Office of Rail Regulation

HS1 Data Assurance

Review 2013-14

REP/232046/00

Issue 1 | 3 June 2014

Job number 232046-00

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1 Executive Summary

1.1 Introduction

1.1.1 In summer 2013, ORR provided Arup (as Independent Reporter for HS1) with a Draft Mandate which is shown in Appendix A, which defined the requirements for this review, which took place on 15/16 January 2014 (the 2013/14 review).

1.1.2 In summary, these requirements are to undertake:

- a high level review of Performance measures, to include confidence grading and progress against 2011 recommendations;
- a high level review of asset management measures, to include confidence grading and progress against 2011 recommendations; and
- a review of the asset register – to provide assurance that progress against the 2011 recommendations has been achieved; specifically, condition indicator and criticality data have been migrated, and errors on maintenance forms are reported such that the asset register is corrected. On this basis, to judge if the asset register, and quality of data and information in it, has improved since the 2011 review.

1.1.3 As a result of the 2011 review, all the assessed KPIs were awarded a confidence rating of A1. The 2013/14 review seeks to establish what further progress has been made by HS1 and Network Rail (HS) in developing their procedures for reliably and accurately extracting and reporting on operational performance data.

1.1.4 It was agreed in the inception meeting that the current Network Rail "Part A" Reporter confidence grading system could be used in this report. This allows for A1* ratings, which was not possible under previous approach.

1.1.5 In addition, this year we have taken a sample of source data from PSS to confirm that source performance data is being extracted from TRUST robustly, and that no error factor has been imported into this process as a result of improperly or inaccurately formatted queries.

1.2 Performance KPIs

1.2.1 The 2011 audit confirmed that the NR (HS) and HS1 management processes for populating the regulated KPIs had improved significantly since 2010 and the confidence ratings awarded – all A for reliability and 1 for accuracy - reflected this. It should be noted that the reliability and accuracy definitions used in our Network Rail "Part A" Reporter work have since been amended, and we have agreed with HS1 and ORR to use the present system, detailed in Section 7 of this report. The 2014 grades are not consistent with the

grades used in our previous reports. As a result of the 2013/14 review, the confidence ratings awarded are as follows:

- Total number of trains timetabled – A for reliability and 1* for accuracy. The arrangements are unchanged from the last audit. However, one aspect of data extraction using train headcodes is felt to be a risk to the reliability of data, and a recommendation to review these arrangements has been made.
- Total number of trains delayed – A for reliability and 1* for accuracy. The arrangements are unchanged from the last audit, confirmed by a data and process review.
- Number of trains delayed by an incident wholly or mainly attributable to HS1 - A for reliability and 1* for accuracy. The arrangements are unchanged from the last audit, confirmed by a data and process review.
- Number of trains delayed by an unidentifiable incident - A for reliability and 1* for accuracy. The arrangements are unchanged from the last audit, confirmed by a data and process review.
- Our source data review (section 4.3 below) has highlighted a single process weakness, relating to the extraction of data for services delayed or cancelled for multiple reasons, and a recommendation for improving the data extraction query has been made.

1.3 Asset Management KPIs

1.3.1 The previous audit noted the overall improvement in procedures and definitions from the 2010 audit, and confidence ratings awarded – all A for reliability and 1 for accuracy - reflect this. The overall volume of events are very small and this suggests that accuracy levels are always likely to be high. However, NR (HS), on behalf of HS1, has undertaken a series of data management and reporting improvements over the last 2 years. These included the establishment of a reporting dashboard, which includes condition and criticality data, and other data not available at the time of the last audit.

1.3.2 Track quality induced speed restrictions and broken rails continue to be reported as zero occurrences, and only one instance of a service affecting defective rail was recorded in 2012/3. ORR and HS1 have given consideration as to whether these are appropriate measures for monitoring the management of an almost new high speed route (in response to a recommendation to this effect in 2011), and concluded that they are appropriate. However, a range of additional reportable measures are being considered, including a number of leading (as distinct from lagging) indicators.

