

Galway County Council

Options Selection Report

N17 Milltown to Gortnagunned





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N17 Milltown to Gortnagunned

Options Selection Report

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Chapter 1
Introduction and Description



1 Introduction and Description

1.1 Description of Scheme

The N17 is a National Primary Route linking Galway to Sligo via the towns of Milltown and Ballindine. The section of N17 between Milltown and Ballindine is approximately 7.0km in length and it is along this stretch that the proposed scheme is located. The scheme commences at the townland of Gortnagunned in the north and extends approximately 3.0km south where it ties in at the 50kph speed limits in Milltown.

The section of the N17 immediately to the north of the proposed scheme was realigned and upgraded to a Type 1 Single Carriageway in 2014 and this was extended to Ballindine in Co. Mayo in 2016. The town of Milltown was improved with traffic calming in 2014 and the N17 to the south of Milltown to Tuam has also been improved in recent years. This is the only section of the N17 in County Galway which has not been improved to a Type 1 Single Carriageway with hard shoulders.

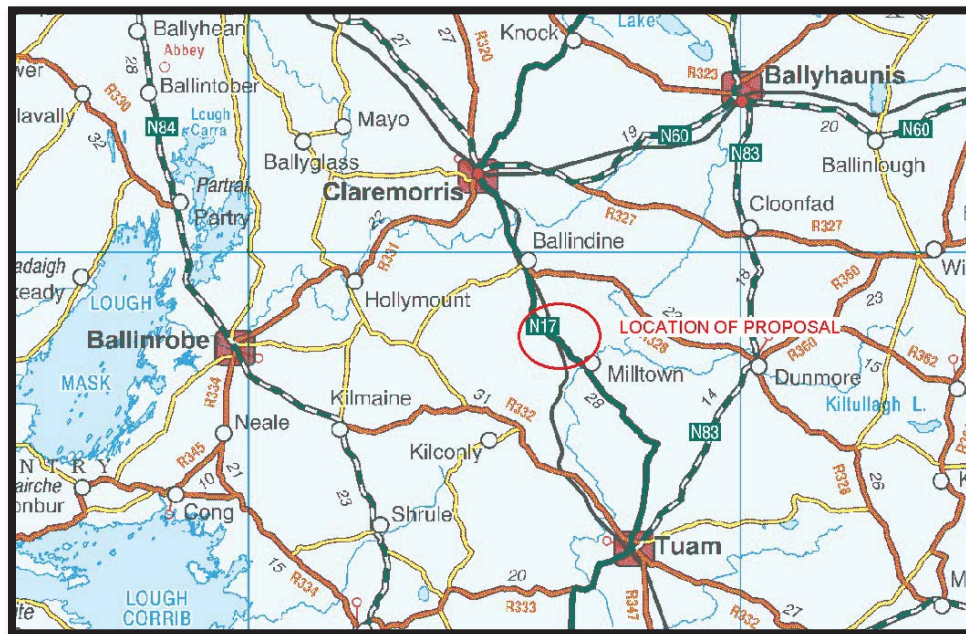


Fig 1.1 Location Map

It is anticipated that any proposed scheme at this location will be almost 3 km in length and will involve online and / or offline improvements. Consequently, the project has initially been classified as a Minor Project (€5m to €20m) in accordance with Unit 12.0 of the TII Project Appraisal Guidelines (PAG).

The existing road cross section is narrow with average lane widths of approximately 3.0m in each direction with little or no hard strip. A geometric review of the road indicates that the horizontal and vertical alignment of the road is poor and below the standard of the TII Publications (Standards). This results in limited opportunities for road users to overtake in a safe manner and makes it unsuitable for non-motorized users (pedestrians and cyclists).

The TII maintains a network of traffic counters on the National Road Network. One such traffic counter (Ref. TMU N17 080.0 N) is located on the N17, approximately 3km south of Milltown, in the townland of Kilcloony. Traffic flow data from this counter is available since 2013 and analysis of the 2017 data indicates that the Annual Average Daily Traffic (AADT) flow at this location was 8402 vehicles per day with 4.5% Heavy Commercial Vehicles (HCV). At the time of writing, there is an 84.5% coverage of data for the year 2018, which indicates a significant increase in vehicle numbers with a projected AADT of 9716 with 4.2% HCV.

TII publish National Road Network Indicators on an annual basis, with the latest edition published for the year 2017. Section C of this report deals with the *Volume to Capacity Ratio: National Primary Roads*. The Volume to Capacity (V/C) Ratio relates the AADT volume carried on a section of road to its daily operational capacity. This assessment indicates that the N17 between Milltown and Ballindine is operating above 120% capacity. As previously stated, the projected AADT shows for 2018 shows an increase of approximately 16%, further driving this road above its capacity.

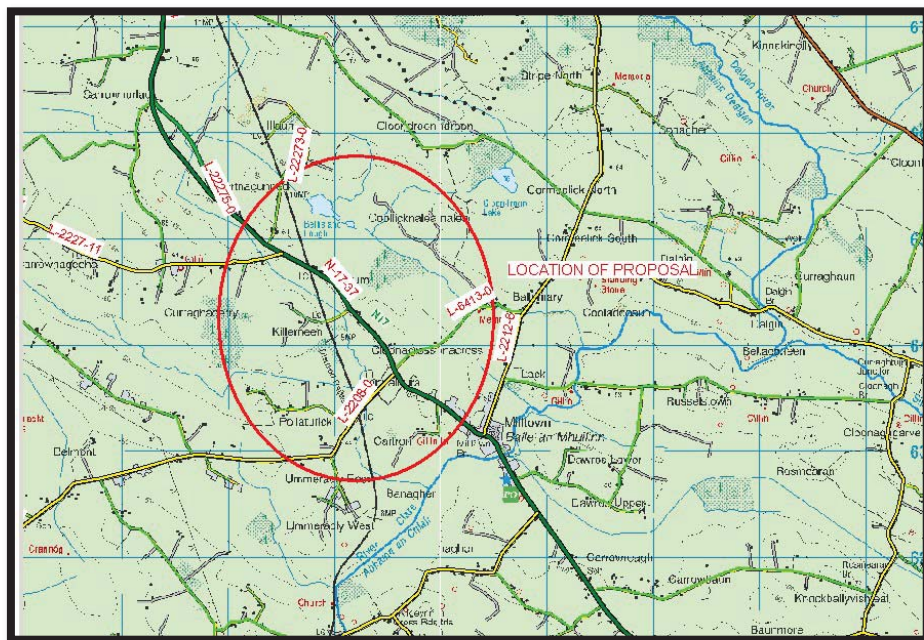


Fig 1.2 OS Map

Galway County Council were directed by the TII to assist in the scheme development stages as set out in the TII's Project Management Guidelines (published in 2017). The overall sequence covered in the guidelines is summarised in Table 1.1.

	Title	Coverage
Phase 0	Scope and Pre-Appraisal	Ensure Project alignment with current TII strategic programmes and plans.
Phase 1	Concept and Feasibility	Develop and investigate in further detail the feasibility of the Project and Project management structure.
Phase 2	Option Selection	Examination of alternative options to determine a Preferred Option.
Phase 3	Design and Environmental Evaluation	Develop the Project design, following the selection of a Preferred Option, based on both technical and environmental inputs, to a stage where sufficient levels of detail exist to establish land take requirements and to progress the Project through the statutory processes.
Phase 4	Statutory Processes	Compile documentation and participate in oral hearing(s) as required by the statutory processes to ensure that the proposed Project is developed in accordance with planning and environmental legislation.
Phase 5	Enabling and Procurement	Compile tender documentation to allow for the appointment of a Contractor to execute the Main Contract and undertake enabling works to facilitate the works.
Phase 6	Construction and Implementation	Administration and execution of the Main Contract in accordance with the design, specification, relevant standards and legislation.
Phase 7	Closeout and Review	Complete all outstanding contractual and residual issues relating to the Project.

Table 1.1: Summary of the TII's Project Management Guidelines Process

The Option Selection (Phase 2) process is split into three distinct stages within the TII Project Management Guidelines, each requiring a greater level of assessment and appraisal. The three stages are referred to as:

- Stage 1: Preliminary Options Assessment;
- Stage 2: Project Appraisal Matrix; and
- Stage 3: Selection of a Preferred Option.

1.2 Purpose of Options Selection Report

This report summarises the route selection work undertaken during Phase 2, which leads from considering physical constraints to recommending a preferred route corridor. The processes followed for the N17 scheme followed the Phase Stages as set out in TII Project Management Guidelines below.

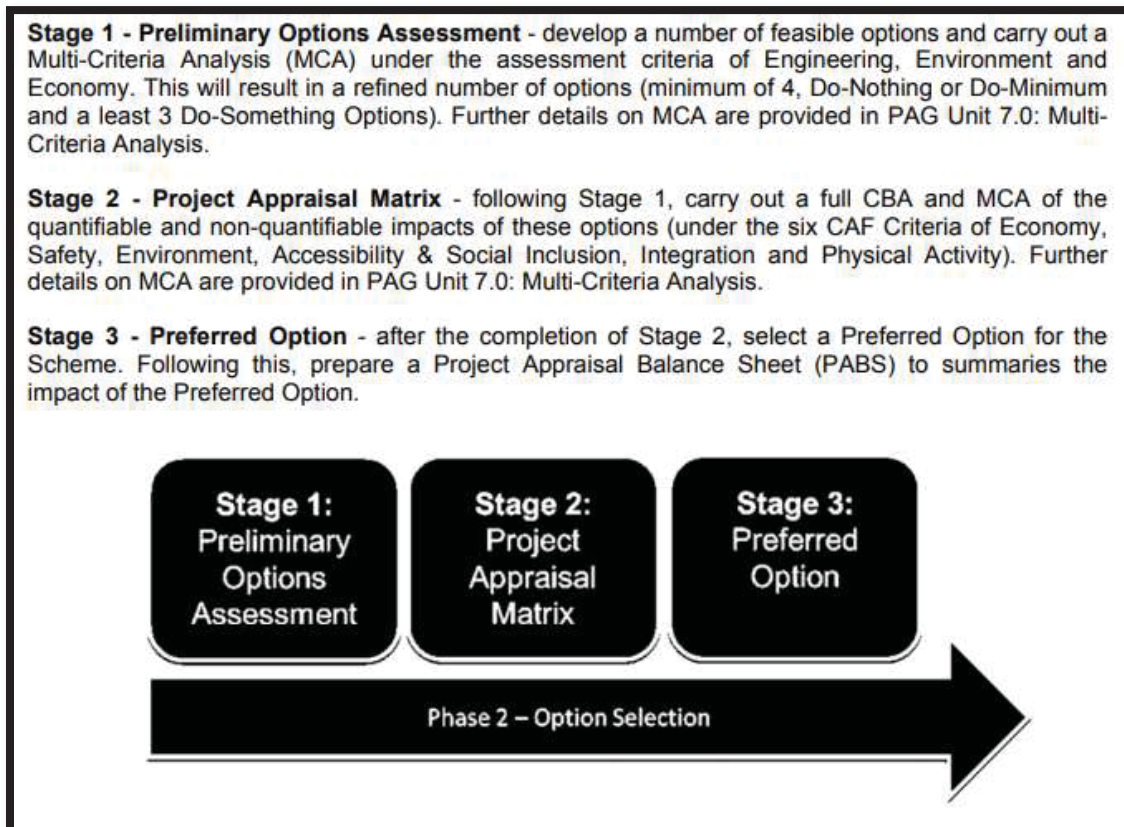


Figure 1.3 Corridor Selection Process for N17 Milltown to Gortnagunned Scheme

1.3 Scheme Operational Goals and Design Strategies

The N17 between Milltown and Gortnagunned is part of a strategic link servicing Sligo and the Northwest, currently providing a poor level of service for users and has sections of sub-standard road with a poor safety record. The need to improve the N17 as a strategic link is recognised in several policy documents as summarised in Chapter 2 of this report. In order to identify route options for appraisal we have determined a specific objective for the scheme based on providing an appropriate level of service as follows:

“to improve level of service and safety for users in accordance with applicable design standards.”

The TII’s Publications (Standards) sets out current design standards applicable to National Primary routes and the broad concepts outlined in this have been considered in identifying and appraising the corridor options. Of particular relevance, at this stage, is the adoption of a 100kph design speed, which, for example, influences the curves used in developing feasible corridors. Another key consideration is dealing with access, whereby the TII Publications (Standards) stipulates *“number of accesses should be minimised by concentrating turning movements where practicable”*

Chapter 2 **Identification of Need**



2 Identification of Need

2.1 Road Development Policy

The proposed N17 Scheme is compatible with local and national strategies and is referenced in a number of policy documents:

- The National Development Plan (NDP), 2018 – 2027
- National Planning Framework (NPF), 2020 – 2040
- Galway County Development Plan, 2015 – 2021
- Regional Planning Guidelines, 2010 – 2022

Specific references are recited below to demonstrate the context of the proposed scheme.

2.1.1 The National Development Plan, 2018 – 2027

The National Development Plan 2018 – 2027 is a ten-year plan which sets out the strategic frameworks for public capital investment over the next ten years. The plan focuses on the achievement of two over-arching objectives;

“Meeting Ireland’s infrastructure and investment needs”
and
“Reforming how public investment is planned and delivered”

The plan recognizes the fact that a good quality physical infrastructure is a key ingredient in overall competitiveness. The NDP, along with the National Planning Framework (NPF), sets out 10 National Strategic Outcomes, one of which is NSO 2 - Enhanced Regional Accessibility. As part of this outcome, the NDP states that

“A core priority under the NPF is the essential requirement to enhance and upgrade accessibility between urban centres of population and their regions, in parallel with the initiation of compact growth of urban centres. This has a crucial role to play in maximising the growth potential of the regional urban centres and the economy as a whole.”

It goes on to further reference the West of Ireland when stating a

“major objective is to make substantial progress in linking our regions and urban areas not just to Dublin but to each other. This will be a major enabler for balanced regional development to occur. A particular priority in this is substantially delivering the Atlantic Corridor, with a high-quality road network linking Cork, Limerick, Galway and Sligo.”

2.1.2 National Planning Framework

The National Planning Framework 2020 – 2040 (NPF), is a *“is a national document that will guide at a high-level strategic planning and development for the country over the next 20+ years, so that as the population grows, that growth is sustainable (in economic, social and environmental terms).”*

NPF Section 3.3 (Northern and Western region) describes the development of Towns such as Sligo and Galway and that connectivity is a priority for this regional area.

“Improved north-south connectivity, focused on a network of regional assets such as Higher Education Institutes, the M17 and Ireland West-Knock Airport and a strengthening of the urban and employment structure of the wider North-Western region, will provide new opportunities, to be complemented by enhanced east-west accessibility.”

Overall, the proposed Scheme is consistent with the objectives of the NPF in improving access between throughout the west of Ireland.

2.1.3 Galway County Development Plan 2015 – 2021

The Galway County Development Plan 2015 - 2021 sets out the following vision for County Galway:

“Enhance the quality of life of the people of Galway and maintain the County as a uniquely attractive place in which to live, work, invest and visit, harnessing the potential of the County’s competitive advantages in a sustainable and environmentally sensitive manner.”

With this over-arching vision in mind, the County Development Plan includes transport and development objectives to ensure that the transportation, infrastructure, natural and energy resources shall be developed in a sustainable and efficient manner to promote the social and economic wellbeing of the county and its population.

Chapter 5 of the County Development Plan deals specifically with Roads and Transportation. It is acknowledged in this section that Galway, due to its peripheral location relies heavily on its public road network for transportation. The CDP places a specific emphasis on the county’s *“strategic routes”*, which includes the M6, N18 and N17, with the N17 Tuam to Claremorris Scheme being highlighted as a Priority Transportation Infrastructure Project for the period of the Plan.

The County Development Plan describes several policies set out by the County Council. Policy T1 7 – Protection of National Road Network states:

“Protect the motorway and national road network and national road junctions in line with Government policies. Safeguard the carrying capacity, operational efficiency, safety and significant investment made in the motorway and national road network within the County including the M6 Dublin to Galway Motorway, the M18 Gort to Crusheen Motorway and the M17/M18 Galway to Tuam when completed”.

Considering the issues with alignment and geometry, current operating capacity and history of accidents attributed to the section of the N17 between Milltown and Gortnagunned, the proposed scheme is consistent with the policy above.

2.1.4 Regional Planning Guidelines for the West Region, 2010 – 2022

The West Regional Planning Guidelines 2010 – 2022 provide a planning framework for the future physical, economic and social development of the West Region.

These guidelines reflect other national social, economic and environmental policies which affect the West Region, as well as a range of existing regional strategies.

Chapter 5 of the Guidelines deals with Infrastructure Strategy and sets out policies and objectives which are considered to be the priority access, travel and transport related infrastructure for the region with regard to roads, rail and bus, ports and harbours, airports and surrounding industrial areas and cycling and walking

One such policy, IP2, states:

“Support the National Roads Authority investment to remedy deficiencies generally in the roads network minimising environmental impact.”

Considering the issues with alignment and geometry, current operating capacity and history of accidents attributed to the section of the N17 between Milltown and Gortnagunned, the proposed scheme is consistent with the policy above.

In one of the RPG objectives, IO5, the Northern and Western Regional Assembly identifies a number schemes which have been assigned a priority completion status in order to promote a balanced regional development. One such scheme is the:

“Atlantic Road Corridor – M18 and M17 and N17 from Gort to Charlestown minimising environmental impact.”

Having considered the above policy, IP2, and objective, IO5, it is clear to see that completion of the proposed project would be in line with the Regional Planning Guidelines.

2.2 Scheme Specific Need

The need for this improvement scheme is well established and has been identified in various publications on Road Development Policy, including National, Regional and Local publications, which have been discussed in section 2.1.2 Road Development Policy of this report. These policies all refer to the N17, in various ways, as an important inter-urban link whose performance is key to the development of the West region.

Upon review of the existing road network, traffic conditions, journey times, level of service and safety, all of which are examined in greater depth below, it becomes apparently clear that the route is not capable of safely accommodating the current and future traffic needs of the route. For the route to serve its purpose as an important transport link, improvement works are required.

2.2.1 Existing Road Network

This section of the N17 falls below the standard of the TII Publications (Standards) in terms of horizontal and vertical alignment, visibility and cross-section, and safety on the route is compromised as a result.

Transport Infrastructure Ireland has carried out a Sinuosity Analysis of the National Road Network and prepared a Sinuosity Map showing the results. Sinuosity has been shown to be a good indicator of horizontal road bendiness and by extension an approximate indicator of the standard of the horizontal alignment. The results for the N17 between Milltown and Gortnagunned are shown below in the extract from the TII Sinuosity Map. This analysis shows that two thirds of the section of the N17 under consideration has a moderate or severe sinuosity indicating the substandard horizontal alignment of the existing road.

An analysis of the rural sections of the existing road was carried out regarding its geometry. This analysis shows that in terms of alignment, over 70% of the seven horizontal curves are substandard, and 86% of the vertical curves are substandard. The minimum stopping sight distance (215m) is not achieved along approximately 50% of the route. The overtaking value achieved is approximately 15%, which is substantially below the requirement of 50% for Type 1 single carriageway rural roads. A Design Speed calculation was carried out for the rural section of the N17 between Milltown and Gortnagunned. The results indicated that the design speed of the existing road is just 85 kph.

In terms of the cross-section the existing road is sub-standard for a 100kph speed limit. The average lane widths in each direction are approximately 3.0m with no hard shoulder, little or no hard strip, limited verge space and unforgiving roadsides. This makes it unsuitable for use by non-motorised users (pedestrians and cyclists)

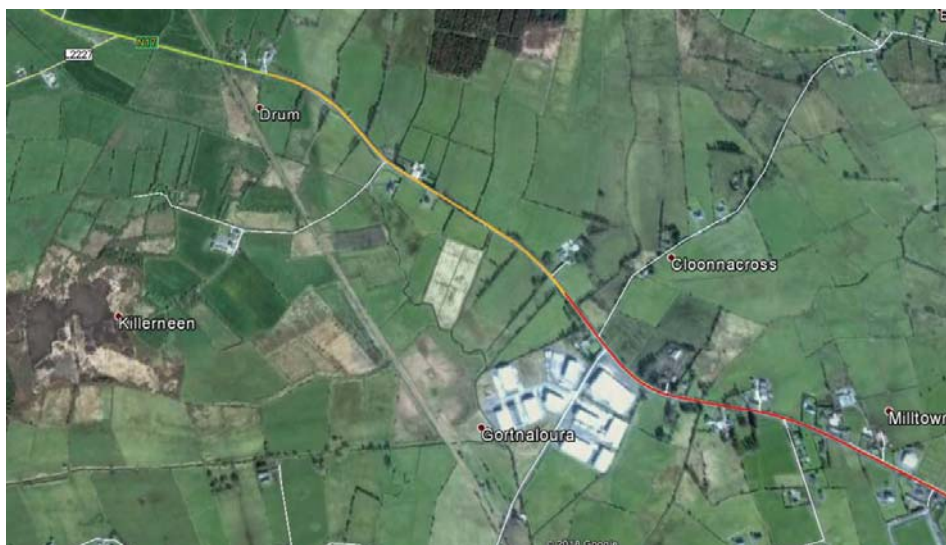


Fig 2.1: TII Sinuosity Map

2.2.2 National Traffic Demands

The TII maintains a network of traffic counters on the National Road Network. One such traffic counter (Ref. TMU N17 080.0 N) is located on the N17 at Kilcloony townland, approximately 3km south of Milltown. Traffic flow data is available for this counter since 2013. Analysis of this data indicates that the Annual Average Daily Traffic (AADT) flow for 2017 on the N17 this location was 8402 vehicles per day with 4.5% Heavy Commercial Vehicles (HCV).

The TII Project Appraisal Guidelines for National Roads Unit 5.3 – Travel Demand Projections provides annual growth factors based on link based growth rates. The factors for the West region have been applied to the 2017 AADT value to forecast an AADT for the design year of the scheme. These provided the following results:

Low Sensitivity Growth -	AADT = 9,300 with 5.8% HCV
Central Growth -	AADT = 9,950 with 5.7% HCV
High Sensitivity Growth -	AADT = 10,200 with 5.7% HCV

(Note: results rounded to the nearest 50)

While reviewing these figures it was noted that projected AADT for 2018 shows a significant increase in the volume of traffic on the road. The 2018 count, at the time of writing, has a coverage of 84.5% and indicates an AADT of 9716 with 4.2% HCV and it is assumed that this increase can be attributed to the opening of the new M17 motorway. This assumption was confirmed by locals who, during public consultation, noted a significant increase in vehicular volume since the opening of the new M17. For the entirety of Phase 2, the 2017 figures shall be used for consistency. However, during subsequent phases where counts for the entirety of 2018, which accounts for seasonal changes, are available, they shall be used.

TII publish National Road Network Indicators on an annual basis with the latest publication being released in 2017. Section C of the report deals with the *Volume to Capacity Ratio: National Primary Roads*. The Volume to Capacity (V/C) Ratio relates the AADT volume carried on a section of road to its daily operational capacity. This assessment indicates that the N17 between Milltown and Ballindine is operating above 120% of capacity.

It is clear that the existing road is operating below Level of Service D and in order to extend the life of the existing N17, it is necessary for this scheme to progress.

2.2.3 Road Safety

Road Safety is an important issue, particularly on national primary single carriageway roads. TII produce collision rate analysis for all National Routes, with the latest data available for 2012 – 2014. This data indicates that the accident rate on the N17 is twice the expected collision rate for one third of the scheme and twice below for the remainder of the scheme. See figure 2.2 below.

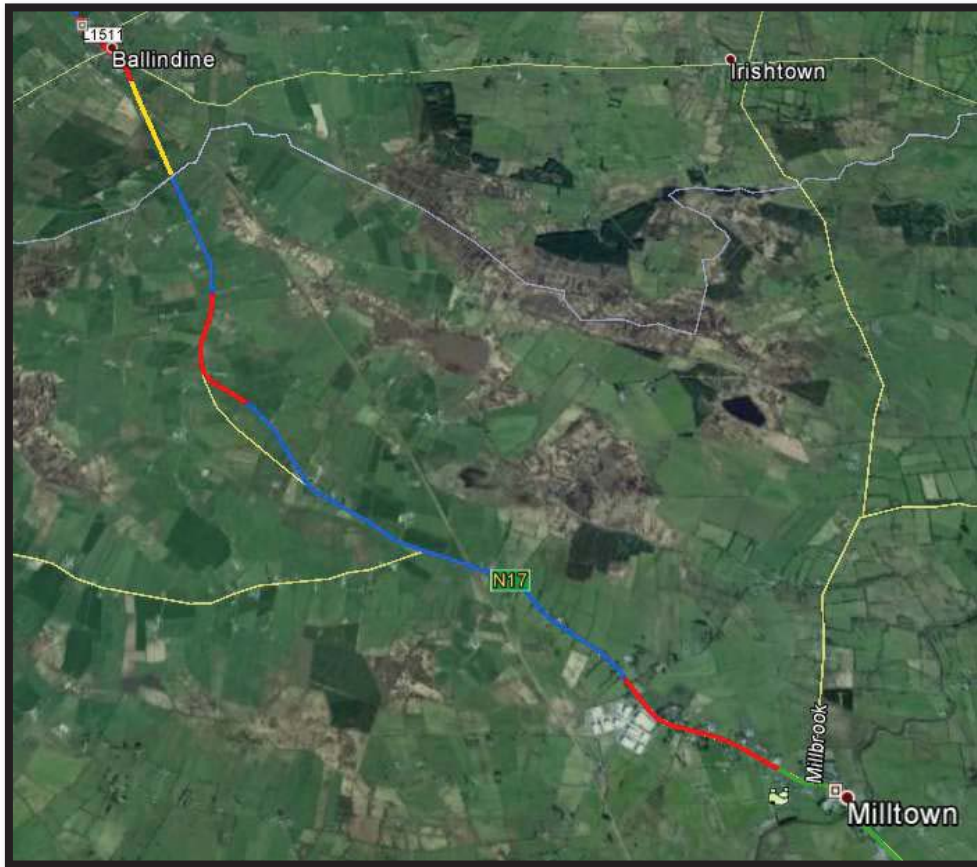


Figure 2.2 TII collision maps 2012 – 2014; red is twice above expected collision rate, blue is twice below

Based on the Road Safety Authority website, see Figure 2.3 below, the collision data along this section of road between 2005 and 2014 has been as follows:

Fatal:	0
Serious Injury:	0
Minor accidents:	10

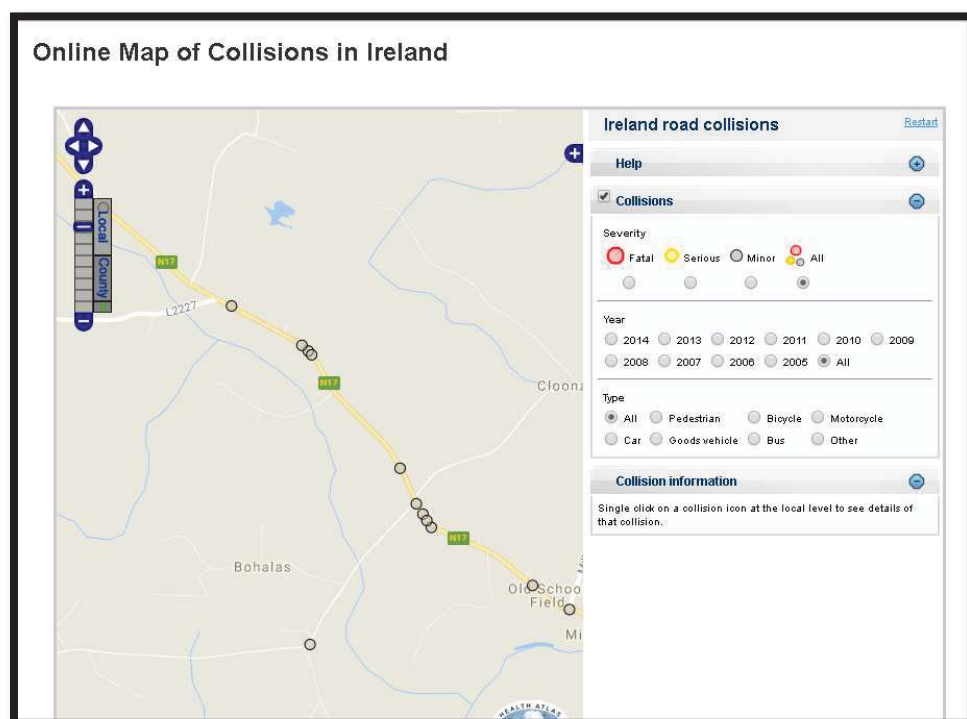


Figure 2.3: Extract from the Road Safety Authority – Road Collisions 2005 - 2014

Following an examination of the AADT from the TII traffic counter in Kilcloony we can see that there has been a 29% increase in the volume of traffic travelling on this section of the N17 from 2014 to 2018. With this increase, the likelihood is that the number of accidents has increased, and will increase further with future travel demands.

As stated previously, the existing road has several issues which make it substandard in regard to horizontal and vertical alignment, sightlines and cross-section. There are also a multitude of hazards within the clear zone of the road resulting in unforgiving roadsides that can significantly increase the level of injury severity should a vehicle leave the road.

There are five level crossings within in the Study Area, with one of these located on the section of the N17 being considered. The railway line is not currently in use, however, if the line were to be re-opened, it could cause a significant safety hazard. Conflict between road and rail traffic can lead to an increased risk of rear-end type collisions at the end of traffic queues and collisions with rail traffic at each crossing and from each direction. In addition, the stopping of traffic at each crossing leads to the formation of traffic platoons along the route once the road re-opens. This can lead to driver frustration and riskier driver behaviour potentially leading to more collisions. Additionally, in terms of railway safety, the 2030 Rail Network Strategy Review states that “*Level Crossings represent the single biggest safety risk and also impact on journey times*”. This is echoed in the EU’s *Railway Safety Performance in the European Union, 2016* report which shows that between 2012 and 2014, level crossings accidents represented 26% of all railway accidents.

Safety is also compromised by the number of at-grade junctions and private accesses. There are six junctions with local roads along this section of the N17 and seventy direct accesses onto the road. The overriding principle in TII publication *DN-GEO-03060, Geometric Design of Junctions (priority junctions, direct accesses, roundabouts, grade separated and compact grade separated junctions)* is that direct access onto national roads should be avoided.

Several of these junctions and accesses do not have the required sight distance and are thus a safety risk.

A section of the N17 immediately to the north has been improved, which results in this section of road being inconsistent in terms of road standard, creating a potential problem where speeds are inappropriate for the road conditions. The substandard alignment can lead to user frustration and encourage unsafe manoeuvres. It can also be extremely dangerous for vulnerable road users such as pedestrians and cyclists. See Photos in below.



Chapter 3
Traffic Assessment & Route Cross Section



3 Traffic Assessment & Route Cross Section

3.1 Summary of Traffic Modelling

As the proposed scheme involves a minor realignment of a localised and confined nature, it was determined that a simple, static traffic model would be appropriate. In this regard, no change in the distribution of traffic is expected as a result of this project and there are no alternate parallel routes in close proximity to the Study Area. It is expected that all traffic will reassign to any proposed scheme within the Study Area identified. Consequently, the base model network for the static traffic model shall be limited to the existing roads contained within the Study Area.

3.2 Initial Selection of Road Type

The carriageway types which make up our road network are chosen on the basis of capacity and level of service (LOS). The capacity of a road link is the ability of that section of road to carry the maximum number of vehicles in safety at an appropriate LOS. The LOS, as defined in the National Road Needs Study, 1998, is “*a technical concept which attempts to describe the travel experience in terms of operating speed, the ability to overtake traffic in safety, traffic congestion, overall safety and driver and passenger comfort.*” LOS has six levels ranging from A (best) to F (worst) with a LOS of D being internationally regarded as a minimum acceptable standard for new national road schemes.

To determine the existing capacity (AADT) of the N17, traffic surveys were undertaken in November 2017 and are discussed in detail in Section 4.3.2. The results of this survey allow a design year forecast of AADT to be calculated using growth factors which can be found in table 5.3.2 of *TII Publications Project Appraisal Guidelines for National Roads Unit 5.3 - Travel Demand Projections (PE-PAG-02017)*. The resulting design year AADT can be seen in table 3.1 below.

Year	Low Sensitivity Growth AADT		Central Growth AADT		High Sensitivity Growth AADT	
	Light Vehicle	Heavy Vehicle	Light Vehicle	Heavy Vehicle	Light Vehicle	Heavy Vehicle
2036	9,750	600	10,400	650	10,650	650

Table 3.1: Travel Demand Projections

Note; Light Vehicle (Cars & Light Goods Vehicles), Heavy Vehicles (Ordinary Goods Vehicles 1 & 2)

These flow volumes are within the capacity of a Type 1 single carriageway (11,600 AADT) but exceed the capacity of a Type 2 single carriageway (8,600 AADT) as set out by Table 6.1 of *TII Publications Rural Road Link Design (DN-GEO-03031)*. Therefore, the proposed route should be developed as a Type 1 Single Carriageway.

Type of Road 1.	Capacity ² (AADT) for Level of Service D	Edge Treatment	Access Treatment	Junction Treatment at Minor Road	Junction Treatment at Major Road
Type 3 Single (6.0m) Carriageway (National Secondary Roads Only)	5,000	0.5m hard strip. Cycle Facilities Footways	Minimise number of accesses to avoid standing vehicles and concentrate turning movements.	Simple Priority Junctions ⁵	Priority junctions, with ghost islands where necessary ⁵ or roundabouts.
Type 2 Single (7.0m) Carriageway	8,600	0.5m hard strips. Cycle Facilities Footways	Minimise number of accesses to avoid standing vehicles and concentrate turning movements.	Priority junctions, with ghost islands where necessary ⁵ .	Priority junctions, with ghost islands ⁵ roundabouts ³ , compact grade separation where necessary.
Type 1 Single ⁴ (7.3m) Carriageway	11,600	2.5m hard shoulders	Minimise number of accesses to avoid standing vehicles and concentrate turning movements.	Priority junctions, with ghost islands where necessary ⁵ .	Ghost islands ⁵ or roundabouts or, compact grade separation where necessary
Type 3 Dual ^{3,4} (7.0m + 3.5m) Divided 2+1 lanes Primarily for retro fit projects	14,000	0.5m hard strips. Cycle Facilities Footways where required.	Minimise the number of accesses to avoid standing vehicles and concentrate turning movements.	Restricted number of left in/left out or ghost island priority junctions. ^{5,7}	Priority junctions ^{5,7} , u-turn facility with right turn ⁵ , at-grade roundabouts, compact grade separation
Type 2 Dual ^{3,4} Divided 2 + 2 Lanes (2x7.0m) Carriageways.	20,000	0.5m hard strips Cycle Facilities Footways	No gaps in the central reserve. Left in / Left out	No gaps in the central reserve. Left in / Left out	At-grade roundabouts and compact grade separation
Type 1 Dual ⁴ Divided 2+2 Lanes ⁶ (2x7.0m) Carriageways	42,000	2.5m hard shoulders	No gaps in the central reserve. Left in / Left out	No gaps in the central reserve. Left in / Left out	At-grade roundabouts and full-or compact grade separation.
Motorway Divided 2 + 2 Lane ⁶ (2X7.0m)	52,000	2.5m hard shoulders	Motorway Regulations	No gaps in the central reserve.	Motorway standards Full-grade separation.
Wide Motorway Divided 2+2 Lane (2X7.5m)	55,500	3m hard shoulders	Motorway Regulations	No gaps in the central reserve	Motorway standards Full-grade separation.

Notes:

- For details of the standard road cross-sections, see DN-GEO-03036 and the relevant TII Publications Standard Construction Details.
- Capacity figures are indicative for general guidance. The appropriate cross section shall be selected with reference to the TII Project Appraisal Guidelines.
- The Type 3 Dual Carriageway cross-section shall only be considered where an existing road is to be upgraded on-line. The Type 2 Dual Carriageway cross-section shall be utilised for offline alignments.
- This road type may be used as an Express Road with the following conditions - access and junction control.
- This junction type is not permitted on Express Roads.
- Should the traffic assessment indicate that more than 2 lanes are required in each direction for a Standard Motorway or Type 1 Dual Carriageway, the additional lanes shall be a minimum width of 3.5m subject to curve widening.
- Right turns off the Major Road only permitted at priority junctions located at single lane sections of Type 3 Dual Carriageways, right turns onto the Major Road are not permitted (see DN-GEO-03060).

Fig 3.1: Table 6.1 Rural Road Link Design (DN-GEO-03031)

3.3 Consideration of Preliminary Junction Strategy

TII Publications Geometric Design of Junctions (priority junctions, direct accesses, roundabouts, grade separated and compact grade separated junctions) (DN-GEO-03060) sets out the standards for the geometric design of junction and provides guidance on the suitability of different junction types. It states that;

“The operation of junctions on the national road network must be readily understood by all road users and therefore sequences of junctions should ensure a consistency of junction type application and not involve many different layout types. It is therefore essential that

designers prepare a junction strategy when introducing or modifying a junction(s) on a road scheme and evaluate their effect upon the safety and operational performance of the network as a whole.”

There are a number of key aspects which are critical to junction selection and should be considered and included in the decision framework, these include;

- traffic flows (operational efficiency);
- safety;
- collision history;
- sight distances;
- consistency;
- location;
- maintenance;
- environmental effects;
- land take;
- capital cost;
- economic assessment;
- provision for NMUs.

Simple priority junctions are generally viewed as the most appropriate junction type for all local access on single carriageway roads.

Traffic survey undertaken in November 2017, included traffic volume counts on all local roads within the Study Area. The results of this survey are included in Appendix A of this report. From these counts, it is clear to see that the most appropriate junction type is a priority junction type. These junction types ensure through traffic on the major road, the N17, is not delayed while also keeping land take and construction cost reduced relative to other, more complex junction types. It is suggested, however, that a ghost island junction should be provided on the L-2208, as this junction has an AADT which falls with the range as set out in *Table 4.1: Flow Ranges – Ghost Island Junctions* of TII Publications *Geometric Design of Junctions (priority junctions, direct accesses, roundabouts, grade separated and compact grade separated junctions)* (DN-GEO-03060).

Major road AADT	Minor road AADT	
< 5,000	> 600	< 5,000
5,000 - 10,000	> 450	< 3,000
> 10,000	> 300	< 1,500

Note: AADT values provided should only be used as an initial assessment of the most appropriate junction type, the final junction arrangement shall be informed by a detailed analysis of peak hour flows (see Appendix D).

Fig 3.2: Table 4.1 Geometric Design of Junctions (priority junctions, direct accesses, roundabouts, grade separated and compact grade separated junctions) (DN-GEO-03060)

Chapter 4 Constraints Study



4 Constraints Study

The initial stage of the route selection process is to identify the nature and extent of significant constraints within a defined Study Area. These constraints are identified, mapped and assessed so that feasible route options can be designed to avoid such constraints, where possible.

The Study Area is to be large enough to encompass all feasible route options and associated zones of influence, but not excessively so, as the Route Selection and Appraisal needs to be a focussed approach, where the use of resources and the acceleration of the design and development process is to be maximised.

The Constraints Study objective is to identify the constraints which could affect the design, delay progress, influence the construction costs and therefore influence the route selection process and the identification of a preferred route option. The methodology for compiling this information comprised a detailed desktop study, as well as a number of on-site surveys including an ecology survey.

For the purposes of this Constraints Study, the principal constraints have been split into Natural and Physical Constraints. These are described in Sections 4.1. and 4.2 below.

4.1 Description of Natural Constraints

The study of the Natural Constraints was undertaken with reference to TII planning guideline documents which provide guidance on the assessment of impacts on the natural environment during the planning and design of national road schemes. These documents include:

- Guidelines for Assessment of Ecological Impacts of National Road Schemes;
- Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes;
- Guidelines for the Assessment of Architectural Heritage Impacts of National Road Schemes;
- Guidelines for the Assessment of Archaeological Heritage Impacts of National Road Schemes;
- Guidelines for the Treatment of Noise and Vibration in National Road Schemes.

4.1.1 Ecological Constraints

4.1.1.1 Special Areas of Conservation

There are six SAC sites situated within 15km of the study area, including:

- Lough Corrib SAC (Site Code: 000297) located to the east of the scheme;
- Carrowkeel Turlough SAC (Site Code: 000475) located 6km to the west of the scheme;

- Greaghans Turlough SAC (Site Code: 000503) located 8km to the west of the scheme;
- Skealaghan Turlough (Site Code: 000541) located 13.1km west of the scheme;
- Kilglassan/Cahervoostia SAC (Site Code: 000504) located 9km to the west of the scheme; and
- Ardkill Turlough (Site Code: 000461) which is also located to the west of the scheme approximately 10km.

See map below.

Notably, the Carrownageesha stream, which flows into the Clare River, is within the Study Area. Both the stream and the river are considered part of the Lough Corrib cSAC.

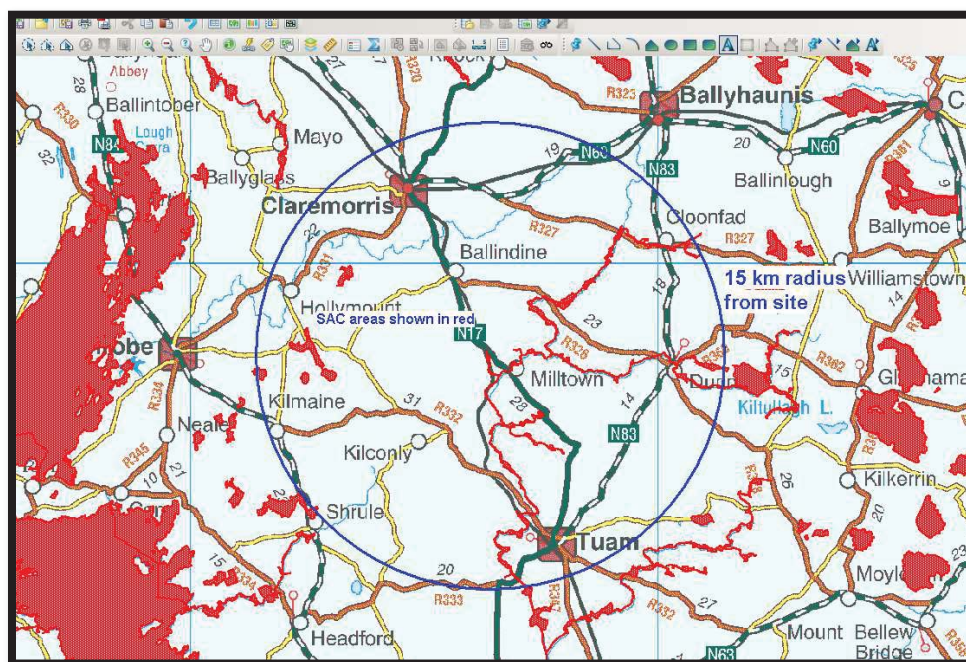


Fig 4.1: Special Areas of Conservation

4.1.1.2 Natural Heritage Area

There are eight NHA Areas within 15 km of the proposed improvement. See map below.

- Carrowkeel Turlough SAC (Site Code: 000475) located 6km to the west of the scheme;
- Kilglassan/Cahervoostia SAC (Site Code: 000504) located 9km to the west of the scheme;
- Greaghans Turlough SAC (Site Code: 000503) located 8km to the west of the scheme;

- Skealaghan Turlough (Site Code: 000541) located 13.1km west of the scheme;
- Ardkill Turlough (Site Code: 000461) located approximately 10 km to the west of the scheme
- Rathbaun Turlough (Site Code: 000215) located 5km to the west of the scheme
- Atore lake (Site Code: 000224) located 3km to the south west of the scheme
- Turlough O'Gall (Site Code: 000331) located 15km to the south of the scheme
- Killower Turlough (Site Code: 000282) located 14km to the south of the scheme
- Belcare Turlough (Site Code: 000234) located 8km to the west of the scheme
- Knockavanny Turlough (Site Code: 000289) located 13m to the southst of the scheme
- Drumulcaun Bog (Site Code: 000262) located 13m to the west of the scheme

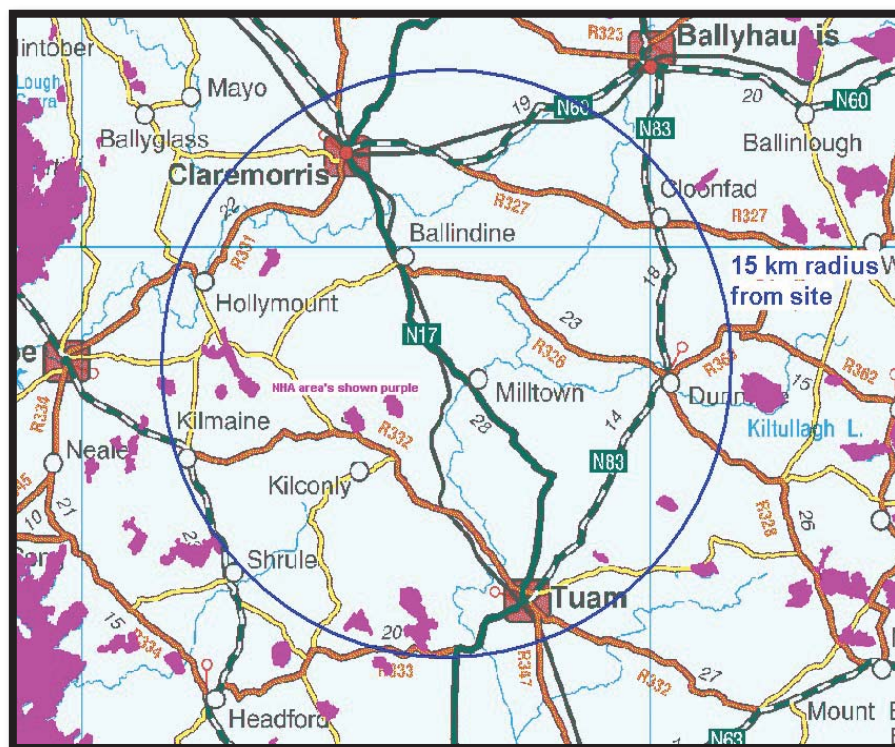


Fig 4.2: Natural Heritage Areas

4.1.1.3 Special Protection Areas

There are no Special Protection Area's within 15km of the site.

