Development Impact Assessment

Bugle Footpath Crossing

Proposed Development of up to 80 properties, open space, play area, landscaping, parking areas, cycle, and vehicular routes.

Bugle Nurseries, Upper Halliford Road, Shepperton, TW17 8SN

Spelthorne Council Planning Ref: 22/01615/OUT

Dated: 10/02/2023

Contents

1. Introduction, Level Crossing Details and Description of Locality

This Development Impact Assessment (hereinafter referred to as 'the Assessment') has been produced by Network Rail Infrastructure Limited (NR) to assess the projected increase in risk from the development to both the public and the railway at NR's level crossing called Bugle Footpath (the Crossing).

Table 1 - Level Crossing details

Level Crossing Details	
Name	Bugle Footpath
Type	Public Footpath crossing with gates
Crossing Status	Public Footpath
Overall Crossing Status	Open
Route Name	Wessex
Engineers Line Reference and Mileage	NMS2 17m 74c
OS Grid Reference	TQ088684
Number of Lines Crossed	2
Line Speed (mph)	60 mph on both lines
Electrification	750v DC Conductor Rail
Controlling Signal Box	Basingstoke

Up direction (Blue arrow) Down direction (Yellow Arrow)

Crossing location (Orange arrow) with the planned development site located to the East

Figure 1 - Direction of train travel

Figure 2 - Locations of Level Crossing and Development

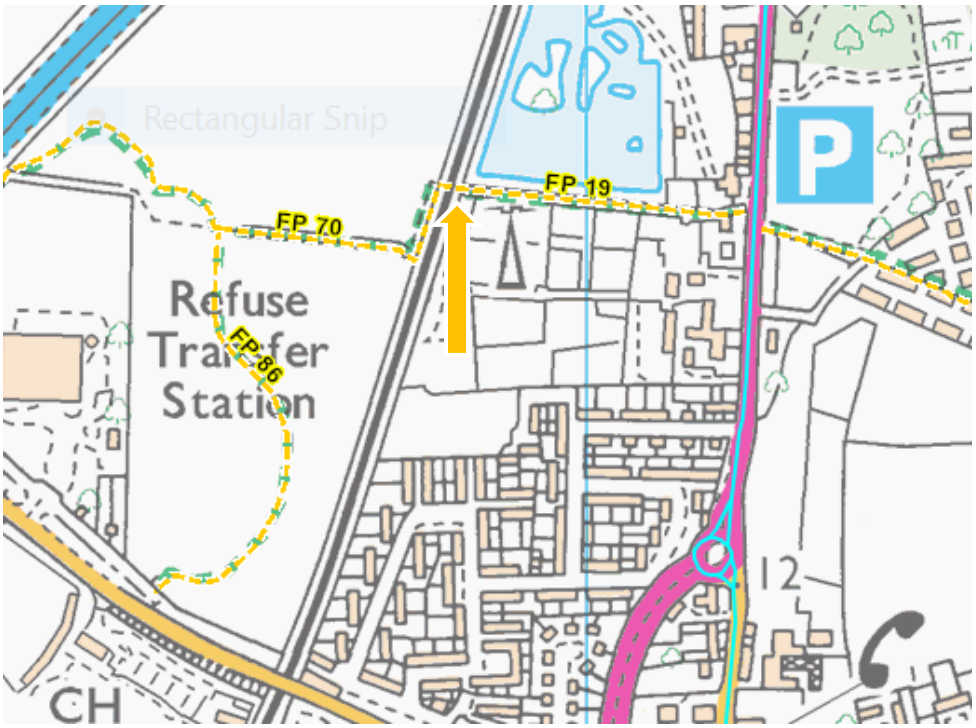


Figure 3 - Map showing location of Bugle Footpath crossing

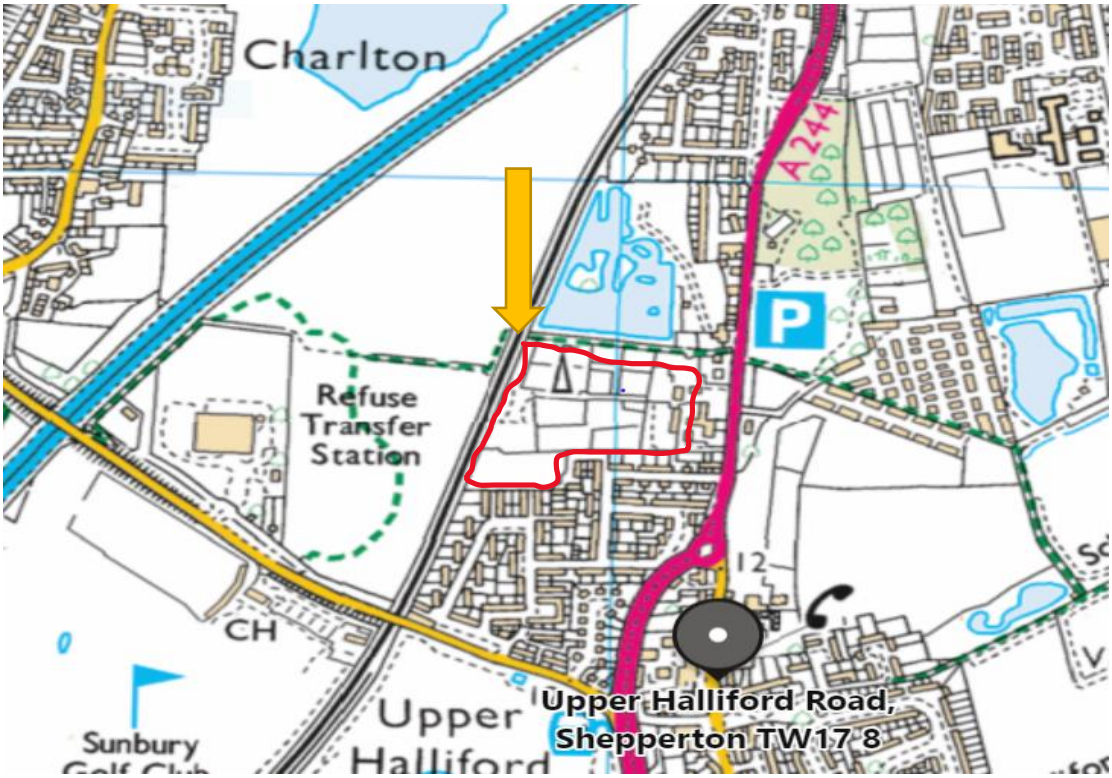


Figure 4 - Map Showing the Location of Bugle Footpath Level Crossing in relation to the approximate location of the proposed development site (Crossing arrowed Yellow, development site marked Red)

The Crossing serves public footpaths FP19 leading from Upper Halliford road to FP70 once traversed over the crossing.

Figure 5 - Up-Side Approach

Figure 6 - Down-Side Approach

On the East side, FP19 leads from Upper Halliford Road, alongside the proposed development site on the left of the crossing approach path and out to open land on the West side of the crossing.

2. Risk Assessment

Level Crossings are considered by Network Rail's regulator (the ORR) as the single biggest source of catastrophic risk. Consequently, Network Rail is subject to a strict statutory and regulatory regime, mandating proactive management of risk and its eradication where possible.