1.3.3 The relevant asset management KPIs are set out below. The changes in definition to the confidence grades described in 1.2.1 above apply here also.

- Overall Fault Levels – more robust definition of what type of fault is to be included now ensures that this KPI is reporting on the

critical few faults, rather than the trivial many. The measure is graded A for reliability and 1* for accuracy.

- Plan Attainment (Backlog) – the measure generally reports very low levels of uncompleted items during any given period, with no material shortfall in either of the last two years, 2011/12 and 2012/3. A current significant backlog on Plant maintenance is a most unusual occurrence, for which a recovery plan has been agreed with the Contractor. Data management and reporting is, however, robust and the measure is graded A for reliability and 1* for accuracy.
- Track Quality-Induced Speed Restrictions – A for reliability and 1* for accuracy. As stated earlier, there have been zero reported events in the last 2 years.
- Broken Rails - A for reliability and 1* for accuracy. As stated earlier, there have been zero reported events in the last 2 years.
- Service-Affecting Defective Rails - A for reliability and 1* for accuracy. As stated earlier, only one service affecting defective rail event has occurred in the last 2 years.

1.4 Asset Register

1.4.1 The Asset Register is held in an integrated and flexible Enterprise Asset Management System (eAMS) system. We commented in 2011 that the Asset Register was comprehensive and accurate, but it did not at that time hold important data, for example condition and criticality data.

1.4.2 We observed these factors were not consistent with the concept of an Asset Register as a single source of truth, and reduced the quality of management reports which can be generated by the system.

1.4.3 During our 2013/14 review, HS1 showed clear evidence of significant progress in tackling these issues. The improvements related to asset data are as follows:

- track data is now being gathered at a detailed level and held in eAMS
- data fields are identified as mandatory or non-mandatory, ensuring that the data held within the Asset Register is more comprehensive
- the introduction of Asset Quality arrangements, which create an audit trail of activity associated with each asset
- on-going work to measure asset quality data and create a high level dashboard of indicators

1.4.4 Similarly NR (HS) showed evidence of the following improvements in Asset Criticality and Condition Monitoring:

- defined criticality and priority for all assets as part of the Asset Policies for each asset group, currently mapped at system level
- defined arrangements for Condition Monitoring & Reporting

- using eAMS to support maintenance activity by providing asset service and maintenance history, and a maintenance database.

1.4.5 Areas requiring more work and understanding in the future are degradation rates and profiles, as well as recording this information in a meaningful and user-friendly fashion. HS1 has developed asset policies and NR (HS) intend to use Quality Plans to hold Asset Policy intervention triggers.

1.4.6 These are all significant improvements which will provide long term asset management benefits. The work HS1 have demonstrated should be viewed as work in progress and part of a continuous improvement process. NR (HS) showed a commitment to continue making further improvements, for example the production of Asset Knowledge Standards, and plans for further developments in relation to condition and criticality data. We suggest there may be a benefit in a review of these further asset data developments at an appropriate time.

2 Introduction

2.1 Structure of Report

2.1.1 This report is a development of our 2011 report, and therefore presents our 2013/14 findings in the context of our earlier work and recommendations.

2.2 Background

2.2.1 ORR became the regulator of HS1 in October 2009, under the terms of a Concession that sets out train and asset performance obligations. HS1 also has obligations to provide asset management strategy and statement documents to demonstrate the effective stewardship of its operational assets.

2.2.2 Whilst HS1 is the concessionaire and owner of operational assets on the route, day-to-day management of the route operations and asset maintenance is undertaken by Network Rail (High Speed) Ltd. under an operation and maintenance agreement (known as OA or Operator's Agreement). NR (HS) is a discrete entity within Network Rail, but is part of the Kent Route organisation. In practice, therefore, HS1 is largely reliant upon NR (HS) for the provision of an up-to-date asset register; this register being based on data originally supplied to NR (CTRL) by Union Railways at completion of the original project.

