12. Preferred Scheme – Transmission Pipeline

As outlined in Section 11 there are a number of infrastructure components that collectively make up the water supply system. These can broadly be defined as:

The Transmission Pipeline (Linear Infrastructure), and

Other (Non – Linear Infrastructure)

Section 11 describes the methodology of site appraisal for the different components of infrastructure, and how that has been applied in bringing the characteristics of each site into formalised comparison in the MCA process and in the MCA table. In doing this, Section 11 and Appendices E to H provides a high level view of how these Non – Linear Infrastructure components interact with the main categories of Environmental Impact Assessment, and have included that information for:

Intake and Raw Water Pumping Station

Water Treatment Plant

Break Pressure Tank

Termination Point Reservoir

This Section 12 is concerned with the Transmission Pipeline (Linear Infrastructure), and similarly its impact on its environment, using the adopted multi-criteria analysis (MCA) outlined in Section 11.1.

12.1 Background

The Preliminary Options Appraisal Report (POAR) identified a “Least Constrained Route Corridor” (2km wide) for siting a supply main, between the water treatment plant and the termination point.

The methodology employed in siting this supply main was documented in the POAR, *Appendix B: Site Selection Methodology*; and its implementation on the Water Supply Project included in its *Appendix F*.

The POAR *Site Selection Methodology*, amongst other things, sets out a 5 step process for identification of pipeline corridors, via a multi-criteria analysis based on the principle of least constraint and the development of constraint mapping, with the objective of determining an “Indicative 50m Pipeline Corridor”

In this regard the “2km Least Constrained Route Corridor” identified in the POAR represented Step 2 in the site selection methodology (Figure 12.1).

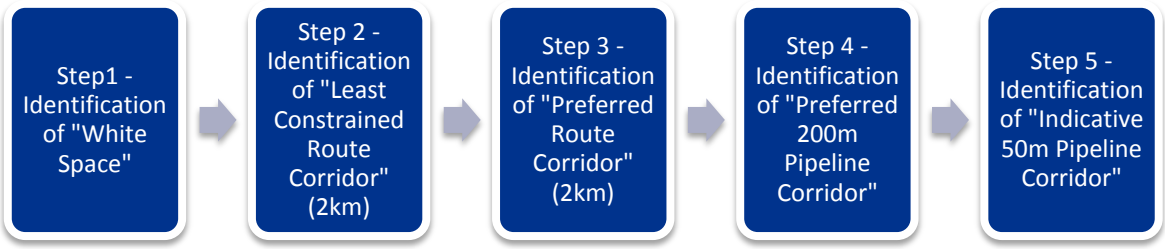

Figure 12.1 - "Linear Corridor Methodology" Process Flow Summary, *Site Selection Methodology*

Since publication of the POAR Step 3, Identification of "Preferred Route Corridor" and Step 4 Identification of "Preferred 200m Pipeline Corridor" have been completed, and are presented in Sections 12.2, 12.3 and 0.

Step 5 in discussed in Section 12.5

12.2 Identification of "Preferred Route Corridor" (2km)

Step 3 of the *Site Selection Methodology* details the methodology employed in confirming the "Preferred Route Corridor" (2km wide); and is based on incorporation of the feedback from the public consultation on the "Preliminary Route Corridors" and "Least Constrained Route Corridor" identified/ consulted upon for Step 2 of the process.

As part of the POAR public consultation process, feedback was received from a number of stakeholders on the "Least Constrained Route Corridor". This feedback formed the basis for a detailed review undertaken by the project team of the "Least Constrained Route Corridor". The review resulted in a number of refinements to this corridor; detailed in Sections 12.2.1 to 12.2.5 below.

The review was supported by site visits onto the lands that potentially could be affected by the proposed scheme, field surveys arranged in consultation with landowners.

Note: The "Least Constrained Route Corridor" was informed by 'desktop' investigation, and contrasts with the development of a 200m corridor which is required to 'prove' a technically viable route. The methodology employed in identification of the 200m corridor is outlined in Sections 12.3 and 0.

It is also important to note that while the 2km corridor was established as 'least constrained' in the POAR, between nodal points and when taken on its overall length, this does not mean that it is fully optimised locally at every location along its route. Subsequent work outlined in Sections 12.2.2 to 12.2.5, outlines where local adjustments have been made, to achieve a locally less constrained position.

12.2.1 Parteen Basin (Lower Lake)

The western boundary of the "Least Constrained Route Corridor" was amended to accurately reflect the riparian boundary of Parteen Basin and the positioning of non-linear infrastructure sites (Section 11); as shown in Figure

12.2. The 2km least constrained corridor was broadened on the approaches to Parteen Basin, to include the areas within which the non-linear infrastructure sites were then proposed and sited, and assessed for 'least constraint' in their own right. Further work on pipeline routing, then concentrates on linking the preferred raw water intake site, with the preferred water treatment plant site as fixed points in this area.

Figure 12.2 – "Least Constrained Route Corridor" and "Preferred Route Corridor" at Parteen Basin

12.2.2 Annaghmore

Due to the high density of constraints identified in the area of Annaghmore, south of Tullamore (Co. Offaly), it was established that a "Preferred 200m Pipeline Corridor" would be difficult to route within the area originally identified for the "Least Constrained Route Corridor" (2km) alignment; as shown in Figure 12.3. The environmental constraints identified included:

- Groundwater vulnerability;
- Additional habitats (raised bogs);
- Woodland habitats; and
- Forestry