The core principle 'to run a *safe* and efficient railway network" (our emphasis) is unequivocally expressed in Network Rails Operating Licence (the Licence).

Level Crossings are risk assessed on a regular basis; the periodicity of the risk assessment is dependent upon the identified risk at a particular crossing. Additional 'trigger' assessments may be undertaken if a significant incident or occurrence happen that justify a standalone risk assessment being undertaken. Typical examples include cases where the risk is likely to change by virtue of increased usage, timetable changes or a planned housing development close to the railway.

The risk assessment process includes quantitative as well as qualitative risk assessment. In quantifying risk Network Rail uses a risk model called the All-Level Crossings Risk Model (ALCRM). As an Industry wide accepted system for assessing risk, this model provides a consistent method of assessing risk to crossing users, train passengers and rail staff across all level crossings. The model incorporates over 200 variables relating to types of trains, number of trains, train speed, public usage, the crossing environment (location etc.), environmental factors (prone to fog, sun glare etc.), layout, sighting distance for approaching trains, incident history, user behaviour and the effectiveness of mitigations in already place.

The ALCRM reports two measures of risk: collective risk and individual risk of fatality. Collective risk includes risk to members of the public, train passengers and train crew. It is given a value between 1 and 13 where 1 is high and 13 is zero risk. Individual risk is the risk of a fatality to a crossing user, and this is given a value between A and M, where A is high, and M is zero risk. Also, the total collective risk is expressed in terms of Fatalities and Weighted Injuries (FWI) – which is the recognised measure used throughout the UK, not just across the rail industry.

A qualitative risk assessment (or "structured expert judgment") is applied by the Level Crossing Manager (LCM) throughout the risk assessment process. Information to support structured judgement is derived through the collation of evidence during the site visit, by applying local knowledge, using smart intelligent sources such as the internet and mapping services, through stakeholder engagement and analysis of previous assessments and accident/incident data.