2.2.3 As was the case in 2010 and 2011, this audit of HS1 was undertaken within the context of HS1 still being a relatively new railway, with capacity utilisation still some way below maximum. The recent introduction of regular overnight freight services between Dollands Moor and Ripple Lane adds a new dimension to the management, operation and maintenance of HS1. These services are operated by DB Schenker and began in 2011, initially 4 trains/ week, but now up to 16 trains /week, operating to/from Spain and Poland. These developments impose a further onus of responsibility on HS1 to apply relevant and appropriate management systems for both performance and asset management, and the generation of accurate data and information.

2.2.4 The HS1 Concession states that ORR shall have the right to audit the data and information supplied on operational performance and asset management, including any HS1 monitoring procedures. In order to effectively hold HS1 to account, it is essential for ORR to have confidence in this data, including any related systems, processes, methodologies and procedures. Arup was appointed in 2010 by the ORR on a three-year call off contract to provide assurance as to the quality, accuracy and reliability of the HS1 data and processes that are used to report on performance and asset management to ORR. This report is the final one to be commissioned by ORR under this contract.

2.2.5 Since the publication of our 2011 report, HS1 and Network Rail (HS) have further developed their procedures for extracting and reporting on operational performance data, and have further enhanced the management processes and routines which populate and update the

asset register. Because neither the 2010 nor the 2011 reviews specified an examination of source train performance data, a review of source TRUST data for a sample, random, recent quarter has been undertaken this time. We have also undertaken a thorough review of any aspects of the management process which have changed since the 2011 audit, as well as assessing progress against the recommendations made in 2011, and any which remained open from the 2010 audit.

2.3 Scope

2.3.1 This report describes a data assurance audit of the following measures and documents. The Mandate for this work is provided in Appendix A.

Performance

2.3.2 A high level review of the following measures, to include progress against 2011 confidence grading's and recommendations:

- Total number of trains timetabled;
- Total number of trains delayed;
- Number of trains delayed by an incident wholly or mainly attributable to HS1;
- Number of trains delayed by an unidentifiable incident.
- Source TRUST data checks for a sample, random, recent quarter

Asset Management

2.3.3 A high level review of the following measures, to include progress against 2011 confidence grading's and recommendations:

- Plan Attainment (Backlog);
- Overall Fault Levels;
- Track Quality-Induced Speed Restrictions;
- Broken Rails; and
- Service-Affecting Defective Rails.

Asset register

2.3.4 A review of the Asset Register, not as an indicator, but to verify actions taken in response to our 2011 report related to the processes and systems currently being used to maintain and develop the asset register. The objective is to provide assurance that progress against 2011 recommendations has been achieved, and in particular that:

- condition indicator and criticality data have been migrated;
- errors on maintenance forms are reported such that the Asset register is corrected; and
- assurance that the Asset Register, and data quality of information in it, has improved since the 2011/12 review.

3 Data Audit Methodology

3.1 Inception Meeting

3.1.1 The inception meeting for this study was held on the 21st August 2013 as described below. The purpose was to agree the scope of work, methodology and work programme. The meeting agreed to defer the audit until the Periodic Review process was more complete.

Subject	Location	Date	Present
Project Initiation Meeting	1 Kemble St	21st August 2013	Head of Regulation, HS1 Ltd. Business Intelligence Manager, ORR Arup, Independent Reporter for HS1

3.2 Review of Performance and Asset Management KPIs

3.2.1 Both the performance and asset management KPIs were subject to audit in 2010 and a high level review of progress against recommendations was undertaken the following year. A more detailed review, akin to the 2010 review has been undertaken this year, to:

- confirm that the processes, definitions and overall arrangements implemented following the 2010 review remain in place and continue to be used effectively to provide accurate and reliable train performance information;
- confirm the asset management KPIs in use, and the means by which they are populated;
- confirm the formalisation of definitions; and
- confirm that the data stream from source to reporting is robust, and is populating accurate and reliable KPIs in accord with the agreed definitions and requirements.