4.1.2 Geological, Hydrological and Hydrogeological Constraints

4.1.2.1 Geological

Several resources were examined during the undertaking of this study in order to determine the Geological constraints which may affect this scheme. This included:

- 1:100,000 Scale Bedrock Mapping from Geological Survey of Ireland
- Quaternary Maps from Geological Surveys of Ireland
- Teagasc Soil Mapping

4.1.2.1.1 **Bedrock:**

The bedrock was determined using 1:100,000 Scale Bedrock Mapping from Geological Survey of Ireland. This map indicated that the bedrock in the area consists of Visean Limestone (undifferentiated) as can be seen in the Figure 4.3 below. The mapping data also indicates an area of bedrock consisting of medium to thick-bedded pure limestone named “Cong Canal Formation”. According to the mapping data, this area of bedrock does not fall within the immediate area of the scheme, with a minimum separation of 250m, however, due to possible inaccuracies within the mapping data, it must be considered.

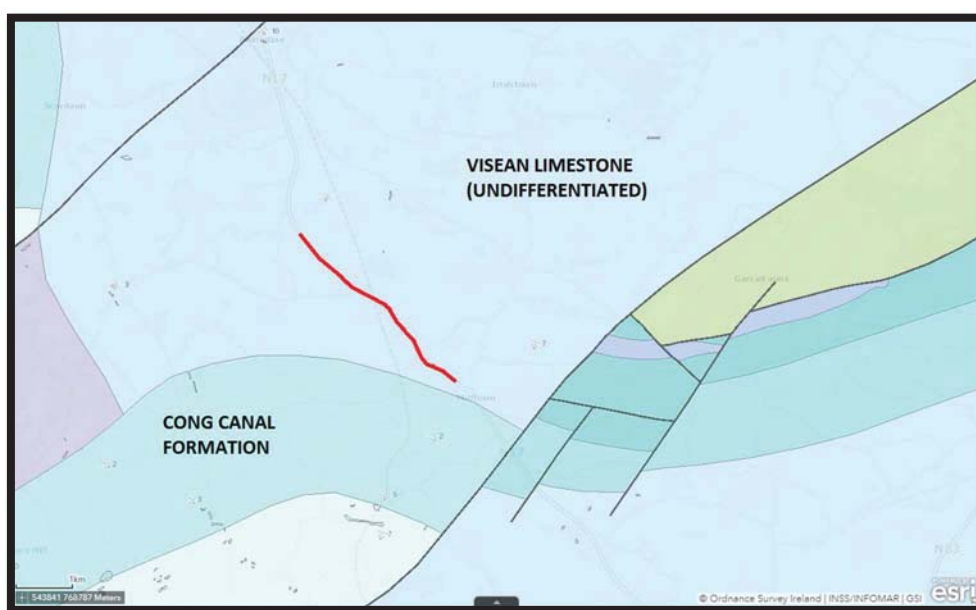


Fig 4.3: Bedrock Data

4.1.2.1.2 **Subsoil:**

Subsoil classification was determined using Quaternary Maps from Geological Surveys of Ireland. As can be seen in Figure 4.4 below, this map indicates three distinct subsoil classes within the Study Area. The western side of the existing N17, including the line of the existing road is characterised as “Till derived from Carboniferous sandstones and cherts”. The Eastern side of the N17 is characterised as “Cut over raised peat”, while there is a small section of the Study Area at the Southern end of the scheme characterised as “Alluvium”. This could prove significant as a portion of the offline section detailed in Option 3 will traverse this area of cut over peat.

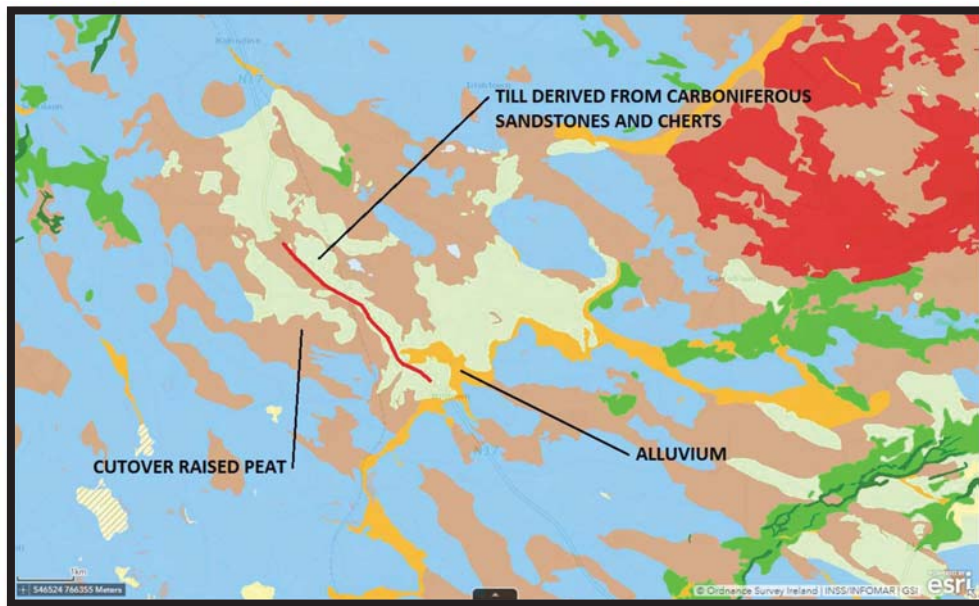


Fig 4.4: Subsoil Data

4.1.2.1.3 Soil:

Soil classification was determined using Teagasc soil mapping. This data indicates a number of soil types within the study area including:

- Peat
- Fine Loamy Drift with Limestones
- Coarse Loamy Drift with Limestones
- River alluvium

The majority of the soil within the Study Area is characterised as either peat or fine loamy drift with limestone. The other soil types within the Study Area, coarse loamy drift with limestones and river alluvium, are confined to the southern end of the Study area. This can be seen in Figure 4.5 below.

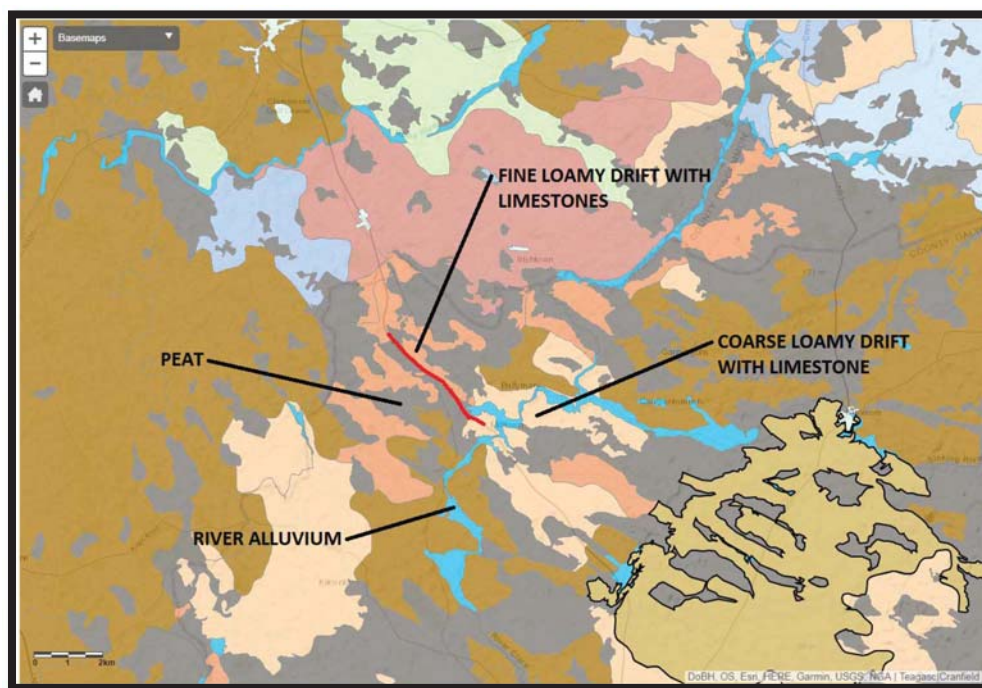


Fig 4.5: Soil Data

4.1.2.2 Hydrological

Several resources were examined during the undertaking of this study in order to determine the Hydrological constraints which may affect this scheme. This included:

- Discovery Series Maps
- EPA Ireland Catchment Maps
- OPW Flood Mapping
- EPA Water Quality Monitoring Station Data
- EPA Groundwater Vulnerability Mapping

4.1.2.2.1 Surface Water Features

Surface water features were identified using Discovery Series Maps. This data indicates a number of surface water features within the study area. This includes:

- Bellisland Lough 0.5km East of the proposed scheme
- River Clare 0.4km South of the proposed scheme
- Streams in various locations throughout the study area

The majority of surface water features, including Bellisland Lough and the Clare River, will remain unaffected by the proposed scheme. However, there may be impacts on Carrownageesha stream, which forms part of the Lough Corrib SAC, and other minor streams within the Study Area, depending on the route chosen. Should any of the surface water features be affected by the works, mitigation and remediation procedures will be implemented to keep impacts to a minimum.

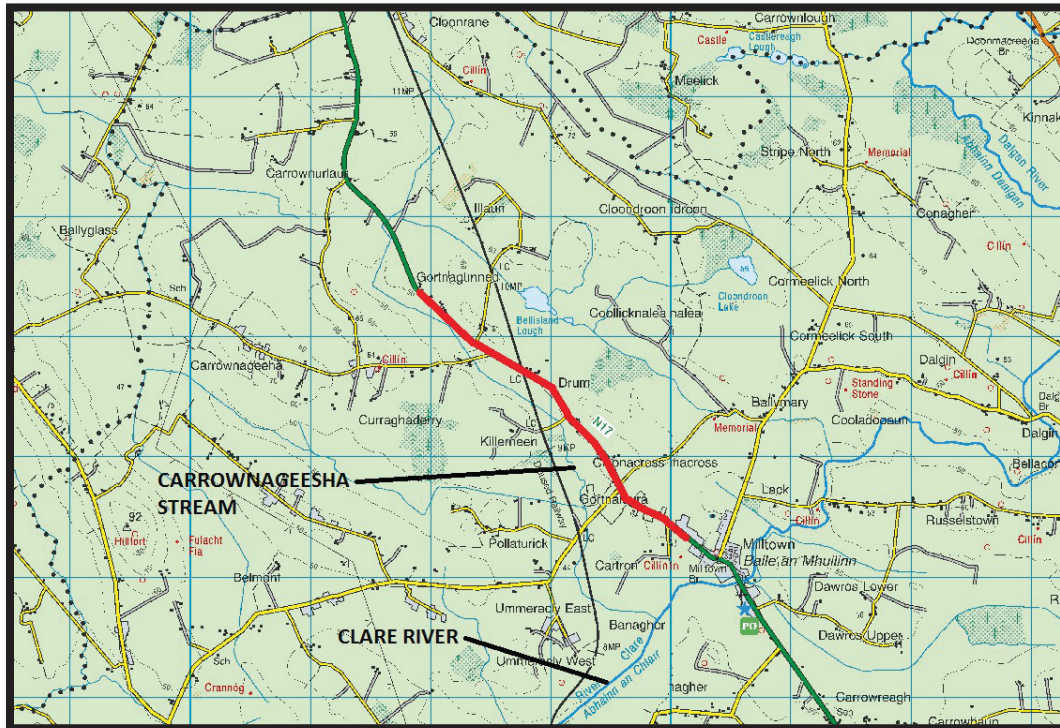


Fig 4.6: Surface Water Features

4.1.2.2.2 Catchments

The Study area falls within the Clare[Galway]_SC_020 sub-catchment which forms part of the greater Corrib Catchment area.

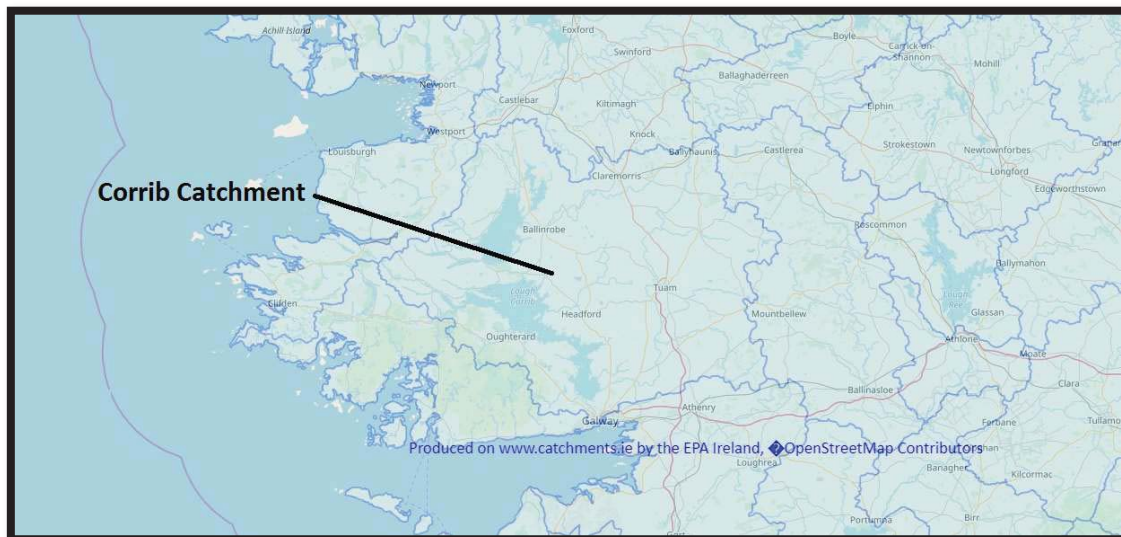


Fig 4.7: Catchment Area

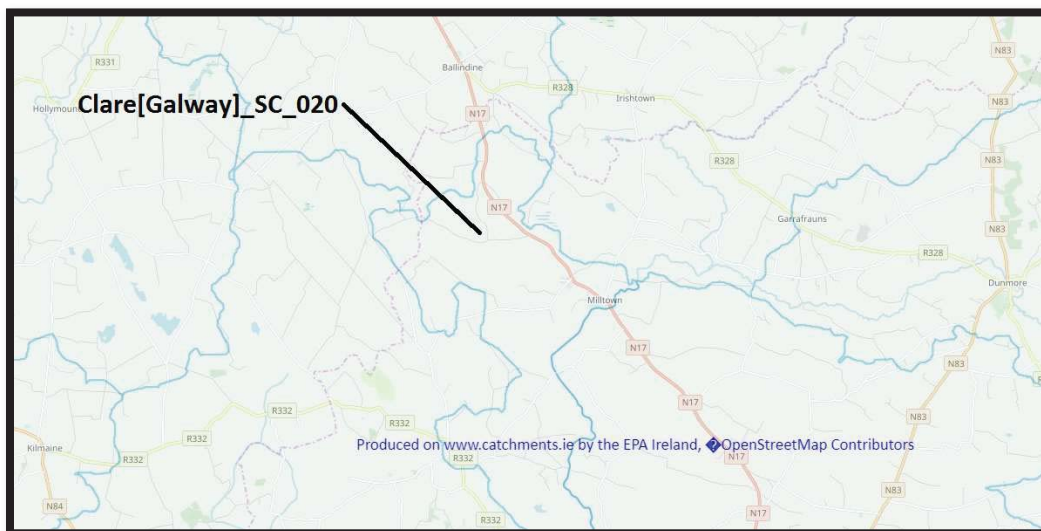


Fig 4.8: Subcatchment Area

4.1.2.2.3 Flooding

Information on flooding has been obtained from the OPW. This data illustrates the extent of a 1 in 10-year flood, 1 in 100-year flood and a 1 in 1,000-year flood and can be seen in Figure 4.9. We can interpret from the information that the proposed realignment does not fall within the flood plain of any of these three events.



Fig 4.9: Flooding Data

4.1.2.2.4 Water Quality

The EPA maintains a number of water quality monitoring stations in rivers and streams across Ireland. They assess the water quality of these water bodies using a biological assessment method and assigns biological river quality ratings from Q5 – Q1 to watercourse sections. Q5

denotes a watercourse with good water quality and high community diversity, whereas Q1 denotes a bad water quality and very low community diversity.

There are two monitoring stations within the study area which are located on the Clare River. One station, code RS30C010100, is located 1.5km upstream of Milltown and the second, code RS30C01200, is located at Liskeevy Bridge in Milltown. Data is available for both stations however, it is to be noted that the data from the Liskeevy Bridge station is from 1993 and has therefore been disregarded. Table 4.1 below details the current water quality status of the Clare River at monitoring stations RC30C010100.

River	Monitoring Station	Location	Q Value	Status
Clare River	RS30C010100	Br 1.5 km u/s Milltown	3-4	Moderate

Table 4.1: EPA River Monitoring Stations Data

4.1.2.2.5 Groundwater Vulnerability

Groundwater vulnerability has been evaluated using EPA data. This data shows that the majority of the scheme is located in an area where the vulnerability of the groundwater is described as Low. However, at the Southern end of the scheme, the vulnerability of the groundwater increases to Moderate, High, Extreme (E) and Extreme (X).

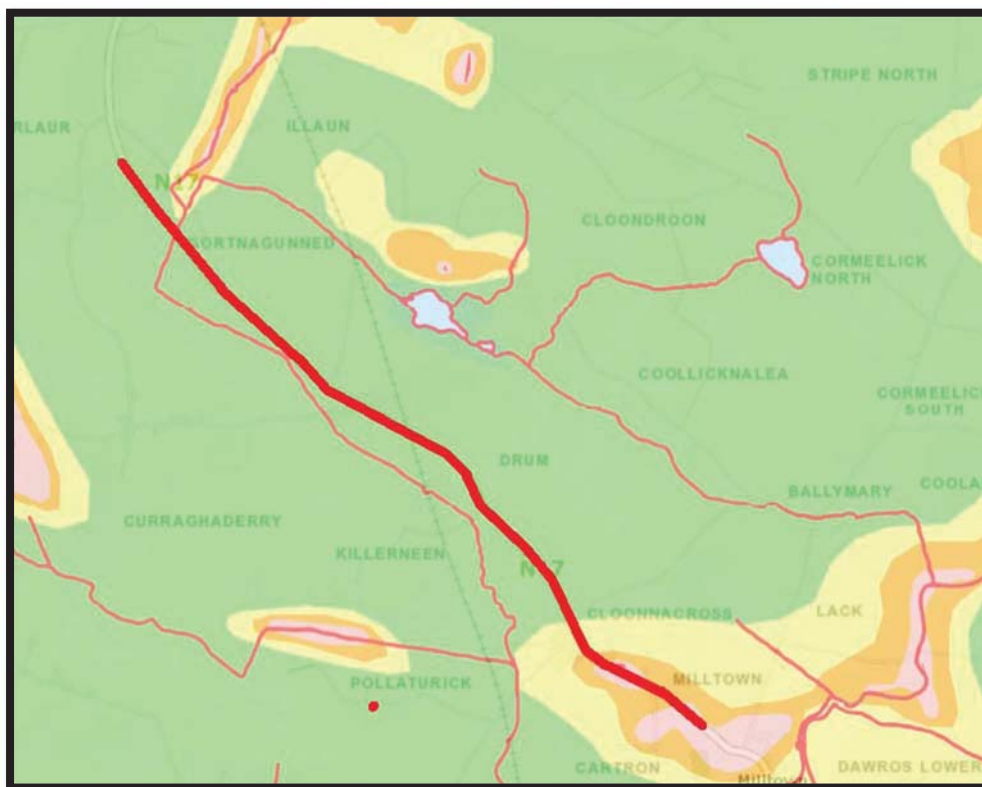


Fig 4.10: Groundwater Vulnerability

4.1.2.3 Hydrogeological

Several resources were examined during the undertaking of this study in order to determine the Hydrogeological constraints which may affect this scheme. These included:

- Ordnance Survey of Ireland
- Geological Survey of Ireland
- Environmental Protection Agency

4.1.2.3.1 Aquifers:

Aquifer data was collated from the online databases of Geological Survey Ireland (GSI) and the Environmental Protection Agency (EPA). These databases indicated that the study area is underlain by karstic groundwater bodies and the underlying aquifer is described as “Regionally Important Aquifer – Karstified (conduit)”

4.1.3 Ecology

As part of the preliminary design process, an Appropriate Assessment Screening was carried out and a report produced. This AASR findings are listed below:

- There will be no negative direct impacts or reduction in Annex I habitat area within any European Site.
- There will be no reduction in key habitats supporting populations of Annex I bird species and no reduction in the populations of Annex I species.
- There will be no reduction in key habitats supporting populations of Annex II species and no reduction in the population of Annex II species
- Any potential pathways for impact have been blocked through good design, best practice and a thorough investigation of the suitability of the lands for development of this type.
- The works themselves will involve little disturbance or disruption to the ecological processes in the area during either construction or operation.

The report concludes that:

“The proposed project, by itself or in combination with other plans and projects, in light of best scientific knowledge in the field, will not, in view of the sites’ conservation objectives, have significant effects on any European Site. There is no requirement for Appropriate Assessment.”

4.2 Description of Physical Constraints

The study of the Physical Constraints was undertaken with reference to TII Publications (Standards) in respect to the following:

- Archaeological
- Existing Road Network
- Traffic
- Railway Infrastructure
- Houses, Buildings and Other Structures
- Planning, Zoning and Land Use
- Utilities

- Construction Phasing
- Required Level of Service
- Technical Standards

4.2.1 Archaeological

Baseline information for the Study Area was gathered from the following sources of information:

- Record of Monuments and Places (RMP);
- Sites and Monuments Record (SMR);
- Register of Historic Monuments;
- First edition Ordnance Survey 6" mapping (1829-1841) and first edition Ordnance Survey 25" mapping (1897-1913) from www.irishhistoricmaps.ie;
- The National Inventory of Architectural Heritage (NIAH) for Galway;
- National Inventory of Architectural Heritage (NIAH) Survey of Historic Gardens and Designed Landscapes;
- List of Structures on the Record of Protected Structures for County Galway;
- Galway County Development Plan 2015-2021 for the Record of Protected Structures, Architectural Conservation Areas and relevant heritage policies.

The Study Area is bisected by the existing N17 and the area is generally rural, characterised by residential properties and agricultural land.

A total of three Recorded Monuments were identified within or in close proximity to our Study Area. These are presented in Table 4.2 below.

Reference No.	Legal Status	Townland	Description	Coordinates (ITM)
GA016:123	Recorded Monument	Milltown	Ringfort	540125, 763490
GA016:124	Recorded Monument	Milltown	Earthwork Enclosure	540345, 763210
GA016:016A	Recorded Monument	Cartron	Children's Burial Ground (Cilín)	540050, 763195

Table 4.2: Recorded Monuments

4.2.2 Existing Road Network

The existing road network is shown in Figure A01 in Appendix A and consists of 1 No. National Primary Road, the N17, passing through the centre of the Study Area with a series of Local Roads crossing the N17 at various locations. Local roads are presented in Table 4.3 below:

Road Name	Location (Chainage)	AADT	Description
L-22273	Ch 560	90	Local road serving the townland of Illaun
L-2227	Ch 610	220	Local road serving a number of townlands West of the N17
L-22087	Ch 1550	30	Local Road serving the Townland of Killerneen
L-6413	Ch 2285	80	Local Road serving the Townland of Cloonnacross
L-2208	Ch 2310	710	Local Road serving several townlands West of the N17 as well as several commercial and industrial units
L-64131	Ch 2790	(Unknown)	Cul-de-sac serving approximately 8 No. houses.

Table 4.3: Local Road Network

In terms of the cross-section, the existing road is sub-standard for a 100kph speed limit. The average lane widths in each direction are approximately 3.0m with no hard shoulder, little or no hard strip and limited verge space. Overall, the cross-section of the N17 in the Study Area could be considered as a Type 3 Single Carriageway.

4.2.3 Traffic

As part of Traffic Assessment for the Proposed Scheme and in order to derive estimates of Annual Average Daily Traffic (AADT) on the existing N17 and the connecting local roads within the Study Area, 12-hour Junction Turning Counts were undertaken at 6 No. locations and 7 No. Automatic Traffic Counter (ATC) were installed for a period of 14 days in November 2017. It was determined that base year (2017) AADTs ranged from 8680 at the Northern end of the scheme to 9320 at the Southern end in Milltown, with medium to high design year (2036) forecasts ranging from 9,700 to 10,650.

As stated in Section 4.1.2.2 above, the existing N17 road cross-section in the Study Area can be considered to be a Type 3 Single Carriageway. The AADT capacity for a Level of Service (LoS) D for a Type 3 is 5,000 AADT, as per Table 6.1: Recommended Rural Road Layouts of TII Publications "Rural Road Link Design", DN-GEO-03031. Therefore, the existing N17 within the Study Area is currently operating above capacity, below LoS D.

In relation to road collisions, the RSA's Online Map of Collisions in Ireland was examined. This map containing collision data from 2005 to 2014. A total of 10 No. minor Road Traffic Collisions occurred within the Study Area during this 10-year period.

4.2.4 Railway Infrastructure

Existing Iarnród Éireann infrastructure, including railway lines and level-crossings, within the Study Area is shown in Figure 4.11 below.

The currently abandoned Galway – Sligo railway runs through the Study Area with a series of intersections between the railway and the road network. These intersections include 4 No. level crossings at locations LC1, LC2, LC3 and LC4 and an overbridge at location OB1 as per Figure 4.11 below.

Although the railway is currently not in use, it forms part of the Western Rail Corridor which is referenced in National, Regional and Local Policy documents as an important infrastructural project for the growth of the West Region. It is therefore important to maintain minimal conflicts between the proposed scheme and the existing railway.

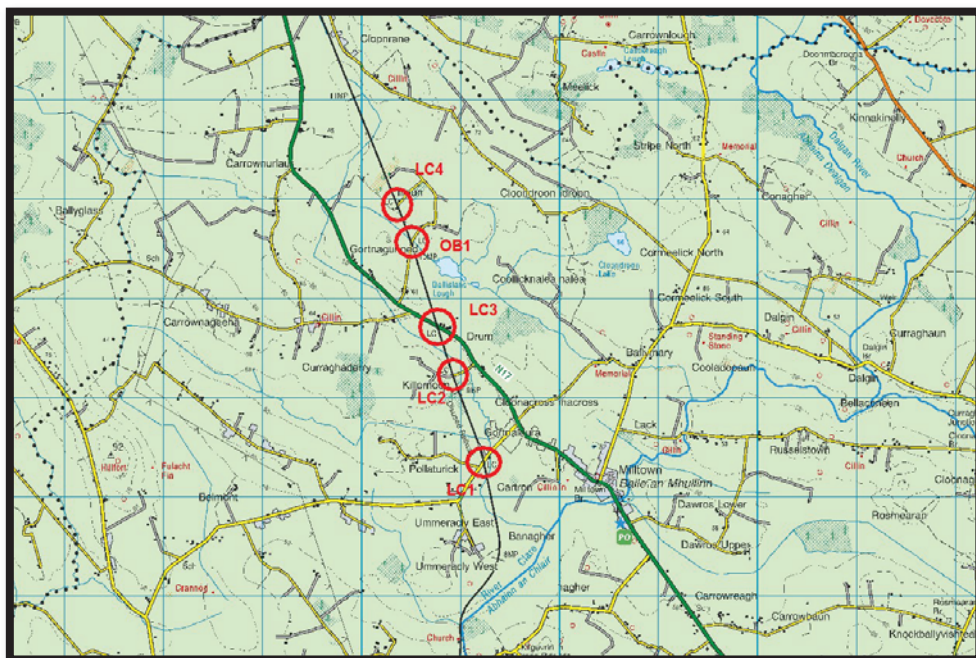


Fig 4.11: Railway Infrastructure

4.2.5 House, Buildings and Other Structures

The main building types in the Study Area are dwelling houses and farm structures, and are presented in Figure A2 in Appendix A. The area is characterised mainly by scattered, single dwellings along the existing N17, with clustered development at the south end of the study area within the town of Milltown.

The land holdings are smaller in the vicinity of Milltown, and tend to be larger outside this area. All the landowners on the existing N17 have curtilage onto the road.

With reference to Figure A2 there are a number of commercial, agricultural and social buildings within the Study Area. These include:

- Milltown Community Centre (Northern End of Milltown)

- Service Garage
- N17 Superstore and Mr. Price located on the N17 with access from the L-2208.
- Industrial Units located in the townland of Gortnaloura with access from the L-2208.

It is desirable to plan routes that affect the least number of landowners and businesses while severance is also an important consideration and this should be minimised when planning route options. Where this cannot be done, however, it may be necessary to provide alternative access or to purchase additional land that would become severed from the owner's main holding.

4.2.6 Planning, Zoning and Land Use

As well as existing properties, discussed in Section 4.1.2.5, potential future property developments are to be treated as major constraints. As part of the Constraints Study, a search of existing planning applications within the Study Area from 2007 to present was undertaken. The search yielded 1 No. open planning application within the Study Area. This application, for the construction of a domestic garage with all necessary site works, was granted on 6th June, 2016, however no works have been carried out to date. The proposed development will not be considered a constraint as it is located a minimum of 28m from the proposed road edge.

A location plan of relevant planning applications within the Study Area is provided in Figure A.3 in Appendix A.

In relation to land zoning within the Study Area, Galway County Development Plan 2015 - 2021 do not specify any particular land zoning objectives for Milltown or other areas within the Study Area. There is no Local Area Plan for Milltown. The nearest Local Area Plan is the *Tuam Local Area Plan 2018 - 2024*, which does not include Milltown or any other Townlands within the Study Area.

Regarding land use, the majority of the land within the Study Area is agricultural. Residential and commercial development is concentrated at the Southern end of the Study Area along the existing N17 as outlined in Section 4.1.2.5 above. Figure A4 in Appendix A contains information on Land Use within the Study Area.

4.2.7 Utilities

As part of the Constraints Study, updated utility record drawings were requested from all known service providers. The following existing public utilities have been identified within the Study Area and are shown on Figures A05 – A07 in Appendix A:

- Eircom Telecommunications;
- Group Water Schemes; and
- ESB Networks.

Please note that Bord Gáis were consulted in this process and informed GCC that there were no Gas services within the Study Area.

4.2.7.1 Eircom

The southern end of the scheme, from the L-2208 to Milltown, contains a combination of underground and overhead Eircom services. The services are generally underground in the grass verge or the hard shoulder with connections to dwellings running overhead from poles located next to junction boxes. The remainder of the services are overhead and are generally located adjacent to the existing N17 and existing side roads within the Study Area.

The services cross the existing N17 at 4 No. locations, which are listed below.

- L-2227, Ballyglass Road, Ch 700
- L-22087, Killerneen Road, Ch 1540
- L-2208, Kilconly Road, Ch 2300
- L-64131, Cul-de-sac, Ch 2770

4.2.7.2 Water Services - Group Water Scheme

Maps of the Group Water Schemes have been obtained from the GWS Committee and can be seen in Figure A06 in Appendix A. The maps are large scale plans of the entire scheme which indicate that the watermains are located within the existing roads, however there is no indication as to the exact location of the watermains.

- L-22271, Illuan Road, Ch 560
- L-2227, Ballyglass Road, Ch 700
- L-22087, Killerneen Road, Ch 1540
- L-2208, Kilconly Road, Ch 2300
- L-64131, Cul-de-sac, Ch 2770

4.2.7.3 ESB

There are no ESB Transmission High Voltage Cables within the Study Area. There are a number of ESB Networks MV and LV overhead cables in the Study Area which are generally offset from the existing N17 and within adjacent landowners' fields. The MV cables cross the existing N17 at a number of locations within the Study Area, which are listed below:

- Ch 360
- Ch 840
- Ch 1660
- Ch 2220
- Ch 2360
- Ch 2480
- Ch 2620
- Ch 2755

It is noted that the ESB Networks drawing do not show localised connections to properties but these are considered a minor constraint.

4.2.8 Construction Phasing

The phasing of construction works is considered to ensure that the proposed scheme can be constructed within the known limits. Traffic management will be an integral component of the construction process owing to the likelihood that a proportion of the scheme will be online. There may be some temporary disruption to accesses but it is anticipated that this will not be significant.

The need for full or partial road closures has not been determined as part of the Preliminary Design Process, however, if any such closures are deemed necessary, they will only be permitted subject to prior agreement with Galway County Council and an Garda Síochána.

Consideration needs to be given to the utility diversions / protection and whether these will be undertaken in advance of the main works. It is anticipated that some of the utility diversions can be carried out in advance, but some will be undertaken in conjunction with the main works due to the nature of the cut and fill locations.

As part of the phased construction plan, particular attention will be paid to level crossings, junctions and adjacent railway line sections. Temporary roads may be necessary but these will be considered further during the Design Stage.

An area has yet to be identified for the storage of construction fill material. This will be decided once the preferred route option is determined.

4.2.9 Required Level of Service

The overall target of the National Roads Needs Study (1998) is for the development of the National Road System in order to ensure that no section of the network would fall below “Level of Service D” (LoS D) equivalent to an inter- urban travel speed of 80km/h.

4.2.10 Technical Standards

Technical design standards will impose geometric constraints on the proposed scheme and will influence the alignment of the route options. The applicable technical standard in this case are the TII Publications (Standards). The following publication and standards are applicable to the design of the mainline, side roads and accesses:

- DN-GEO-03031 Rural Road Link Design
- DN-GEO-03036 Cross Sections and Headroom
- DN-GEO-03060 Geometric Design of Junctions (priority junctions, direct accesses, roundabouts, grade separated and compact grade separated)

The required cross-section for the proposed Scheme is a Type 1 Single Carriageway. This comprises a 7.3m carriageway, 2.5m hard shoulder and verges of typically 3m. The design speed is 100km/h.

Chapter 5 **Consideration of 'Do-Nothing' and 'Do Minimum' Alternatives**



5 Consideration of “Do Nothing” & “Do Minimum Alternatives”

5.1 Summary of Alternatives

This chapter considers the ‘Do-nothing’ and ‘Do-minimum’ scenarios which are defined in the Project Management Guidelines as being:

“The Do-Nothing alternative shall comprise an investigation of the existing road infrastructure and its ability to meet future demands for traffic and safety without any upgrade works”

“The Do-Minimum alternative will generally comprise an investigation of the feasibility of an on-line upgrade of the existing route that would be capable of delivering the required levels of service and safety in accordance with the applicable design standards”.

5.2 “Do Nothing” Option

The “Do-Nothing” option examines the existing road network, traffic conditions and road safety to determine if the existing road infrastructure has the ability to meet future traffic demands while maintaining safety without any upgrade works. This has been investigated in the following sections.

5.2.1 Existing Road Network

The existing N17 within the study area comprises of a single carriageway with narrow hard strips at the carriageway edge. The average lane widths in each direction are approximately 3.0m with no hard shoulder, limited verge space and unforgiving roadsides. Overall, the cross section of the road within the Study Area is sub-standard for a 100kph speed limit.

In terms of horizontal and vertical alignment, there are a number of bends that fall below the desirable minimum as set out by TII Publications. An analysis has been carried out on the study area and this shows that 70% of the horizontal curves are substandard and 86% of the vertical curves are substandard.

There are a number of junctions within the study area and a high number of direct accesses. Junctions are laid out as priority junctions with no provision of ghost islands or nearside passing bays. This can lead to tailbacks, when vehicles attempt to turn right during peak flows, as vehicles approaching from behind have no opportunity to safely pass the stationary, turning vehicle. In terms of direct access, there are a total of 70 No. split between field access (40 No.) and private access (30 No.). As with the junctions, there is no opportunity for vehicles to safely pass a stationary vehicle awaiting an opportunity to complete a right turning movement.

As previously mentioned, the horizontal and vertical alignment of the carriageway is sub-standard for a 100kph road. This, in turn, leads to issues with stopping sight distance and overtaking opportunities. The minimum stopping sight distance of 215m is not achieved along

approximately 50% of the route. The overtaking value achieved is approximately 15%, which is substantially below the requirement of 50% for Type 1 single carriageways.

5.2.2 Traffic

The main source of traffic data for the route is the permanent automatic traffic counter located in the townland of Kilcloony, south of Milltown. For the year 2017, the AADT was recorded as 8,402 vehicles, of which 4.5% were heavy goods vehicles. A comprehensive set of traffic surveys was carried out over 14 days in November 2017, throughout the study area, and these counts indicated an AADT equivalent to 9,300. A design speed calculation was carried out for the rural section of the N17 under consideration and the results indicated that the design speed of the existing road is just 85kph. Overall, in terms of traffic, it is clear that the route operates at a poor level of service.

5.2.3 Road Safety

Historic accident records for the route have been obtained from the Road Safety Authority (RSA). These records show that between 2005 and 2014, there were a total of 10 minor accidents on this section of the N17. The TII collision rates have also been reviewed and these show that the accident rate for one third of the scheme is twice the expected collision rate while the remainder is twice below.

The data highlights that the sub-standard geometry of the route, particularly in terms of horizontal alignment, is the main cause of accidents, with 70% of all accidents occurring on bends.

5.2.4 Conclusion

Given the sub-standard layout and the poor level of service in terms of traffic and road safety the Do-nothing scenario is not capable of achieving the scheme objectives either now or in the future, as described in the above sections.

5.3 Do-Minimum

Sections of the existing route have been examined to see if a Do-minimum scenario could be identified that comprises upgraded sections that would be “capable of delivering the required levels of service in accordance with appropriate design standards”. However, given the extensive sections of sub-standard geometry, those with limited overtaking opportunity, the urban sections and generally high frequency of junctions, no feasible “low-cost” solution was identified as a do- minimum. It was therefore decided that a full upgrade within the existing corridor should be considered as an option and directly appraised against other off-line scenarios. The on-corridor upgrade, known as the Option 1, is further described in Chapter 6.

For assessment purposes, all options are therefore compared against the Do-nothing, with the Do-minimum being equivalent to the Do-nothing.

Chapter 6

Preliminary Options Assessment



6 Preliminary Options Assessment

6.1 General Introduction

As outlined in the Forward to this Report, the current *TII Project Management Guidelines (2010)* relate to 'Major Road Schemes' as defined by the Major Projects Unit of the TII as projects with a value over €20m. The realignment of the N17 Milltown to Gortnagunned Scheme has an estimated cost of less than €20m so is not considered a Major Project. Therefore, only those elements of the *TII Project Management Guidelines (2010)* which are required and considered necessary in order to arrive at the optimum solution have been adopted in relation to the consideration and recommendation of a preferred option in relation the N17 Milltown to Gortnagunned Scheme, in this Report.

Under Phase 2 (Route Selection) of *the TII Project Management Guidelines (2010)*, the appraisal is outlined as a 3 Stage Process. These three stages are as follows:

- Stage 1: Preliminary Options Assessment
- Stage 2: Project Appraisal of Route Options
- Stage 3: Selection of a Preferred Route Corridor

For the purposes of this report, a more concise and focused approach has been adopted, whereby Stages 1 and 2 have been combined into a singular appraisal process, with Stage 3 being maintained. These are considered in sections 6 and 7 of this report, respectively.

The Options Appraisal below has assessed the Route Options in context of the following Criteria:

- Environment;
- Engineering;
- Safety; and
- Economics.

6.2 Feasible Route Options Identified

Four feasible route options were initially established, taking into consideration known constraints and maximising the size of the study area investigated. These corridors were created to allow the development of a high standard road whilst minimising the impact on properties and known cultural and environmental constraints. To aid in the comparison of the corridors, each was assigned a colour (Yellow, Blue, Red and Magenta) with each of the options commencing at the end of the Carrownurlaur realignment to the north of the study area and terminating at the traffic calming in Milltown village. Figure A8 in Appendix A indicates the route corridor options that have been assessed and that are introduced below.

- Option 1 follows the existing road and this is the Do-Minimum scenario.
- Option 2 is partially off-line and would involve demolition of 3 No. existing houses at Ch. 1700, Ch. 2460 and Ch 2500
- Option 2A is also partially offline and would involve demolition of 2 No. existing houses at Ch 2460 and Ch 2500.
- Option 3 is largely off-line. The route will go at the back of two house at Ch.1550 and Ch. 1700 and will involve the demolition of 2 No. existing house at Ch. 2260 and Ch. 2450

6.3 Management Option

The Common Appraisal Framework (Department of Transport, June 2016) requires consideration of a “Management versus Investment option” as part of the options appraisal process for transport projects. This option is described as follows:

“Investment options will not always represent the most appropriate response to identified needs or objectives. Non-infrastructure options such as regulatory change, provision of improved information, changes to land use planning, bottleneck improvements, road safety works, fiscal or control measures, Intelligent Transport Systems or investment in other modes should always be considered before the major investment options are appraised.”

In terms of this project the “management option” has been identified arising from the consideration of the existing route, as described in Chapter 5. The Yellow corridor, Route Option 1, offers the only means to achieve the scheme objective through maximising use of the existing road infrastructure. As described above the Yellow option does incorporate extensive works, similar in scale to other “do-something” options, in order to achieve the design standard appropriate for a strategic national route. Appraisals of the yellow corridor are contained later in this chapter.

6.4 Assessment of the Route Corridor Options

In accordance with the TII Project Management Guidelines, each option has been assessed against **Engineering, Road Safety, Environment and Economy** criteria. These criteria have been subdivided into a number of quantifiable parameters, as described below.

6.4.1 Findings from Public Consultation and consultation with Public bodies.

An initial, informal Public Consultation was carried out throughout June and July 2018 in the form of a visit to the homes of affected landowners by an Engineer from Galway County Council. These meetings provided an opportunity for early engagement with those directly affected by any of the proposed route options, with the current conditions on the road and a perception that it was not fit for purpose proving to be a major point of discussion. There were concerns in regard to impacts the routes will have on pockets of land and other properties owned or occupied along the routes, however the general consensus was that the progression of the scheme would be a positive step and strong support was acknowledged.

Consultation was also undertaken with other stakeholders such as Local Councillors, Iarnród Éireann, Inland Fisheries Ireland, OPW and Utility Suppliers, with findings below.

- Local Councillors
 - Strong desire for project to progress
- Iarnród Éireann
 - Requested that no additional level crossings be constructed within the study area.
- Inland Fisheries Ireland
 - No comment
- OPW
 - No comment
- Utility Suppliers
 - No comment

A formal Public Consultation was held on 18th December, 2018 in the Milltown Community Centre, where Options 1, 2 and 3 were presented to the public, with Option 2 being highlighted as the emerging preferred route. The meeting was advertised in the local print media, on Galway Bay FM, and through Galway County Council's social media accounts, while landowners also received a letter notifying them of the meeting. This was reflected in the strong turnout with 34 people signing the attendance register, however the actual attendance was estimated to be closer to 45. An overwhelming amount of support for the scheme was evident throughout the evening along with a general consensus that Option 2 would be the most preferred option. An item that continually popped up during the evening was a strong desire from the local community for the existing footpaths to be extended to the N17 - L2208 junction (junction at the N17 Superstore). This was viewed as a majorly positive step in improving safety for pedestrians and cyclists travelling to the commercial and industrial units at this junction and also for children walking and cycling to the school located on the L2208.

6.4.2 Engineering Assessment

In accordance with the *TII Project Management Guidelines 2010 Appendix 2.4 Checklist for Preliminary Options Assessment (Engineering & Environmental)*, the following engineering aspects have been considered for the engineering appraisal and are described in Sections 6.4.2.1 to 6.4.2.11

- Traffic Assessment and Road Cross Section;
- Technical Standards;
- Junctions, Access and Interaction with Existing Network;
- Structures
- Geology & Hydrogeology;
- Earthworks;
- Drainage;
- Construction;
- Services Conflicts;
- Land and Property;
- Impact on Iarnród Éireann Infrastructure

With regard to the importance of safety placed on the appraisal of the chosen route, weightings have been applied proportionately to some of the sections within the Engineering appraisal. Junction, Access and Interaction with Existing Network has been weighted by a higher factor of 2 while Services Conflicts has been weighted by a lower factor of 0.5. A Stage F Road Safety Audit has been undertaken and findings are included in the Safety appraisal, given in Section 6.4 of this report.

6.4.2.1 Traffic Assessment and Road Cross-Section

6.4.2.1.1 Traffic Assessment

A Traffic Model was not undertaken as part of the Traffic Assessment, instead a basic Cost Benefit Analysis (COBA) Network was constructed for the purposes of forecasting and CBA. This approach was chosen as an examination of the existing road network within the Study Area concluded that no reassignment of traffic would result from the scheme. Therefore, the traffic flow forecasts are the same under both the Do-Minimum Alternative and Do-Something Alternatives (Options 1–3). A traffic count was carried out in November 2017 and the results from this were used in the analysis.