In August 2014, Network Rail introduced the Narrative Risk Assessment (NRA); a new documented means of presenting the output of all new routine level crossing risk assessments. It adopts the quantitative calculated risk and the qualitative commentary/observations recorded by the LCM in ALCRM, enabling the LCM to reach and document balanced decision making of the risks and risk controls required.

The NRA draws together all the factors used to justify the increase in usage of the Crossing following the development. This information is then input into ALCRM to calculate the final risk score. Network Rail uses both the quantitative ALCRM and the NRA which articulates the qualitative, expert judgment of the LCM to ensure a full and balanced approach is adopted in the risk management of any level crossing.

3. Level Crossing Risk

As set out above, the Licence provides, inter alia, that Network Rail's primary obligation is to run a 'safe and efficient' railway network in Great Britain. The overarching duty to ensure safety is met, principally, by elimination or mitigation of risks.

Consequently, Network Rail has a rigorous process of risk assessing its crossings and a publicly funded programme of risk reduction. As regards the risk assessing process, Network Rail is the only body responsible for and capable of expertly and consistently assessing such risk. This flows not only from the fact that Network Rail has a duty to manage such risk but, centrally, from the fact that level crossings are unique infrastructure assets and so is the degree of interaction they have with railway operations.

Risk reduction, in an ordinary case, is achieved by implementation of risk mitigation methods or the complete elimination of risk (i.e., through closure). Any public investment into such measures being deployed is predicated upon clear recommendation made in the risk assessment and having a positive business case.

Figure 7 - Up-Side Up Direction Train Approaching View

Figure 8 - Up-Side Down Direction Train Approaching

Figure 9 - Downside down direction train approaching view

Figure 10 - Downside Up direction train approaching view

4. Train Count

There are currently 92 trains per day travelling over the Crossing. The nearest station is Upper Halliford 17m 34c in the Up direction (Trains to London) and Shepperton 18m 73c in the Down direction.

This crossing is on the NMS2 (London Waterloo to Shepperton) line of route. Rolling stock used is in the form of Electrical Multiple Units. All passenger trains are operated by the Southwestern railway franchise. All trains are powered by the third rail at 750DC.

Trains travelling over the crossing are of various length and speed, making it difficult for a user to judge when a train may arrive at the crossing.

There are 86 passenger trains (Showing on the Realtime trains website 09/01/2023) with an average length of 160 metres that can achieve the 60-mph line speed. The remaining trains are either Freight / Multi-purpose wagons that can travel at the line speed of 40mph on the Up line, and 35mph on the Down line. There are 6 freight trains with an average length of 300 metres.

The line is open 24 hours a day 7 days a week consequently traffic can be expected over the crossing at any time of the day or night.

Typically, there are 4 passenger trains per hour (2 in each direction)

Table 2 – A detailed train count in respect of the Crossing

Up trains	Type of Stock	Down trains
43	455 / 450 / 700	43
3	Freight / Multi-purpose wagons	3
46	**Total in each direction**	**46**

5. Line Speeds

The maximum permitted line speed at the Crossing is 60 mph. The speed reduces for the passage of Freight / Multi-purpose wagons to 40mph on the Up line, and 35mph on the Down line, for the purpose of ALCRM the highest speed must be used for calculating the risk of the Crossing.

