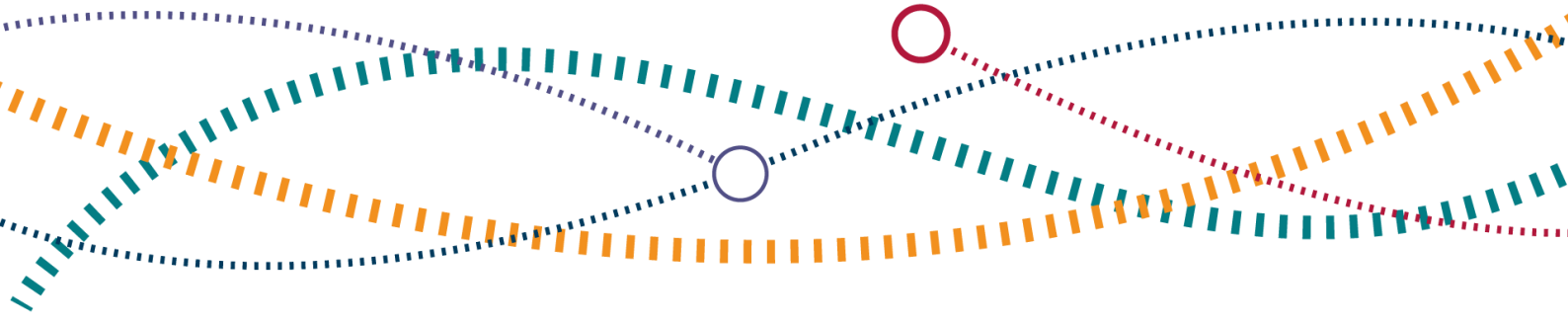
OFFICE OF RAIL AND ROAD

Management of Track Geometry by On-Track Machines

Targeted Assurance Review



Contents

Glossary of Terms

Abbreviation / Acronym	Description
ABP	Activity based plans.
CCQ	Colour Coded Quality charts. Charts used to display changes in standard deviation of 1/8th mile sections over time and assess against track quality bands.
CSI	Composite Sustainability Index. A composite measure of remaining life of a number of Network Rail's key assets.
DU	Delivery Unit.
eDST	Enhanced Decision Support Tool.
GTG	Good Track Geometry.
L1 and L2 Geometry Faults	Designation of faults received through the 'Track Geometry Reports', received following runs of the Track Recording Vehicles.
LADS	Linear Asset Decision Support tool.
MDU	Maintenance Delivery Unit.
ORR	Office of Rail & Road. The independent safety and economic regulator for Britain's railways.
OTM	On-track machines, includes tampers and stoneblowers.
PTG	Poor Track Geometry. A percentage representation of track that has geometry non-compliant to Network Rail standards (i.e. 'very poor' and 'super-red').
QLM	Quarterly Liaison Meeting.
RAM	Route Asset Manager / Regional Asset Manager

RF11	An annual reforecasting activity undertaken by Network Rail in period 11. Actuals versus plans are reported for maintenance and renewals delivery and the remaining years plans are reforecast.
RFI	Request for Information.
ROTME	Route On-Track Machine Engineer
RPP	Railway Planning & Performance.
SBP	Strategic Business Plan. The plans through which Network Rail sets out their strategy in the Control Period for each business area.
SD	Standard Deviation.
TAR	Targeted Assurance Review.
TGR	Track Geometry Reports. Reports issued following run of track recording vehicles, which detail findings and requirements.
TME	Track Maintenance Engineer.
VTISM	Vehicle Track Interaction Strategic Model. The whole life cost model for the vehicle – track system utilised by Network Rail.

Executive Summary

Purpose

Management of track geometry using On Track Machines (OTM) is one of the highest priorities within the track asset discipline. Inappropriate OTM management decisions will lead to performance impacts and in certain circumstances safety implications. Network Rail spend a significant amount of time and money on the procurement, leasing and maintenance of OTMs and this warrants scrutiny to ensure ongoing effectiveness and efficiency.

Network Rail relies on successful deployment of OTMs, specifically tampers and stoneblowers to maintain track geometry. Tamping is the preferred method of track geometry maintenance. Tamping maintains track to a high degree of accuracy, however as the underlying ballast breaks down, it becomes increasingly difficult to maintain high quality long-lasting geometry. Stoneblowing machines are maintenance machines that are an alternative to tamping. These are used where ballast has degraded or become significantly fouled and tamping no longer produces a sustainable result.

As part of our Targeted Assurance Review programme, we reviewed the procurement of the new stoneblower fleet. In tandem, we reviewed the standards and guidance describing how track geometry is managed at Maintenance Delivery Unit level. Our review included the monitoring and assurance of OTM activities.

The findings have been split into two reports. This report focuses on the management of track geometry. The accompanying report on the Stoneblower business case can be found on the ORR's website[1].

Objectives

The objectives of this Targeted Assurance Review are to assure us that:

(a) There are appropriate technical standards and guidance in place for the management of stoneblowing and tamping;

(b) There are suitable success criteria identified for on-track machine activities;

(c) Competency management systems are in place that support the effective delivery of stoneblowing and tamping;

[1] Targeted assurance review reports: engineering and asset management assurance work | Office of Rail and Road (orr.gov.uk)

(d) Systems supporting effective decision making are in place; and

(e) Data used for decision making and evaluating the effectiveness of stoneblowing and tamping are understood and assured.

Conclusions

- There is a lack of guidance and training for staff making decisions on requirements for stoneblowing. Several of the supporting standards and guidance documents were found to be significantly out of date. We recognise that work is being done in the introduction of new decision support tools and roll-out of the Track Competency Framework that should enhance competency and decision making.

- Success criteria for on-track machines are typically limited to improvements in track geometry traces and standard deviations. We saw some consideration for how specific track geometry defects could be targeted in the specification of work.

- We saw variability of the role of the Route On-track Machine Engineer across the regions and the associated reporting line. We did not see a defined competency profile for the role. Staff in the role would benefit from assessment through the Track Competency Framework to allow regions to understand the responsibilities and requirement of the role within their organisation and support any training or competency requirements.

- We did not see defined strategies for substituting stoneblowing for tamping. We observed that tamping is undertaken until it is perceived as no longer providing a benefit – then a switch to stoneblowing is undertaken. This judgement relies on local expertise and leaves open the possibility for local bias.

