NR/L3/CIV/00012/F003 - Road/Rail Neighbouring Site - Scoring Sheet PROPOSED WORST CASE Section K

Issue 1 June 2015

Factor	Options	Score	Factor	Options	Score
f1 (See Note 1)	**Relative level of Road and Rail** Score A for rail more than 3m above road with >30 degree slope Score B for rail above road with <30 degree slope or <3m vertical rise Score C for rail level with road Score D for rail less than 2m below road on slope Score E for rail more than 2m below road or vertical drop of any height	**3**	f8 (See Note 4)	**Site-specific Hazards Increasing Consequences of Event** Score 1 for no obvious hazards Score 3 for single site-specific hazard Score 5 for multiple site-specific hazards and/or Railway infrastructure likely to increase severity of an incident.	**1**
f2 (See Note 1)	**Site Characteristics** Score M if bund over 2m high or ditch/river over 1m deep and 3m wide between road and rail Score N if bund up to 2m or ditch up to 1m deep or 3m wide between road and rail or heavy vegetation Score P if smooth gradient/level over 15m distance between road and rail or medium vegetation Score Q if smooth gradient/level 5 - 15m distance between road and rail Score R if smooth gradient/level less than 5m distance between road and rail	**11**	f9	**Length of Parallel Section** Score 1 for less than 100m Score 3 for 100m - 500m Score 5 for 500m - 2km Score 7 for 2km - 5km Score 9 for more than 5km	**1**
f3 (See Notes 1 and 2)	**Interface Arrangements** Score T for buildings Score V for acceptable (safety barrier or concrete wall thicker than 450mm) Score W for partially acceptable (brick wall thicker than 450mm) Score X for barely acceptable (225mm thick concrete wall) Score Y for inadequate (imperfect fencing or 225mm thick brick wall) Score Z for non-existent (No fencing or only post and rail/wire)	**12**	f10	**Road Kerbs** Score 1 for Trief or other safety kerbing Score 2 for physical kerb higher than 100mm Score 4 for carriageway edge marking or physical kerb less than 100mm high Score 5 for no kerb or marking (just grass to carriageway)	**2**
f4	**Road Alignment (Horizontal) at Ends of Parallel Section** Score 1 for straight road with at least 7.3m carriageway Score 2 for straight less than 7.3m carriageway or gently curved at least 7.3m carriageway Score 4 for gently curved road less than 7.3m carriageway Score 4 for tightly curved road more than 7.3m carriageway Score 7 for tightly curves less than 7.3m carriageway	**4**	f11 (See Note 5)	**Volume of Road Traffic** Score 1 for 0 to 10 HGVs (<200 vehicles) per day (generally green lane or farm access) Score 2 for 11 to 100 HGVs (<2000 vehicles) per day (generally unclassified) Score 3 for 101 to 500 HGVs (<7,150 vehicles) per day (generally C or B class) Score 4 for 501 to 1,000 HGVs (<12,500 vehicles) per day ('Other Strategic' roads) Score 5 for 1,001 to 5000 HGVs (<60.000 vehicles) per day (generally 'Primary Routes') Score 7 for Over 5,000 HGVs (>60,000 vehicles) per day (motorways and major trunk routes)	**1**
f5	**Actual Speed of Road Traffic** Score 1 for <10mph Score 3 for <30mph Score 5 for <50mph Score 7 for <70mph Score 9 for >70mph	**3**	f12	**Permissible Line Speed and Track Alignment** Score 1 for straight track up to 45mph Score 4 for straight track up to 75mph or curved up to 45mph Score 8 for straight track up to 90mph or curved up to 75mph Score 12 for straight track up to 100mph or curved up to 90mph Score 16 for straight track up to 125 mph or curved up to 100mph Score 20 for straight track up to 140 mph or curved up to 125mph Score 24 for straight track above 140 mph or curved above 125mph	**1**
f6 (See Note 3)	**Site-specific Hazards Increasing Likelihood of RTA** Score 1 for no obvious hazards Score 5 for single site-specific hazard Score 7 for multiple minor hazards, or single major hazard (e.g. junctions, steep slopes, sharp bends) Score 9 for multiple major hazards	**1**	f13	**Type of Rail Traffic** Score 1 for Non-Dangerous Goods Freight Score 3 for Loco-Hauled Stock Score 5 for Sliding-door Multiple Units (up to 100mph) or Dangerous Goods Freight Score 7 for Slam-door Multiple Unit or Sliding-door Multiple Units (over 100mph) Score 11 for Light Rail (see definition in instruction notes)	**11**
f7	**7a: Road Traffic Incident History** Score 0 for no evidence or recorded incident history Score 1 for evidence of damage but no recorded incident in the last 3 years Score 2 for 1 recorded incident in the last 3 years Score 4 for more than 1 recorded incident in the last 3 years	**0**	f14 (See Note 6)	**Volume of Rail Traffic** Score 1 for seldom used route (fewer than 500 trains per year) Score 3 for lightly used route (501 to 3,000 trains per year) Score 5 for medium used route (3,001 to 10,000 trains per year) Score 8 for heavily used route (10,001 to 50,000 trains per year) Score 12 for very heavily used route (more than 50,000 trains per year)	**12**
	7b: Long Distance Route Effects Score 0 for not a long distance route Score 1 for no obvious risk factor Score 3 for a site on a featureless rural road Score 5 for a long sweeping right hand bend or at the end of a long route Score 9 for a combination of the above two factors	**0**			

