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Road Asset Safety Inspections: A Risk Based Approach

Inspectors Operations Manual

Version:

Date:

(NB. this should be a controlled Document)

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Document Information

Title	Road Asset Inspections: A Risk Based Approach Inspectors Operations Manual
Author	Atkins/SCOTS
Description	To provide information and guidance to inspectors on the method to be deployed in undertaking risk assessment and the prioritisation of defects.

Document History

Version	Status	Date	Author/ Revised by	Changes from Previous Version
1.0	Final	Sept 2018	Atkins/SCOTS	n/a
1.1	Revision	Nov 2018	SCOTS	Following Authority feedback, revision to Likelihood Table 8: removal of % descriptor and amendment to timeframe column values

Document Control

Version	Date Authorised (SCOTS RAMP Steering Committee)
1.0	13/09/2018
1.1	19/11/2018

How to Use the Template

This is a template document. It is expected that authorities will edit it to create their own manual. In doing so **this page,** and the **instructional text** within the document that is highlighted in yellow, **should be removed** on completion.

Sections that have an orange background are content prompts/suggested text that can be **amended or replaced** to reflect local requirements where appropriate. On completion **remove the background colour**.

Finally, once the local inspectors' manual is ready, update the Table of Contents.

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Table of Contents

Purpose

The Inspections Operations Manual is one of several documents in the SCOTS Risk Based Approach suite; this document is aimed at Road Asset Safety Inspectors, providing information and guidance regarding the method to be deployed in undertaking risk assessment and the prioritisation of defects.

The adoption of this SCOTS recommended approach across Scottish Authorities promotes a consistency in the management of the road network that focuses on delivering a programme of permanent repairs to improve its condition and safety.

Background

Legislative Requirements

The methodology described in this document has been designed to comply with the following current legislative requirements:

Roads (Scotland) Act 1984

The Roads (Scotland) Act 1984 Section 1, states that "…a local roads authority shall manage and maintain all such roads in their area as are for the time being entered in a list (in this Act referred to as their "list of public roads") prepared and kept by them under this section."

Common Law – Duty of Care

Road Authorities have a Duty of Care under Common Law. The criteria commonly used by the courts to determine if a defendant is liable are:

1. The harm which occurred must be a reasonable foreseeable result of the defendant's conduct;
    - Was the authority aware of the defect?
    - Was the route inspected within assigned timescales?
    - Experience of similar defects and the deterioration/degradation rates? Will the defect deterioration/degradation cause the likelihood and/or impact of the defect to increase before the next inspection?
    - Has there been similar incidents on the authorities' network or is the authority aware of similar incidents occurring?

2. It is fair, just and reasonable to impose liability.
    - Did the authority assess, prioritise and maintain the defect in accordance with their Maintenance Strategy/Manual or equivalent documents?
    - What was the defect risk and priority?
    - If necessary, what action(s) had been taken to repair the defect? Timescale for the repair?
    - Was the defect repaired within specified timescales?

Well Managed Highway Infrastructure – a Code of Practice

On 28th October 2018, Well Maintained Highways will be superseded by Well Managed Highway Infrastructure (WMHI), removing all prescriptive intervention levels, action timescales, inspection frequencies, etc.

The Inspection Operations Manual does not provide any minimum or default standards but provides guidance and advice to support the objective risk assessment of defects.

Inspector Competency

Competency and Training

Road Authorities must ensure that all Road Asset Safety Inspectors are competent.
Taking a consistent approach to this requirement, *Council* are utilising the SCOTS Risk-based Approach to Safety Defect Inspections methodology and training resources.
All safety inspectors are therefore required to undertake this training and achieve a pass grade on the course assessment. This will be arranged by *x role e.g. 'Team Leader'*

Competency Training Records and Plans
A "Training and Competency" record will be kept locally and reviewed at *x interval* by *x role*.
If an inspector does not meet *x Council's* minimum competency requirements, a Training Plan will be developed by *x role* to assist the inspector achieve the necessary level of competency.

Inspection Procedures

Safety Inspections

Planned Cyclic Safety Inspections

The Safety Inspection regime forms a key aspect of the road authority's strategy for managing liability and risk. Its purpose is to systematically identify defects which are hazardous (to any user of the road including drivers, pedestrians, equestrians and cyclists) so that an effective repair can be carried out within an appropriate response time, determined by the level of risk the defect poses.

Replace the following text with details of modes of inspection as per the local strategy:

Cyclic Safety Inspections are carried out to specified frequencies, dependent upon the hierarchy of each section of road or any other factor deemed appropriate by the authority.

Safety inspections are normally undertaken by an inspector in a slow-moving vehicle. In heavily used urban areas, particularly when inspecting footways, walked inspections may be required. It may also be appropriate to inspect cycle routes and / or footways on a bicycle. The method of undertaking each inspection should therefore be subject to a risk based approach considering traffic type, accessibility and footfall. The reason for the mode of inspection adopted should be documented.

The objectives of safety inspection activity are to:

- Minimise the risk of injury and disruption to road users as far as is reasonably practicable,
- Provide a regular, structured inspection of the public road network, within available resources,
- Deliver a consistent, reliable response to identified defects, within available resources,
- Maintain accurate and comprehensive records of inspections and response and
- Provide a clear, accurate and comprehensive response to claims.

During safety inspections, observed defects that provide any foreseeable degree of risk to users will be recorded. The degree of deficiency in the road elements will be crucial in determining the nature and speed of response. Judgement will always need to take account of particular circumstances. For example, the degree of risk from a pothole depends upon not only its depth but also its surface area, location within the road network and other factors such as the volume and speed of traffic.