- Regions have proactively built their own degradation models to support this decision making. However, the new 'enhanced Decision Support Tool' (eDST), supplied by the Technical Authority was stated to capture this functionality. We will continue to monitor the rollout of this tool and will be assuring ourselves that it delivers the promised benefits.

- We noted issues around capturing data within Ellipse. This stemmed from variety in units of measure or mixing of job codes within activities. This aligns with our findings from the review of the business case for the new fleet of stoneblowers. A recommendation has been made in that review around improvement of supporting data.

We have made three recommendations based on our findings.

Recommendation 1

Network Rail should define competency profiles for their Route On-Track Machine Engineers. The role should be defined within the Track Competency Framework that is being rolled out and assessment completed against this to understand any supporting requirements.

We will continue to monitor the ongoing rollout and engagement with the Track Competency Framework through our liaison meetings with the Technical Authority.

Recommendation 2

Network Rail should assure the uptake and effectiveness of the tools and systems used to support decision making in relation to the planning and management of OTM. This should demonstrate the data sources drawn on, the system requirements, interdependencies between systems, areas of overlap and whether these are fit for purpose, in practice.

Recommendation 3

Network Rail should assess the adequacy of the existing suite of standards and guidelines relating to the use of on-track machines. This should identify any associated risk and establish any future requirements.

We will review the responses to these recommendations and state of progress in March 2022. This will inform our approach to Periodic Review 2023 and our future targeted assurance review programme.

1. Introduction

Purpose

1.1 This Targeted Assurance Review (TAR) was undertaken to assess the management of the On-Track Machine (OTM) stoneblower fleet during 2020-21. As part of this TAR, the Office of Rail and Road (ORR) sought assurance that there is sufficient guidance and assurance of the management of track geometry and utilisation of on-track machines.

1.2 The TAR has been split into two reports;

(a) The procurement of the new fleet of OTM stoneblowers.

(b) The management of track geometry by OTM stoneblowers and tampers.

1.3 This document provides a record of the strategy, findings, analysis and recommendations for "The management of track geometry by OTM". The accompanying report on "the procurement of the new fleet of OTM stoneblowers" can be found on the ORR's website[2].

1.4 This report was based on responses to requests for information (RFI), as well as supplementary meetings with key personnel responsible for the day-to-day management of stoneblowing and tamping.

Background

1.5 The ORR's Railway Planning & Performance (RPP) directorate is responsible for the monitoring and holding to account of Network Rail for the delivery of its outputs and obligations set out in the Periodic Reviews.

1.6 Network Rail relies on effective and efficient deployment of tampers and stoneblowers to maintain track geometry. Management of track geometry is a high priority for the track asset discipline. Inappropriate OTM management decisions will lead to safety and performance impacts and in certain circumstances safety implications. Network Rail spend a significant amount on the procurement, leasing and maintenance of OTM to support track geometry activities. This therefore warrants continued scrutiny to ensure ongoing effectiveness and efficiency.

[2] Targeted assurance review reports: engineering and asset management assurance work | Office of Rail and Road (orr.gov.uk)

1.7 Tamping is the preferred method of track geometry maintenance. Whilst tamping maintains track to a high degree of accuracy, it becomes difficult to achieve and maintain high quality and long-lasting geometry as the underlying ballast breaks down. Stoneblowing machines are track geometry maintenance machines that act as an alternative to tamping. These are useful where ballast has degraded or become significantly fouled and tamping no longer produces a sustainable result.

1.8 Through ongoing liaison, we were aware that Network Rail had begun the process to procure a new fleet of stoneblowers. We had concerns around the current utilisation of the existing fleet and decided to undertake a TAR to assess the procurement of the new fleet.

1.9 As part of this TAR, we decided to include the 'management of track geometry through OTMs' as part of the scope. This would assure Network Rail's capability in this area and identify current risks or opportunities. Through this, we sought assurance that:

(a) There are appropriate technical standards and guidance in place for the management of stoneblowing and tamping;

(b) There are suitable success criteria identified for OTM activities;

(c) Competency management systems are in place that support the effective delivery of stoneblowing and tamping;

(d) Systems supporting effective decision making are in place; and

(e) Data used for decision making and evaluating the effectiveness of stoneblowing and tamping are understood and assured.

Approach

1.10 Our approach included creating and distributing a set of questionnaires addressing the items described in 1.9. These responses were followed up by meeting with key individuals.

1.11 RFIs were sent to three Track Route Asset Managers (RAM)[3]. Through the RFI we sought information on:

[3] **Note**: This was completed prior to the final stages of Network Rail's Putting Passengers & Freight First (PPFF) programme. A number of roles have since changed.

- Local standards or processes accompanying OTM activities;
- Key Performance Indicators (KPIs) used for the monitoring of these activities, how they are assured and feed back into maintenance planning;
- How track geometry is managed at Delivery Units, including how decisions on OTM requirements and different intervention methodologies were decided;
- Local initiatives to look at OTM requirements and improve efficiency; and
- How data quality is managed and assured.

1.12 Following the responses to the RFIs, we met with a Track Maintenance Engineer and Route On-Track Machine Engineer from each of the selected regions. These conversations explored the following:

- Roles and responsibilities in relation to track geometry management and the planning & utilisation of OTM;
- The interfaces with other key stakeholders;
- Their key competencies in relation to track geometry and OTM management;
- What tools and processes are available to support their decision making; and
- What systems are used to manage data and how this is verified.

2. Findings

Desktop analysis

Technical standards & legislation

2.1 We reviewed relevant standards and Track Work Instruction (TWI) documents relating to the planning of mechanised track treatment. These have been listed in Appendix 01.

Observation 01 – Several of the technical documents relating to track geometry OTM were old and dated back to the mid-2000s. A number of these were not up to date with modern standards, tools or technology.

RFI – Network Rail regions

2.2 RFIs were distributed to selected Network Rail regions. The following routes were selected for further analysis:

- Kent and Sussex routes (Southern region)
- Wales route (Wales and Western region)
- Scotland route (Scotland's Railway)

2.3 These routes were selected for the following reasons:

(a) <u>Kent & Sussex routes (Southern region)</u>

(i) Low volumes were reported against planned within Southern region in the 2019-20 Maintenance Volumes Report P11. These are shown in Figure 2.1 and 2.2 below.