				63
Note 1	*For factors f1, f2, and f3 refer to the matrixes in the instruction note to determine the score*	*Note 4*	*Site-specific hazards increasing the consequences of the event include the following features in proximity to the site: exposed gas or chemical pipelines, etc.*	
Note 2	*Score f3 on the basis of the stretch with the least containment*	*Note 5*	*Railway infrastructure likely to increase severity of incident to include pointwork, platforms, bridge piers and abutments and tunnel portals, etc., within 800m (½ mile) of structure.*	
Note 3	*Site-specific hazards increasing the likelihood of an RTA include the following features in the length of the section: farm access, road junction, private driveway, lay-by, bus stop, steep downhill slope, on approach, etc. Lack of adequate signage would also be included here.*		*Equivalent traffic flows for all vehicle types may be substituted, depending upon the units of measurement used by the relevant highway authority.*	
		Note 6	*Volume of rail traffic to be provided by Railway Infrastructure Controller, see instruction notes.*	

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Date: June 2015

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Table C.1 – Scoring Matrix for Factor f1

	A	B	C	D	E
Road is downhill steeper than 1:8	1	5	7	9	10
Road is downhill between 1:20 and 1:8	1	4	6	8	10
Road is less than 1:20 (uphill or downhill)	1	3	5	7	10
Road is uphill between 1:20 and 1:8	1	3	6	7	10
Road is uphill steeper than 1:8	1	3	7	8	10

Table C.2 – Scoring Matrix for Factor f2

	M	N	P	Q	R
Road is downhill steeper than 1:8	3	6	9	12	14
Road is downhill between 1:20 and 1:8	2	5	8	11	14
Road is less than 1:20 (uphill or downhill)	1	4	8	11	14
Road is uphill between 1:20 and 1:8	1	4	6	9	12
Road is uphill steeper than 1:8	1	3	5	8	10

Table C.3 – Scoring Matrix for Factor f3

	T	V	W	X	Y	Z
Road/Rail angle 60° - 90°	1	8	12	12	18	24
Road/Rail angle 30° - 60°	1	4	6	10	15	24
Road/Rail angle 10° - 30°	1	2	3	8	12	24
Road/Rail angle less than-10°	1	1	1	8	12	24

