serious injuries, up to 2,000 evacuated.
		Environment	Heavy contamination, localised effects of extended duration.
		Infrastructure	10M-25M Euros.
		Social	Community functioning poorly, minimal services available.
5	Catastrophic	Life, Health, Welfare	Large numbers of people impacted with a significant number of fatalities (>50), injuries in the hundreds, more than 2,000 evacuated.
		Environment	Very heavy contamination, widespread effects of extended duration.
		Infrastructure	>25M Euros.
		Social	Serious damage to infrastructure causing significant disruption to, or loss of, key services for prolonged period. Community unable to function without significant support.

### 20.2.3.3 Risk Evaluation

23. In accordance with the DoEHLG (2010) guidelines, the evaluated MANDs were compared to a risk matrix to determine the risk category for each scenario. These have been grouped according to three categories, described below, and presented visually in Table 20.5:

- High risk – Scenarios that have an evaluation score of 15 to 25, as indicated by the red zone in Table 20.5
- Medium risk – Scenarios that have an evaluation score of 8 to 12, as indicated by the amber zone in Table 20.5
- Low risk – Scenarios that have an evaluation score 1 to 6, as indicated by the green zone in Table 20.5.

Table 20.5: Risk Matrix

Likelihood	5 – V. Likely	5	10	15	20	25
	4 – Likely	4	8	12	16	20
	3 – Unlikely	3	6	9	12	15
	2 – V. Unlikely	2	4	6	8	10
	1 – Ext. Unlikely	1	2	3	4	5
		1 – Minor	2 – Limited	3 – Serious	4 – V. Serious	5 – Catastrophic
Consequence of Impact						

24. MANDs that fall within the amber or red zones ('Medium' or 'High' risk scenarios) are considered to be likely significant effects and are taken forward for further consideration and are then assessed with mitigation measures being applied.

## **20.3 Assessment of Effects**

### **20.3.1 Do Nothing Scenario**

25. With respect to MANDs, the 'Do Nothing' scenario means that there are no changes to existing infrastructure or utilities as a result of the Proposed Project. Therefore, there would be a neutral impact on risk of MANDs under the 'Do Nothing' Scenario.

### **20.3.2 Construction Phase and Operational Phase Impacts**

26. A register has been developed which contains the plausible scenarios identified as presenting a potential risk during the Construction Phase and Operational Phase of the Proposed Project and the risks have been evaluated using the criteria in Section 20.2.3. This is provided in Table 20.6. The assessment in this section accounts for embedded mitigation that has been incorporated into the design. Embedded mitigation is included in Table 20.6 where relevant.

Table 20.6: Rating of Major Accidents and Disasters Pre-Mitigation

Risk	Risk Event	Proposed Project Element	Discussion	Likelihood	Consequence	Resulting Risk Category
<b>Construction (including commissioning)</b>						
C1 Impacts of power failure and/or damage to existing power infrastructure	C1a. Risk of outage of power supply impacting on machinery and plant during construction.	Project-wide	The Construction Compounds would have a mains power connection and if there was a power supply outage generators would be used as a back-up. For the construction of the pipeline, generators would be the primary power supply and in the event of an outage there would be no back up beyond the use of further generators. A short-term outage could result in temporary suspension of activities dependent on power. A review of the activities that could potentially be affected has identified that suspending dewatering would be the activity most likely to result in an effect because excavations could fill with water creating a risk of a pollution incident or impact on operatives. The operatives would not be exposed to additional risk because the works will be stopped as soon as power was lost. The risk of pollution incident occurring would result in a simple contamination event with localised effects of short duration. This would only occur if the water was able to escape from the excavation and therefore, it is unlikely to occur and the risk is considered to be as low as reasonably practicable.	Very Unlikely (2)	Limited (2)	Low (4)
	C1b. If the Proposed Project were to be subject to sabotage or arson resulting in wilful damage to machinery or plant during construction, this could result in water or pollutants being released into the local environment.	Project-wide	The construction working area will be secured, for example using security fencing, and only authorised personnel will be admitted to the working area. Outside of working hours, there will be a security guard to check for trespassers that could result in sabotage or arson. The key liquids likely to be on site would be fuels, coolants and oils. The volumes of liquids would be relatively small and it is proposed that use of diesel, for example, will be replaced with hydrogenated vegetable oil (as set out in Chapter 13: Climate). The highest risk sites in terms of a receptor would be the RWI&PS, WTP and BPS where there would be water bodies adjacent to the site boundary. The sites are not near large populations. All liquid sources of pollution will be stored in bunded areas and therefore, for there to be an environmental effect, the bunding would also have to be damaged and fail. The consequence of this risk would be a simple, localised pollution event as the volumes stored on site at any one time would be relatively small. This risk is considered to be as low as reasonably practicable.	Unlikely (3)	Limited (2)	Low (6)
	C1c. If third-party buried services were to be struck during construction it could cause harm to the workforce, and/or could result in other undesirable events depending on the type of service affected (e.g. loss of water supply, loss of power, pollution incident from a gas or fuel pipeline).	Project-wide	Service strike is assessed in Chapter 18 (Material Assets), which explains the standard methods in place for identifying services and measures that will be put in place to avoid service strike such as scanning for services before construction and marking out services on site. This will include the work being undertaken in accordance with ESNB practice and procedure. As this risk is already assessed in Chapter 18 (Material Assets) and is considered to be as low as reasonably practicable, there is no additional risk considered in relation to MANDs.	N/A	N/A	N/A
C2 Impacts of accidental release to surface water	C2a. Pollution event leading to environmental damage, e.g. associated with the potential release of silt to a watercourse or spillage associated with fuel storage, use and handling during construction works.	Project-wide	The construction approach includes for the use of attenuation ponds and temporary drainage ditches. Without additional mitigation it would be likely that there would be some form of pollution event during the construction works. This could result in a simple, localised pollution incident.	Likely (4)	Limited (2)	Medium (8)
	C2b. Risk of mobilisation of silt during installation of secant piles / temporary piling platform and revetment matting.	RWI&PS	During the construction of the RWI&PS, there would be the risk of a pollution incident from silt mobilisation without additional mitigation. The majority of the works would be contained with secant piles; however, there would be temporary activities within Parteen Basin including the installation of a temporary piling platform and the revetment matting which would mobilise silt. This could result in a simple, localised pollution incident.	Very likely (5)	Limited (2)	Medium (10)
	C2c. Risk of failure of silt curtain.	RWI&PS	The mitigation for risk C2b is set out in Section 20.4 and consists of a double silt curtain. In the event of failure of the silt curtains there would be a pollution event as a result of the release of silt. As the silt curtains would have facilitated the build-up of the silt during construction, a failure of the mitigation measure would result in a silt plume occurring. This could result in a simple, widespread pollution incident. The silt curtain will be installed to engineering standards and therefore failure would be related to an extreme event and accordingly a failure is not 'likely'.	Unlikely (3)	Serious (3)	Medium (9)
C3 Impacts of ground instability leading to structure collapse	C3a. The treatment plant, pumping station or another structure collapsing due to subsidence or other unforeseen issues causing harm to the workforce.	Project-wide	A programme of ground investigations has been undertaken to understand ground conditions and to design the structures and methods accordingly. The designs will be undertaken to technical standards and include secant piling at the RWI&PS, either a raft foundation or piled foundations and reinforced concrete construction at the WTP, and suitable foundations at the BPT, BPS, FCV and TPR. Design checks will be in place at specific points in the programme to check that the standards are met. Specific risks have been identified at the RWI&PS and the BPT and design measures adopted accordingly. At the RWI&PS the depth of the excavation along the shoreline in Parteen Basin, on which the revetment mats would be placed, means that there would be a risk of the embankment collapsing and so sheet pile retaining walls have been included either side of the intake structure to prevent this. At the BPT there would be the risk of differential settlement due to a potential Karst feature and so ground treatment consisting of a combination of excavate and replace and grouting has been proposed to prevent a structural impact on the BPT. These measures reduce the likelihood of an accident occurring. The consequence of the accident would be fatality or injuries of a 'serious' classification, as per the criteria in Table 20.4.  This risk is considered to be as low as reasonably practicable.	Very Unlikely (2)	Serious (3)	Low (6)