Figure 2.1 MNT005 – Stoneblown Track using OTM, Maintenance Volumes Report 2019-20 P11

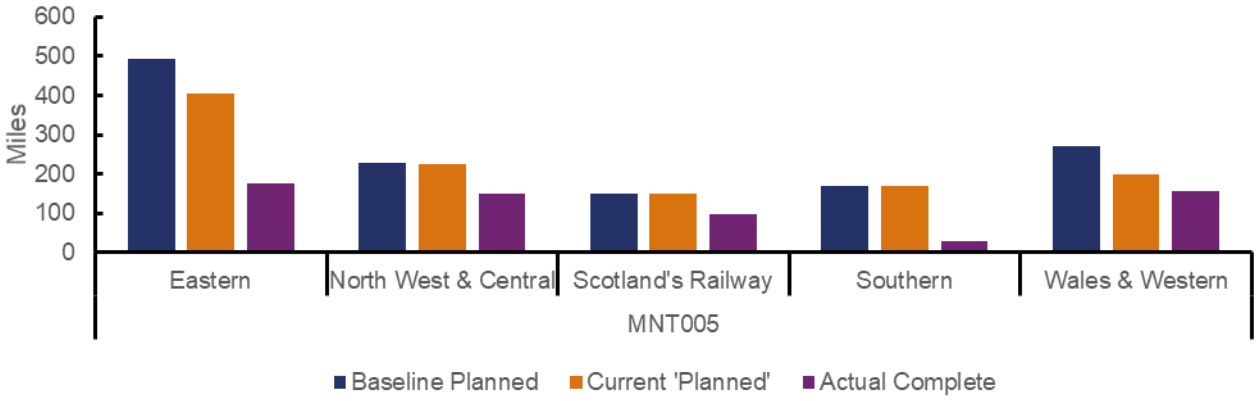


Figure 2.2 MNT124 – Stoneblown S&C using OTM, Maintenance Volumes Report 2019-20 P11

(i) 'Used life' of the ballast is reported to be the highest in Southern region (oldest ballast on average). Regional comparisons of the used life metrics for the track asset can be seen in Figure 2.3. Given that stoneblowing is primarily targeted where ballast is fouled, we considered there could be a link between the age of ballast and levels of stoneblowing undertaken. However, a comparison of activity by shifts showed that Kent and Sussex routes planned to undertake proportionally less stoneblowing than other routes. This can be seen in Figure 2.4 below. We sought to understand this further.

Figure 2.3 % Used Life – Track assets, Network Rail Annual Return 2020 data tables

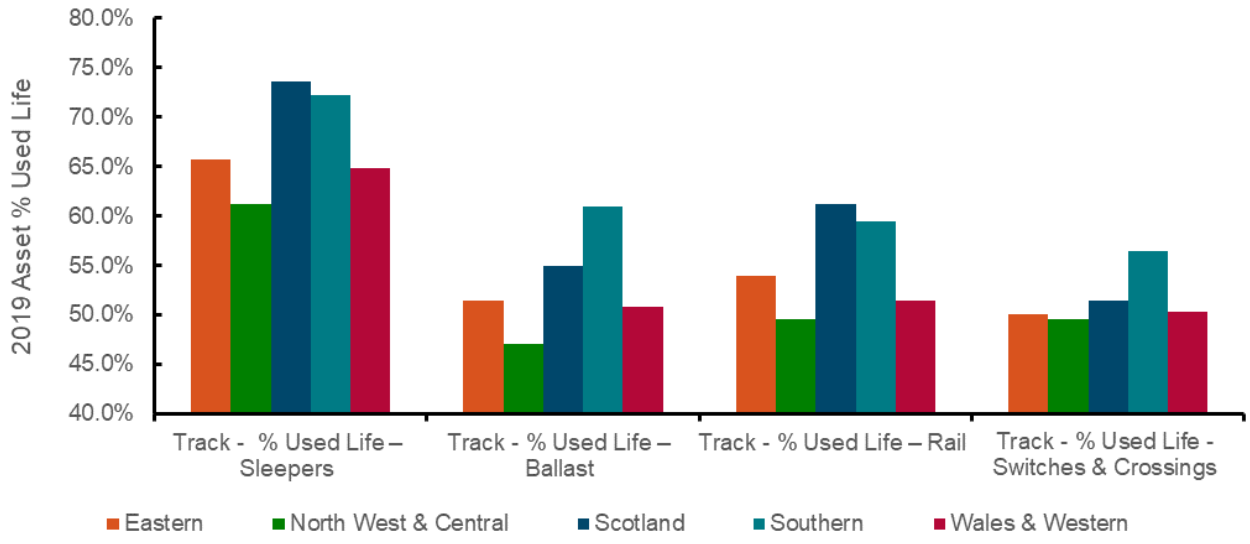
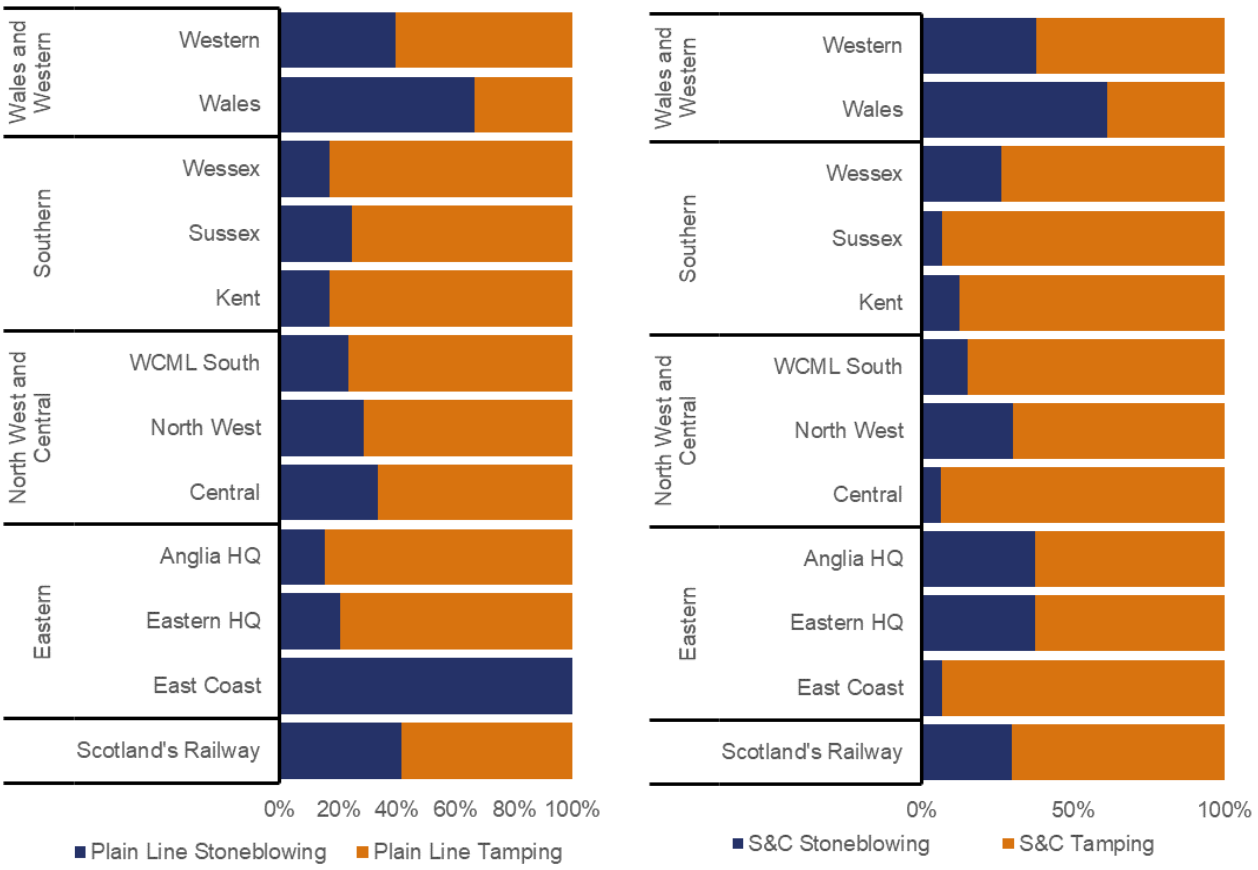