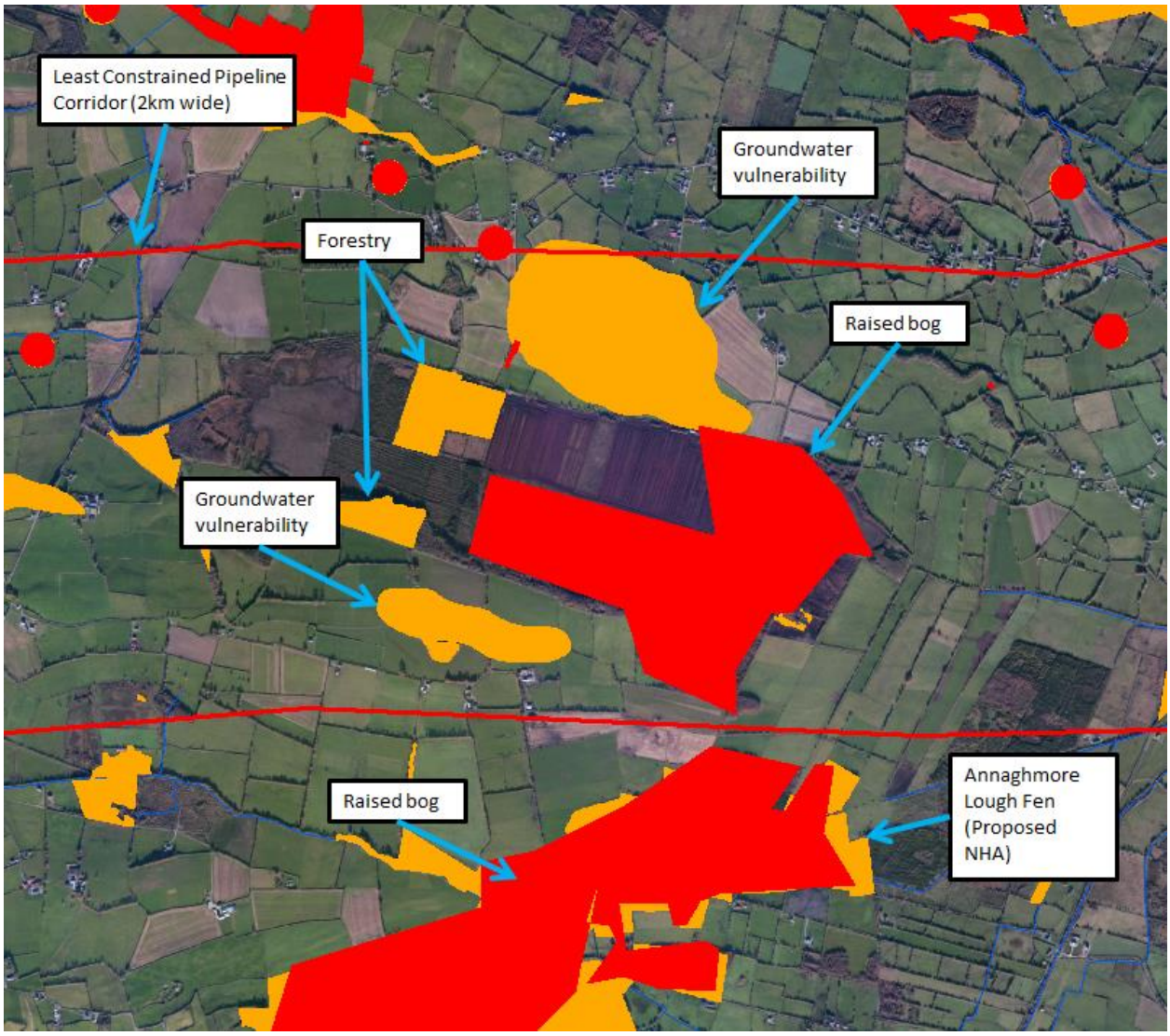

Figure 12.3 – "Least Constrained Route Corridor" at Annaghmore

A detailed review of this area was conducted and a minor positional amendment was made to the "Least Constrained Route Corridor", in consideration of these environmental constraints. The amended corridor allowed the identification of a 200m wide corridor in this area within the known constraints; and became part of the "Preferred Route Corridor" (2km). The amended corridor is re-positioned slightly south of its original position; as shown in Figure 12.4.

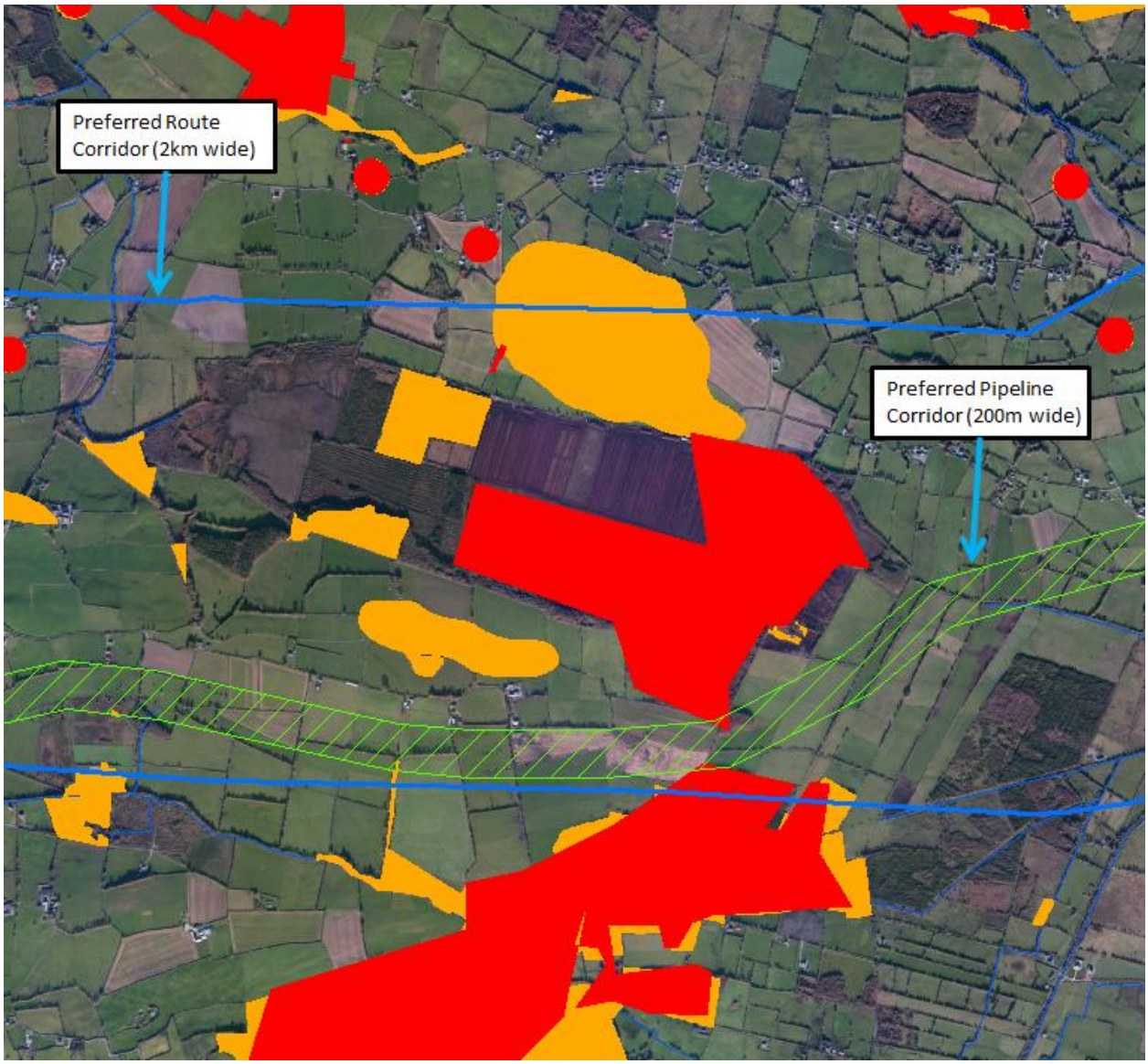

Figure 12.4 – "Preferred Route Corridor" at Annaghmore

12.2.3 Esker Bog

The positioning of the "Least Constrained Route Corridor", to the south west of Edenderry, was shown to pass directly through Esker Bog (see Figure 12.5). It was subsequently confirmed through stakeholder consultation that this bog is currently in production.