The base year for the network is 2017. The opening year is 2022 and the design year is 15 years following this at 2037. The traffic growth from the base year 2017 to the opening year, 2022, and design year 2037 was completed in accordance with the Project Appraisal Guidelines 2011, Unit 5.5 Link-Based Traffic Growth Forecasting. Factors of Low, Medium and High growth scenarios were applied.

Base Year AADT values and % HGVs are outlined in **Table 6.1** below and Design Year AADT values are shown in **Table 6.2** for low growth, medium growth & high growth for each link road on the various options.

Link Road Name/Ref.	AADT	% HGV's
N17 –North of Milltown	9300	4.5%
L-2208-0	800	6.7%
L-2227-11	600	5.0%
L-6413-0	200	3.5%
L-22273-0	700	4.5%

Table 6.1: Base Year AADT (2017) and % HGVs

Note: Traffic flows are rounded to the nearest 100 vehicles on the N17 and to the nearest 50 vehicles on local roads.

Year	Low Sensitivity Growth AADT		Central Growth AADT		High Sensitivity Growth AADT	
	AADT	HGV's	AADT	HGV's	AADT	HGV's
2036	9,750	600	10,400	650	10,650	650

Table 6.2: Design Year AADT (2036) Low Growth, Medium Growth & High Growth for N17

6.4.2.1.2 Road Cross-Section

The capacity of a roadway, its cross section and the passing sight distance along the Route Corridor Option are determined from the desired Level of Service (LoS) of the route. LoS, as defined in the *National Road Needs Study 1998*, has six levels ranging from A to F. LoS A is essentially free flow operation and LOS F indicates breakdown in vehicular flow.

The cross section proposed for all Route Corridor Options is a Type 1 Single Carriageway Cross Section with hard shoulders. Operating at LoS D, the capacity of a Type 1 Single Carriageway is 11,600

AADT as outlined in *Table 6.1: Recommended Rural Road Layouts of TII Publications “Rural Road Link Design”, DN-GEO-03031.*

The forecasted traffic indicates that in all growth scenarios, Low, Medium and High, a Type 1 Single Carriageway is the optimum choice for each route options.

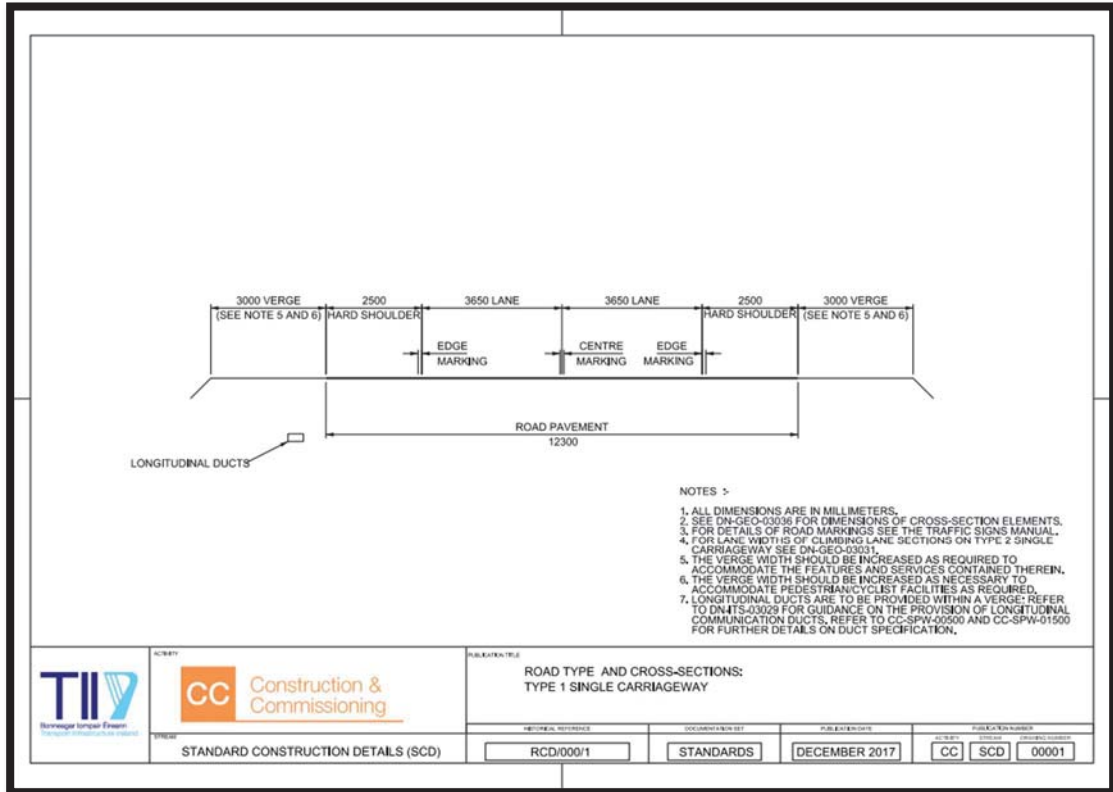


Figure 6.1: Type 1 Single Carriageway

6.4.2.1.3 Conclusion

In relation to traffic flows, as stated above, the reassignment of traffic flows has not been considered for any options and AADT growth forecasts are the same for the Do-Minimum and Do Something (i.e. Options 1 – 3) Alternatives. In relation to travel times, although Options 1, and 2 will have slightly longer journey times than Options 3, this cannot be considered a differentiator under the Traffic Assessment Heading. Therefore, for the purposes of this assessment, all route options have been given the same preference in **Table 6.3** below.

Route	Overall Rating
Option 1	Same Preference
Option 2	Same Preference
Option 2A	Same Preference
Option 3	Same Preference

Table 6.3: Traffic Assessment Summary

6.4.2.2 Technical Standards

The Route Corridor Options are designed in accordance with the TII Publications (Standards), in particular, “*Road Link Design*” DN-GEO-03031, “*Cross Sections and Headroom*” DN-GEO-03036 and “*Geometric Design of Junctions (priority junctions, direct accesses, roundabouts, grade separated junctions and compact grade separated junctions)*” DN-GEO-03060. The principal geometric parameters used in the design of the Route Corridor Options are summarised in Table 6.4 below. Reference is to be made to Route Option Alignment Drawings provided in Appendix A of the Report.

Design Heading	Design Element	Design Requirement	Standard Ref.
Road Type	Road Type	All Purpose Road	TII DN-GEO-03031
Design Speed	Alignment Constraint Ac	100kph	Paragraph 1.1.1 TII DN-GEO-03031
	Layout Constraint Lc	100kph	Paragraph 1.1.2 TII DN-GEO-03031 Table 1.1 TII DN-GEO-03031
LoS	Level of Service	Los D	TII Needs Study 1998
Sight Distance	Stopping Sight Distance	215m	Table 1.3 TII DN-GEO-03031
	Full Overtaking Sight Distance	580m	Table 1.3 TII DN-GEO-03031
Horizontal Alignment	Road Camber	2.50%	Paragraph 3.1 TII DN-GEO-03031
	Superelevation Range	2.5% < S < 7.0%	Paragraph 3.2 TII DN-GEO-03031
	Min. R without Superelevation	2040m	Table 1.3 TII DN-GEO-03031
	Min. R superelevation of 5%	720m	Table 1.3 TII DN-GEO-03031
	1 step below Desirable Min. R with superelevation 7%	510m	Table 1.3 TII DN-GEO-03031
Vertical Alignment	Minimum crest K	100	Table 1.3 TII DN-GEO-03031
	1 Step below Min. crest K	55	Table 1.3 TII DN-GEO-03031
	Minimum Sag K	37	Table 1.3 TII DN-GEO-03031
	1 Step below Min. sag K	26	Table 1.3 TII DN-GEO-03031
	FOSD Overtaking crest K	400	Table 1.3 TII DN-GEO-03031
	Desirable Max Gradient: S2	5%	Paragraph 4.1.1, TII DN-GEO-03031
	1 Step below Des. Max. Gradient	6%	Paragraph 4.1.2, TII DN-GEO-03031
	S2 Minimum Gradient	0.50%	Paragraph 4.1.3, TII DN-GEO-03031
Cross Section and Headroom	Cross Section		Table 3.2, TII DN-GEO-03036
	Headroom (Road over Road)		Table 5.1, TII DN-GEO-03036
Junctions	Permitted Junction Types (S2)	Simple	Table 5.1, TII DN-GEO-03060
		Ghost Island	Table 5.1, TII DN-GEO-03060
		Roundabout	Table 6.1, TII DN-GEO-03031

Table 6.4: Principal Geometric Standards for the Scheme

Route Option 1, the “Do-Minimum” option, contains the most departures. The route closely follows the line of the existing N17 and this leads to issues with full overtaking sight distance. It also has departures surrounding direct access onto the route with a total of 60nr accesses exiting directly onto the route.

Route Options 2, 2A and 3 are the most preferred options. Neither option has any departures in regard to its vertical or horizontal alignment. Departures associated with these options are confined to those surrounding direct access onto the route. Route Option 2 has a total of 52nr direct accesses, Route Option 2A has 50nr direct accesses and Route Option 3 has a total of 51nr direct accesses.

6.4.2.2.1 Conclusion

For the purposes of ranking the route options in terms of Technical Standards, the total number of departures for each route option has been taken as the deciding factor.

The preference ratings in terms of Technical Standards are provided below in **Table 6.5**

Route	Route Option 1	Route Option 2	Route Option 2A	Route Option 3
Overall Rating	Low Preference	High Preference	High Preference	High Preference

Table 6.5: Technical Standards Assessment Summary

6.4.2.3 Junction, Access and Interaction with Existing Network

TII DN-GEO-03060 *Geometric Design of Junctions (priority junctions, direct accesses, roundabouts, grade separated and compact grade separated junctions)* Section 4 outlines the junction strategy guidelines to be adopted on two-way single carriageway roads. A junction strategy should provide drivers with layouts that have consistent standards and are therefore not confusing. The requirement to provide the most appropriate form of junction, based on operational, economic and environmental considerations, must be balanced with the need to maintain consistency of junction type though the scheme.

Lengths of Type 1 Single Carriageway should, therefore, not involve many different junction layout types. The junction strategy adopted for these roads during the detailed design stage will have to take account of the following factors:

- Safety
- Design Standards
- Maintenance of Existing Road Network

In addition to the above, the junction strategy should seek to minimise the number of direct accesses onto a scheme. TII DN-GEO 060601 Section 5.5 states that “The overriding principle is that vehicular access onto national roads shall be avoided as far as possible.

In the case of Single Carriageway Roads, the recommended junction treatments are Priority Junctions (with ghost islands where necessary) and Roundabouts. With reference to the Route Option Alignment Drawings in Appendix A, the proposed number of junctions with the existing roads for each route option is provided below in **Table 6.6**. It is noted that existing road network within the Study Area has been described in Section 4.2.2.

Option	No. of Junctions	Location of Junction
1	6	1) L-22271 @ Ch 560
		2) L-2227 @ Ch 700
		3) L-22087 @ Ch 1550
		4) L-6413 @ Ch 2280
		5) L2208 @ Ch 2320
		6) L 64131 @ Ch 2790
2	7	1) L-22271 @ Ch 560
		2) L-2227 @ Ch 730
		3) L-22087 @ Ch 1550
		4) N17 @ Ch 2090
		5) L-6413 @ Ch 2260
		6) L2208 @ Ch 2300
		7) L 64131 @ Ch 2760
2A	7	1) L-22271 @ Ch 550
		2) L-2227 @ Ch 720
		3) N17 @ Ch 1050
		4) L-22087 @ Ch 1530
		5) L-6413 @ Ch 2250
		6) L2208 @ Ch 2300
		7) L 64131 @ Ch 2760
3	7	1) L-22271 @ Ch 560
		2) L-2227 @ Ch 720
		3) N17 @ Ch 1100
		4) L-22087 @ Ch 1550
		5) L-6413 & N17 @ Ch 2200
		6) L2208 @ Ch 2300
		7) L 64131 @ Ch 2770

Table 6.6: Number of Junctions for Existing Roads on the Route Options

The number of direct accesses on the Route Options is provided in Table 6.7 and 6.8. In summary, the highest number of accesses is associated with Option 1 with it being a primarily online solution. Option

2, Option 2A and Option 3 all have a similar number of direct accesses and a similar split between field and private accesses.

Route	Total No. of Accesses	Split of Total No.			
		No. of Field Accesses	% Field Accesses	No. of Private Accesses	& of Private Accesses
Option 1	60	35	58%	25	42%
Option 2	52	30	58%	22	42%
Option 2A	50	31	62%	19	38%
Option 3	51	33	65%	18	35%

Table 6.7: Number of Direct Accesses on the Route Options

Route	Total No. of Accesses	Total No. of Junctions
Option 1	60	6
Option 2	52	7
Option 2A	50	7
Option 3	51	7

Table 6.8: Summary Table of Proposed Junctions & Direct Accesses on the Route Options

6.4.2.3.1 Conclusion

For the purposes of ranking the route options in terms of Junctions, Accesses, and Interaction with the Existing Network, the total number of proposed junctions and the total number of direct accesses for each route option has been taken as the deciding factors. As safety is of particular concern for this scheme, this section of the Engineering Appraisal has been weighted by a factor of 2; therefore, the preference score given for this section is worth double that of other sections.

When considering the proposed junctions and accesses in combination, Option 1 was given a low preference due to a higher number of accesses and proposed junctions. Option 2, Option 2A and Option 3 were given a High preference as, although they have an additional junction to Option 1, they have significantly less direct accesses.

Route	Overall Rating
Option 1	Low Preference
Option 2	High Preference
Option 2A	High Preference
Option 3	High Preference

Table 6.9: Summary Table of Proposed Junctions & Direct Accesses on the Route Options

6.4.2.4 Structures

There are no significant existing bridges along the N17 within the Study Area while no underpasses exist primarily due to the large presence of direct field accesses.

A number of structures have been considered as part of the outline design. These structures mainly consist of crossings of watercourses, in the form of drainage ditches, and should not be overly significant. However, Route Option 1 could potentially involve the construction of a retaining wall at approximate Ch 2550. These are subject to change as the development of the design progresses. Table 6.10 outlines proposed structures which may be required.

Route	Underpass	Retaining Walls	Culverts / Watercourse Crossing
Option 1	0	1	7
Option 2	0	0	7
Option 2A	0	0	7
Option 3	0	0	13

Table 6.10: Proposed Structures

6.4.2.4.1 Conclusion

Option 2 and Option 2A have been assigned a medium preference as they require 7 No. culvert and watercourse crossings. Option 1 has been given a low preference as, although it too has 7 No. culvert and watercourse crossings, it could potentially require construction of a retaining wall. Option 3 has also been assigned a low preference as this route will require a total of 13 No. culvert and watercourse crossings. Preference rankings for each route option are provided in the table below.

Route	Overall Rating
Option 1	Low Preference
Option 2	Medium Preference
Option 2A	Medium Preference
Option 3	Low Preference

Table 6.11: Structures Summary

6.4.2.5 Geology and Hydrogeology

Peat and soft ground across the Study Area will require treatment, before construction of any of the routes, where it is encountered. Treatment of the ground will depend largely on the thickness and extent of the deposits and also on the nature of the proposed earthworks at that location. Options for treating peat or soft ground include stripping and removal of the deposits, soil improvement by mixing in-situ, or ground treatment by reinforcement using geogrid and/or geotextile. Where the peat is of significant thickness (greater than about 3-4m), it is anticipated that the new road construction will need to be piled in order to limit settlements (both total and differential). For thinner peat deposits, it would generally be more economical to either excavate and replace the peat or use soil mixing to improve the strata. It is anticipated that full settlement of any soft deposits under the existing route will already have occurred, however any road widening will be subject to additional, differential settlement.

In general, the limestone tills are likely to vary significantly in gravel, sand and clay content across the site and possess a wide variety of permeabilities. The thickness of the deposits is also likely to vary significantly due to the nature of the underlying bedrock. Although these deposits may not pose a general engineering issue with respect to cuttings and embankments, the nature and variation of the deposits along the proposed route should be investigated carefully should any specific area require treatment.

It is anticipated that any karstic features within the limestone outcropping at the surface along the current route will have been encountered and treated during construction of the existing road, or any subsequent failures will have been remediated. However, it should be noted that the additional loading due to widening, and particularly along sections of new embankment, may generate new areas of weakness within the karstic material.

All of the limestone bedrock likely to be encountered within the Study Area has the potential to be karstified. This should be investigated thoroughly along the proposed route, including widening of the existing route. Any features or significant areas of weakness encountered will require treatment before construction. Options for treating karst features should be considered carefully due to the significance of the limestones as regionally and locally important aquifers. In this respect, conventional backfilling or grouting up of any voids or sinkholes may not be appropriate and geogrid/ geotextile mattresses may be required to bridge the areas of weakness.

6.4.2.5.1 Conclusion

Based on the information available within the constraints study, it is anticipated that all of the proposed routes will encounter Cutover Peat and Limestone Till over potentially karstified Carboniferous Limestone at depth. All of the proposed routes have the potential to encounter karstic limestone outcropping at the surface.

The following summary of route options in **Table 6.12** is based exclusively on the potential impact of the various ground conditions likely to be encountered and the amount of earthworks anticipated along that route.

Route	Peat / Soft Ground	Limestone Till	Surface Karst Features	Potentially Karstified Bedrock
Option 1	Moderate	Moderate	Moderate	Moderate
Option 2	Moderate	Moderate	Moderate	Significant
Option 2A	Moderate	Moderate	Moderate	Significant
Option 3	Significant	Significant	Moderate	Significant

Table 6.12: Impact of Route Options on Existing Ground Conditions

Note: It is to be noted that while the extent of the earthworks along the existing Route Option 1 is significantly reduced compared to the other routes, differential settlement may be a significant issue along the route due to the existing road having already settled.

The three route options have been assessed against the anticipated ground conditions likely to be encountered along each route. The results of the assessment are summarised in **Table 6.13**

Route	Peat / Soft Ground	Limestone Till	Surface Karst Features	Potentially Karstified Bedrock	Overall Rating
Option 1	High Preference	High Preference	High Preference	High Preference	High Preference
Option 2	High Preference	Medium Preference	Medium Preference	Low Preference	Medium Preference
Option 2A	High Preference	Medium Preference	Medium Preference	Low Preference	Medium Preference
Option 3	Low Preference	Low Preference	Medium Preference	Low Preference	Low Preference

Table 6.13: Geology and Hydrogeology Assessment Summary

6.4.2.6 Earthworks

The gross quantities of cut and fill for each Route Option are outlined in **Table 6.14**

For the purposes of presentation of the earthworks balance below in **Table 6.14**, all excavated material is considered to be reusable. Once selected, the Preferred Route Option will undergo a detailed topographical and ground investigation survey and the design will then be re-examined in detail to investigate whether the alignment can be adjusted to improve the earthworks balance.

Route Option	Cut (m3)	Fill (m3)	Balance (m3)	Location of Significant Cut		Location of Significant Fill	
				Chainage	Approx. Depth	Chainage	Approx. Depth
Option 1	62,410	8,590	53,820	-	-	-	-
Option 2	43,400	29,200	14,210	460 - 1010	4	1310 - 1480	3
				-	-	1730 - 1980	4
Option 2A	31,640	33,123	-1,480	360 - 760	4	1110 - 1400	4
				-	-		
Option 3	45,740	27,190	18,550	-	-	370 - 520	3
				-	-	930 - 1250	4
				-	-	1710 - 1940	3

Table 6.14: Earthworks Balance Summary (rounded to nearest 10m3)

6.4.2.6.1 Conclusion

Route Option 1 has no significant area of fill as it is predominantly online. However, it will consist of significant volumes of cut to allow for new full depth road construction. This leads to a significant surplus of material as can be seen in Table 6.14 above. Route Options 2 and 3 contain significant areas of both cut and fill which allows for a reduced surplus of material, while Route Option 2A is the most balanced approach with a small amount of imported material required.

By taking into account the earthworks balance and depths/extents of cut and fill, the overall ratings of the Route Options are summarised in Table 6.15.

Route Option	Overall Rating
Option 1	Low Preference
Option 2	Medium Preference
Option 2A	High Preference
Option 3	Medium Preference

Table 6.15: Earthworks Assessment Summary

6.4.2.7 Drainage

The construction of a new road scheme will invariably necessitate the relocation of services. Adequate provision must be made for drainage if the road pavement is to give satisfactory performance.

The principal functions of a drainage system are to:

- to prevent flooding of the carriageway by rain or by water flowing onto the road from adjoining areas;
- to avoid weakening of the sub-grade soil and the pavement structure which might be caused by the presence of water; and
- to avoid erosion of the side slope on embankments or the faces of cuttings.

Regarding carriageway drainage, preliminary analysis of the area indicates that there are sufficient suitable outfalls in the area for all options to take the water from the drainage scheme without the need for alternative measures such as soak pits, pumping, way leaves etc. However, in consultation with Inland Fisheries Ireland and the EPA, mitigation measures shall be taken to reduce the potential pollution impact of the road drainage on stream water quality. Therefore, silt and oil/petrol interceptors will be provided, where necessary, which shall mitigate against contamination of watercourses.

It is anticipated that a combination of filter drains and open drains will be sufficient to meet drainage requirements. In cuttings, filter drains will intercept both surface water and ground water, interceptor ditches will divert runoff from adjacent properties while groundwater shall be drained by means of a separate filter drain. On embankments, over the edge drainage of surface water to toe drains may be used. In the design stage, the drainage requirements will be considered in detail.

The Carrownageesha stream flows through the south west area of the study area. This stream flows into the Clare river to the south of the study area on the border of the townlands of Carton and Ummeracly East. The Clare river and this stream south of the side road L-22087_0 are in the Lough Corrib SAC area. The intention is for all drainage to flow into this stream and onto the Clare River.

Approximate locations of potential outfalls from identified low points on the alignment for each route option are provided in **Table 6.16**.

Route	Estimated No. of Potential Outfalls	Approx. Chainage of Potential Outfall Location	Watercourse at Potential Outfall Location
Option 1	4	Ch 0430	Field Drain
		Ch 1010	Field Drain
		Ch 1400	Field Drain
		Ch 2580	Drainage Ditch
Option 2	4	Ch 0440	Field Drain
		Ch 1010	Field Drain
		Ch 1450	Field Drain
		Ch 2560	Drainage Ditch
Option 2A	4	Ch 0440	Field Drain
		Ch 1010	Field Drain
		Ch 1450	Field Drain
		Ch 2550	Drainage Ditch
Option 3	3	Ch 0130	Field Drain
		Ch 1630	Stream
		Ch 2560	Drainage Ditch

Table 6.16: Potential Drainage Outfall Locations

Option 1 will have an impact on the drainage pattern in the area. However, as this option is online the impact will be limited to run-off from the additional areas in cut or on embankment which will be required to be included in the carriageway drainage system. In addition, there will be a greater paved area to be drained than the existing situation due to the improved road cross section.

Option 2 and Option 2A, which have some offline sections, will have an impact on the drainage pattern in the area. The run-off from the additional areas in cut or on embankment in online sections will be required to be included in the carriageway drainage system, in addition to the increased paved area from the new carriageway cross section. Approximately 40% of both options comprises of new offline carriageway which will increase the amount of paved surface in the catchment area resulting in a change to the existing drainage regime.

Option 3 is offline for a significant portion of the route resulting in 7 of the required culverts being located in the offline sections. Option 3 will have an impact on the drainage pattern in the area as the run-off from the areas in cut or on embankment in online sections will be required to be included in the carriageway drainage system in addition to the increased paved area from the new carriageway cross section. Approximately 57% of this option comprises new offline carriageway which will increase the amount of paved surface in the catchment area resulting in a change to the existing drainage regime. Option 3 will also require works to be carried out on Carrownageesha stream. The stream flows below the proposed route between Ch. 1510 and Ch. 1620 and will be realigned to avoid the conflict.

6.4.2.7.1 Conclusion

When comparing the different routes in terms of their impact on the existing drainage regime, Option 1 is the most preferred option as it is online and introduces the least amount of new paved area to the catchment. Option 2 and Option 2A have a medium preference with approximately 40% of each route consisting of offline development and Option 3 is the least preferred with a total offline development percentage of 57%.

The drainage layout will be optimised during design development of the preferred route and the vertical alignment will be defined in more detail. Likely low spots can then be identified allowing drainage discharge locations to be identified. In terms of an optimised drainage design and provision of suitable outfalls, the frequency of suitable watercourses along all routes means that there is no measurable advantage in terms of draining the different options. However, with regard to the spread of discharge points along the different routes, which results in a more even runoff discharge to the catchment, Options 2, 2A and 3 have a slight advantage with more discharge points than the other options.

Comparing the number of watercourse crossings on the different routes, Options 1, 2 and 2A have a clear advantage having the least number of culvert crossings, all of which are at existing culvert locations on the N17 with potential to retain and extend these culverts. Option 3 is the least preferred in terms of culvert crossings as it has significantly more culvert crossings, 7 No. of which are along the offline section of the route where there are no existing culverts. This means there is no potential to retain and expand culverts as with Options 1, 2 and 2A.

In terms of impact on the alignment of existing watercourses, Options 1, 2 and 2A are the preferred options, requiring no watercourse diversions.

A summary of the preferences for each option in relation to the different factors of drainage is provided in Table 6.17 along with the overall drainage preference of each of the seven options.

Route	Culverts / Watercourse	No. of Discharge Points	% Offline	Watercourse Alignment	Overall Rating
Option 1	High Preference	High Preference	High Preference	High Preference	High Preference
Option 2	High Preference	High Preference	Medium Preference	High Preference	High Preference
Option 2A	High Preference	High Preference	Medium Preference	High Preference	High Preference
Option 3	Low Preference	Medium Preference	Low Preference	Low Preference	Low Preference

Table 6.17: Drainage Assessment Summary

6.4.2.8 Construction

In order to assess the impact of each route option from the construction of the proposed road development, an assessment of the following sub-criteria was undertaken:

- Traffic Management & Diversions;
- Construction Duration; and

- Complexity of Construction.

Due to the significant online nature of Option 1, this will be the most disruptive to implement due to the traffic management and the levels of proposed diversions during construction. The phasing of construction stages on Option 1 would also be complicated and time consuming due to traffic management/diversions as mentioned above.

Options 2 and 2A contain sections of online development which, as with Option 1 can be disruptive to implement. However, they also contain sections of offline development which should cause a much lesser degree of disruption.

Option 3 is the most preferred in terms of traffic management and diversions due to the large sections of offline development. This also provides a positive effect on duration and complexity as phasing shall be less complicated and time consuming.

Route Option	Traffic Management and Diversions	Construction Duration	Complexity of Construction
Option 1	Low Preference	Low Preference	Medium Preference
Option 2	Medium Preference	Medium Preference	Medium Preference
Option 2A	Medium Preference	Medium Preference	Medium Preference
Option 3	High Preference	High Preference	High Preference

Table 6.18: Construction Assessment

6.4.2.8.1 Conclusion

In summary, the Construction preference of each of the four options is given below in **Table 6.19**.

Route	Overall Rating
Option 1	Low Preference
Option 2	Medium Preference
Option 2A	Medium Preference
Option 3	High Preference

Table 6.19: Construction Assessment Summary

6.4.2.9 Services Conflicts

The construction of a new road scheme will inevitably require the relocation of services. Service diversions will have financial and time implications during the construction work and, therefore, should be avoided as much as possible.

For the purpose of this section of the report, a conflict is considered a service providers plant which will require remedial works due to a conflict with the proposed route. For example, an eircom pole which will require relocation is considered a conflict.

With reference to Figures A05 – A07, provided in Appendix A, a list of the number of conflicts/crossing points with each existing service for each Route Option is provided in **Table 6.20** below.

Route	Eir	Group Water Scheme	Bord Gáis Transmission	ESB (LV and MV)	Total
Option 1	32	-	0	19	51
Option 2	30	-	0	19	49
Option 2A	35	-	0	14	49
Option 3	19	-	0	13	32

Table 6.20: Route Option Conflicts with Existing Services

6.4.2.9.1 Eir

As outlined in the Section 4.2.7.1, the Eircom plant is generally located adjacent to existing N17 and existing side roads resulting in all Route Options having a number of conflicts. Where existing poles are located within the proposed clear zone, they will have to be relocated outside of the clear zone or diverted with an underground ducting system. It is also likely that at crossing points, cables will be diverted into an underground ducting system.

Option 1, Option 2 and Option 2A are given a low preference as they have the highest number of conflicts with the existing Eir plant which is currently running parallel with the existing N17. Option 3 is given a high preference as there are a lower number of conflicts due to its offline nature.

6.4.2.9.2 Group Water Scheme

As outlined in Section 4.2.7.2, the watermains within the Study Area generally follow the existing road network. The information available doesn't provide great detail on exact locations and depths of pipework. We therefore must make engineering assumptions in completing our assessment.

Route Option 1 has been assigned a high preference as the proposed route closely follows the existing route in terms of line and level. Assuming watermains have been installed at the required depth, there should be little conflict. Option 2, Option 2A and Option 3 have been assigned a medium preference as they contain offline sections which sever side roads. This provides a potential for conflict as the vertical alignment of the proposed route would involve reducing the existing level of the side road, particularly the L-22271, and therefore a conflict with the existing watermain.

6.4.2.9.3 Bord Gáis Transmission Line

There are no Bord Gáis services in the study area.

6.4.2.9.4 ESB

The ESB Networks MV & LV overhead cables are generally offset from the existing N17 and within adjacent landowner fields. At overhead crossing points, the cables will likely be diverted with an underground ducting system. The ESB Networks record drawings do not show all localised connections to properties. These are considered a minor constraint and are not considered in this assessment.

Option 2A and Option 3 have been assigned a high preference as they contain the least number of conflicts/crossings while Option 1 and Option 2 have been assigned a low preference as they contain a higher number of conflicts.

6.4.2.9.5 Conclusion

The preference of each of the four options in terms of services conflicts is given below in Table 6.21. As safety is of particular concern for this scheme, this section of the Engineering Appraisal has been weighted by a factor of 0.5; therefore, the preference score given for this section is worth half that of other sections. This is mainly due to the fact that service diversions should not involve any major disruption to utility infrastructure.

Route	Eircom	Group Water Scheme	ESB (LV and MV)	Overall
Option 1	Low Preference	High Preference	Low Preference	Medium Preference
Option 2	Low Preference	Medium Preference	Low Preference	Low Preference
Option 2A	Low Preference	Medium Preference	High Preference	Medium Preference
Option 3	High Preference	Medium Preference	High Preference	High Preference

Table 6.21: Service Conflict Summary

6.4.2.10 Land & Property

Impact of the route options on agricultural land has been assessed in Section 6.4.4.8 (Agronomy Assessment) of the Environmental Appraisal below. The impact of the route options on Land and Property was assessed using the following criteria and is provided in **Table 6.22**:

- Approximate Potential Land take for each Option; and
- Number of properties/buildings directly impacted by the Scheme.

The approximate land take for each option was based upon the potential footprint of the route option and consideration was given to existing landownership in the area with reference to the Land Registry Drawings. It is highlighted that the majority of the existing national road N17 network within the Study Area is in the ownership of private owners and not Galway County Council.

Route	Potential Land Take Required	Number of Properties / Buildings Directly Impacted by the Scheme
Option 1	5.8 Ha	2 No.
		Ch. 1630 - Shed
		Ch. 2285 - Derelict House
Option 2	8.4 Ha	4 No
		Ch. 1700 - House
		Ch. 2270 - Derelict House
		Ch. 2460 - House
Option 2A	9.3 Ha	3 No
		Ch. 1615 – Agricultural Shed
		Ch. 2470 - House
		Ch. 2500 - House
Option 3	9.4 Ha	3 No.
		Ch. 2260 - House
		Ch. 2225 - Derelict Shed
		Ch 2450 - House

Table 6.22: Land and Property Impacted by Scheme

6.4.2.10.1 Conclusion

Taking the above into account, the preference ratings for each of the three options in terms of Land and Property are given in **Table 6.23**.

Route	Overall Rating
Option 1	High Preference
Option 2	Low Preference
Option 2A	Medium Preference
Option 3	Medium Preference

Table 6.23: Land and Property Assessment Summary

6.4.2.11 Impact on Iarnród Éireann Infrastructure

As part of the consultation process, a meeting was held in March 2018 with Iarnród Éireann. It was requested by Iarnród Éireann that no new crossings would be part of this scheme. Accordingly, it is considered that the existing level crossing on the N17 be maintained at the same location approximately.

6.4.2.11.1 Conclusion

Taking the above into account, the preference ratings for the impact of each route option on Iarnród Éireann Infrastructure are provided below in **Table 6.24**.

Route	Overall Rating
Option 1	Same Preference
Option 2	Same Preference
Option 2A	Same Preference
Option 3	Same Preference

Table 6.24: Impact on Iarnród Éireann

6.4.2.12 Overall Engineering Appraisal

The four route options have been assessed under the Engineering Appraisal Criteria highlighted in the previous sections. The Engineering Appraisal has been summarised in **Table 6.25**. The individual assessments have been combined to give an overall preference for each Route Option.

	Route Option 1	Route Option 2	Route Option 2A	Route Option 3
Traffic Assessment and Route Cross-Section	Same Preference	Same Preference	Same Preference	Same Preference
Technical Standards	Low Preference	High Preference	Medium Preference	High Preference
Junctions, Access and Interaction with Existing Networks	Low Preference	High Preference	High Preference	High Preference
Structures	Low Preference	Medium Preference	Medium Preference	Low Preference
Geology and Hydrogeology	High Preference	Medium Preference	Medium Preference	Low Preference
Earthworks	Low Preference	Medium Preference	High Preference	Medium Preference
Drainage	High Preference	High Preference	High Preference	Low Preference
Construction	Low Preference	Medium Preference	Medium Preference	High Preference
Service Conflicts	Medium Preference	Low Preference	Medium Preference	High Preference
Land and Property	High Preference	Medium Preference	Medium Preference	Low Preference
Impact on Iarnród Éireann	Same Preference	Same Preference	Same Preference	Same Preference
Overall	Low Preference	High Preference	High Preference	Medium Preference

Table 6.25: Engineering Assessment Summary

6.4.3 Safety Appraisal

6.4.3.1 Road Safety Impact Assessment

TII Publication Road Safety Impact Assessment Guidelines (PE-PMG-02005) states that:

“Road Safety Impact Assessment shall apply to Major Schemes on national roads as defined in PE-PMG-02041 Project Management Guidelines, which result in a substantial modification to the existing national road network. Smaller projects will not generally require assessment but if there is any doubt the TII Roads and Tunnels Safety section should be consulted in order to determine the requirement for Road Safety Impact Assessment for each specific scheme.”

As the proposed scheme is considered a Minor scheme, the TII Roads and Tunnels Safety section was consulted to determine any requirement for a RSIA. They confirmed that it was not necessary for a RSIA to be carried out.

6.4.3.2 Road Safety Audit Stage F Part 1

A Stage F Part 1 Road Safety Audit (RSA) was undertaken by PMCE consultants Ltd. in October and November 2018. The audit was undertaken in accordance with the requirements of TII GE-STY-01024 Road Safety Audit. **A copy of the RSA Stage F Part 1 is provided in Appendix B of this Report.**

The audit team examined the documents relating to each of the four route options and carried out on-site observations. A series of matters which may have an adverse effect on road safety, with consideration for all road users, were identified and noted in the report.

A summary of findings is provided in Table 6.26. The findings are separated into General, which relate to all four route options and specific. A detailed account of the findings is provided in the RSA Stage F Part 1 Report in Appendix B of this Report.

Option	Element/Location	RSA Stage F Part 1 Comment
General	Short radius horizontal curves immediately north of Milltown	Within the existing 80kph section of the N17, to the north of Milltown, a number of horizontal curves have been proposed with radii which are considered at, or below, the desirable minimum (720m, 510m, 460m) for the assumed design speed (100kph). To achieve the required stopping sight distance (SSD) widening of between 0.75m and 5.5m will be required depending on the radius of horizontal curve proposed.
General	Staggered T-junction of the N17, the L22208 and the L6413	The existing staggered T-junction of the N17, the L22208 and the L6413 at Ch. 2,300 is proposed to be retained in all route options. This is a left-to-right staggered T-junction which is located between two horizontal curves. The Road Safety Authority’s collision database indicates a history of minor injury rear end shunt collisions at this location. The radius of the horizontal curve indicated to the south of the junction is 460m.

General	At-grade level crossing of railway line	An at-grade level crossing of the disused railway line is indicated as being retained in all route options. While not currently in use, decommissioned railway lines throughout the country have recently been redeveloped as facilities for vulnerable road users (VRUs) such as Greenways. If consideration is given to such redevelopment of this railway line in the future this will lead to an increase in VRUs crossing the N17 carriageway at this location. Also, there is potentially a risk that the railway line itself may be reopened resulting in vehicles having to stop on the national road when a train crosses the carriageway.
Option 1	Lack of overtaking opportunities	Option 1 does not contain sufficient overtaking opportunities throughout its length.
Option 1	Frequency of direct accesses	There are a number of domestic and agricultural accesses within the extents of the proposed scheme. In Option 1 these direct accesses are likely to be retained.
Option 1	Skewed junction layout at Ch. 700	The L2227 intersects the N17 carriageway within the scheme (Ch. 700) at an acute angle. Visibility towards approaching N17 traffic for a driver exiting the L2227 may be restricted as a result of the alignment of the side road.
Option 2	Flat sections of carriageway	Sections of carriageway with proposed longitudinal gradient of 0.2% have been indicated between Ch. 0 – 500 and between Ch. 2,550 - 2,950. An overtaking crest curve has also been indicated between Ch. 600 - 920 with a k-value of 400, essentially a section of flat pavement. The gradient at these locations may result in the carriageway being unable to sufficiently shed surface run-off.
Option 2	Skewed junction layout at Ch. 700	The L2227 intersects the N17 carriageway within the scheme (Ch. 700) at an acute angle. Visibility towards approaching N17 traffic for a driver exiting the L2227 may be restricted as a result of the alignment of the side road.

Option 2A	Flat sections of carriageway	A section of carriageway with proposed longitudinal gradient of 0.2% has been indicated between Ch. 2,550 - 2,950 which is essentially a section of flat pavement. The gradient at this location may result in the carriageway being unable to sufficiently shed surface run-off.
Option 2A	Horizontal curves with radii of 3,500m and 2,900m	Horizontal curves have been indicated with radii of 3,500m and 2,900m between Ch. 155 – 578 and Ch. 1,616 – 2,140 respectively. The Full Overtaking Sight Distance (FOSD) may not be available at these locations without widening of 2.9m and 5.4m respectively.
Option 2A	Potential hidden dip	Two crest curves have been indicated between Ch. 698 – 930 and between Ch. 1,259 - 2,445. This may result in a hidden dip in the vertical alignment of the N17 within the sag curve between these two crests.
Option 3	Option Skewed junction layout at Ch. 700	The L2227 intersects the N17 carriageway within the scheme (Ch. 700) at an acute angle. Visibility towards approaching N17 traffic for a driver exiting the L2227 may be restricted as a result of the alignment of the side road.
Option 3	Creation of crossroad junction on local road at Ch. 1,545	The proposed offline realignment of the N17 carriageway to the south of its existing location will create a crossroad junction with a local road at Ch. 1,545. Drivers on the local road, who are familiar with the area, may not anticipate a crossroad junction at this location, especially one which requires them to give way to N17 traffic.

Table 6.26: Summary of RSA Stage F Part 1 Findings

6.4.3.3 Conclusion

Taking the findings above into account, the route options were ranked in terms of road safety by the RSA Stage F Part 1 Audit Team. These rankings are purely a relative grading of the route options with respect to each other, and all of the proposed Route Options represent a significant improvement to the existing arrangement within this section of the N17.

Preference ratings for each option as part of the Safety Assessment are provided in Table 6.27 below which have been assigned based on the RSA Audit teams ranking.

Route	Overall Rating
Option 1	Low Preference
Option 2	High Preference
Option 2A	Medium Preference
Option 3	High Preference

Table 6.27: Safety Assessment Summary

6.4.4 Environmental Assessment

The Environmental Option Appraisal of the proposed route options has been undertaken with regard to the requirements of the following National Road Authority (TII) Documents:

Transport Infrastructure Ireland Project Management Guidelines 2017;

and

National Roads Authority Environmental Assessment and Construction Guidelines.

The main aims of the Environmental Options Assessment are as follows:

- To ensure consideration of the environmental effects of the Route Options so that decisions can be made with knowledge of their environmental consequences;
- To aid in the identification of ways in which the potential environmental effects could be minimised through route selection and other measures; and
- To ensure consideration of the likely environmental effects of options in a way that enables the importance of the proposed effects, and the scope for mitigating these, to be properly evaluated.

The following environmental aspects have been considered in this assessment:

- Ecology;
- Archaeological, Architectural and Cultural Heritage;
- Soils, Geology and Hydrogeology;
- Surface Water;
- Landscape and Visual;
- Air;
- Noise; and
- Agronomy.

At this stage, it must be appreciated that there is still scope at a future stage, during the environmental assessment process of the final selected route, to alter the horizontal and vertical alignment of the proposed road within the defined corridors.

6.4.4.1 Ecology

The Transport Infrastructure Ireland documents entitled “Guidelines for Assessment of Ecological Impacts of National Road Schemes – Chapter 5 – Route Corridor Selection Study” and the “Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes” provide guidance on the route selection assessment procedures. In undertaking the assessment consideration has been given to this guidance.

6.4.4.1.1 Assessment Methodology

Overview

An Ecological Impact Assessment was undertaken to consider whether or not the proposed road improvement and realignment works would be likely to have significant effects on the environment. This screening report has been carried out in accordance with a methodology that is based on Environmental Impact Assessment (EIA), Guidance for Consent Authorities regarding Sub-Threshold

Development (EPA, 2003), the Environmental Impact Assessment of National Road Schemes – A Practical Guide (NRA, 2008) and The European Commission Guidelines on EIA Screening (June 2001).

The Appropriate Assessment Screening Report for the proposed works has been included in Appendix C of this report.

Defining the Ecology Study Area

The latest draft route options available at the time of writing were examined to determine an appropriate ecology Study Area for the route selection assessment.

Identification of Key Ecological Receptors

In accordance with TII guidelines (TII, Guidelines for Assessment of Ecological Impacts of National Road Schemes 2009), the route selection assessment only takes account of “key ecological receptors”. Key ecological receptors must be within the “zone of influence” of the route option(s) and “both of sufficient value to be material in decision making and likely to be affected significantly”. The TII defines “sufficient value” in this context as being an ecological feature of “Local Importance (Higher value)” or higher as per the TII’s ecological valuation criteria (TII, 2009).

All ecological features within the potential zone of influence were therefore valued in accordance with TII valuation criteria, and key ecological receptors were identified. Features of “Local Importance (Lower value)” did not qualify as key ecological receptors, and are therefore not described in detail. See Section 3.3.1 Ecological Constraints for further details.

There are six Natura 2000 sites situated within 15km of the study area, including:

- Lough Corrib SAC (Site Code: 000297) located to the east of the scheme;
- Carrowkeel Turlough SAC (Site Code: 000475) located 6km to the west of the scheme;
- Greaghans Turlough SAC (Site Code: 000503) located 8km to the west of the scheme;
- Skealaghan Turlough (Site Code: 000541) located 13.1km west of the scheme;
- Kilglassan/Cahervoostia SAC (Site Code: 000504) located 9km to the west of the scheme; and
- Ardkill Turlough (Site Code: 000461) which is also located to the west of the scheme approximately 10km.

6.4.4.1.2 Options Assessment

Potential Ecological Impacts of Route Options

The route options have been assessed in the context of the “unmitigated project”. In accordance with TII Guidelines (TII, Guidelines for Assessment of Ecological Impacts of National Road Schemes 2009):

Table 6.28 and **Table 6.29** provide a comparative assessment of each option for each ecological feature.

Potential Impacts to Designated Sites

There is one European site (cSAC), the Lough Corrib SAC, located within the Study Area. This SAC is not within the footprint of Route Options 1, 2 and 2A, however, it is within the footprint of route Option 3 and will be impacted during the construction phase. There was no nationally designated site (pNHA) identified within the study area.

A positive response in Table 6.28 below indicates that an adverse impact arises for a given route option, and is likely to be significant, albeit at different geographic scales. Differentiation between the levels of significance of such impacts cannot be assigned at the route selection assessment stage but will be assessed on the emerging preferred route.

Site Name and Code	Ecological Value	Risk of likely significant effects on designated sites?			
		Route Option 1	Route Option 2	Route Option 2A	Route Option 3
Lough Corrib SAC	International	No	No	No	Yes

Table 6.28: Summary of Potential Impacts to Designated Sites

Potential Impacts to Undesignated Sites

Table 6.29 lists which key ecological receptors (other than Designated Sites) which could potentially be significantly impacted upon by each route option.