Risk	Risk Event	Proposed Project Element	Discussion	Likelihood	Consequence	Resulting Risk Category
	C3b. Peat instability as a result of excavation of the trench for the installation of the section of pipe.	Project-wide	<p>To reduce the risk of peat movements into the trench or peat instability causing a pollution incident, specific management measures have been set out in Appendix A5.3 (Methods of Working in Peat) for the construction approach in areas of peat and poor ground. These measures are:</p> <ul style="list-style-type: none"> <li>Timing works to 'drier' periods, specifically summer months</li> <li>Only short lengths of trench to be excavated at one time and each section of excavation is to be left open for as short a period of time as reasonably practicable</li> <li>Interceptor drains on the perimeter of the Construction Working Width and dewatering of the excavation for the pipeline, will be used to create 'dry' conditions as far as reasonably practicable ((definition of 'dry' as per (CIRIA 2001))</li> <li>Movement of machinery to be suspended during heavy rainfall or high water levels (other than as required to respond to a potential incident)</li> <li>Slacken side slopes on the batter on the trench excavation as informed by peat probes and further Ground Investigation undertaken as part of the preparation of the Construction Phase. This is to be set out in construction Method Statements for each section of pipeline construction within peat soils</li> <li>Utilise land within the Construction Working Width upstream and downstream of the section of pipeline being constructed for activities with flexibility over their location, such as the temporary stock piling of material and drainage ponds. This will be done to maximise the land available at the section of pipeline being built that could be utilised in slackening side slopes</li> <li>For sections of construction where there would be deep peat and/or dewatering proves not to be effective, or slacker side slopes cannot be adopted, the appointed Contractor will adopt a trench box or temporary sheet piled coffer dam (this would be installed using a vibratory plate method / press piling) in order to retain the side slopes</li> <li>Temporary sheet piling to be used to retain the earthworks for sections of deep peat (deeper than 4.5m) at the bell pits.</li> </ul> <p>These measures would reduce the risk that an incident would occur and would limit the extent of the consequence if an incident did occur. With this embedded mitigation within the design the consequence of the accident would be fatality or injuries of a 'limited' classification, or a simple pollution event of a localised scale, as per the criteria in Table 20.4.</p> <p>With the implementation of the design measures this risk is considered to be as low as reasonably practicable.</p>	Unlikely (3)	Limited (2)	Low (6)
	C3c. A third-party structure, such as a road or railway, or an existing gas or water pipeline, could collapse as a result of subsidence caused by tunnelling or other trenchless crossings. This could harm users of the structure, such as major roads and rail lines traversed by the route of the pipeline.	Project-wide	<p>The design includes for minimum design requirements of third-party structure crossings. This includes the Transport Infrastructure Ireland requirements for road crossings and Iarnród Éireann for rail crossings. Settlement assessments have been undertaken and this has informed the depth of the crossings to avoid settlement posing a structural risk to third-party assets.</p> <p>These measures reduce the likelihood of an accident occurring. The consequence of the accident would be fatality or injuries of a 'serious' classification, as per the criteria in Table 20.4, and similarly an impact on infrastructure of a 'serious' classification as the cost would be expected to be 10M Euro or less given only a short section of the third-party asset would be expected to be affected given the diameter of the proposed pipeline.</p> <p>This risk is considered to be as low as reasonably practicable.</p>	Very Unlikely (2)	Serious (3)	Low (6)
	C3d. Pipeline collapse as a result of placement on marl or poor ground conditions.	Project-wide	<p>The design includes for marl to be excavated to avoid the structural risk.</p> <p>Further, the method of working in peat, as set out in Appendix A5.3, provides for structural support of the pipeline including either stone pillars or concrete piles in poor ground. This would include areas of peat and alluvium.</p> <p>These measures would reduce the likelihood of an accident occurring. However, the consequence of the accident would be an impact on the pipeline structure itself that would affect the supply. The consequence would be social impacts due to loss of supply at a level classified as 'serious', as per the criteria in Table 20.4.</p> <p>This risk is considered to be as low as reasonably practicable.</p>	Very Unlikely (2)	Serious (3)	Low (6)
C4 Impacts of invasive species and biosecurity risks	C4a. Risk of spread of invasive species due to movement of soil, animals and vehicles during construction. Invasive species have been noted within Chapter 8 (Biodiversity).	Project-wide	<p>Pre-construction surveys will confirm the presence of any invasive species and specific measures will be put in place where these are found, as described within Chapter 8 (Biodiversity) and the Invasive Species Management Plan (Appendix A5.1, Annex F). As this risk is already assessed in Chapter 8 and is considered to be as low as reasonably practicable, there is no additional risk considered in relation to MANDs.</p>	N/A	N/A	N/A
	C4b. Risk of spread of livestock diseases (e.g. bovine tuberculosis or foot and mouth) due to movement of soil, animals and vehicles during construction.	Project-wide	<p>The appointed Contractor will be required to comply with any third-party guidance, procedures and measures for livestock diseases in the unlikely event that an outbreak occurs during construction. Standard measures will be in place such as cleaning and washing down machinery between different sites and maintaining stock proof boundaries, as described in Chapter 11 (Agriculture). As this risk is already assessed in Chapter 11 and is considered to be as low as reasonably practicable, there is no additional risk considered in relation to MANDs.</p>	N/A	N/A	N/A