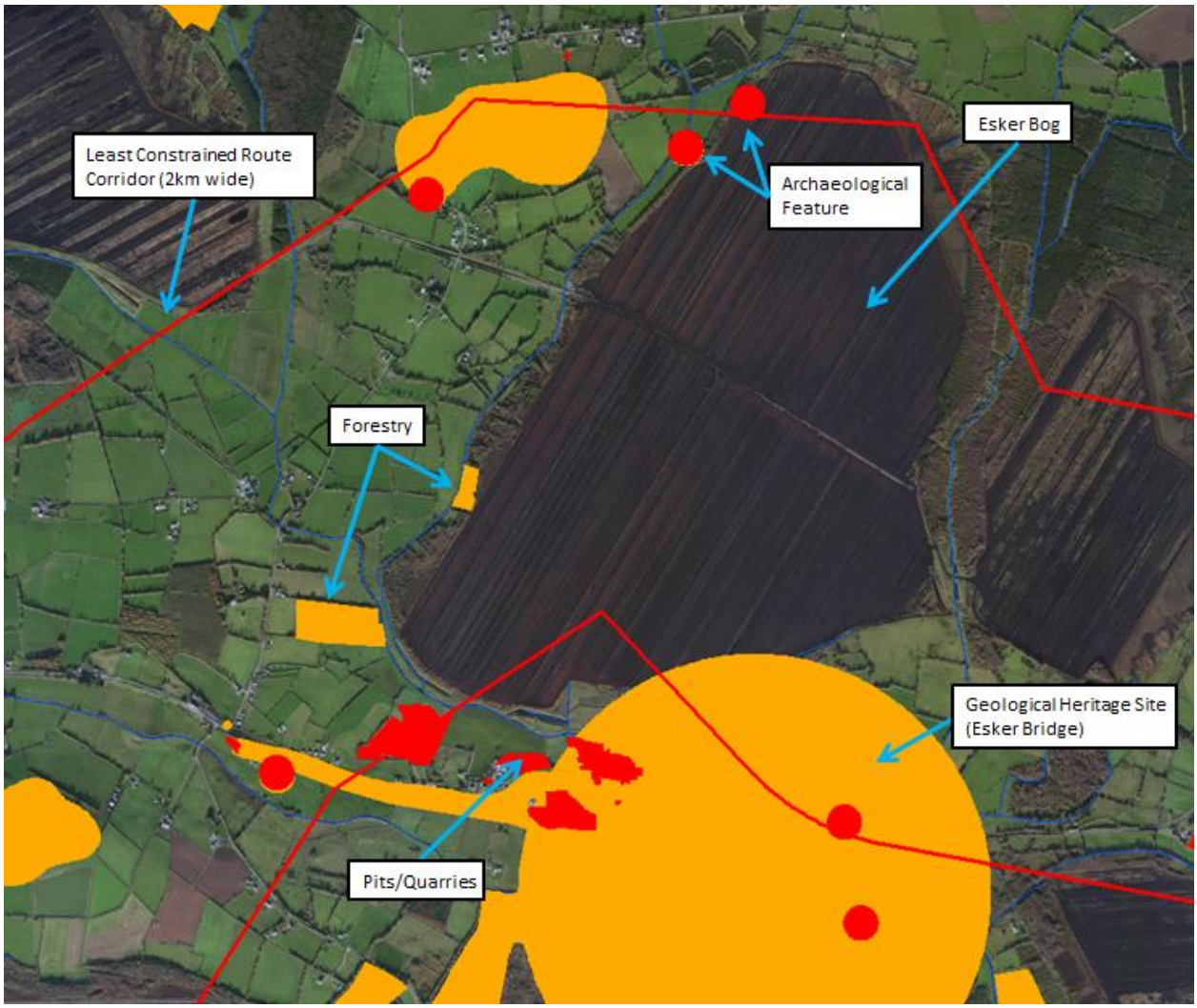

Figure 12.5 – "Least Constrained Route Corridor" at Esker Bog

Consequently, a detailed review of this area was conducted and realignment to the "Least Constrained Route Corridor" was proposed, enabling the identification of a 200m wide corridor in this area within the known constraints. The positioning of the 200m corridor is cognisant, and mitigatory, of the:

Impact on future habitat regeneration plans; and

Impact on active peat production lands

It was determined that the alignment should be re-positioned slightly south of the original location of the "Least Constrained Route Corridor, to allow a 200m corridor to skirt the boundary of the active bog workings (see Figure 12.6). It is noted that no new landowners are affected by this re-alignment. This became part of the "Preferred Route Corridor" (2km).

Figure 12.6 – "Preferred Route Corridor" at Esker Bog

12.2.4 Timahoe North Bog

The positioning of the "Least Constrained Route Corridor", to the south of Enfield, was shown to pass directly through Timahoe North Bog (see Figure 12.7). It was subsequently confirmed through stakeholder consultation that an existing wetland habitat in this area and a section of original undisturbed bog remnant should be avoided, in order to minimise impacts on these habitats.

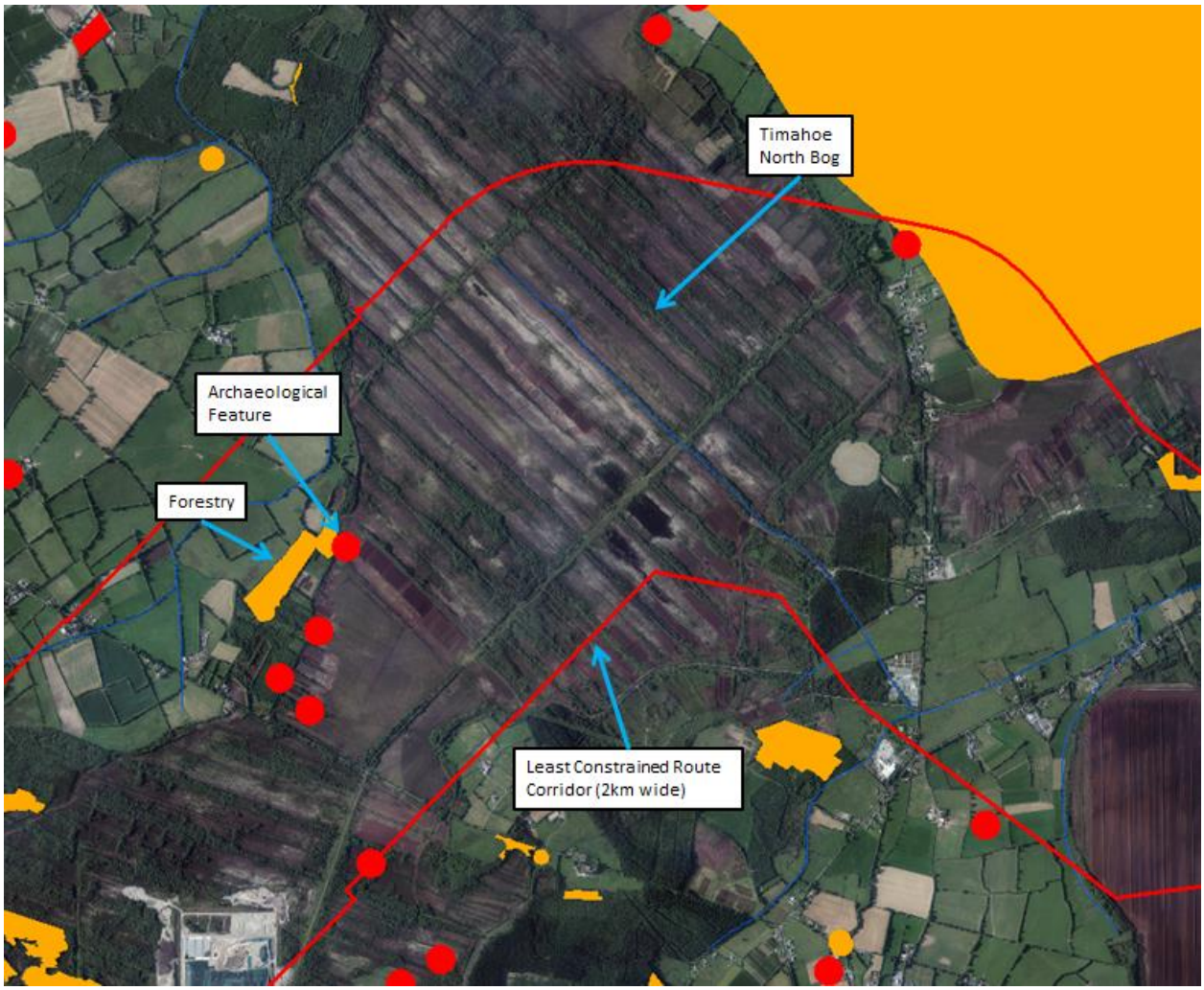

Figure 12.7 – "Least Constrained Route Corridor" at Timahoe North Bog

A detailed review of this area proposed a local amendment to the "Least Constrained Route Corridor", enabling the identification of a 200m wide corridor which would avoid the identified important habitat in this area. The positioning of the 200m corridor is cognisant, and mitigatory, of the:

Impact on existing wetland; and

Impact on original bog remnant

It was determined that the route should be re-positioned slightly south of its original location skirting the boundary of the bog (see Figure 12.8). It is noted that no new landowners are affected by this re-alignment. This became part of the "Preferred Route Corridor" (2km).

Figure 12.8 – "Preferred Route Corridor" at Timahoe North Bog

12.2.5 North Kildare

Feedback received during the POAR public consultation indicated that the positioning of the "Least Constrained Route Corridor", to the south of Maynooth, passed through an area of high constraint density, and directly through a number of large scale local enterprises (see Figure 12.9), which were not immediately identifiable through the earlier 'desktop' investigations. This local constraint density would make it difficult to route a 200m corridor, within the 2km alignment of the overall "Least Constrained Route Corridor".

