

## Appendix D

### Stage 1 Road Safety Audit

#### **N2 Monaghan Town to Emyvale, County Monaghan Proposed Pavement and Minor Improvement Scheme**

#### **Corracrin to Emyvale**

#### Contents:

Stage 1 Road Safety Audit, Phase 3

Monaghan County Council

**N2 – Gortmoney to Emyvale Road  
Realignment**

**Stage 1 Road Safety Audit**

RSA1

Issue 2 | February 2012

**Ove Arup & Partners Ireland**

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RSA Stage 1

This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

Job number 218692-00

**ARUP**

# Document Verification

# ARUP

<b>Job title</b>		N2 – Gortmoney to Emyvale Road Realignment		<b>Job number</b>		218692-00	
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		Name					
		Signature					

Issue Document Verification with Document



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# 1 Introduction

Arup has been instructed to carry out a Stage 1 Road Safety Audit on the proposed N2 Gortmoney to Emyvale Realignment.

The proposed development consists of a largely online realignment of the existing N2 between the villages of Gortmoney and Emyvale.

A plan showing the location of the proposed scheme, in the context of the surrounding local road network is presented in Figure 1.

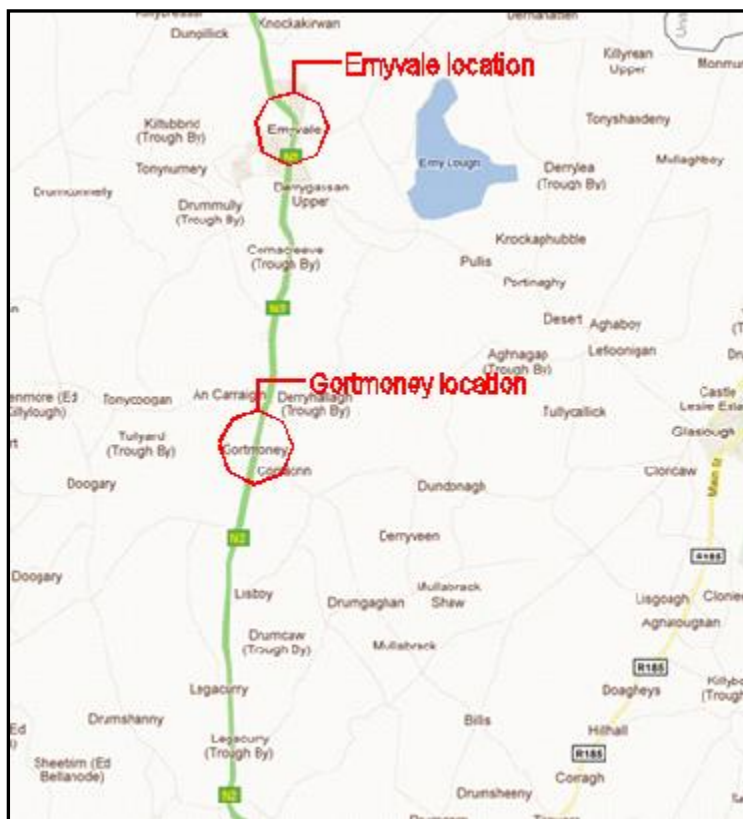
The audit was carried out between the 1<sup>st</sup> and 9<sup>th</sup> February 2012 both on site and in the Arup Dublin office.

The audit team members were as follows:

- Eileen McCarthy – (Team Leader) Arup Cork
- Shane Fitzgerald – ( Team Member) Arup Dublin
- Kieran Malone – (Observer) Arup Dublin

The audit comprised an examination of the drawings relating to the scheme and a daytime site visit made on Wednesday 1<sup>st</sup> February 2012 between the hours of 11:00 and 13:00. On the day of the site visit the weather was dry and sunny, and the road surface was dry.

An Audit Team Statement and feedback is included at the end of the Report.