Ecological Receptor / Site Name	Ecological Value (TII, 2009)	Is there potential for the receptor to be significantly impacted assuming mitigation?			
		Route Option 1	Route Option 2	Route Option 2A	Route Option 3
Dry Meadows and Grassy Verges (GS2)	Local Importance (Higher Value)	Yes	Yes	Yes	Yes
Hedgerow (WL1)	Local Importance (Higher Value)	Yes	Yes	Yes	Yes
Treeline (WL2)	Local Importance (Higher Value)	Yes	Yes	Yes	Yes
Spoil and bare ground (ED2)	Local Importance (Higher Value)	Yes	No	No	No
Stone walls and Other Stonework (BL1)	Local Importance (Higher Value)	Yes	Yes	Yes	Yes
Wet Grassland (GS4)	Local Importance (Higher Value)	No	No	No	Yes
Scrub (WS1)	Local Importance (Higher Value)	No	Yes	Yes	Yes
Drainage Ditches (FW4)	Local Importance (Higher Value)	No	Yes	Yes	Yes
Lowland Depositing River (FW2)	Local Importance (Higher Value)	No	No	No	Yes
Immature Woodland (WS2)	Local Importance (Higher Value)	No	No	No	Yes

Table 6.29: Summary of potential Impacts of Route Options to Undesignated Features

Given that this assessment is based on 50m wide Route Option corridors, it may be possible, through the design process, to avoid or reduce the magnitude of the potential impacts of any of the route options on the identified ecological receptors; which in turn may affect the relative ecological preference of each of the route options.

Extenuation measures for ecological features potentially impacted by the route options may be assumed at this stage to allow for practical consideration of the options. These are given in **Table 6.30** below;

Feature	Measure
Breeding Birds	-Seasonal restriction on works to occur outside breeding season (March-August). -Nesting checks prior to site clearance if seasonal restricting works is not practical. Derogation licences required to remove licences if located within working zone. -Exclusion zones around Wheatear, Grasshopper Warbler and Skylark nests if located within the working zone, and seasonal restriction are not practical.
Badgers* and Otters*	-Micrositing of aspects of the road e.g. culverts, crossings, to avoid otter holts and badger setts. - Exclusion and/or artificial holt/sett creation under license. -Appropriate landscaping and fencing proposals (e.g. to screen cycle/pedestrian paths or lead animals to underpasses). -Sensitive lighting design (e.g. of watercourses and hedgerows). -Sensitive culvert design and/or provision of ledges (as per TII guidelines).
Amphibians*	-Translocation to suitable receptor site under license.
Hedgehogs* and Pygmy Shrew*	-Seasonal works to avoid breeding bird season (coincides with majority of Hedgehog and Pygmy Shrew breeding season).
Bats*	-Exclusion and/or artificial roost creation under license. -Inclusion of underpasses to mitigate break in commuting.
Crayfish	-Licenced translocation of crayfish prior to commencement of in- stream works.
Fisheries Protection	-Timing of works to avoid sensitive seasons and/or measures to reduce impacts -during construction (e.g. barriers) -All culverts to be fish-passable (including specific measures potentially required for European Eel)
Invasive Species	-Use of pillars rather than embankment for construction -Invasive Species Management Plan to prevent spread of Japanese Knotweed, and Canadian Waterweed
Protected & Rare Flora	-Micrositing of road infrastructure. -Plant translocation (and propagation as enhancement measure) where necessary (last resort as success of translocation is difficult to predict).
Other Habitats (Woods, grasslands, treelines, watercourses)	-Appropriate landscape proposals including species-rich landscape mixes.

* Measures may not be required if further surveys/preferred route do not predict significant impacts

Table 6.30: Likely Extenuation Measures

6.4.4.1.3 Assessment Conclusion

Table 6.31 below provides the number of impacts from each route option based on potential impact of features of ecological value.

Impact Level	Route Option 1	Route Option 2	Route Option 2A	Route Option 3
Significant Impact on feature of International Importance	0	0	0	1
Significant Impact on feature of National Importance	0	0	0	0
Significant Impact on feature of County Importance	0	0	0	0
Significant Impact on feature of Local Importance (Higher value)	5	6	6	9

Table 6.31: Summary Comparison of Impacts on all Ecological Features

It is considered that the environmental effects arising from the project will generally be localised, minor impacts and occur principally during the construction period, which will be limited by a number of extenuation measures. Potential impacts of highest concern relate to those on the Lough Corrib cSAC (International Importance), which shall be impacted by Route Option 3 only.

Despite the chance of impact to features, it is considered that the works will not adversely impact site integrity subject to appropriate measures.

The ecological preference of each of the four options is provided below in Table 6.32;

Route	Overall Rating
Option 1	High Preference
Option 2	Medium Preference
Option 2A	Medium Preference
Option 3	Low Preference

Table 6.32: Ecological Impacts Assessment Summary

6.4.4.2 Archaeological, Architectural and Cultural Heritage

TII Archaeologist, Mr. Jerry O’Sullivan, undertook an assessment of the Archaeological, Architectural and Cultural Heritage within the Study Area in July 2018. The final report can be viewed in Appendix A of this report and has been summarised below.

6.4.4.2.1 Assessment Methodology

For the purposes of this assessment, Study Areas extending 250m from the edge of each route option were defined. The known archaeological, architectural and cultural heritage sites within the Study Area are shown in Figure A9 in Appendix A.

Baseline information for the Study Areas was gathered from the following sources of information:

- Record of Protected Structures for County Galway per the Galway County Development Plan 2015–2021 (amended 2017)
- Record of Monuments and Places in County Galway (OPW 1997)
- Archaeological Inventory of County Galway, Vol. II – North Galway (Alcock et al. 1999)
- vertical aerial photographs available from the Ordnance Survey at Galway County Council (2010, 2015) and also on the Internet at www.bing.com (undated)
- local publication on the Milltown Heritage Trail (2010) by the Milltown Development Company Ltd and Milltown Tidy Towns Group and also local heritage and information websites (www.milltown.galwaycommunityheritage.org and www.milltowngalway.com)
- online gazetteer of licensed archaeological excavations in Ireland at www.excavations.ie for the townlands traversed by the route options for the project.
- Sites and Monuments Record for County Galway maintained by the Archaeological Survey of Ireland (National Monuments Service) and available to view online at www.heritage.ie
- National Inventory of Architectural Heritage (NIAH) for County Galway compiled by the Department of Environment, Heritage and Local Government in 2008–11 and available to view online at www.buildingsofireland.ie
- Bedrock geology and soils maps of the Geological Survey of Ireland at www.gsi.ie and Teagasc at www.gis.teagasc.ie

The Study Area is dominated by the existing N17 and is generally rural, characterised by residential properties and agricultural land. From the sources listed above, over 20 places of potential interest were identified for inspection in the field, including archaeological sites and monuments within the corridor and roadside buildings or sites of buildings as indicated on the early Ordnance Survey maps.

All of the features and sites of potential interest that were identified by the desk study were inspected, photographed and described in the field by the writer, over the course of two visits, in October 2017 and July 2018.

6.4.4.2.2 Options Assessment

There are three Recorded Monuments in or near our study area. These are listed below:

- A ringfort (RMP GA016:123) in the northern outskirts of the village has been more or less entirely removed. The site is c. 100 m from the present road and is now occupied by modern farm buildings.
- An earthwork enclosure (GA016:124) in the village, c. 300 m from the project road, was shown on the first edition Ordnance Survey map (c. 1840) but is not extant and the site is now occupied by a modern dwelling house.
- A children's burial ground or cillín (RMP GA016:016A) occupies an irregular area of rough ground in a pasture field south of the existing road, again in the western outskirts of Milltown. The site is c. 150 m from the present road but note that the Milltown Heritage Group has placed a plaque identifying the site on a gate pier at the main road, within the limits of the project road.

None of these three Recorded Monuments will be affected by any of the four route options.

In terms of Architectural Heritage, there were no Protected Structures identified within the Study Area. However, a number of elements of local architectural heritage, which are not Protected Structures, have been identified and will be impacted by all four route options. These have been summarised in the table below:

No	Description	Grid Ref (Irish) (and ITM)	Significance	1	2	3	Impact
1	Farm buildings	137870 265400	Local	—	—	—	Nil impact
		(537834 765421)					
4	Derelict cottage	138110 265230	Local	—	Slight	Slight	Direct impact on roadside boundary
		(538074 765250)					
5	Farmstead	138430 265080	Local	—	—	—	Nil impact
		(538394 765101)					
6	House (former cottage)	138320 264800	Local	—	—	—	Nil impact
		(538284 764821)					
7	Railway crossing	138760 264720	Regional	Slight	Slight	—	Direct impact on crossing barriers, roadside boundary and pedestrian stile
		(538724 764741)					
8	Farmhouse	138830 264720	Local	Slight	Slight	—	Direct impact on roadside boundary
		(538794 764741)					
9	Connolly's Shop (former)	138870 264690	Local	—	—	—	Nil impact
		(538834 764711)					
10	Ruined byre house	139080 264500	Local	—	—	—	Nil impact
		(539044 764521)					

No	Description	Grid Ref (Irish (and ITM))	Significance	1	2	3	Impact
16	Chaper (site of)	139120 264340	Nil	—	—	—	Nil impact
		(539084 764361)					
15	Farmhouse	139230 264220	Local	—	Severe	—	Direct impact causing Demolition if Option 2
		(539194 764241)					
17	Farmhouse, mature boundary planting	139550 263980	Local	Moderate	—	—	Direct impact on roadside boundary and mature broadleaf trees (beech)
		(539514 764001)					
18	House (site of cottage), ruined byre	139540 263760	Local	—	—	Severe	Direct impact with demolition if Option 3.
		(539504 763781)					
26	Farmhouse (ruins)	139584 263766	Local	Moderate	Moderate	—	This ruined shell of a 19th-century farmhouse would be removed entirely by Option 1 and Option 2.
		(539548 763787)					
23	M J Molloy cottage (playwright)	139705 263535	Local	Slight	Slight	—	Options 1 and 2 would affect part of the stone boundary wall.
		(539669 763556)					
19	Pound (site of)	139750 263610	Nil	—	—	—	Nil impact
		(539714 763631)					
25	House with mature boundary planting	138835 263490	Local	Moderate	Moderate	Moderate	Direct impact on roadside boundary and mature broadleaf trees (beech, sycamore) that contain a rookery of several nests.
		(538799 763511)					

No	Description	Grid Ref (Irish) (and ITM)	Significance	1	2	3	Impact
20	Ringfort (site of) RMP GA016:123	140150 263470	Local	—	—	—	Nil impact
		(540114 763491)					
21	Children's burial ground (RMP GA016:016	140075 263210	Local	—	—	—	Nil impact
		(540039 763231)					
22	Early buildings (site of)	140161 263335	Nil	—	—	—	Nil impact
		(540125 763356)					
24	Townland name stones	Various	Local	Slight	Slight	Slight	Direct impact on one or more plaques by all three options

Table 6.33: Archaeological, Architectural and Cultural Heritage Impacts

No	Description	Grid Ref (Irish) (and ITM)	Significance	2A	Impact
1	Farm buildings	137870 265400	Local	—	Nil impact
		(537834 765421)			
4	Derelict cottage	138110 265230	Local	Slight	Direct impact on roadside boundary
		(538074 765250)			
5	Farmstead	138430 265080	Local	—	Nil impact
		(538394 765101)			
6	House (former cottage)	138320 264800	Local	—	Nil impact
		(538284 764821)			
No	Description	Grid Ref (Irish) (and ITM)	Significance	2A	Impact

7	Railway crossing	138760 264720	Regional	Severe	Direct impact on crossing barriers, roadside boundary, pedestrian stile and Gatehouse
		(538724 764741)			
8	Farmhouse	138830 264720	Local	—	Nil impact
		(538794 764741)			
9	Connolly's Shop (former)	138870 264690	Local	—	Nil impact
		(538834 764711)			
10	Ruined byre house	139080 264500	Local	—	Nil impact
		(539044 764521)			
16	Chaper (site of)	139120 264340	Nil	—	Nil impact
		(539084 764361)			
15	Farmhouse	139230 264220	Local	—	Nil impact
		(539194 764241)			
17	Farmhouse, mature boundary planting	139550 263980	Local	—	Nil impact
		(539514 764001)			
18	House (site of cottage), ruined byre	139540 263760	Local	—	Nil impact
		(539504 763781)			
26	Farmhouse (ruins)	139584 263766	Local	—	Nil impact
		(539548 763787)			
23	M J Molloy cottage (playwright)	139705 263535	Local	—	Nil impact
		(539669 763556)			
19	Pound (site of)	139750 263610	Nil	—	Nil impact
		(539714 763631)			

No	Description	Grid Ref (Irish) (and ITM)	Significance	2A	Impact
25	House with mature boundary planting	138835 263490	Local	Moderate	Direct impact on roadside boundary and mature broadleaf trees (beech, sycamore) that contain a rookery of several nests.
		(538799 763511)			
20	Ringfort (site of) RMP GA016:123	140150 263470	Local	—	Nil impact
		(540114 763491)			
21	Children's burial ground (RMP GA016:016)	140075 263210	Local	—	Nil impact
		(540039 763231)			
22	Early buildings (site of)	140161 263335	Nil	—	Nil impact
		(540125 763356)			
24	Townland name stones	Various	Local	Slight	Direct impact on one or more plaques by all three options

Table 6.33B: Archaeological, Architectural and Cultural Heritage Impacts – Option 2A

6.4.4.2.3 Assessment Conclusion

None of the four options will have any impacts on known elements of the archaeological heritage. All four options would have slight impacts on elements of the architectural heritage. What separates the four options is the number and character of the moderate and severe impacts they would have on elements of the architectural heritage, as set out in Table 6.33 above.

Route Option 1 would have four slight impacts, three moderate impacts and no severe impacts. The slight impacts would be to boundary features (walls, gateways), the railway level crossing (Inventory No. 7) and townland name plaques along the margins of the existing road (No. 24). The moderate impacts would be the loss of boundaries with mature broadleaf trees at two early modern houses (Inventory Nos 17 and 25) and demolition of a ruined early modern farmhouse (No. 26).

Route Option 2 would have five slight impacts, two moderate impacts and one severe impact. Again, the slight impacts would be to boundary features (walls, gateways), the railway level crossing (No. 7), and townland name plaques along the margins of the existing road (No. 24). The moderate impacts would be the loss of a boundary wall with mature broadleaf trees (No. 25); and demolition of a ruined early modern farmhouse (No. 26). The severe impact would be demolition of a well-maintained farmhouse in a highly visible roadside setting (No. 15).

Route Option 2A would have 2 slight impacts, 1 moderate impact and 1 severe impact. The slight impacts would be to boundary features (walls, gateways) and townland name plaques along the

margins of the existing road (No. 24). The moderate impact would be the loss of a boundary wall with mature broadleaf trees (No. 25) while the severe impact is the demolition of existing pedestrian stile and gatehouse at railway level crossing.

Route Option 3 would have two slight impacts, one moderate impact and one severe impact. Once again, the slight impacts are to boundary features (No. 4) and townland name plaques along the margins of the existing road (No. 24). The moderate impact would be the loss of a boundary wall with mature broadleaf trees (No. 25). The severe impact would be the demolition of an attractive, well maintained house with traditional features, in a highly visible roadside setting (No. 18).

Table 6.34 provides a comparison of the four route options for Archaeological, Architectural and Cultural Heritage.

Route Option	Impacts				Overall Rating
	Slight	Moderate	Severe	Profound	
Option 1	4	3	0	0	High Preference
Option 2	5	2	1	0	Low Preference
Option 2A	2	1	1	0	Medium Preference
Option 3	2	1	1	0	Medium Preference

Table 6.34: Archaeological, Architectural and Cultural Heritage Impacts Assessment Summary

6.4.4.3 Soils, Geology and Hydrogeology

The Transport Infrastructure Ireland document entitled “Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes” provides guidance on the route selection assessment procedures in “Chapter 4 – Route Corridor Selection”. In undertaking the assessment consideration has been given to this guidance.

6.4.4.3.1 Assessment Methodology

In addition to the above guidance, the Irish Geological Society online mapping tool provided valuable information regarding soils, bedrock, karst, faulting, aquifers and aquifer vulnerability for each of the routes.

No private water supplies data is available along each of the route corridors and as such no weighting has been given to the number of wells along each route corridor and/or their distance from the route centre line when assessing relative impacts.

Existing Environment

Information on the geology underlying the site has been obtained from maps and information obtained from the GSI (2008), GIS Bedrock Geological Map of Ireland. The Road Improvement Scheme is completely underlain by Undifferentiated Visean Limestone which is described as a pure bedded limestone. It is indicated that this rock type is susceptible to Karstification (GSI)

The groundwater vulnerability of the aquifers within the Study Area has been taken from GSI Mapping data and is, in the main, Low. The mapping data indicates a section of the Study Area, at the southern end, has an increased groundwater vulnerability of high and also 'X', indicating "rock near the surface or karst".

6.4.4.3.2 Options Assessment

Route Option 1, closely follows the line of the existing N17 and as such will have the least impact on soils, geology and hydrogeology. Route Option 2, 2A and 3 all involve the development of sections of off- line roads of different length.

The gross quantities of cut and fill for each option are outlined in Table 6.35 Indicative Earthworks Balance of the Route Corridor Options below. The earthworks quantities shown are based on the assumption that all excavated material can be reused in the proposed scheme as there is insufficient geotechnical information available at this time that would suggest otherwise.

Once selected, the preferred route corridor option will undergo a detailed topographical and ground investigation survey and the design will then be re-examined in detail to investigate whether the alignment can be adjusted to improve the earthworks balance and the suitability of excavated material.

Route Option	Cut	Fill	Balance
	(m3)	(m3)	(m3)
Option 1	62,411.96	8,587.14	53,824.83
Option 2	43,406.42	29,199.41	14,207.01
Option 2A	31,641	33,123	-1,482
Option 3	45,740.99	27,191.00	18,549.99

Table 6.35: Indicative Earthworks Balance of the Route Corridor Options

Route Options 2 and 2A contain significant areas of both cut and fill while Route Option 3 contains significant area of fill. The cuttings and embankments have a maximum depth of 4.0m in an area above a Regionally Important Aquifer which is of low vulnerability. This could potentially alter the drainage pattern in the area and impact groundwater.

Route Option 1 has been assessed as the most preferable option as it closely follows the route of the existing N17 and will therefore have the least impact on soils, geology and hydrogeology.

6.4.4.3.3 Assessment Conclusion

Based on the information contained within the previous sections, the following ranking order has been assigned to the four options.

Route	Overall Rating
Option 1	High Preference
Option 2	Medium Preference
Option 2A	Medium Preference
Option 3	Medium Preference

Table 6.36: Soils, Geology and Hydrogeology Impacts Assessment Summary

6.4.4.4 Surface Water

The Transport Infrastructure Ireland document entitled “Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes” provides guidance on the route selection assessment procedures in “Chapter 4 – Route Corridor Selection”. In undertaking the assessment consideration has been given to this guidance.

6.4.4.4.1 Assessment Methodology

The following data resources were referred to during this assessment:

- Ordnance Survey of Ireland (OSI);
- Environmental Protection Agency (EPA);
- Water Quality Monitoring Databases and Reports;
- EPA flow and water level measurements (EPA Hydronet System);
- Water Framework Directive Ireland Database;
- The Western River Basin District Management Plan (WRBDMP) and associated Water Management Unit plans;
- National Parks and Wildlife Services (designated site); and
- Strategic Flood Risk Assessment for the Galway County Development Plan 2015-2021.

Consultation letters were issued as part of the constraints and route selection process. Consultees included Inland Fisheries Ireland (IFI) and the Office of Public Works (OPW).

Field Surveys

Site walkovers were undertaken in August and July 2017. These walkover surveys were carried out within the proposed scheme footprint and extended as required to include other relevant hydrological aspects. The field surveys were carried out as a cursory inspection of the important surface water sites and features along the route corridors.

Detailed field studies will be progressed in accordance with the requirements of the TII guidelines during Phase 3 Design and Environmental Evaluation after recommendation of a preferred route.

Existing Environment

This section describes the hydrological attributes and the potential impacts on these attributes as a result of the various route options.

The main threats to hydrological attributes as a result of this proposed scheme have been identified as a result of:

- Water quality impact on receiving streams, land rivers from routine carriageway runoff (heavy metals, organics, nutrients, hydrocarbons, suspended solids, coliforms, etc.) and from accidental spillages (agricultural, oil/chemical spillages, bulk liquid cement); and
- Increase in runoff characteristics (due to impervious road pavement area and increased transmission time and point loading) resulting in a possible increase in the overall flood peak magnitude and flooding frequency in the receiving stream.

The new drainage system will be designed to avoid impacts, or mitigate against them where avoidance is not possible, thereby limiting the effect road drainage will have on water quality or water flow into receiving watercourses. The new drainage system will remove hydrocarbons and heavy metals from runoff which currently discharges from the pavement, which may lead to an improvement in water quality within the receiving watercourses. It is currently too early to determine if the new drainage system will give an overall positive impact to the surface water features in the area, but this shall become clear later in the Design Stage.

Overview of Catchments and Sub-Catchments Crossed

All four route options lie within the Lough Corrib Catchment and the Clare river subcatchment, within the Western River Basin District (WRBD). The Clare River in the south is of Moderate status

Overview of Watercourses in the Area

Watercourses within and adjacent to the Study Area include the following:

- Clare River;
- Carrownageesha stream; which flows into the Clare river and
- A number of unnamed streams.

The Clare River and a section of the Carrownageesha stream are designated as Special Areas of Conservation (SAC) as they are a tributary of Lough Corrib, see Figure 4.1, 4.2 and Ecological Constraints. These surface water features, along with the number of unnamed streams shown on Figure 4.6. There are also a number of ditches associated with drainage of the farmland in the area.

Crossings and Encroachment

The mainline of the four route options cross or encroach upon a number of field drain/ streams. These are identified in Table 6.37 and any designated rivers or streams are also identified. It is noted that the crossings of the proposed side roads have not been considered as part of the assessment at this stage.

Option 3 is the only option which will have a direct impact on the Carrownageesha stream. The route of the proposed offline section of this realignment will conflict with the route of the stream from Ch

1500 to Ch 1620 (approximately). It will be necessary to realign this section of the stream to avoid the conflict, while also balancing the stream loss with mitigation and restoration efforts by adhering to the “no net loss” principle.

Route	Number of Watercourses Directly Impacted	Name or Description of Watercourse	Approximate Location of Watercourse
Option 1	10	Field Drain	Ch 0040
		Field Drain	Ch 0130
		Field Drain	Ch 0430
		Field Drain	Ch 0830
		Field Drain	Ch 1010
		Field Drain	Ch 1140
		Field Drain	Ch 1400
		Field Drain	Ch 2120
		Drainage Ditch	Ch 2440
		Drainage Ditch	Ch 2580
Option 2	11	Field Drain	Ch 0040
		Field Drain	Ch 0130
		Field Drain	Ch 0440
		Field Drain	Ch 0830
		Field Drain	Ch 1010
		Field Drain	Ch 1130
		Field Drain	Ch 1450
		Field Drain	Ch 1900
		Field Drain	Ch 2100
		Drainage Ditch	Ch 2420
Drainage Ditch	Ch 2560		
Option 2A	10	Field Drain	Ch 0040
		Field Drain	Ch 0125
		Field Drain	Ch 1000
		Field Drain	Ch 1140
		Field Drain	Ch 1450
		Field Drain	Ch 1880
		Field Drain	Ch 2100
		Drainage Ditch	Ch 2380
		Drainage Ditch	Ch 2390
		Drainage Ditch	Ch 2560
Option 3	12	Field Drain	Ch 0040
		Field Drain	Ch 0130
		Field Drain	Ch 0440
		Field Drain	Ch 0840
		Field Drain	Ch 1040
		Field Drain	Ch 1150
		Field Drain	Ch 1450
		Carrownageesha Stream	Ch 1630
		Field Drain	Ch 1920
		Field Drain	Ch 2100
		Drainage Ditch	Ch 2420
		Drainage Ditch	Ch 2560

Table 6.37: Watercourses Crossed by Each Route Option

EPA Classification and Water Quality

The EPA assess the water quality of rivers and streams across Ireland using a biological assessment method, which is regarded as a representative indicator of the status of such waters and reflects the overall trend in conditions of the watercourse.

Biological Water Quality Data for the watercourses in the Study Area was sourced from the EPA. The EPA assigns biological river quality (biotic index) ratings from Q5–Q1 to watercourse sections. Q5 denotes a watercourse with good water quality and high community diversity, whereas Q1 denotes a bad water quality and very low community diversity.

There are two monitoring stations within the study area which are located on the Clare River. One station, code RS30C010100, is located 1.5km upstream of Milltown and the second, code RS30C01200, is located at Liskeevy Bridge in Milltown. Data is available for both stations however, it is to be noted that the data from the Liskeevy Bridge station is from 1993 and has therefore been disregarded. Table 4.1 below details the current water quality status of the Clare River at monitoring stations RC30C010100.

River	Monitoring Station	Location	Q Value	Status
Clare River	RS30C010100	Br 1.5 km u/s Milltown	3-4	Moderate

Table 6.38: EPA River Quality Details

Overview of Amenity Areas

The Clare River is noted as a fishing attraction in the area and offers trout fishing.

Overview of Flood Aspects

The proposed options all involve sections of off-line road developments as well as upgrading of online sections of the existing N17. The existing road network does not have any engineered/designed drainage systems (e.g. carrier pipes, gullies, etc.) except for a short 20m section at the Milltown end. Surface water drains over the edge of the road into road ditches eventually discharging into nearby streams.

It is unlikely that sections of road raised above the existing ground level, comparable to the existing road levels, would be at significant risk from flooding associated with storm surges or rivers.

It is also believed that raising road levels above ground level will make the options less susceptible to flooding from overland flow and groundwater. To further reduce the risk of flooding it is assumed that the new options will also be provided with drainage, designed to the necessary standards.

The Office of Public Works (OPW) has developed the Preliminary Flood Risk Assessment (PFRA), a national screening exercise to identify areas where there may be a significant risk associated with flooding. Figure 4.9 OPW Flood Mapping shows there is no flood risk in the study area.

6.4.4.4.2 Options Assessment

Table 6.39 summarises the associated impacts identified for each option. An order of preference is given for the route options at the end of the table.

Attribute	Attribute Importance	Route Option 1	Route Option 2	Route Option 2A	Route Option 3
Lough Corrib SAC	Very High (Attribute has a high quality or value on a Regional or National scale)	Minimal Impact	Minimal Impact	Minimal Impact	Will require the diversion of Carrownageesha Stream which forms part of the Lough Corrib SAC. Impacts will be moderate during construction stage but should be mitigated sufficiently to prevent long term impacts.
Water Quality	High (attribute has a high quality of value on a local scale)	<p>Potential water quality impact on receiving waters from routine carriageway runoff (heavy metal, organics, nutrients, hydrocarbons, suspended solids, coliforms, etc.) and from accidental spillages.</p> <p>Potential water quality impact on receiving waters from machine servicing or concrete mixing areas during the construction phase.</p>	<p>Potential water quality impact on receiving waters from routine carriageway runoff (heavy metal, organics, nutrients, hydrocarbons, suspended solids, coliforms, etc.) and from accidental spillages.</p> <p>Potential water quality impact on receiving waters from machine servicing or concrete mixing areas during the construction phase.</p>	<p>Potential water quality impact on receiving waters from routine carriageway runoff (heavy metal, organics, nutrients, hydrocarbons, suspended solids, coliforms, etc.) and from accidental spillages.</p> <p>Potential water quality impact on receiving waters from machine servicing or concrete mixing areas during the construction phase.</p>	<p>Potential water quality impact on receiving waters from routine carriageway runoff (heavy metal, organics, nutrients, hydrocarbons, suspended solids, coliforms, etc.) and from accidental spillages.</p> <p>Potential water quality impact on receiving waters from machine servicing or concrete mixing areas during the construction phase.</p> <p>Potential water quality impact during in-stream works</p>
Flooding	Medium (attribute has a medium quality or value on a local scale)	Flood risk associated with storm surge and artificial drainage systems.	Flood risk associated with storm surge and artificial drainage systems.	Flood risk associated with storm surge and artificial drainage systems.	Flood risk associated with storm surge and artificial drainage systems.
Amenity	Low (attribute has a low quality or value on a local scale)	Minimal Impact	Minimal Impact	Minimal Impact	Minimal Impact
Overall Preference		High Preference	High Preference	High Preference	Low Preference

Table 6.39: Hydrology Assessment Summary

6.4.4.4.3 Assessment Conclusion

Route Option 1 is considered to be one of the most preferable option as it closely follows the line of the existing N17 and as such will have the least extent and significance of hydrological impact.

Impacts will be most significant during construction and measures to protect water quality will be required.

Options 2 and 2A have a similar preference to Option 1 as they closely follow the line of the existing N17 and will also have the least extent and significance of hydrological impact. The routes contain short sections of offline development however these sections will not have any hydrological impact of significance.

Route Option 3 will have a higher level of hydrological impact when compared to Route Option 1 and 2. This includes the diversion of Carrownageesha Stream, which forms part of the Lough Corrib SAC, and several drainage ditch crossings.

Whatever option is finally selected, an assessment of potential impacts on surface water will be required and will provide recommendations for mitigation measures for the protection of water quality.

Based on the information contained within the previous sections, the following ranking order has been assigned to the four options.

Route	Overall Rating
Option 1	High Preference
Option 2	High Preference
Option 2A	High Preference
Option 3	Low Preference

Table 6.40: Summary of Hydrological Assessment

6.4.4.5 Landscape and Visual

The Transport Infrastructure Ireland document entitled Project Appraisal Guidelines for National Roads Unit 4.0 - Consideration of Alternatives and Options provides guidance on the route selection assessment procedure. The Transport Infrastructure Ireland guidelines "A Guide to Landscape Treatments for National Road Schemes in Ireland" was also referred to in the development of this section.

6.4.4.5.1 Assessment Methodology

Landscape has two separate, but closely related, aspects. The first is visual impact, i.e. the extent to which a new structure in the landscape can be seen. The second is landscape character impact, i.e. effects on the fabric or structure of the overall landscape.

Visual Impact

Visual impacts are categorised under 'Visual Intrusion' and 'Visual Obstruction' where; Visual Intrusion is an impact on a view without blocking; and Visual Obstruction is an impact on a view involving blocking thereof.

The majority of receptors within this Study Area will involve residential properties. In this report, the term 'receptors' means viewers within residential properties but will also include viewers within the general environment. Those community services and sensitive receptors, which have been identified within the Study Area.

Landscape Character

Landscape character is derived from the appearance of the land, and takes account of natural and manmade features such as topography, landform, vegetation, land use and built environment and their interaction to create specific patterns that are distinctive to particular localities. The landscape impact assessment predicts impacts and describes the likely nature and scale of changes to individual landscape elements and characteristics, together with the significance of such effects.

Landscape planning designations, including National and County designations or listings are considered and assessed for impacts, where appropriate. In addition, potential impacts on designated sites of cultural heritage value and ecological value are also considered.

The following criteria to further assess the landscape character and visual impact of the routes are used:

- Statutory designations
- Designated scenic views and landscapes;
- Residential amenity;
- Trees and woodland;
- Cultural landscapes;
- Listed houses, parklands and gardens;
- Recreational amenities; and
- Landscape character.

The potential impact of each option on the criteria listed above will be used to determine the option preference as either high preference, medium preference or low preference.

Existing Environment

The proposed road development is set within a normal rural landscape of low sensitivity. The landscape and appearance of the area surrounding the existing N17 is characterised by grassy verges, hedgerows, treelines and stone walls. The scheme will involve the removal of sections of the above items, however mitigation and remediation measures will be put in place to insure impacts will not be significant and will be temporary or short-term in duration.

Visually, up to 25 No. properties will experience some degree of visual impact during the construction and operational stages. In the long term, these impacts shall be reduced to slight to imperceptible following the implementation of mitigation and remedial works.

There are no designated scenic or protected views within the Study Area. There are no listed houses, parklands or gardens within the Study Area.

It is not anticipated that there will be a significant impact on the shorelines of the Clare River due to the distance between the four route options and the Clare River

6.4.4.5.2 Options Assessment

Each of the four route options incorporates sections of online improvements to the existing N17 and off-line road development.

The four route options have been assessed to identify impacts which could result in visual intrusion or visual obstruction and impacts on the landscape character of the area. This includes consideration of impacts on topography, landform, vegetation, land use and built environment are likely to result from the proposed scheme. The potential significant impacts associated with each route option are set out in the paragraphs below.

6.4.4.5.3 Assessment Conclusion

Route Option 1 is considered to be the most preferable as it closely follows the line of the existing N17 and as such will have the least extent and significance of impact on landscape and visual impact. The route will involve the widening of the existing N17 and will therefore involve disturbance to existing roadside plantings. Impacts will be most significant during construction and will involve disturbance and or loss of property boundaries.

Options 2 and 2A have a lesser preference as the sections of offline development may have a negative impact on residential properties. The route will also involve disturbance to existing roadside plantings. Impacts will be most significant during construction and will involve disturbance and or loss of property boundaries.

Route Option 3 is considered to be the least preferred due to the length of new offline sections of road which will have a higher landscape and visual impact on residential properties. As with other Options, Option 3 will involve disturbance to existing roadside plantings. Impacts will be most significant during construction and will involve disturbance and or loss of property boundaries.

A detailed consideration of the impacts and mitigation requirements will be completed during the environmental assessment process for the preferred route option.

Based on the information contained within the previous sections, the following ranking order has been assigned to the three options.

Route	Preference
Option 1	High Preference
Option 2	Medium Preference
Option 2A	Medium Preference
Option 3	Low Preference

Table 6.41: Landscape and Visual Impact Assessment Summary

6.4.4.6 Air

The Transport Infrastructure Ireland document entitled “Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes” provides guidance on the route selection assessment procedures in “Chapter 2 – Route Selection”. In undertaking the assessment consideration has been given to this guidance.

6.4.4.6.1 Assessment Methodology

The primary aspects of the assessment relate to existing ambient air quality, proximity of sensitive receptors and a review of the overall significance of potential changes in air quality.

The objective at this stage of the route selection process is to indicate whether there are likely to be significant air quality impacts associated with particular broadly defined routes. In the current assessment, the number of residential properties within 50m of each route option have been identified.

The assessment focuses on the pollutants NO₂ and PM₁₀ only, as these pollutants are of most concern with respect to traffic related emissions, in accordance with the “*Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes*”, TII 2011.

Existing Environment

The primary influences on air quality in County Galway include emissions from transport and domestic/commercial heating sectors. The greatest existing source of air pollution within the Study Area is road traffic, specifically that emanating from the existing N17. There are no IPPC licenced industrial facilities with emissions to the atmosphere within the Study Area.

The EPA maintains a number of air quality monitoring sites throughout the country. The nearest of these sites to our study area is located in Claremorris and has a current air quality rating of “Good”.

6.4.4.6.2 Options Assessment

Sensitive Receptors

The number of receptors sensitive to air quality within 50m of the carriageway of each of the proposed routes has been determined. In addition to the residential properties there is also a shop and a garage. The numbers of sensitive receptors along each route within 50m are included in **Table 6.42** below.

Route	No. of Receptors (0-50m)	Preference
Option 1	25	Low Preference
Option 2	21	Medium Preference
Option 2A	20	Medium Preference
Option 3	18	High Preference

Table 6.42: Summary of Sensitive Receptors and Impact Assessment

Impact on Sensitive Ecosystems

The EC Directive 92/43/EEC on the *Conservation of Natural Habitats and of Wild Fauna and Flora (the "Habitats Directive")* requires an Appropriate Assessment to be carried out where there is likely to be a significant impact upon a European protected site. The TII requires the Air Quality Specialist to liaise with an ecologist on schemes where there is a European protected site within 2km of the route.

Per the TII Guidelines where there is a significant change to traffic flows (>5%) and a designated site lies within 200m of the road centre line, the assessment at the Route Selection stage will involve a calculation of nitrogen oxides (NO_x) concentrations and nitrogen deposition.

6.4.4.6.3 Assessment Conclusion

Based on the of sensitive receptors along each proposed route, the following ranking order has been assigned to the four route options.

Route	Preference
Option 1	Low Preference
Option 2	Medium Preference
Option 2A	Medium Preference
Option 3	High Preference

Table 6.43: Air Impact Assessment Summary

6.4.4.7 Noise

The Transport Infrastructure Ireland document entitled "Guidelines for the Treatment of Noise and Vibration in National Road Schemes" provides guidance on the route selection assessment procedures in "Chapter 5 – Route Corridor Selection". In undertaking the assessment consideration has been given to this guidance.

6.4.4.7.1 Assessment Methodology

Assessment of potential impact is based primarily upon sensitive receptor counts and likely changes in traffic flow. Sensitive properties may include residential units, schools and crèches; although at this stage of the assessment no further distinction is made between these different types of properties.

Property counts have been conducted as a measure of sensitive receptors. This has been carried out within four bands either side of the centreline of each route, i.e. 0 to 50m, 50 to 100m, 100 to 200m and 200 to 300m. Each band has been assigned a weighting of between 1 and 4 to provide a total impact rating for each route. Consideration of the likely changes in traffic flow have also been considered within the assessment.

Existing Environment

The existing environment of the Study Area is rural in nature. The land use is predominately a mixture of agricultural lands, residential properties and a few small commercial properties. The main contributors to the existing noise environment are road traffic movements along the existing N17, road traffic along the existing local roads, and general environmental sources including bird song and rustling foliage.

6.4.4.7.2 Options Assessment

An assessment of potential impact in terms of noise and vibration based upon the number of noise sensitive receptors within specified distance bands from each of the options under consideration is set out in the following Section.

A desktop study has been carried out in order to determine, as accurately as possible, the number and type of properties potentially sensitive to noise and/or vibration within 300m of each of the proposed route options. This has been undertaken for four bands either side of centreline of each option, i.e. 0-50m, 50-100m, 100- 200m and 200-300m. Refer to Figures A.11 A to C for locations of these bands relative to each of the options.

A desktop study has been carried out in order to determine as accurately as possible the number and type of properties in the vicinity of each of the proposed options.

The total number of receptors in each band is multiplied by an arbitrary rating factor. The rating factor is 4 for Band 1, 3 for Band 2, 2 for Band 3 and 1 for Band 4. The resultant values are summed to give a single number for each route option, termed the Potential Impact Rating (PIR).

The option with the lowest PIR has the lowest nominal potential impact.

Table 6.44 presents the potential impact rating for Route Options 1 to 3 based on the number of property counts within 300m of each of the proposed road centreline.

Band	Rating	Number of Receptors in Band multiplied by the Factor			
		Route Option 1	Route Option 2	Route Option 2A	Route Option 3
1 (0 - 50m)	4	24 x 4 = 96	24 x 4 = 96	20 x 4 = 80	18 x 4 = 72
2 (50 - 100m)	3	6 x 3 = 18	5 x 3 = 15	8 x 3 = 24	11 x 3 = 33
3 (100 - 200m)	2	14 x 2 = 28	13 x 2 = 26	11 x 2 = 22	14 x 2 = 28
4 (200 - 300m)	1	13 x 1 = 13	13 x 1 = 13	19 x 1 = 19	14 x 1 = 14
Potential Impact Rating		155	150	145	147

Table 6.44: Potential Impact Rating for Route Options 1 to 7

6.4.4.7.3 Assessment Conclusion

A detailed consideration of the impacts and mitigation requirements will be completed during the environmental assessment process for the preferred route option.

Based on the information contained within the previous sections, the following ranking order has been assigned to the seven route options based on the PIR assessment, assigning a preference order based on the number of sensitive receptors in proximity to the proposed route options.

Route	PIR	Overall Rating
Option 1	155	Low Preference
Option 2	150	Medium Preference
Option 2A	145	High Preference
Option 3	147	High Preference

Table 6.45: Noise Impact Assessment Summary

6.4.4.8 Agronomy

The Transport Infrastructure Ireland documents entitled “*Project Management Guidelines*” and “*Environmental Impact Assessment of National Road Schemes – A Practical Guide*” provides guidance on the route selection assessment procedures. In undertaking the assessment consideration has been given to this guidance and the guidance provided in the EPA documents entitled “*Guidelines on Information to be Contained in Environmental Impact Statements*” and “*Advise Notes on Current Practice (on the preparation of Environmental Impact Statements)*”.

6.4.4.8.1 Assessment Methodology

The assessment of the agricultural impact consisted of a combination of a desktop survey of available information, a roadside inspection and local knowledge of the Study Area. The study carried out an assessment of the agricultural impact of each of the three route options and allocated them a level of preference.

The desktop study consisted of aerial photography and scheme mapping. Scheme mapping consisted of preliminary design plan for all route options and landownership mapping for the Study Area. The roadside survey was carried out in June 2018. The assessment of the impact on agricultural land was completed for categories including:

- Land quality;
- Land use; and
- Land severance and farmyard disturbance.

The assessment of route sections under each of the above categories involved identifying an impact rating to each route section and a relevant preference level. The selection of a preference level for each section will feed into the comparison matrix for the proposed scheme and allow for the selection of a preferred route.

Assessment Criteria

The proposed scheme will pass through agricultural land with impacts on farm holdings or individual land parcels. Slight positive impacts could be associated with some route options through improvement of accessibility to lands for some agricultural enterprises. The overall impacts are generally found to be negative as with agricultural properties the negative impacts will be found to be greater than any positive impact.

In general, negative impacts from the development of a new road are mainly due to the level of land take, land severance and access problems to land and farmyard facilities. Intensive farm enterprises such as dairy farms may be particularly affected by the loss of direct access to severed lands.

Severance of a land parcel occurs when a road alignment splits a field or land parcel into two or more pieces. This results in the fragmentation of the farm into a greater number of management units and access may involve a considerable distance to the severed area of land. Fragmentation of farms results in greater costs due to increased livestock and grassland management involved in farming more than one unit e.g. movement of livestock between land parcels and increased travel distances for grassland, silage and tillage machinery. The category of land severance is also given a greater weighting when land quality and land use are similar for route sections. The definitions for each level of land severance are presented in **Table 6.46** on the following page.

Significance Impact	Impact
Large Negative Impact	There is a high number of land parcels on the route option with those affected being primarily of good land quality. Land use is arable or grassland based. Affected parcels primarily consist of intensive grassland-based livestock enterprises. There is a relatively high level of land take on the route option. Land Severance of affected land parcels is mainly major. There is a high level of farmyard disturbance.
Moderate Negative Impact	There are a high number of land parcels with those affected being primarily of average to good land quality. Land use is mainly grassland based. There is a relatively moderate level of land take on the route option. Land Severance of affected land parcels is moderate to major. There is a level of farmyard disturbance.
Minor Adverse Impact	The affected lands are primarily of poor to average land quality. Land use is grassland based and includes non-grassland parcels such as wetlands and woodlands. There is a relatively low level of land take on the route option. Land Severance of affected land parcels is primarily minor to moderate. There is a low level of farmyard disturbance.
Neutral	No effect on agricultural land.
Slight Positive Impact	Increased access to the affected land parcels or improved drainage. However, this will not outweigh the removal of a portion of land.
Moderate Positive Impact	Not applicable to agriculture.
Large Positive Impact	Not applicable to agriculture.

Table 6.46: Details of Significance Impact

Existing Environment

The Study Area commences in the townland of Gortnagunned, and terminates in the townland of Cartron/ Milltown. The majority of the land in the Study Area can be broadly classified as agricultural. The main land use is grassland, with generally an average to good quality, and some small areas of forestry, scrub and bog.

Agriculture within the Study Area is dominated by grassland farming and predominantly specialist beef, sheep and mixed livestock enterprises. No dairy farms, tillage farms or specialist equine farms were identified within the Study Area. The farm enterprises range from intensively managed systems in areas of good land quality to very extensive systems in areas of average to poor quality land.

Farms in the Study Area generally consist of more than one parcel of land. Some farms are quite fragmented consisting of several land parcels in close proximity to each other. This may result in a route option affecting more than one land parcel on a farm holding.

6.4.4.8.2 Options Assessment

The results of the assessment for each route section are shown in the following sections for land quality, land use, land severance and farmyard disturbance. For each section, the number of land parcels under several headings is recorded and expressed as a percentage of the total.

Land Quality

The definitions for the assessment categories under land quality are presented in Table 6.47 below.

Good quality land	High agricultural value and potential. Accessibility is good and the maintenance level is very high. The drainage is very good or the soils are free draining. It is suitable for a wide range of arable and livestock enterprises at an intensive level
Average quality land	Average agricultural value with a high agricultural potential. There may be drainage problems in these areas. These areas may require maintenance work to increase productivity. It is suitable for a wide range of arable and livestock enterprises
Poor quality land	Low agricultural value and potential. These areas are unsuitable for intensive grazing by livestock enterprises. They are suitable for extensive stocking, rough grazing, forestry or peat production.

Table 6.47: Definitions of Land Quality

The impact on agriculture is greater where the affected land is of a higher quality. Higher quality land has a high agricultural potential and the agricultural value attached to that land is greater as a result. Land of a lower quality has a lower agricultural potential and value and as a result, a lesser impact.

Route	Land Parcels	% Land Quality		
		Good	Average	Poor
Option 1	27	30%	67%	3%
Option 2	30	40%	53%	7%
Option 2A	30	40%	53%	7%
Option 3	32	38%	56%	6%

Table 6.48: Assessment of Land Quality

The Study Area of the proposed development contains a varying quality of land, ranging from good to poor quality agricultural land. Some of the route sections traverse good quality and poor-quality land parcels. Poor quality parcels are mostly in low lying areas along the routes. These lands are more limited in terms of agricultural range and usage.

Land Use

The definition for the assessment categories under land use are presented in **Table 6.49**.

Grass	This consists of areas of grassland.
Forestry	This consists of areas of natural woodland, commercial forestry and areas with significant levels of scrub and hazel.
Other	This consists of lands which are in other uses such as for horticultural use.