Figure 2.4 Percentage comparison of tamping versus stoneblowing for plain line and S&C activities for 2020-21 to 2023-24, 2020-21 Plant Activity Based Plans



(b) Wales route (Wales & Western region)

(i) Reported volumes similarly low against plan within the 2019-20 Maintenance Volumes Report P11. However, the region was the closest to achieving planned volumes nationally.

(ii) Comparison in levels of tamping and stoneblowing activity for Wales route suggested a much higher proportion of stoneblowing compared to other routes.

(c) Scotland route (Scotland's Railway)

(i) Targeted as a reflection of the 'average' – a fair proportion of stoneblowing undertaken, plain line activity on target but S&C activity under target and a higher used life of ballast than average.

Technical standards & legislation

2.4 Each region detailed local processes for determining

(a) when OTMs are utilised;

(b) when ballast renewal is required; and

(c) selection of track treatment methodology.

These were in line with overarching Network Rail standards and processes, with some variation locally around assessment and justification.

2.5 Determining when and where mechanised track treatment is required was highlighted as a business-as-usual activity. This is guided by continuous inspection, recording on Track Engineering Forms (TEF) and review as per Network Rail standards. Track quality standard deviation (SD) data for 1/8th mile sections is used to monitor overall condition through relation to bandings. This influences track treatment decision making.

Maintenance decision making

2.6 Maintenance decisions are the responsibility of the local Track Maintenance Engineer (TME).

2.7 The function of the Route On-Track Machine Engineer (ROTME) varied across regions. This role is primarily focussed on the overall management of OTM programmes and smoothing of requirements.

- In Scotland, there was an assurance function highlighted, in checking proposed site suitability.

2.8 Establishing Control Period maintenance volumes varied.

- Scotland stated that initial volumes were based on sustainability and criticality modelling. These would be checked by the ROTME and TME against previous planned and delivered volumes.
- Southern's response focussed on previous years deliverables. This looked at opportunities, resources and available plant with consideration given to the machine's output.

2.9 Little evidence of how ballast condition is monitored and recorded was provided and the relationship with OTM was not defined. TEF3017[4] and TEF3022[5] capture overall condition as part of visual inspection, in tandem with review of track geometry. Ballast fouling index was also highlighted as a measure of monitoring condition, but it was unclear of the suitability or governance around this.

- Wales detailed monitoring through track quality deterioration rates and associated predictions of quality. This drives the timeline for planning intervention.

2.10 Restriction of time available mid-week was highlighted as a substantial constraint.

- Southern noted the amendments to the Rulebook for December 2020, which allowed for possessions to be given up around OTM. This was quoted as a potential productivity improvement, once realised.

Success criteria and quality management

2.11 Most regions established a target for usage, shortfalls and volumes achieved. Track quality improvements from intervention are generally monitored and focussed on GTG/PTG trending and post-work feedback from the TQS through the Daily Work Returns (DWR).

[4] Network Rail Track Engineering Form 3017 (TEF3017) – Engineer's Visual Track Inspection Report (Issue 2, dated June 2008)

[5] Network Rail Track Engineering Form 3022 (TEF3022) – Supervisor's Visual Inspection Report (Issue 3, dated 04/09/2010)

- Scotland detailed more involvement from the ROTME, with sites being assessed for potential improvement prior to utilisation.

2.12 Little evidence was given around how information was fed back into the maintenance planning lifecycle. DWRs from the TQS provide direct feedback from site and will inform of any shortfalls or additional information.

- Scotland highlighted post-work assessments completed by the ROTME.

2.13 Deferred activities, through lost shifts or shortfalls, are primarily dealt with through track geometry review meetings. Any shift losses or shortfalls are analysed and reprioritised as required.

- Scotland highlighted that the stoneblower is fully utilised in the region and there is little scope for replanning where losses are experienced.

Observation 02 – Assessment of the output from work and associated decision making relies heavily on manual reporting, local assessment and local engineering expertise. Improving quality criteria for works, and of the supporting tools to allow for better run-on-run analysis and modelling of degradation, would increase consistency in decision making and lessen the manual requirements.

2.14 No detail was given on ramifications of under-delivery apart from further expected deterioration of track quality. Further deterioration would decrease the durability of the asset as a whole and increase the potential for speed restrictions and performance impacts.

Follow up meetings – ROTMEs and TMEs

2.15 ROTMEs and TMEs are critical personnel in the decision making processes for OTM activities and track geometry management. We met with one ROTME and one TME from each of the selected regions to discuss the themes from the original RFIs in greater detail. A sample agenda of these meetings can be found in Appendix 02.

Organisational structure

2.16 Roles and responsibilities of ROTMEs slightly differed across the different regions, including their reporting line. Two of the ROTMEs reported into the RAM (Track), whilst the other reported into the Area Services Manager, which in turn reports to the Head of Maintenance.