Inspection Routes

Insert local process of assigning routes to inspectors:

Inspection routes are assigned as follows:

Inspection Tolerances

All road safety inspections will be carried out to the SCOTS recommended frequencies detailed in the following tables and should be completed within the tolerances shown in Table 1, as follows:

Table 1 Inspection Tolerances

Frequency of Inspection	Inspection Tolerances
Monthly	± 5 working days of the Due Date
Quarterly	± 10 working days of the Due Date
Six Monthly	± 15 working days of the Due Date
Annual	± 20 working days of the Due Date

Definition of above terms

- **Monthly** indicates that twelve regular spaced inspections will be carried out per year.
- **Quarterly** indicates that four regular spaced inspections will be carried out per year.
- **Six Monthly** indicates that two regular spaced inspections will be carried out per year.
- **Annual** indicates that one regular spaced inspection will be carried out per year.
- **Due Date** is the programmed date of an inspection.

Revise to reflect local procedure as appropriate:

In the event of being aware that the due date for a programmed inspection cannot be met, the inspector must, without delay, inform the manager and provide the reason(s) for this.

In the case of absence of an inspector due to, for example, annual leave or ill health the roads authority will ensure that a suitably trained substitute Inspector undertakes any inspection due within the time frames set down in this document.

During periods of extreme weather, the roads authority will decide on the viability of a safety survey being undertaken, taking into account the availability of staff and the prevailing weather conditions.

If a monthly inspection is more than 2 weeks late then that inspection will be missed and an inspection carried out at the next due date. The reason for this will be recorded as follows:

[local procedure]

In all other cases where inspection tolerances are exceeded, the manager will decide whether the programme can be accelerated or adjust the inspection programme appropriately and record this decision.

This guidance is primarily intended to refer to planned safety inspections but councils may wish to apply all or part of it to reactive inspections. For example, all inspections/techniques should receive the risk based assessment training but the processes for carrying out reactive inspections will be different. The following section can be used to outline processes for reactive inspections if to be included, or to refer reactive inspectors to those parts of this document which outline the risk based inspection methodology.

Ad-Hoc reactive Safety Inspections

Inspectors may be instructed to undertake ad-hoc safety inspections e.g. in response to a third party report that is deemed to merit inspection of a defect to determine whether reactive repair is required.

Insert local process for assigning such ad-hoc inspections

The process for assigning ad-hoc inspections is as follows:

The risk assessment methodology outlined in the 'Defect Identification and Risk Assessment Process' section of this document will also be adopted for reactive safety inspections.

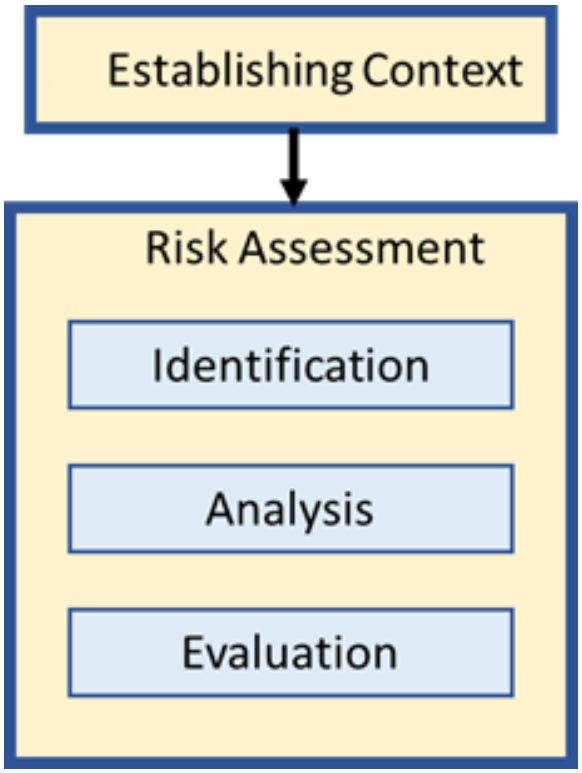
Any individual safety-related defect identified and inspected outside a planned or ad-hoc cyclic safety inspection must be recorded.

Defect Identification and Risk Assessment Process

Inspectors undertaking safety inspections or responding to reported incidents require to use judgement in assessing the risk posed by reported defects. 'Well-Managed Highway Infrastructure: A Code of Practice' recommends that roads authorities adopt a system of defect risk assessment for determining the response categories to road defects.

> ***Note on the rationale behind a risk based approach:***
> *For many councils this guidance represents a step change in the way that defects are assessed. Taking a risk based approach, as per the above code of practice, means that there are NO prescriptive investigation or intervention levels to apply. The rationale for removing these is that the same defect will represent a different level of risk in a different context. In the past this has led to inappropriate and often unnecessary, costly, temporary repairs. Instead, by using a risk based approach, councils can reduce such reactive interventions and target more of their scarce resources towards programmed work that in the longer term will lead to an overall improvement of road condition.*

[Council] is adopting the SCOTS recommended procedure for risk assessment that is based on the ISO31000 Risk Management Process (contained in Appendix B). In undertaking assessment of safety defects, the following steps are applicable:



Step 1: Establishing Context

Establishing context requires the inspector to utilise experience and knowledge during the inspections to assess the road characteristics, such as giving consideration to environment (speed limit, width, rural/urban, road hierarchy, visibility, bend, hill - incline/decline, road camber/crossfall, etc.), relevant road user types (pedestrians, cyclists, horse riders, cars, LGV's, HGV's, PSV's, etc.), traffic volumes, maintenance history, historical incidents/claims/complaints (e.g. experience/knowledge of similar hazards being a contributory factor to incidents/claims within the authority or a neighbouring authority), demographics and key local amenities (proximity to doctors surgery, hospitals, shopping areas, schools, etc.).