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Factor	**Guidance**	**Matrix**
F1	A vehicle travelling downhill can lose control and thus increase its chance of reaching the line. Vehicles travelling uphill could inadvertently accelerate on level and downward slopes going from the road to the railway. These effects alter the effectiveness of bunds and ditches.	Yes
F2	Other factors that reduce the chance of reaching running railway lines should be included here, such as heavy vegetation or sidings. Where the score is a letter, then the following scoring matrix **Score M** for a bund over 2m high or a ditch over 1m deep and over 3m wide. **Score N** for a bund up to 2m high or ditch up to 1m deep or up to 3m wide, or heavy vegetation. -'Heavy vegetation' means trees greater than 500mm girth with centres less than 2m apart for the entire stretch of parallel running. **Score P** for a smooth gradient/ level with over 15m distance between the road and rail. -The distance is to be measured from the edge of the road to the nearest running rail. Sidings and empty land, e.g. where tracks have been removed, are to be included in this distance. **Score Q** for a smooth gradient/level with 5-15m distance between the road and rail. -The distance is to be measured from the edge of the road to the nearest running rail. Sidings and empty land, e.g. where tracks have been removed, are to be included in this distance. **Score R** for a smooth gradient/ level with less than 5m distance between the road and rail. -The distance is to be measured from the edge of the road to the nearest running rail. Sidings and empty land, e.g. where tracks have been removed, are to be included in this distance.	Yes

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F3	Where the section being considered is almost perpendicular to the railway line, the containment is likely to be less effective as, for instance, safety barriers are not designed to stop HGVs from breaking through when they collide. Wooded side approaches on Network Rail land can only be relied on in determining road approach containment where a process is in place to monitor vegetation work programmes that may remove this protection in future. NOTE It is good practice to record the total risk score both with and without the protection offered by wooded side approaches to understand how this could change the overall vehicle incursion risk if the vegetation is removed. **Score T** for buildings between the road and railway. Buildings have to be over the complete section being assessed for the score to be T. There should be virtually zero chance of a road vehicle penetrating, or evading the end of, the containment following an RTA. A score of 1 means that the entire site does not have a realistic incursion risk, so the assessment can be terminated and a note to that effect made. **Score V** for acceptable containment, e.g. safety barrier or concrete walls 450mm or thicker. The scorer is to assess whether the barrier takes into consideration normal design parameters, i.e. a safety barrier is not designed to resist perpendicular loading at a Z-bend. Concrete walls in good condition, 450mm or greater in thickness, are to be scored as V. **Score W** for partially-acceptable containment (masonry walls 450mm or thicker). Masonry walls in good condition, 450mm or greater in thickness, are to be scored as W. **Score X** for barely-adequate containment (concrete wall between 225mm and 450mm thick). Concrete walls in good condition, a minimum of 225mm thick, are to be scored as X. **Score Y** for inadequate containment, e.g. inadequate safety barrier or masonry walls between 225mm and 450mm thick. The safety barrier is expected to provide containment perpendicular to the face, and this also includes either a safety barrier provided to a standard now superseded or a non-standard safety barrier application. Masonry walls should be in good condition, a minimum of 225mm thick. Sites where several layers of protection exist, each of which would be inadequate on its own, but which, it is felt, would, together, offer a reasonable level of containment, e.g. a pedestrian safety barrier at a kerb edge and close-boarded fence on concrete posts at a boundary. **Score Z** for non-existent containment (including post rail/wire fencing and a brick wall less than 225mm thick). This includes road approach slopes with no fencing or only post/wire or post/rail fencing. There should also be a high chance of a road vehicle which leaves the highway continuing at undiminished speed.	Yes
F4	Where containment varies, the highest-scoring portion is to be considered. Particular consideration is to be given to containment immediately adjacent to bends and the factor scored accordingly. Where the section being considered is almost perpendicular to the railway line, the containment is likely to be less effective as, for instance, safety barriers are not designed to stop HGVs from breaking through when they collide.	No
F5	The speed should be taken as actual, from site-measured figures. Where site measured figures are not available, an evaluation should be made during the site visit. Signed and designed speeds are to be disregarded, as Highway Engineers' experience indicates that actual speeds may be much higher than permitted, or design, speed.	No