2.17 The primary function of the ROTME is providing support to the DUs for their OTM requirements and acting as an effective go-between for the DUs and Route Services. The role maintains an overview of all tamping and stoneblowing activity across their area of management, looking to de-conflict, prioritise and work with planning teams to secure access.

2.18 ROTMEs also hold accountability for maintaining oversight of grinders and milling machines.

- The Southern ROTME also highlighted additional responsibility for the management of the Mobile Maintenance Trains (MMTs), providing line manager support and accountability for their planning, whilst also looking after inspection vehicles (Track Recording Vehicle [TRV], Plain Line Pattern Recognition [PLPR] and Ultrasonics Test Unit [UTU]). This utilised a significant proportion of their time and impeded their ability to complete some of the track geometry related activities reviewed. Discussions were said to be in place around whether some of these accountabilities would sit better elsewhere in the organisation.

2.19 Focus of the role varied between the ROTMEs, further to their core duties described.

- In Wales, there was more of a strategic look at plain line and S&C activities, with degradation modelling undertaken and subsequent planning.
- For Scotland, we viewed this to cover more of an assurance function; challenging and assessing proposed sites as well as problem solving on sites with issues and assessing benefit post-work.
- Southern's ROTME highlighted acting as a facilitator in ensuring sites were well planned, site staff were properly briefed and competent, and worked with suppliers to utilise their technical expertise where required.

2.20 It was noted that all ROTMEs were fairly new to post and two had started within the last year. Challenges of adapting to the role within lockdown periods were highlighted.

2.21 TMEs hold accountability for track geometry management within their area and maintaining compliance to NR/L2/TRK/001[6], in particular Module 11[7]. One of the main requirements are the trace reviews which are conducted within three weeks of issue of the Track Geometry Reports (TGR). The standard highlights several items for consideration around faults, trends and work requirements. A record of this review is required through the manual annotation of a copy of the trace.

2.22 Strong relationships between the ROTMEs and TME team were typically demonstrated. Frequent communication was displayed, which was typically supplemented by geometry review meetings.

2.23 Interfaces between ROTME and the RAM team varied depending on where they sat within the organisation. Where the ROTME sat within the RAM team, there was strong correspondence with frequent meetings held with the associated team. Where the ROTME role sat within the maintenance side of the organisation, there was less direct correspondence.

- Wales highlighted close working with the Gauging Engineer, holding discussions on areas with clearance issues to try and incorporate them into the OTM plan where possible.

2.24 For TMEs, the interface with the RAM team varied across the regions. In general, frequent communication was held between the TME and Renewals and Enhancements Engineers to understand upcoming renewals and assess proposals, and also through the RAM's technical cascade briefings.

- Scotland have Senior Asset Engineers within the RAM team that cover maintenance areas and demonstrated a strong interface there.

2.25 ROTMEs frequently interfaced with Route Services as the manager of the supplier contracts.

- In Southern, briefings were highlighted around the introduction of the new fleet of MPSBs, looking at when they would be coming in, what the training requirements are and other general details.

2.26 Interaction with the machine suppliers is typically left to Route Services to manage. Any issues or items would be raised through them. Suppliers may be

[6] NR/L2/TRK/001 – Inspection and Maintenance of Permanent Way (Issue 17, dated 06/03/2021)

[7] NR/L2/TRK/001/MOD11 – Track Geometry – Inspections and Minimum Actions (Issue 8, dated 05/09/2015)

contacted directly for some specific details on the machines or if looking at arranging site visits.

2.27 The role of Track Quality Supervisor (TQS) was discussed at each of the meetings. This role was generally undertaken by dedicated staff but supplemented by Technical staff as required. The arrangements for this varied across the regions. If required, some areas would also utilise agency staff or approach a neighbouring section. A dedicated TQS would primarily be used for S&C activity whilst Technical staff typically supported plain line works.

- Scotland highlighted a reduction in number of staff in role over time and issues around rostering.
- Wales highlighted some previous problems with rostering, but that this had been mitigated through better forward resource planning.

2.28 The role of Section Planner was discussed. There were issues reported with retention of people within this role. The responsibility and accountability within the role meant that tenure of staff was often short. A potential lack of career progression opportunities was also reported. Whilst some DUs benefitted from long-term employees in this role, others highlighted difficulty in retention, causing potential continuity planning issues.

Competence management

2.29 Engagement with the Track Competency Framework for TMEs was varied at the time of meeting. Some self-assessments had been completed and were awaiting review with the RAM, whereas others had yet to commence.

- In Wales, the framework was being rolled out to the ATMEs and the Section Manager and Supervisor criteria was being reviewed.

2.30 The TME training that has been delivered internally in the past couple of years, including a module that looked at track geometry and OTM planning, was spoken about positively. Benefits included highlighting some of the more obscure standards and documents that staff had not been aware of before. The course also looked at the reasoning behind requirements and afforded a chance to ask questions to an expert in the field. This training was noted to have started with the TMEs/ATMEs but now anyone working towards TMEs roles could be considered.

2.31 No specific competency profile was noted for the ROTME role. All ROTMEs we met had experienced track backgrounds and had generally covered a variety of technical roles having worked within track maintenance teams in the past. This

generally entailed a lot of hands-on experiences with OTMs, as well as survey, design and geometry analysis.

2.32 Where the ROTME role sat within the RAM team, there was familiarity with the ongoing rollout of the Track Competency Framework and some staff were going through the assessment. It was highlighted that there was no specific role of ROTME on the framework, but some regions were treating it as a Senior Asset Engineer for assessment purposes. Assessment through this framework would help establish the competency profile for the role.

Maintenance decision making

2.33 Supporting track tools were discussed and have been broken down below.

(a) **Track Geometry Traces** and **Colour Coded Quality (CCQ) charts** were highlighted as being the main tools used for track geometry analysis.

(b) **Linear Asset Decision Support (LADS) tool** was occasionally used for predictive type work. However, general concerns were noted around the tool, particularly around how slow it was in operation and non-user-friendliness. This discouraged several people from utilising the tool.

(c) There was a lot of interest in the new **Enhanced Decision Support Tool (eDST)**. The increased ability to be able to predict cyclic top sites and intervene was highlighted. Not all regions had local data for them to utilise at the time of meeting but were keen to see what it would deliver. The importance of the tool delivering on its specification whilst also staying as user friendly as possible was noted.

(d) Familiarity with **Network Rail Online Logistics (NROL)** was highlighted as important for the ROTMEs. This is Route Services centrally held system and details booked machines and associated details.