Step 2: Risk Assessment

Step 2a: Hazard Identification

The Risk Identification stage involves the inspector identifying road asset defects (hazards) which might pose a risk to road users i.e. lead to a negative consequence. Appendix C of this document provides a list of example hazards that inspectors should consider risk assessing during the inspections, however it should be noted that the list is not exhaustive. Inspectors must utilise experience and judgement, the intention is not to limit identification of hazards to those provided in Appendix C.

Inspectors may identify defective equipment or assets which are NOT the responsibility of the authority, such as Statutory Undertakers reinstatements or equipment (e.g. sunk inspection chamber); in these circumstances a duty of care still applies. The inspector should conduct a Risk Analysis to determine the defect's risk category and priority response as well as following the [Council] local procedure contained in document *(or detail local procedure in this manual)*

Step 2b: Risk Analysis

In general, when assessing risk, the human tendency is to consider the worst possible outcome, rather than the most probable. Psychologically, the word 'risk' forces our thinking down that route.

The following risk analysis procedure is designed to mitigate this 'worst case scenario' thinking and ensure an objective assessment is carried out.

It is important that the analysis is carried out in the defined step sequence to determine the appropriate level of risk and corresponding priority response,

DO NOT WORK BACKWARDS from a Priority conclusion.

Hazards identified through the Hazard Identification step must therefore be analysed in terms of their significance which means assessing the **likelihood** of the risk occurring followed by the most probable **consequences (impact/severity)** should the risk occur.

1. Assess Risk Likelihood

Table 2 (below) should be used to assess Risk Likelihood.

It contains descriptions of the possible likelihood of encountering the hazard, quantified on a scale of Remote to Almost Certain.

The information ascertained in "Step 1 – Establish Context" should inform the inspector's judgement in assessing the likelihood of a road user encountering the hazard.

Table 2 Risk Likelihood

Likelihood / Probability	Likelihood Description	
Almost Certain	Will undoubtedly happen	Daily
Likely	Will probably happen, but not a persistent issue	Monthly
Possible	May happen occasionally	Annually
Unlikely	Not expected to happen, but it is possible	10 Years
Remote	Improbable	20 Years

2. Assess Risk Consequence (Impact/Severity)

Table 3 (below) should be used to assess the **most probable** (NOT worst possible) Consequence of a road user encountering the hazard (reasonably foreseeable extent of the impact on Service, Finance, People and Reputation). It contains descriptions of the possible consequences of encountering the hazard, quantified on a scale of Negligible to Catastrophic.

Table 3 Consequence (Impact/Severity)

Consequence (Impact/Severity)	Description			
	Impact on Service Objectives	**Financial Impact**	**Impact on people**	**Impact on Reputation**
Catastrophic	Unable to function, inability to fulfil obligations	Severe financial loss	Death	Highly damaging, severe loss of public confidence
Major	Significant impact on services provision	Major financial loss	Extensive injury, major permanent harm	Major adverse publicity, major loss of confidence
Moderate	Service objectives partially achievable	Significant financial loss	Medical treatment required, semi-permanent harm up to 1 year	Some adverse publicity, legal implications
Minor	Minor impact on service objectives	Moderate financial loss	First aid treatment, non-permanent harm up to 1 month	Some public embarrassment, no damage to reputation
Negligible	Minimal impact, no service disruption	Minimal financial loss	No obvious harm/injury	No interest to the press, internal only

All hazards identified must be assessed against each of the four consequence categories (Service Objectives, Financial, People and Reputation) contained in Table 3 (above); **the consequences with the highest severity** of the four categories should be considered in the Risk Analysis.

With practice and experience conducting the above risk assessment process steps is a quick assessment. Inspectors are not required to record their reasons for selecting a particular category of likelihood and impact, only the result of this assessment. The rationale for this is that to do so would slow down the inspection process and make it impractical to carry out with the current level of resources.

Step 2c: Risk Evaluation

The outcomes from the Likelihood and Consequence assessment are used to determine the risk category of the hazard (Table4).

Insert local arrangements for completing the evaluation (depending on whether using manual or electronic system to identify the priority response)

Table 4 Risk Matrix

Consequence / Likelihood	Negligible	Minor	Moderate	Major	Catastrophic
Remote	**NR**	**NR**	**NR**	**NR**	**P3**
Unlikely	**NR**	**NR**	**P4**	**P4**	**P3**
Possible	**NR**	**P4**	**P4**	**P3**	**P2**
Likely	**NR**	**P4**	**P3**	**P2**	**P1**
Almost Certain	**NR**	**P3**	**P2**	**P1**	**P1**

Table 5 Risk Category & Priority Response

Risk Category	Priority Response
Critical Risk	**Priority 1 response**
High Risk	**Priority 2 response**
Medium Risk	**Priority 3 response**
Low Risk	**Priority 4 response**
Negligible Risk	**No response#**

The associated response times have been deliberately omitted from this guidance to encourage inspectors to be objective in their assessment and not be influenced by consideration of response times.

