ENVIRONMENTAL IMPACT STATEMENT FOR A PROPOSED AVIATION FUEL PIPELINE FROM DUBLIN PORT TO DUBLIN AIRPORT

VOLUME 1 - NON-TECHNICAL SUMMARY

MARCH 2015

FEHILY TIMONEY & COMPANY

ENVIRONMENTAL IMPACT STATEMENT FOR A PROPOSED AVIATION FUEL PIPELINE FROM DUBLIN PORT TO DUBLIN AIRPORT

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Abstract: Fehily Timoney and Company (FTC) was retained by Fingleton White to prepare an environmental impact statement (EIS) for the proposed aviation fuel pipeline from Dublin Port to Dublin Airport. The potential impacts on the human environment, air noise, climate, flora and fauna, hydrology, soils and geology, water quality, ecology, material assets, archaeology, architecture and cultural heritage are evaluated. This document consists of a non-technical summary of the information provided in the main volume (Volume 2) of the Environmental Impact Statement which accompanies the planning application to Dublin City Council and Fingal County Council for the proposed aviation fuel pipeline.

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1 INTRODUCTION

Fehily Timoney & Company (FTC) was appointed by Fingleton White to prepare the Environmental Impact Statement for the proposed aviation fuel pipeline from Dublin Port to Dublin Airport for submission to two planning authorities - Dublin City Council and Fingal County Council.

The 14.4 km proposed pipeline will transport aviation fuel from an inlet station at Dublin Port to a reception station at Dublin Airport as indicated on Figure 1.1. In summary the proposed route is as follows:

- Dublin Port
- Bond Drive
- Tolka Quay Road
- East Wall Road
- Tolka River crossing
- Alfie Byrne Road
- Clontarf Road
- Howth Road
- Copeland Avenue
- Malahide Road (R107)
- Malahide Road (R139)
- Clonshaugh Road North
- AUL/FAI Sports Grounds
- M1 Crossing
- DAA Long Term Car Park(Red)
- Eastlands Car Hire Compound
- ALSAA Sports Complex
- Swords Road
- Corballis Road
- Dublin Airport.

The pipeline will be located predominantly (approximately 96%) within the road carriageway. A short section of pipeline will be located off road at the Athletic Union League- Football Association of Ireland (AUL- FAI) Sports Complex at Clonshaugh as well as sections through the Eastlands Car Hire Compound.

There will be seven crossing points of rivers/streams, including the Tolka, Santry, Mayne, Wad and Naniken Rivers and the Cuckoo and Kilbarrack Streams. Five of these rivers/streams, namely the Mayne, Wad and Naniken, Cuckoo and Kilbarrack have been piped at the point of crossing. Both the Tolka and Santry Rivers are open rivers at the point of crossing. A foreshore licence from the Department of the Environment, Community and Local Government will be required for the crossing of the Tolka River.

The transporting of aviation fuel by pipeline is not a new concept and is in operation in the United Kingdom and in Europe in locations including Heathrow, Gatwick, Birmingham, Manchester, Amsterdam, Frankfurt, Brussels, Zurich and Luxembourg. Some of these pipelines have been in operation since the 1950s. The major oil companies currently operating in Ireland use these UK and European pipelines. Pipelines are used in these instances as a transport mode, to ensure that the fuel supply chain is both safe and flexible.

1.1 Applicant – Fingleton White

The applicant for the planning application is Fingleton White, applying on behalf of the developer - Independent Pipeline Company Ltd whose main shareholders are Fingleton White and Reynolds Logistics.

Fingleton White is an engineering company with a record of management, design and construction of petroleum oil and gas infrastructure. The company was formed in 1981 and since then has been involved in many significant projects in the energy sector, in particular power generation. Fingleton White has been involved in the design, construction and operation of a range of infrastructural projects including a 16,000 Mega Watt (MW) gas station, hydroelectric stations, combined heat and power plants, water, oil and gas pipelines, refrigeration systems, boiler houses, district heating and broadband communication networks.

Reynolds Logistics is the largest road distribution company for oil products in Ireland. It currently transports by road tanker 60% of the aviation fuel from Dublin Port to Dublin Airport.

Its management service covers the entire fuel supply chain including warehousing, packed distribution, tank farm operations, interplant operations and customer deliveries.

1.2 The Need for the Project

Dublin Airport is a gateway of prime importance to the island of Ireland. It serves incoming and outgoing commercial passenger and freight travel as well as incoming and outgoing tourist and leisure passenger travel. It is of high level importance to the Irish economy and to Irish society.

Currently, aviation fuel supplies for Dublin Airport are transported from Dublin Port to Dublin Airport via road tankers. The largest permitted road tankers are used, each having a capacity of 40,000 litres. At the current demand for fuel this equates to over 15,000 tanker trips per year on a continuous 24 hour – 7 days a week rota. It is estimated that some 200,000 litres of diesel fuel are used each year by the tankers transporting the fuel, which equates to an annual emission of 500 tonnes of CO_2 which is a greenhouse gas.

The pipeline is designed to replace the existing road delivery system. Fuel will be pumped from existing tanks within the Port via a new inlet station direct to a new reception station where the pipeline will terminate. The fuel will be stored in storage tanks at Dublin Airport.

The pipeline will be operated as an open access transportation system. It will be open to all fuel suppliers providing aviation fuel to Dublin Airport.

The Greater Dublin Area Draft Transport Strategy 2011 – 2030 states that in the Greater Dublin Area (GDA) there are two international gateways, namely Dublin Airport and Dublin Port and that the role and function of these facilities is of critical national importance and the management of transport to and from these locations needs to be considered at a regional level to ensure their efficient operation.

The transportation of petroleum products by tanker along busy commuter roads raises a number of health and safety issues. A safety and environmental impact evaluation conducted by AMEC UK concluded that the operation of the proposed pipeline has a significantly lower level of risk than the alternative use of road tankers. The failure frequency of the pipeline is over 90 times lower than that associated with transportation by road tanker.

From an economic perspective, the pipeline provides a sustainable and secure means of fuel supply for Dublin Airport. Passenger figures at the airport have continued to rise steadily since 2009, reaching 20.2 million in 2013 which constitutes a 6% increase and is well ahead of the European Union average increase of 1%. Significant new capacity was secured for Dublin Airport for 2014, in terms of summer long-haul and short-haul services. This includes a 17% increase in capacity to North America and a major planned expansion in capacity to the Middle East (2013 Annual Report). Dublin Airport Authority predicts a further increase in passenger numbers to 28 million by 2018. By 2030, this is anticipated to have reached 40 million.

The proposed pipeline will cater for both current and future demands beyond 2035.

1.3 Planning History

Fingleton White received permission in 2001 from Dublin City Council (planning ref 0189/00) and Fingal County Council (F99A/0063) for the construction of a 150 mm diameter pipeline (versus 200 mm for the current proposal) for the transport of aviation fuel along the following route:

- Branch Road North
- Tolka Quay Road
- East Wall Road
- Alfie Byrne Road
- Fairview Park
- Fairview
- Marino Mart

- Marino Park Avenue
- Marino Park
- Croydon Park Avenue
- Croydon Terrace
- Griffith Avenue
- Swords Road
- Airport Service Road.

An environmental report rather than an environmental impact statement (as the development was sub-threshold for a mandatory environmental impact statement) accompanied the application.

The Dublin City grant was subject to third party appeal to An Bord Pleanála (ABP). ABP upheld the decision of Dublin City Council (Planning ref PL29N.122692). This permission has however since lapsed.

1.4 Application and EIS Process

As the proposed pipeline route passes through two local authority functional areas, two planning applications will be made. One will be submitted to Dublin City Council to cover the Dublin Port to R139 section of the pipeline, with the second application made to Fingal County Council for the R139 to Dublin Airport section. Each application will be accompanied by a Planning Report, Safety and Environmental Impact Evaluation Report, Design Basis Report, Route Selection Report, Construction Plan, Traffic Management Plan, Outline Emergency Response Plan, Environmental Impact Statement (EIS) and a Natura Impact Statement (NIS).