(e) **GEORINM** was highlighted as a useful tool in being able to assess sites as it provides high quality photographs. In Wales, they used this to assist with works briefings.

(f) **Forward facing camera footage** gave an opportunity to assess sites.

(g) Regions had transitioned to utilising the **Track Integrated Geometry Engineer's Report (TIGER).** Some issues were raised around the quality of the underlying asset data and difficulty in use. The system was highlighted to be heavily based on Ellipse and consequently difficult for some parts of

maintenance teams to utilise. Some highlighted section planners being utilised for managing the reports, as experts in Ellipse.

2.34 Regions have built their own tools to be able to model degradation. The Wales ROTME had their own tool and Scotland utilised a model that had been built within the North West and Central region. This had proven useful in being able to introduce proactive track geometry management and used to challenge some proposed sites. The new 'eDST' is stated to capture this requirement.

2.35 The benefits of 'sprinter tamping' were discussed at several meetings. In 'sprinter tamping', shortwave discrete faults are targeted, as opposed to continuous lengths that are typically completed through normal tamping. This was seeing some success through trials in Scotland and the Southern ROTME had experience with the technique on the High Speed network. The ability to customise tools to better support identification and planning of these activities was highlighted as a possible area of improvement.

2.36 Several processes associated with track geometry and OTM management were viewed as quite manual, and several activities were managed through individual spreadsheets. For example, output of the TME trace review meetings were typically captured through a set of meeting notes or a locally maintained spreadsheet that details the review and records actions. Whilst no particular concern was raised around ongoing management, it was viewed that there was a potential for the activity to be archived and consequently not inform future decision making effectively.

2.37 Decisions around when to switch from a tamping to stoneblowing regime were discussed. This was normally considered within the trace review meetings.

- Wales highlighted use of the track deterioration tool which could trigger discussion to look at the associated ballast and whether there are any underlying issues. On sites that rapidly degrade after tamping the decision to switch to stoneblowing can be made.

- In Scotland, the decision was noted to be primarily down to the TME but with the ROTME providing a level of independent assurance. Benefits of treating cyclic top sites with the stoneblowers were noted in the Scotland discussions as the ballast memory was retained when tamping.

2.38 Local registers of stone-blown sites were used in managing areas previously treated to ensure similar treatment patterns. TMEs are required to maintain oversight of renewals in the area and advise on the alignment of the OTM plans

accordingly. Some previous incidents were highlighted of sending the incorrect machine to a site (i.e. a tamper to a stone-blown site). No recent evidence of this was shared.

- Southern highlighted an intent to map all areas that had been stone-blown to provide a visual guide.
- In Wales, the tamping and stoneblowing sites were displayed in the local degradation model built.

2.39 Restrictions in stoneblower operation were noted. Where wire heights are a constraint, due to the large lifts required by the stoneblower, a tamper may be the only possible type of intervention. Additionally, the stoneblowers are unsuitable for steel sleeper sites.

2.40 Points were raised around being able to simplify and align the data as much as possible. The current method of gathering all required information for review was highlighted as very labour intensive. The sheer number of systems that required consultation on a regular basis was highlighted to be a significant time-sink. Improved times between running of track geometry vehicles were noted as a positive in being able to identify and action but had meant an additional challenge in being able to keep on top of this. There were differing views on the suitability of the trace reviews and associated markup – some thought this required further modernisation whilst others had a preference to completing it this way, opposed to utilising the newer tools.

Observation 03 – There is a significant number of tools and systems utilised by maintenance staff. We recognise that there are many data sources and interdependencies. An exercise to map these different systems and their interdependencies could prove beneficial and support future efforts to consolidate.

Success criteria and quality management

2.41 Volumes for tamping and stoneblowing activities were set at the start of the Control Period and OTM allocation comes from the annual volume review. Some input from TMEs and ROTMEs was shown in this process. Adherence to these set volumes varied across the regions.

- Scotland highlighted a strategy of understanding benefit from OTM interventions, having focussed on volume-based delivery in the past. A move to target more specific faults, then completing a level of rationalisation to

optimise volume and output, instead of targeting arbitrary mileage was discussed. This was supported by the RAM.

- Indications in Southern were that targets were focussed on achieving volume, at the possible detriment of quality.

2.42 Quality targets were reported to be primarily managed through assessing the work completed on site – paperwork details the pre, design and post SDs. This is then monitored through the trace reviews. When ineffective or quick deterioration is noted, this will prompt further discussions on alternative solutions or underlying issues. This was supported using local degradation models, where established.

2.43 Scotland highlighted some local issues around cancellations and complaints from suppliers relating to contaminated ballast bunkers (for stoneblowers) and dumping of scrap, which prevented work. Discussions were being held with the Infrastructure Maintenance Engineers (IMEs) and a project underway to look at sidings and any potential upgrades that may mitigate some of the issues experienced. Also, the opportunity to introduce more sidings for stabling in a bid to reduce transit times to sites was being investigated. This was particularly noted for the North of East Coast route, where there is typically less time available on site.

2.44 A query was raised within one of the meetings around ORR setting targets relating to PTG / GTG. It was clarified that ORR does not set targets within these areas and it does not form any of the scorecard metrics which Network Rail regions are held to account against. Both metrics are reported via the Annual Return and are monitored for trends at a regional level to help inform discussion.

Data & information management

2.45 Daily Work Returns (DWR) and the Plant Hire System (PHIRES) form are returned following each shift on site by the TQS. This detail the activity completed on site, any issues encountered, completed mileages and pre and post SDs measured. ROTMEs generally had a system for managing this paperwork and often logged it on a local spreadsheet. It was somewhat unclear around how work orders associated with tamping and stoneblowing activities worked in practice. Paperwork was distributed to the Section Planner for closeout but there were also some issues raised of occasional inconsistencies between DWRs, Ellipse and NROL. There was some commitment to cross-checking for these inconsistencies, but it was also recognised that they were not able to micromanage these details.

2.46 Issues were raised around how information was captured within Ellipse. For instance, S&C interventions are required to be captured in point ends but have

been measured in mileage previously. It was also said to be often muddled where work captures both S&C and plain line activity in a single shift.

Observation 04 – Guidance around capturing maintenance information in Ellipse should be clear, for instance when work may be split across two maintenance codes in one shift. These issues lead to opaque information and data issues elsewhere.