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F6	These include, but are not limited to: a) Steep descent on the road approach and the parallel stretch and adjacent access tracks; b) Lay-byes; c) Bus stops; d) Car parking; e) Cafes/shops, etc. f) Surface conditions (including propensity for ice); g) Likely vehicle conditions, e.g. areas of social deprivation where vehicles may not be in top condition; h) None or inadequate signage; i) Situations where traffic-calming measures direct vehicles towards the railway boundary.	No
F7a	Where there is a history of accidents, then the score for this factor should be scored as indicated on the scoring sheet.	No
F7b	Sites that are not on long-distance routes score 0.	No
F8	Railway infrastructure likely to increase the consequences of an incident comprises those items which either create a derailment hazard, such as switch and crossing work or junctions, or are likely to increase the severity of an incident, due to being hit by a derailed vehicle. These include station platforms, bridge piers and abutments and tunnel portals, etc., within 800m (½ mile) of the site. Overhead-line masts should be disregarded within this factor.	No
F9	The longer that the parallel section is, the more chance there is that an RTA will occur that results in a road vehicle coming onto the railway. This factor should be scored for the length of the entire parallel site, even if the assessment is being done in sections. This factor should be scored for the length of the entire parallel site, even if the assessment is being done in sections.	No
F10	Road kerbs are considered to reduce the risk of vehicles reaching the railway by keeping the vehicle on the road.	No
F11	This factor may require adjustment upwards to next-higher category where local conditions, e.g. a quarry, leads to localised increases of traffic figures, which may not be reflected in the original survey figures. The following vehicles-per-day figures may be used as an alternative where the Highway Auth Where a route is a strategic diversion route, then the traffic volume is to be amended to reflect this. Traffic figures will be provided by the Highway Authority.	No

F12	The scoring reflects increased chance of derailment with increased speed, or curvature, and also that the magnitude of the effects of the event increase with speed. Speed categories that are above present operating speeds have been included to allow use of the model on the Channel Tunnel Rail Link and other high speed routes and to allow ranking where speed enhancement schemes are being considered. Details of line speeds are available from the Railway Infrastructure Controller. This may be, for example, Network Rail, London Underground Ltd, Nexus (Tyne & Wear), a private railway operator or other infrastructure controller. The existence of curvature will be established at the site inspection.	No
F13	Though a route may be considered to be used primarily by one of the lower risk categories below, if a significant number of higher risk trains (more than either 5 per day or 15% of the traffic on lower traffic routes), then the route should be scored for the higher scoring group, e.g. East Coast Mainline, north of York, is principally a loco-hauled passenger route for HSTs/IC225s, but also carries sliding-door Sprinters and some dangerous goods traffic, so the score to be 5. **Score 1** for freight-only routes not carrying dangerous goods, e.g. petrol. -These are considered the least risk, as, generally, there is a reduced chance of derailment. There is also a substantially-reduced number of possible casualties. **Score 3** for loco-hauled passenger trains (to include push-pull services, i.e. HST/IC225 and similar). -There is a reduced chance of derailment, due to being loco-hauled and with better crash-resistance than lighter rolling stock. The possible number of injuries, however, increases the risk. **Score 5** for sliding-door multiple units (maximum speed 100mph), and/or dangerous goods freight trains. -Modern diesel and electric sliding-door multiple units (Sprinters, Electric Multiple Units (EMUs)) and goods trains carrying dangerous goods are seen as an increased risk, due to subsequent explosion/fire, owing to the possible number of train casualties, or damage to others in the vicinity. **Score 7** for slam-door multiple units and sliding-door multiple units (maximum speed greater than 100mph), due to the reduced structural integrity of older slam door stock and passengers in leading vehicles of modern higher-speed multiple units, as an increased chance of passenger fatalities exists. **Score 11** for light-rail, lightweight passenger trains, as operated by Nexus (Tyne & Wear Metro), etc., which are seen as being at greatest risk, due to the high number of possible casualties and the increased chance of derailment of a light rail vehicle when compared with a conventional multiple unit/loco-hauled service. -Light rail is not intended to include 'preserved' railways operating under a Light Railway Order. These should be assessed against the types of vehicles normally operated. The Railway Infrastructure Controller will provide confirmation of the types of rail traffic likely to use a route.	No

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F14	NETRAFF will supply information for each track at a location, split into passenger/freight movements. The total for the location should be scored initially, even at multi-track locations, where only the outer tracks are being considered in factor f12: Permissible Line Speed and Track Alignment, due to acceptable parapet containment in factor f8: Parapet Resilience. The information by track, split into passenger/freight movements, may, however, be of value later, when carrying out a more detailed risk assessment of the site.	No