Intersections and Multiple Road Users Types

The hazard context considers the location and the types of road users which could be impacted by the defect. Inspectors should consider the different impacts and consequences for each road user type (e.g. pedestrians, cyclists, vehicle drivers, etc.) and at intersections, consider the hierarchy of each route. Inspectors **must therefore assess the likelihood and consequence for <u>each</u> road user type and/or route hierarchy**. The priority of the response is based on the highest priority determined from the risk matrix (Table 4).

Appendix A 'Example Scenarios' Scenario 1 provides an example scenario of assessing the impact and consequences of a defect on multiple road user types. The most common instance where this occurs is at pedestrian crossings where defects on the carriageway must be considered in terms of impact on pedestrians as well as vehicles.

Inspection Records

Insert local procedure for how inspection records are captured and stored. This section can also be used to specify the procedure to be followed for non-council defects recording e.g. utility defects.
It is recommended that the procedure for recording days when inspections cannot be undertaken are also set out here (if not already covered in the Inspection Tolerances section):

Local procedure…

Health and Safety

Amend following health and safety instructions, or reference local health and safety guidance document. Please note, this is suggested text only.

General

In General road inspections are conducted from a slow-moving motor vehicle, bicycle or foot.

The Council's Lone Working Procedures must be followed when an inspector is undertaking a safety inspection on their own.

Vehicles must be driven or ridden at an appropriate speed to allow any defects to be identified.

Health and Safety

Inspections are to be conducted in accordance with [Council] procedures for the health, safety and health of its employees and others:

1. All staff engaged in inspections must wear high visibility clothing to BS EN 471 class 3.
2. All vehicles used to carry out inspections shall be liveried to an appropriate standard and all necessary vehicles and equipment (e.g. Data Capture Device, Software, etc) checks shall be carried out prior to inspections being undertaken.
3. Driven safety inspections should be undertaken by two people.

All surveys should make use of two-way communications (i.e. mobile telephone).

Drivers must abide by Regulation 110 of the Road Vehicles (Construction and Use) Regulations, which prohibits a person from driving a motor vehicle from using a held-hand mobile telephone or a hand-held device.

Communication devices must only be utilised by drivers when the vehicle is safely parked, unless it is an emergency and the driver needs to dial 999 and it is unsafe or impractical to stop.

When parking the vehicle, vehicles should be parked off the live carriageway wherever possible. If this cannot be achieved then there must be clear visibility in both directions and the roof mounted beacon must be switched on. Traffic must not be forced across continuously solid white lines. If this cannot be achieved, advanced temporary traffic signing must be installed.

Make safe

If a defect is assessed as a serious hazard (Critical Risk - Priority 1 response) to road users, the inspector should remain at the hazard until the risk treatment is implemented.

[insert how the defect is to be protected]

Equipment

All inspection vehicles should carry a minimum of three 750mm traffic cones. The cones should be kept clean and should be inspected quarterly and replaced as necessary. [Council] will keep a record of the cone inspections.

In addition to any other equipment they consider necessary, SCOTS recommend, where it is locally feasible, that Inspectors carry a digital camera to record defects and a GPS enabled system to accurately record the location of defects.

Documents

The safety inspection team should also carry a copy of:

a) This guidance document

b) New Roads & Street Works Act 1991 – Code of Practice for Inspections

c) Safety at Street Works and Road Works, A Code of Practice

Appendix A - Example Scenarios

The examples in this section **are for illustration purposes only**, demonstrating the thought process for the Risk Based Approach and highlighting how context changes can impact the Risk Category.

Scenario 1 provides an example showing the process for assessing a defect based on the different road user types that typically utilise the road asset.

Scenario 2 and 3 illustrate that the context can change the likelihood and/or consequences, therefore impact the Risk Category/Priority Response.

Scenario 1

In this first scenario of a gully deterioration, the Inspector considers likelihood and consequences on each of the alternative road users that may be impacted by the defect to determine the appropriate response.

Context

- Bituminous patch around a gully has deteriorated creating a difference in level in the road surface, plus edge of adjoining material and gully casing exposed, creating a possible trip hazard.

The following considerations, where known, should be taken into account.

Likelihood Considerations

- Urban Environment
- Narrow road (roughly 5 metres)
- Over 5,000 motor vehicles per day travel along the route
- Commuter route used by over 100 cyclists; no dedicated cycleways/cycle path.
- Local urban centre/high street, with shops and services (e.g. banks, doctors, dentists, etc) both sides of road
- Pedestrian crossing approximately 20 metres from location

Consequence Considerations

- 30mph speed limit on single two-lane carriageway
- Mixture of ages utilise the shops and facilities
- Part of a national cycle route and therefore relevant to the authority's strategy on promoting more sustainable transportation and healthier residents through cycling. Due to restrictive widths of the road boundary through the high street, the dedicated cycleway ends, due to not being possible to create or construct dedicated cycleway or cycle paths.

The following considerations are included here for demonstration purposes, such information would only form part of the assessment if known by the inspector. It is not suggesting that inspectors seek out such information.

- National cyclists group members magazine published article on the deterioration of the Scottish road network, using this road as an example and photograph of editor and his bike after his incident. This article was picked up by the BBC; BBC interviewed the editor and published his pictures on the national BBC website, plus appeared on BBC Scottish News.
- Five complaints over the last twelve months received from local cyclists and a nation cyclist group regarding the general condition of road, plus:
  - Reports/claims for property damage (damaged wheels)
  - Reports of minor injuries (cuts, grazes and bruises); one of the injured is editor of national cyclist group members magazine
- One claim over the last twelve months from pedestrian who tripped and fell over a similar defect, breaking their arm and collar bone.
- Ten claims for damaged tyres/wheels after hitting similar defects along the road in the last three years.