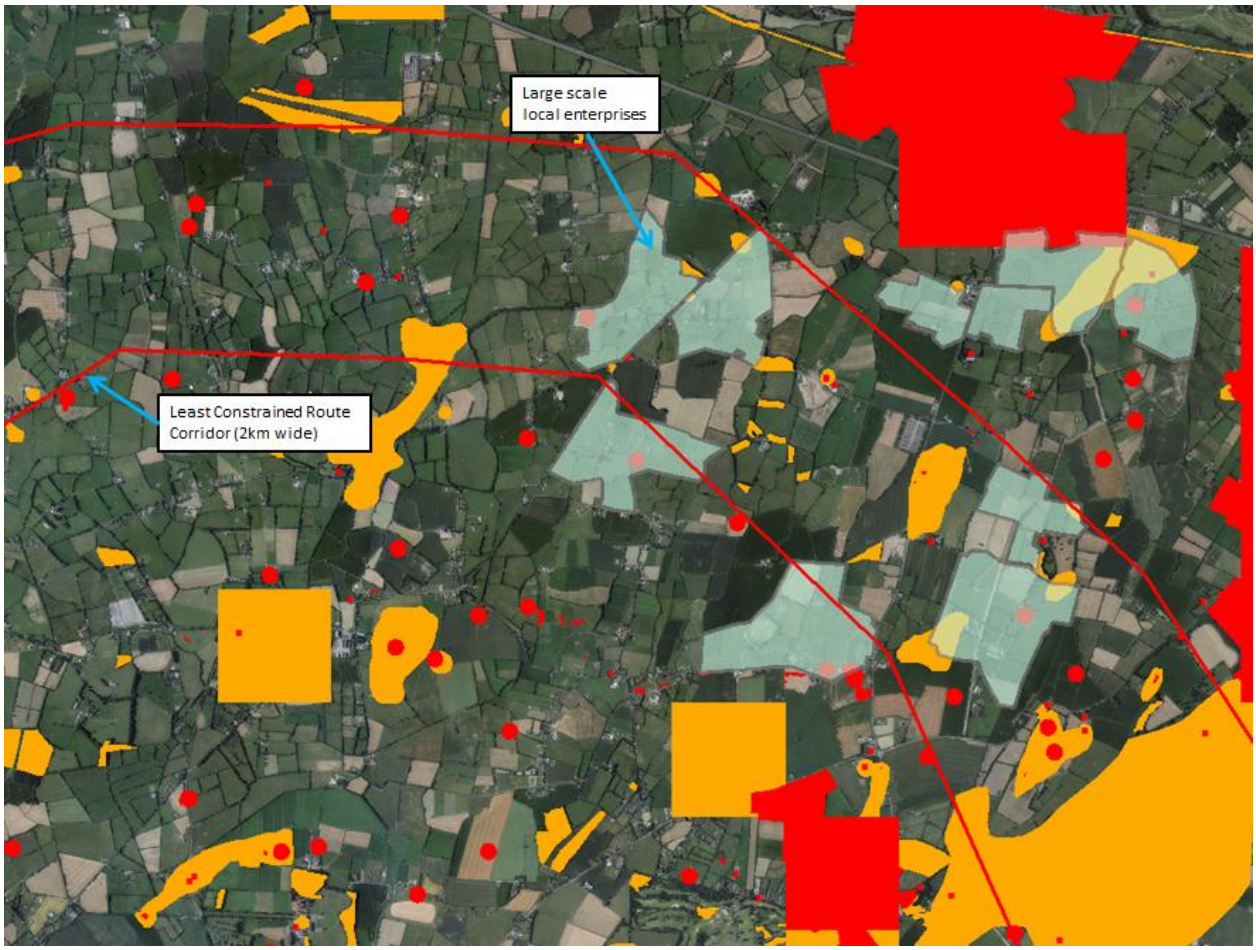

Figure 12.9 – "Least Constrained Route Corridor" in North Kildare

A re-assessment of the potential route corridors in this area, as shown in the area of the Barreen Loop in Figure 12.10, was carried out. These corridors were previously considered as part of the POAR published in November 2015.

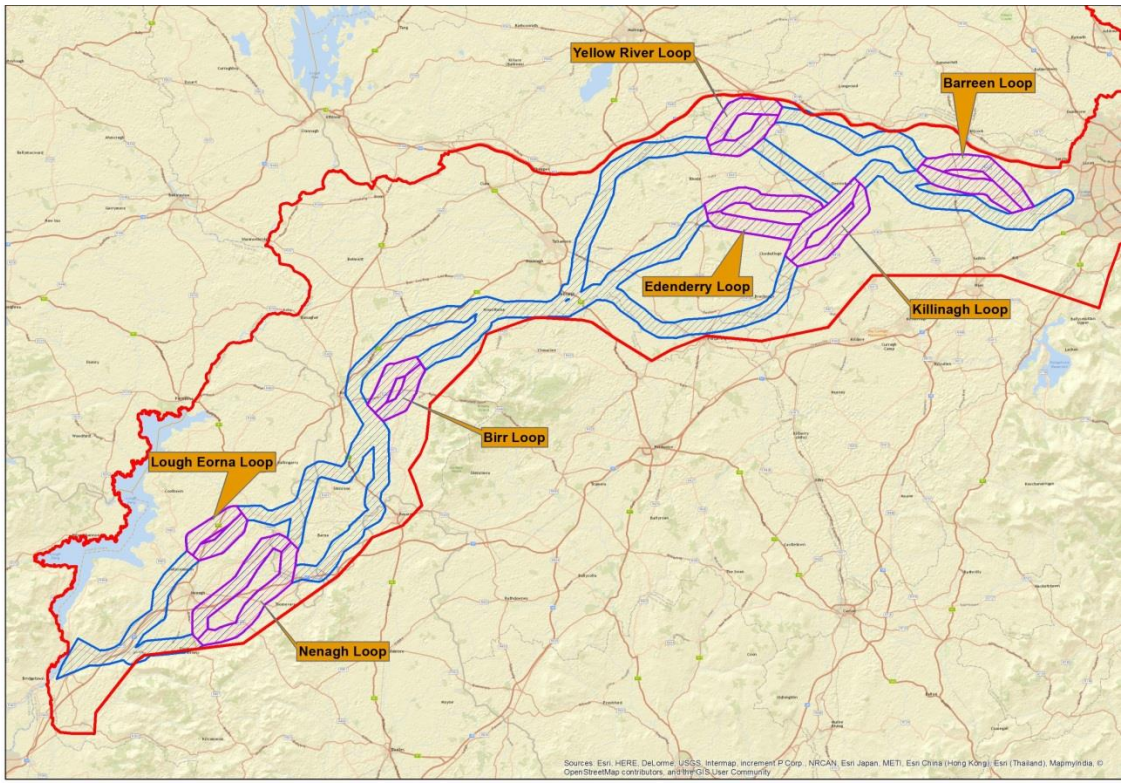

Figure 12.10 – Preliminary Route Corridors and Loops (POAR, November 2015)

As shown on **Figure 12.10** there were a number of options, and sub-options (loops) considered for routing a proposed water supply main. In North Kildare the Barreen Loop, which identified two potential route corridors, is pertinent to this re-assessment. The Multi-Criteria Analysis (MCA) process, originally developed in the POAR, identified the northern loop as the least constrained option for the following reasons:

- It encounters the lowest number of road crossings;
- The southern loop contains two County Geological Sites: Liffey Oxbow Lake and St. Patrick's Well;
- The southern loop contains areas of cutover bog; and
- Lower potential for air and noise impacts

In light of the additional information coming from the on-the-ground surveys, where the earlier conclusion drawn was that this northern loop was the least constrained, a re-examination of the Barreen Loop was conducted.