**Figure 1 – Location Plan**

## 2 Items Raised at this Stage 1 Road Safety Audit

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### 2.1 N2 Mainline

#### 2.1.1 Problem: Mainline Design Speed

**Location:** Along the entire scheme length

**Issue:** The mainline has been designed to a Design Speed of 85kph. The N2 is a national primary route with a current speed limit of 100kph. There is concern that the Design Speed chosen is not appropriate for this type of road.

This could lead to drivers driving at the posted speed limit of 100kph with the associated risks then of collisions as they fail to negotiate the short sharp bends.

**Recommendation:** A Design Speed of 100kph should be applied if possible. Otherwise consideration should be given to reducing the speed limit along this section of road to 80kph in keeping with the selected design speed.

#### 2.1.2 Problem: Interface with School

**Location:** At southern terminus of scheme at Ch. 0+050

**Issue:** The scheme passes in front of a local primary school, Scoil Naoimh Padraig, in the village of Gortmoney between Ch. 0+000 to Ch. 0+050. There is an existing set-down area in front of the school to allow vehicles pull in. The proposed plan and profile show an overlay of approximately 200mm in this area but no details are provided of how this will tie into the existing school set-up.

There is concern that there will be water draining from the newly raised road elevation and resting in the set-down area in front of the school. This could lead to problems with children slipping on ice in winter conditions.

**Recommendation:** The alignment design should be revised to ensure that the level difference between the existing and proposed alignments is kept to a minimum in the vicinity of the school. The tie-in point of the scheme should also be reviewed to see if it is necessary to extend the scheme as far as the school.

#### 2.1.3 Problem: Provision of private accesses

**Location:** Along the entire scheme length

**Issue:** Along the length of the scheme there are more than 40 private accesses, both agricultural and domestic. From the submitted drawings there is only accommodation made for one of these accesses to tie-in to the proposed scheme. Some of these accesses already have steep gradients on the approach to the existing road.

There is concern that these accesses have not been considered as part of the scheme design, which could lead to drivers advancing into the mainline traffic at inappropriate speeds resulting in the potential for collisions.

**Recommendation:** These accesses should be designed as part of the scheme. Sufficient land should be acquired to ensure that safe access with appropriate approach gradients can be maintained to all of the existing accesses.

### 2.1.4 Problem: Visibility at private accesses

**Location:** Along the entire scheme length

**Issue:** Along the length of the scheme there are more than 40 private accesses, both agricultural and domestic. From the submitted drawings, it is difficult to assess whether adequate sightlines have been provided at each access, some of which are located on the inside of bends.

The auditors are concerned that drivers will not have adequate visibility to see oncoming vehicles and could advance into the path of oncoming traffic, which could cause serious collisions.

**Recommendation:** Sufficient land should be acquired to ensure that appropriate sightlines can be provided.

### 2.1.5 Problem: Drainage clash with private accesses

**Location:** Along the entire scheme length

**Issue:** Along the length of the scheme there are more than 40 private accesses, both agricultural and domestic. From the submitted drawings, it appears that there are clashes between the interceptor ditches shown adjacent to the N2 mainline and a number of these accesses.

It is a concern that vehicles will be crossing open drains without appropriate protection, which could lead to accidents due to loss of control of the vehicle.

**Recommendation:** Sufficient land should be acquired to ensure that safe access can be maintained to each access while providing appropriate drainage measures.

### 2.1.6 Problem: Forward visibility at junction

**Location:** Stagger junction at Ch 0+350

**Issue:** The proposed stagger junction at Ch 0+350 is situated on a crest curve with a K value of 31. While traffic from the south will be leaving the village of Gortmoney at relatively low speeds, traffic users from the north will be approaching the junction at high speed with the reduced speed limit zone only commencing 50m north of the northern arm of the staggered junction.

There is concern that traffic users coming from the north will not be aware of the southern arm of the stagger junction if they are travelling at 100kph on the approach from the north, given the K value of the crest curve, which it is acknowledged is an improvement on the existing crest curve. This could lead to collisions with vehicles joining the N2 at the southern arm of the staggered junction.