Risk Analysis

Road User 1: Car Driver

Likelihood: **Almost Certain**

Context indicates the road is narrow, plus the defect is roughly 0.5 metre from the kerb, which would be close to vehicles wheel paths.

Consequence: **Negligible**

There have been claims for damaged tyres and wheels in the last three years, but the likelihood of this is improbable based on the number of claims vs daily traffic flow. The likely consequences are that 'no noticeable injury' or 'minimal financial lose' occurs; therefore, the consequences are 'Negligible'.

Priority: **No Response Required (Negligible risk)**

Utilising the Risk Matrix (table 3) the defect is prioritised as "No Response Required".

Road User 2: Motorcyclist

Likelihood: Unlikely

Context indicates the road is narrow, therefore motorcyclists would most likely ride down the centre of the lane, avoiding the defect.

Consequence: **Negligible**

Speed limit is low, therefore if a motorcyclist did hit the defect, the likely consequence is 'no noticeable injury' or 'minimal financial lose' occurs; therefore, the consequences are 'Negligible'.

Priority: **No Response Required (Negligible risk)**

Utilising the Risk Matrix (table 3) the defect is prioritised as "No Response Required".

Road User 3: Cyclist

Likelihood: **Possible**

Context indicates the road is narrow, therefore cyclists are likely to be pushed towards the kerb by motor vehicle drivers, therefore increasing the chance of hitting the defect.

Consequence: **Major**

- **Service –** It is the authority's strategy to promote cycling to improve health and sustainability of the authority and the route forms part of the national cycle route network. Due to the condition of the road, it would make people less likely to cycle to work or to shop. Therefore, the likely consequence is the 'Service objective is partially achievable' which is a '**Moderate'** consequence.
- **Financial** – Context indicates that there are up to five claims against the authority for damage to the bikes and loss of earnings over the last twelve months. These financial

losses are likely to be moderate for the authority and/or the claimant, therefore the consequences have been assessed to be '**Minor'**.

- **People** – Context indicates that cyclists that have hit similar defects are likely to get minor injuries, therefore the consequences have been assessed to be '**Minor'** due to 'First aid treatment, non-permanent harm up to 1 month'.
- **Reputation –** Context indicates that there has been national media interest in the authorities and specifically this roads condition, therefore the likely consequences of another incident are '**Major'**, due to 'Major adverse publicity'.

Priority: P3 (Medium Risk)

Utilising the Risk Matrix (Table 3) the defect is prioritised P3 "Medium Risk".

Road User 4: Pedestrian

Likelihood: Possible

Context indicates that there has been an incident where a pedestrian has tripped over a similar defect in the last twelve months.

Consequence: Moderate

Context indicates that the claimant's injuries include a broken arm and fractured collar bone; the consequences have been assessed to be:

- **People** – 'Moderate' due to 'Medical treatment required, semi-permanent harm up to 1 year'.
- **Financial –** 'Minor' due to the 'Moderate financial loss' to the injured claimant or the authority, if the claim is successful.

Priority: 4 (Low risk)

Utilising the Risk Matrix (Table 3) the defect is prioritised as Priority 4 (Low Risk) due to the reputational risk to the authority.

Scenario 1 - Summary Risk Analysis

Road User	Priority Response – Risk Category
Car Driver	No Response required
Motor Cyclist	No Response required
Cyclist	**P3 - Medium Risk**
Pedestrian	P4 – Low Risk

RESULT: Following the SCOTS Risk Based Approach for all road user types, the highest Risk Category/Priority Response take precedence, therefore **'Priority 3 – Medium Risk'** for the Cyclist.

Scenario 2

This scenario illustrates how the context can impact the likelihood of the defect and change the Risk Category/Priority Response.

Scenario 2a

Context

- Damaged Vehicle Restraint System (VRS) with a drainage ditch and woodland behind the VRS.

Likelihood Considerations

- Rural Environment
- Over 1,000 vehicles per day travel along the route, of which 100 HGV's per day
- Inspected Quarterly
- No record of other historical VRS damage within 500m of location
- Straight road with good visibility
- No junctions or high-risk locations within 1km of the damage

Consequence Considerations

- 40mph Speed limit on Single Two-way Carriageway
- Majority of vehicles are cars.
- Narrow drainage ditch and woodland at same ground level as road behind VRS

Risk Analysis

Likelihood: **Unlikely**

Based on the information provided in the context, the likelihood of the hazard being encountered (VRS being struck in close proximity of the damage) is **"Unlikely" ('Not expected to happen, but is possible')** due to low traffic flows and the location not being in the vicinity of highway high risk sites, such as features that could cause sudden braking e.g. junctions, crossings or bends.

Consequence: **Moderate**

The VRS damage will compromise the asset's structural performance affecting the VRS function of preventing vehicles from leaving the road. If the VRS was struck again while damaged, it is anticipated that it would not prevent the vehicle leaving the road and result in it hitting a tree causing **moderate injury (medical treatment required, semi-permanent harm up to 1 year) and moderate financial loss**. Based on this analysis, the consequence has been assessed as Moderate

Priority: **4 (Low risk)**

Utilising the Risk Matrix (table 3) the defect is prioritised as Priority 4 – Low risk; likely action is to add the works to the VRS Planned Works Programme to be repaired based on the authorities works prioritisation process.

Scenario 2b

Context

- Damaged Vehicle Restraint System (VRS) with a drainage ditch and woodland behind the VRS.