Risk	Risk Event	Proposed Project Element	Discussion	Likelihood	Consequence	Resulting Risk Category
C5 Impacts of unknown contaminated land	C5. Risk that unknown contaminated land is encountered during soil excavation that could lead to harm to the workforce or to a pollution event if contaminants enter air, soil or water. <sup>2</sup>	Project-wide	The potential for encountering contaminated ground is assessed in Chapter 10 (Soils, Geology & Hydrogeology). A programme of ground investigations has been undertaken to understand ground conditions and risks of encountering contaminated land. Further investigation will be undertaken as part of detailed design prior to construction. The workforce will be briefed in how to identify potential contaminated land and suitably qualified people will be employed during construction to advise on measures should potential contaminated land be encountered. This would reduce the likelihood of an incident. The consequence of this risk would be a localised outbreak of disease of a 'limited' classification, or simple, localised contamination event, as per the criteria in Table 20.4. This risk is considered to be as low as reasonably practicable.	Unlikely (3)	Limited (2)	Low (6)
C6 Impact of flooding of excavations	C6. Risk that during excavation of the trench for the pipeline severe rain, surface runoff or groundwater floods the excavations.	Project-wide	The alignment of the pipeline has been selected to avoid areas of floodplain where reasonably practicable (taking account of other constraints) and this is reflected in the Flood Risk Assessment in Chapter 9 (Water). Further, the approach to construction includes for the use of a cut-off drain within the Construction Working Width and over-pumping will be used to manage the water level within the excavation. However, without further mitigation, it would be likely there would be flooding within the excavation. The consequence of this would be fatality or injuries of a 'limited' classification given the length of trench excavation and number of operatives, as per the criteria in Table 20.4.	Likely (4)	Limited (2)	Medium (8)
C7 Impact of an accident during ground treatment	C7. Risk that during ground treatment, specifically use of grouting, that there is a pollution incident contaminating ground water.	BPT	Ground treatment may be required at the BPT to manage the risk of settlement due to karst features. Grouting will be avoided if reasonably practicable; however, it may be required. Without further mitigation there would be the risk of polluting groundwater. This is assessed in Chapter 10 (Soils, Geology & Hydrogeology) and mitigation measures have been proposed. As this risk is already assessed in Chapter 10 and is considered to be as low as reasonably practicable, there is no additional risk considered in relation to MANDs.	N/A	N/A	N/A
C8 Impacts of failure during commissioning	C8. Risk of failure of the valves or the pipe during pressure testing as part of the testing and commissioning.	Project-wide	Each section of the pipe would initially be tested separately and a specific monitoring plan will be implemented during testing and commissioning. The risk of a valve failure would be very unlikely given the testing protocol. This accident could result in a single fatality or a few serious injuries with hospitalisation of a 'limited' classification, as per the criteria in Table 20.4. This risk is considered to be as low as reasonably practicable.	Very Unlikely (2)	Limited (2)	Low (4)
C9 Impacts of construction on existing assets	C9. Risk that building the RWI&PS affects the Fort Henry Embankment, the Category A Earthen Embankment Dam which forms Parteen Basin directly adjacent the intake area. This could be due to ground movement, drainage or vibration. The embankment is part of the Electricity Supply Board's (ESB) infrastructure.	RWI&PS	A geo-technical risk assessment has been completed and the structural design adapted to respond to the results. This includes the use of secant piles and ground anchors to reduce ground movement and groundborne noise and vibration. Uisce Éireann and ESB have been and will continue to work together to manage the risk including developing an agreed monitoring regime. The design includes the use of secant piles and ground anchors to reduce ground movement. A vibration assessment has also been undertaken. ESB's normal operating procedure includes the management and daily inspections of Parteen Basin and this ensures that ESB monitors and manages the Ardnacrusa Generating Station proactively. The proposed RWI&PS site is adjacent to the Fort Henry Embankment, which forms part of Parteen Basin impoundment. The embankment is a Category A dam, where breach of the dam may result in loss of life. ESB has operated Parteen Basin and the Ardnacrusa Generating Station system for almost 100 years and there are no recorded failures of the system. There would be rock break out required at the RWI&PS site and this would have the potential to generate vibration. The structural formation of the Fort Henry Embankment is not certain and so there is a risk of vulnerability to vibration. In order to reduce the risk of vibration, a number of embedded mitigation measures have been adopted: <ul style="list-style-type: none"> <li>Use of hydraulic rock breaking equipment</li> <li>Use of lower vibration emitting breakers.</li> </ul> A monitoring regime will be agreed between Uisce Éireann and ESB. This will include installing piezometers to monitor groundwater and ground movement/stability monitoring. No additional mitigation is proposed in relation to MANDs other than what is already set out within the assessment in Chapter 10 (Soils, Geology & Hydrogeology). With the selection of the plant and machinery and rock breaking methodology taking account of the vibration risk, and the use of monitoring, the risk of an impact to the integrity of the embankment is very unlikely. The consequence of an incident would be social and infrastructure impacts of a 'serious' classification given the consequence of a bank failure, as per the criteria in Table 20.4. This risk is considered to be as low as reasonably practicable.	Very Unlikely (2)	Serious (3)	Low (6)

<sup>2</sup> It is known that as part of the Proposed Project there will be a requirement to remove the above ground structures associated with a former petrol station to facilitate the access road for the WTP.

