



Queensberry
DESIGN LIMITED
RESIDENTIAL AND COMMERCIAL DESIGN CONSULTANTS

Keresforth Road, Barnsley
Road Restraint Risk Assessment

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1. Introduction

- 1.1 Queensberry Design has been appointed to produce a Road Restraint Risk Assessment (RRRA) for the proposed development at Keresforth Road, Barnsley.
- 1.2 The development is at master planning stage and outline planning has been submitted to Barnsley Metropolitan Borough Council (BMBC) under reference 2022/0016.
- 1.3 Civil engineering appraisal has been carried out by Queensberry Design Ltd (QDL) consisting of an assessment of levels, earthwork and structures, which can be viewed within the QDL Road Crossing Design Assessment document.
- 1.4 The outcome of the civil engineering appraisal and options assessment has determined that a retaining wall will be required to provide a road crossing over the existing watercourse cutting through the site.
- 1.5 The purpose of this assessment is to understand what mitigation may be required to prevent vehicles exiting the elevated road, or collision with proposed structures.

2. Site Characteristic

- 2.1 The assessment relates to an area within a large residential development, the site consists of a 5.5m conventional street with 2.0m footpaths.
- 2.2 The carriageway crosses a watercourse which is located at the base of a deep cutting (circa 5.0m) and will require retaining structures to cross the watercourse.
- 2.3 The alignment over the watercourse is straight, before the straight stretch the alignment curves with 65m (heading south) and 80m (heading north) centreline curves.
- 2.4 Approach gradient from the south is 1:24 falling towards the hazard and is within cutting, the approach gradient from the north is 1:15 as it is above existing ground level.
- 2.5 Proposed cutting and embankments are at a gradient of 1:3.
- 2.6 The road surface on the approach to the hazard will be close graded asphalt concrete.

3. Appraisal Process

- 3.1 To determine whether a Road Restraint System is required CD 377 (DMRB) states that a RRRAP Assessment (Road Restraint Risk Assessment Process) should be carried out for each site/scheme to establish the need for a vehicle restraint and, if so, its performance requirements.
- 3.2 CD 377 is intended for use on roads with design speed or imposed speed limit of ≥ 50 mph, reference CD 377 paragraph 2.2.
- 3.3 Where the design speed or imposed speed limit is <50 mph the RRRAP is less applicable and the guidance given in the document "*Provision of Road Restraint Systems on Local Authority Road*" published by UK Roads Liaison Group and the Department of Transport should be used to assess if whether a Vehicle Restraint System (VRS) is required and the performance requirements associated.
- 3.4 The fundamental criteria to justify the road restraint system (RRS) is to establish if the risk level without a RRS is unacceptable, this is characterised into three categories using the principles of *As low as is reasonably practical* 'Broadly Acceptable', 'Tolerable' and 'Unacceptable'.

3.5 On applying an assessment, the site will be prioritised into one of three grouping as Table 5.2 within *Provision of Road Restraint Systems on Local Authority Road* provides the risk groupings, detailed below:

CATEGORY	RISK LEVEL	OUTCOMES
Higher Priority Site	Risk cannot be accepted safe in extraordinary circumstances	Where the risk assessment has defined a Site as Higher Priority the installation of an RRS is justified in terms of the level of risk. Further consideration is then required to determine if the site meets the other appraisal criteria. Even at high risk site non-RRS interventions may reduce the risk to a level where a RRS can be omitted.
Medium Priority Site	Intervention may be required to introduce control measures to drive residual risk towards the lower priority site category. The residual risk can be tolerated only if further risk reduction is impractical or requires action that is grossly disproportionate to the reduction in risk is achieved.	Where the risk evaluation has identified a site as medium priority a RRS may be justified however a non-RRS approach to reducing the risk may prove sufficient to negate the need for a RRS. If suitable effective measures cannot be introduced, then the appraisal process would normally continue in order to consider the other criteria.
Lower Priority Site	Level of risk regarded as generally acceptable. Further effort to reduce risk is not likely to be required as resources to reduce risk would be grossly disproportionate to risk reduction achieved	Where the risk evaluation identifies a site that is lower priority further appraisal is not required and the level of risk does not normally support installation of a RRS. Simple low-cost measures that could reduce the risk can still be considered.