2.47 Wales highlighted historical inaccuracies within their Ellipse workbank around items planned in and not effectively closed out. These are constantly being worked through when they arise. Improvements were stated to be being driven by the IME and IMSM in Cardiff around how Ellipse data is being managed and looking at the handling of data at DU level.

Observation 05 – Historical inaccuracies within Ellipse could lead to incorrect decision making or time wasted rectifying. An effective 'purge' of the system and better assurance practices would benefit the users.

2.48 There were some potential issues around transparency of information reported following completion of works on site. Experience was raised of suppliers closing works off as complete where only one of the multiple proposed sites has been treated. Additionally, an issue was raised of non-reporting of any poor performance post-shifts by TQSs, which may be from long standing relationships with machine operators. This was not recognised across all parties; local assurance in the Cardiff DU had not picked this up as an issue and found everything to be transparent and open.

Continuous improvement

2.49 Concluding the discussions, we sought to understand what the main challenges that the TMEs and ROTMEs had to deal with and if they had any suggestions on what could be done to support them further.

2.50 Challenges of the roles varied across the regions. A general challenge was noted around visibility of the ROTMEs to the maintenance staff and encouraging others to approach them with issues relating to OTMs and track geometry.

- Southern's ROTME raised points of additional accountability in their role for looking after MMTs and track inspection vehicles and often being required to assist with investigations. Whilst wanting to look more at supporting tools, be able to challenge tamping proposals and build longer term plans around

junctions, they were unable to afford the time commitment with these other responsibilities. This had been raised up within their organisation accordingly.

2.51 TMEs generally raised issues around availability of their time. A significant degree of ‘firefighting’ was noted by some, whereas there would be a preference to work more proactively. Pressures were noted around undertaking the required amount of site assurance within busy schedules and adapting to changes in standards or special inspection requirements that may not have consideration for existing workload. It was suggested that they would benefit from consistent early engagement to allow for better preparation and an awareness of what is coming, in terms of changes to standards or Special Inspection Notices (SIN). The amount of online conferencing was viewed to have increased in the last year, with consequential longer days and not being able to get out onto site as much as desired.

2.52 Some difficulties were raised around conducting scheduled track walks with open line working now being restricted. This had meant that their track walks were now scheduled for Sundays but noted to be very disruptive if they are to take a day off in lieu. The track walks were pointed out to be quite inefficient at times; waiting for 20-30 minutes to get on for a 20-minute line block. The significant amount of equipment to be carried for inspections was also noted.

2.53 Scotland raised track access planning as a particular priority and detailed some of the significant challenges and the benefits that additional time could bring for delivery of work. Local discussions were highlighted to be ongoing with the seasonal treatment teams to be able to secure better access.

2.54 In Wales, there were noted difficulties in managing the transition to having more overhead contact systems in-situ and the additional time pressures this brings. At the beginning, they had been planning mileages as per previous plans but found that an additional 30-60minutes were required for isolations. Issues were also experienced where changes to the possession happen on the night and the effect this has on planned works, potentially leading to work being cut back or cancelled. Increased awareness of this issue has meant they have generally become better at managing it.

3. Conclusions

3.1 From review of the submitted material and meetings held, we have drawn several conclusions relating to management of OTM stoneblowers and tampers. Relating to the themes identified throughout this review, we have made the following conclusions:

Technical standards and legislation

3.2 We found several of the relevant standards and guidance documents were significantly out of date. A number of these were not up to date with modern standards, tools, or technology.

3.3 There was no evidence that any of these standards were used in practice, outside of the main standard framework for track. It was highlighted that the Network Rail were able to view the access logs for various documents and standards to understand where demand was.

3.4 It was recognised that there is a growing backlog of Network Rail standards and guidance documents. However, updates are priority based and depend on resource available to complete.

3.5 We noted that there was a lack of formal guidance around changing between maintenance strategies and that the decision criteria would vary between routes. This led to the potential for local bias in the decision making.

3.6 It was highlighted that the new Track Decision Support Tool would enhance local decision making by providing the ability to model degradation for instance. This was also noted to be captured within the developed Track Competency Framework. This was seen as a real positive and saw a lot of support across the various regions.

Success criteria and quality management

3.7 Track quality measures such as CCQs, PTG and GTG were viewed as the primary metrics to assess the effectiveness of tamping and stoneblowing. Overall reduction of levels of L1 and L2 track geometry faults would be a product of the work. We saw consideration for how these activities could be more targeted at L1 and L2 faults, for example through use of sprinter tamping. However, work was still being done to identify suitable sites with grouping of faults and establish how benefit could be reported. This could also be at the expense of a reported volume,

which has been a popular delivery metric in the past. Currently, success criteria is weighted towards achieving volume.

3.8 Most regions reported that they are not held to ‘arbitrary’ volume and are able to tackle sites that will give more benefit even if less volume is achieved. We would encourage Network Rail to take this more strategic approach to OTM activities and seek to establish the benefits.

Organisational structure

3.9 The roles of ROTMEs were not particularly well defined and varied across the regions we met. We recognise that this may suit the organisational structure of the region.

3.10 From the meetings held where the ROTME role sat within the regional asset management team, we saw it helped strengthen a strategic focus and acted as a good intermediary between maintenance and asset management. There were also potential benefits of working in tandem with renewal engineers & gauging engineers. Renewal requirements could be understood in real time and potential to synergise some of the activities. Within gauging, areas of existing issue or aspirational gauges could be captured and influence the OTM plans.

3.11 TQS and Section Planners were identified as key supporting roles. Both were highlighted as potentially being difficult to resource or retain. This is an area to be explored further.

Competence management

3.12 We saw strong support for the Track Competency Framework and recent TME training that been delivered. There was varied engagement with the framework at the time of meeting but is something we continue to monitor through our engagement with the Technical Authority and understand it is high on their agenda.

3.13 We recognise that the role of the ROTME varied across the regions but did not see a specific competency profile. Given the general role and requirements, we believe that all ROTMEs should be engaged with the Track Competency Framework and requirements understood. This would help support the regions in understanding any training requirements or competency gaps across their organisation.

Maintenance decision making

3.14 We did not view defined strategies around decisions to change between intervention type. Typically, this focussed on a 'tamp until no longer achieving benefit, then swap to stoneblowing' type strategy. This was supported using degradation modelling tools developed by regions in some instances but was not widespread. The introduction of the new eDST was said to support degradation modelling and offers an opportunity to support the decision making in this area.

3.15 We found there are many tools and systems utilised by maintenance staff. This took a significant proportion of their time to effectively engage and gather the information required. Opportunities should be taken to consolidate these tools and systems where possible.