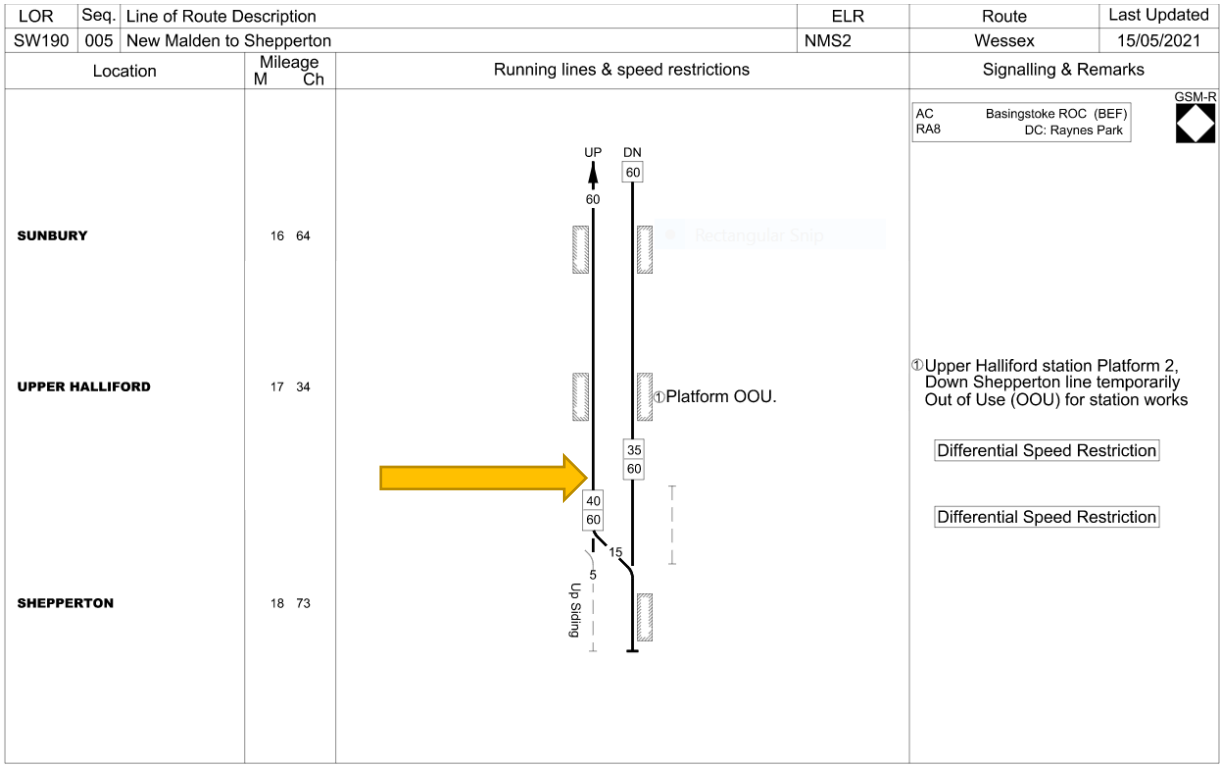


Figure 11 - Extract from the Sectional Appendix Showing Line Speeds

6. Crossing Traverse

The Crossing length is 9.5 metres. There are no step ups onto the Crossing deck within the decision points at the Crossing which would elongate this timing. The crossing has recently undergone renewal upgrade works, installing a new Strail rubberised decking and new GRP type cattle guard boards.

Using a walking speed of c.1.189m/s, a crossing time of 7.99 seconds has been calculated for pedestrians traversing from decision point to decision point. This crossing time of 7.99 seconds is for an able-bodied pedestrian to cross safely. At a line speed of 60mph and with a traverse time of 7.99 seconds pedestrians require a minimum of 214 metres sighting of approaching trains. Sighting for pedestrians from a 2-metre decision point was measured at:

- 394 metres from the Upside looking at Down direction train approach,
- 490 metres from the Upside looking at Up direction train approach,
- 369 metres from the Downside looking at Down direction approach and
- 490 metres from the Downside looking at Up direction train approach.

These are all within the minimum compliant requirement of 214m sighting of approaching trains.

Table 3 – Required and Measured Sighting Distances for pedestrian users

	Upside looking at trains travelling in the up direction		Upside looking at trains travelling in the down direction		Downside looking at trains travelling in the up direction		Downside looking at trains travelling in the down direction	
Line 1:	Minimum required sighting distance	Actual sighting distance			Minimum required sighting distance	Actual sighting distance		
	214	490			214	490		
	Sighting distance measured to point				Sighting distance measured to point			
	Gauged to bridge structure				Gauged to bridge structure			
Line 2:			Minimum required sighting distance	Actual sighting distance			Minimum required sighting distance	Actual sighting distance
			214	394			214	369
			Sighting distance measured to point				Sighting distance measured to point	
			Location cabinet in cess area				Track curvature	

7. User Census

A 7-day census of crossing usage was undertaken using a camera placed at the Crossing between the 09th – 16th December 2021. During the 7 days the average daily usage was calculated to be 1 pedestrian per day.

Weather during this period was mainly dry and mild.

The previous census was conducted between the 12th / 19th July 2017 for a 7-day recording, this census captured a daily usage of 6 pedestrians per day on average.

8. Current Risk Score

The current risk score and Fatalities Weighted Index (FWI) for the Crossing is currently assessed as shown below:

ALCRM Risk Score	
Risk per traverse risk	C
Collective risk	8
FWI	0.000041147

Table 4 – Current ALCRM Score

At the current time, based on known usage and user demographics the Crossing is compliant with the minimum Network Rail safety standards.