**Recommendation:** Appropriate advance warning signage, line marking, surfacing or other means should be provided to ensure traffic users are aware of the junction layout and to slow the speed of vehicles on the approach to the junction. Consideration should also be given to extending the reduced speed limit zone further to the north of the staggered junction.

### 2.1.7 Problem: Visibility from Local Road L-5170 (Derryhee Road)

**Location:** At the junction of local road L-5170 with the proposed N2 at Ch. 0+400

**Issue:** It is not clear whether adequate sightlines can be provided from the local road at the junction with the N2 mainline due to the position of the crest curve on the mainline.

The auditors are concerned that drivers will not have adequate visibility to see oncoming vehicles and could advance into the path of oncoming traffic, which could cause serious collisions.

**Recommendation:** Adequate sightlines should be provided at the junction.

### 2.1.8 Problem: Culvert protection

**Location:** Existing Culvert at Ch 1+250

**Issue:** There is an existing culvert located at Ch 1+250. There is currently no protection provided for road users at the culvert location, with a sheer drop into the stream adjacent to the existing N2 on the eastern side of the mainline.

There is a concern that without adequate safety protection, a driver could lose control of their vehicle on this bend and end up crashing into the stream and/or headwall which will result in serious injury.

It is unclear from the drawings provided whether consideration has been given to providing safety barriers at this culvert as it is likely that the culvert will need to be extended in length to provide for the proposed road cross section.

**Recommendation:** Adequate safety barrier protection should be provided at this location and sufficient land should be acquired to ensure that this can be provided.

### 2.1.9 Problem: Level differences

**Location:** Ch 0+900 and Ch 1+400

**Issue:** There are a number of areas including the above mentioned along the N2 mainline where there is a significant level difference from the back of the existing footpath to the adjacent land on the eastern side of the N2.

There is a concern that without adequate safety protection, a driver could lose control of their vehicle and career down the embankment which will result in serious injury.

It is not clear from the submitted drawings that provision has been made for possible safety barrier requirements at these and other locations.

**Recommendation:** Adequate safety barrier protection should be provided where required on embankments and sufficient land should be acquired to ensure that this can be provided.

### 2.1.10 Problem: Visibility at Industrial Access

**Location:** Industrial access at Ch 2+050

**Issue:** The proposed N2 mainline has been shifted closer to the mushroom plant at Ch 2+050. The existing verge had been widened significantly at this location to provide sightlines from the existing access on the inside of the bend. It was noted that a significant number of HCV's were using this access during the site visit. It is not clear from the submitted drawings whether adequate sightlines can be provided from the existing junction to the revised mainline alignment. Equally, no details have been provided on any safety barriers at this location, given that there is a large level difference between the yard in the mushroom plant and the back of footpath.



The auditors are concerned that drivers will not have adequate visibility given the location of the access to see oncoming vehicles and could advance into the path of oncoming traffic, which could cause serious collisions.

**Recommendation:** Sufficient land should be acquired to ensure that appropriate sightlines can be provided at this access.

## 2.2 Realigned Local Road L-5207 (Glennan Road)

### 2.2.1 Problem: Tie-in with existing road

**Location:** At the tie-in between new and existing local road

**Issue:** The proposed local road design includes a verge which is wider than the existing local road cross-section. There could be a perception issue with the sudden change from wide verge to narrow or no verge. This could cause driver confusion.

**Recommendation:** Ensure adequate taper to transition from the proposed verge width to the existing verge width.

### 2.2.2 Problem: Pedestrian Crossing

**Location:** At the junction between the L-5207 and the N2 mainline

**Issue:** The submitted drawing shows a traffic splitter island at this location. It is not clear from the drawing if this island is suitable for sheltering pedestrians as they cross from the footpath on the southern side of the junction to the footpath on the northern side of the junction

**Recommendation:** Ensure the junction design caters for the anticipated pedestrian movements.

## 2.3 Realigned Local Road L-5170 (Derryhee Road)

### 2.3.1 Problem: Tie-in with existing road

**Location:** At the tie-in between new and existing local road

**Issue:** The proposed local road design includes a verge which is wider than the existing local road cross-section. There could be a perception issue with the sudden change from wide verge to narrow or no verge. This could cause driver confusion.