Likelihood Considerations

- Rural Environment
- Over 10,000 vehicles per day travel along the route, of which 4,000 HGV's per day
- Inspected Weekly
- Damage is after right bend with poor visibility
- Damage within 100m of a traffic signal-controlled junction; traffic queues are known to be up to 50m during peak hours at the signals.
- 40mph speed limit on Single Carriageway

Consequence Considerations

- 40mph speed limit on Dual Carriageway
- Drainage ditch and woodland behind VRS

Risk Analysis

Likelihood: **Likely**

Based on the information provided in the context, the likelihood of the VRS being struck in close proximity of the damage is **"Likely" ('Will probably happen, but not a persistent issue')** primarily due to the VRS damage being situated after a bend with poor visibility and close to a traffic signal-controlled junction. Additionally, at peak times, it is known that traffic queues can be up to 50m in length. Finally, the traffic flows have increased compared to Scenario 2a, which also contributes to the increase in the likelihood of a road user encountering the hazard.

Consequence: **Moderate**

Compared to Scenario 2a, the context has not changed any of the factors which would impact the consequence of the hazard, therefore it is anticipated the consequence are the same as Scenario 2a and remain as **"Moderate".**

Priority: **3 (Medium risk)**

Based on the Risk Matrix (table 3) the defect priority increase to Priority 3 – Medium risk; the likelihood of the VRS being hit has increased, but the probable consequence remains the same. The authority should action a risk treatment within the Road Authorities local timescales for the Priority 3.

Scenario 2c

Context

- Damaged Vehicle Restraint System (VRS) on an elevated section of road, with 4m in height difference woodland behind the VRS and the road surface

Likelihood Considerations

- Rural Environment
- Over 10,000 vehicles per day travel along the route, of which 4,000 HGV's per day
- Inspected Weekly
- Damage is after right bend with poor visibility
- Damage within 100m of a traffic signal-controlled junction; traffic queues are known to be up to 50m during peak hours at the signals.
- 60mph speed limit on Single Carriageway

Consequence Considerations

- 60mph Speed limit on Single Two-way Carriageway
- Road is on an elevated section, with a 4-metre retaining wall behind the VRS followed by woodland.

Risk Analysis

Likelihood: **Likely**

Compared to Scenario 2b, the speed limit has increased from 40mph to 60mph, this is anticipated to increase the possibility of incidents occurring, however not sufficiently to change the likelihood from 'Likely' to 'Almost certain'; therefore, the likelihood remains '**Likely'**.

Consequence: **Catastrophic**

Compared to Scenario 3c, the speed limit has increased from 40mph to 60mph and the road is now on an elevated section with a 4-metre drop height difference between the road surface and the woodland ground. Due to the changes in speed limit and the height of the road, if a vehicle was to strike the damaged VRS and the VRS failed to contain the vehicle, it is anticipated that the most probable consequence is envisaged to result in a Death, due to the higher speed of the road and the vehicle also falling from a height of 4m. Therefore, the consequences have been assessed to be '**Catastrophic'.**

Priority: 1 **(Very High risk)**

Utilising the Risk Matrix (table 3) the defect is prioritised as Priority 1 – Very High risk; this hazard would require the inspector to take implement a risk treatment immediately to either reduce the likelihood, consequence or both of the hazard; the risk treatment can be a temporary measure until the permanent risk treatment can be implemented. The inspector could consider either temporary traffic management to reduce the likelihood, a temporary barrier to reduce the consequence or a combination of both as temporary risk treatments.

Due to the Very High risk nature of the hazard, the inspector must stay at the site until the temporary risk treatment is implemented; however the priority is to safety, therefore the inspector must ensure that they follow the local Health and Safety Procedures.

Scenario 2 - Summary Risk Analysis

Context	Priority Response – Risk Category
If Context 2a applied	Priority 4 – Low risk
If Context 2b applied	Priority 3 – Medium risk
If Context 2c applied	Priority 1 – Very High risk

RESULT: Scenario 2 examples provides an insight into how the risk rating can change for the **same defect** with slightly **different contexts that** changes the likelihood and /or consequences. It also demonstrates that not all defects are the same and the need to consider the characteristics of the location when assessing the likelihood of encountering the defect and the probable consequence.

Scenario 3

As with scenario 2, this scenario illustrates how the context can impact the likelihood and/or consequence of the defect and change the Risk Category/Priority Response.

Scenario 3a

Context

- Deteriorated road surface on the approach to a junction with a high trafficked route which connects a city to a large town.

  Likelihood Considerations

  - Rural Environment
  - Minor road providing access to three farms only
  - Less than 20 vehicle movements per day
  - No recorded or experience of incidents at junction

  Consequence Considerations

  - 60mph Speed limit on major and minor roads
  - Road is mainly utilised by agricultural, 4x4 and HGV's vehicles.

Risk Analysis

Likelihood: **Almost Certain (Agricultural vehicles)**

Based on the information provided in the context, even though the vehicle numbers are low, the likelihood of vehicles (bearing in mind user type) running over the deteriorated carriageway surface is 'Almost Certain'. It would be difficult to avoid the hazard as the deterioration is extensive, with pot-holes along the road and loose chippings.

Consequence: **Negligible**

Consequence of the road deterioration on the Milk lorries and agricultural vehicles utilising the road is "Negligible" causing no harm/injury, no damage to reputation, minimal financial loss and minimal impact of services.

Priority: **No Response**

The Risk Matrix (Table 3) indicates that this defect is a NR (No Response).