Table 6.49: Definitions of Land Use

The impact on agriculture is greater on the grassland category and in other intensive land uses. Those in the grassland category are primarily used for livestock based enterprises which are most affected by land access, severance or disturbance to farmyards or animal handling facilities. As a result, high levels of parcels in these categories would indicate a greater impact on agriculture.

Route	Land Parcels	% Land Use		
		Grass	Forestry	Other
Option 1	27	96%	0%	4%
Option 2	30	96%	0%	4%
Option 2A	30	96%	0%	4%
Option 3	32	94%	3%	3%

Table 6.50: Assessment of Land Use

The majority of the Study Area is in grassland. There is a small section of forestry which has been planted by a local due to the poor land quality, while there is a section of shrubland next to the railway line. The farmland is generally of average to good quality. The grassland based activities comprise beef and sheep enterprises.

Land Severance and Farmyard Disturbance

The definitions for the assessment categories under land severance are presented in **Table 6.51**.

The levels of significant land severance together with the level of farmyard disturbance are often the most influential factors that impact on agriculture. Significant severance is regarded as the

combined levels from the major and moderate categories. Severance of livestock-based farm holdings can have a high impact due to the difficulties created in stock movement around the farm or access to and from the fields to the farmyard.

Major	Major severance refers to land parcels that are characterised by the route splitting the parcel in two resulting in a significant area of the parcel becoming inaccessible or landlocked. It also occurs in smaller parcels where the route may occupy a significant portion of the parcel area. The route may impact on farmyard buildings or a significant agricultural facility.
Moderate	Moderate severance refers to land parcels where a significant portion is separated from the rest by the new development. The isolated portion is large enough to continue to be farmed in a productive manner. There will be operational difficulties when moving livestock or machinery. Alternative access and/or gateways may need to be provided. Animal handling facilities or a farmyard area may be affected.
Minor	Minor severance denotes land parcels that are characterised by having a relatively small portion of land isolated by the route or a realignment of a local road, or where the land take is along the boundary of a land parcel and impacts upon access to remaining lands. Small severed parcels of land may be too small to farm in a productive manner.
None	No severance refers to land parcels that are impacted along the boundary of the parcel or where a corner of a field is removed. It generally involves a low level of land take. There is no impact on access to lands.

Table 6.51: Definitions of Land Severance

Under this assessment, farmyard disturbance was recorded. Such facilities may include animal housing or fodder storage facilities and also applies to animal-handling facilities such as yards and cattle pens. Farmyard disturbance is recorded as one group of farm buildings or facilities.

The assessment of severance did not include the impact of the route on land drainage, provision of services such as electricity and water supply. It has been assumed that the provision of land drainage will be restored and services to severed land will be restored.

Route	Land Parcels	% Land Use				Farm Yards
		Major	Moderate	Minor	Not Significant	
Option 1	27	0%	0%	4%	96%	0
Option 2	30	0%	0%	13%	87%	0
Option 2A	30	0%	0%	13%	87%	0
Option 3	32	0%	16%	13%	71%	0

Table 6.52: Land Severance and Farmyard Disturbance

Discussion

Route Option 1 is predominately online. The land take for this option would occur along the existing road corridor, therefore disturbance will be minimised by staying on line. The route impacts on 27 land parcels and is approximately 3km long. There is no farmyard disturbance on this route.

Route Option 2 is predominantly online, with a short section of offline development from Ch1700 – 2200. The land take for this option would occur along the existing N17, including land take for the offline section where the remaining pocket of land between the new route and existing N17 will be of no benefit to landowner due to its minimal area. The route impacts on 30 land parcels and is approximately 3km long. No farmyards are disturbed by this route.

Route Option 2A is similar to Option 2 with a predominantly online development. The land take for this option would occur along the existing N17, including land take for the offline section where the remaining pocket of land between the new route and existing N17 will be of no benefit to landowner due to its minimal area. The route impacts on 30 land parcels and is approximately 3km long. No farmyards are disturbed by this route.

Route Option 3 is online until Ch1000 It then travels in a southerly direction to the west of the existing N17 causing severance to land parcels. It comes back online at Ch2450 reducing severance for the remainder of the online section. It impacts on 32 land parcels and is approximately 3km long. There is no farmyard disturbance along the route

6.4.4.8.3 Assessment Conclusion

This study carried out an assessment of the agricultural impact of each of the four route options and allocated them an agricultural impact. The impact of the individual route options on agriculture has been assessed under several categories including land quality, land use, land severance and farmyard disturbance. The assessment of land use has also considered the impact on local farms of particular note such as dairy or equine farms. There were no farms of particular note within the Study Area.

Route Option 1 (online alignment) has the least impact on agriculture and is the most preferred route option. This is mainly attributed to land severance and no farmyard disturbance occurs along this route. This route option is most preferred.

Route Option 2 and 2A are identified as having a medium preference. This is attributed to the low level of land severance, lower number of land parcels impacted and no farmyard disturbance occurs along the route.

Route Option 3 is identified as the least preferred option. This is due to the higher number of land parcels impacted and a higher level of land severance along the proposed corridor.

The land quality under all options is predominately of average to good quality of limited use range.

The farming in the area of the proposed routes appears to be of low intensity and none of the farms are of national or regional importance. The permanent loss of agricultural land in the Study Area would affect agricultural productivity on a local level only.

Based on the information contained within the previous sections, the following ranking order has been assigned to the three route options based on the agricultural impact of each of the route options.

Route	Overall Rating
Option 1	High Preference
Option 2	Medium Preference
Option 2A	Medium Preference
Option 3	Low Preference

Table 6.53: Agronomy Assessment Summary

6.4.4.9 Overall Environmental Assessment

The seven route options have been assessed under the Environmental Criteria highlighted in the previous sections. The environmental assessment has been summarised in Table 6.54 below. The individual assessments have been combined to give an overall preference for each option.

	Route Option 1	Route Option 2	Route Option 2A	Route Option 3
Ecology	High Preference	Medium Preference	Medium Preference	Low Preference
Archaeological, Architectural and Cultural Heritage	High Preference	Low Preference	Medium Preference	Medium Preference
Soils, Geology and Hydrogeology	High Preference	Medium Preference	Medium Preference	Medium Preference
Surface Water	High Preference	High Preference	High Preference	Low Preference
Landscape and Visual	High Preference	Medium Preference	Medium Preference	Low Preference
Air	Low Preference	Medium Preference	Medium Preference	High Preference
Noise	Low Preference	Medium Preference	High Preference	High Preference
Agronomy	High Preference	Medium Preference	Medium Preference	Low Preference
Overall	High Preference	Medium Preference	Medium Preference	Low Preference

Table 6.54: Summary of Environmental Assessment

6.4.5 Economy

6.4.5.1 Option Comparison Cost Estimates

The Option Comparison Cost Estimate (OCCE) for the four route options, which has been determined in accordance with the *TII Project Appraisal Guidelines (PAG) Unit 6.7 – Preparation of Scheme Costs*, is provided in Table 6.55 below.

The OCCE comprises the Scheme Base Cost, Total Inflation Allowance and TII Programme Risk.

	Option 1	Option 2	Option 2A	Option 3
Option Comparison Cost	€6.20m	€7.55m	€7.01m	€7.99m
Overall Length of Mainline (km)	2.935	2.92	2.92	2.91
Cost per Km	€2.11m	€2.59m	€2.40m	€2.75m

Table 6.55: Option Comparison Cost Estimate Summary

Route Option 1 is the most economically advantageous in terms of overall comparison cost. The second most advantageous is Option 2A with Option 3 proving to be the least advantageous. The order remains the same when comparing the cost per kilometre, as there is very little difference in mainline scheme length.

6.4.5.1.1 Conclusion

The preference ratings for each option have been ranked in terms of the OCCE and Cost per km, and are provided in Table 6.56.

Route	Overall Rating
Option 1	High Preference
Option 2	Medium Preference
Option 2A	Medium Preference
Option 3	Low Preference

Table 6.56: Option Comparison Cost Estimate Assessment Summary

6.4.5.2 Cost Benefit Analysis

Cost Benefit Analysis (CBA) is an economic evaluation carried out to determine if the scheme will provide a suitable return and represents value for money. The CBA compares the Do-Minimum scenario (Route 1) with the Do-Something scenario (i.e. Route Options 2, 2A and

3), as defined in Section 4, and determines whether benefits resulting from the provision of the scheme will outweigh the costs of construction and future maintenance.

The CBA for the scheme was undertaken using the TII Simple Appraisal tool and is provided in Appendix E. This tool calculates the Benefit to Cost Ratio (BCR) for each route from the expenditure breakdown according to category as well as the total inflation allowance, TII programme risk and a number of input parameters which are set out, and have been input in accordance with, *TII Project Appraisal Guidelines for National Roads Unit 6.0 - Cost Benefit Analysis Overview*.

The CBA is conducted over the standard 30-year appraisal period, but also includes the residual value of the asset beyond the 30-year appraisal period, within the calculation. The First Scheme Year has been taken as 2022, with the Last Scheme Year being 2052.

The Benefit to Cost ratio for each route option resulting from the CBA is presented in Table 6.57 below.

Route Option	Benefit to Cost Ratio
Option 1	1.66
Option 2	1.27
Option 2A	1.39
Option 3	1.23

Table 6.57: Benefit to Cost Ratio

6.4.5.2.1 Conclusion

The preference ratings for each option have been ranked in terms of the TII Simple Appraisal Tool Outputs, and are provided below in **Table 6.58**.

Route Option	Preference
Option 1	High Preference
Option 2	Low Preference
Option 2A	Medium Preference
Option 3	Low Preference

Table 6.58: CBA Assessment Summary

6.4.5.3 Overall Economic Appraisal

As the CBA considers the OCCE in its assessment, the preference ratings for the overall economic appraisal will be the same as the preference rating for the CBA provided in Table 6.58 above. The Overall Economic Appraisal is presented in Table 6.59 below.

Route Option	Cost	Cost Benefit Analysis	Overall Preference
Option 1	High Preference	High Preference	High Preference
Option 2	Medium Preference	Low Preference	Medium Preference
Option 2A	Medium Preference	Medium Preference	Medium Preference
Option 3	Low Preference	Low Preference	Low Preference

Table 6.59: Overall Economic Appraisal Summary

Chapter 7
Stage 2 Project Appraisal Matrix



7 Project appraisal Matrix

7.1 Engineering Appraisal

	Route Option 1	Route Option 2	Route Option 2A	Route Option 3
Traffic Assessment and Route Cross-Section	Same Preference	Same Preference	Same Preference	Same Preference
Technical Standards	Low Preference	High Preference	High Preference	High Preference
Junctions, Access and Interaction with Existing Networks	Low Preference	High Preference	High Preference	High Preference
Structures	Low Preference	Medium Preference	Medium Preference	Low Preference
Geology and Hydrogeology	High Preference	Medium Preference	Medium Preference	Low Preference
Earthworks	Low Preference	Medium Preference	High Preference	Medium Preference
Drainage	High Preference	High Preference	High Preference	Low Preference
Construction	Low Preference	Medium Preference	Medium Preference	High Preference
Service Conflicts	Medium Preference	Low Preference	Medium Preference	High Preference
Land and Property	High Preference	Low Preference	Medium Preference	Medium Preference
Impact on Iarnród Éireann	Same Preference	Same Preference	Same Preference	Same Preference
Overall	Low Preference	High Preference	High Preference	Medium Preference

Table 7.1: Overall Engineering Appraisal

7.2 Safety Appraisal

	Route Option 1	Route Option 2	Route Option 2A	Route Option 3
RSA Stage F Part 1	Low Preference	High Preference	Medium Preference	High Preference
Overall	Low Preference	High Preference	Medium Preference	High Preference

Table 7.2: Overall Safety Appraisal**7.3 Environmental Appraisal**

	Route Option 1	Route Option 2	Route Option 2A	Route Option 3
Ecology	High Preference	Medium Preference	Medium Preference	Low Preference
Archaeological, Architectural and Cultural Heritage	High Preference	Low Preference	Medium Preference	Medium Preference
Soils, Geology and Hydrogeology	High Preference	Medium Preference	Medium Preference	Medium Preference
Surface Water	High Preference	High Preference	High Preference	Low Preference
Landscape and Visual	High Preference	Medium Preference	Medium Preference	Low Preference
Air	Low Preference	Medium Preference	Medium Preference	High Preference
Noise	Low Preference	Medium Preference	High Preference	High Preference
Agronomy	High Preference	Medium Preference	Medium Preference	Low Preference
Overall	High Preference	Medium Preference	Medium Preference	Low Preference

Table 7.3: Overall Environmental Appraisal

7.4 Economic Appraisal

Route Option	Route Option 1	Route Option 2	Route Option 2A	Route Option 3
Cost	High Preference	Medium Preference	Medium Preference	Low Preference
Cost Benefit Analysis	High Preference	Low Preference	Medium Preference	Low Preference
Overall Performance	High Preference	Medium Preference	Medium Preference	Low Preference

Table 7.4: Overall Economic Appraisal

7.5 Project Appraisal Matrix

Having appraised each of the Route Options for Environmental, Engineering, Safety and Economy in the sections above, a preference weighting of high, medium and low for each heading was allocated to each Route Option and is shown in **Table 7.1**.

	Route Option 1	Route Option 2	Route Option 2A	Route Option 3
Engineering	Low Preference	High Preference	High Preference	Medium Preference
Safety	Low Preference	High Preference	Medium Preference	High Preference
Environmental	High Preference	Medium Preference	Medium Preference	Low Preference
Economic	High Preference	Medium Preference	Medium Preference	Low Preference
Overall	Medium Preference	High Preference	Medium Preference	Low Preference

Table 7.5: Project Appraisal Matrix

7.6 Recommendation of a Preferred Route Option

Route Option 2 has emerged as the Preferred Route Option from the Project Appraisal Matrix.

Option ranked highly in terms of Engineering and Safety with a Medium Preference in regard to the Environmental and Economic appraisal.

Chapter 8 Project Appraisal Balance Sheet



8 Project Appraisal Balance Sheet

8.1 Project Appraisal Balance Sheet

The Project Appraisal Balance Sheet (PABS) was completed in accordance with TII Publications *Project Appraisal Guidelines for National Roads Unit 12.0 – Minor Projects (€5m to €20m)*. The PABS acts as a tool for summarizing the expected impacts of the Preferred Route Option under the headings and subheadings which are listed below:

- Environment:
 - Air Quality;
 - Noise and Vibration;
 - Landscape and Visual Quality;
 - Biodiversity;
 - Cultural Heritage;
 - Land Use
 - Water resources.

- Safety:
 - Collision Reduction;
 - Security.

- Economy:
 - Transport Efficiency and Effectiveness;
 - Wider Economic Impacts;
 - Funding.

- Accessibility and Social Inclusion:
 - Vulnerable groups.
 - Deprived geographical area;

- Integration:
 - Transport integration;
 - Land use integration;
 - Geographical integration;
 - Other Government Policy Integration.

- Physical Activity:
 - Physical Activity

The structure and content of the PABS is fixed and cannot be altered. It consists of a qualitative evaluation summarising the impact of the Scheme in qualitative terms and where possible a quantitative evaluation that sets out quantified and monetised impacts of the Scheme.

The headings are also subject to a scaling Quantitative Statement indicating whether the impacts are Highly Positive; Moderately Positive; Slightly Positive; Neutral; Slightly Negative or Moderately Negative.

Project Appraisal Balance Sheet - (Minor Projects costing €5m to €20m)

Scheme	Description	Problems Identified		TSB	
N17 Milltown to Gortnagunned	3km upgrade to Type 1 standard, removing below standard bends.	Narrow road with severe bends, inconsistent with the standard of adjacent sections, with resulting high incidence of accidents		€7m	
Objective	Sub-objective	Qualitative impacts	Quantitative assessment	Monetised (€ million over 30yrs.)	Score
Environmental	Air Quality	Neutral Impact. Increase in average traffic speeds will be offset by the reduction in the accelerating and decelerating that occurs on the existing alignment.	Air Pollution	€0.00	4.0
	Noise and vibration	Increase in noise from construction; This is more than offset by a slight reduction in noise during operation from improved road surface and realignment.	Noise	€0.00	4.5
	Landscape & Visual Quality	Slight impact with a wider road, however this will be adequately mitigated by proposed planting.			3.5
	Biodiversity	No significant impact on Lough Corrib SAC. Compensation measures mitigate local habitat loss.			4.0
	Archaeological & Architectural Heritage	Slightly negative impact with the demolition of a newly renovated farmhouse.			3.0
	Land Use	Land take primarily within Agricultural areas.			4.0
	Water resources	Increased runoff to local streams. Improved quality of runoff with application of SUDS.			4.0

Safety	Collision Reduction	A reduction in road collisions is anticipated resulting from improved alignment and consistency of road standard along the route			Value of change	€0.0	6.0
	Security	Pedestrians and cyclists benefit from wide hard shoulders and verge.					5.0
Economy	Transport Efficiency and Effectiveness	Improved efficiency derived from improvement in average travel speeds and in improvement in overtaking opportunities.	-	Vehicle-hours per day in travel time savings	Non-Business	€-	5.0
					Business	€-	
		-	vehicle-km per day in travel distance savings	Active Travel	€-		
				Residual Value	€-		
	Wider Economic Impacts	Increased output in imperfectly-competitive markets				€0.00	4.5
Funding	Not assessed			PVC	€11.42	4	
Accessibility and Social Inclusion	Vulnerable Groups	Pedestrians and cyclists benefit from wide hard shoulders and verge.				4.5	
	Deprived Geographic Areas	The upgrade provided improved access for the rural area of Gortnagunned to the village of Milltown and further along the N17				4.5	
Integration	Transport Integration	The route supports a number of Bus Éireann services. Proposed route would offer cycling potential				5.5	
	Land-Use integration	The scheme is identified as a strategic linking corridor in Regional Planning Guidelines.				4.5	
	Geographical integration	The N17 connects Galway City with Knock Airport				4.5	

	Other Government Policy Integration	The N17 is a route of regional significance		4.5
Physical Activity	Physical Activity	Improved facilities for cyclists and pedestrians.		4.5
			PVB	€11.82
			BCR	1.30

PABS for Option 2 – Preferred Route

8.2 Summary of Road Safety Audit Stage F

A Stage F Part 1 Road Safety Audit was carried out via a desktop study and a site visit in October and November 2018, following the methodology described in TII Publications Road Safety Audit Guidelines (GE-STY-01027). Due to the lack of design detail at this stage of the scheme development, the report comments on potential safety related differences between the options rather than stating specific problems and recommendations. The full report is included in Appendix B and rankings can be viewed in Table 8.1 below.

Route	Overall Rating
Option 1	Low Preference
Option 2	High Preference
Option 2A	Medium Preference
Option 3	High Preference

Figure 8.1 : Stage F Part 1 Road Safety Audit Summary

8.3 Recommendation of Preferred Route

Bases on the information that has been detailed throughout this report, the route selection process has concluded that the preferred route option is Route Option 2.

It is recommended that Route Option 2 be designated as the Preferred Route Option and that this route option be brought forward to *Phase 3 - Design and Environmental Evaluation* for further development as per TII Project Management Guidelines.

Appendices



Appendix A - Figures

Figure a01 Existing Road Network

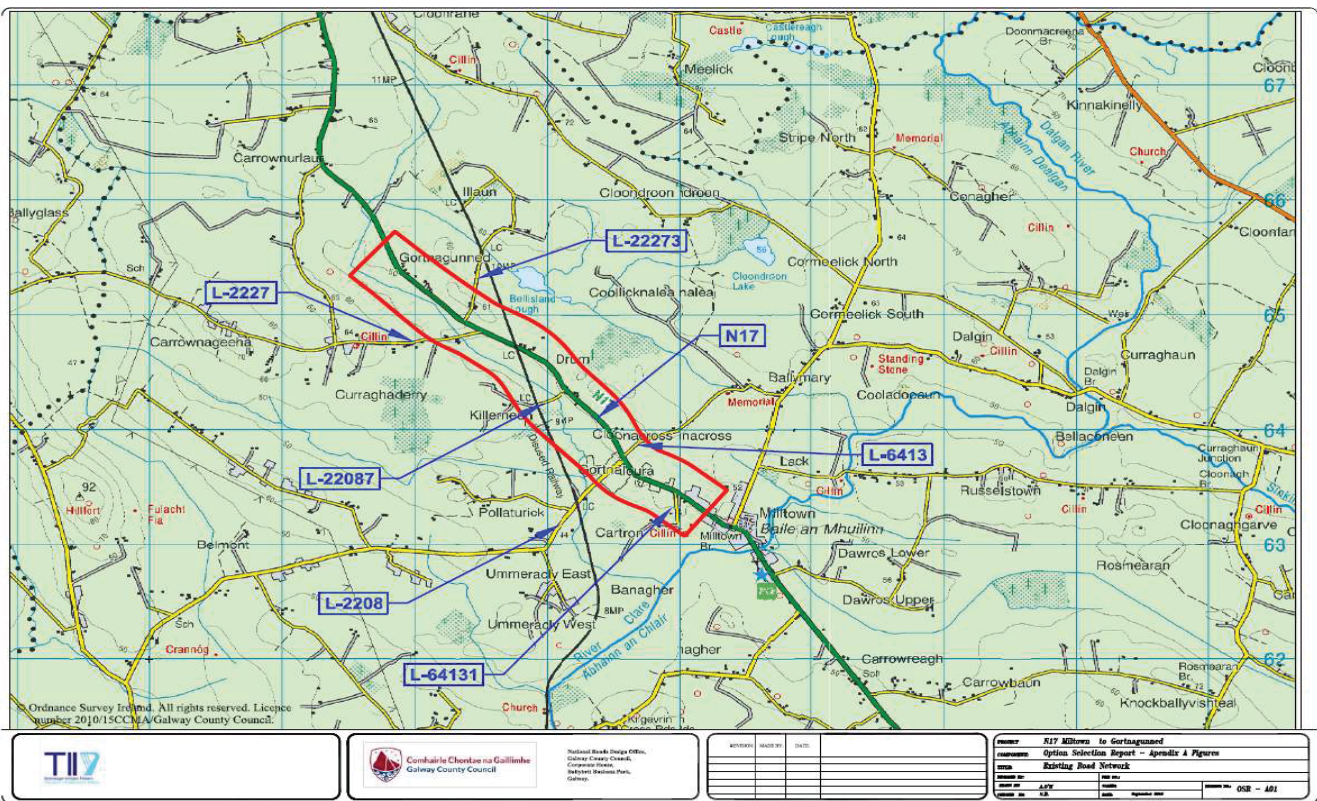


Figure 202 Houses, BUILDINGS and OTHER STRUCTURES

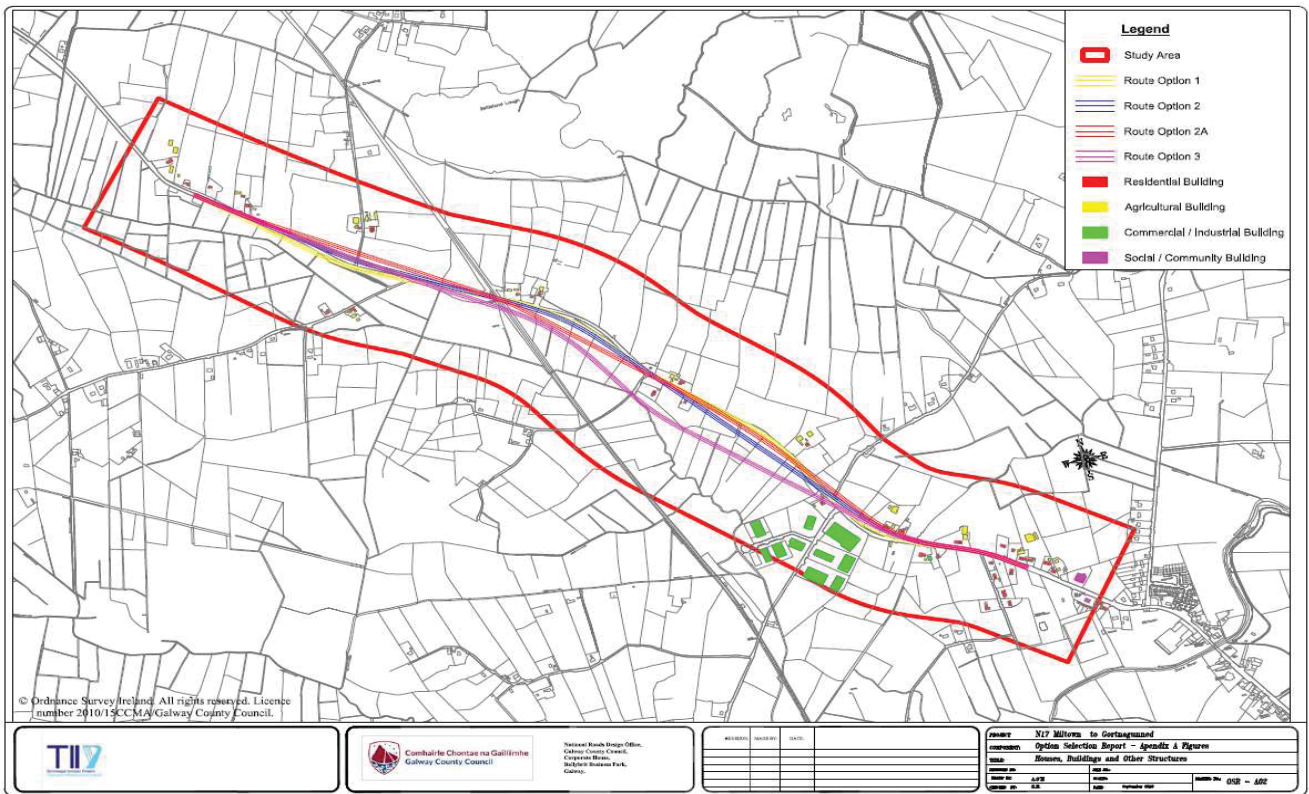


Figure a03 Planning Applications

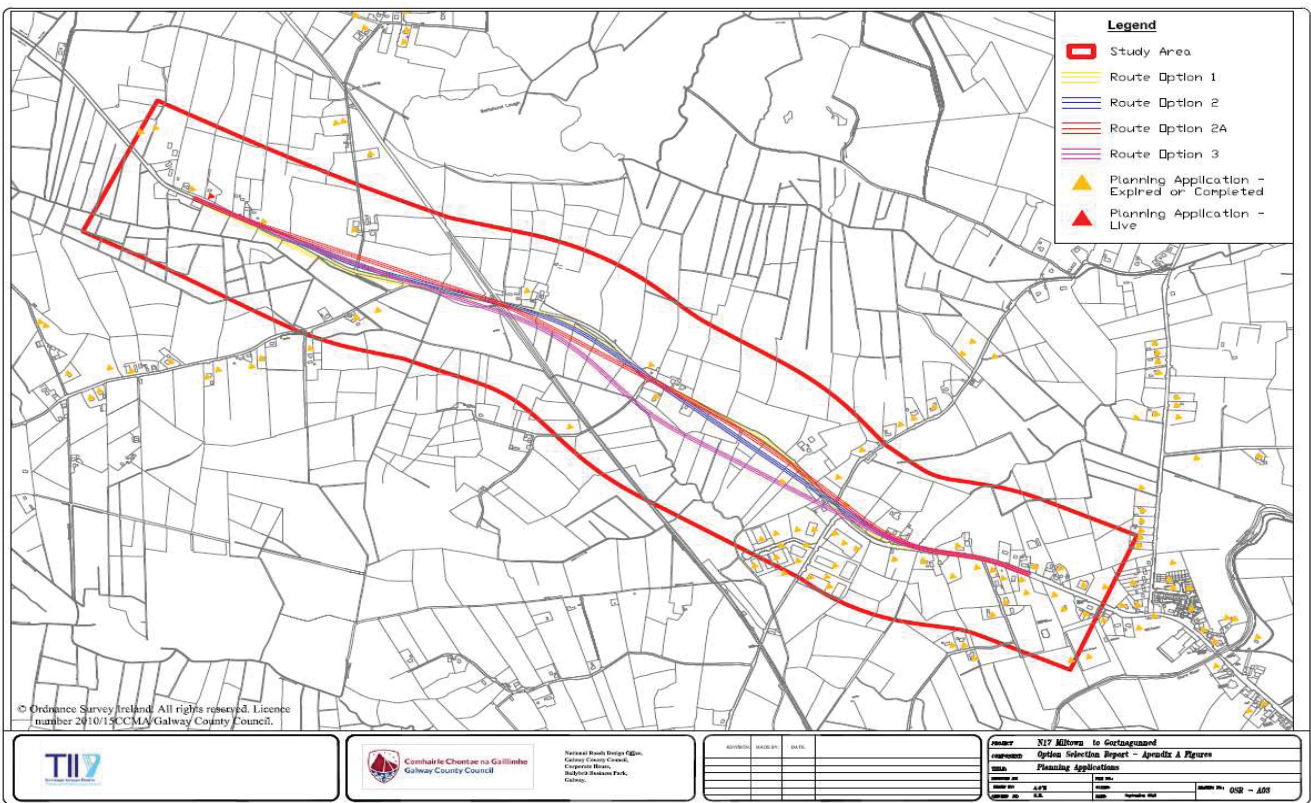


Figure a04 Land Use

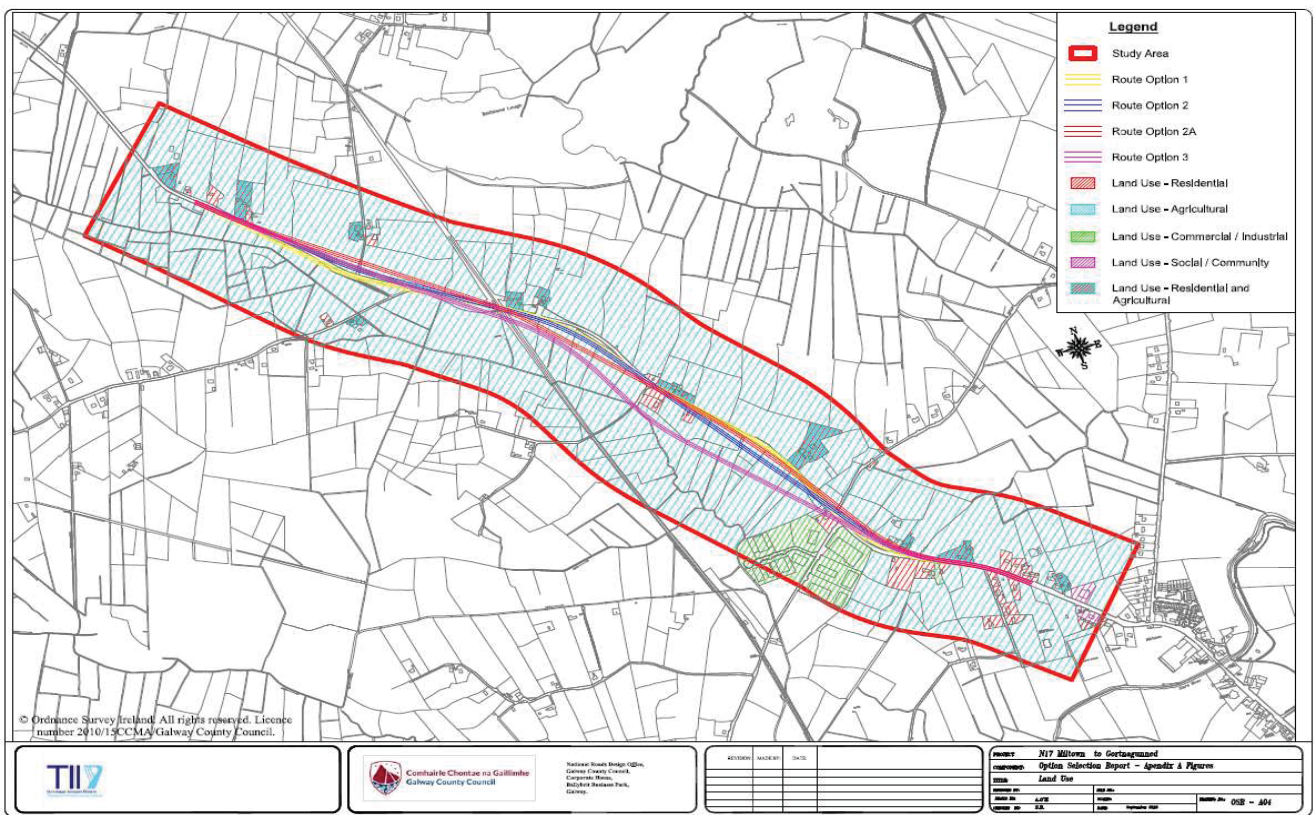


Figure 205 EIR Service Locations

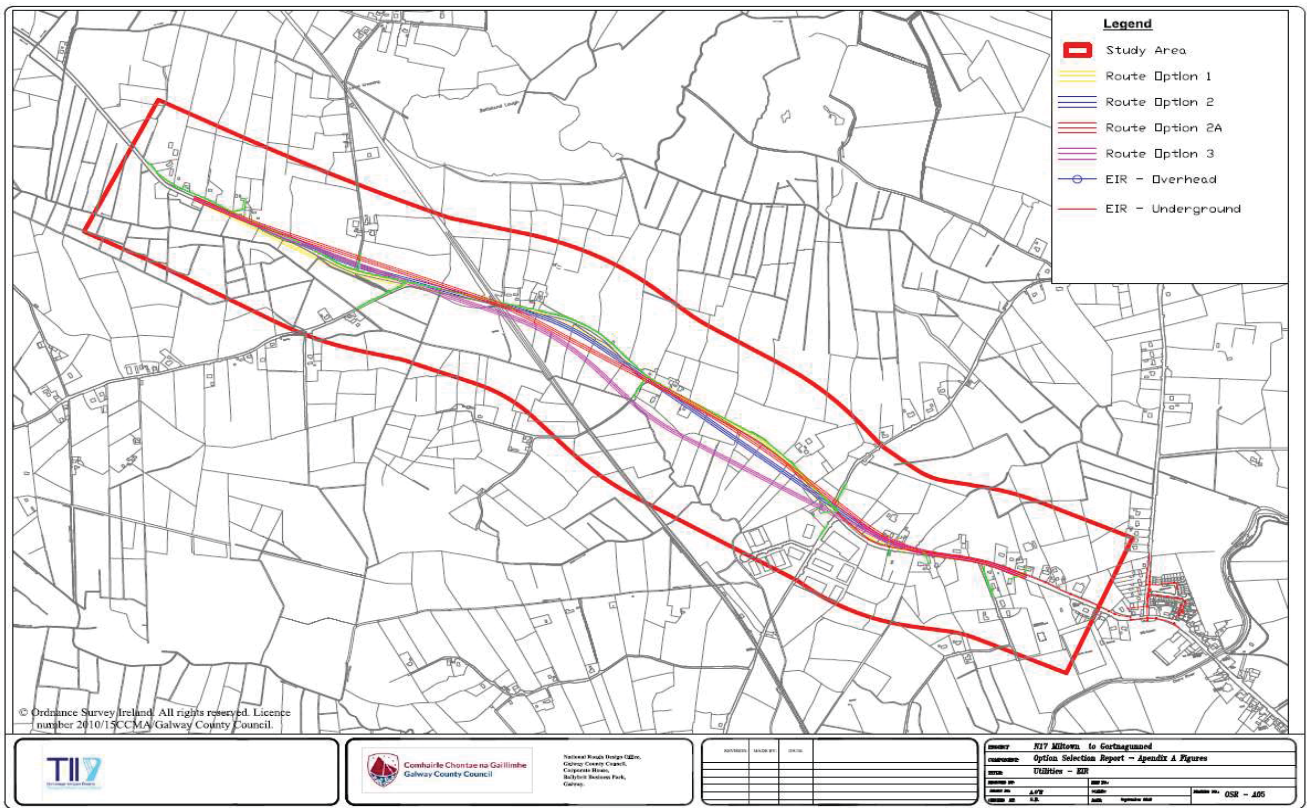


FIGURE 206 GROUP WATER SCHEME LOCATION MAP

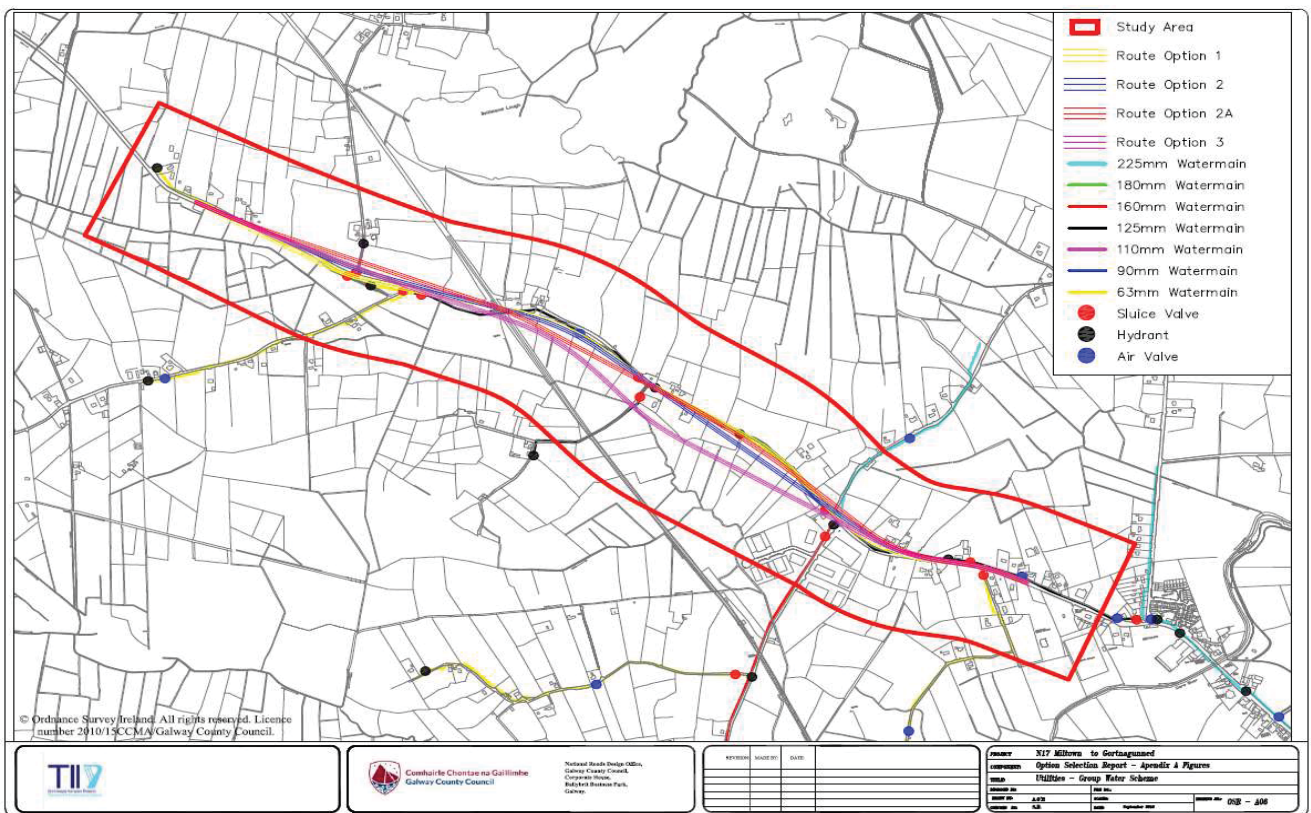


Figure a07 ESB Location Map

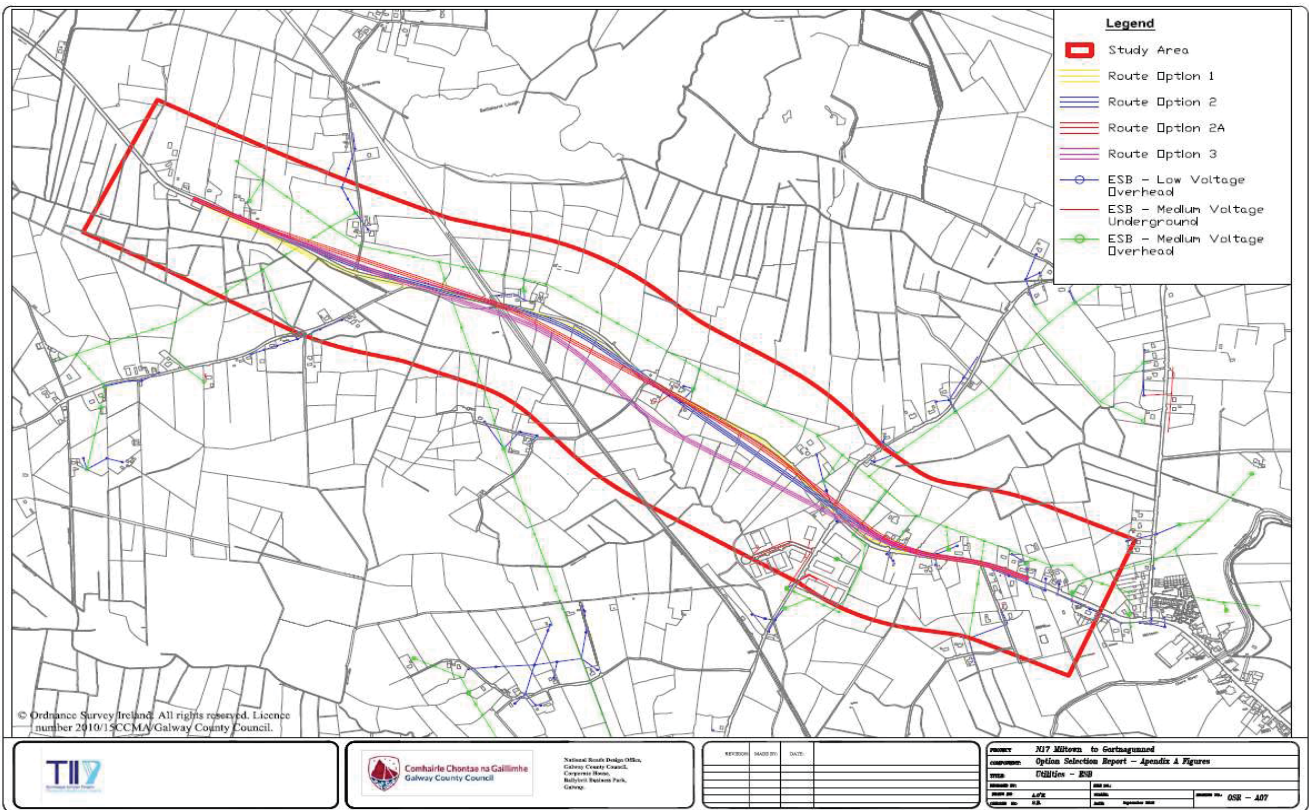


FIGURE a08 Route OPTIONS

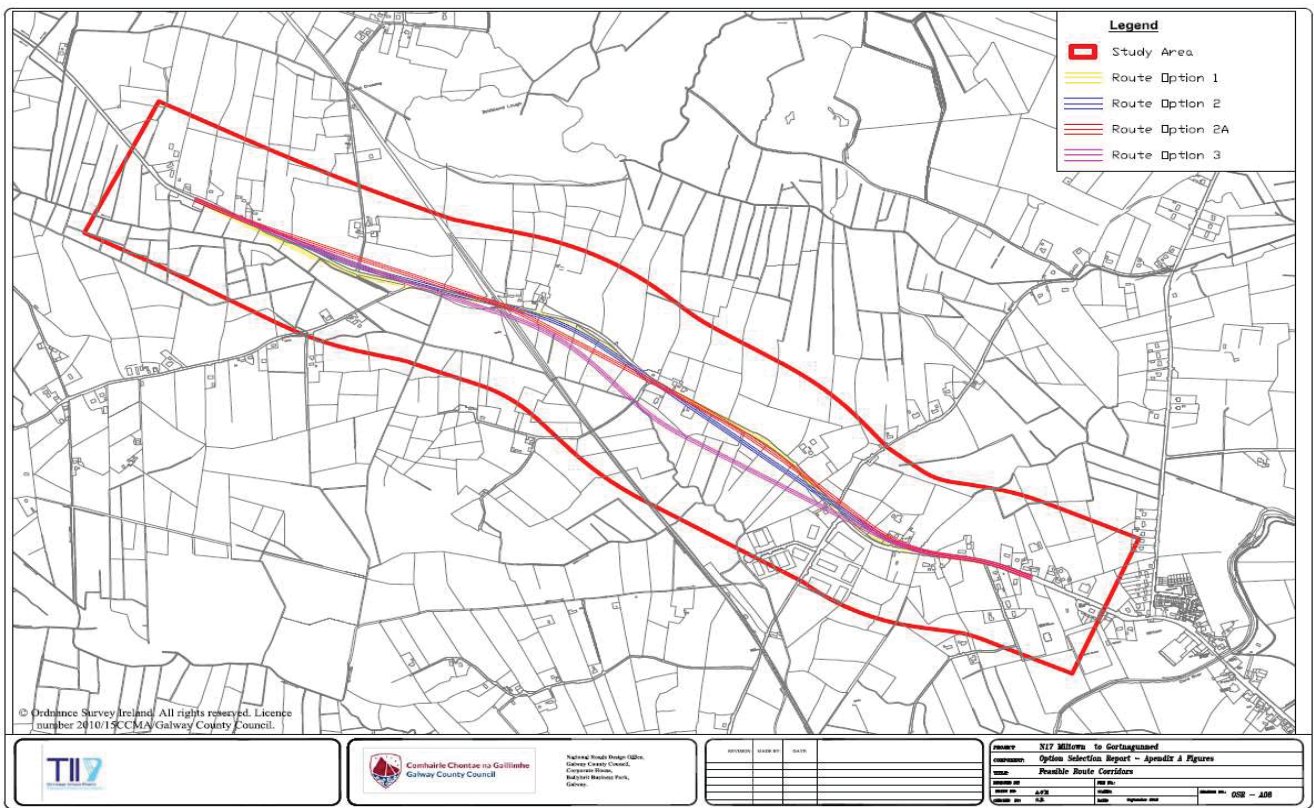
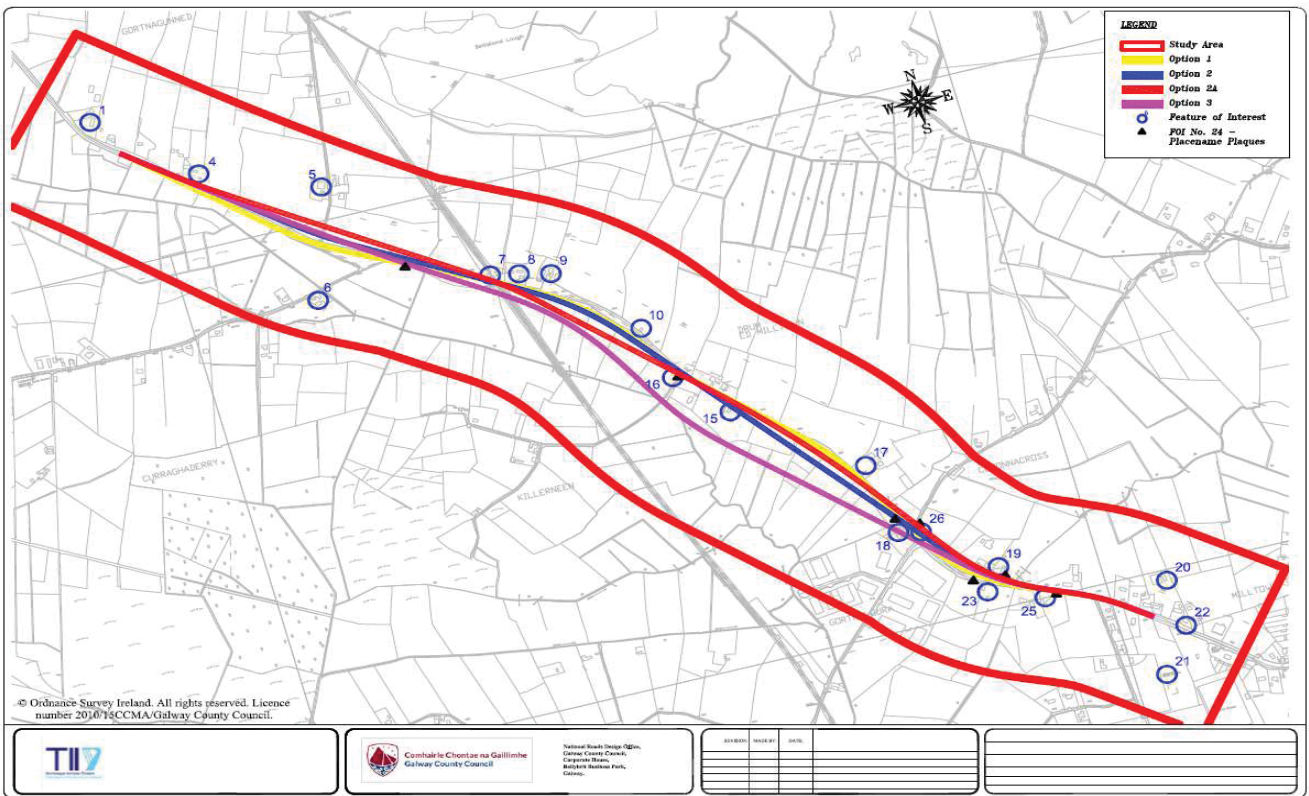


Figure a09



Appendix B – Road Safety Audit

See attachment

Galway County Council

N17 Milltown to Gortnagunne

Stage F (Part 1) Road Safety Audit

Galway County Council

N17 Milltown to Gortnagunned

Stage F (Part 1) Road Safety Audit

Document Ref: P18-072-PSW1-RP-001

Rev	Prepared By	Reviewed By	Approved By	Issue Date	Reason for Revision
1.0	AOR	PJM	TAG	15 th Nov. 2018	Draft Report

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1 Introduction

1.1 General

This report results from a Stage F (Part 1) Road Safety Audit carried out on the proposed N17 Milltown to Gortnagunned Improvement Scheme, Co. Galway. The Audit was carried out at the request of Mr. Sean Breathnach of Galway County Council.