It was concluded through the MCA, which incorporated the latest up-to-date constraint datasets, that a "Preferred Route Corridor" should incorporate some areas of both the northern and southern stretches of this Barreen Loop, as shown in Figure 12.11.

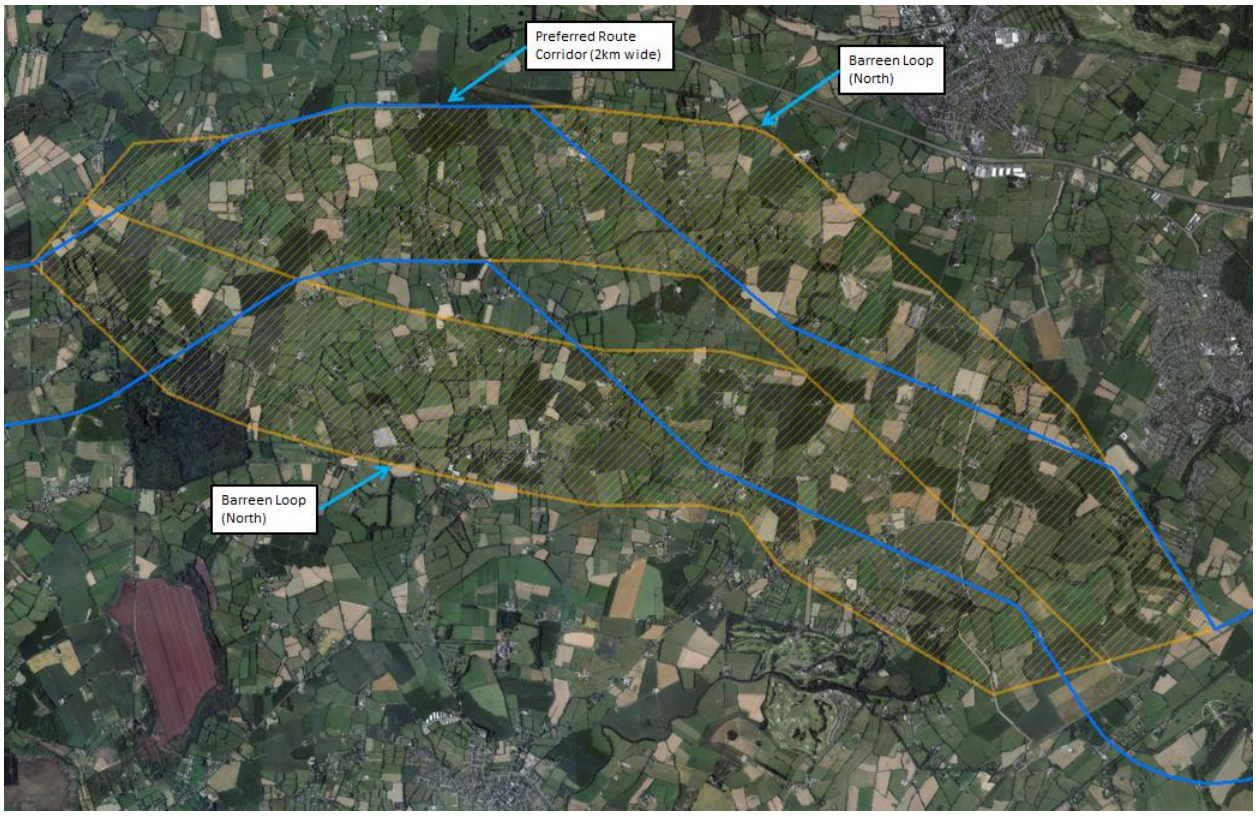

Figure 12.11 – "Preferred Route Corridor" in North Kildare

12.2.6 Summary – Refining the "Least Constrained Route Corridor" (2km)

The POAR identified a "Least Constrained Route Corridor (2km).

Subsequent to feedback from the public consultation on the POAR, and other stakeholders, site visits onto the lands that potentially could be affected by the proposed scheme, and field surveys arranged in consultation with landowners, a number of corrections to the alignment were made to this "Least Constrained Route Corridor (2km). These corrections were made at the following locations:

- Parteen Basin (Lower Lake) (Section 12.2.1)
- Annaghmore (Section 12.2.2)
- Esker Bog (Section 12.2.3)
- Timahoe North Bog (Section 12.2.4)
- North Kildare (Section 12.2.5)

The "Least Constrained Route Corridor (2km), incorporating the re-alignments at Parteen basin (Lower Lake), Annaghmore, Esker Bog, Timahoe North Bog and North Kildare, is the **"Preferred Route Corridor" (2km)**. Refer to Appendix I for mapping.

12.3 Constraints Mapping – "Preferred 200m Pipeline Corridor"

For Step 4 of the linear infrastructure site selection process (see Figure 12.1) the following Specialists/ specialisms were engaged:

- Engineering
- Cultural Heritage
- Ecology
- Noise & Vibration
- Air Quality
- Traffic
- Landscape and Visual
- Agronomy
- Soils/Geology
- Water Quality/Hydrology
- Hydrogeology

The selection of the "Preferred 200m Pipeline Corridor" is based upon the following:

- Constraints, or datasets, are mapped and assigned a red or amber classification by the Specialists/ specialisms (Section 12.3.1); and
- Consideration of technical constraints/requirements including obstructions, ground conditions, accessibility, idealistic elevation and landowner impact (Section 12.3.2).

Step 4 is a further refinement of the site selection process.

12.3.1 Constraints Classification by Specialists

A list of constraints was compiled, classified on the basis of potential impact, by each of the project specialists and incorporated within a GIS database. The following classification system was adopted:

Table 12-1 Classification System

Colour	Classification	Criteria
Red	High	Avoid unless no alternative available
Amber	Medium	Avoid where possible
Green	Low	Minimal impact if encountered

A comprehensive list of constraint datasets is outlined in Appendix I. These were assessed in further detail, and augmented with a number of technical constraints (see Section 12.3.2), to define a viable 200m wide pipeline corridor.

Using the refined data sets, Specialists were employed on the following basis:

1) Individual Specialists were engaged to independently assess the routing option relative to the criteria applicable to their field of expertise, and establish an initial position on the least impact.
2) The initial position of each Specialist was collated and their collective findings presented in a workshop setting.
3) In this workshop setting, the collective findings were discussed to reach a consensus of agreement on a least constrained route

12.3.2 Technical Constraints

The engineering constraints used to augment the environmental constraints were:

- Obstructions;
- Ground Conditions;

- Accessibility;
- Idealistic Elevation; and
- Landowner Impact.

12.3.2.1 Obstructions

Any proposed engineering solution will be directly influenced by the number of physical obstructions impacting the pipeline alignment, e.g. properties (domestic/non-domestic), roads, rivers, railways, etc.

The 'Preferred 200m Pipeline Corridor' will have multiple crossings of major obstructions (e.g. national, primary & secondary roads, major rivers and railways) and minor crossings (e.g. local and regional roads, minor rivers and streams). The engineering intent was to keep the number of these crossings to a minimum.

12.3.2.2 Ground Conditions

The assessment considered the potential ground conditions; in particular, it endeavoured to avoid areas of poor ground (e.g. peat, lake deposits, soils containing alluvial or fluvioglacial deposits, and shallow rock or karst features), wherever possible.

Challenging soil types introduce additional constructability issues e.g. establishing a firm foundation; and can require extensive ground improvement measures (both temporary and permanent) to ensure a robust design. From experience, these soils often require large scale dewatering works during the construction phase. The use of expensive ground stabilisation options, such as mechanically stabilized geogrids and piling, may be necessary.

Likewise, rock, where encountered, can be a challenge requiring local engineering solutions; the use of rock-breaking is employed where shallow rock is encountered. Ground stabilisation, as outlined above and including grouting of voids, may be necessary where karst features are encountered.