3.2.2 Meetings were held with the data champions for performance and asset management to review progress and to review source data. The meetings were held as follows:

Subject	Location	Date	Present
Performance KPIs and Source Data Checks	1, Euston Square (HS1 HQ offices)	15th January 2014	Strategic Planning Analyst, NR (HS) Regulatory Commercial Manager, HS1 Ltd
Asset Management KPIs	Singlewell Maintenance Delivery Unit	16th January 2014	Asset Reporting Engineer, NR (HS) Asset Knowledge Manager, NR (HS) Regulatory Commercial Manager, HS1 Ltd Business Intelligence Manager, ORR

3.2.3 At each of the meetings the processes and procedures which support the generation of KPI information were reviewed, and progress on

recommendations was sought. Evidence was examined if available, or requested, to support the stated position. As well as evidence against the recommendations, we requested copies of the most recent reports to establish the reporting framework which confirmed that this had remained unchanged.

3.3 Asset Register Review

3.3.1 During our work, in 2011 we reviewed various documents related to the Asset Register. In addition whilst visiting the offices of NR (HS) we reviewed the HS1 /NR (HS) eAMS database and associated procedures.

3.3.2 The focus of our review in 2013/14 was to verify the improvements in managing asset data which NR (HS) implemented since 2011. Our approach to this was to work through the issues, identified in our earlier review with NR (HS) during the meeting at Singlewell.

3.3.3 We were aware that NR (HS) had published Asset Specific Policies in 2011, and in October 2013 had issued a Five Year Asset Management Statement[1] as part of the PR14 process. These documents demonstrate that HS1 / NR (HS) have been developing and improving their approach to Asset Management during the past two years.

[1] High Speed 1 Five year Asset Management Statement - Consultation, 18 October 2013

4 Findings – Review of KPI Collation

4.1 Performance Management Processes

4.1.1 The data management processes currently in use, and how these have developed since 2010, were described by NR (HS). At the 2010 review, most of the arrangements required a large degree of manual input and intervention, and the KPI definitions which underpinned the data extraction processes were still to be formally agreed. At that time, only one annual Performance Floor Report (for 2009/10 financial year) had been submitted to ORR. All the arrangements were immature.

4.1.2 It was noted that the performance measures on which HS1 are regulated are significantly different to the UK mainstream railway, in that the measures focus around trains run and trains delayed, rather than the more conventional UK measures of PPM and delay minutes. It is important to understand how the data is collected, and how the queries are established in Business Objects to allow the collation and reporting of these very different measures.

4.1.3 NR advised that consultancy resources were retained to develop the reporting suite and establish the necessary processes which enabled NR (HS) to create the model to extract data and produce reports, as recommended in the 2010 Report. This largely manual process has now been almost entirely automated. Additionally, HS1 formalised the definitions which underpinned the KPIs and agreed these with ORR.

4.1.4 The Performance Floor workbook was examined to evidence the process, and the definitions in use, by opening the ORR Report tab in the Workbook, to display the KPIs:

- (1) Total number of trains timetabled
- (2) Total number of trains delayed – all trains arriving at St. Pancras (up direction) or leaving HS1 (down direction) which are more than 4mins 59 secs late, for whatever cause.
- (3) Total number of trains delayed by an incident wholly or mainly attributable to HS1 – subset of (2) above.
- (4) Total number of trains delayed by an unidentified incident – again, a subset of (2) above. Includes all Z or ON coded incidents, which after investigation by NR (HS) and the TOC(s), cannot be attributed. These events are actively managed by the NR Performance team, and it was noted as encouraging by the Reporter that the most recent Quarterly Report showed a nil return in this category.
- (5) Portion of trains delayed as a percentage of the total - (2)/(1)
- (6) Portion of trains delayed wholly or mainly by HS1 as a percentage of total = (3)/(1) – noted that this rarely reaches 1% against a Performance Floor target of 15%

- (7) Portion of trains delayed by an unidentified incident as a percentage of the total = (4)/(1).
- (8) Portion of trains delayed by incidents *allocated* to HS1 as a percentage of total = total of trains delayed by HS1 attributed incidents + 50% of unidentified delays

4.1.5 The Quarterly Floor Report does not currently pick up comparator data from previous Reports - an issue still to be resolved with by HS1.