1.5 Environmental Impact Statement

1.5.1 Environmental Impact Statement Methodology

Pursuant to the provisions of EU and Irish law, when a proposed development is required to be the subject of an environmental impact assessment (EIA), the developer is required to present information to the competent authority (in this case Dublin City Council and Fingal County Council) in an environmental impact statement for examination.

Thus, an environmental impact statement is required to provide information so as to ensure that the competent authority may make a reasoned conclusion on the significant effects of the project on the environment, taking account of, i*nter alia*, the information contained in the EIS.

The EIS for this project has been prepared in accordance with EIA-specific and other relevant environmental legislation, guidance and advice notes. As part of the preparation process for the EIS, there has been extensive consultation with the competent authorities, prescribed bodies as well as the public and other interested parties.

This document is Volume 1 of the EIS and comprises a Non-Technical Summary of the information contained in the main EIS report (Volume 2), with Volume 3 containing the Appendices.

The broad methodology framework used in the EIS includes descriptions of:

- Existing Environment
- Potential Impacts (direct, indirect and cumulative)
- Mitigation Measures
- Residual Impacts (direct, indirect and cumulative).

1.5.2 Environmental Impact Statement Structure

The EIS has been structured as described below. The detailed information in respect of each environmental aspect is provided in the main EIS report, Volume 2, and each of those sections is dealt with in summary form in this Non-Technical Summary as follows:

- Description of the Proposed Development
- Policy
- Human Environment – Land use
- Human Environment – Socio-Economics
- Roads, Traffic and Transportation
- Noise and Vibration
- Flora and Fauna
- Soils, Geology and Hydrogeology
- Surface Water Quality & Drainage
- Air and Climate Change
- Archaeological, Architectural and Cultural Heritage
- Landscape and Visual
- Interactions and Inter-relationship Impacts of the Foregoing.

1.5.3 Pre-Submission Consultations

Prior to preparing this EIS, a number of state and public agencies and individuals were consulted to ensure that the most significant impacts were addressed during the preparation of the environmental impact statement.

Consultation through meetings, elected members information days, public information days, letters, emails and telephone calls, with various statutory and non-statutory consultees, the local communities and other interested parties has been maintained throughout the preparation of the environmental impact statement. Details of the scoping and consultation are contained in Chapter 5 of the Main EIS in Volume 2.

1.6 Requirements for Non-Technical Summary

In accordance with the provisions of the EIA Directive[1] and Article 94 of and Schedule 6 to the Planning and Development Regulations 2001, as amended, this report is a summary in non-technical language of the information provided in the EIS, in non-technical language.

1.7 Permission Period

A ten-year planning permission is beING applied for in respect of this proposed development within a planning corridor, to include road, footway and verges. Where the route passes through green areas and private amenity areas the planning corridor will be 8 m in width. This is to allow re-routing of the pipeline within these corridors during construction to avoid, for instance, any existing services.

[1] Directive 2011/92/EU of the European Parliament and of the Council of 13 December 2011 on the assessment of the effects of certain public and private projects on the environment (codification). It should also be noted that certain amendments have been effected to the EIA Directive by Directive 2014/52/EU), which entered into force on 15 May 2014, to simplify the rules for assessing the potential effects of projects on the environment. Member States have until 16 May 2017 to transpose these obligations into national law.

1.8 Difficulties Encountered

There were no technical difficulties encountered during the preparation of this environmental impact statement.

1.9 Viewing and Purchasing of the EIS

Any member of the public can view the planning application and accompanying EIS documentation, including the Non-Technical Summary and the Natura Impact Statement free of charge or can purchase on payment of a specified fee during normal office hours at the following locations:

- Dublin City Council, Planning Department, Civic Offices, Wood Quay, Dublin 8
- Fingal County Council, Planning Department, County Hall, Main Street, Swords, Co. Dublin.

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LE10-727-01_Figure 1.1_Proposed Pipeline Route_Rev F

Date	11/03/2015
Name of Client	Fingleton White
Name of Job	EIS for Aviation Fuel Pipeline between Dublin Port - Dublin Airport
Title of Figure	Proposed Pipeline Route
Scales Used	1 : 50,000 @ A4
Figure No.	1.1
Rev	F

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2 DESCRIPTION OF THE PROPOSED DEVELOPMENT

2.1 Proposed Development

The proposed pipeline will be a 200 mm (8") diameter, continuously welded steel pipe, with a wall thickness of 12.7 mm. It will be 14.4 km in length. It will be capable of delivering 300 m^3 per hour (equivalent to 2,700 million litres per annum) of Jet A1 aviation fuel to Dublin Airport.

The safest way to transport aviation fuel is by pipeline and this is reflected by the number of pipelines in operation throughout the UK and Europe. The failure frequency of the proposed pipeline, which has been designed with inbuilt safety measures, is over 90 times lower than that of a road tanker.

Jet A1 fuel is kerosene which is also used in Ireland for domestic central heating, stand-alone domestic heaters, camping stoves and lights. In these situations the kerosene is stored in plastic tanks or containers within the curtilage of a domestic dwelling.

Kerosene is used for fuel for aviation turbine engines fitted to aircraft given its low freezing point of -47°C. It is subject to strict quality requirements and product integrity by users.

Kerosene is stable in normal conditions. Vapour will not form unless the temperature is greater than 38° - 42°C which is well above ambient temperatures in Ireland. The fuel will not ignite unless an ignition source is provided and these conditions will not normally occur in a pipeline of this nature.

The proposed pipeline has been designed and will be commissioned and operated in accordance with the Irish Standards for pipelines which is I.S. EN 14161:2011 – Petroleum and natural gas industries – Pipeline transportation systems (ISO 13623:2009 modified). In the UK, the Health and Safety Executive is the regulating authority for pipelines. All the pipelines are operated in accordance with the UK Pipeline Safety Regulations (No. 825 of 1996). Given that there are no corresponding Regulations in Ireland at this time, it is proposed that this pipeline will be operated in accordance with the UK Pipeline Regulations and will be independently audited on an annual basis by an internationally recognised body, the British Pipeline Agency. The audit report will be submitted each year to both Dublin City Council, Fingal County Council, Dublin Airport Authority and Dublin Port Company.

2.2 Construction

It is anticipated that construction works will be completed over a 10 month period commencing in February and continuing until November of that year (dependent on consent timelines).

This 10 month programme can be broken down into a number of sub-phases which may overlap. These are:

- Set up and establishment of traffic management plans
- Construction
- Permanent re-instatement
- Commissioning of the pipeline.

The linear and repetitive nature of the works is similar to the works required to provide other utility infrastructure such as water, drainage, gas, telecoms and electricity. The proposed pipeline will be laid by four 'crews' working separately along the length of the pipeline. Each works site will measure approximately 72 m long x 4 m wide and will be fenced off from the public.

It is proposed that each crew will lay an average of 24 m of pipeline each day before each works site is moved ahead as the pipeline advances. The anticipated duration outside any one property is two days.

Conventional pipe laying techniques called 'open cut trenching' will be used for the majority of the route. This is a standard method for the construction of steel pipelines and to-date some 200 km of steel pipeline has been laid in urban environments throughout Ireland using this construction method.

Open cut trenching involves the following:

- Set up of Traffic Management Plan
- Establishment of a safe working zone with barriers which will only be accessible to authorised personnel
- Saw cutting the carriageway
- Breaking out the surface with an excavator
- Excavation of a trench to the required depth to accommodate the pipeline at 1.2 metres of backfill
- Removal of the excavated material directly to awaiting vehicles for transport to an appropriate facility (in agreement with the local authorities)
- At road crossings/junctions, steel plates will be installed over the first half of the carriageway to facilitate traffic management during excavation of the second half of the carriageway
- Steel plates will also be installed as a temporary measure, where required, to allow temporary access to property or to facilitate traffic movement along a carriageway.