**Recommendation:** Ensure adequate taper to transition from the proposed verge width to the existing verge width.

## 2.4 Realigned Local Road L-1160 (Davagh Etra Road)

### 2.4.1 Problem: Tie-in with existing road

**Location:** At the tie-in between new and existing local road

**Issue:** The proposed local road design includes a verge which is wider than the existing local road cross-section. There could be a perception issue with the sudden change from wide verge to narrow or no verge. This could cause driver confusion.

**Recommendation:** Ensure adequate taper to transition from the proposed verge width to the existing verge width.

## 2.5 N2 Mainline: Comments

### 2.5.1 Comment: Drawings provided for the audit

The drawings provided for this Stage 1 Safety Audit provided no details on proposed fence locations, safety barrier locations, traffic sign locations, etc. As such, the audit team were unable to comment on the design in relation to these design items.

### 2.5.2 Comment: Tie-in of Redundant Road sections

The drawings provided for this Stage 1 Safety Audit provided no details on how the proposed sections of realigned road tie back to the existing redundant sections of road at ch. 1+300 and ch. 1+750. These redundant sections of road are required to provide access to various dwellings and fields post realignment of the mainline. Therefore, safe access from these future cul-de-sacs back on to the mainline is essential to avoid collisions with mainline traffic.

### 2.5.3 Comment: Traffic information

The auditors did not have any information on local traffic data for this Stage 1 Safety Audit. Therefore, they were unable to determine the level of right turning vehicles at the local road leading to Drummully on the L-1160. It was noted that there were a significant number of signs on this junction indicating various businesses on the road. However, the audit team were unable to comment on the need or otherwise for a right turn lane due to lack of traffic information.

### 2.5.4 Comment: Side Road Alignments

The auditors did not receive any drawings showing the proposed vertical alignments for the side roads forming junctions with the N2 mainline. Therefore, they were unable to comment on the suitability of the vertical alignments of the proposed side road realignments.

### 3 Audit Team Statement

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We certify that we have examined the drawing listed in Appendix B to this Report. 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 associated safety improvement suggestions, which we recommend should be studied for implementation. The Auditors have not been involved with the scheme design.

**Ms. Eileen McCarthy; BE, CEng MIEI**

Signed: Eileen McCarthy .....

Date: ... 29/02/2012.....

**Mr. Shane Fitzgerald; BA, BAI, MIEI**

Signed: Shane Fitzgerald .....

Date: .....29/02/2012.....

**Mr. Kieran Malone; BA, BAI, MIEI**

Signed: Kieran Malone .....

Date: .....29/02/2012.....

## **Appendix A**

### **Safety Audit Feedback Form**

# A1 Safety Audit Feedback Form (Designers Response)

<b>Scheme: N2 – Gortmoney to Emyvale</b>	<b>Route No:</b>
Audit Stage: Stage 1 Road Safety Audit	Date Audit Completed: 9 <sup>th</sup> February 2012