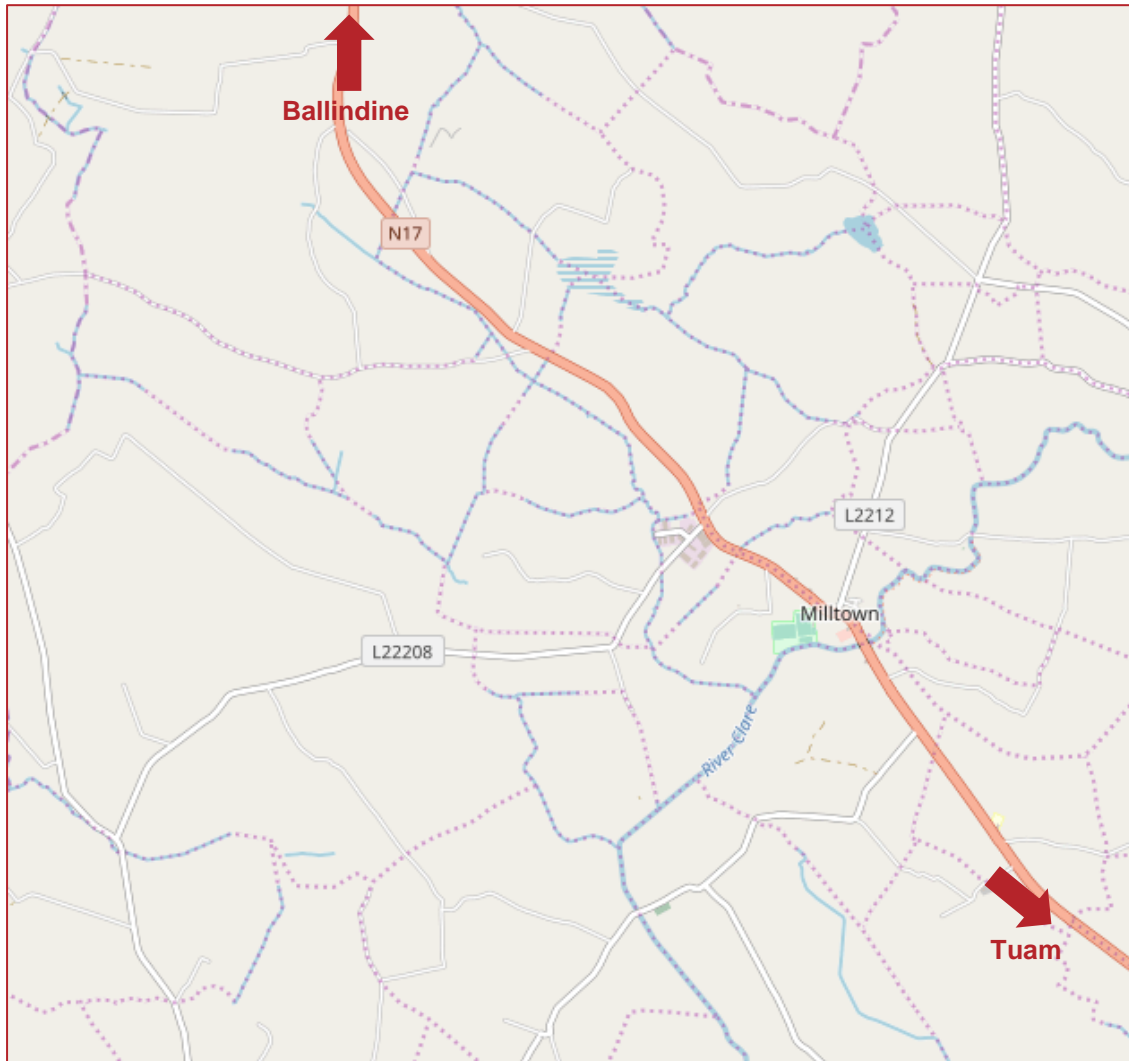


FIGURE 1.1: SCHEME LOCATION

1.2 Audit Team

The members of the Road Safety Audit Team are independent of the design team, and include:

Mr. Peter Monahan
(BE MSc CEng FIEI RSACert)
Road Safety Audit Team Leader

Mr. Alan O'Reilly
(BA BAI MSc MIEI RSACert)
Road Safety Audit Team Member

Mr. Aly Gleeson
(MBA, MEng, BSc, CEng, RSACert, MIEI, MSORSA)
Road Safety Audit Team Member

1.3 Audit Information

The Road Safety Audit took place during October & November 2018 and comprised an examination of the documents provided by Galway County Council (see Appendix A). In addition to examining the documents supplied the Road Safety Audit Team visited the site of the proposed measures on the 31st October 2018. Weather conditions during the site visit were dry, the road surface was wet and traffic volumes were considered to be low to moderate.

This Stage F (Part 1) Road Safety Audit has been carried out in accordance with the requirements of GE-STY-01024 - Road Safety Audit, dated December 2017, contained on the Transport Infrastructure Ireland (TII) Publications website.

The proposed route options have been examined and this report compiled in respect of the consideration of those matters that may have an adverse effect on road safety and considers the perspective of all road users. It has not been examined or verified for compliance with any other standards or criteria.

All of the route options presented would provide significant improvement to safety on this section of the N17. The overall number and severity of identified hazards, as well as the overall safety considerations of each route option, has advised the comparative safety ranking of the route options in this report.

Although not explicitly stated in the information provided to the Audit Team the Design Speed of the route options proposed has been assumed to be 100kph. Four route options have been provided to the Audit Team to be reviewed under this road safety audit.

1.4 Scheme Description

The scheme is located on the N17 national primary road between the village of Milltown and the townland of Gortnagunned, a distance of approximately 3km, and involves the upgrade of the existing N17 to a Type 1 single carriageway. This includes a 7.3m carriageway (3.65m lanes) with 2.5m wide hardshoulders and 3m wide verges.

The existing carriageway has an average lane width of approximately 3m in both directions with little or no hard strip. Clear zones are not available along the road edge of this section of the N17, with many hazards such as boundary walls and service poles in close proximity to the road edge leading to unforgiving road sides. There are no new road projects within the study area which will affect this scheme.

At the scheme's southern extent, close to Milltown, the posted speed limit is 80kph. There are a number of direct accesses, both agricultural and domestic, on both sides of the N17 immediately north of Milltown. There is an existing staggered t-junction within the scheme extents. The posted speed increases to 100kph immediately north of this junction.

Four route options have been proposed for consideration. All four options commence in the townland of Gortnagunned at the end of the previously completed Carrownurlaur realignment scheme and extend 3km south to the village of Milltown and involve sections of both online and offline development.

The proposed route options are described in further detail below:

- **Option 1:** Option 1 closely follows the line of the existing N17 and is considered the “Do-Minimum” Option. This option involves widening the existing N17 to a Type 1 single carriageway and the removal of 2 no. substandard bends.
- **Option 2:** Option 2 is approximately 60% online with four sections of offline realignment which are between the following chainages: -
 - Ch. 460 – 690;
 - Ch. 1190 – 1440;
 - Ch. 1720 – 2150; and
 - Ch. 2290 - 2510.
- **Option 2A:** Option 2A is approximately 60% online with three sections of offline realignment which are between the following chainages: -
 - Ch. 340 - 820;
 - Ch. 1080 - 1470; and
 - Ch.2220 - 2520.
- **Option 3:** Option 3 contains the largest section of offline development of all of the options. The route is approximately 40% online with three sections of offline realignment which are between the following chainages:
 - Ch. 470 - 620;
 - Ch. 890 - 2240; and
 - Ch. 2350 - 2510.

Where offline realignment is proposed, the Audit Team have assumed that the sections of the existing road will be retained for local access to domestic and agricultural properties thus reducing the number of direct accesses onto the N17 carriageway.

All of the route options propose to retain the staggered t-junction and other existing side road junctions within the scheme extents. In the options where offline realignment is proposed (Option 2, Option 2A and Option 3) the vertical and horizontal alignment differs north of the existing 80kph speed limit zone north of Milltown. The horizontal and vertical alignment within this section is similar in all of the proposed route options.

1.4.1 Information Provided to Audit Team

Drawings detailing the proposed route options were provided, details of which are listed in Appendix A.

National Road HD15 collision rates for the Period 2014 to 2016 were obtained from the Open Data Portal (data.gov.ie) and are shown in Figure 1.2. The sections shown in yellow are those sections of road with collision rates above the average and sections shown in green are those sections of road with collision rates twice (or more) below the average.



FIGURE 1.2: HD15 COLLISION RATES (2014 TO 2016)

2 Items Arising from the Audit

2.1 All Routes

2.1.1 Short radius horizontal curves immediately north of Milltown

Problem

Within the existing 80kph section of the N17, to the north of Milltown, a number of horizontal curves have been proposed with radii which are considered at, or below, the desirable minimum (720m, 510m, 460m) for the assumed design speed (100kph). To achieve the required stopping sight distance (SSD) widening of between 0.75m and 5.5m will be required depending on the radius of horizontal curve proposed.

Hazard

If sufficient widening is not provided drivers may have restricted forward visibility to a hazard in the carriageway ahead resulting in them having insufficient time to react safely. This could lead to rear end shunts should the hazard be a stationary vehicle or to material damage collisions or potentially collisions with pedestrians or cyclists.

2.1.2 Staggered t-junction of the N17, the L22208 and the L6413

Problem

The existing staggered t-junction of the N17, the L22208 and the L6413 at Ch. 2,300 is proposed to be retained in all route options. This is a left-to-right staggered t-junction which is located between two horizontal curves. The Road Safety Authority's collision database indicates a history of minor injury rear end shunt collisions at this location. The radius of the horizontal curve indicated to the south of the junction is 460m.

Hazard

Visibility for drivers exiting the side roads may be restricted due to the horizontal curve to the south if widening is not provided. Similarly, an N17 driver's forward visibility to a stationary right turning vehicle waiting to turn into either side road may be restricted leading to rear end shunt collisions.

The proposed horizontal alignments in Options 2, 2A and 3 at this location offers improved, yet still limited, visibility from these side roads in comparison to Option 1.

2.1.3 At-grade level crossing of railway line

Problem

An at-grade level crossing of the disused railway line is indicated as being retained in all route options. While not currently in use, decommissioned railway lines throughout the country have recently been redeveloped as facilities for vulnerable road users (VRUs) such as Greenways. If consideration is given to such redevelopment of this railway line in the future this will lead to an increase in VRUs crossing the N17 carriageway at this location.

Also, there is potentially a risk that the railway line itself may be reopened resulting in vehicles having to stop on the national road when a train crosses the carriageway.

Hazard

Drivers travelling at 100kph in this section may not anticipate VRUs crossing the carriageway at-grade which could lead to them failing to stop and collisions with VRUs. Similarly, drivers travelling at 100kph may not anticipate having to stop for a crossing train resulting in overshooting the level crossing and material damage or collisions with a train.

2.2 Option 1

The overall length of Option 1 is 3km and closely follows the line of the existing N17 while also removing two substandard horizontal curves. Minor amendments only will be required to the existing side road junctions in this route option.

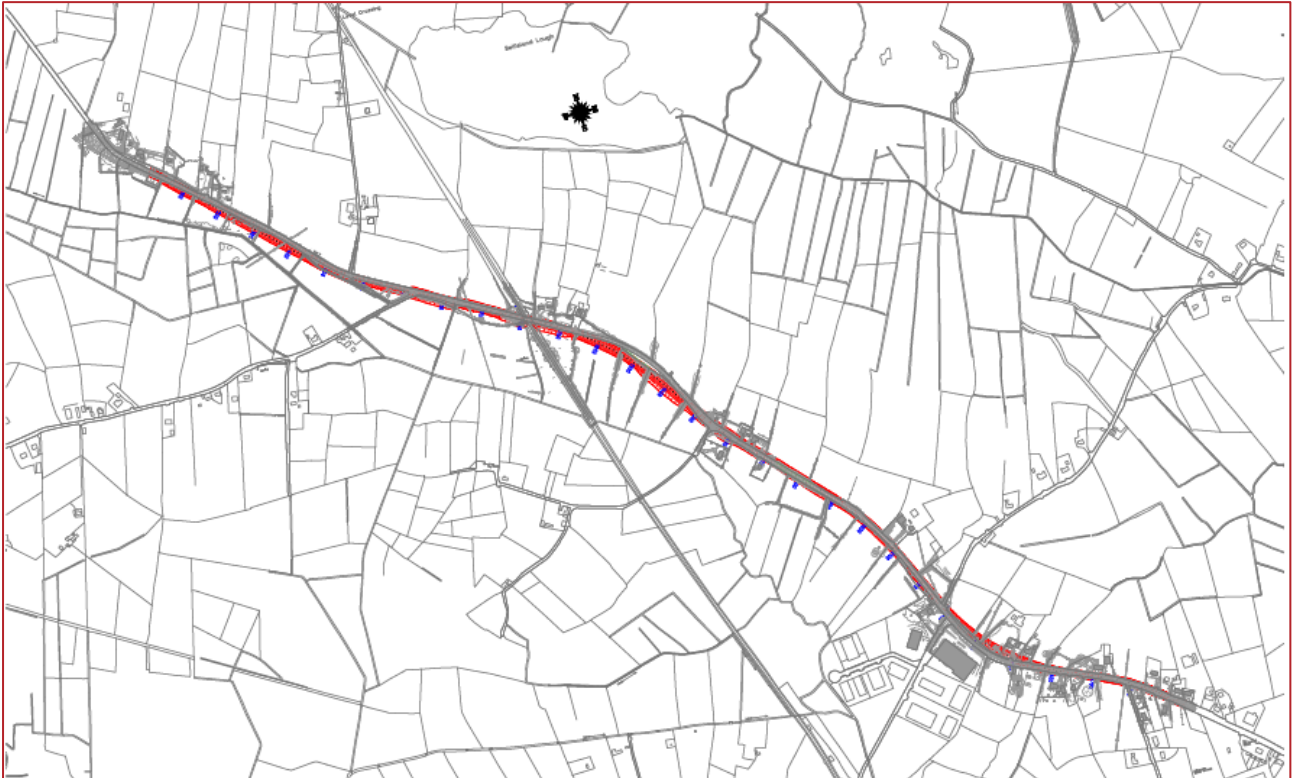


FIGURE 2.1: ROUTE OPTION 1

2.2.1 Lack of overtaking opportunities

Problem

Option 1 does not contain sufficient overtaking opportunities throughout its length.

Hazard

Drivers may become frustrated if travelling behind slow moving larger vehicles such as agricultural vehicles or HGVs which could lead to them attempting an overtaking manoeuvre when it is unsafe to do resulting in an increased risk of head-on collisions.

2.2.2 Frequency of direct accesses

Problem

There are a number of domestic and agricultural accesses within the extents of the proposed scheme. In Option 1 these direct accesses are likely to be retained.

Hazard

A large number of direct accesses to/from the N17 increases the risk of rear end shunts or side-on collisions as vehicles slow down to enter accesses or pull out of properties onto the high-speed carriageway respectively.

2.2.3 Skewed junction layout at Ch. 700

Problem

The L2227 intersects the N17 carriageway within the scheme (Ch. 700) at an acute angle. Visibility towards approaching N17 traffic for a driver exiting the L2227 may be restricted as a result of the alignment of the side road.

Hazard

This could lead to drivers exiting the L2227 when it is unsafe to do so into the path of oncoming vehicles resulting in side-on collisions. There is also a risk of right turning vehicles, especially large vehicles, cutting the corner when turning into the side road from the N17 where there is a risk of collisions with vehicles waiting at, or approaching, the stop line.

2.3 Option 2

The overall length of Option 2 is 3km and approximately 60% of the route is on the existing alignment of the N17. There is a total of four sections of offline realignment.

Improved overtaking opportunities are provided in this option in comparison to Option 1. Potential overtaking opportunities have been identified between Ch. 0 - 1,000 and between Ch. 1,400 - 2,400 although this section would be reduced by the existing side road junction at Ch. 2,300. This gives an estimated overtaking provision of approximately 1.7km.

The number of direct accesses has also been reduced in comparison to Option 1.



FIGURE 2.2: ROUTE OPTION 2

2.3.1 Flat sections of carriageway

Problem

Sections of carriageway with proposed longitudinal gradient of 0.2% have been indicated between Ch. 0 – 500 and between Ch. 2,550 - 2,950. An overtaking crest curve has also been indicated between Ch. 600 - 920 with a k-value of 400, essentially a section of flat pavement. The gradient at these locations may result in the carriageway being unable to sufficiently shed surface run-off.

Hazard

Standing water on the carriageway as a result of the carriageway failing to sufficiently drain surface run-off could lead to a loss of traction between the pavement and the wheels of vehicles leading to loss of control type incidents and collisions.

2.3.2 Skewed junction layout at Ch. 700

Problem

The L2227 intersects the N17 carriageway within the scheme (Ch. 700) at an acute angle. Visibility towards approaching N17 traffic for a driver exiting the L2227 may be restricted as a result of the alignment of the side road.

Hazard

This could lead to drivers exiting the L2227 when it is unsafe to do so into the path of oncoming vehicles resulting in side-on collisions. There is also a risk of right turning vehicles, especially large vehicles, cutting the corner when turning into the side road from the N17 where there is a risk of collisions with vehicles waiting at, or approaching, the stop line.

2.4 Option 2A

The proposed alignment of the N17 in Option 2A is similar to that in Option 2. The offline sections in Option 2A between Ch. 200 – 1,000 and Ch. 1,000 – 1,550 are indicated as being offset further from the existing N17 carriageway than in Option 2. As a result, the number of direct accesses to/from the N17 carriageway is further reduced.

Improved overtaking opportunities are provided in this option in comparison to Option 1. Potential overtaking opportunities have been identified between Ch. 0 - 720 and between Ch. 960 - 2,100. This gives an estimated overtaking provision of approximately 1.7km.

Where the carriageway is proposed to be realigned offline it is assumed that a new side road junction will be provided with the N17 to facilitate access to these properties via a new link road with the old section of the N17 carriageway.

**FIGURE 2.3: ROUTE OPTION 2A**

2.4.1 Flat sections of carriageway

Problem

A section of carriageway with proposed longitudinal gradient of 0.2% has been indicated between Ch. 2,550 - 2,950 which is essentially a section of flat pavement. The gradient at this location may result in the carriageway being unable to sufficiently shed surface run-off.

Hazard

Standing water on the carriageway as a result of the carriageway failing to sufficiently drain surface run-off could lead to a loss of traction between the pavement and the wheels of vehicles leading to loss of control type incidents and collisions.

2.4.2 Horizontal curves with radii of 3,500m and 2,900m

Problem

Horizontal curves have been indicated with radii of 3,500m and 2,900m between Ch. 155 – 578 and Ch. 1,616 – 2,140 respectively. The Full Overtaking Sight Distance (FOSD) may not be available at these locations without widening of 2.9m and 5.4m respectively.

Hazard

This could lead to drivers attempting an overtaking manoeuvre when it is unsafe to do so resulting in an increased risk of head-on collisions with oncoming vehicles in the opposing traffic lane.

2.4.3 Potential hidden dip

Problem

Two crest curves have been indicated between Ch. 698 – 930 and between Ch. 1,259 - 2,445. This may result in a hidden dip in the vertical alignment of the N17 within the sag curve between these two crests.

Hazard

This could lead to a vehicle between these crest curves being hidden from another driver's line of sight. This could lead to a driver having restricted visibility to a stationary or broken-down vehicle ahead resulting in them having insufficient time to react safely and the potential for rear end shunts. Also, a driver may perceive the opposing traffic lane to be clear, should a vehicle be restricted from view between the crest curves, which could lead to unsafe overtaking manoeuvres and head-on collisions.

2.5 Option 3

Option 3 also proposes 60% of offline realignment, similar to Option 2 and Option 2A, however Option 3 proposes a longer, continuous section of offline realignment between Ch. 1,050 – 2,300. This Option has the fewest direct accesses to/from the N17 carriageway.

Improved overtaking opportunities are provided in this option in comparison to Option 1. Potential overtaking opportunities have been identified between Ch. 0 - 1,000 and between Ch. 1,700 - 2,100. This gives an estimated overtaking provision of approximately 1.4km.

Where the carriageway is proposed to be realigned offline it is assumed that a new side road junction will be provided with the N17 carriageway to facilitate access to private properties/land via a new link road with the old section of the N17 carriageway.

The offline realignment of the N17 creates a crossroad junction with a local road to the south of the existing N17 carriageway at Ch. 1,545.

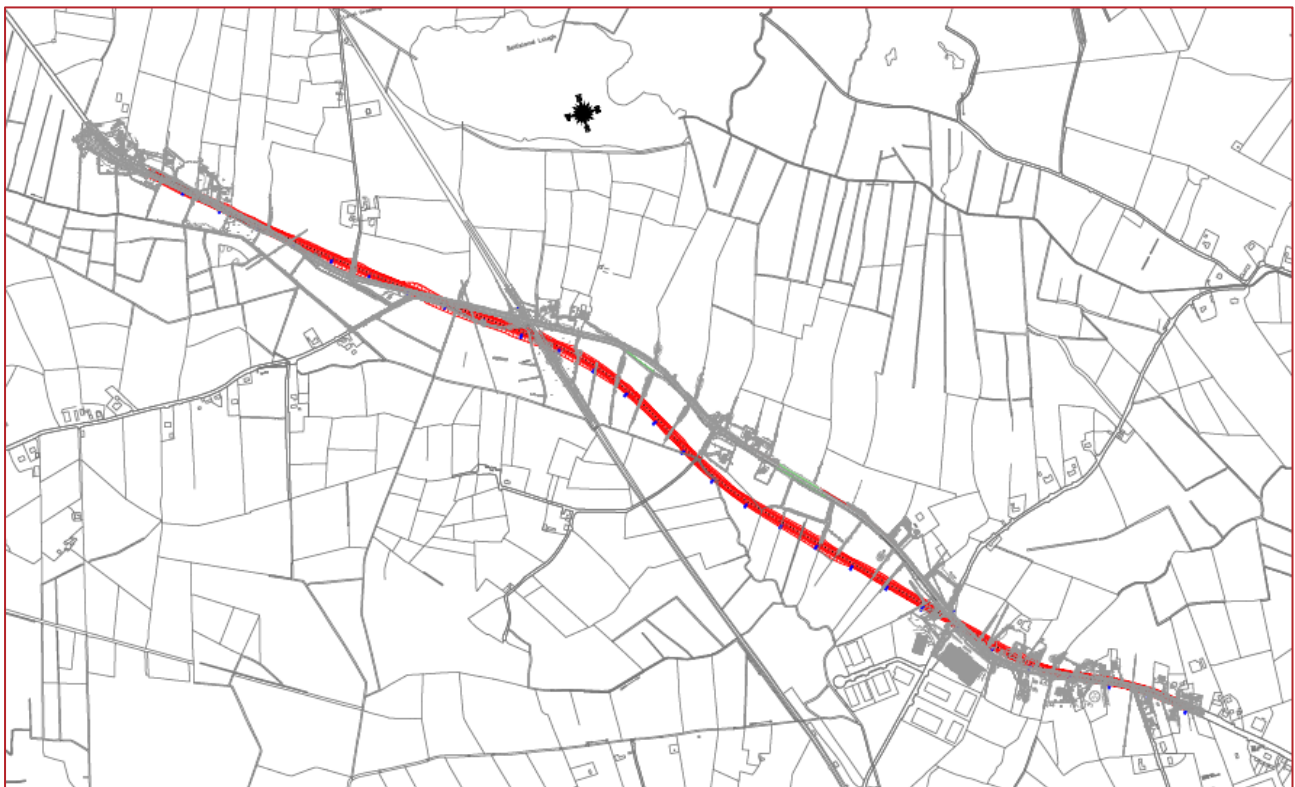


FIGURE 2.4: ROUTE OPTION 3

2.5.1 Option Skewed junction layout at Ch. 700

Problem

The L2227 intersects the N17 carriageway within the scheme (Ch. 700) at an acute angle. Visibility towards approaching N17 traffic for a driver exiting the L2227 may be restricted as a result of the alignment of the side road.

Hazard

This could lead to drivers exiting the L2227 when it is unsafe to do so into the path of oncoming vehicles resulting in side-on collisions. There is also a risk of right turning vehicles, especially large vehicles, cutting the corner when turning into the side road from the N17 where there is a risk of collisions with vehicles waiting at, or approaching, the stop line.

2.5.2 Creation of crossroad junction on local road at Ch. 1,545

Problem

The proposed offline realignment of the N17 carriageway to the south of its existing location will create a crossroad junction with a local road at Ch. 1,545. Drivers on the local road, who are familiar with the area, may not anticipate a crossroad junction at this location, especially one which requires them to give way to N17 traffic.

Hazard

This could lead to high approach speeds to the junction on the local road and the potential for overshoot of the stop line or failing to stop and side-on collisions with through traffic on the N17.

3 Preference of Design Options

Following on from the safety concerns outlined in the previous section, this is a summary of the main points/issues identified for each option.

3.1 Option1

Option 1 does not contain sufficient overtaking opportunities throughout its length leading to the potential for driver frustration and unsafe overtaking manoeuvres resulting in an increased risk of head-on collisions.

There are a number of domestic and agricultural accesses directly onto the N17 carriageway which increases the risk of rear end shunts or side-on collisions as vehicles slow down to enter accesses or pull out of properties onto the high-speed carriageway respectively.

The L2227 intersects the N17 carriageway within the scheme (Ch. 700) at an acute angle potentially restricting a driver's visibility when exiting onto the N17. This could lead to drivers exiting the L2227 when it is unsafe to do so resulting in side-on collisions. There is also a risk of right turning vehicles cutting the corner when turning into the side road leading to collisions with side road vehicles approaching the junction.

3.2 Option 2

Sections of carriageway with proposed longitudinal gradient of 0.2% have been indicated. The gradient at these locations may result in ponding on the carriageway. This could lead to a loss of traction between the pavement and the wheels of vehicles leading to loss of control type incidents and collisions.

The L2227 intersects the N17 carriageway within the scheme (Ch. 700) at an acute angle potentially restricting a driver's visibility when exiting onto the N17. This could lead to drivers exiting the L2227 when it is unsafe to do so resulting in side-on collisions. There is also a risk of right turning vehicles cutting the corner when turning into the side road leading to collisions with side road vehicles approaching the junction.

3.3 Option 2A

Sections of carriageway with proposed longitudinal gradient of 0.2% have been indicated. The gradient at these locations may result in ponding on the carriageway. This could lead to a loss of traction between the pavement and the wheels of vehicles leading to loss of control type incidents and collisions.

Horizontal curves have been indicated with radii of 3,500m and 2,900m such that widening will be required to achieve the necessary FOSD. This could lead to drivers attempting an overtaking manoeuvre when it is unsafe to do resulting in head-on collisions.

There is a potential hidden dip between two crest curves in the vertical alignment. This could lead to a vehicle between these crest curves being hidden from another driver's line of sight which could lead to rear end shunts with stationary or slow-moving vehicles or head-on collisions between overtaking vehicles and oncoming traffic.

3.4 Option 3

The L2227 intersects the N17 carriageway within the scheme (Ch. 700) at an acute angle potentially restricting a driver's visibility when exiting onto the N17. This could lead to drivers exiting the L2227 when it is unsafe to do so resulting in side-on collisions. There is also a risk of right turning vehicles cutting the corner when turning into the side road leading to collisions with side road vehicles approaching the junction.

The proposed offline realignment of the N17 carriageway to the south of its existing location will create a crossroad junction with a local road at Ch. 1,545 which drivers may not anticipate and may therefore fail to give way to N17 traffic at the junction.

3.5 Ranking of Route Options

The Audit Team carried out a full review of all relevant drawings and documents in relation to the proposed route options and also visited the site during daytime on the 31st October 2018. The main safety considerations in comparing the routes at this stage included: -

- Overtaking opportunities provided;
- Changes in vertical and horizontal alignment;
- Frequency of direct accesses;
- Improvements to existing safety problems at side roads (e.g. visibility, angle of intersection etc.)
- Potential design issues; and
- Potential residual risks.

A summary of some of the comparative items reviewed is given in Table 3.1. The Audit Team consider, from a road safety perspective, that: -

1. the horizontal and vertical alignment of Option 3 is preferred;
2. the reduced number of direct accesses onto the N17 carriageway in Options 2A and 3 is preferred;
3. the overtaking opportunities in Options 2, 2A and 3 are preferred;
4. the amendments to the horizontal alignment immediately south of the staggered t-junction of the N17, the L22208 and the L6413 in Options 2, 2A and 3 are preferred;
5. the fewer changes in the horizontal and vertical alignment in Options 2A and 3 are preferred;
6. the improvements in the road alignment in Options 2 and 3 have the greatest impact in improving the safety of the N17 within the scheme.

Route Option	Length [km]	Approx. Length of Overtaking [km]	No. of Horizontal Curves	No. of Vertical Curves		Freq. of Direct Accesses	Improvements to Existing Junctions	Safety Improvement in Alignment
				Sag	Crest			
1	3	0	6	4	5	High	No	Very Minor Improvement
2	3	1.7	4	4	4	Medium	Yes (slightly)	Improved
2A	3	1.7	5	3	2	Medium	Yes	Minor Improvement
3	3	1.4	5	3	3	Low	Yes (slightly)	Greatly Improved

TABLE 3.1: COMPARISONS ADVANTAGES/DISADVANTAGES (NON-EXHAUSTIVE/SELECTED)

The Audit Team have concluded that the Route Options, as provided, rank as shown in Table 3.2 in terms of road safety.

The ranking is purely a relative grading of the route options with respect to each other, and all of the proposed Route Options represent a significant improvement to the existing arrangement within this section of the N17 between Milltown and the previously completed Carrownurlaur Realignment Scheme.

Route Option	Rank
Option 1	4
Option 2	2
Option 2A	3
Option 3	1

TABLE 3.2: OPTION RANKING

4 Road Safety Audit Team Statement

We certify that we have examined the drawings and other information referred to in this report and listed in Appendix A, and that the site was visited during daytime on the 31st October 2018. We further certify that we are independent from the design team for the scheme. The examination has been carried out with the sole purpose of identifying any features of the design that could be removed or modified in order to improve the safety of the scheme.

The problems identified have been noted in this report, together with suggestions for a preferred route option.

ROAD SAFETY AUDIT TEAM LEADER

Peter Monahan Signed: _____

Dated: _____

ROAD SAFETY AUDIT TEAM MEMBER

Aly Gleeson Signed: _____

Dated: _____

ROAD SAFETY AUDIT TEAM MEMBER

Alan O'Reilly Signed: _____

Dated: _____

Appendix A – Documents Submitted to the Road Safety Audit Team

DOCUMENT/DRAWING TITLE	DOCUMENT/DRAWING NO.	REV
RSA Brief	-	-
Galway County Council N17 Milltown to Gortnagunned Traffic Survey	-	-
N17 Milltown to Gortnagunned – ATC Site 1 – 7	-	-
Option 1 – Site Extents	SE-01-WR	-
Option 2 – Site Extents	SE-02-WR	-
Option 2A – Site Extents	SE-02A-WR	-
Option 3 – Site Extents	SE-03-WR	-
Option 3 – Site Extents	SE-01-WR	-
Option 3 – Site Extents	SE-02-WR	-
Option 3 – Site Extents	SE-02A-WR	-
Option 3 – Site Extents	SE-03-WR	-

Appendix B – Audit Team Approval

From: TII Systems Notification <noreply@tii.systems>
Sent: Thursday 1 November 2018 09:02
To: sbreathnach@galwaycoco.ie
Cc: roadsafetyaudits@nra.ie; Fiona.Bohane@corkrdo.ie; Alastair.DeBeer@TII.ie; Peter Monahan; Aly Gleeson; Alan O'Reilly
Subject: RSAAS - Road Safety Audit Approvals System - Audit Approval 1379549/5388/Stage F

Importance: High

*Sean Breathnach
County Hall
Prospect Hill
Galway*

Date: 01/11/2018

Our Ref: 1379549/5388/Stage F

re: N17 N17 Milltown to Gortnagunna

APPROVAL OF ROAD SAFETY AUDIT TEAM, Stage F

Dear Sean Breathnach,

The following members of the proposed road safety audit team are approved to carry out the Stage F road safety audit of N17 N17 Milltown to Gortnagunna.

1. Peter Monahan - PMCE Ltd. - Leader
2. Aly Gleeson - PMCE Ltd - Leader
3. Alan O'Reilly - PMCE Ltd - Member

A copy of all audit reports, design team response and exception reports must be uploaded through RSAAS. Successful upload of these reports and completion of the audit approval process is necessary for any further audit approval on this scheme.

Yours sincerely,

Lucy Curtis

Regional Road Safety Engineer
roadsafetyaudits@nra.ie

Appendix C – Appropriate Assessment Screening Report

See attachment

Appropriate Assessment Screening Report

N17 Road Realignment Options
Milltown to Gortnagunned



Planning & Environmental Consultants

DOCUMENT DETAILS

Client: Galway County Council

Project title: N17 Road Realignment Options,
Milltown to Gortnagunned

Project Number: 171042

Document Title: Appropriate Assessment Screening
Report

Doc. File Name: 171042- AASR - 2018.02.12 - F

Prepared By: McCarthy Keville O'Sullivan Ltd.
Planning & Environmental Consultants
Block 1, G.F.S.C.
Moneenageisha Road, Galway



Document Issue:

Rev	Status	Issue Date	Document File Name	Author(s)	Approved By:
01	Final	12.02.2018	171042 - AASR - 2018.02.12 - F	LK	JH

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Appendix 1 Outline Erosion and Sediment Control Plan

1 INTRODUCTION

McCarthy Keville O’Sullivan Ltd. (MKO) has been appointed to prepare a report to provide the information necessary to allow the competent authority to conduct an Article 6(3) Screening for Appropriate Assessment of the proposed N17 Milltown to Gortnagun road realignment options, Co, Galway (Grid Ref: E139736 N263600).

The current project is not directly connected with, or necessary for, the management of any European Site, consequently the project has been subject to the Appropriate Assessment Screening process.

The assessment in this report is based on a desk study and field surveys undertaken in 2017. It specifically assesses the potential for the proposed development to impact on European sites.

This Report has been prepared in accordance with the European Commission guidance document ‘*Assessment of Plans and Projects Significantly affecting Natura 2000 Sites: Methodological Guidance on the provisions of Article 6(3) and 6(4) of the Habitats Directive 92/43/EEC*’ (EC, 2001) and the Department of the Environment’s Guidance on the Appropriate Assessment of Plans and Projects in Ireland (December 2009, amended February 2010).

In addition to the guidelines referenced above, the following relevant guidance was considered in preparation of this report:

1. *DoEHLG (2010) Appropriate Assessment of Plans and Projects in Ireland Guidance for Planning Authorities. Department of the Environment, Heritage and Local Government,*
2. *European Communities (2000) Managing Natura 2000 Sites: the provisions of Article 6 of the ‘Habitats’ Directive 92/43/EEC, Office for Official Publications of the European Communities, Luxembourg. European Commission,*
3. *Directive 92/43/EEC, Office for Official Publications of the European Communities, Luxembourg. European Commission,*
4. *EC (2007) Guidance document on Article 6(4) of the ‘Habitats Directive’ 92/43/EEC – Clarification of the concepts of: alternative solutions, imperative reasons of overriding public interest, compensatory measures, overall coherence, opinion of the commission. European Commission,*
5. *EC (2013) Interpretation Manual of European Union Habitats. Version EUR 28. European Commission,*
6. *EPA (2002) Guidelines on the information to be contained in Environmental Impact Statements. Environmental Protection Agency,*
7. *EPA (2017) Draft Guidelines on the information to be contained in Environmental Impact Statements. Environmental Protection Agency,*
8. *EPA (2015), Advice Notes on current practice in the preparation of Environmental Impact Statements. Environmental Protection Agency, and*
9. *CIEEM (2016) Institute of Ecology and Environmental Management Guidelines for Ecological Impact Assessment.*
10. *NRA (2009) Guidelines for Assessment of Ecological Impacts of National Roads Schemes, National Roads Authority, Dublin.*

1.1 Appropriate Assessment

1.1.1 Screening for Appropriate Assessment

Screening is the process of determining whether an Appropriate Assessment is required for a plan or project. Under Part XAB of the Planning and Development Act, 2000, as amended, screening must be carried out by the Competent Authority to assess, in view of best scientific knowledge, if a land-use plan or proposed development, individually or in combination with another plan or project, is likely to have a significant effect on a European site. The Competent Authority's determination as to whether an Appropriate Assessment is required must be made on the basis of objective information and should be recorded. The competent authority may request information to be supplied to enable it to carry out screening.

Consultants or project proponents may undertake a form of screening to establish if an Appropriate Assessment is required and provide advice, or may submit the information necessary to allow the Competent Authority to conduct a screening with an application for consent. Where it cannot be excluded beyond reasonable scientific doubt, that a proposed plan or project, individually or in combination with other plans and projects, would have a significant effect on the conservation objectives of a European site, an Appropriate Assessment (Natura Impact Statement (NIS)) of the plan or project is required.

1.1.2 Appropriate Assessment (Natura Impact Statement)

The term Natura Impact Statement (NIS) is defined in legislation¹. An NIS, where required, should present the data, information and analysis necessary to reach a definitive determination as to 1) the implications of the plan or project, alone or in combination with other plans and projects, for a European site in view of its conservation objectives, and 2) whether there will be adverse effects on the integrity of a European site. The NIS should be underpinned by best scientific knowledge, objective information and by the precautionary principle.

¹ As defined in Section 177T of the Planning and Development Act, 2000 as amended, an NIS means a statement, for the purposes of Article 6 of the Habitats Directive, of the implications of a proposed development, on its own and in combination with other plans and projects, for a European site in view of its conservation objectives. It is required to include a report of a scientific examination of evidence and data, carried out by competent persons to identify and classify any implications for the European site in view of its conservation objectives

2 DESCRIPTION OF THE PROPOSED DEVELOPMENT & BASELINE ENVIRONMENT

2.1 Site Location

Galway County Council is currently planning a 3km (approx.) upgrade of the N17 National Primary Route, between the townlands of Milltown and Gortnagunned located immediately north west of Milltown, Co. Galway. The realignment will take place in the townlands of Milltown, Cartron, Gortnaloura, Cloonnacross, Killerneen, Drum and Grotnagunned. The project location is provided in Figure 2.1. The project will remove a number of substantially deficient bends on this section of the route and in so doing, will improve aspects such as safety, sight distance, cross sectional width and drainage.

The final design option is not confirmed and this report assess the potential for impact associated with the following four potential options:

- Option 1 – Widening of the existing road. This will involve minimal improvement to the existing road alignment and very little disruption to the surrounding area.
- Option 2 – Realignment of existing road with an at grade railway level crossing. This would involve the removal of dangerous bends, and provide greater overtaking sections.
- Option 2A – Same as option 2, however with the addition a bridge over the existing railway.
- Option 3 – Offline realignment. This route crosses over several open drains and a stream that flows directly into the Clare River which is designated as part of Lough Corrib SAC. The route proposed for Option 3 crosses the lower section of this stream which is also designated as part of Lough Corrib SAC. It is proposed to divert the stream (1.3km) at this location to make it parallel with the new road realignment. All works will be done in accordance with Inland Fisheries Ireland 'Guidelines on protection of fisheries during construction works in and adjacent to waters' (2016).