It is proposed that the trenches will be backfilled and temporarily reinstated each evening, ensuring minimum disruption to pedestrians, home owners and businesses.

All works within the public roadway will require road opening licence(s) from either Dublin City Council and/or Fingal County Council, which will be applied for if planning permission is obtained. The licence(s) will specify the permitted hours of construction. It is anticipated that the majority of construction works will be carried out during daytime hours, however evening and weekend working will also be required at some locations. In addition, the exact alignment of the route within Dublin Airport Authority and Dublin Port Company owned lands will be agreed and all works will be conducted under a Permit to Work from both these organisations.

In more difficult locations, such as the crossings of the seven rivers/streams and the M1 motorway, alternative construction techniques will be used. These are known as trenchless techniques and they allow the installation of the pipelines below the ground (and below the bed of the river/stream) with minimal excavation.

The pipeline will be covered by 1.2 m of backfill consisting of 300 mm sand or gravel, followed by 700 mm of leanmix concrete to 200 mm below the surface as indicated in Figure 2.1. This backfill material will be delivered directly to each works site on an as needed basis. Therefore, there will be no requirement for the stockpiling of materials along the route.

A marker tape will be installed above the pipeline to notify third parties of its presence. The use of leanmix concrete in the trench significantly reduces the impact from third party interference which has been found to be the principal reason for damage to pipelines of this nature. It is proposed to begin to permanently reinstate the surface of the trench to its former condition once the pipeline is laid.

There will be a requirement for the establishment of one to two temporary compounds for the duration of the construction works. These sites will be used for the storage of the steel pipe, plant and machinery each night and re-fuelling of such machinery. These will be located at existing available sites and suitable sites have been identified at:

- Dublin Port
- Malahide Road Industrial Park off Greencastle Road

These are vacant sites, having existing hardstanding and will not require any works to accommodate the pipe materials. The use of these sites is dependent on availability and the agreement of suitable terms and conditions, when a contractor is appointed.

The inlet station will pump fuel from existing fuel storage tanks within Dublin Port along the pipeline to a reception station at Dublin Airport where fuel will be stored at the existing fuel tank farm operated by Dublin Airport Authority. Both of these stations will be located at existing facilities which will be modified to accommodate the proposed pipeline. Modifications include the construction of a building, associated pipe and pumps, security fencing and single vehicle parking at each location.

Testing and Commissioning

The entire pipeline with be tested with clean water and pressurised. The pipeline will then be dried before fuel is admitted.

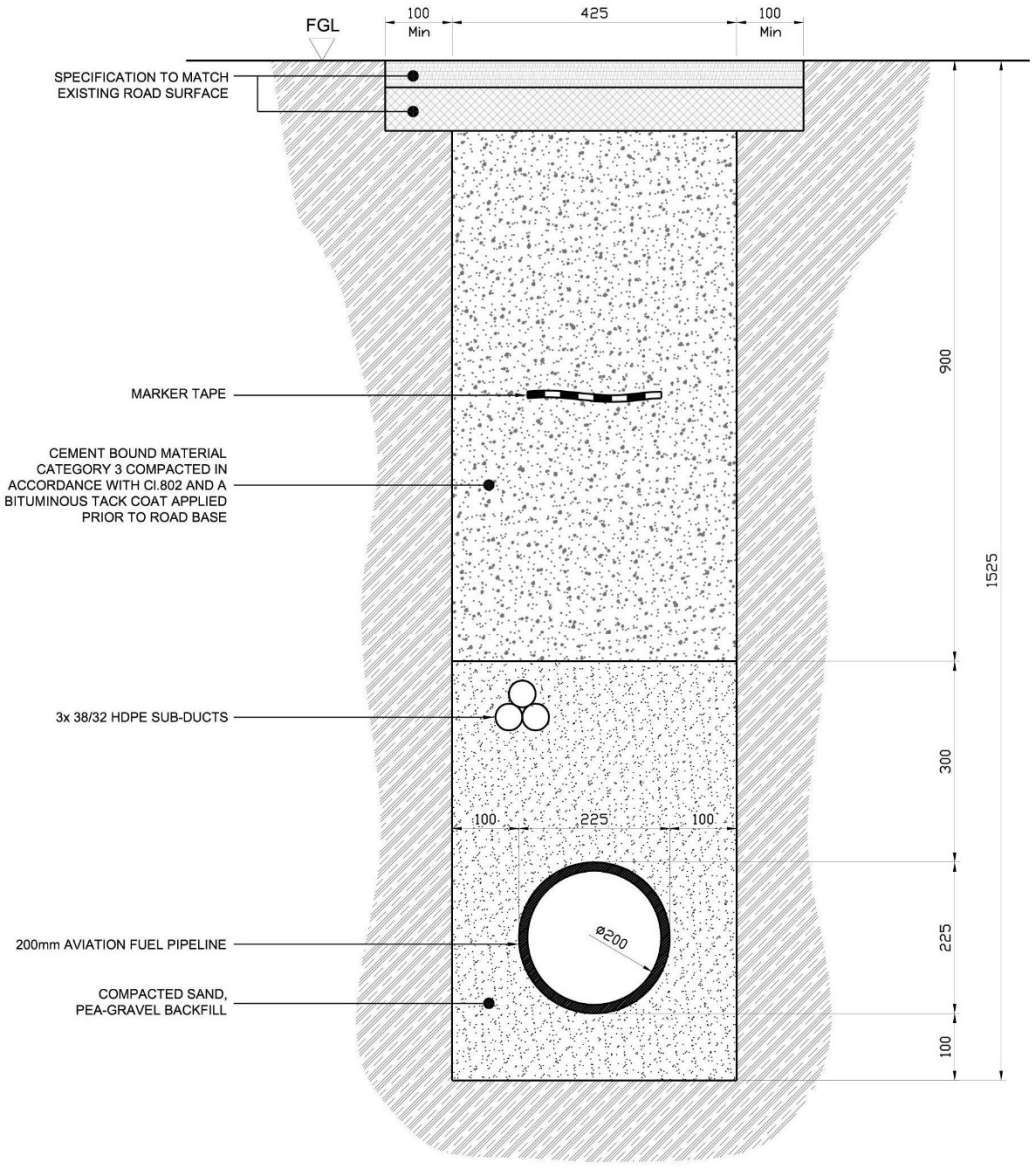

Figure 2.1: Typical Reinstatement Detail for the Trench

2.3 Operation, Monitoring and Decommissioning

The pipeline will be operated using an automated system which allows monitoring and control from both Dublin Port and Dublin Airport. The pipeline will be operated by Fingleton White with standby backup provided by Reynolds Logistics in the form of trucks which will be made available to transport fuel to the airport in the event of a loss of the pipeline. Both companies currently operate 24/7 response systems.

The pipeline will be protected from excessive leakage in the event of damage by the use of two emergency shutdown valves which will automatically shut, thus stopping the flow of fuel. AMEC Environmental & Infrastructure UK Ltd conducted an assessment which concluded that the predicted failure frequency of this pipeline is 1 in 5,130 years.

The pipeline will be monitored continuously and will be fitted with a leak detection system so that early preventative action can be taken in the event of any leak. This includes visual detection which will be conducted along the route fortnightly as well as instrumentation monitoring (known as on line leak detection). Additional leak detection will be provided at the Tolka River crossing. This will comprise a slotted duct installed in the pipeline trench with a sensing cable installed in the duct which will detect any leak. The duct will have 0.5 mm wide slots to prevent it filling with silt.