Network Rail has no plans, nor there is any present immediate requirement, to upgrade the protection at the Crossing.

9. Vulnerable Users

Network Rail characterises 'vulnerable users' as those who are unable to use a level crossing quickly and effectively, and/or those who are not fully aware of the dangers at a level crossing.

9.1. Elderly Users

Level crossings can cause difficulties for people who move slowly and are not suitable for users who are unable to see or hear approaching trains. Slips and trips are a recurrent theme reported in level crossing accidents; elderly crossing users are often less sure footed than regular users and are therefore more vulnerable to this risk.

Additionally, at level crossings with reasonable sighting distances users often think they have longer to cross than is the case. They may commit themselves to crossing when seeing or hearing a train a considerable distance away, believing it is travelling at a slow speed. They then realise that the train is approaching more quickly than expected and they have minimal or insufficient time to get clear. Again, due to slower speed of movement and reduced fields of vision and/or hearing, elderly members of society are particularly vulnerable to this risk.

9.2. Children

Network Rail position, in accordance with the underlying scientific research, is to classify children as *vulnerable* because (broadly) their perception of danger is still not fully developed. Consequently, they display an increased propensity for taking risks, tend not to be as risk averse as adults and, at level crossings, this has the potential to exacerbate an already high-risk situation.

Census at public footpath level crossings have demonstrated a trend in the behaviours of youths in comparable locations. It is human nature to gather at known sites and places of interest, away from the main thoroughfare, especially amongst children and adolescents. Of great concern to Network Rail, this behaviour often leads to misuse of the level crossing

and deliberate trespass by youths. Trespass on the railway, is a criminal offence and puts individuals at serious risk of harm or death, on the railway.

Network Rail has a significant amount of photographic evidence of youths alone or in groups, loitering on level crossings, sitting on the deck, walking up and down the rails, chasing each other as though in a playground, and playing 'chicken' with approaching trains (i.e., running out in front of approaching trains or standing in front of them until the very last seconds). Network Rail also has evidence that new residential developments in the vicinity of a level crossing increases this dangerous type of activity.

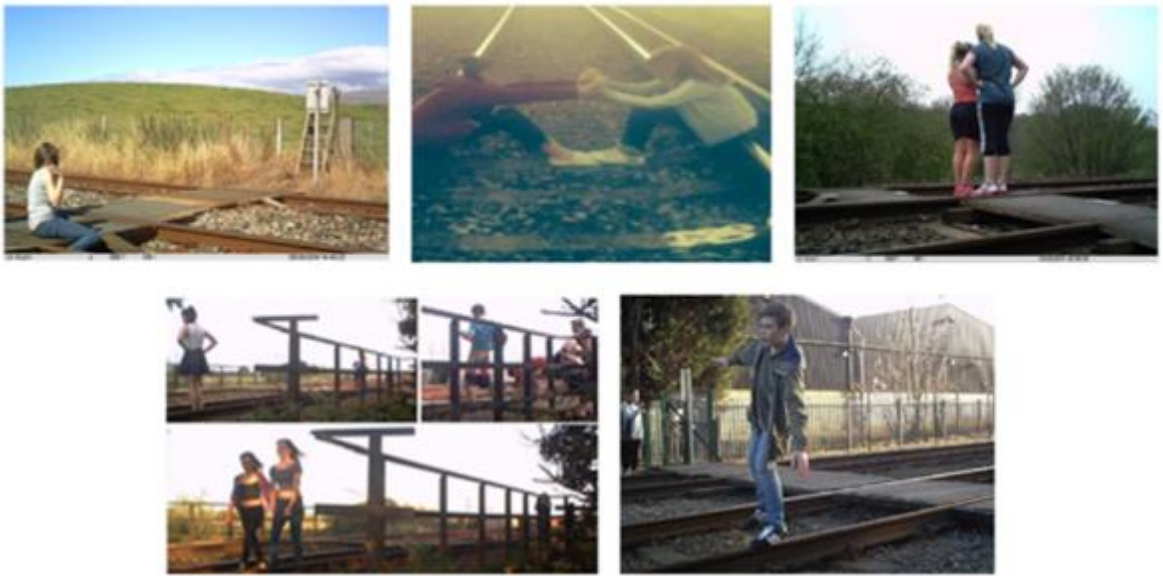


Figure 12 – Examples of dangerous activity

9.3. Encumbered Users

Fully able-bodied people become vulnerable when they are encumbered. An encumbered user is someone crossing with something that reduces their agility and/or can cause distraction. This might include those pushing or riding a bicycle, walking with a pram, and those who are carrying objects. It can also include those with a dog or multiple dogs, either on or off the lead.