12.3.2.3 Access

Sufficient access will be required along the route to allow the Contractor to undertake the works in a timely manner. The works will involve the use of large plant, equipment and materials. The national and regional road networks will be relied upon to facilitate access; subject to confirmation from Transport Infrastructure Ireland and Local Authorities as regards their suitability to facilitate construction activity, including load/width restrictions etc.; and may involve:

- upgrading the existing road network and
- construction of temporary access roads along the route

The identification of suitable access to the pipeline route can have a significant bearing on how construction traffic is managed, and by association, works sequencing. Ultimately, ease of access to the completed works is paramount for operation and maintenance.

12.3.2.4 Elevation Profile

In the development of a preferred route, the selected route will directly influence the engineering solution to be adopted; the ground, or elevation, profile is a critical parameter in this regard as it is a major factor in system operation. Through the constraint mapping, and MCA analysis, a number of observations were made on the route between the abstraction and termination points. The proposed route traverses north east from Parteen Basin Reservoir, but south of Nenagh town through the northern part of County Tipperary and into County Offaly. For the most part the elevation is on an upward trajectory, except for a 'dip' at the Little Brosna River, to a high point in the vicinity of the County Tipperary/ County Offaly border. The route continues to skirt the southern perimeter of County Offaly, maintaining a due east direction through County Kildare and onwards to the Termination Point Reservoir in County Dublin.

This route is typical of the general topography between the Parteen Basin (Lower Lake) and south County Dublin whereby the lands in County Offaly are higher relative to the abstraction and termination points. Consequently, any route through these lands means a high point becomes a key component of any engineering solution, and becomes an integral part of any design.

An engineering solution will look to make use of this topography; and will consider how this elevation can be integrated, and optimised, within the scheme.

Wherever the constraint mapping, and MCA analysis, permits it is preferable to use the topography to create a 'smoother' profile, i.e. one that limits the extent of undulation along the route. This can reduce engineering complexities in system design, and induce efficiencies in operation and maintenance practices.

12.3.2.5 Landowner Impact

A further refinement of the constraint mapping data sets incorporated An Post's Geodirectory which categorises each building as either residential or commercial located to within a metre. The 'Preferred 200m Pipeline Corridor' is aligned to be outside these created Geodirectory buffers.

The 40m buffer dimension reflects a conservative position on the footprint of residential properties/commercial premises and potential outbuildings; while ensuring a minimum buffer from residential dwellings such that construction impacts can be properly managed.

In developing the "Indicative 50m Pipeline Corridor" the extremity of the 50m was routed along the boundaries of fields (where possible) in order to reduce, or minimise, the overall impact of the route on landowners.

12.4 Preferred 200m Pipeline Corridor Selection Methodology

As outlined in Section 12.3 the constraint data sets were refined further to identify areas of least constraint from within the "Preferred Route Corridor" (2km) in order to reduce the study width from 2km to 200m. This reduced width is the 'Preferred 200m Pipeline Corridor'.

The following process was adopted in defining the 'Preferred 200m Pipeline Corridor':

1) The environmental and technical constraints were carried forward and refined within the GIS database;
2) Data from Ordnance Survey Ireland was also mapped to take account of additional buildings e.g. farmhouses, sheds, etc. not previously identified by Geodirectory.
3) Areas were excluded where a constraint, or combination of constraints, ("High" or "Medium" classification) were of sufficient extent to influence the routing of the 200m corridor.

One typical example showing the mapping of environmental constraints is provided in Figure 12.12.

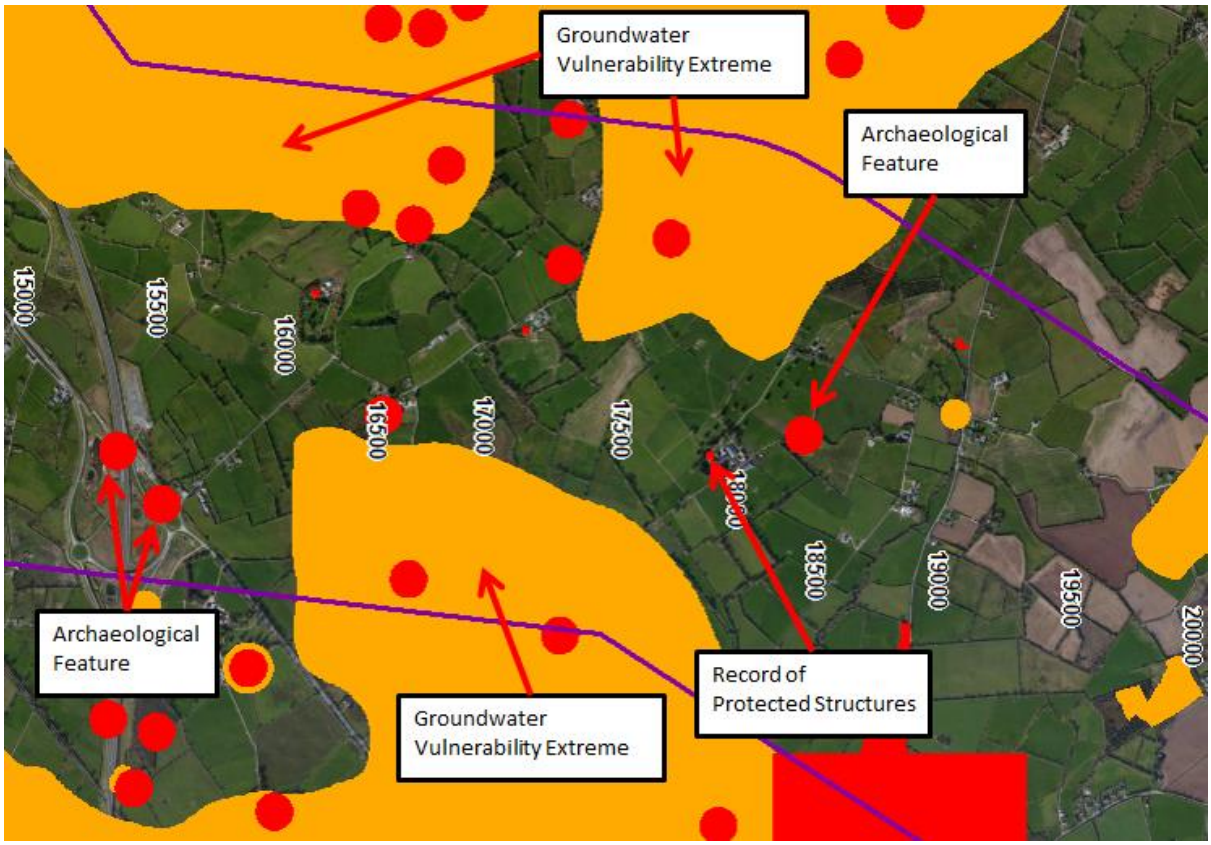

Figure 12.12 – Typical example of environmental constraints identified within the 'Preferred 200m Pipeline Corridor'

This mapping is developed further; technically (see Section 12.3.2) this may have involved, inter alia, the following:

a) Maintaining a pipeline elevation profile to optimise system (engineering) operation;

b) Avoidance of areas of poor ground, where possible;

c) Minimising the number of major obstructions such as road, rail and river crossings

d) Minimising landowner impact;; and

e) Ease of access, both during construction and operation, to the existing road infrastructure.

For the same area extent shown in Figure 12.12 the technical constraints are identified in Figure 12.13.