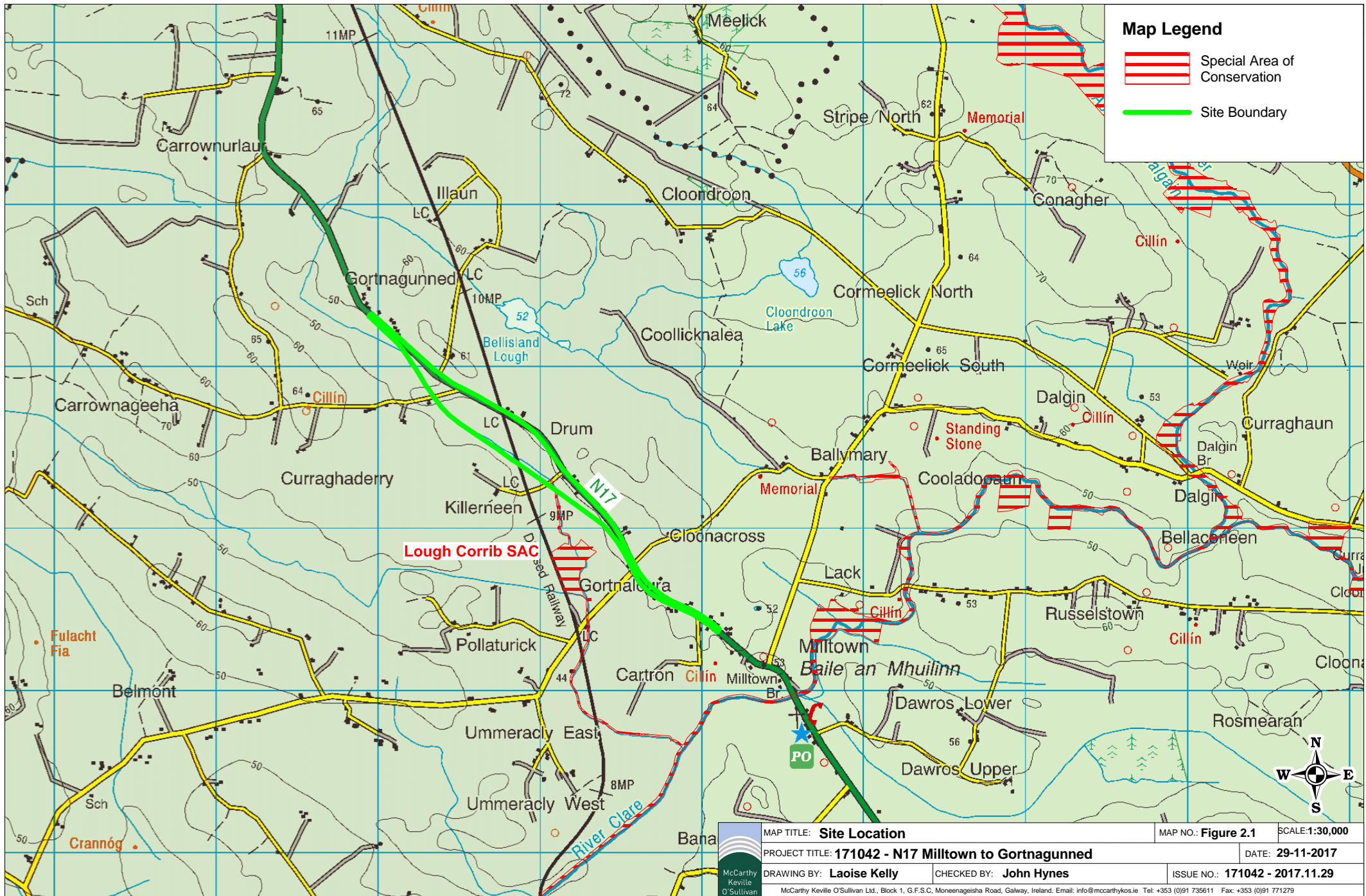
The proposed layout options are shown in Figure 2.2 – 2.5.

2.2 Characteristics of the Proposed Development

The road type proposed for the project corresponds to a Type 1 Single Carriageway arrangement as outlined in Figure 1-2 of the Galway County Council Outline Erosion and Sediment Control (OESC) Plan shown in **Appendix I**. The 'verge' width outlined in the aforementioned figure, will be determined during the design phase; however, it will be in the range of 4.5m to 5m on each side.

An Outline Erosion and Sediment Control Plan has been prepared as a method of water quality preservation to offset potential construction stage pollution impacts from the N17 project to adjacent watercourses including various tributaries of the River Clare which is protected under Lough Corrib SAC (000297). The OESC is provided as **Appendix I**.

All works in proximity to watercourses shall adhere to the best practice guidance outlined in the following documents:





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Figure 2.2



Comhairle Chontae na Gaillimhe
Galway County Council

National Roads Design Office,
Galway County Council,
Corporate House,
Ballybrit Business Park,
Galway.

REVISION:	MADE BY:	DATE:

PROJECT:	N17 Miltown 2017		
COMPONENT:	Preliminary Design		
TITLE:	Option 1 - Site Extents		
DESIGNED BY:	FILE NO.:		
DRAWN BY: M.J.	SCALES: 1:5000 @ A1, 1:10000 @ A3		DRAWING NO.: SE-01-WR
CHECKED BY: S.B.	DATE: July 2017		



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Figure 2.3



Comhairle Chontae na Gaillimhe
Galway County Council

National Roads Design Office,
Galway County Council,
Corporate House,
Ballybrit Business Park,
Galway.

REVISION:	MADE BY:	DATE:

PROJECT:	N17 Miltown 2017		
COMPONENT:	Preliminary Design		
TITLE:	Option 2B - Site Extents		
DESIGNED BY:	FILE NO.:		
DRAWN BY: M.J.	SCALES: 1:5000 @ A1, 1:10000 @ A3		DRAWING NO: SE-01-WR
CHECKED BY: S.B.	DATE: July 2017		



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Figure 2.4



Comhairle Chontae na Gaillimhe
Galway County Council

National Roads Design Office,
Galway County Council,
Corporate House,
Ballybrit Business Park,
Galway.

REVISION:	MADE BY:	DATE:

PROJECT:	N17 Miltown 2017		
COMPONENT:	Preliminary Design		
TITLE:	Option 2A - Site Extents		
DESIGNED BY:	FILE NO.:		
DRAWN BY: M.J.	SCALES: 1:5000 @ A1, 1:10000 @ A3		DRAWING NO.: SE-01-WR
CHECKED BY: S.B.	DATE: July 2017		



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Figure 2.5



Comhairle Chontae na Gaillimhe
Galway County Council

National Roads Design Office,
Galway County Council,
Corporate House,
Ballybrit Business Park,
Galway.

REVISION:	MADE BY:	DATE:

PROJECT:	N17 Miltown 2017		
COMPONENT:	Preliminary Design		
TITLE:	Option 5		
DESIGNED BY:	FILE NO.:	SCALES:	DRAWING NO.:
DRAWN BY: M.J.		1:5000 @ A1, 1:10000 @ A3	SE-05-WR
CHECKED BY: S.B.	DATE:	April 2017	

- NRA 'Guidelines for the crossing of Watercourses During Construction of National Road Schemes (2008);
- Inland Fisheries Ireland 'Guidelines on protection of fisheries during construction works in and adjacent to waters' (2016).

The works will result in the loss of hedgerow/treeline. Vegetation removal shall be conducted under the provisions of the Wildlife Acts 1976-2012. Any length of hedgerow to be removed will be replaced by planting a hedgerow of equal length post construction works. The hedging plants chosen will be indigenous to the local area.

No external lighting is proposed as part of the project.

Haul roads will not be required as part of the works. Any required road construction material will be transported to the site using the existing road networks.

Any waste material arising from the proposed works will be treated in accordance with the waste hierarchy.

2.3 Construction Site Management Incorporated into the Project Design

The following best practice control measures will be implemented in the prevention of ecological impacts. In addition, the measures outlined below will limit artificial lighting and noise emanation during the construction phase.

2.3.1 Site Set Up

- Prior to the outset of any excavation, the works area will be assessed and clearly delineated with permanent fencing. The minimum area necessary will be identified and there will be no access to works vehicles outside the fenced off areas.
- Adjacent to drainage features, a silt fence will be attached to the fencing and buried beneath the ground to filter any run-off that may occur as a result of the proposed works.
- All works will be located within the confines of these fences. No works will take place outside the fences to prevent damage to areas outside the necessary development footprint.
- Where drainage features are redesigned, a silt fence shall be placed downstream of the works area to filter any runoff to watercourses located downstream of the works area.
- The construction compound and storage area will be located within the land acquisition boundary and will be positioned a minimum of 30m away from watercourses.

2.3.2 Measures in place to Prevent Disturbance of Fauna

2.3.2.1 Disturbance Limitation Measures

- During the construction phase, noise limits, noise control measures, hours of operation (i.e. dusk and dawn is high faunal activity time) and selection of plant items will be considered in relation to disturbance of animals. Plant machinery will be turned off when not in use.
- Reduced illumination of the site will be used where possible to prevent disturbance to local fauna that may potentially occur in the wider area. Light spills during construction works will be minimised where possible.

- All plant and equipment for use will comply with the Construction Plant and Equipment Permissible Noise Levels Regulations (SI 359/1996).
- Operating machinery will be restricted to the proposed development site boundary.

2.3.2.2 Route Option 3 – Stream Diversion

Diversion

One of the four route options, Option 3 (see Figure 2.5) requires the diversion of a stream that flows into the Clare River. The length of the diversion will be approx. 1.3km with approximately 66m located within the boundary of Lough Corrib SAC. The Clare River and the southern section of this stream are designated under Lough Corrib SAC (000297).

The project has been designed following the no net loss principle, thus ensuring that there will be no net loss of potential fisheries habitat at any watercourse crossing location. The design of watercourse diversions and new channel section has incorporated best practice measures to enhance its fishery value and to ensure that there will be no significant impact on downstream aquatic habitats or on the upstream passage of fish during construction or operation.

The new channel shall be constructed in dry conditions and shall incorporate instream structures, features and meanders that will give rise to flow type variation as found in fish bearing waters. The channel base width has been designed to match the width of the diverted channels. The diversion channel will be subject to channel stabilization works, which consist of lining the new channel with rounded washed gravel to a maximum depth of 300mm below finished bed level and bank scour protection in the form of rock armour, along the channel.

Prior to dewatering of the channel IFI or a suitably qualified contractor will conduct an electrofishing operation and crayfish trapping to remove any fish/crayfish from the channel. Any removed fish/crayfish will be translocated to a suitable location downstream of the newly constructed channel and released. Translocation of crayfish shall be conducted under licence from the NPWs while electrofishing will be conducted under authorization from the Department of Communications, Climate Action and Environment under Section 14 of the Fisheries Act (1980).

All construction proposals adhere to Inland Fisheries Ireland (2016) *Guidelines on the Protection of fisheries during construction works in and adjacent to water*. This document sets out issues of concern in terms of construction impacts and their prevention. The timing of works will be as per that stipulated in the IFI guidance document and shall be agreed with Inland Fisheries Ireland prior to commencement of works.

2.3.2.3 Pre-construction Otter survey

Prior to any works being carried out, a pre-construction Otter survey will be undertaken to ensure that Otter have not taken up residence within or close to the road footprint. It is not anticipated that any Otter holts will require to be excluded as part of this proposed road project based on the findings of the Otter surveys undertaken. However, should any holt be encountered during the pre-construction surveys, it will be subject to exclusion procedures as outlined in the NRA guidelines (2006).

2.3.3 Pollution Prevention Measures

This project has potential to cause pollution of the surrounding environment. Pollution could take a number of forms and could occur during a number of the operations involved in the construction process. An Outline Erosion and Sediment Control (OESC) Plan has been prepared as a method of water quality preservation to offset potential construction stage pollution impacts from the Project to adjacent watercourses. The OESC is provided as **Appendix 1**.

Listed below are the activities during which pollution may arise and the type of pollution that may occur along with prescribed best practice construction measures.

2.3.3.1 Earth Works

- Prior to the outset of any excavation, the works area will be assessed and clearly delineated permanent fencing as described above.
- There will be no access to works vehicles outside the fenced off areas.
- All storage of plant, excavated material/topsoil and other materials required for construction/landscaping, will be held within the fenced area.
- Any excavated topsoil that is to be reused for landscaping will be stored on within the land acquisition boundary. Any excavated rock will be used as infill to replace excavated soil.
- No washing of plant, vehicles or equipment will be completed within 30m of a watercourse. Site foreman will ensure that all deliveries are required to complete wash out at their own company base, not on site.
- In all circumstances, excavation depths and volumes will be minimised and excavated material will be re-used where possible.
- There will be no release of suspended solids during construction works as a direct or indirect result of the proposed works.
- Temporary stockpiles of soil will be covered with polyethylene sheeting to avoid sediment release associated with heavy rainfall.
- Stock-piling of topsoil and subsoil in heaps during construction will take place in designated areas within the site boundary, away from watercourses.

2.3.3.2 Hydrocarbons and Waste Material

The use of hydrocarbons during the construction process leads to the potential for pollution to enter the wider environment, including drainage ditches and watercourses. Leaks in poorly maintained plant and machinery could lead to hydrocarbon dispersal over works areas. Leaks in fuel storage tanks and spillages during refueling operations could lead to larger releases of hydrocarbons into the environment.

The works will be carried out in accordance with the following measures to avoid such impacts:

- Potential impacts caused by spillages etc. during the construction phase will be reduced by keeping spill kits and other appropriate equipment on-site.
- All construction vehicles will be regularly checked and maintained prior to arrival at the site to prevent hydrocarbon leakage.
- Hoses and valves will be checked regularly for signs of wear and will be closed and securely locked when not in use.
- Fuels, lubricants and hydraulic fluids for equipment used on the construction site should be carefully handled to avoid spillage, properly secured against unauthorised access or vandalism, and provided with spill containment in accordance with current best practice.

- Fuelling and lubrication of equipment shall only be carried out in designated areas away from watercourses.
- Waste oils and hydraulic fluids will be collected in leak-proof containers and removed from the site for disposal or re-cycling.
- Vehicles will never be left unattended during refuelling.
- Appropriate control measures will be incorporated to ensure that materials (including any requirement for concrete pouring etc.) will be contained within the footprint of construction works.
- All construction materials and substances will be stored in a secure compound when not in use. This compound will be fenced off and all chemicals will be stored in suitable, secure containers to avoid the potential for contamination.
- Mobile storage such as fuel bowsers will be bunded to 110% capacity to prevent spills. Tanks for bowsers and generators shall be double skinned. When not in use, all valves and fuel trigger guns from fuel storage containers will be locked. All pumps using fuel or containing oil will be locally and securely bunded where there is the possibility of discharge to waters.
- All plant refuelling will take place using mobile fuel bowsers. No refuelling is to take place within **30m** of any watercourse. Only dedicated trained and competent personnel will carry out refuelling operations. The plant refuelling procedures shall be detailed in the contractor's method statements.
- Strict procedures for plant inspection, maintenance and repairs shall be detailed in the contractor's method statements and machinery shall be checked for leaks before arrival on site. All site plant will be inspected at the beginning of each day prior to use. Defective plant shall not be used until the defect is satisfactorily fixed. All major repair and maintenance operations will take place off site.
- Care will be taken at all times to avoid contamination of the environment with contaminants other than hydrocarbons, such as uncured concrete or other chemicals.
- Any waste material arising as a result of the proposed development will be removed to a permitted waste facility.

2.3.4 Monitoring

The construction works will be monitored at several levels to ensure that the environmental best practice prescribed in this document is fully adhered to and is effective. The following system will be put in place to ensure compliance.

- The contractor will assign a member of the site staff as the environmental officer with the responsibility for ensuring the environmental measures prescribed in this document are adhered to. A checklist will be filled in on a weekly basis to show how the measures above have been complied with. Any environmental incidents or non-compliance issues will immediately be reported to the project team.
- The project managers (client representatives) will be continuously monitoring the works and will be fully briefed and aware of the environmental constraints and protection measures to be employed.

The works will be periodically monitored during the construction phase by a suitably qualified ecologist. Following completion of the works, the ecologist will complete a final audit report to show how the works complied with the environmental provisions described in this document.

2.3.5 Invasive Species

Due to the legislative requirements to control the spread of noxious weeds and non-native invasive plant species, it is important that any activities associated with the planning, construction and operation of national road schemes comply with the requirements of the Wildlife Acts, 1976-2012. Regulations 49 and 50 of the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. 477 of 2015) include legislative measures to deal with the dispersal and introduction of Invasive Alien Species (IAS), which are listed in the Third Schedule of the regulations.

Regulation 49 deals with the Prohibition on introduction and dispersal of certain species while Regulation 50 relates to Prohibition on dealing in and keeping certain species (Regulation 50 has not yet been commenced). Invasive species listed under the Third Schedule of the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. 477 of 2015).

The introduction and/or spread of invasive species such as Himalayan Balsam, Giant Rhubarb or Rhododendron for example, could result in the establishment of invasive alien species and this may have negative impacts on the surrounding environs. Appropriate spread prevention measures have been incorporated into the design of the project.

Control measures for the management of Invasive Species

The following measures address potential impacts associated with the construction phase of the project:

- Good construction site hygiene will be employed to prevent the introduction and spread of problematic invasive alien plant species (e.g. Himalayan Balsam, Japanese Knotweed etc.) by thoroughly washing vehicles prior to leaving any site.
- All plant and equipment employed on the construction site (e.g. excavator, footwear, etc.) will be thoroughly cleaned down using a power washer unit prior to arrival on site to prevent the spread of invasive plant species
- All washing must be undertaken in areas with no potential to result in the spread of invasive species. This process will be detailed in the contractor's method statement.
- Any soil and topsoil required on the site will be sourced from a stock that has been screened for the presence of any invasive species and where it is confirmed that none are present.
- All planting and landscaping associated with the proposed development shall avoid the use on invasive shrubs such as Rhododendron.

The treatment and control of invasive alien species will follow guidelines issued by the National Roads Authority – *The Management of Noxious Weeds and Non-native Invasive Plant Species on National Roads* (NRA 2010).

2.4 Field Survey Methodology

A field visit was carried out by suitably qualified ecologists from McCarthy Keville O'Sullivan, John Hynes (B. Sc., M SC.) on the 09th of November 2017.

Habitats were identified in accordance with the Heritage Council's '*Guide to Habitats in Ireland*' (Fossitt, 2000). The walkover survey was designed to detect the presence, or

likely presence, of a range of protected species with a particular emphasis on the Qualifying Interests of Lough Corrib SAC.

An Otter survey was conducted as per NRA (2009) guidelines (*Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes*) in order to determine the presence or absence of Otter signs within the areas identified as having potential to support the species. This involved a search for all Otter signs e.g. spraints, scat, prints, slides, trails, couches and holts.

It is proposed to divert a watercourse as part of Option 3. This water course was assessed with regard to its potential to support aquatic Qualifying Interests of Lough Corrib SAC (i.e. Otter, Lamprey, White - clawed Crayfish and Atlantic Salmon).

Seasonal factors that affect distribution patterns and habits of species were taken into account when conducting the surveys. The potential of the site to support certain populations (in particular those of conservation importance that may not have been recorded during the field survey due to their seasonal absence or nocturnal/cryptic habits) was assessed. Incidental observations of birds were also recorded.

The ecological survey was undertaken outside the optimal time of year to undertake a habitat and flora survey (Smith *et al.* 2011). This was not considered a constraint on the ecological assessment as the habitats present within the development site boundary were easily identifiable during the site visit.

2.5 Field Survey Results

Route Option 1 involves the widening of the existing road (Plate 2.1). This will involve minimal improvement to the existing road alignment and very little disruption to the surrounding area. Habitats encountered along the route of the existing road include Dry meadows and grassy verges (GS2), Hedgerow (WL1), Treeline (WL2), Spoil and bare ground (ED2) and Stone walls and other stonework (BL1).

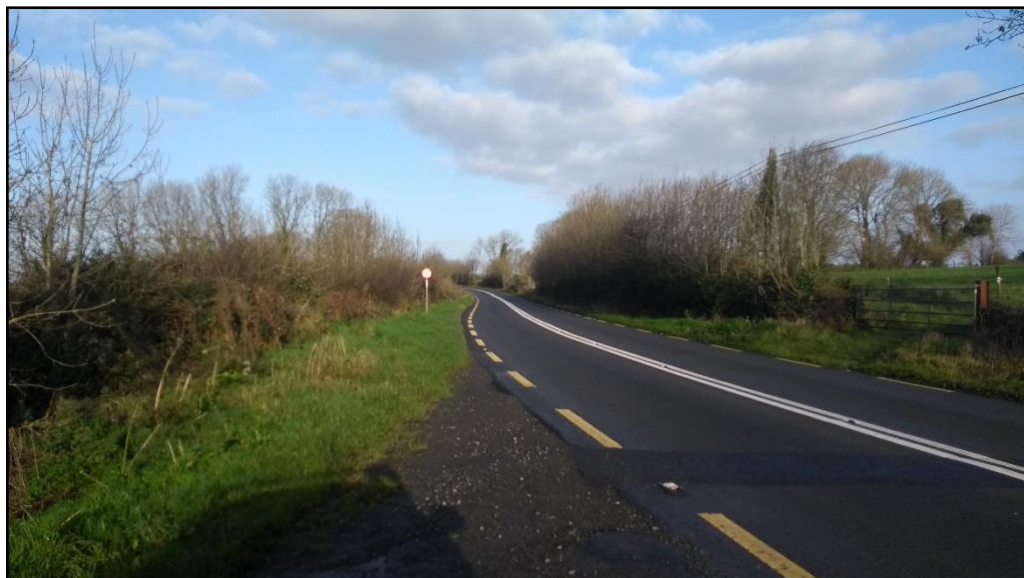


Plate 2.1. Route of the existing road.

Route Option 2 and 2A follow the same with route corridor. Route option 2 includes an at-grade crossing of the existing disused railway while option 2A includes a bridge over the roadway. The majority of the routes follow the existing road with the offline section traversing fields of Wet grassland (GS4), Improved agricultural grassland and some Scrub (WS1) along the disused railway line (Plate 2.2). Land boundaries are demarcated by Hedgerows (WL1), Treelines (WL2) and Drainage ditches (FW4).



Plate 2.2. Section along route options 2 and 2a.

Route Option 3 is predominantly offline and involves the diversion of an existing watercourses (1.3km). The offline section traverses fields of Wet grassland (GS4), Improved agricultural grassland and some Scrub (WS1) along the disused railway. Land boundaries are demarcated by Hedgerows (WL1), Treelines (WL2) and Drainage ditches (FW4). The watercourse at the diversion location consists of a modified and straightened channel which is best categorized as a Lowland Depositing River (FW2) (Plate 2.3). The stream width varied between 1.5m and 3m and it was dominated by glide habitat with only short riffle sections recorded. The substrate was dominated by silt with occasional, isolated pockets of gravels.

No evidence of Otter was recorded during the site visit but the watercourse at the diversion location has the potential to support the species. The watercourse, while not providing optimal habitat, has the potential to support Atlantic Salmon, Lamprey species and White – clawed crayfish.



Plate 2.3. Existing watercourse along the proposed diversion section.

2.5.1 Significance of Habitats and Fauna

Ecological evaluation within this section follows a methodology that is set out in Chapter 3 of the 'Guidelines for Assessment of Ecological Impacts of National Roads Schemes' (NRA, 2009).

None of the habitats recorded within the footprint of the proposed works correspond to Annex I habitats.

The watercourses proposed for diversion is assigned **International Importance** as it is partially located within the boundary of Lough Corrib SAC and it is essential to maintaining the coherence of the Natura 2000 Network. The watercourse also has potential to support faunal populations of International Importance associated with Lough Corrib SAC (i.e. Otter, Atlantic Salmon, Lamprey species and White Clawed-crayfish).

Hedgerow and Treelines within the study area are assigned **Local Importance (higher value)** on the basis of supporting semi-natural habitat types with high biodiversity and high degree of naturalness in a local context.

Although there are habitats of ecological significance within the study area, the development footprint is dominated by habitats of low ecological significance and are assigned **Local importance (lower value)**, as per the NRA 2009.

3 IDENTIFICATION OF RELEVANT EUROPEAN SITES

3.1 Background to European Sites

The Habitats Directive (92/43/EEC) (together with the Birds Directive (2009/147/EC)) forms the cornerstone of Europe's nature conservation policy. It is built around two pillars: the Natura 2000 network of protected sites and the strict system of species protection. All in all the directive protects over 1,000 animal and plant species and over 200 "habitat types" (e.g. special types of forests, meadows, wetlands, etc.), which are of European importance.

With the introduction of the EU Habitats Directive and Birds Directive which were transposed into Irish law as S.I. No. 94/1997 *European Communities (Birds and Natural Habitats) Regulations 1997*, the European Union formally recognised the significance of protecting rare and endangered species of flora and fauna, and also, more importantly, their habitats. The 1997 Regulations and their amendments were subsequently revised and consolidated in S.I. No. 477/2011- *European Communities (Birds and Natural Habitats) Regulations 2011*. This legislation requires the establishment and conservation of a network of sites of particular conservation value that are to be termed 'European Sites'.

Habitats Directive/Special Areas of Conservation

Articles 3 – 9 of the EU Habitats Directive (92/43/EEC) provide the EU legislative framework of protecting rare and endangered species of flora and fauna, and habitats. **Annex I** of the Directive lists habitat types whose conservation requires the designation of **Special Areas of Conservation (SAC)**. Priority habitats, such as Turloughs, which are in danger of disappearing within the EU territory are also listed in Annex I. **Annex II** of the Directive lists animal and plant species (e.g. Marsh Fritillary, Atlantic Salmon, and Killarney Fern) whose conservation also requires the designation of **SAC**. **Annex IV** lists animal and plant species in need of strict protection such as Lesser Horseshoe Bat and Otter, and **Annex V** lists animal and plant species whose taking in the wild and exploitation may be subject to management measures. In Ireland, species listed under Annex V include Irish Hare, Common Frog and Pine Marten.

Species can be listed in more than one Annex, as is the case with Otter and Lesser Horseshoe Bat which are listed on both **Annex II** and **Annex IV**.

Birds Directive/Special Protection Areas

Council Directive 79/409/EEC of 2 April 1979 on the conservation of wild birds (Birds Directive) has been substantially amended several times. In the interests of clarity and rationality the said Directive was codified in 2009 and is now cited as Directive 2009/147/EC. The Directive instructs Member States to take measures to maintain populations of all bird species naturally occurring in the wild state in the EU (**Article 2**). Such measures may include the maintenance and/or re-establishment of habitats in order to sustain these bird populations (**Article 3**).

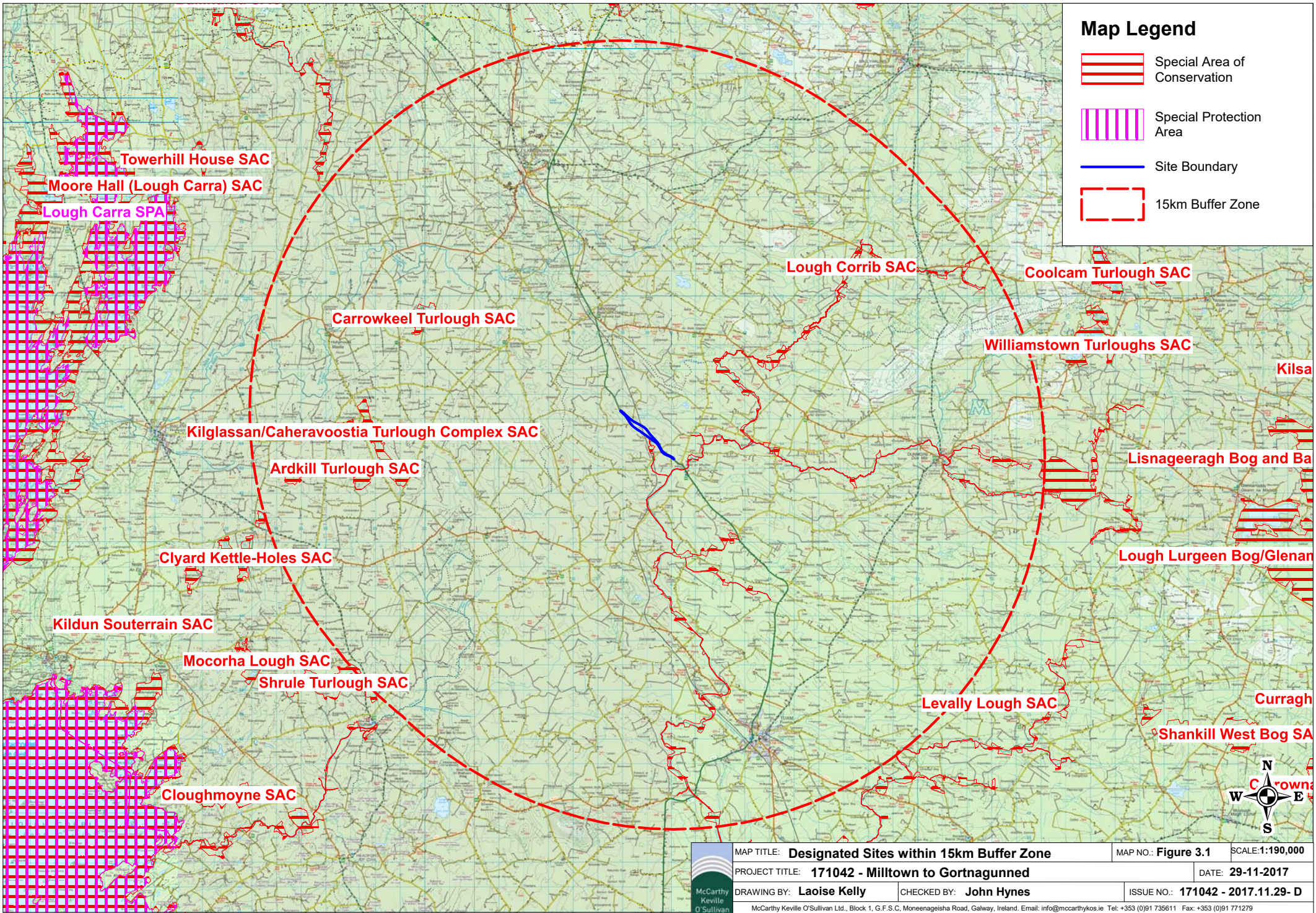
A subset of bird species have been identified in the Directive and are listed in **Annex I** as requiring special conservation measures in relation to their habitats. These species have been listed on account of inter alia: their risk of extinction; vulnerability to specific changes in their habitat; and/or due to their relatively small population size or restricted distribution. **Special Protection Areas (SPAs)** are to be identified and classified for these Annex I listed species and for regularly occurring migratory species, paying particular attention to the protection of wetlands (**Article 4**).

3.2 Identification of the Designated Sites within the Likely Zone of Influence of the Proposed Development





The most up to date GIS spatial datasets for European designated sites were downloaded from the NPWS and Northern Ireland websites (www.npws.ie) on the 12/02/2018. Using the GIS software, MapInfo (Version 10.0), European sites within the likely zone of influence of the project were identified. The following rationale was used to identify the Zone of influence. Initially, sites within a 15km radius of the proposed development were identified (as per the DoEHLG Guidance (2010)). In addition, using the precautionary principle, European Sites located outside the 15km buffer zone were also taken into account and assessed where potential pathways for impact were identified and particularly where hydrological connectivity could be established. In this case, no potential for effects on sites located outside the 15km zone was identified.

Figure 3.1 shows the location of the proposed development in relation to all European sites within the Zone of Impact as identified according to the criteria described above.

Table 3.1 below, lists all European Sites that were considered to be within the Zone of Impact. The site synopses and conservation objectives of these sites, as per the NPWS website (www.npws.ie), were considered at the time of preparation of this report (12/02/2018). Details of these sites, including their distance from the proposed development, are provided in Table 3.1.



Map Legend

-  Special Area of Conservation
-  Special Protection Area
-  Site Boundary
-  15km Buffer Zone

	MAP TITLE: Designated Sites within 15km Buffer Zone	MAP NO.: Figure 3.1	SCALE: 1:190,000
	PROJECT TITLE: 171042 - Milltown to Gortnagunned	DATE: 29-11-2017	
	DRAWING BY: Laiose Kelly	CHECKED BY: John Hynes	ISSUE NO.: 171042 - 2017.11.29 - D
	<small>McCarthy Keville O'Sullivan Ltd., Block 1, G.F.S.C. Moneenageisha Road, Galway, Ireland. Email: info@mccarthykos.ie Tel: +353 (0)91 735611 Fax: +353 (0)91 771279</small>		

Table 3.1 Designated sites within the Likely Zone of Impact

European Site	Distance from Proposed Development (km)	Qualify Interests/Special Conservation Interests for which the European Site has been designated (Sourced from NPWS online Conservation Objectives, www.npws.ie on the 12/02/2018)	Conservation Objectives
Special Areas of Conservation (SACs)			
Lough Corrib SAC (000297)	<p>Option 1, 2 and 2A are located a minimum distance of. 65m from Lough Corrib SAC.</p> <p>Option 3 includes the diversion of the adjacent stream for a distance of approximately 1.3km. Approximately 66m of the this stream is located within the boundary of Lough Corrib SAC.</p>	<ul style="list-style-type: none"> ▪ Oligotrophic waters containing very few minerals of sandy plains (<i>Littorelletalia uniflorae</i>) [3110] ▪ Oligotrophic to mesotrophic standing waters with vegetation of the <i>Littorelletea uniflorae</i> and/or <i>Isoeto-Nanojuncetea</i> [3130] ▪ Hard oligo-mesotrophic waters with benthic vegetation of <i>Chara spp.</i> [3140] ▪ Water courses of plain to montane levels with the <i>Ranunculion fluitantis</i> and <i>Callitriche-Batrachion</i> vegetation [3260] ▪ Semi-natural dry grasslands and scrubland facies on calcareous substrates (<i>Festuco-Brometalia</i>) (* important orchid sites) [6210] ▪ <i>Molinia</i> meadows on calcareous, peaty or clayey-silt-laden soils (<i>Molinion caeruleae</i>) [6410] ▪ Active raised bogs [7110] ▪ Degraded raised bogs still capable of natural regeneration [7120] ▪ Depressions on peat substrates of the <i>Rhynchosporion</i> [7150] ▪ Calcareous fens with <i>Cladium mariscus</i> and species of the <i>Caricion davallianae</i> [7210] ▪ Petrifying springs with tufa formation (<i>Cratoneurion</i>) [7220] ▪ Alkaline fens [7230] ▪ Limestone pavements [8240] ▪ Old sessile oak woods with <i>Ilex</i> and <i>Blechnum</i> in the British Isles [91A0] ▪ Bog woodland [91D0] 	Detailed conservation objectives for this site (Version 1, April 2017) were reviewed as part of the assessment and are available at www.npws.ie

European Site	Distance from Proposed Development (km)	Qualify Interests/Special Conservation Interests for which the European Site has been designated (Sourced from NPWS online Conservation Objectives, www.npws.ie on the 12/02/2018)	Conservation Objectives
		<ul style="list-style-type: none"> ▪ <i>Margaritifera margaritifera</i> (Freshwater Pearl Mussel) [1029] ▪ <i>Austropotamobius pallipes</i> (White-clawed Crayfish) [1092] ▪ <i>Petromyzon marinus</i> (Sea Lamprey) [1095] ▪ <i>Lampetra planeri</i> (Brook Lamprey) [1096] ▪ <i>Salmo salar</i> (Salmon) [1106] ▪ <i>Rhinolophus hipposideros</i> (Lesser Horseshoe Bat) [1303] ▪ <i>Lutra lutra</i> (Otter) [1355] ▪ <i>Drepanocladus vernicosus</i> (Slender Green Feather-moss) [1393] ▪ <i>Najas flexilis</i> (Slender Naiad) [1833] 	
Carrowkeel Turlough SAC (000475)	8.3km	<ul style="list-style-type: none"> ▪ Turloughs [3180] 	<p>This site has the generic conservation objective:</p> <p><i>'To maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been selected.'</i> (NPWS Generic version 5.0, 2016)</p>
Greaghans Turlough SAC (000503)	8.8km	<ul style="list-style-type: none"> ▪ Turloughs [3180] 	<p>This site has the generic conservation objective:</p> <p><i>'To maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been selected.'</i> (NPWS Generic version 5.0, 2016)</p>
Kilglassan/Caheravoostia Turlough Complex SAC (000504)	9.5km	<ul style="list-style-type: none"> ▪ Turloughs [3180] 	<p>This site has the generic conservation objective:</p>

European Site	Distance from Proposed Development (km)	Qualify Interests/Special Conservation Interests for which the European Site has been designated (Sourced from NPWS online Conservation Objectives, www.npws.ie on the 12/02/2018)	Conservation Objectives
			<i>'To maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been selected.'</i> [NPWS Generic version 5.0, 2016]
Ardkill Turlough SAC (000461)	10.5km	<ul style="list-style-type: none"> ▪ Turloughs [3180] 	<p>This site has the generic conservation objective:</p> <p><i>'To maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been selected.'</i> [NPWS Generic version 5.0, 2016]</p>
Skealaghan Turlough SAC (000541)	13.1km	<ul style="list-style-type: none"> ▪ Turloughs [3180] 	<p>This site has the generic conservation objective:</p> <p><i>'To maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been selected.'</i> [NPWS Generic version 5.0, 2016]</p>
Shrule Turlough SAC (000525)	14.6km	<ul style="list-style-type: none"> ▪ Turloughs [3180] 	<p>This site has the generic conservation objective:</p>

European Site	Distance from Proposed Development (km)	Qualify Interests/Special Conservation Interests for which the European Site has been designated (Sourced from NPWS online Conservation Objectives, www.npws.ie on the 12/02/2018)	Conservation Objectives
			<i>'To maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been selected.'</i> [NPWS Generic version 5.0, 2016]
Clyard Kettle-Holes SAC (000480)	14.9km	<ul style="list-style-type: none"> ▪ Turloughs [3180] ▪ Calcareous fens with <i>Cladium mariscus</i> and species of the <i>Caricion davallianae</i> [7210] 	This site has the generic conservation objective: <i>'To maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been selected.'</i> [NPWS Generic version 5.0, 2016]
Special Protection Area (SPA)			
No SPAs occur within 15km of the project site			

4 ASSESSMENT OF LIKELY EFFECTS ON EUROPEAN SITES

4.1 Article 6(3) Assessment Criteria

The Screening Assessment criteria examined in the impact assessment section of this document follows the suggested screening matrix structure detailed in *Assessment of Plans and Projects Significantly Affecting Natura 2000 Sites: Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive* (EC, 2001).

4.2 Description of Individual Elements of the Project with Potential to give Rise to Effects on the European Site

This section of the report sets out the main work elements that could have the potential for significant impact on European sites.

- **Site Clearance and Earthworks**

Site clearance works will require vegetation removal, top soils stripping and construction of temporary access routes for construction plant within the land acquisition boundary. In some instances, there may also be a requirement for removal of significant amounts of earth material. Such activities, in the absence of best construction practice, have the potential to give rise to indirect impacts on European sites via pollution of the aquatic environment. There is no potential for direct impacts on European sites.

- **Earthworks and Road Drainage**

The movement of material resulting from earth works i.e. topsoil and rock material has the potential to alter drainage patterns and result in surface run-off. In the absence of best construction practice the runoff could potentially contain an increased loading of silt and pollutants such as hydrocarbons or concrete. The operational stage of the road development may result in surface water run-off entering water courses. Such water can contain high levels of silt, salts, heavy metals and hydrocarbons. In addition, there is the possibility for pollution events resulting from collisions, leaks and other unforeseen events. Potential pathways for indirect impacts on European sites have been identified via pollution of the aquatic environment. There is no potential for direct impacts on European sites.

- **Stream Diversion**

One of the four route options, Option 3 (see Figure 2.5) requires the diversion of a stream that flows into the Clare River. The Clare River and the southern section of this stream are designated under Lough Corrib SAC (000297). The diversion of this stream will follow best practice measures set out in the Galway County Council's Outline Erosion and Sediment Control Plan (OESCP) and will adhere strictly to Inland Fisheries Ireland 'Guidelines on protection of fisheries during construction works in and adjacent to waters' (2016). The OESCP is provided as **Appendix I** of this report. The watercourse crossings have been designed to minimise the potential for both short and long-term negative ecological impacts on all watercourses including drainage ditches. The design of the project avoids net loss of habitat through appropriate design and ensures that the crossing points do not result in barrier effect and that significant changes to the nature of the channel is avoided. Potential pathways for indirect impacts on European sites have been identified via pollution of the aquatic environment. There is no potential for direct impacts on European sites.

- **Culverts**

Culverts are features of the proposed project. The construction of structures can interfere with the morphology of the watercourses and in the absence of best construction practice could give rise to pollution of the aquatic environment. During the operational phase the presence of culverts could potentially deplete light availability and could impact on fisheries/ faunal passage. Potential pathways for indirect impacts on European sites have been identified via pollution of the aquatic environment. There is no potential for direct impacts on European sites.

- **Temporary Construction Facilities/Installations**

The construction and operation of site compound and storage area will be a feature of the construction stage of this road project. The removal of vegetation, earthworks, plant and fuel storage drainage and movement of plant will be a feature of this phase. Such activities, in the absence of mitigation, have the potential to give rise to indirect impacts on European sites via pollution of the aquatic environment.

4.3 Description of any Likely Direct, Indirect or Secondary Effects of the Project on European Sites

Any likely direct, indirect or secondary effects of the proposed project, both alone and in combination with other plans and projects, on the identified European Sites in light of their conservation objectives by virtue of the following criteria: size and scale, land-take, distance from the European Site or key features of the site, resource requirements (such as water abstraction), emissions (disposal to land, water or air), excavation requirements, transportation requirements and duration of construction, operation or decommissioning are presented in Table 4.1.

Table 4.1 Likely Effects of the Proposed Development on the European Sites

Likely Direct, Indirect or Secondary Effects of the project on the European Sites	
Size and Scale	Pathways for impact with regard to size and scale were not identified with regard to any European sites.
Land-take	Approximately 66m of watercourse within Lough Corrib SAC will be diverted as part of Option 3. This will be replaced with a diversion of the stream channel in line with IFI Guidelines (2016), thus resulting in no net loss of fisheries habitat. None of the other route options proposed will result in land-take within any European site.
Distance from the European Sites or Key Features of the Site	Approximately 66m of watercourse within Lough Corrib SAC will be diverted as part of Option 3. Option 1, 2 and 2A do not occur within the boundary of any European sites although they are in close proximity to Lough Corrib SAC (000297). All options have incorporated best practice measures into their design in order to avoid significant effects on any European site. There will be no impact on key features of any European Site as a result of the project given that a suite of best practice measures have been incorporated into the project design as described in Section 2.3 and in the Outline Erosion and Sediment Control Plan (OESCP).
Resource Requirements	There will be no exploitation of any resources within any European Site as part of the proposed project. The stream diversion associated with Option 3 will result in no net loss of fisheries habitat and will be carried out in line with Inland Fisheries Ireland guidelines (2016).
Emissions	Emissions from the construction of the proposed development may have the potential to effect European Sites in the zone of influence. These include emissions to surface and ground water such as silt laden run off, hydrocarbons or other pollutants during both construction and

Likely Direct, Indirect or Secondary Effects of the project on the European Sites	
	<p>operational phases and noise resulting in disturbance of QIs. However, a suite of best practice measures, as described in Section 2.3, have been incorporated into the project design to avoid any significant impacts on European sites.</p> <p>Consequently, in view of best scientific knowledge and on the basis of objective information, the proposed road development, either individually or in combination with other plans or projects, is not likely to have significant effects on any European Sites via emissions.</p>
Excavation Requirements	<p>There will be some excavation (approx. 66m of stream) within Lough Corrib SAC (000297) associated with Option 3. The stream diversion associated with Option 3 will result in no net loss of fisheries habitat and will be carried out in line with Inland Fisheries Ireland guidelines (2016). A potential indirect impact is emissions to surface waters. This potential impact is considered above in relation to Emissions.</p>
Transportation Requirements	<p>All transportation will be conducted within the existing public road network or within the land acquisition boundary for the proposed road development. No potential pathway for direct impacts on any European Site as a result of the transportation requirements associated with this road project was identified. However, potential pathways for indirect impacts in the form of emissions to air and water associated with the transportation requirement were identified and are discussed above in relation to emissions.</p>
Duration of Construction, Operation, Decommissioning	<p>No potential impacts that relate directly to the duration of each phase of the project were identified (the duration of the construction phase is short term and the operational phase is assumed permanent).</p> <p>Impacts resulting from emissions are affected by the duration of each phase of the project but are considered above under the relevant headings with no additional potential for impacts arising specifically as a result of the duration of each phase identified.</p>
Cumulative Impacts with other Projects or Plans	<p>Galway County Council website was accessed on 02/02/2018 to take into account other plans or projects that may have potential to have a cumulative impact when considered with the proposed project. A number of small scale projects have been proposed within the townlands overlapping the project site, these include; construction of four dwelling houses, development at the bar/retail and residential premises and adjacent yard formerly known as Glynn's Milltown, construction of a workshop repair garage including office accommodation and pump house, construct a domestic garage, construction and extension to existing dwelling houses, change of use of a shop unit to a bedroom apartment; construction of four 2 storey detached dwellings and associated garages; construction of two domestic garages; extension to an existing dwelling house; alterations to the residential aspect of a previously approved development permitted under pl. ref. 15/1268.</p> <p>These projects are typical of small-scale urban development and are not deemed to have a significant effect on any European site. The proposed project along the N17 has incorporated a suite of best practice measures into the design of the project. The project proposed is not deemed to have a significant effect on any European site, consequently cumulative effects are not anticipated.</p>

4.4 Description of any Likely Changes to European Sites

Any potential changes to the European Sites are described below in Table 4.2 with reference to the following criteria: reduction of habitat area, disturbance to key

species, habitat or species fragmentation, reduction in species density, changes in key indicators of conservation value (e.g. water quality etc.) and climate change.