If, at a subsequent risk assessment, Network Rail identifies a high number of vulnerable users it is required to add an additional 50% traverse time (safety margin) over the Crossing, which would make sighting non-compliant due to track curvature as explained above. Network Rail would then be duty bound to act, this would likely take the form of reducing train speeds (with ensuing 'delay minute' compensation payable to train operators and performance/timetabling issues) over the Crossing until warning technology can be installed. This is a significant concern for Network Rail.

10. Pedestrian Behaviour

Pedestrians are responsible for their own safety and level crossing Users are expected to use reasonable vigilance to satisfy themselves that no trains are approaching before they start to cross the line. They should cross quickly and remain alert while crossing. However, the RSSB records members of the public, and particularly pedestrians, are mostly exposed to the risk presented by level crossings.

Despite sustained network-wide campaigns to educate people of the dangers of level crossings, users do not consistently behave in a predictable or appropriate manner. The level of deliberate misuse or accidental human error, for example, remains stubbornly high. The causes of pedestrian accidents at level crossings can be factorised by the number of pedestrians using a crossing against, the number of trains; the numbers of accidents increase with the age of the pedestrian.

Network Rail has a duty of care towards trespassers. However, without a realistic ability to police all high-risk level crossings on a regular and ongoing basis, such deliberate misuse persists. Aside from providing education in schools and post-incident awareness days at level crossings (for example, following a fatality at a level crossing), Network Rail has only limited means at its disposal to change crossing users' behaviour. Consequently, the risk of an incident and injury remains.

11. Development Impact

Planning application 22/01615/OUT proposes the construction of up to 80 homes on land adjacent to Bugle footpath crossing. These homes include 34 x 3 bedroom and 11 x 4-bedroom family houses, The Crossing also forms access to a large open space once the crossing is traversed from the Downside over to the Upside, this large grassland area is sometimes used by dog walkers, as a result, it is anticipated that this development will introduce more pedestrians and children onto the Crossing, consequently increasing the risk to the railway, public and future occupiers of the development.

11.1. Location of Development in Relation to the Crossing

The projected increase in risk, brought about by this residential development, not only increases pedestrian numbers but also introduces the concept of vulnerable users, children, and the likelihood of misuse as discussed in section 9.

The railway line in this area runs approximately North to South. The positioning of the Development to the south-east of the level crossing would create a larger, more condensed residential area, reducing the amount of green space East of the railway. There is only 1 point where the railway line can be crossed to reach the open land West of the railway.

The map below shows the development dwellings location in relation to the railway. They are located in the far corner of the plot and there is an open area that separates the crossing from the houses. In order to reach the level crossing, users from the development would have to travel along the Upper Halliford Road before joining Footpath 19.

This is only likely to increase the number of users to engage with the crossing, increasing the numbers higher than what has been previously suggested in this document.

11.2. Increase in general pedestrian use

The Office of National Statistics (ONS) census data for 2011 shows that the average household in England was home to 2.36 people – a figure that has remained stable for the last three decades. On these figures alone, full occupation of the development is likely to translate into an **increase of 272 residents** to the area.

It can be assumed that overall crossing usage will increase as new residents use the Crossing in a leisure capacity e.g., dog walking, walking, or running. As an illustration, if only 10 % of the new resident population use the Crossing this would **increase use to 28 pedestrian traverses** per day, notwithstanding that this number could potentially double if this was used as a circular walk.

It is also worth considering that, due to the development, an increase in use, and therefore safety risk, if 25 % of the new residents were to use the crossing this would push the daily usage up to a possible 68 users daily.

11.3. Increase in vulnerable users

The ONS reports that 29 % of occupied households included dependent children and, where present, the average number of dependent children per household was 1.8. This means a potential increase of **122 children** residing in the development in the vicinity of the Crossing.

This figure was calculated by the Level Crossing Manager from the number of rooms per new proposed dwelling.

Statista, an online statistic, market research and business intelligence portal providing data from market and opinion research institutions, reports that (in 2019/20) 23 % of all UK households also own a dog. On this basis, it is likely that the number of dog walkers, using the Crossing would likely increase. Network Rail estimates that there will be approximately 61 pet dogs introduced within the area on the development.

Dog walkers can be classified as either vulnerable or encumbered users and typical exercise their pets in the morning before work and in the evening; during winter months this may be in the hours of darkness.