3.16 We saw continued issues with LADS reported, due to its slow speeds of operation and non-'user friendliness'. Engagement with the different tools varied across the regions. We recognise that different people will use different tools to support their decision making but believe that best practice could be identified and shared.

Data & information management

3.17 We noted issues around capturing data within Ellipse. This stemmed from variety in units of measure or mixing of job codes within activities. Network Rail must ensure that there is consistency in approach as this influences reporting and decision making.

3.18 This aligns with our findings from the review of the business case for the new fleet of stoneblowers. We noted poor alignment between different data-streams, a number of significant misreported numbers that heavily influenced the regional overview and difficulty to justifying the demand stated. A recommendation has been made in that review around improvement of supporting data.

Continuous improvement

3.19 Additional items were noted through discussion of the challenges faced and potential for further support.

3.20 Workload of TMEs was a common message and one that we have seen in the past. This came through in a variety of means:

(a) Significant time spent pulling together information and resources to support work.

(b) Requirements to undertake site assurance and inspections, especially with the shift to more weekend and night working.

(c) General track access issues with a busier network over the years. The tightening of available windows over the years and requirement for better planning necessitate more time spent considering this.

(d) More home working in the last year had seen a rise in online meetings and longer days/less time to get out to site.

3.21 We heard a noteworthy case study of the impact of route electrification on the maintenance team. This had seen a decrease in achievable working time due to possession requirements and the wider impact of possession changes on the night, leading to cancelled or cut-back work. We believe this is a good learning point and should be further considered for future electrification projects, ensuring that maintenance teams are fully aware of the impact of changes and can plan accordingly.

4. Recommendations and Next Steps

4.1 This TAR raised several questions including quality of data that we will follow up through our ongoing liaison or additional work. These are as follows:

- Is the condition of ballast effectively understood and how does this link to tamping and stoneblowing requirements? What relation does this have to the modelling completed through VTISM? How is this influenced by the underlying data and by the potential data quality issues noted in this review?
- Is the number of tampers sufficient for the management of track geometry across the network? Is the correct balance between volume and quality being achieved? Are the levels of tamping completed appropriate – do we over or under tamp?
- What is the competency profile for Track Quality Supervisors and Section Planners? Are these roles sufficiently resourced?

4.2 Additionally, we have made three recommendations based on our findings and the evidence presented.

The intent of this recommendation is to support the role of the ROTME in being able to define required competencies and ensure that the requirements have been met to suit organisational need. We recognise that different regions have different organisational structures and different requirements of the role. The definition of competencies for the role will support future gap analysis and provide assurance of effective coverage.

Recommendation 1

Network Rail should define competency profiles for their Route On-Track Machine Engineers. The role should be defined within the Track Competency Framework that is being rolled out and assessment completed against this to understand any supporting requirements.

We will continue to monitor the ongoing rollout and engagement with the Track Competency Framework through our liaison meetings with the Technical Authority.

The intent of this recommendation is to assure the utility of tools and systems that support decision making for the planning and management of OTM.

Recommendation 2

Network Rail should assure the utility of the tools and systems used to support decision making in relation to the planning and management of OTM. This should demonstrate the data sources drawn on, the system requirements, interdependencies between systems, areas of overlap and whether these are fit for purpose in practice.

The intent of this recommendation is to ensure that there are effective standards and guidance to support staff in decision making for use of OTM. The existing standards and guidance documents are dated and may not be up to date with modern practices, knowledge or systems. This will ensure that the existing suite is fit for purpose and if there are any future requirements for update.

Recommendation 3

Network Rail should assess the adequacy of the existing suite of standards and guidelines relating to the use of OTM. This should identify any associated risk and establish any future requirements.

4.3 We will review the responses to these recommendations and state of progress in March 2023. This will inform our approach to Periodic Review 2023 and our future targeted assurance programme.

4.4 Findings relating to workload of TMEs have been shared with the Railway Safety Directorate.

5. Appendices

Appendix 1 - Network Rail standards and work instructions

- TWI 3T041 – How to manage plain line tamping (Version 1, dated March 2005)
- TWI 2T008 – How to prepare track for tamping (Version 1, dated March 2005)
- TWI 3S093 – How to tamp switches & crossings (Version 1, dated March 2005)
- TWI 2T018 – How to prepare track for stoneblowing (Version 1, dated March 2005)
- TWI 3T033 – How to formulate a strategy for stone blowing (Version 1, dated March 2005)
- TWI 3T034 – How to formulate a strategy to stabilise & improve track condition (Version 1, dated March 2005)
- NR/L2/TRK/6001 – Renewals Workbank Management (Issue 2, dated 26th August 2008)
- NR/L2/TRK/4239 – Track Bed Investigation, Design and Installation (Issue 01, dated 5th December 2015)
- NR/L3/TRK/3240 – Preparation for the use of on track machines (Issue 02, dated 26th August 2008)
- NR/L3/TRK/3250 – Post-work activities following works using on-track maintenance machines (Issue 02, dated 26th August 2008)

Appendix 2 - Example meeting agenda – ROTME and TME follow-up meetings

Welcome & Introductions	
1.	**Key role & responsibilities of the Track Maintenance Engineer in relation to the management of Track Geometry management and on-track machines**
2.	**Interfaces with other key stakeholders**
(a)	**OTM Engineers & Planners (for TME)**
(b)	**Track Maintenance team (for ROTME)**
(c)	**Route Asset Management Team**
(d)	**Route Services / Technical Authority**
(e)	**Machine suppliers**
3.	**Competencies**
(a)	**What are the key competencies & how are they managed?**
	(i) Areas of engineering, access, contractual relationships, planning timescales?
4.	**Tools and processes**
(a)	**What tools & processes do you utilise to make informed decisions?**
(b)	**What would you want to see?**
5.	**KPIs associated with Stoneblowing and Tamping activities**
(a)	**How are targets set for the route and machine supplier? Are these defined by volume?**
(b)	**Are there any targets around the quality of work?**
(c)	**What targets do ROTMEs/TMEs work to?**

6.	**How is type of intervention decided upon? (i.e. tamping or stoneblowing)**
7.	**Data quality**
(a)	**How is information from Track Geometry reviews & machine interventions captured?**
(b)	**Is information inputted into Ellipse verified?**
8.	**What could be done differently?**
(a)	**What are the main challenges you face in your role?**
(b)	**Do you have any suggestions for what could be done to support you further?**

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