Table 4.2 Likely Changes to European Sites

Likely changes to the European Sites	
Reduction of Habitat Area	<p>Approximately 66m of watercourse within Lough Corrib SAC will be diverted as part of Option 3. The stream diversion associated with Option 3 has been designed to result in no net loss of fisheries habitat and will be carried out in line with Inland Fisheries Ireland guidelines (2016).</p> <p>There will be no reduction in Annex I habitat area or net loss of potential supporting habitat for and QI/SCI within or outside any European Sites as a result of the proposed development.</p>
Disturbance to Key Species	<p>The stream diversion associated with Option 3 will result in no net loss of fisheries habitat and will be carried out in line with Inland Fisheries Ireland guidelines (2016). Fish species, lamprey species and White-clawed Crayfish will be surveyed for and where encountered will be translocated downstream prior to diversion works being carried out as detailed in Section 2.3. A pre-construction Otter survey will also be carried out to avoid potential impacts on this species. There will be no disturbance associated with the proposed project. All works will adhere to Fisheries Guidelines and the OESCP. There will be no significant impacts on key species associated with any European site.</p>
Habitat or Species Fragmentation	<p>There will be no habitat or species fragmentation within any European Site associated with the development. Diversion of the stream will be carried out in consultation with Inland Fisheries Ireland. The new stream channel will not result in a barrier effect for fish passage and has been designed to enhance to the fisheries vale of the watercourse.</p>
Reduction in Species Density	<p>There will be no reduction in species density associated with the proposed development.</p> <p>The stream diversion associated with Option 3 will result in no net loss of fisheries habitat and will be carried out in line with Inland Fisheries Ireland guidelines (2016). Fish species, lamprey species and White-clawed Crayfish will be surveyed for and where encountered will be translocated downstream prior to diversion works being carried out as detailed in Section 2.3. . A pre-construction Otter survey will also be carried out to avoid potential impacts on this species. There will be no reduction in species density as a result of the proposed works.</p>
Changes in Key Indicators of Conservation Value	<p>Given the nature, scale and design of the proposed development options, it is considered unlikely that there will be any changes to the key indicators of conservation value of any of the European Site</p>
Climate Change	<p>Given the nature, scale and design of the proposed development options, it is considered unlikely that there will be any significant negative resultant impact on climate change.</p>

4.5 Description of any Likely Effects on any European Site

There is no potential for direct effects on any European Site. Table 4.3 describes the potential nature of any indirect effects in terms of the structure and function of the identified European Sites.

Table 4.3 Assessment of Potential Indirect Effects on the Structure and Function of European Sites

Likely Changes to the European Sites	
Interference with the key relationships that define the structure of a European Site	No potential for impact on the key relationships that define the Structure of any European Sites have been identified.
Interference with key relationships that define the function of the European Site	No potential for impact on the key relationships that define the Function of any European Sites have been identified.

4.6 Indicators of Significance as a Result of the Identification of Effects

Indicators of significance are provided in Table 4.4 below for any effects identified above in terms of loss, fragmentation, disruption, disturbance and changes to key elements of the European Sites, such as water quality.

Table 4.4 Indicators of Significance as a result of the Identification of Effects

Indicators of significance as a Result of the Identification of Effects	
Loss	There will be no reduction in Annex I habitat area within any European Sites as a result of the proposed project. There will be no net loss of supporting habitat of QI/SCI species.
Fragmentation	There will be no habitat or species fragmentation within any European Site associated with the proposed project.
Disruption	There will be no disruption to the ecological processes within any European Sites as a result of the proposed project.
Disturbance	There will be no disturbance within any European Sites as a result of the proposed project.
Changes to Key Elements of the Site	There will be no changes to key elements within any Natura 2000 site as a result of the proposed project.

5 ARTICLE 6(3) SCREENING STATEMENT AND CONCLUSIONS

The findings of this Screening Assessment are presented following the European Commission guidance document *Assessment of Plans and Projects Significantly affecting Natura 2000 Sites: Methodological Guidance on the provisions of Article 6(3) and 6(4) of the Habitats Directive 92/43/EEC* (EC, 2001) and the Department of the Environment's Guidance on the Appropriate Assessment of Plans and Projects in Ireland (December 2009, amended February 2010).

5.1 Assessment of Significance of Effects

Is the project directly connected with or necessary to the management of the site?

The project is not directly connected with or necessary to the management of any European Site.

Are there any other projects or plans that together with the project being assessed could affect the site?

A search in relation to plans and projects that may have the potential to result in cumulative impacts on European sites was conducted. The N17 realignment will have no individual or cumulative impacts on any European site in any regard.

Describe how the project is likely to affect the Natura 2000 sites

The project design has incorporated a suite of best practice measures to prevent and robustly block any potential impact on European sites. The project will not significantly affect any European Sites.

Explain why these effects are not considered significant

- There will be no negative direct impacts or reduction in Annex I habitat area within any European Site.
- There will be no reduction in key habitats supporting populations of Annex I bird species and no reduction in the populations of any Annex I species.
- There will be no reduction in key habitats supporting populations of Annex II species and no reduction in the populations of any Annex II species.
- Any potential pathways for impact have been blocked through good design, best practice and a thorough investigation of the suitability of the lands for development of this type.
- The works themselves will involve little disturbance or disruption to the ecological processes in the area during either construction or operation.

It has been concluded, in view of best scientific knowledge and on the basis of objective information, that the proposed development either individually or in combination with other plans or projects, is not likely to have significant effects on the European Sites that were assessed as part of the screening exercise.

5.2 Data Collected to Carry Out Assessment

In preparation of the report, the following sources were used to gather information:

- Review of NPWS Site Synopses, Conservation Objectives for the European Sites
- Review of 2013 and 2007 EU Habitats Directive (Article 17) Reports.

- Review of online web-mappers: National Parks and Wildlife Service (NPWS), and EPA.
- Review of OS maps and aerial photographs of the site of the proposed road development.
- Review of relevant databases including National Biodiversity Ireland Database and available literature of previous surveys conducted in the area.
- Review of other plans and projects within the area.

5.3 Concluding Statement

The proposed project, by itself or in combination with other plans and projects, in light of best scientific knowledge in the field, will not, in view of the sites' conservation objectives, have significant effects on any European Site.

There is no requirement for Appropriate Assessment.

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Appendix I

Outline Erosion and Sediment Control Plan

Appendix D – Archaeological, Architectural and Cultural Heritage

Route Options Report on the N17 Milltown to Gortnagunned Road Improvements Scheme

Archaeology and Architectural Heritage

Jerry O'Sullivan, TII Archaeologist
August 2018; Revised February 2019

1. Summary

This report considers four route options for the N17 Milltown to Gortnagunned road improvement project in relation to its potential impacts on the archaeological and architectural heritage. The report was compiled using standard methods and with reference to the relevant published guidelines for architectural and archaeological heritage in a development context, published by the Department of Arts, Heritage, Gaeltacht and Island (1999), The Heritage Council (2002) and the National Roads Authority (2010). The study area was a corridor c. 3.5 km long and 0.5 km wide.

None of the four options considered would have any impact on any known archaeological site or monument, though it would be wise to conduct archaeological test excavations, on a precautionary basis in any offline area affected by the project, on whatever route might be approved. Testing would seek to identify and record any previously undiscovered archaeological remains in those sectors.

All four options have potential impacts on elements of the architectural heritage. These are mostly early modern farm buildings and dwelling houses of local interest—variously ruined, derelict or well maintained and in use. The potential impacts are mostly to roadside boundary features (walls, gateways, mature trees) and these are deemed to be 'slight' or 'moderate'. In two cases the impacts would result in the demolition of a ruined farmhouse or byre and these are deemed to be 'moderate impacts'. In two other cases the impacts would result in the demolition of attractive, well maintained dwelling houses—both of them of a traditional form and scale and in highly visible locations—and these are deemed to be 'severe' impacts. One option would result in the demolition of a railway crossing keeper's cottage and this is also rated a 'severe' impact. In fact, this is the least desirable impact of any of the options, because of the group associations of a railway building and because the building type is less common than the other rural building types (dwellings, byres) potentially affected by this project.

Comparing the number and severity of the impacts of the three route options, the preferred option here is Option 1, followed by Option 3, then Options 2 and 2A.

2. Desk assessment

Prior to inspecting the road corridor in the field, a desk-based assessment of the study area was made with reference to the following sources.

- Ordnance Survey first and second-edition six-inch maps of County Galway (Sheet 4 surveyed 1839, revised 1925–26; and Sheet 16 surveyed 1838, revised 1926).
- Record of Protected Structures for County Galway per the *Galway County Development Plan 2015–2021* (amended 2017)
- Record of Monuments and Places in County Galway (OPW 1997)
- *Archaeological Inventory of County Galway, Vol. II – North Galway* (Alcock et al. 1999)
- vertical aerial photographs available from the Ordnance Survey at Galway County Council (2010, 2015) and also on the Internet at www.bing.com (undated)
- local publication on the *Milltown Heritage Trail* (2010) by the Milltown Development Company Ltd and Milltown Tidy Towns Group and also local heritage and information websites (www.milltown.galwaycommunityheritage.org and www.milltowngalway.com)
- online gazetteer of licensed archaeological excavations in Ireland at www.excavations.ie for the townlands traversed by the route options for the project.
- Sites and Monuments Record for County Galway maintained by the Archaeological Survey of Ireland (National Monuments Service) and available to view online at www.heritage.ie
- National Inventory of Architectural Heritage (NIAH) for County Galway compiled by the Department of Environment, Heritage and Local Government in 2008–11 and available to view online at www.buildingsofireland.ie
- Bedrock geology and soils maps of the Geological Survey of Ireland at www.gsi.ie and Teagasc at www.gis.teagasc.ie

From these sources over 20 places of potential interest were identified for inspection in the field, including archaeological sites and monuments within the corridor and roadside buildings or sites of buildings as indicated on the early Ordnance Survey maps.

3. Fieldwork

All of the features and sites of potential interest that were identified by the desk study were inspected, photographed and described in the field by the writer, over the course of two visits, in October 2017 and July 2018.

Some additional features were identified in the field by a 'windscreen' survey of the route corridor (i.e. as seen from the existing N17) and these were also inspected, photographed and described.

The writer made a third visit to the study area with Project Engineer Andrew O'Halloran, in July 2018, to confirm some of the impacts, with reference to detailed route options drawings that Mr O'Halloran had prepared for the project.

4. Consultations

The writer took the opportunity to speak with householders and landowners wherever possible in the course of the two field inspections in October 2017 and July 2018 and also met in July 2018 with Mr Frank Glynn and Mr Tony Murphy of the Milltown Heritage Group. The writer also attended a public consultation event for the scheme in Milltown Community Hall in December 2018.

More widespread written consultations with interested organisations and individuals (e.g. County Conservation Officer, County Heritage Officer, An Taisce, Galway Archaeological and Historical Society) would have potential value if the project proceeds to design stage for a preferred route.

5. Statutory Protections

5.1 Archaeology

The principal protections for archaeological sites and monuments in Ireland are afforded by the *National Monuments Acts 1930–2004*. They include a Ministerial Preservation Order (for National Monuments) or entry on the Register of Historic Monuments or entry on the Record of Monuments and Places. The Record of Monuments and Places for County Galway was published in 1997.

Any site or monument that is a scheduled National Monument or that is entered on the Register of Historic Monuments will appear in the Record of Monuments and Places (unless a more recent Preservation Order has been issued), so that this may be regarded for practical purposes as a comprehensive source for sites and monuments having legal protection in our study area.

The minimum legal protection afforded an archaeological site or monument entered in the Record of Monuments and Places is that anyone proposing to do works to the site or monument (including an investigation) must give not less than two months' notice to the Minister. Archaeological excavations are subject to licensing by the Minister and an excavation licence will only be granted to a competent and suitably qualified person.

There are three Recorded Monuments in or near our study area. None of them would be affected by any of the three route options.

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- A ringfort (RMP GA016:123) in the northern outskirts of the village has been more or less been entirely removed. The site is c. 100 m from the present road and is now occupied by modern farm buildings.
 - An earthwork enclosure (GA016:124) in the village, c. 300 m from the project road, was shown on the first edition Ordnance Survey map (c. 1840) but is not extant and the site is now occupied by a modern dwelling house.
 - A children's burial ground or *cillín* (RMP GA016:016A) occupies an irregular area of rough ground in a pasture field south of the existing road, again in the western outskirts of Milltown. The site is c. 150 m from the present road but note that the Milltown Heritage Group has placed a plaque identifying the site on a gate pier at the main road, within the limits of the project road.

No other, newly identified archaeological sites or monuments were identified in the study area by the desk study or by field inspection for this assessment.

For completeness, signage for the Milltown Heritage Trail indicates a *fulacht fiadh* or burnt mound site north of the village, in rough pasture east of the (L2212) Dunmore road. This is a very common type site of Bronze Age date, typically found in wet, low-lying ground. It was not inspected by the writer. It would not be affected by any of the three route options.

5.2 Architecture

Architectural Heritage in Ireland is protected under the Planning and Development Acts and especially Part IV of the 2000 Act. This requires all local authorities to include in their development plans a Record of Protected Structures. The current Record of Protected Structures for County Galway is published as Appendix V in the *Galway County Development Plan 2015–2021* and was last amended in 2017. Any works or alterations to a Protected Structure must be authorised by the Council, as the planning authority, and must have regard to the setting, character and features of special interest of the Protected Structure.

There are no Protected Structures within the study area for this project (< 500 m corridor) but there are a few within 1 km of the project road. These include the single-arch masonry bridge (RPS 3858) that carries the N17 over the Clare River in Milltown village; Millbrook House (RPS 0014), in Lack, north of the village; the old railway station building (RPS 3856) in Pollaturrick, west of the village; and the Edmond Hopkins monument (RPS 3857) in Cloonacross, which is also a Recorded Monument, as we saw above. None of these Protected Structures would be affected by any of the route options for the project.

All three route options would affect local elements of the architectural heritage that are not Protected Structures, as we shall see below.

6. Impacts of the route options compared

None of the three options will have any impacts on known elements of the archaeological heritage. All three options would have slight impacts on elements of the architectural heritage. What separates the three options is the number and character of the moderate and severe impacts they would have on elements of the architectural heritage, as set out here (and see Table 6.1 below).

- **Route Option 1** would have four slight impacts, three moderate impacts and no severe impacts. The slight impacts would be to boundary features (walls, gateways), the railway level crossing (Inventory No. 7) and townland name plaques along the margins of the existing road (No. 24). The moderate impacts would be the loss of boundaries with mature broadleaf trees at two early modern houses (Inventory Nos 17 and 25) and demolition of a ruined early modern farmhouse (No. 26).
- **Route Option 2** would have five slight impacts, two moderate impacts and one severe impact. Again, the slight impacts would be to boundary features (walls, gateways), the railway level crossing (No. 7), and townland name plaques along the margins of the existing road (No. 24). The moderate impacts would be the loss of a boundary wall with mature broadleaf trees (No. 25); and demolition of a ruined early modern farmhouse (No. 26). The severe impact would be demolition of a well maintained farmhouse in a highly visible roadside setting (No. 15).
- **Route Option 2A** would have two slight impacts, one moderate impact and one severe impact. Again, the slight impacts would be to boundary features (walls, gateway) and roadside name plaques (No. 24). The moderate impact would be the loss of a boundary wall with mature broadleaf trees (No. 25). The severe impact would be to a group of railway features including crossing barriers, a boundary wall and pedestrian stile and the crossing-keeper's cottage (No. 7).
- **Route Option 3** would have two slight impacts, one moderate impact and one severe impact. Once again, the slight impacts are to boundary features (No. 4) and townland name plaques along the margins of the existing road (No. 24). The moderate impact would be the loss of a boundary wall with mature broadleaf trees (No. 25). The severe impact would be the demolition of an attractive, well maintained house with traditional features, in a highly visible roadside setting (No. 18).

Table 6.1
Impacts of Route Options 1, 2 and 3 on the Archaeological and Architectural Heritage

FEATURES OF INTEREST			IMPACTS OF ROUTE OPTIONS COMPARED					Impact
No	Description	Grid Ref (Irish) (and ITM)	Significance	1	2	2A	3	
1	Farm buildings	137870 265400 (537834 765421)	Local	—	—	—	—	Nil impact
4	Derelict cottage	138110 265230 (538074 765250)	Local	—	Slight	Slight	Slight	Direct impact on roadside boundary
5	Farmstead	138430 265080 (538394 765101)	Local	—	—	—	—	Nil impact
6	House (former cottage)	138320 264800 (538284 764821)	Local	—	—	—	—	Nil impact
7	Railway crossing	138760 264720 (538724 764741)	Regional	Slight	Slight	Severe	—	Direct impact on barriers, boundary, and stile; also keeper's cottage if 2A
8	Farmhouse	138830 264720 (538794 764741)	Local	Slight	Slight	—	—	Direct impact on roadside boundary
9	Connolly's Shop (former)	138870 264690 (538834 764711)	Local	—	—	—	—	Nil impact
10	Ruined byre house	139080 264500 (539044 764521)	Local	—	—	—	—	Nil impact
16	Chapel (site of)	139120 264340 (539084 764361)	Nil	—	—	—	—	Nil impact
15	Farmhouse	139230 264220 (539194 764241)	Local	—	Severe	—	—	Direct impact, demolition if Option 2
17	Farmhouse, mature boundary planting	139550 263980 (539514 764001)	Local	Moderate	—	—	—	Direct impact on boundary and mature trees (beech)
18	House (site of cottage), ruined byre	139540 263760 (539504 763781)	Local	—	—	—	Severe	Direct impact, demolition if Option 3.

Table 6.1 (continued)

FEATURES OF INTEREST			IMPACTS OF THREE ROUTE OPTIONS COMPARED					Impact
No	Description	Grid Ref (Irish) (and ITM)	Significance	1	2	2A	3	
26	Farmhouse (ruins)	139584 263766 (539548 763787)	Local	Moderate	Mod.	—	—	Shell of 19th-cent. house, demolished if Option 1 or 2.
23	M J Molloy cottage (playwright)	139705 263535 (539669 763556)	Local	Slight	Slight	—	—	Options 1 and 2 affect stone boundary.
19	Pound (site of)	139750 263610 (539714 763631)	Nil	—	—	—	—	Nil impact
25	House with mature boundary planting	138835 263490 (538799 763511)	Local	Moderate	Mod.	Mod.	Mod.	Direct impact on boundary and mature trees (beech, sycamore) with rookery.
20	Ringfort (site of) RMP GA016:123	140150 263470 (540114 763491)	Local	—	—	—	—	Nil impact
21	Children's burial ground (RMP GA016:016)	140075 263210 (540039 763231)	Local	—	—	—	—	Nil impact
22	Early buildings (site of)	140161 263335 (540125 763356)	Nil	—	—	—	—	Nil impact
24	Townland name stones	Various	Local	Slight	Slight	Slight	Slight	Direct impact on one or more plaques by all options

7. Preferred option

Arising from the above the preferred route option in terms of potential impacts on the archaeological and architectural heritage is Option 1, followed by Option 3 then Options 2 and 2A. Although three options have severe impacts, the loss of a railway crossing-keeper's cottage on Route 2A is deemed to be a worse outcome than the loss of dwelling houses, albeit well maintained and of traditional form, because the crossing-keeper's cottage is part of a larger group and is a less common building type.

Options	Impacts				Ranking
	Slight	Moderate	Severe	Profound	
Option 1	4	3	0	0	A
Option 2	5	2	1	0	C
Option 2A	2	1	1	0	D
Option 3	2	1	1	0	B

Selected photos of architectural heritage features potentially affected by the three route options being considered in this report appear on the following pages.



Illus. 5.1 and 5.2—Two attractive, well-maintained houses with traditional features are directly threatened by Route Option 2 (Inventory No. 15, above) and Route Option 3 (No. 18, below) and would be demolished, amounting to severe impacts of these options.



Illus. 5.3 and 5.4—Roadside boundaries with mature trees are threatened by all four options: Inventory No. 17, above (Option 1) and No. 25, below (Options 1, 2, 2A and 3). These are rated moderate impacts of these options.



Illus. 5.5 and 5.6—A ruined early modern farmhouse would be demolished on Route Options 1 and 2 (Inventory No. 26, above), which is rated a moderate impact. Inscribed townland names along the existing N17 (No. 24) would be removed by all four options, and should be reinstated on the new road.



Illus. 5.7 and 5.8—Railway crossing on the N17 (Inventory No. 7). Options 1 and 2 would affect the boundary wall and pedestrian stile (below); Option 2A would result in the demolition of the keeper's cottage also, which is rated a severe impact of the road project.

Appendix E - Option Comparison Cost Estimate**CBA Cost Conversion Spreadsheet -
Phase 2 Option Selection****Scheme Name**

N17 Milltown to Gortnagunned

	€m			
	Option 1	Option 2	Option 2A	Option 3
Base Costs (Incl. VAT and Project-specific contingency)				
Main Contract Construction	€ 4.12	€ 3.97	€ 3.91	€ 4.27
Main Contract Supervision	€ 0.21	€ 0.20	€ 0.20	€ 0.21
Archaeology	€ 0.08	€ 0.08	€ 0.08	€ 0.09
Advance Works and other contracts	€ 0.12	€ 0.12	€ 0.12	€ 0.13
Residual Network	€ 0.08	€ 0.08	€ 0.08	€ 0.09
Land & Property	€ 0.66	€ 2.08	€ 1.66	€ 2.11
Planning and Design	€ 0.41	€ 0.40	€ 0.39	€ 0.43
Subtotal	€ 5.69	€ 6.92	€ 6.43	€ 7.32
Total Inflation Allowance	€ 0.23	€ 0.28	€ 0.26	€ 0.30
TII Programme Risk	€ 0.28	€ 0.35	€ 0.32	€ 0.37
Option Comparison Cost Estimate	€ 6.20	€ 7.55	€ 7.01	€ 7.99

Base Cost Expenditure Heading	Assumed Labour content	Applicable VAT rate	Government Funds (% of total expenditure)
Main Contract Construction	30.0%	13.5%	100%
Main Contract Supervision	50.0%	23.0%	100%
Archaeology	50.0%	18.3%	100%
Advance Works and other contracts	30.0%	13.5%	100%
Residual Network	30.0%	13.5%	100%
Land & Property	10.0%	0.0%	100%
Planning and Design	60.0%	23.0%	100%

CPI / RPF / Shadow price Data

CPI Index at month of cost estimate	0.8
CPI Index for base year	1.0
Shadow Price of Government Funds	1.3
Shadow Price of Labour	0.8
RPF Factor	1.0

Base Costs (Ex VAT and Project-specific contingency)	Option 1	Option 2	Option 2A	Option 3
Main Contract Construction	€ 5.82	€ 5.61	€ 5.52	€ 6.04
Main Contract Supervision	€ 0.26	€ 0.25	€ 0.24	€ 0.27
Archaeology	€ 0.11	€ 0.10	€ 0.10	€ 0.11
Advance Works and other contracts	€ 0.17	€ 0.17	€ 0.17	€ 0.18
Residual Network	€ 0.12	€ 0.11	€ 0.11	€ 0.12
Land & Property	€ 1.10	€ 3.48	€ 2.78	€ 3.53
Planning and Design	€ 0.50	€ 0.48	€ 0.48	€ 0.52
Subtotal	€ 8.08	€ 10.21	€ 9.40	€ 10.77

Appendix F – TII Simple Appraisal Tool

ROUTE OPTION 1

Simple Appraisal Tool - PAG Unit 12



Part E - Projected Benefits

Appraisal Period (Years)	30
Journey Time Benefits (€ Million)	€ 14.66
Vehicle Operating Costs Benefits (€ Million)	-€ 0.37
Present Value Benefits, PVB (€ Million)	€ 14.29
Present Value Costs, PVC (€ Million)	€ 8.62
Net Present Value (NPV)	€ 5.67
Benefit to Cost Ratio (BCR)	1.66

Residual Benefits	€ 2.87
Benefit to Cost Ratio (including Residual Benefits - if applicable)	1.99

Design Year AADT	10,417
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ROUTE OPTION 2**Simple Appraisal Tool - PAG Unit 12****Part E - Projected Benefits**

Appraisal Period (Years)	30
Journey Time Benefits (€ Million)	€ 14.82
Vehicle Operating Costs Benefits (€ Million)	-€ 0.30
Present Value Benefits, PVB (€ Million)	€ 14.52
Present Value Costs, PVC (€ Million)	€ 11.42
Net Present Value (NPV)	€ 3.10
Benefit to Cost Ratio (BCR)	1.27

Residual Benefits	€ 2.91
Benefit to Cost Ratio (including Residual Benefits - if applicable)	1.53

Design Year AADT	10,417
------------------	--------

ROUTE OPTION 2a

Simple Appraisal Tool - PAG Unit 12



Part E - Projected Benefits

Appraisal Period (Years)	30
Journey Time Benefits (€ Million)	€ 14.82
Vehicle Operating Costs Benefits (€ Million)	-€ 0.30
Present Value Benefits, PVB (€ Million)	€ 14.52
Present Value Costs, PVC (€ Million)	€ 10.41
Net Present Value (NPV)	€ 4.11
Benefit to Cost Ratio (BCR)	1.39

Residual Benefits	€ 2.91
Benefit to Cost Ratio (including Residual Benefits - if applicable)	1.67

Design Year AADT	10,417
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ROUTE OPTION 3

Simple Appraisal Tool - PAG Unit 12



Part E - Projected Benefits

Appraisal Period (Years)	30
Journey Time Benefits (€ Million)	€ 14.97
Vehicle Operating Costs Benefits (€ Million)	-€ 0.22
Present Value Benefits, PVB (€ Million)	€ 14.75
Present Value Costs, PVC (€ Million)	€ 12.02
Net Present Value (NPV)	€ 2.73
Benefit to Cost Ratio (BCR)	1.23

Residual Benefits	€ 2.95
Benefit to Cost Ratio (including Residual Benefits - if applicable)	1.47

Design Year AADT	10,417
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Appendix G – Traffic Survey



Ireland

9 City Gate,
Lower Bridge Street,
Dublin 8

Tel: 01 633 4725
Fax: 01 633 4562

**GALWAY COUNTY COUNCIL
N17 MILTOWN TO GORTNAGUNNED
TRAFFIC SURVEY**

**FINAL REPORT
NOVEMBER 2017**

PROJECT NO.	8064
CHECKED	P. MURRAY
DATE	05/12/2017
CONTACT	A.CHAMBERS
REVISION	

CONTENTS

Introduction

Junction Turning Counts

Pedestrian and Cyclist Link Counts

Automatic Traffic Counts

Diagram 8064-01

Drawings 8064-01 & 8064-02

Appendix A – Vehicle Categories

INTRODUCTION

Nationwide Data Collection (NDC) was instructed by Galway County Council to undertake the following surveys along the N17 between Miltown and Gortnagunned, Co. Galway.

A general location plan is given in Diagram 8064-01.

JUNCTION TURNING COUNTS

Junction turning counts were undertaken at the following sites:

Site No.	Location.	Day / Date
1	N17(W) / L64131 / N17(E)	Thursday 9 th November 2017
2	N17(N) / L2208 / N17(S)	
3	N17(N) / N17(S) / L6413	
4	N17(N) / Killeeneen Road / N17(S)	
5	N17(N) / L2227 / N17(S)	
6	N17(N) / N17(S) / L22271	

All sites were surveyed using telescopically mounted video cameras from which the information was subsequently extracted. Details of the observed movements are given in Drawings 8064-01 & 8064-02.

The survey was carried out with survey hours of 07:00 to 19:00. All information was collected in 15 minute intervals and has been tabulated with both hourly and period totals.

Vehicles were classified into the following categories:

- Cars and Taxis (**CAR**)
- Light Goods Vehicles (**LGV**),
- Other Goods Vehicles - type 1 (**OGV1**),
- Other Goods Vehicles - type 2 (**OGV2**),
- Buses (**PSV**),
- Caravan (**CARA**)
- Motorcycles (**M/C**),
- Pedal Cycles – On Road (**PCO**)
- Pedal Cycles – Off Road(**PCF**).

A detailed description of the vehicles included in each category is provided in Appendix A.

PEDESTRIAN AND CYCLIST LINK COUNTS

Pedestrian and cyclist link counts were undertaken at the following sites:

Site No.	Location.	Day / Date
A	N17 south of JTC Site 1	Thursday 9 th November 2017
B	N17 north of JTC Site 6	

All sites were surveyed using telescopically mounted video cameras from which the information was subsequently extracted.

The survey was carried out with survey hours of 07:00 to 19:00. All information was collected in 15 minute intervals and has been tabulated with both hourly and period totals.

Vehicles were classified into the following categories:

- Pedestrians (**PEDS**)
- Pedal Cycles – On Road (**P/C - ON**) and
- Pedal Cycles – On Road (**P/C - OFF**)

AUTOMATIC TRAFFIC COUNTS

Automatic traffic counts were undertaken at the following sites:

Site No.	Location.	Days / Dates
1	N17, south of JTC Site 1	Tuesday 7 th November to Tuesday 21 st November 2017
2	L2208, south of JTC Site 2	Tuesday 7 th November to Monday 20 th November 2017
3	L2227, west of JTC Site 5	Tuesday 7 th November to Saturday 11 th November and Tuesday 21 st November to Monday 4 th December 2017
4	L6413, north of JTC Site 3	Tuesday 7 th November to Monday 20 th November 2017
5	Killereen Road, south of JTC Site 4	Tuesday 7 th November to Tuesday 21 st November 2017
6	L22271, north of JTC Site 6	
7	N17, south of Link Site B	

*Water damage to counter and survey period extended due to data loss.

METROCOUNT 5600 series automatic traffic counters, attached to pneumatic tubes, were used at all the sites. Data was collected in both directions at all locations, with one counter being used for single carriageway sites (1 lane per direction).

The survey was carried out with survey hours of 00:00 to 00(24):00 on sites 2 and 4 and 12:00 to 12:00 on sites 1, 5 to 7.

The results have been provided in excel, in hourly totals and includes the following information:

- Total Vehicles
- Class Bin Totals (12 Class)
- Number of Vehicles over Speed Limit
- Percentage of Vehicles over Speed Limit
- Number of Vehicles over Speed Limit 1 (Speed Limit + 5kph)
- Percentage of Vehicles over Speed Limit 1
- Number of Vehicles over Speed Limit 2 – (Speed Limit + 10kph)
- Percentage of Vehicles over Speed Limit 2
- Mean Speed
- 85th Percentile Speed
- Speed Bin Totals (Range 0 to 140kph)

12hr (07:00 to 19:00), 16hr (06:00 to 22:00), 18hr (06:00 to 00:00) and 24hr (00:00 to 00:00) totals are also included along with a virtual day, week and grand total. The peak time period for both the a.m (00:00 to 12:00) and p.m (12:00 to 24:00) are also highlighted.

A detailed description of the vehicles included in each category is provided in Appendix A.

SITE REPORT

Weather Overcast with sunny intervals.

Accidents None.

Roadworks None.

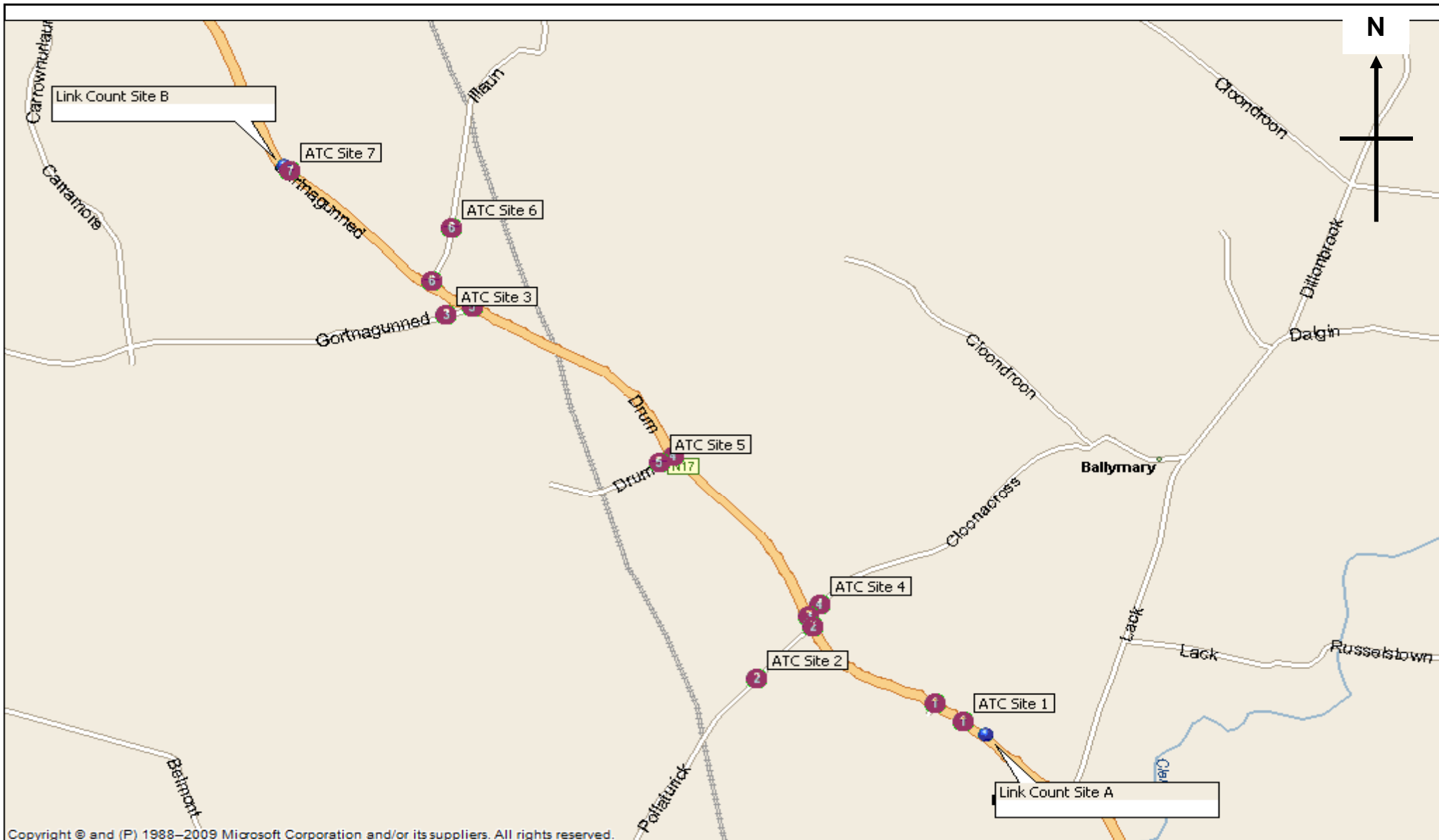
Queues Not required.

Pedestrians Only at sites A & B.


General Site Notes. No additional notes.

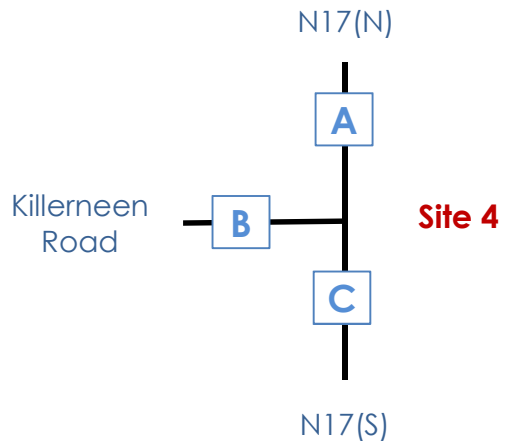
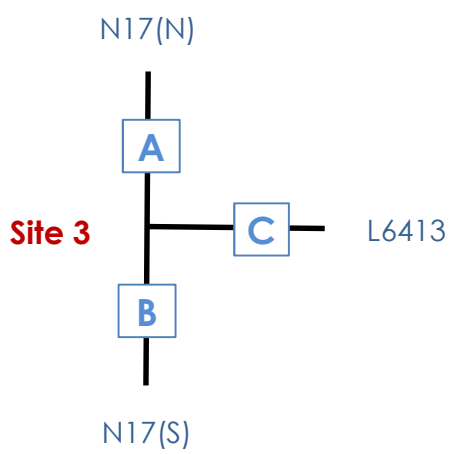
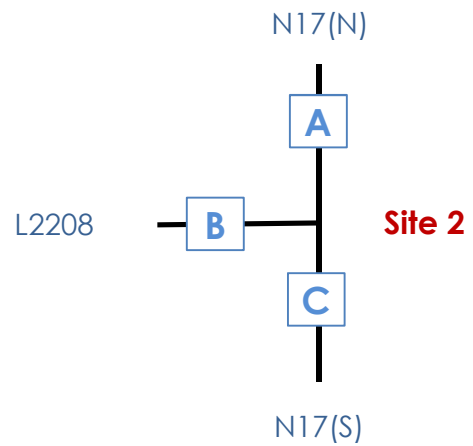
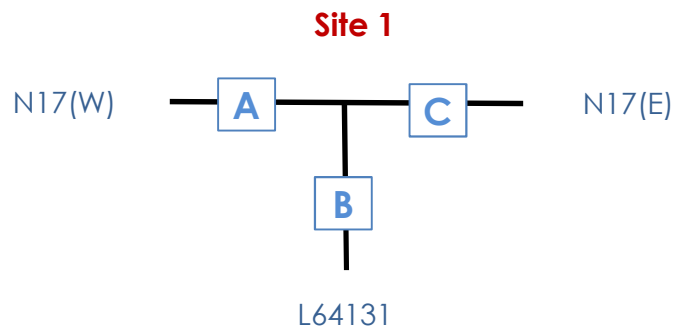
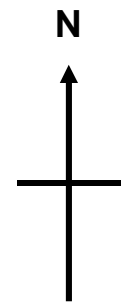
APPENDIX A

VEHICLE CATEGORIES

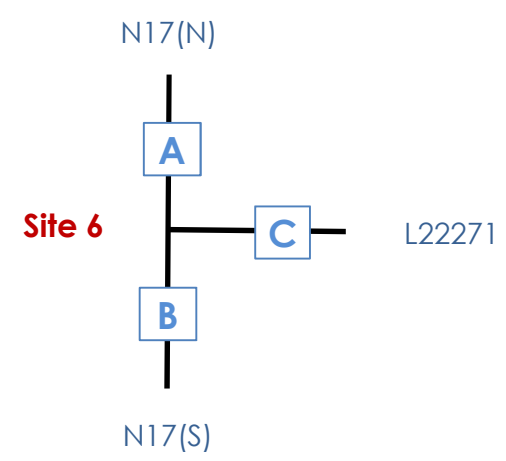
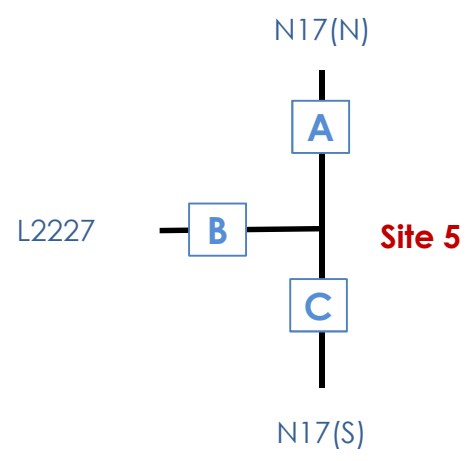
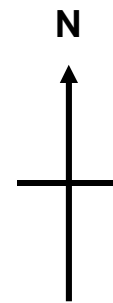


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	Sites / Location: JTC Sites 1 to 6, Link Sites 1 & 2 and ATC Sites 1 to 7	Project No: 8064	Diagram No: 8064-01	Drawn By: AC	
	Survey Date: JTC & Link: Thursday 9th November 2017 ATC: Tuesday 7th November to Tuesday 21st November 2017	Project Name: N17 MILTOWN TO GORTNAGUNNED			
	Survey Times: JTC & Link: 07:00 to 19:00 ATC: 00:00 to 00(24):00	Diagram Title: General Location Plan			









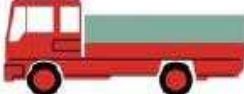






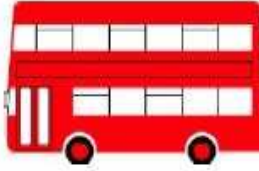



Sites / Location:	1 to 4 / N17	Project No:	8064	Drawing No:	8064-01	Drawn By:	AC		
	Survey Date:		Thursday 9th November 2017		Project Name:		N17 MILTOWN TO GORTNAGUNNED		
	Survey Times:		07:00 to 19:00				Drawing Title:	Site Layout and Observed Movements	



Sites / Location:	5 & 6 / N17	Project No:	8064	Drawing No:	8064-02	Drawn By:	AC			
	Survey Date:		Thursday 9th November 2017		Project Name:		N17 MILTOWN TO GORTNAGUNNED			
	Survey Times:		07:00 to 19:00				Drawing Title:	Site Layout and Observed Movements		

COBA VEHICLE CATEGORIES

<p>CAR</p>	<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;">  SALOON </div> <div style="text-align: center;">  ESTATE </div> </div> <div style="display: flex; justify-content: space-around; margin-top: 20px;"> <div style="text-align: center;">  PEOPLE CARRIER </div> <div style="text-align: center;">  CAR TOWING CARAVAN / TRAILER </div> </div>
<p>LIGHT GOODS VEHICLE (LGV)</p>	<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;">  VAN </div> <div style="text-align: center;">  <3.5 TONNES – single rear tyres </div> <div style="text-align: center;">  PICK-UP </div> </div>
<p>OTHER GOODS VEHICLE (OGV1)</p>	<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;">  > 3.5 TONNES – twin rear tyres </div> <div style="text-align: center;">  2-AXLES RIGID </div> </div> <div style="display: flex; justify-content: space-around; margin-top: 20px;"> <div style="text-align: center;">  2-AXLES RIGID </div> <div style="text-align: center;">  3 AXLES-RIGID </div> </div>
<p>OTHER GOODS VEHICLE (OGV2)</p>	<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;">  4 OR MORE AXLES RIGID </div> <div style="text-align: center;">  3-AXLES ARTIC </div> </div> <div style="display: flex; justify-content: space-around; margin-top: 20px;"> <div style="text-align: center;">  4 OR MORE AXLES ARTIC </div> <div style="text-align: center;">  OTHER GOODS VEHICLE WITH TRAILER </div> </div>
<p>BUSES & COACHES (PSV)</p>	<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;">  DOUBLE DECK BUS </div> <div style="text-align: center;">  SINGLE DECK BUS OR COACH </div> </div>

COBA VEHICLE CATEGORIES

Definition of Categories

The various components of traffic have different characteristics in terms of operating costs, growth and occupancy. The most common categories into which the traffic is split in COBA; these are defined as:

Cars (CARS)

Including taxis, estate cars, 'people carriers' and other passenger vehicles (for example, minibuses and camper vans) with a gross vehicle weight of less than 3.5 tonnes, normally ones which can accommodate not more than 15 seats. Three-wheeled cars, motor invalid carriages, Land Rovers, Range Rovers and Jeeps and smaller ambulances are included. Cars towing caravans or trailers are counted as one vehicle unless included as a separate class.

Light Goods Vehicles (LGV)

Includes all goods vehicles up to 3.5 tonnes gross vehicle weight (goods vehicles over 3.5 tonnes have sideguards fitted between axles), including those towing a trailer or caravan. This includes all car delivery vans and those of the next larger carrying capacity such as transit vans. Included here are small pickup vans, three-wheeled goods vehicles, milk floats and pedestrian controlled motor vehicles. Most of this group is delivery vans of one type or another.

Other Goods Vehicles (OGV 1)

Includes all rigid vehicles over 3.5 tonnes gross vehicle weight with two or three axles Includes larger ambulances, tractors (without trailers), road rollers for tarmac pressing, box vans and similar large vans. A two or three axle motor tractive unit without a trailer is also included.












Other Goods Vehicles (OGV 2)

This category includes all rigid vehicles with four or more axles and all articulated vehicles. Also included in this class are OGV1 goods vehicles towing a caravan or trailer.

Buses and Coaches (PSV)

Includes all public service vehicles and works buses with a gross vehicle weight of 3.5 tonnes or more, usually vehicles with more than 16 seats.

ATC VEHICLE CATEGORIES

Axles	Groups	Description	Class		Parameters	Dominant Vehicle	Aggregate
2	1 or 2	Very Short - Bicycle or Motorcycle	MC	1	d(1)<1.7m & axles=2		
2	1 or 2	Short - Sedan, Wagon, 4WD, Utility, Light Van	SV	2	d(1)>=1.7m, d(1)<=3.2m & axles=2		
3, 4 or 5	3	Short Towing - Trailer, Caravan, Boat, etc.	SVT	3	groups=3, d(1)>=2.1m, d(1)<=3.2m, d(2)>=2.1m & axles=3,4,5		1 (Light)
2	2	Two axle truck or Bus	TB2	4	d(1)>3.2m & axles=2		
3	2	Three axle truck or Bus	TB3	5	axles=3 & groups=2		
>3	2	Four axle truck	T4	6	axles>3 & groups=2		2 (Medium)
3	3	Three axle articulated vehicle or Rigid vehicle and trailer	ART3	7	d(1)>3.2m, axles=3 & groups=3		
4	>2	Four axle articulated vehicle or Rigid vehicle and trailer	ART4	8	d(2)<2.1m or d(1)<2.1m or d(1)>3.2m axles = 4 & groups>2		
5	>2	Five axle articulated vehicle or Rigid vehicle and trailer	ART5	9	d(2)<2.1m or d(1)<2.1m or d(1)>3.2m axles=5 & groups>2		
>=6	>2	Six (or more) axle articulated vehicle or Rigid vehicle and trailer	ART6	10	axles=6 & groups>2 or axles>6 & groups=3		
>6	4	B-Double or Heavy truck and trailer	BD	11	groups=4 & axles>6		
>6	>=5	Double or triple road train or Heavy truck and two (or more) trailers	DRT	12	groups>=5 & axles>6		3 (Heavy)