Provision of Road Restraint Systems on Local Authority Road – Table 5.2 Site Risk Categories

3.6 Assessment methods available to appraise the site are as follows:

- Accident Assessment (A) – Only suitable for existing roads where accident data is available. This method is not suitable for Road/Rail interfaces and new construction.
- Network Rail Methodology (B) – This approach is only suitable where there is a road/rail interface.
- Risk Scoring (C) – This method is available for use on new routes where no accident data is available.

3.7 Based on this method (C) is applicable for this assessment

4. Alternatives to RRSs

4.1 Other measures can be introduced that would assist in reducing the risk of vehicles leaving the carriageway or encountering a hazard when they leave the carriageway, examples include:

- Removal of the roadside hazard
- Relocation of the hazard
- Replacement with passively safe street furniture
- Resurfacing or treatment of the carriageway to reduce the skid risk
- Speed control measures
- Re-alignment of the carriageway
- Installation of chevron and warning signs, including vehicle activated signs
- Installation of bollards

5. Risk Scoring

5.1 The risk scoring method has been determined as the appropriate method of appraising the site, factors will be given a priority rank in order to achieve a risk category and outcome as table 5.2 of *Provision of Road Restraint Systems on Local Authority Road*

Hazard Category

5.2 This step is used to assess whether certain scenarios where the risk can be assumed to be sufficiently high to justify further appraisal is applicable. These scenarios are where there is a realistic possibility of a vehicle leaving the carriageway and reaching one of the following features:

- Public building
- Place of regular congregation (e.g. outside a school)
- Office block/place of work
- Large block of flats
- Playground/open sports area

Location factor

5.3 The level of risk present will vary based on the type of route, the speed limit as well as the amount and make up of traffic on the route. The location factor collectively considers all these issues and acts as a proxy for the probability of a vehicle leaving the carriageway and results in a risk score that represents the nature of the road adjacent to the hazard.

5.4 Table 1 provides a route rank and risk factor score; the site is viewed as 'all other roads':

PRIORITY RANK	RISK FACTOR SCORE
0 – All other roads	0
1 – Rural U & B roads and urban C roads	1
2 – Rural A road and urban B road	3
3 – Urban A road	6

Table 1 – Route rank

Layout factor

- 5.5 The layout of the carriageway can increase the likelihood of a vehicle encountering the roadside hazard, table 2.10 of CD 109 (DMRB) is relevant for horizontal curvature which the carriageway geometry has been assessed against in table 2.

PRIORITY RANK	RISK FACTOR SCORE
0 – Straight alignment and/or complies with CD 109	0
1 – One step below desirable minimum R with superelevation of 5%	1
2 – Two steps below desirable minimum R with superelevation of 5%	2
3 – Three steps below desirable minimum R with superelevation of 5%	3
4 – Four steps below desirable minimum R with superelevation of 5%	4
5 – Five steps below desirable minimum R with superelevation of 5%	5

Table 2 – Layout factor part 1

- 5.6 The second factor to consider is the complexity of the carriageway layout, in the instance of the site on manoeuvres or lane changes are expected.

PRIORITY RANK	RISK FACTOR SCORE
0 – No reason for lane changing/manoeuvres	0
1 – Some potential for lane changing, overtaking, positioning manoeuvres, or avoiding action	2
2 – High likelihood of lane changing, overtaking, positioning manoeuvres, or avoiding action	3

Table 3 – Layout factor part 2

Collision factors

- 5.7 Potential hazards are to be assessed and ranked in priority as table 4, in the case of the site there is a longitudinal hazard consisting of the embankment and retaining structure adjacent to the carriageway.

PRIORITY RANK	RISK FACTOR SCORE
0 – Individual spot hazard	0
1 – Series of individual hazards less than 50m apart or a longitudinal hazard that may be reached	1
2 – Longitudinal hazard that is highly likely to be reached resulting in harm or a spot hazard downstream if a feature which may guide the vehicle towards the hazard.	2

Table 4 – Collision factor part 1

- 5.8 The percentage severity of the possible impact should be considered using the national percentage KSI data, in the instance of this site the percentage of KSI is considered to be > 30%.