Scenario 3b

Context

- Deteriorated road surface on the approach to a junction with a high trafficked route which connects a city to a large town.

Likelihood Considerations

- Rural Environment
- Minor road leading to a small village containing roughly 200 homes.
- Approximately 300 vehicles per day
- No recorded or experience of incidents at junction

Consequence Considerations

- 60mph Speed limit on major and minor roads
- Road is mainly utilised by cars, no experience or knowledge of motorcyclists or cyclists using the road

Likelihood: **Almost Certain (cars)**

Given the extent of deterioration across the road the likelihood of vehicles (mainly cars) driving over the hazard is still 'Almost Certain'.

Consequence: **Minor (Cars)**

The potholes are fairly near the junction, so vehicles should not be approaching them at high speed, however the volumes encountering them is high and deterioration before the next inspection is likely to continue. The probable consequence of a car driving over these pot-holes is damage to the vehicle such as a buckled wheel or damaged tyre, incurring a moderate financial loss for the vehicle owner. Based on table 2, the impact would thus be classified as "Minor".

Priority: 3 (Medium Risk)

The Risk Matrix (Table 3) indicates that this defect is classified as a priority 3 defect.

Scenario 3c

Context

- Deteriorated road surface on the approach to a junction with a high trafficked route which connects a city to a large town.

Likelihood Considerations

- Rural Environment
- Minor road connects two major routes; used as a rat run during peak times.
- Over 750 vehicles per day
- Recent incident where a motorcyclist received severe injuries when losing control on road in similar condition

Consequence Considerations

- 60mph Speed limit on major and minor roads
- Road is mainly utilised by a variety of different vehicles

Likelihood: Almost Certain (cars), Likely (motor cyclists)

The likelihood of encountering the hazard is 'Almost Certain' for cars and large vehicles. For motor cyclists there is greater opportunity to 'navigate' the potholes approaching the junction, however encountering them is 'likely' due to the extent of the deterioration and previous incident occurring in similar circumstances.

Consequence: Minor (cars), Moderate (motor cyclists)

The most probable consequence for cars will be as scenario 3b (Minor), however for a motorcyclist the risk is higher, most probably losing control and coming off the bike as in recent incident. Although a 60mph road, speed of approach is unlikely to be very high due to the proximity of the give way junction. The most probable consequence to the motorcyclist would be 'Moderate': medical treatment required, semi-permanent harm up to 1 year.

Priority: 3 for motor cyclists (Medium Risk)

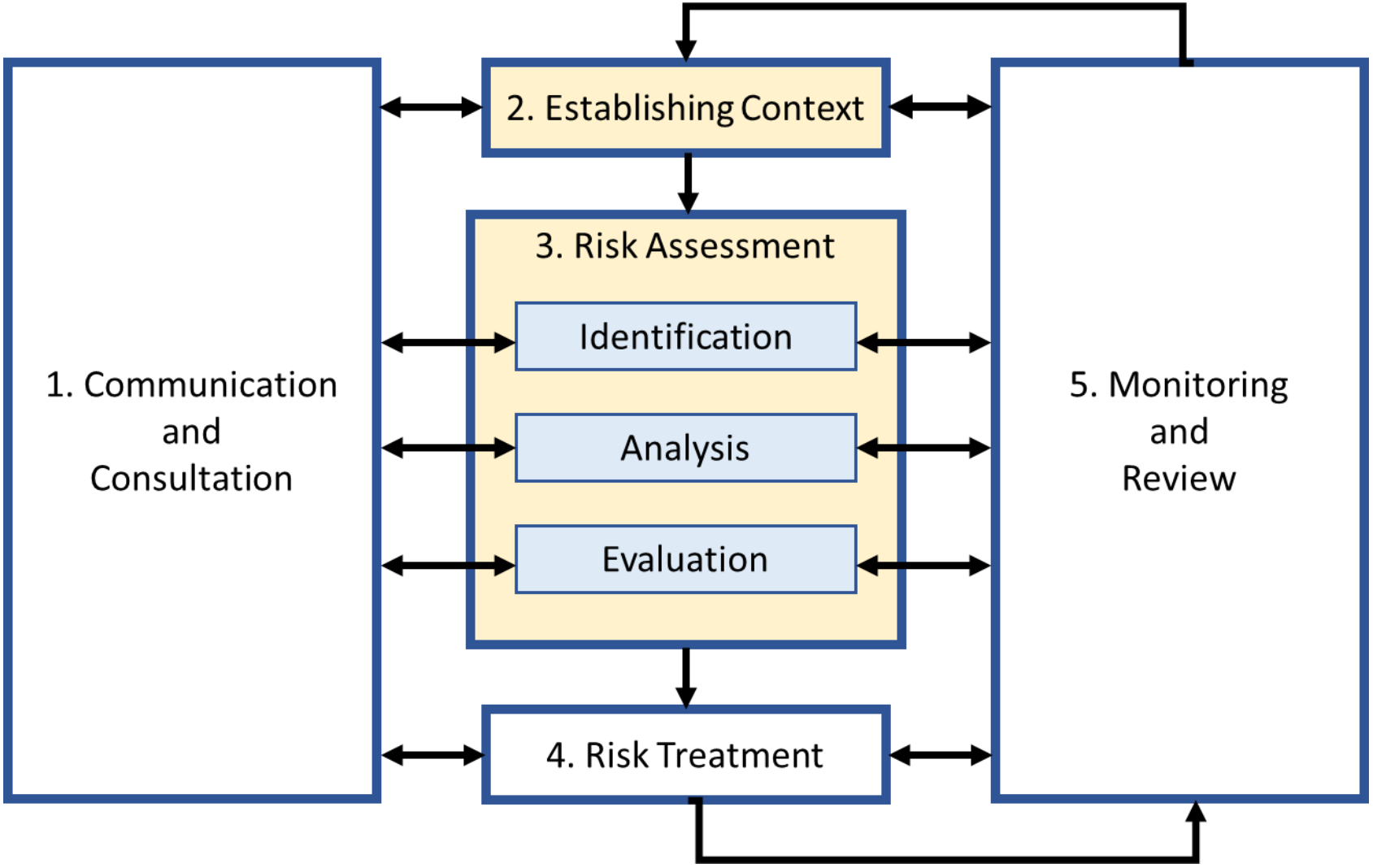
The assessment should prioritise the road user to which the hazard poses the greatest risk, in this case motorcyclists. The Risk Matrix (Table 3) indicates that the hazard assessed as Likely/Moderate is classified as a priority 3 defect.