Risk	Risk Event	Proposed Project Element	Discussion	Likelihood	Consequence	Resulting Risk Category
<b>Operation</b>						
O1 Impacts of power failure and/or damage to power infrastructure	O1a. A risk of outage to the power supply could impact on the operation of pumping stations and other plant during operation. This could lead to water not reaching the end users.	Project-wide	All critical systems and actuated valves will be equipped with uninterruptible power supplies to ensure their continued safe operation and controlled shut down in the event of failure of the mains power supply, as set out in Appendix A4.1 (Operational Strategy). In the event of fire causing loss of communication between sites, the pumps would come to a controlled stop. If water supply was disrupted to end users this could be supplied through alternative sources until the power was reinstated.  The risk of an outage from mains supply is very unlikely. The consequence would be social impacts due to loss of supply at a level classified as 'serious', as per the criteria in Table 20.4.  This risk is considered to be as low as reasonably practicable.	Very Unlikely (2)	Serious (3)	Low (6)
	O1b. If the Proposed Project were to be subject to sabotage or arson resulting in wilful damage to the pipeline or other structures, this could result in water being released into the local environment and water not reaching the end users.	Project-wide	The pipeline would be made of steel, which would be resistant to damage and not at risk of catching fire. In the extremely unlikely event that the pipeline was damaged (or damage to ancillary pipeline elements that could result in damage to the pipeline), the change in pressure and/or flow would trigger an alarm to alert the operators in the control room who would take action to shut down the pumps and isolate the main as necessary, making it safe pending investigations.  In terms of risk of sabotage or arson at the infrastructure sites, the sites will have security fencing/gates. Although not manned (except the WTP), sites will have required fire safety systems in place in buildings. Buildings will be designed in accordance with all relevant fire safety building regulations.  Given these measures, the risk of sabotage is very unlikely.  As a result, the consequence would be an infrastructure impact of 3-10M Euros, a level classified as 'serious', as per the criteria in Table 20.4. This could also result in a simple, widespread pollution incident.  If water supply was disrupted to end users, this could be supplied through alternative sources until the power was reinstated.  This risk is considered to be as low as reasonably practicable.	Very Unlikely (2)	Serious (3)	Low (6)
	O1c. If the Proposed Project were to be subject to sabotage or arson resulting in wilful damage to the chemical storage this could result in pollutants being released into the local environment and water not reaching the end users.	Infrastructure Sites	There would be chemicals stored at the Infrastructure Sites during the operation of the Proposed Project. This would primarily be at the WTP but there would also be chemical dosing at the BPT and TPR and potential for use of chemicals in treatment of invasive species at the RWI&PS.  The chemical with the potential for the greatest impact on the aquatic environment would be the aluminium sulphate stored at the WTP, as it is particularly toxic to fish life, but the same principle applies to all water treatment chemicals.  All chemicals will be stored in secure areas inside buildings within a bund area. Level monitoring will be used to detect any sudden change in the volume stored in each tank and detect a leak or damage to containers. Any sudden change in tank volume will be alarmed and this would prevent an extensive release of chemicals into the environment.  As a result, it would be very unlikely that there would be an incident and in the event that it occurred a release would be a small volume resulting in a simple, widespread pollution incident.  This risk is considered to be as low as reasonably practicable.	Very Unlikely (2)	Serious (3)	Low (6)
	O1d. A transport disaster such as a road traffic accident or train derailment leading to damage of the pipeline or associated structures. This could result in water being released into the local environment and water not reaching the end users.	Project-wide	This would be the same risk and response as O1b.	Very Unlikely (2)	Serious (3)	Low (6)
O2 Impacts of pipe failure releasing water	O2a. The pipeline could be damaged in a number of ways, including those noted in risk ID O1 (Impacts of power failure and/or damage to power infrastructure) which would result in water being released into the local environment and water not reaching the end users.	Pipeline	The pipeline would be placed at a minimum depth of 1.2m (deep enough so as not to be affected by agricultural activities). It would be made of steel, which is harder to damage than other pipeline materials. Landowners will be made aware of the route of the pipeline and associated land rights will outline the activities that can take place over the pipeline.  In the very unlikely event that the pipeline was damaged, the change in pressure and/or flow would trigger an alarm to alert the operators in the control room who would take action to shut down the pumps and isolate the main as necessary, making it safe pending investigations.  If water supply was disrupted to end users this could be supplied through alternative sources until the supply was reinstated.  Given these measures, the risk of damage is very unlikely. The consequence would be social impacts due to loss of supply at a level classified as 'serious' and this could also result in a simple, widespread pollution incident, as per the criteria in Table 20.4.  This risk is considered to be as low as reasonably practicable.	Very Unlikely (2)	Serious (3)	Low (6)
	O2b. The pipeline integrity deteriorates and suffers a failure which would result in water being released into the local environment and water not reaching the end users.	Pipeline	Steel has been selected as the preferred material for the Proposed Project because of its proven record for pipelines. Therefore, a failure in the material would be very unlikely.  Cathodic Protection will be installed as part of the design to monitor the integrity of the pipeline and would give an early warning of any deterioration in the integrity of the pipe. This would allow for an intervention before it became a bigger problem.  The consequence would be social impacts due to loss of supply at a level classified as 'serious' and this could also result in a simple, widespread pollution incident, as per the criteria in Table 20.4.  This risk is considered to be as low as reasonably practicable.	Very Unlikely (2)	Serious (3)	Low (6)