A PLC based alarm system will alert the on-call operator using a pager in the event of an accident with the pipeline. If the operator fails to respond, a backup callout via 24 hour call centre service will be initiated to the emergency response team. An outline emergency response plan has been included in Appendix 3.7 of Volume 3 of the EIS. A detailed emergency plan will be drawn up based on existing plans used by the aviation fuel transportation industry in the UK and adapted and modified as necessary to meet local conditions in agreement with Dublin Fire Brigade. This plan will include a communications link to Dublin Port, Dublin City Council, Fingal County Council and Dublin Airport Authority.

In addition, a fibre optic communications cable will be laid above the pipeline which will have a secondary function in detecting third party interference of the pipeline. Any disturbance of the pipeline will also break this cable which will result in a shutdown of the pumps at Dublin Port and Dublin Airport as well as the two emergency shutdown valves. This together with the online leak detection system gives a very high reliability of detection of damage to the pipe and minimisation of the volume of fuel leaked.

In the unlikely event that the pipeline is decommissioned, the pipeline will be emptied of fuel and flushed with water sourced from mains supply. The water will then be collected, sampled for contaminants and disposed of either to a surface water body (if deemed appropriate) or collected and taken offsite for disposal at an appropriate wastewater treatment facility in agreement with the local authority.

2.4 Site Selection and Alternative Layouts for the Proposed Development

Route Selection

Since 2008, the applicant has, in consultation with both local authorities, investigated a number of alternative route corridor options. Each option has been assessed from an environmental (including health and safety), planning and economic perspective. This included a review of the 2001 consented pipeline design and route which highlighted a number of changes that had taken place in the intervening period which deemed this route unsuitable. These included an increase in underground services in Dublin City in particular, as well as an increase in traffic congestion.

A total of six routes were examined with the emergence of a preferred route (which is the subject of this environmental impact statement) for the following reasons:

- The route was technically feasible both from an engineering and construction point of view
- The route is predominantly located in the public road and does not directly impact on any public park or amenity areas
- 75% of the pipeline will be laid in roads with 3 lanes or more which reduces potential traffic congestion during construction works as well as impacts on residents/businesses/facilities along the route (given greater separation distances)
- Environmentally, the route has no direct impacts on designated/protected sites and there is only one Record of Monument and Place (RMP) within the corridor.

Figure 2.2 shows the six route options which were considered.

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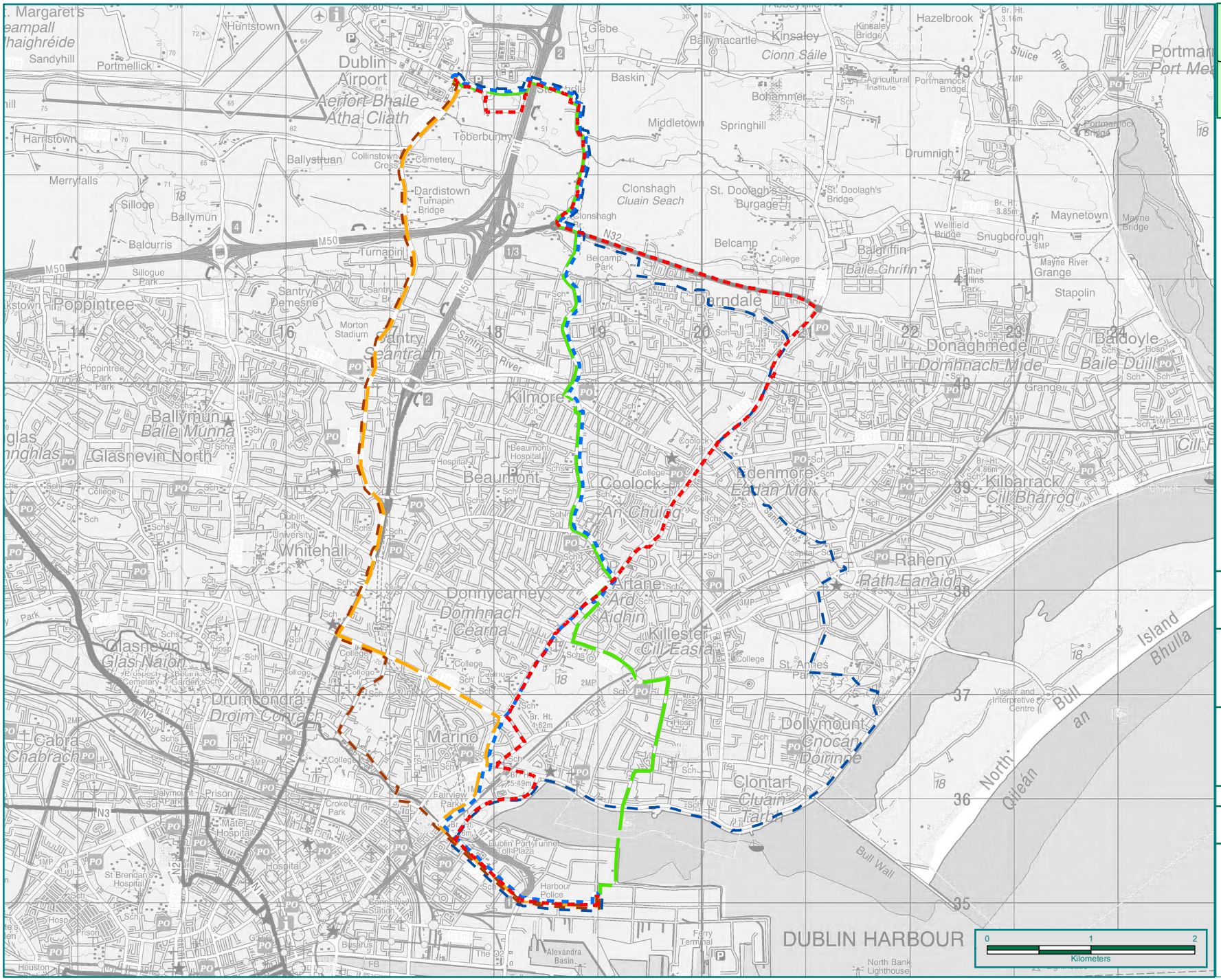
LE1072701_Map 2.2 Route_Options



Date 11/03/2015

Name Of Client

Fingleton White & Co. Ltd

Name Of Job

EIS for Aviation Fuel
Pipeline between Dublin
Port - Dublin Airport

Title Of Figure

Proposed Aviation Fuel Pipeline
Route Options

Scale Used 1:50,000 @ A4

Figure No. 2.2

Rev B

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Alternative Construction Techniques

An open-cut approach is proposed. It is the standard method for the construction of a pipeline in urban areas. In more difficult locations, such as crossings of rivers (open channel and piped) alternative approaches will be used including trenchless techniques to minimise environmental impacts of construction works at these locations.

2.5 Do-Nothing Scenario

While the proposed development seeks to replace all of the currents journeys by road tankers, it does not seek to preclude road supply by fuel suppliers nor road supply in the event of an emergency.

In the event that the proposed pipeline development does not proceed, the existing method of transporting fuel by road tanker from Dublin Port to Dublin Airport on a daily basis will continue. Continued transportation by road tanker will result in increased:

- Greenhouse gas emissions and air pollutants
- Noise
- Accident risk
- Contribution to traffic congestion
- Damage to public roads
- Potential for interruption of fuel supplies to the airport.