Problem	To be completed by Designer/Contractor				Designers Response	To be completed by Audit Team Leader	
	Problem Accepted		Recommended Measure Accepted			Alternative Measures Accepted	
	Yes	No	Yes	No		Yes	No
2.1.1		<b>x</b>		<b>x</b>	Scheme brief was to design to 85km/h. Our phase would be inconsistent with other scheme phases as they are designed to 85km/h. Design speed calculated for existing alignment is 85km/h. Arup will seek confirmation from Monaghan County Council that the speed limit for the road will be reduced to 80kph.	<b>x</b>	
2.1.2	<b>x</b>		<b>x</b>		The alignment design will ensure that the level difference between the existing and proposed alignments is kept to a minimum in the vicinity of the school.	<b>x</b>	
2.1.3	<b>x</b>		<b>x</b>		Accesses have been considered as part of the scheme design. Appropriate land has been identified in the proposed landtake to provide both appropriate gradients and sight distances for these entrances.	<b>x</b>	
2.1.4	<b>x</b>		<b>x</b>		Sufficient land will be acquired to ensure that appropriate sightlines can be provided.	<b>x</b>	
2.1.5	<b>x</b>		<b>x</b>		Sufficient land will be acquired to ensure that safe access can be maintained to each access while providing appropriate drainage measures.	<b>x</b>	
2.1.6	<b>x</b>		<b>x</b>		Appropriate advance warning signage, line marking, surfacing or other means will be provided to ensure traffic users are aware of the junction layout and to slow the speed of vehicles on the approach to the junction. Consideration can be given to extending the 60km/hr speed limit zone.	<b>x</b>	
2.1.7	<b>x</b>		<b>x</b>		Sufficient land will be acquired to ensure that appropriate sightlines can be provided	<b>x</b>	

	To be completed by Designer/Contractor				To be completed by Audit Team Leader		
Problem	Problem Accepted		Recommended Measure Accepted		Designers Response	Alternative Measures Accepted	
	Yes	No	Yes	No		Yes	No
					at this local road. Junction visibility provided as follows: a) visibility to left X=3.0m, Y=160m, target height 0.26m; b) visibility to right: X=3.0m, Y=120, target height 0.8m which exceeds requirement of 60km/h.		
2.1.8	x		x		Adequate safety barrier protection will be provided at this location and sufficient land will be acquired to ensure that this can be provided.	x	
2.1.9	x		x		Adequate safety barrier protection will be provided where required on embankments at detailed design stage and sufficient land will be acquired to ensure that this can be provided.	x	
2.1.10	x		x		Sufficient land will be acquired to ensure that appropriate sightlines can be provided at this access. Visibility provided as follows: a) visibility to left X=2.4m, Y=160m, b) visibility to right: X=3.0m, Y=160m, which is appropriate for 85km/h design speed.	x	
2.2.1	x		x		Adequate taper to transition from the proposed verge width to the existing verge width will be provided at detailed design stage.	x	
2.2.2	x		x		Junction design will cater for the anticipated pedestrian movements at detailed design stage.	x	
2.3.1	x		x		Adequate taper to transition from the proposed verge width to the existing verge width will be provided at detailed design stage.	x	
2.4.1	x		x		Adequate taper to transition from the proposed verge width to the existing verge width will be provided at detailed design stage.	x	
2.5.1 (Comment)	x		x		These elements will be designed at Detailed Design Stage.	x	
2.5.2	x		x		Access details where appropriate have been indicated on the drawings. Other access will	x	

Problem	To be completed by Designer/Contractor				Designers Response	To be completed by Audit Team Leader	
	Problem Accepted		Recommended Measure Accepted			Alternative Measures Accepted	
	Yes	No	Yes	No		Yes	No
(Comment)					be designed at detailed design stage. Proposed landtake has taken account of provision of access to re-aligned scheme.		
2.5.3 (Comment)	<b>x</b>		<b>x</b>		All three local road junctions have been designed and landtake provided to incorporate ghost islands to improve safety for right turning vehicles,	<b>x</b>	
2.5.4 (Comment)	<b>x</b>		<b>x</b>		Appropriate vertical alignments have been designed for all sideroads connecting into re-aligned N2.	<b>x</b>	

Signed ..... Designer Date .....

Signed ..... Audit Team Leader Date .....

Signed ..... Employer Date .....

## **Appendix B**

### **Drawings Examined in this Audit**



## **B1 List of Drawings**

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N2-T-100-101 to 104 – Horizontal and Vertical Alignment