Risk	Risk Event	Proposed Project Element	Discussion	Likelihood	Consequence	Resulting Risk Category
	O2c. The operation of the pipeline results in too much water arriving at the WTP, BPT or TPR which would result in water being released into the local environment and water not reaching the end users.	WTP, BPT and TPR	<p>The Proposed Project has been designed with automatic fail safes so that the pumping would shut down as soon as an issue is detected. This could be triggered by monitoring or in the event of a loss of signal within the telemetry system.</p> <p>In addition, overflow/additional water storage capacity has been allowed for at the WTP, BPT and TPR in order to manage water during a shut down.</p> <p>The risk that this capacity could be exceeded or the system not shut down is very unlikely.</p> <p>The consequence would be social impacts due to loss of supply at a level classified as 'serious' and this could also result in a simple, widespread pollution incident, as per the criteria in Table 20.4.</p> <p>This risk is considered to be as low as reasonably practicable.</p>	Very Unlikely (2)	Serious (3)	Low (6)
	O2d. The discharge of chlorinated water from a washout would result in a change in the chemical properties or water quality of a receiving water body.	Project-wide	<p>The Proposed Project has been designed to provide for de-chlorination of water at each Washout Valve prior to discharge of any water from the pipeline. Any discharge would be a planned event and so there would be no risk that water could be accidentally discharged without de-chlorination taking place first.</p> <p>Therefore, it is very unlikely that discharge of chlorinated water would take place. This could result in a simple, widespread pollution incident.</p> <p>This risk is considered to be as low as reasonably practicable.</p>	Very Unlikely (2)	Serious (3)	Low (6)
	O2e. A sudden change in pressure within the pipeline results in a failure of the integrity of the pipe which would result in water being released into the local environment and water not reaching the end users.	Pipeline	<p>Surge management measures have been included within the design of the Proposed Project to allow for changes in pressure to be managed without damage to the proposed infrastructure including the pipeline itself.</p> <p>Therefore, it would be very unlikely that a change in pressure would result in an incident.</p> <p>The consequence would be social impacts due to loss of supply at a level classified as 'serious' and this could also result in a simple, widespread pollution incident, as per the criteria in Table 20.4.</p> <p>This risk is considered to be as low as reasonably practicable.</p>	Very Unlikely (2)	Serious (3)	Low (6)
	O2f. A failure in a joint between sections of the pipeline which would result in water being released into the local environment and water not reaching the end users.	Pipeline	<p>Steel has been selected as the preferred pipeline material because this allows for easy connection of sections of pipe. These will be fully tested prior to putting the pipeline into operation and then Cathodic Protection will be used to monitor the integrity of the pipeline including joints. This would allow for an intervention before it became a bigger problem, and therefore an incident occurring is very unlikely.</p> <p>The consequence would be social impacts due to loss of supply at a level classified as 'serious' and this could also result in a simple, widespread pollution incident, as per the criteria in Table 20.4.</p> <p>This risk is considered to be as low as reasonably practicable.</p>	Very Unlikely (2)	Serious (3)	Low (6)
O3 Impacts of fire or storm damage to infrastructure	O3a. The pipeline or above ground structures could be damaged during a fire or storm. This could lead to damage to the structures leading to water or chemicals being released into the local environment and water not reaching the end users. Fire could also lead to peat/forest fires leading to harm to the workforce or local receptors.	Project-wide	This would be the same risk and response as O1b and O1c.	Very Unlikely (2)	Serious (3)	Low (6)
	O3b. The pipeline or above ground structures could be damaged during a fire or storm. This could result in chemicals being set on fire and resulting in a release to the atmosphere.	Infrastructure Sites	<p>There would be chemicals stored at the Infrastructure Sites during the operation of the Proposed Project. This would primarily be at the WTP but there would also be chemical dosing at the BPT and TPR and potential for use of chemicals in treatment of invasive species at the RWI&amp;PS.</p> <p>The chemical with the potential for toxic release during a fire would be sodium hypochlorite as it gives off toxic fumes in a fire (although it is non-combustible).</p> <p>The buildings will be built to fire safety standards as per Part B of the Building Regulations and will have automatic sprinklers. Additionally dampening / sprinklers will be provided in areas of chemical storage.</p> <p>As a result, it would be very unlikely that there would be an incident and in the event that it occurred a release would be a small volume resulting in a simple, widespread pollution incident.</p> <p>This risk is considered to be as low as reasonably practicable.</p>	Very Unlikely (2)	Serious (3)	Low (6)
O4 Impacts of interruption to water supply services	O4. If the Proposed Project were to be subject to a cyber-attack, this could result in the system being shut down and water not reaching the end users. Alternatively, if pollution occurred to Parteen Basin, this would limit abstraction until the water was safe to use.	Project-wide	This would be the same risk and response as O1a.	Very Unlikely (2)	Serious (3)	Low (6)