3 POLICY AND LEGISLATION

3.1 Irish Energy & Environment Policies

In national planning policy guidance, there is no reference to an aviation fuel pipeline as such. The importance of Dublin Airport and the promotion of sustainable transport is however clearly supported in the following:

- National Spatial Strategy for Ireland 2002 – 2020
- National Development Plan 2007 – 2013
- White Paper - Delivering a Sustainable Energy Future for Ireland'
- Smarter Travel a Sustainable Transport Future: *A New Transport Policy for Ireland 2009 – 2020*
- Ireland's Greenhouse Gas Emissions Projections 2013 – 2030
- Regional Planning Guidelines for the Greater Dublin Area 2010-2022
- A Platform for Change - An Integrated Transportation Strategy for the Greater Dublin Area 2000 to 2016
- Greater Dublin Area Transport Strategy 2011-2030

3.2 Dublin City Council Development Plan 2011 -2017

Part 2.1 of the Plan advises "*this development plan sets out a new approach to meet the needs and aspirations of the citizens of Dublin and the country in the long term. The approach is based on the principles of sustainability and thematic integration…..This philosophy for the future planning of the city has evolved over recent years and takes on board global and national concerns, together with inputs from the development plan consultation process. At global level there is increasing concern about climate change, carbon emissions and depletion of the earth's resources. At national level, the Climate Change Strategy has been introduced. Dublin City Council has taken a number of initiatives such as the Climate Change Strategy for the City, which sets out a series of actions to reduce the city's carbon footprint."*

Emphasising the sustainability theme, part. 2.3 states that Dublin must now make the transition to a low-carbon sustainable city. "*The evidence and costly implications of not doing so are indisputable and the benefits of a more sustainable city are numerous. Dublin must make the transition to a low carbon and ultimately to a post-carbon economy to become a competitive, resilient and sustainable city."*

The Core Strategy of the Plan incorporates the principles enunciated in the National Spatial Strategy and the Regional Planning Guidelines for the Greater Dublin Area.

3.3 Fingal County Development Plan 2011 -2017

A local objective has been included in the Plan which is directly related to the proposed pipeline development:

- Local Objective 399 - Support the construction of an oil pipeline from Dublin Port to provide fuel service to Dublin Airport.

In addition, the Plan highlights the strategic importance of Dublin Airport with Objective 9 of the plan stating:

- Objective 9 - Safeguard the current and future operational, safety, and technical requirements of Dublin Airport and provide for its ongoing development within a sustainable development framework.

4 THE MAIN EFFECTS OF THE DEVELOPMENT & THEIR MITIGATION

4.1 Mitigation by Avoidance and Design

A number of potential impacts of the proposed pipeline scheme have been avoided through route selection and the overall design of the scheme. This is known as mitigation by avoidance and it applies to a number of environmental topics including the human environment, roads, traffic and transportation, flora and fauna, surface water quality and drainage, landscape and visual. Rather than repeating this information under each environmental topic, a summary of these measures is provided below.

- Route Selection – the route selection process has taken great care to avoid areas heavily congested with existing services and to avoid narrow roads. This will minimise the potential for road closures and allow the pipeline to be constructed in a short timeframe. Further details in respect of the route corridor selection process are described in Chapter 2 – Background to the Development of Volume 2 of the Main EIS
- Construction Methodology – a number of short sections of the pipeline (including M1 and all river and stream crossings) will be constructed using trenchless techniques which means that the potential environmental impact is either greatly reduced or removed altogether
- The pipeline route has been designed in accordance with best practice such as I.S. EN 14161:2011 – Petroleum and natural gas industries – Pipeline transportation systems (ISO 13623:2009 modified) which stipulated the avoidance of direct impacts on ecologically designated sites (Annex D)
- The route has been selected to pass through areas of high regulation which require a road opening licence which will control third party interference
- The pipeline will be protected from excessive leakage in the event of a rupture by the use of two emergency shutdown valves positioned along the pipeline, one on the Malahide Road and one on the R139. The emergency shutdown valves are strategically located to limit the drain down of the pipeline taking into account topography of the route
- Disturbance of the fibre optic communications cable laid above the pipe will automatically initiate an emergency shutdown of the pumps and closure of the valves.
- The trench will be backfilled with 300 mm of sand or pea gravel, then 700 mm of lean mix concrete to 200 mm below ground surface. The use of leanmix concrete significantly reduces the risk of third party interference. The steel pipeline is also 12.7 mm thick to provide additional protection
- An external protection system will be utilised to prevent corrosion of the pipe (and hence leakage events). This is known as 'cathodic' protection
- Additional external leak detection will be provided at the Tolka River. This will comprise a slotted duct installed in the pipeline trench with a sensing cable installed in the duct. The duct will have 0.5 mm wide slots to prevent it filling with silt. The pipeline itself will be laid 2 m below the bed of the river and therefore a significant event would have to occur at or near that location for product to enter the surface water
- Other river crossings on the route are in culverts or in a concrete open channel (Santry River crossing)
- The operation of the pipeline will be monitored on a 24/7 basis and in the event that a leak is detected, the automatic leak detection system will ensure that the pipeline shuts down
- Existing vacant sites with hardstand areas are to be utilised for site compounds thus reducing landtake associated with the development.

4.2 Human Environment - Land use

96% of the route is located within public road way. The remaining 4% is located off-road within the private lands of the Athletic Union League (AUL)/FAI Sports Complex near Stockhole as well as short sections through Dublin Airport Authority lands. The pipeline also traverses lands owned by Dublin Port. There are a variety of land uses along the proposed pipeline corridor, including residential, green open/amenity space, community, offices, industrial, commercial, and sports and leisure as well as lands dedicated to transport infrastructure.

There will be impacts on land use as a result of the construction of the proposed scheme. Some temporary or short-term land take will be necessary to facilitate the construction of the pipeline.

However as the proposed scheme will be progressed in a sequential manner, with separate crews laying sections of the pipeline, the landtake will be restricted to the fenced off working area (some 72 m long by 4 meters wide).

In all instances the minimum amount of land necessary will be taken and provisions will be made for redirecting traffic. Permanent landtake will result at Dublin Port and Dublin Airport where the inlet and reception stations are located. However given the existing industrial setting of these locations, the impacts will be imperceptible.

Upon completion of the construction phase and permanent re-instatement of the trench to pre-construction condition, the land use along the pipeline route corridor will be restored to its previous condition and use, with the resultant impacts on land use being negligible. During the operation of the proposed pipeline the main impact on land use will arise in the unlikely event of damage to the pipeline and a subsequent leak. This will require repair to the pipeline which may include excavations.

Residual impacts are impacts that still remain after mitigation. There are no residual land use construction impacts as short-term or temporary landtake will be restored post construction. There will be permanent residual impacts along the route of the pipeline through the AUL/FAI sports complex and Dublin Airport Authority lands arising from the sterilisation of lands directly above the pipeline where access arrangements will be required.

4.3 Human Environment - Socio Economics

There are numerous factors which affect the socio-economic profile of areas along the proposed scheme. These include education levels, travel characteristics, tourism, industries and other economic activity in an area.

Relevant construction impacts include temporary diversions to pedestrian/traffic flows, nuisance (such as noise) and the visual impact of construction works. In terms of the effect on businesses along the proposed pipeline corridor, the construction phase will lead to temporary pedestrian/traffic diversions, which may decrease footfall in some areas close to the construction works. All of these impacts will be temporary given that the maximum duration of works outside or adjacent to properties will be 2 days. A positive impact arising from the construction phase will be the direct employment of construction workers.

The transport of fuel by pipeline is more than 90 times safer than the existing mode by road tanker. In the unlikely event of a leak from the pipeline, which is predicted at a level of 1 in 5,130 years, localised excavation resulting in temporary disruptions may be required.

The operation of the pipeline will provide Dublin Airport with a secure and sustainable fuel supply and will be designed to cater for future fuel demands. This will assist in supporting the expansion of Dublin Airport while potentially removing over 15,000 fuel tankers each year from public roads (at current demands).

4.4 Road, Traffic and Transportation

The proposed pipeline corridor passes along a number of busy commuter routes including the East Wall Road, Clontarf Road, Malahide Road (R107) and the R139. Traffic surveys were commissioned by Fehily Timoney and Company at a number of key junctions along the route in order to gain an understanding of the volume and type of traffic using the roads as well as to identify peak traffic flows.