11.4. Increased Risk

Without any information to indicate otherwise, Network Rail have modelled a moderate assumption of c.10% of residents using the level crossing daily, increasing the number of traverses from 1 to 29 traverses per day. The modelled risk using the All-Level Crossing Risk Model increases to 0.001306491 FWI from the original value of 0.000041147.

- **10% increase**

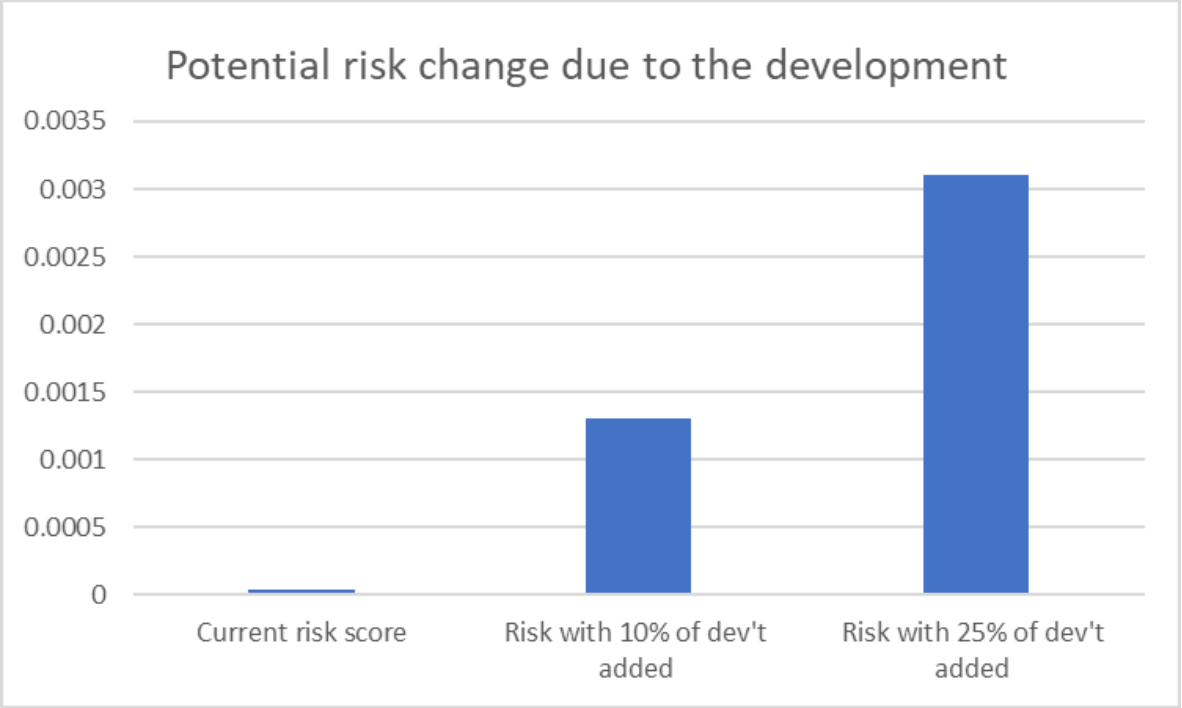
ALCRM Risk Score	
Collective Risk	C
Individual Risk	4
Fatalities Weighted Index	0.001306491
Fatalities Weighted Index Increase	0.001265344

The chart below shows the risk increase for 25% of the residents using the crossing daily, this figure would show an increased usage of 69 pedestrians daily.

- **25% increase**

ALCRM Risk Score	
Collective Risk	C
Individual Risk	4
Fatalities Weighted Index	0.003108549
Fatalities Weighted Index Increase	0.003067402

Table 5 - FWI score against increase in risk



Due to the very low nature of use before the addition of the development, the potential changes in risk are large. In context, the current risk score ranks the Crossing 620th on a list of 900 level crossings in the region. The 10 % increase in use from the development added to the current use moves it up to 244th while the 25 % increase takes it to 139th. This is a helpful comparision with similar level crossings.

12. Options to Mitigate Risk from Development

Network Rail uses a Cost Benefit Analysis (CBA) process, to ensure financial viability of its schemes and value for money. CBA takes the FWI and normalises it against a monetary value called the Value to Prevent a Fatality (VPF) which is currently set at £2.1m [Rail Safety and Standards Board, Taking Safe Decisions – Cost Benefit Analysis 20/5/2019]. This allows financial safety-based business cases to be evaluated. It also allows a range of safety schemes to be prioritised.