Risk	Risk Event	Proposed Project Element	Discussion	Likelihood	Consequence	Resulting Risk Category
O5 Impact of extreme weather conditions	O5a. Extreme weather conditions (e.g. drought) affects the availability of water to be supplied by the Proposed Project.	Parteen Basin	<p>Drought scenarios have been considered within the development of the operation of the Proposed Project and the analysis of the available water. Modelling has shown that the Proposed Project can deliver 300Mld in a drought equivalent to the one in 2018<sup>3</sup> including future climate change. Even during the worst modelled drought event (2018) from the model simulation period, the size and rate of simulated lake level change fits within the range of ESB normal observed lake level fluctuations and the simulated lake levels with the inclusion of the Proposed Project abstraction are still well within the Normal Operating Water Level Band. Typically, unless there are unforeseen circumstances, ESB will raise water levels in advance of a drought event to manage the risk, a forecast will be in place to determine the volume of water required by Uisce Éireann and monitoring will be used by ESB to manage water levels and the volume of water abstracted by Uisce Éireann.</p> <p>The hydrological modelling undertaken for the Proposed Project demonstrates that water supply can be maintained during drought periods. The risk of a loss of supply would therefore be very unlikely. The consequence would be social impacts due to loss of supply at a level classified as 'serious', as per the criteria in Table 20.4.</p> <p>This risk is considered to be as low as reasonably practicable.</p>	Very Unlikely (2)	Serious (3)	Low (6)
	O5b. Extreme weather conditions (e.g. drought) could affect the integrity of the pipeline.	Pipeline	<p>The pipeline would be underground and not susceptible to drought or flooding. Drought conditions could impose abstraction restrictions at Parteen Basin but these are likely to be short-term and, in such cases, water could be imported from other sources. Therefore, the Proposed Project is not considered to be susceptible to extreme weather, and as such, an incident is very unlikely.</p> <p>The consequence would be social impacts due to loss of supply at a level classified as 'serious', as per the criteria in Table 20.4.</p> <p>This risk is considered to be as low as reasonably practicable.</p>	Very Unlikely (2)	Serious (3)	Low (6)
	O5c. Extreme weather conditions (e.g. flooding) could affect the operation of the Infrastructure Sites.	WTP	<p>The RWI&amp;PS has been sited outside the floodplain at Parteen Basin. The other Infrastructure Sites would not be at risk of flooding; however, the access road to the RWI&amp;PS and the access road to the WTP would cross areas of floodplain.</p> <p>The access roads has been designed to be able to operate in a 1 in 100 flood (with allowance for climate change). This would mean that an incident is very unlikely.</p> <p>The consequence would be social impacts due to loss of supply at a level classified as 'serious', as per the criteria in Table 20.4.</p> <p>This risk is considered to be as low as reasonably practicable.</p>	Very Unlikely (2)	Serious (3)	Low (6)
O6 Impacts of operation on existing assets	O6. Risk that abstracting water levels and the permanent infrastructure affects the Fort Henry Embankment, the Category A Earthen Embankment Dam which forms Parteen Basin directly adjacent the intake area. The embankment is part of ESB's infrastructure.	RWI&PS	<p>Modelling has been used to demonstrate that, based on how water levels have been managed in the past, ESB can continue to manage water levels within the Normal Operating Band on Lough Derg and within the upper and lower water levels that it applies to Parteen Basin, with the Proposed Project in operation. This is reported in Chapter 9 (Water). This is the case even at the peak abstraction for the Proposed Project of 300Mld and taking account of future climate change. Therefore, there would be no change in water levels affecting the Fort Henry Embankment.</p> <p>In a drought scenario, whereby ESB are unable to account for the use of water by Uisce Éireann, the water level will be monitored and Uisce Éireann has committed that the abstraction would be reduced if the critical dam safety level was being approached. Modelling has demonstrated that even in extreme drought scenarios this is not likely to occur.</p> <p>Proactive management will be used to reduce the risk of needing to do this, including evaluating demand and reducing abstraction earlier in a drought (before the critical dam safety level was being approached) and balancing different sources of drinking water within the Eastern and Midlands Region to meet demand.</p> <p>The geo-technical risk assessment has demonstrated that the permanent infrastructure is not likely to change groundwater conditions affecting the Fort Henry Embankment. A monitoring regime will be agreed for ground water between ESB and Uisce Éireann.</p> <p>The risk of an impact to the integrity of the embankment is very unlikely. The consequence of an incident would be social and infrastructure impacts of a 'serious' classification given the consequence of a bank failure, as per the criteria in Table 20.4.</p> <p>This risk is considered to be as low as reasonably practicable.</p>	Very Unlikely (2)	Serious (3)	Low (6)

<sup>3</sup> The 2018 drought shows the biggest impact of the Proposed Project scenarios on the simulated lake levels – see Appendix A9.1, Annex A (Hydrological Modelling Report) for further detail.

27. The results from the evaluation are shown in Table 20.7, in relation to the risk matrix in Table 20.5, to determine risk category. Four risks – C1c (service strike), C4a (spread of invasive species), C4b (livestock diseases) and C7 (accident during ground treatment) – are already covered in other EIAR chapters – Chapter 18 (Material Assets), Chapter 8 (Biodiversity), Chapter 11 (Agriculture) and Chapter 10 (Geology, Soils & Hydrogeology) – and would have no remaining risk of MANDs. Therefore, these are not listed in Table 20.7 to avoid double counting.

**Table 20.7: Evaluation of Risk Category in the Absence of Mitigation**

<b>Likelihood</b>	5 – V. Likely		C2b			
	4 – Likely		C2a, C6			
	3 – Unlikely		C1b, C3b, C5	C2c		
	2 – V. Unlikely		C1a, C8	C3a, C3c, C3d, C9, O1a-d, O2a-f, O3a, O3b, O4, O5a-c, O6		
	1 – Ext. Unlikely					
			1 – Minor	2 – Limited	3 – Serious	4 – V. Serious
<b>Consequence of Impact</b>						

28. From examining the plausible risks presented in Table 20.6, all are considered as being below the threshold of significance set for the purposes of this assessment (green zone or ‘Low’ risk event) except for risk ID C2a, C2b, C2c and C6 which fall within the amber zone (‘Medium’ risk scenario). These are therefore brought forward for further consideration and assessment of mitigation measures.

## 20.4 Mitigation and Monitoring Measures

### 20.4.1 Embedded Mitigation

29. The environment team has worked closely with the infrastructure design team to avoid or reduce environmental impacts through the Proposed Project design. This is referred to as embedded (or design) mitigation. Embedded mitigation is inherent to the Proposed Project design, and forms part of the project description and construction methodology described in Chapters 4 and 5 of the EIAR. As such, embedded mitigation is considered in the assessment of pre-mitigation effects in Section 20.3. Embedded mitigation relevant to the risk of MANDs is outlined in Table 20.6 and includes measures such as the following examples:

- Using minimum depths for crossings below third-party assets to reduce the risk of an accident due to collapse
- Excavation of marl layers in areas of peat in order to reduce the risk of collapse of the proposed pipeline
- Use of ground anchors and secant piles to manage the risk of ground movement during the construction of the RWI&PS impacting upon the Fort Henry Embankment
- Operational procedures to monitor change in pressure and/or flow in the pipeline and shut down the pumps and isolate the main as necessary, making it safe pending investigations.