During the construction of the proposed pipeline route there will be a requirement to temporarily occupy road space for construction works resulting in lane closures and associated traffic diversions. The impact on commuters along these routes as well as deliveries to premises, access to on-street parking, pedestrian access and access to public transport is recognised. It is likely that average traffic speeds will reduce in areas where works are undertaken and also on diversion routes.

Pedestrians will be protected from the works by the erection of barriers and signage around the works area. Where pedestrian footpaths are impacted by the works, alternative temporary arrangements will be put in place. These impacts will be temporary and of short duration given that the maximum duration of works outside or adjacent to properties will be 2 days.

The amount of additional construction traffic relating to the project is relatively small and following mitigation, is likely to be create a temporary slight negative impact on the existing traffic in the immediate vicinity of each of the four works site. These works sites will move as the pipeline progresses, therefore the location of the impact will also move.

A traffic management plan has been prepared and included as Appendix 9.1 of Volume 3 of the EIS. This plan will be implemented as part of the road opening licence(s) required to carry out all works within the public roadway. It includes measures such as traffic calming and control and signage.

Once constructed and commissioned, the buried pipeline will have no impact on the road networks under normal operating conditions. In the unlikely event of a leak in the pipeline, the repair and remediation works will almost certainly require road works and these works will (should they be required) have a temporary negative impact on the road network.

A significant positive long-term impact will result from the operation of the pipeline and this is the potential removal of over 15,000 road tankers (based on current demands) per year. The amount of road haulage is predicted to increase as line passenger numbers increase and therefore the proposed pipeline will have the potential to give rise to further positive impacts.

4.5 Flora & Fauna

The proposed pipeline route corridor runs through a largely urban environment. A comprehensive appraisal of the ecological environment was conducted for this environmental impact statement. The habitats recorded along the alignment are predominantly of low to moderate ecological value. The exception to this is the Tolka River which is classed as a local important habitat with high ecological value. A winter bird survey was also carried out over a six month period which focussed on the presence of Brent Goose in the Alfie Byrne Open Space, Tolka Estuary and Belcamp Park.

While the proposed pipeline route corridor does not lie within any designated nature conservation site, there are 34 designated sites lying within a 10 km radius of the pipeline corridor. These sites are protected under European and Irish legislation. The nearest designated site (some 400 metres away) is the South Dublin Bay and River Tolka Estuary Special Protection Area and North Dublin Bay proposed National Heritage Area. The South Dublin Bay and River Tolka Estuary Special Protection Area has been designated as they support internationally important populations of Brent Geese. A number of invasive or 'unwanted' plant species were recorded along the northern sections of the Malahide Road (R109), the R139 and adjacent to the AUL/FAI Sport Grounds to the north of the route.

The construction of the proposed pipeline may potentially have negative impacts on the flora and fauna communities within the proposed planning corridor. These impacts include the removal of trees and habitats such as hedgerows (albeit limited), disturbance and displacement of birds (e.g. Brent Goose), the transport of invasive species within or outside of the work areas and the release of silt or contaminants such as fuel or oil, into local rivers/streams which could impact protected sites situated downstream of the proposed pipeline corridor.

A number of best practice control measures will be implemented on site which result in very low construction residual impacts. This will include the fencing of each working area to limit the wider impacts outside of these areas, the implementation of an invasive species management plan, the control of silt laden run-off and the reinstatement of habitats such as Hedgerows or landscaping measures which will utilise native species suitable for the area.

Construction works along the Alfie Byrne Road and Malahide Road (R139) will only be carried out during the period May to September in order to prevent disturbance to any wintering Brent Geese. Re -instatement works such as permanent road re-surfacing will be carried out where possible within this time frame.

If the felling of tree(s) is required, then this will optimally be conducted in the periods September-November or April-May (NRA, 2006) and will be conducted under the advice of a suitably qualified expert. Any mature broadleaved trees that are to be removed, will first be surveyed for bat presence by a suitably experienced specialist. If bats are found, an application for the required licence to disturb bats will be made to the National Parks and Wildlife Service to allow their legal removal.

The main impact from construction works on bats would be a temporary negative impact through disturbance caused by machinery and noise in the vicinity of treelines and hedgerows. Measures will be taken to minimise impacts on bats such as lighting restrictions (if required). These measures will ensure there is no negative impact on bats from construction works.

In regard to aquatic ecology, mitigation measures have been proposed to avoid siltation, erosion, surface water run-off and accidental pollution events which all have the potential to adversely affect water quality within the site during the construction phase. Measures will be put in place at river/stream crossings to prevent siltation as a result of excavations. These will adequately protect fisheries and aquatic ecology within the proposed development site and also downstream (including designated sites).

Post construction, a regular programme of maintenance will be implemented during the lifetime of the pipeline. This, combined with the continuous monitoring and the design of the pipeline, will significantly minimise the potential for a leak event from the pipeline during operation. The residual impacts, post construction and during operation of the pipeline will depend on whether a leak occurs and its location. However provided that the mitigation measures (including emergency response plan) are implemented as proposed the impacts are anticipated to be very low.

4.6 Soils, Geology & Hydrogeology

Available soil mapping shows that the proposed pipeline corridor and surrounding area is underlain predominantly by made ground with minor areas of soils, mainly in the north of the study area between Santry and Dublin Airport. The rock which extends beneath the proposed scheme largely comprises limestone and shale formations. No working quarries or sites of geological interest have been identified along the proposed pipeline corridor.

Groundwater vulnerability, is the term used to represent the geological and hydrogeological characteristics that determine the ease with which groundwater may be contaminated by human activities. The Geological Survey of Ireland classifies the site as mainly “Low Vulnerability”.

Excavation works will generally be limited to 1.5 m below the existing ground level. Deeper excavations will be required at river crossings, where trenchless technology will be utilised. The potential impacts on soils, bedrock and groundwater during the construction phase are associated with the excavation, handling and transporting of soil and/or made ground. These activities may result in mobilisation of existing contaminants in the ground, increasing the extent or the degree of contamination in surrounding ground. In addition, where soil, subsoil or made ground are disturbed, excavated, and/or stored during construction, they are prone to erosion by surface water runoff (mainly rainfall) which can lead to sediment laden runoff discharging to existing watercourses or existing road drainage systems.

A number of best practice mitigation measures will be implemented which will result in construction residual impacts of low to very low. Such measures include, the direct loading of excavated materials to waiting trucks and the delivery of backfill material for the trench on an as needed basis thus eliminating the requirement for storage of materials on-site; any contaminated material encountered will be excavated and removed off-site by a permitted waste contractor to an appropriate facility for treatment and/or disposal. This will be carried out in agreement with the local authority. In addition, refuelling of vehicles and plant will be conducted off-site away from the pipeline corridor at the temporary construction compound(s) on hardstanding areas. Fuel will be stored in accordance with standard requirements so as to not give rise to any environmental pollution.

During the operation of the proposed pipeline potential impacts may arise from damage to the pipeline and a subsequent leak. A leak can potentially be significant in the absence of any mitigation, however given the predominantly low vulnerability of the underlying groundwater, the risk of any contamination entering a public water supply is deemed to be low. Additionally, as stated previously Jet A1 fuel is a kerosene and is found not to adhere to soil particles.

The potential impacts during the operational phase will be reduced by the use of the protective measures which are in accordance with I.S. EN 14161:2011 – Petroleum and natural gas industries – Pipeline transportation systems (ISO 13623:2009 modified). These are summarised in Section 4.1 of this report resulting in residual impacts which are classified as low to very low.