4.1.6 Delay, and delay attribution, data is collected by NR through TRUST in the conventional manner, at Ashford Signalling Centre. HS1 has its own Route Codes, and delayed trains are extracted by unique train headcode. The TRUST data is all extracted into NR's conventional data warehouse (PSS), and sorted by NR's Business Objects software into a useable form.

4.1.7 The data production processes that NR (HS) use for the generation of performance information is the same on HS1 as the rest of their national network. This process is subject to regular audit by the national Reporter team, which is currently Arup. The last audit was carried out in Quarter 4 2012/3. This reported a high standard of data confidence.

4.1.8 Included/ excluded delay attribution codes are all as per the Delay Attribution Guide, and are built into the Business Objects queries. Note that there is no metric within the HS1 KPI suite for delay minutes. It was stated that in the absence of a pan-European methodology for allocating/ attributing train delays, there is little visibility of delay causation affecting trains heading to the UK from France or Belgium.

4.1.9 In respect of sub-threshold delay – delays of 3 minutes or less - are not attributed, in line with conventional NR UK practice. However, the Floor report (both Quarterly and Annual) records separately the number of trains incurring sub-threshold delay, which are late (>4min 59secs) at St.Pancras or HS1 exit point. These trains appear as 'delayed' in the section 2 count but are not attributed to HS1 in section 3, in accordance with the HS1 Track Access Agreement.

4.1.10 Our source data review (section 4.3 below) has highlighted a single process weakness, relating to the extraction of data for services delayed or cancelled for multiple reasons, and a recommendation for improving the data extraction query has been made.

4.2 Asset Management Processes

4.2.1 NR (HS) gave a brief overview of the data management and reporting improvements instigated over the last 2 years. These included the establishment of a reporting dashboard, which includes condition and criticality data, and other data not available at the time of the last audit.

4.2.2 The NR (HS) team was asked to explain the relationship between the dashboard and the regulated indicators, and how these revised internal processes map to those indicators.

4.2.3 NR (HS) also confirmed the indicators now in use and being reported. At the previous reviews, it was noted that three of the measures were routinely reporting zero occurrences. These were:

- Track Quality-Induced Speed Restrictions;
- Broken Rails; and
- Service-Affecting Defective Rails.

4.2.4 There has been little change in 2012/3; in the year, Track Quality-Induced Speed Restrictions and Broken Rails were zero; and there was a single Service-Affecting Defective Rail recorded in the year.

4.2.5 It was confirmed that the regulated KPIs had not changed, although there had been discussion between ORR and HS1 about benchmarking work undertaken, and the reporting of additional information. There had been particular interest in developing a series of leading, rather than lagging, indicators. ORR and HS1 are looking to see where wear rates differ across the system and are starting to develop degradation rate data. This work is in its early stages, but it is intended to establish these arrangements more formally by the start of year 2 of CP5 (April 2015).

4.2.6 Whilst a number of KPIs are still regularly reporting as nil on a quarterly basis, ORR stated that this was important and relevant information for ORR.

Overall Fault Levels

4.2.7 NR (HS) were asked to describe how data was collected and segmented to derive the key indicators which are reported.

4.2.8 NR (HS) referred to the Fault Management Process Operating Policy (POP) for Infrastructure (Document C/03/SP/39/2001, dated 10.01.2011) which describes how faults are reported, recorded, and information collated, and is the overarching standard covering fault reporting and data collection.