30. The following sections outline the relevant mitigation measures for the ‘Medium’ risk scenarios brought forward for further consideration and assessment.

## **20.4.2 Mitigation for the Risk of an Accidental Release to Surface Water (C2)**

### **20.4.2.1 Pollution Event Leading to Environmental Damage (C2a)**

31. The CEMP (Appendix A5.1) includes standard emergency response procedures that will govern the management of emergency incidents, including accidental spills. Emergency procedures will be specific to the Contractor, therefore the appointed Contractor will develop an Emergency Response Plan, based on the procedures set out in the CEMP, in consultation with the emergency services and other relevant third parties. In addition, a SWMP has also been developed as part of the CEMP (Appendix A5.1 Annex A). This will reduce the risk of MANDs resulting from the potential release of pollutants associated with the Proposed Project to water bodies, including the potential release of sediments and commissioning water.
32. As part of the development of the SWMP, settlement/attenuation lagoons have been strategically located at low points along the Construction Working Width and within the infrastructure sites. These will be adequately sized to ensure that they meet the requirements of a particular location and will include controls such as filter drains to collect runoff and direct it to lagoons. In addition to these settlement/attenuation lagoons, localised attenuation ponds will be required to manage land runoff and for groundwater control. These are particular to the appointed Contractor's method of working but will be managed in the same manner as a lagoon which will require detailed Pollution Control Plan, Emergency Response Plan and Method Statements, drafted in agreement with Inland Fisheries Ireland (IFI) and other relevant authorities, and having regard to relevant pollution prevention guidelines, in particular the IFI's (2016) Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters.
33. The SWMP also includes measures for removing sediment from surface water prior to discharge, as per the Construction Industry Research and Information Association (CIRIA) guidance on the Control of Water Pollution from Linear Construction Projects (CIRIA 2006) (for example silt screens). The treated surface water will be discharged to local watercourses, ditches or road drainage as deemed suitable at locations along the pipeline route. There will be no direct discharge of surface waters from the site without prior attenuation and treatment.
34. During pipeline construction, trenches will not be left open for extended periods of time. Trenches will only be dug to lengths which can be constructed each day. All trenches will be backfilled once the section of pipe is installed. This will prevent pooling of surface water within open trenches.
35. The Treated Water Pipeline will be tested in sections with water abstracted from a number of watercourses along the length of the Proposed Project (refer to Appendix A5.2: Commissioning Strategy). All structures and the pipework under test will be thoroughly cleaned and inspected before testing. Test water will be discharged following appropriate settlement and/or treatment, to watercourses or land along the length of the Proposed Project. There will be no uncontrolled discharges and there will be no discharge that has not been treated to an acceptable standard.
36. The implementation of the CEMP and SWMP would reduce the risk of an incident as low as reasonably practicable.

### **20.4.2.2 Mitigation for the Risk of Mobilisation of Silt During Installation of Secant Piles / Temporary Piling Platform and Revetment Matting (C2b)**

37. The primary mitigation for avoiding the mobilisation of silt during the construction of the intake at the RWI&PS will be the use of a double silt curtain. Examples of this have been shown in Chapter 5 (Construction & Commissioning). A specific series of measures and sequence of management have been adopted to demonstrate that the silt curtains would be effective. This is set out in Chapter 5 (Construction & Commissioning) and is as follows:

- Beyond the silt curtains, total suspended solids will be kept within the prescribed limit (which is  $\leq 25\text{mg/L}$ , in accordance with the Quality of Salmonid Waters Regulations 1988). Turbidity measurements (suspended sediment concentration) will be taken inside and outside the curtain to assess its effectiveness in containing sediment
- Accumulated sediment and silt behind the first curtain will be removed periodically to maintain the curtain's effectiveness. The rate of silt accumulation would vary depending on factors such as water currents, the type of sediment, and the depth of the curtain. Silt curtains will be inspected daily during construction activities with the potential to generate silt and immediately after heavy rainfall/flooding to assess the curtain's condition and identify sediment buildup and excessive drag. Monitoring will be weekly at other times
- The silt curtains will be:
  - Designed to be able to withstand the water velocity of a 1 in 100 flood flow (with allowance for climate change)
  - Buoyant along the top edge of the curtain in order to move with fluctuations in the water level up to a 1 in 100 flood event (with allowance for climate change)
  - Secure along the bottom edge of the curtain in order to prevent silt egress underneath. This will be done using a steel ballast chain or equivalent to maintain the curtain's vertical position in the water
- The intention is that the works will be sequenced to reduce the dependency on the double silt curtain as follows:
  - Install double silt curtain around the working area as part of site mobilisation
  - Install temporary sheet piling to retain the temporary piling platform (this will be on both sides of the piling platform and will form a continuous barrier around the temporary works at the intake)
  - The silt curtain will be used to manage silt during the temporary sheet piling; however, the piling platform becomes the primary silt retention barrier with the two silt curtains providing back-up during the secant piling and all constructions works required for the intake and pumping station (except for the installation of the revetment matting)
  - When the temporary works on the 'wet side' of the intake are completed, the piling platform will be removed. During this phase the silt curtains act as the primary containment measure
  - In preparation for the dredging and placement of revetment matting, a physical barrier consisting of a silt curtain or a structure performing an equivalent function will be placed around, and close to the perimeter of the dredging / revetment matting area. This provides the primary containment and the double silt curtain provides the back-up
- Once the revetment matting has been completed and all works on site completed, the double silt curtain will be removed.

38. The use of a double silt curtain as a mitigation measure will be effective in retaining suspended solids and silt mobilised with the water during construction of the intake and during the dredging of the revetment matting. Therefore, this risk is considered to be as low as reasonably practicable.