4.7 Surface Water Quality & Drainage

Applying classifications from the Water Framework Directive, which was sourced from the Environmental Protection Agency, the current status of the Tolka (Figure 4.1) and Santry Rivers is 'bad' and both are classified as 'at risk of failing to achieve 'good' status by 2015. The current status of the Mayne River is 'poor', and is classified as 'possibly at risk of failing to achieve good status by 2015'. The fish status of the Santry is 'bad', and that of the Tolka is 'poor'. Inland Fisheries Ireland (IFI) however stated in their consultation response that the Tolka is a significant salmonid system and that they are hopeful of positive change for the fisheries status of the Cuckoo Stream and Mayne River .

Figure 4.1: Bank at Tolka River Crossing Location Looking South

There is the potential for contaminated surface water run-off to arise during the construction phase, particularly in the areas of open excavation close to rivers and streams where uncontrolled silt laden water has the potential to be discharged. Other potential construction impacts on water quality include the storage and disposal of any waste materials arising from construction/excavation activities or soil heaps stockpiled along the pipeline corridor, uncontrolled discharge of water used in the testing of the pipeline during commissioning and inadequate controls at refuelling and storage locations in temporary compound(s).

A number of best practice measures will be implemented to mitigate any potential impacts on water quality. These will include the use of trenchless techniques to cross under the rivers/streams along the proposed route significantly reducing the risk of siltation due to construction as there will be no disturbance to the bed of the river or flow within the channel itself, the control of run-off during the construction phase and the delivery of backfill material for the trench on an as needed basis which will eliminate the requirement for stockpiling such material. Similarly, excavated soil from the trench will be removed directly onto awaiting trucks and removed by an authorised contractor for recovery/disposal at an appropriate facility (in agreement with the local authorities). Refuelling of plant and machinery will be confined to the temporary construction compound(s) under appropriate controls.

Provided that all impact mitigation measures are put in place, it is considered that all other impacts of the construction phase on surface water within the study area can be mitigated, thus the residual impact is considered low.

During the construction phase, certain activities have the potential to result in increased surface water run-off and sediment loading which could potentially impact local drainage patterns, cause siltation of the existing drainage network and result in localised flooding.

A flood risk assessment was conducted for the proposed scheme in accordance with the guidelines produced by the Department of the Environment, Heritage and Local Government - *The Planning System and Flood Risk Management Guidelines for Planning Authorities, November 2009*. The results of the flood risk identification process concludes that a sustainable management of flood risk can be applied to this scheme. This will include an early warning system of extreme tides which will suspend construction of the pipeline at Alfie Byrne Road and Clontarf Road, which could be perceived as 'at risk' areas and in an extreme emergency, where a warning may not issue in time, access and egress from these 'at risk' areas will be easily achievable. In addition, the location of known existing services has been identified and slit trenching will be carried out in conjunction with pipe laying along the road sections in order to proof the location of the services. To avoid any residual risks, the developer will liaise on an ongoing basis with Fingal County Council, Dublin City Council, Irish Water, Dublin Port Company and Dublin Airport Authority to ensure that there is adequate information of all services in the vicinity of the proposed pipeline route.

During the operation of the pipeline, the potential impacts on water quality and drainage arise from a potential leak, however the likelihood of such as event is considered low given the design and operational controls which will be put in place.

4.8 Air Quality & Climate

The proposed pipeline route passes through areas where concentrations of pollutants such as nitrogen dioxide and particulate matter, while not in breach of Irish ambient air quality limits, are indicative of areas experiencing high levels of traffic.

The construction phase of the proposed pipeline will give rise to localised dust generation in particular during the excavation and backfilling of the trench. It is not possible to eliminate the emission of dust from a construction site entirely, nevertheless a number of effective control measures will be implemented which will substantially reduce the impact on neighbouring residents, businesses and surrounding land uses.

Emissions of compounds such as nitrogen dioxide, particulates and carbon monoxide will be generated from construction vehicles and plant and machinery such as generators, excavators etc. required at various stages of the construction works. Plant and machinery will be relatively small units which will be operated on an intermittent basis. Although there will be an emission from these units, given their scale and the length of operation time, the impacts from these emissions will be negligible. Similarly, an assessment of emissions from construction vehicles indicates that their impact too is negligible.

Once operational, the proposed development will result in a reduction in emissions of carbon dioxide which is a greenhouse gas. This will be achieved through the removal of road tankers using Dublin's road network which will have positive impacts for air quality and climate change.

4.9 Noise & Vibration

Noise is defined as unwanted sound. The impacts of noise are subjective and vary from person to person.

The construction of the proposed pipeline will introduce additional noise sources to the ambient noise environment. Each phase of construction will entail the use of machinery and plant which will be deployed at various locations along the proposed pipeline corridor. To accelerate the programme to minimise delays and inconvenience to traffic along the major commuter routes, it is expected that works may occur during evening hours and weekends. Noise generated during this phase will be temporary to short-term in duration, two days at road based trenching and two - four weeks at river/stream crossings.

To minimise potential noise impacts during the construction stage of the proposed pipeline, good site management practices will be implemented and these will be documented in a noise management plan. This will include careful selection and positioning of equipment, only working during prescribed hours as specified in the road opening licence(s), the use of noise barriers/screens (which reduce noise from the working area) and monitoring noise levels at prescribed sensitive locations. A monitoring programme will also be put in place once the scheme commences. With these mitigation measures in place the residual construction noise impacts, may be still be significant.

There are no significant noise sources associated with the operation of a buried pipeline and therefore no mitigation is required. The inlet and reception stations will be sources of operational noise but the impacts will be imperceptible given their location within the industrial areas of Dublin Port and Dublin Airport.

Vibration generated at a source can transfer through the ground or other structures and can affect humans, buildings and sensitive equipment by causing annoyance, minor damage or interference. Monitoring conducted as part of this environmental impact statement indicated that the proposed pipeline corridor passes through areas and in the proximity of structures with low levels of baseline vibration that are currently unlikely to cause annoyance or damage.

An assessment of the potential vibration impacts arising from the construction phase of the project were assessed. This examined construction activities such as the excavation and backfilling of the trenches, the crossing of rivers and streams, the use of plant and machinery and the movement of construction vehicles.

No vibration sensitive equipment (such as laboratory equipment) within 100 m either side of the proposed alignment were identified. It was concluded that there will no significant impacts on the human environment, buildings and structures during the construction phase of the proposed pipeline.

Good site management practices will be implemented throughout the construction phase. This will include, carefully selecting and positioning equipment, only working during prescribed hours as specified in the road opening licence(s), and monitoring vibration levels at particularly sensitive locations, such as Clontarf Railway Bridge. Vibration surveys will be conducted at river/stream crossings where boulders are encountered or where ground conditions may lead to increased vibration levels. All vibration surveys will be conducted by an independent acoustic consultant.

There will be no adverse vibration impacts on human beings, buildings, sensitive equipment or ecologically sensitive receptors during the operation of the proposed scheme.

4.10 Archaeology, Architecture and Cultural Heritage

There is one Recorded Monument (DU018:006, bridge site) within the proposed pipeline corridor, located north of Collins Avenue on Malahide Road (R107). This feature however no longer survives above-ground. 33 additional Recorded Monuments were identified within 750 m of the proposed pipeline corridor. The nearest National Monument, Marino Casino, is located approximately 180 m to the west and this site is also designated as an Architectural Conservation Area (ACA). The proposed pipeline will pass under Clontarf Bridge which is a protected structure, and there are an additional six Protected Structures within 50 m of the proposed pipeline corridor. Two industrial heritage records have been identified on the Malahide Road.