Scenario 3 - Summary Risk Analysis

Context	Priority Response – Risk Category
If Context 3a applied	No response required
If Context 3b applied	Priority 3 - Medium Risk
If Context 3c applied	Priority 3 - Medium Risk

Scenario 3 examples provides an insight how the risk rating can change for the same defect within slightly different contexts that change the likelihood and/or consequences. It also demonstrates the need to take into account the alternative road users and consider those to whom the hazard poses the greatest risk.

Appendix B – ISO31000 Risk Management Process



Appendix C – Example Defects

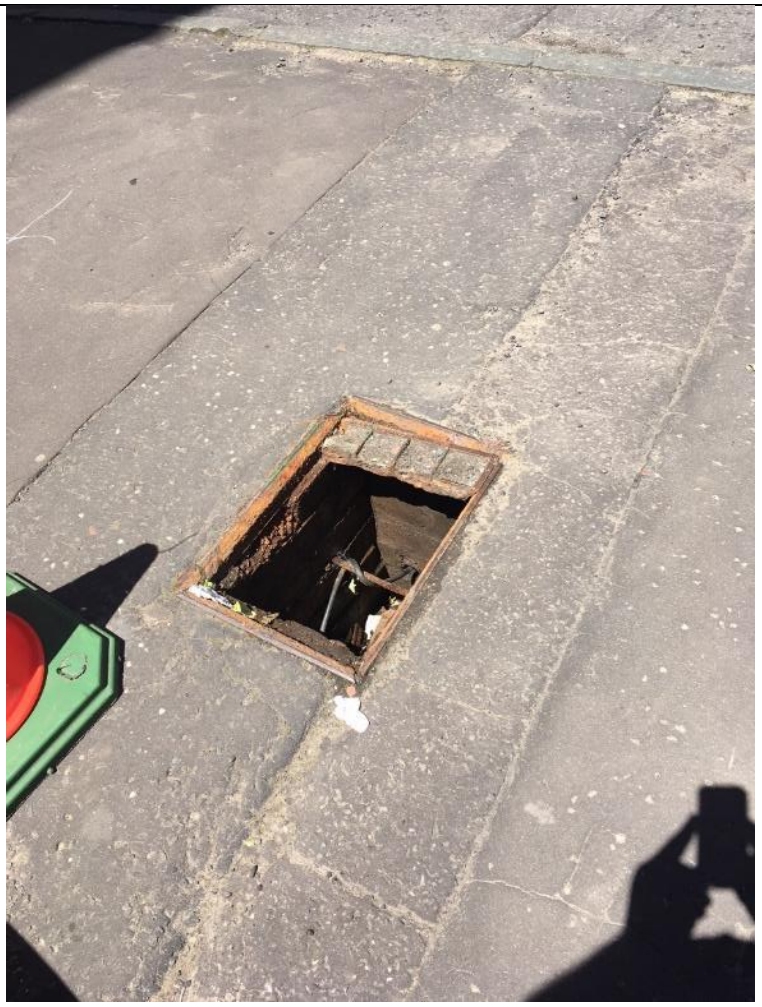
Carriageways

Defect	Example
Surface Defects	
Abrupt level differences in running surface	

Edge deterioration of the running surface	
Excessive standing water, water discharging onto and / or flowing across the road	

Blocked gullies and obstructed drainage channels or grips which could lead to ponding or flooding	
Debris and/or spillages likely to be a hazard	

Missing road studs	
Badly worn Stop, Give Way, double continuous white line or markings associated with TRO's	

Missing or significantly damaged covers	

Footways, Footpaths and Cycleway

Defect	Example
Surface Defects	
Excessive standing water and water discharging onto and or flowing across the foot/cycleway	

Dangerous rocking paving slabs	
Large cracks or gaps between paving slabs	

Missing or significantly damaged covers	
Debris and / or spillages likely to be a hazard	

Damaged kerbs	

Street Furniture

Defect	Example
Damaged vehicle restraint systems, parapets, handrails or guardrails	
Damaged boundary fence where animals or children could gain access	

Damaged or missing signs, such as Give Way, Stop, Speed Limit	

Street Lighting

Defect	Example
Damaged column, cabinet, control pillar, wall mounting	
Exposed, live electrical equipment	

Other Assets

Defect	Example
Sight-lines obstructed by trees and other vegetation	
Trees in a dangerous condition	

Earthslips where ~~debris has encroached or is likely to encroach the road or causing the road to fall away~~ material undermines road construction causing localised collapse.	
Rocks or rock faces constituting a hazard to road users	

Damaged road structures