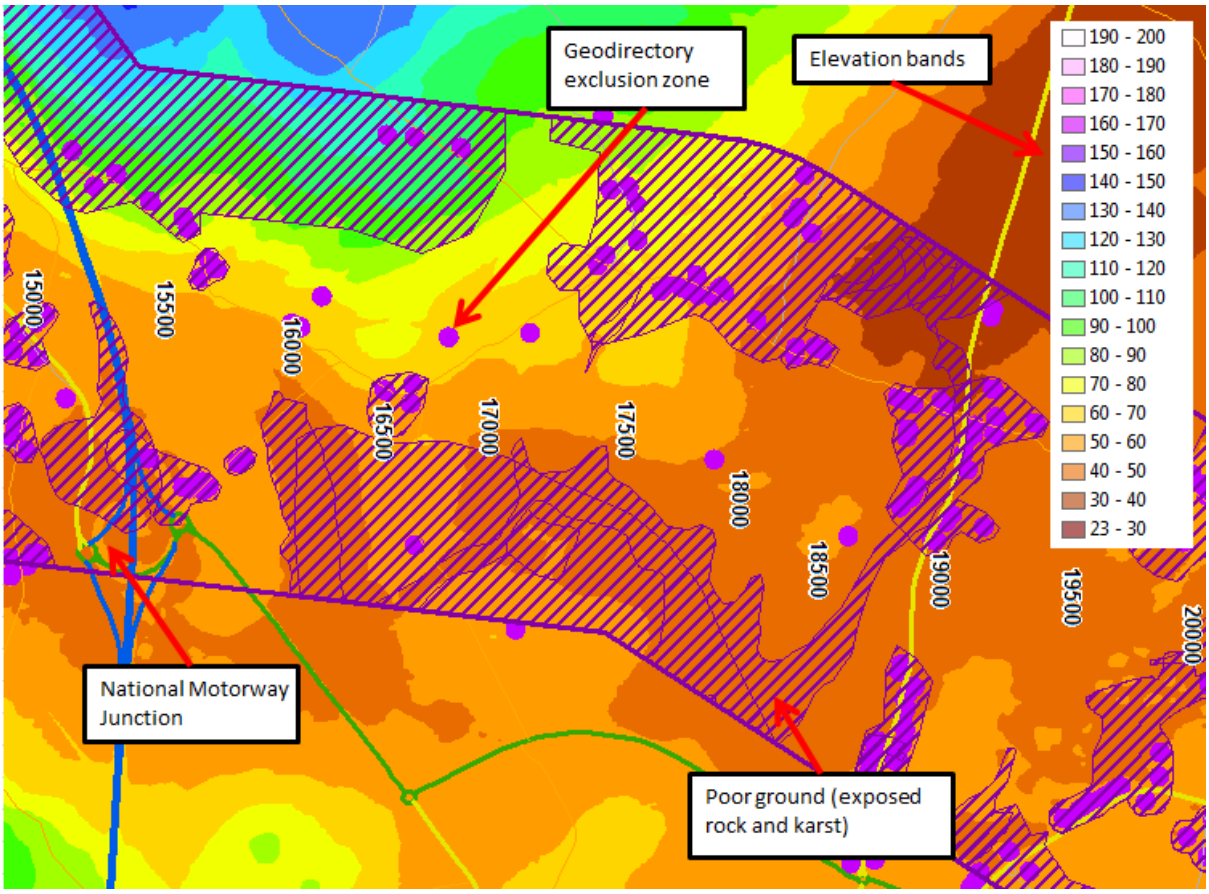

Figure 12.13 – Typical example of technical constraints identified within the 'Preferred 200m Pipeline Corridor'

The combined effect of environmental and technical constraints, informed the decision making process; see Figure 12.14.

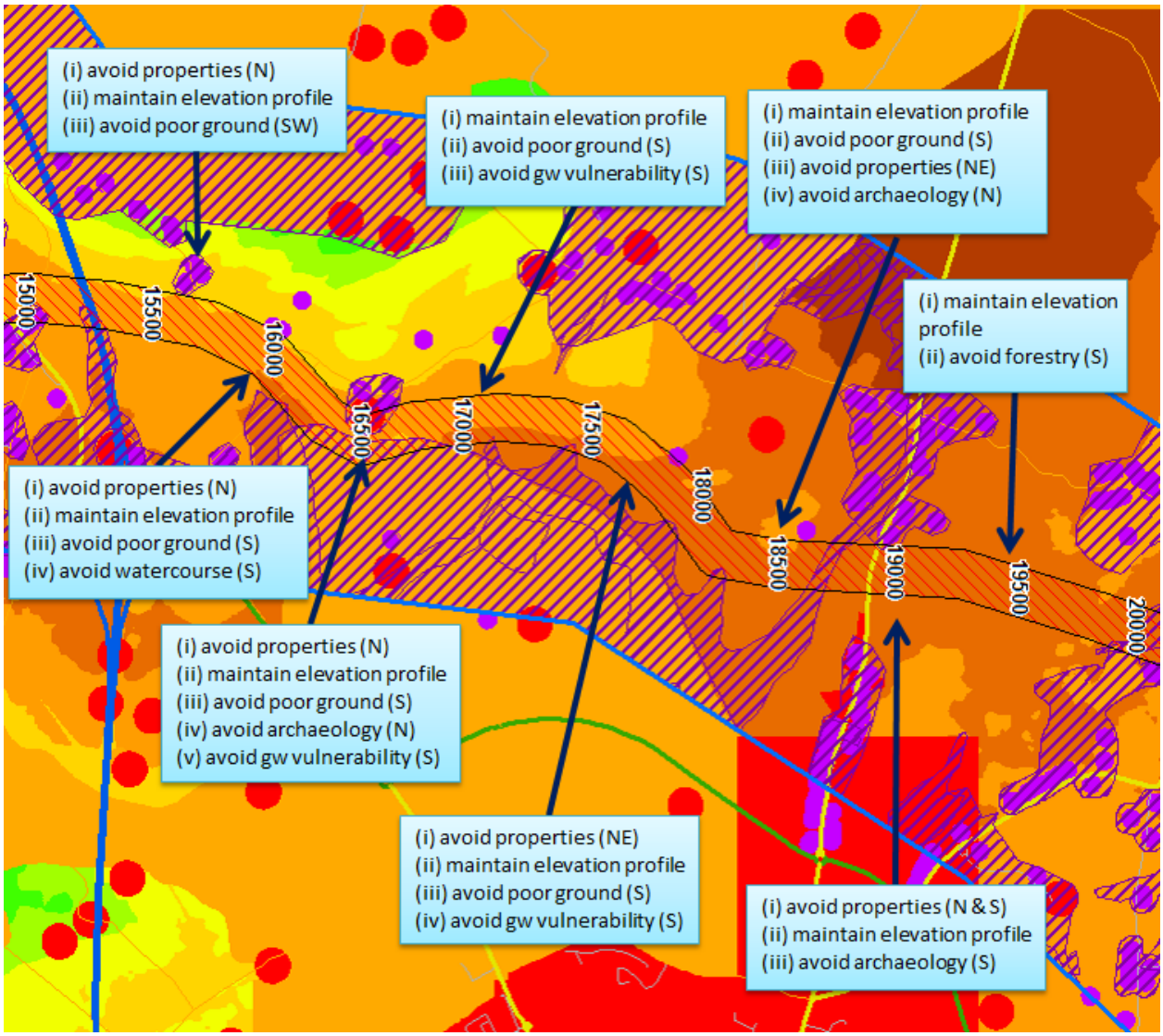

Figure 12.14 – Typical example of decision making process adopted in defining the 'Preferred 200m Pipeline Corridor'

This represented an initial desktop assessment into the identification of a 'Preferred 200m Pipeline Corridor'; reached, by consensus, by the various Specialists/ specialisms

The assessment is an iterative process which affords each of the specialisms opportunity to promote constraints, categorise their importance, and ensure appropriate actions, mitigatory or otherwise, have been taken. Figure 12.15 gives a sample 'snapshot' of how information was recorded from Specialists; and the appropriate correction. *Note: the constraint classification, and consensus reached between specialisms, was paramount in confirming the desktop assessment of the 'Preferred 200m Pipeline Corridor'.*

Specialism Chainage	Biodiversity, Flora and Fauna (terrestrial)	Biodiversity, Flora and Fauna (Aquatic)	Landscape & Visual	Traffic and Transportation	Adjust Corridor
17500	Reduce no of hedgerows	Reduce no of stream crossings	several mature treeline between 17000 - 17500		Corridor adjusted to east between 17500-18500 to avoid mature treelines
18000			several mature tree stands tree lines to be avoided	Low Impact - crossing of local road approx chainage 18000	
18500					
19000			stream crossing and road crossing	Low Impact - crossing of R494 Regional Road approx chainage 19000	No change to corridor.
19500			Mature treelines and copse of trees		

Figure 12.15 – Sample - Specialist Assessments on the 'Preferred 200m Pipeline Corridor'

To validate the 'Preferred 200m Pipeline Corridor', further field investigation was carried out, between May 2016 and October 2016, where the Specialists surveyed this pipeline corridor. This was supported by landowner liaison and consultation with local stakeholders to avail of local advice and knowledge, and to establish known facts that may have a bearing on pipeline routing.