Potential construction impacts on the baseline archaeology, architecture and cultural heritage environment may arise as a result of ground disturbance, visual impacts and vibration impacts arising from construction works and vehicles. A number of mitigation measures have been identified and these have been agreed in advance with the Department of Arts, Heritage and the Gaeltacht, the Dublin City Archaeologist and the Dublin City Conservation Officer. These include a geophysical survey of the target area prior to construction, archaeological monitoring of excavation works by a qualified archaeologist, permanent monitoring during the construction phase of a number of specific features and intermittent monitoring for the rest of the route. The pipeline will be laid in the roadway clear of the Clontarf bridge structure with the final location of the pipeline to be agreed with Iarnrod Eireann and Dublin City Council. Notwithstanding this, vibration monitoring will be carried out during the construction period at this location.

There will be no operational impact on the archaeological, architectural or cultural heritage resource, given that repairs to any leaks will be within the area previously excavated. As such leaks will not result in any adverse impacts and mitigation is unnecessary.

4.11 Landscape and Visual

The proposed pipeline passes through a predominately urban environment where scenic views and prospects are limited. While it does cross seven river and streams, only two of these are open channel and will be crossed using trenchless techniques and therefore there will be no physical impact on the rivers themselves. One of these, the Santry River has been channelised at the point of crossing as shown in Figure 4.2.

The proposed pipeline corridor does not traverse any public amenity areas but instead runs adjacent to amenity areas such as Fairview Park, Alfie Byrne Open Space, Darndale Park, Belcamp Park as well as several other small local parks.

Figure 4.2: Banks at Santry River Crossing Location Looking Southeast

Visual impacts will arise during the construction of the proposed pipeline. Although these will be temporary and short term in nature they will have the potential to impact on road users, nearby residents, business and local communities.

Once the pipeline is laid, the trench will be permanently reinstated, with the surface restored to its previous condition. Operational visual impacts will be limited to two control panel enclosures measuring 1,400 mm wide x 1,300 mm high x 300 mm deep for the emergency shutdown valves on the Malahide Road R107 and the Malahide Road R139 and the inlet and reception stations at Dublin Port (Figure 4.3) and Dublin Airport (Figure 4.4).

Figure 4.3: Proposed Location of Inlet Station at Dublin Port

At Dublin Airport the reception station will be located adjacent to the existing loading and storage facilities and will include a new control building (3 m high) and outdoor infrastructure such as pipe work and meters.

Figure 4.4: Proposed Location of Reception Station at Dublin Airport

As both of these sites are located in areas which already have significant industrial structures and use, there will be no significant visual impacts from either of the stations. In the event that a leak does occur, temporary visual impacts will arise if localised excavation is required.

4.12 Material Assets

Utilities along the alignment that are operated by public and private utility companies and authorities have been assessed. Consultation has taken place with all relevant utility companies and authorities to ensure that all services that are needed to provide continuity of service are known. Utilities infrastructure ensures reliable provision of power (electricity/gas), water and other amenity services in accordance with service level agreements. Fingleton White recognises the importance of ensuring that disruption to any utility service is avoided, and this will be achieved through route proofing which will be carried out during the construction of the pipeline. Where services are identified and cannot be avoided, the pipeline will be re-routed within the proposed pipeline corridor where possible.

Other material assets which may be potentially impacted by the proposed development include land and access, renewable and non-renewable sources (such as the backfill material required for the trench). While non-renewable resources such as backfill material are required onsite during the construction phase, the proposed development will also positively impact non-renewable resources by eliminating the use of fossil fuel in the transportation of the aviation fuel by road tankers.

In the event that the pipeline is damaged and a leak occurs the residual impact to other material assets will be very low following clean-up/remediation.

5 INTER-RELATIONSHIPS & INTERACTIONS

This Chapter considers the potential for interactions and inter-relationships between one aspect of the environment and another which can result in an impact being either positive or negative, as well as having varying levels of significance.

Direct, indirect, cumulative, and interactive impacts were considered during the design of the proposed pipeline project to minimise impacts on the human environment, flora and fauna, traffic, hydrology, water quality and archaeological, architectural and cultural heritage to name just a few. However, all environmental topics are interlinked to a degree such that interrelationships exist on numerous levels. A summary matrix has been developed to identify key interactions that exist with respect to this specific project. As such, this does not represent a form of relative assessment of impacts and other interactions are recognised to exist and have been addressed in individual chapters of this EIS. Table 5.1 herein provides a matrix showing the key interactions and inter-relationships between the key environmental aspects of the proposed development.

Table 5.2 also provides further detail and examples of the diverse range of interactions and inter-relationships between the key environmental aspects.

	Air Quality & Climate	Noise & Vibration	Flora & Fauna	Soils, Geology & Hydrogeology	Surface Water Quality & Drainage	Human Environment	Material Assets	Traffic & Transportation	Archaeological, Architectural & Cultural Heritage	Landscape & Visual
Air Quality & Climate										
Noise & Vibration										
Flora & Fauna										
Soils, Geology & Hydrogeology										
Surface Water Quality & Drainage										
Human Environment										
Material Assets										
Traffic & Transportation										
Archaeological, Architectural & Cultural Heritage										
Landscape & Visual										

= interaction or inter-relationship

= no interaction or inter-relationship

Table 5.1: Summary of Interactions & Inter-Relationships between the Key Environmental Aspects

Table 5.2: Description of Impacts

Interaction	Description
Human Environment, Air Quality & Climate, Traffic & Transportation	Impacts on air quality during the construction phase will occur due to dust emissions from construction activities. Impacts will also occur through increased traffic and associated exhaust emissions from construction traffic. Positive impacts may also arise from the potential removal of road tankers as a result of the scheme. These interactions were therefore considered as part of the EIS, with suitable mitigation measures provided to minimise these potential impacts. The indirect impacts on climate from the displacement of traffic emissions arising from fuel tankers was also considered during the assessment.
Noise and Vibration, Human Environment, Traffic & Transportation	Noise impacts may occur during the construction phase and will be associated with construction plant and traffic. Vibration impacts may also occur during certain aspects of the construction phase which has the potential to impact on the local community as well as buildings and structures. These interactions were therefore considered as part of the EIS. Mitigation measures have been carefully designed in order to minimise these impacts, particularly noise impacts.
Flora and Fauna, Soils, Geology & Hydrogeology, Surface Water Quality & Drainage	There are direct links between these key environmental aspects. Impacts on flora and fauna during the construction phase could include disturbance to birds and mammals from loss/changes in habitat. The hydrological regime could also be altered, through increased flooding and sedimentation/pollution of watercourses, which in turn could impact on flora and fauna. Excavations introduce the risk of increased sedimentation which would impact on flora and fauna and the hydrological environment. During the operation of the pipeline any leak has the potential to impact on soils, water quality and in turn flora and fauna species dependent on them. Given the direct links between these aspects, they were considered in the chapters that support all of these topics in recognition of the fact that impacts on one aspect of this complex system may have knock-on, indirect impacts on other aspects.
Vibration, Archaeology and Cultural Heritage, and Architectural Heritage	The potential for vibration impacts on features of archaeological or cultural importance and architectural heritage has been considered.
Noise and Vibration, Flora and Fauna	Noise impacts during construction (from construction plant and increased traffic) has the potential to impact on local flora and fauna (birds and mammals) in the surrounding environment. These interactions were therefore considered in the EIS, particularly in relation to assessing suitable mitigation measures to reduce the impacts.
Landscape and Visual, Archaeological, Architectural and Cultural Heritage	The construction of the proposed pipeline may impact in the short-term on archaeological, architectural and cultural heritage sites within and in the vicinity of the proposed pipeline corridor. These interactions have been considered in the EIS, particularly in defining mitigation measures to minimise any impacts.
Traffic & Human Environment	Traffic impacts and mitigation measures have the potential to impact on socio economic activity (human environment). The potential for indirect impacts of this nature has been considered when defining appropriate mitigation measures.
Human Environment - Land use and Socio-economics	Impacts on commercial land uses can often have a knock-on effect in terms of socio-economics. Interactions between the two environmental topics were therefore considered to ensure that both direct and indirect impacts were considered and appropriate mitigation measures put in place.