The following CBA criteria are used as a support to decision making:

Table 6 - Cost Benefit

Benefit to Cost Ratio	Decision
≥ 1	positive safety and business benefit established
Between 0.99 and 0.5	reasonable safety and business benefit established where costs are not grossly disproportionate against the safety benefit
Between 0.49 and 0.0	weak safety and business benefit established

In the context of a significant increase in risk to the railway the principal mitigations available to mitigate risk to a lower level are:

*Closure of the crossing has been optioned showing a cost of approximately £100k, this cost would escalate should the need for the proposed closure be taken to a public enquiry.

Table 7 - Mitigation Options for 10% Increase in Usage

Option	ALCRM Risk Score	ALCRM FWI	Safety Benefit	Approximate Cost (£)	Benefit Cost Ratio	GDF
Closure – Installation of a footbridge	M13	0.00E+00	1.31E-03	£1,200,000	0.06	0.15
Closure with no diversion	M13	0.00E+00	1.31E-03	*£100,000	0.74	1.85
Installation of overlay Miniature Stop Lights (MSL)	D8	8.38E-04	1.52E-03	£370,000	0.03	0.08
Minor improvements to the Crossing	C4	1.31E-03	0.0	£17,000	N/A	N/A

The modelling above, with a 10% increase of use applied, shows that there is only a business case to support the closure of the level crossing with no additional work. One of the options put forward for the potential closure of the level crossing was the creation of a diversionary path to Upper Halliford station where these is a footbridge.

13. Conclusions and Recommendations

Policy

The ORR's determination of Network Rail's funding for the previous Control Period (CP5: 2014–2019) had identified a requirement to maximise level crossing risk reduction. This requirement is not diluted under CP6.

Network Rail's duty under Health and Safety legislation includes a responsibility for users of level crossings, so far as is reasonably practicable. Network Rail is firmly committed to eliminating accidental fatalities at level crossings. This is an established, long-term strategy. Closure of level crossings has been proven to be the most effective way of removing this risk from the network.

Network Rail's policy for managing level crossing risk is now published within the document: "Enhancing Level Crossing Safety 2019 – 2029". Designed around ALARP (as far as reasonably practicable) principles, the policy sets out a long-term strategy targeting improved safety on Great Britain's railway, with our long-term level crossing safety vision as "No accidents at level crossings on Britain's main line rail network".

It is a fact that both the volume and character of users at the Crossing will not change significantly following the construction of a further 80 homes south-east of the crossing.

Modelling the crossing in ALCRM demonstrates that the safety risk at the Crossing will increase considerably because of the proposed housing development.

Closure

Closing the existing footpath crossing with installation of a footbridge will eliminate the risk whilst still providing access to the rural land on the west side of the railway. This option would cost in the region of £1.2 million.
There is a new type of footbridge called a Composite footbridge currently being trialled within NR, this new bridge cost in the region of £800k, and it is easier to install than a normal footbridge.

Miniature Stop Lights

Miniature Stop Lights (MSL's) display a red and green light at the crossing as well an audible alarm, informing users when a train is approaching. They are available in two principal variants: a cheaper, overlay system normally deployed at locations with no underlying complexities (i.e., approximate signals, junctions, lines merging etc) and the more expensive, integrated system, which is required for more challenging locations which necessitate, in order for the system to work, its integration with existing signalling infrastructure.

The Crossing is within proximity to stations and signals, this means that a system requiring overlaying the signalling system is likely to be required. Due to sighting that is achieved at the Crossing MSLs would also not lower the risk to as low as reasonably practicable and are open to vandalism and misuse.

Critically, MSLs efficacy against the proposed spend in its installation must be considered. Whilst providing a mitigation to risk, the outcome is ultimately uncertain as MSLs effectiveness depends on user compliance. In our experience, especially in obscure locations such as that of the Crossing, the propensity for misuse and ignoring of the red light is concerning.

Recommendations

Very few of the options available present a reasonable business case and therefore Network Rail would not expect the developer to proceed on such options.

As part of the approval of the development of 80 homes south-east of the Crossing, Network Rail recommends that the developer investigate the possibility of extinguishing the level crossing by entering into negotiations with Network Rail and the local authority to investigate the possibility of diverting the right of way up to Upper Halliford station footbridge. The cost of this option is as yet unknown but is likely to vary between £30,000 to £130,000.

Failing this, then Network Rail would look to the developer to offer minor improvements to the crossing so that it was as safe and amenable in its current format. This would be to the cost of circa £17,000.

Network Rail welcomes further discussions with Spelthorne District Council and the applicant to help further these requirements.

Appendix – Photographs