Subsequently, the in situ investigations have resulted in adjustments to the 'Preferred 200m Pipeline Corridor' as originally positioned using environmental and technical datasets, and Geodirectory; see Figure 12.16.

The 'Preliminary 200m Pipeline Corridor', incorporating adjustments from in situ investigations is the **"Preferred 200m Pipeline Corridor".** See Appendix I for mapping.

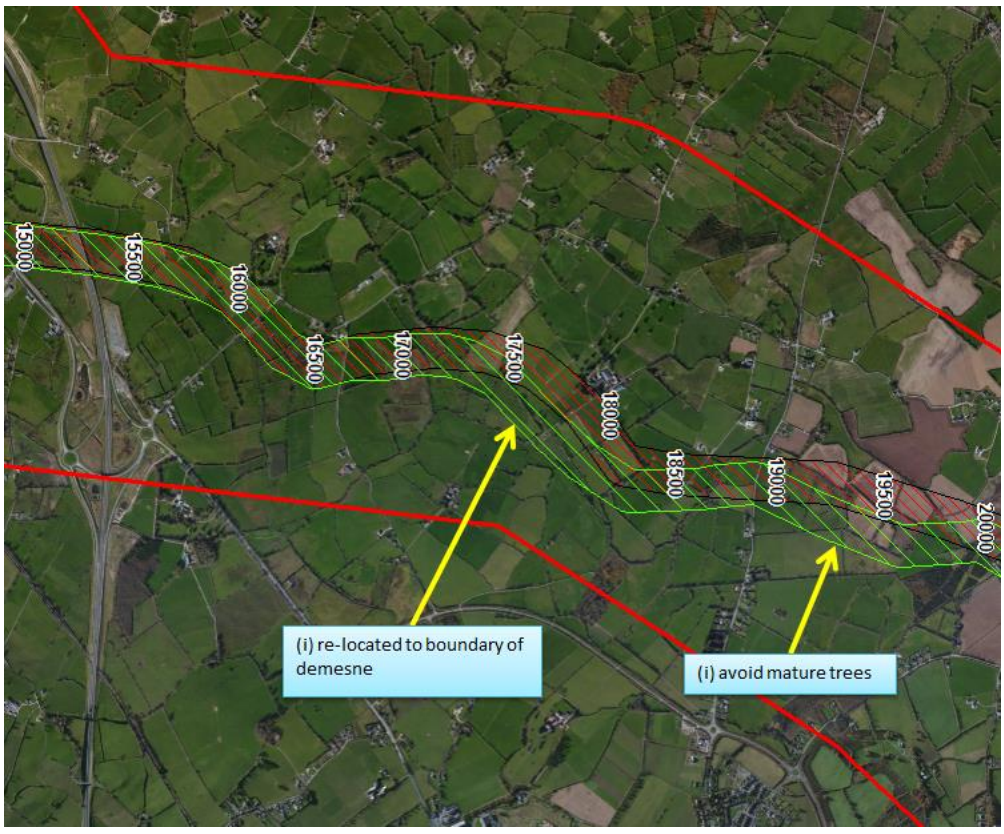

Figure 12.16 – Sample – Identification of 'Preferred 200m Pipeline Corridor' following Environmental Surveys

12.5 Indicative 50m Pipeline Corridor - Selection Methodology

The selection of the "Indicative 50m Pipeline Corridor", the next step in siting of the supply main, has been identified in consideration of known technical and environmental constraints, as well as feedback from landowners as part of the investigative surveys. The final corridor will be subject to the following:

- Feedback from the FOAR public consultation on the "Preferred 200m Pipeline Corridor", and actions arising;
- A further constraints/requirements mapping exercise with the inclusion of an extended constraints/requirements dataset, augmented by additional information upon completion of the environmental surveys, as required;
- Ongoing hydraulic design; and
- Ongoing consultation with landowners.

The "indicative 50m Pipeline Corridor" will be further developed and refined for positional adjustments arising from work outlined in this Section 12.5.

12.5.1 Public Consultation Feedback

This final consultative step in the process will consider, in particular, the public consultation on the "Preferred 200m Pipeline Corridor", any pertinent issues that may have arisen over the intervening period, the corrective actions taken, where required, but ensuring that at all times proposals are aligned with the environmental assessments.

> *Note: Design work is continuing on the "Indicative 50m Pipeline Corridor, within which the final pipeline position will be situated, and some changes are to be expected as part of that process. While such changes will take place after this fourth stage of non-statutory Public Consultation; engagement with affected landowners and communities will be an ongoing process, and the final position of the pipeline route will be part of the planning application documentation, on which An Bord Pleanála will conduct statutory consultation under the planning process.*

12.5.2 Environmental Surveys

Extensive field surveys are required to support the establishment of a robust environmental baseline. The extent and scope of these surveys were identified by the Specialists/ specialisms during the desktop review (during the preparation of the POAR), and undertaken in support of the identification of the 'Preferred 200m Pipeline Corridor' carried out for this FOAR. These surveys will continue, and support, a full and proper impact assessment of the "Indicative 50m Pipeline Corridor" and to enable suitable mitigation to be incorporated, as required.

The FOAR is offered for public consultation along with an *EIS Scoping Report*, where comments are invited on the scope and methodologies proposed for Environmental Impact Assessment on the preferred scheme.

12.5.3 Landowner Engagement

Landowner engagement is currently being carried out by Irish Water via Landowner Liaison Officers (LLOs). The function of LLOs includes relaying issues raised by landowners to the project team for consideration in the identification of the "Indicative 50m Pipeline Corridor.

Landowner engagement is currently being carried out by Irish Water via Landowner Liaison Officers (LLOs). The function of LLOs includes relaying issues raised by landowners to the project team for consideration in the identification of the "Indicative 50m Pipeline Corridor.

> *Note: The "Indicative 50m Pipeline Corridor" refers to the minimum easement required to facilitate construction of the works, generally; however it should be noted that additional space is likely to be*

required, at major road and other infrastructure crossings, and otherwise at intervals of approximately 500m to provide working and stockpiling space for surplus excavated materials.

Because of the large pipeline diameter and route curvature limitations, positional adjustments, where possible, will be undertaken in a collective way, taking these issues into account.

The “Indicative 50m Pipeline Corridor” represents the least constrained route for the construction of a supply main between the water treatment plant and the termination point reservoir, the point of connection to the Dublin Water Supply Area; primarily defined by extensive environmental constraint mapping, and optimised (engineering) to efficiently convey the treated water.

The final route will incorporate those line adjustments which are possible within the engineering constraints of a large diameter pipeline, and developed from a collective consideration of views expressed in consultation with each of the individual landowners, taking account of their advices with regard to their particular lands, and aligned to cause the least impact, during construction and operation.

12.6 Schedule of Drawings

The ‘Preferred 200m Pipeline Corridor’ and “Indicative 50m Pipeline Corridor” are presented in this Report (refer to Schedule of Drawings.