#### 20.4.2.3 Mitigation for the Risk of Failure of Silt Curtain (C2c)

39. Although the silt curtain will be effective in retaining silt, consideration has been given to the situation in the event of the failure of the curtain. Therefore, a double silt curtain consisting of two rows of silt curtains is proposed. Therefore, in the event of a failure of the inner curtain there would be a secondary barrier to prevent a pollution event.

40. The curtains and their fixings will be designed to operate up to the level of a 1:100 flood event (with an allowance for climate change) and withstand the velocity of the water in such an event.

41. A regime of regular removal of silt build-up behind the curtains will be implemented in order to reduce the consequence of any event occurring.
42. With the implementation of these measures this risk is considered to be as low as reasonably practicable.

#### **20.4.3 Mitigation for the Risk of the Flooding of Excavations (C6)**

43. The risk of flooding is assessed in Chapter 9 (Water). The measures set out in Annex A: SWMP within Appendix A5.1 (CEMP) provide for the management of temporary surface water, groundwater and flood water. These will include siting material storage outside areas of floodplain for a flood with a 1 in 100 chance of occurring in any given year. Further, filtration trenches, attenuation ponds and other measures will be used to attenuate any additional runoff during construction of the Infrastructure Sites.
44. In addition to these measures, the appointed Contractor will implement a Method Statement which provides for the dewatering of excavations and produce an Emergency Response Plan including procedures for the emergency evacuation of the excavation. The requirement for these plans is set out in the CEMP.
45. With the implementation of these measures this risk would be as low as reasonably practicable.

#### **20.4.4 Risk of MANDs Following the Implementation of Mitigation Measures**

46. Risk events identified as being of 'Medium' risk (amber zone) were subject to further assessment and determination of risk, after implementation of mitigation measures. The results are presented in Table 20.8.

**Table 20.8: Major Accidents and/or Disasters – Assessment of Mitigation Measures**

Risk ID	Risk Event	Proposed Project Element	Pre-Mitigation Risk Score	Mitigation Measures (Including Confirmatory Studies)	Post-Mitigation Likelihood	Post-Mitigation Consequence of Impact	Resulting Risk Category
<b>Construction</b>							
C2a	Pollution event leading to environmental damage	Project-wide	Medium (8)	The risk will be reduced by the implementation of a CEMP, including a SWMP (Appendix A5.1 Annex A). Settlement/attenuation lagoons will be strategically located at low points along the Construction Working Width and within the infrastructure sites. The appointed Contractor will develop and implement a detailed Pollution Control Plan, Emergency Response Plan and Method Statements for working near water bodies, drafted in agreement with IFI and other relevant authorities, and having regard to relevant pollution prevention guidelines. This would reduce the likelihood of the risk occurring to 'very unlikely'. The consequence of the impact would not change.	Very Unlikely (2)	Limited (2)	Low (4)
C2b	Risk of mobilisation of silt during installation of secant piles and temporary piling platform and revetment matting	RWI&PS	Medium (10)	The risk will be reduced through the use of a double silt curtain supplemented with monitoring. This would reduce the likelihood of the risk occurring to 'very unlikely'. The consequence of the impact would not change.	Very Unlikely (2)	Limited (2)	Low (4)
C2c	Risk of failure of silt curtain	RWI&PS	Medium (9)	The mitigation for risk ID C2b is also relevant to this risk. The risk will be reduced through the use of a second silt curtain and designing the fixtures to withstand 1 in 100 flood flows and levels. This would reduce the likelihood of the risk occurring to 'very unlikely'. Regular removal of silt would avoid the build-up of material and therefore reduce the extent/magnitude of the impact. This would reduce the consequence of the impact (i.e. localised pollution event rather than widespread).	Very Unlikely (2)	Limited (2)	Low (4)
C6	Risk that during excavation of the trench for the pipeline severe rain, surface runoff or groundwater floods the excavations	Project-wide	Medium (8)	The alignment of the pipeline has been selected to avoid areas of floodplain where reasonably practicable (taking account of other constraints) and this is reflected in the Flood Risk Assessment in Chapter 9 (Water). The risk will be further reduced by the implementation of a CEMP, including a SWMP (Appendix A5.1 Annex A). Settlement/attenuation lagoons will be strategically located at low points along the Construction Working Width and the infrastructure sites. The appointed Contractor will develop and implement a detailed Emergency Response Plan and Method Statements. This would reduce the likelihood of the risk occurring to 'very unlikely' The consequence of the impact would not change.	Very Unlikely (2)	Limited (2)	Low (4)

47. The results from the evaluation of risk, once mitigation measures have been applied, have been summarised in Table 20.9.

**Table 20.9: Evaluation of Risk Categories Post-Mitigation**

<b>Likelihood</b>	5 – V. Likely					
	4 – Likely					
	3 – Unlikely		C1b, C3b, C5			
	2 – V. Unlikely		C1a, C2a, C2b, C2c, C6, C8	C3a, C3c, C3d, C9, O1a-d, O2a-f, O3a, O3b, O4, O5a-c, O6		
	1 – Ext. Unlikely					
		1 – Minor	2 – Limited	3 – Serious	4 – V. Serious	5 – Catastrophic
<b>Consequence of Impact</b>						

## 20.5 Residual Effects

48. The assessment has focused on identifying the potential sources of a hazard that could result in a MAND, whether there are potential pathways to receptors that could cause a significant environmental effect, and finally, whether existing design measures, legal requirements, codes and standards adequately control the potential MAND. The assessment has shown that in the majority of cases, the existing design measures, legal requirements, codes and standards adequately control the potential MAND, resulting in 'Low' risks (as per the criteria in Table 20.4), with the exception of four 'Medium' risks in the absence of mitigation measures.
49. Following the application of the proposed mitigation measures for the four hazards with a 'Medium' risk, the potential risks associated with MANDs would reduce to a level below the threshold of significance (green zone or 'Low' risk event). Therefore, the Proposed Project is unlikely to result in a significant effect during construction, commissioning or operation, both in terms of its vulnerability to a MAND and also when considering its potential to cause a MAND.

## 20.6 References

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