PRIORITY RANK	RISK FACTOR SCORE
0 – Percentage of KSI for primary hazard < 20%	0
1 – Percentage of KSI for primary hazard 20 - 30%	1
2 – Percentage of KSI for primary hazard > 30%	2

Table 5 – Collision factor part 2

Consequential factors

- 5.9 Consequential factors consisting of secondary incidents, network disruption and cost of damage are to be considered.

PRIORITY RANK	RISK FACTOR SCORE
0 – No secondary events likely	0
1 – When damaged or collapsed the feature could give rise to the risk of secondary vehicular accidents	1

Table 6 – Consequential Factor part 1

- 5.10 Should an incident arise no network disruption is expected as access can be gained via different routes

PRIORITY RANK	RISK FACTOR SCORE
0 – No impact on network availability	0
1 – If hazardous feature was damaged or collapsed this could give rise to network disruption for more than one day	1

Table 7 – Consequential Factor part 2

- 5.11 No significant cost of repair is expected

PRIORITY RANK	RISK FACTOR SCORE
0 – No significant cost implications	0
1 – Significant cost of repair or replacement following collision	1

Table 8 – Consequential Factor part 2

Risk ranking score

5.12 The risk ranking score is based on the addition of 4 different factors (F) which is to be used to review the site:

FLOCATION (Range 0-6) = **0**

FLAYOUT (Largest of two score, Range 0-5 or 0-3) = **3**

FCOLLISION (Sum of two separate scores, Range 0-4) = **4**

FCONSEQUENTIAL (Sum of three separate scores, Range 0-3) = **2**

5.13 This has determined the total risk score of **9** and therefore a medium priority based on table 5.2 of *Provision of Road Restraint Systems on Local Authority Roads*.

TOTAL RISK SCORE	CATEGORY	OUTCOME
14 or more	Higher Priority	
9 – 13	Medium Priority	Where the risk evaluation has identified a site as medium priority a RRS may be justified however a non-RRS approach to reducing the risk may prove sufficient to negate the need for an RRS. If suitable effective measures cannot be introduced, then the appraisal process would normally continue to consider the other criteria.
0 – 8	Lower Priority	Where the risk evaluation identifies a site that is lower priority further appraisal is not required and the level of risk does not normally support installation of an RRS. Simple low cost measures that could reduce the risk can still be considered

Table 9 – Resultant Risk Categories

6. Risk Mitigation

- 6.1 The site has been assessed as a medium priority site, therefore a RRS may be justified however a non-RRS approach to reducing the risk may provide sufficient to reduce risk.

Mitigation Solutions

- 6.2 As the carriageway falls towards the watercourse and retaining wall, the provision of methods to prevent vehicles exiting the carriageway should be implemented.
- 6.3 The primary incidents which could occur. Are either a vehicle leaving the carriageway and striking the retaining structure or a vehicle exiting the road on the southbound approach and then passing down the embankment towards the woodland/watercourse.
- 6.4 Both instances as this assessment are not a high risk.
- 6.5 Injury to vehicle occupiers cannot be discounted and, costly damage to the retaining wall is possible, likewise damage could occur to protected trees.
- 6.6 It is therefore, proposed to install containment kerbing (Trief kerb or similar) along the road alignment next to the retaining structure and on the downhill gradient when the road is in fill.
- 6.7 It is not deemed necessary to provide containment kerbing when the road is within cut.
- 6.8 The inclusion of robust reflective bollards/hazard markers on the offside radii when approaching the hazard is also proposed to provide a further visual warning that a bend and potential risk is approaching.
- 6.9 Given this risk assessment is primarily against a 1:3 embankment or retaining wall which would need to be greater than 6m high to be considered critical under a RRRAP earthworks assessment, it is thought the above measures shall offer suitable mitigation.
- 6.10 The discussed proposals are provided in appendix 2.

Appendix 1 – Site Characteristics



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Appendix 2 – Mitigation



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