4.2.9 The four severity levels into which faults are now graded were described:

(1) Service affecting

(2) Potentially service affecting

(3) Other faults identified by staff

(4) Everything else, including rectification/ repair requirements picked up during scheduled maintenance

4.2.10 NR (HS) stated that an internal indicator for open faults was also collated period by period.

4.2.11 Numbers reported to HS1 and ORR are now only those in categories (1) and (2). This is explained in the period reporting pack. It was noted that the reporting regime is now improved and much more satisfactory, insofar as the fault totals reported are now only the priority, service affecting faults – the critical few, rather than the trivial many. Reporting is undertaken in the Asset Management Annual Statement for HS1 (issued to both HS1 and ORR) and underpinned by period (monthly) reports.

4.2.12 In respect of definitions, NR (HS) was advised that a key issue for the Reporter is the definition of what is collected to ensure the numbers are consistent, and that the definitions are available to the recipients of KPI information in order that the data can be properly understood. Definitions were inadequate at the last audit.

4.2.13 NR (HS) confirmed that the grading definitions are shown on the fault reporting proforma, and in the reporting regime section of the Asset Management Annual Statement, which is forwarded to HS1 and ORR – evidence to this effect was seen at the review meeting.

4.2.14 Only 22 Priority 1 faults have been recorded in the fault reporting system in 2013/4 to date.

Plan Attainment (Backlog)

4.2.15 Backlog is reported on a periodic basis in the NR (HS) Safety Environment and Assurance Report (SEAR) – total number of items and breakdown to responsible party or function. Where appropriate, recovery plans are also included, with planned timescales for rectification of any significant backlog.

4.2.16 Data sorting and manipulation is controlled by the Asset Knowledge Manager and an audit trail created. The number of Backlog items reported includes everything – it is not prioritised or segmented to reflect importance/ severity.

4.2.17 NR (HS) verifies the backlog numbers which are being reported using software (known as DISCO) bolted onto Oracle, and is manipulated (hard coded) in a SQL database. Data categories are extracted by filters in the system. Backlog reports are sent out weekly to the relevant engineers, who check the details, and report back on actions being taken to address the backlog.

4.2.18 Backlog is defined in the Works Management POP as follows: “Outstanding maintenance work that has not been performed within its schedule tolerance”. The tolerances are specified as ‘time to fix’ and operational priorities in the Minimum Operating Requirements document.

4.3 Source Checks on Performance Data

Data Extraction

4.3.1 NR (HS) gave a review of how data was extracted from Business Objects prior to the running of the macro to calculate performance

data. The transfer of data from TRUST (NR's data system) to Business Objects was not reviewed as part of this work. The process of extracting data was found to be accurate and thorough, with only one risk.

- The extraction of South Eastern train delays and cancellations uses service codes in the data extraction query.

4.3.2 If the service codes change, there is a risk that not all delays and cancellations will be extracted. The NR (HS) performance team believes that, as it works closely with and adjacent to the planning team, they will be informed of any changes. However, the service code issue has occurred before for the Eurostar Disneyland/Avignon services, and was not picked up currently then (see 4.4.2 below).

Process Verification

4.3.3 To review the process, the "HS1 Performance Floor Route Methodology" was followed.

4.3.4 The cause lookup did not have any outstanding causes for the three months reviewed. If a cause is not mapped there is a flag in the model which identifies a lookup error, NR (HS) are then able to input a cause code to correct this. For the process there are three main incident types:

- **Cancelled** or **delayed** trains affected by **one** incident
- **Delayed** trains caused by more than one incident
- **Cancelled trains caused by more than one incident**

4.3.5 Cancelled and Delayed trains caused by one incident are mapped accurately in the model. Delay and cancellation causes are unique.

4.3.6 Delayed trains caused by one or more incident are accurately modelled. When a service appears in the train list more than once, as a result of it being delayed by more than one incident, the duplicate entries are automatically removed whilst the cause minutes are apportioned and assigned correctly to the cause owner. The methodology of cause owner and minutes delay caused is followed accurately within the model

Cancelled Trains Caused by More Than One Incident

4.3.7 The position is less straightforward in respect of Cancelled trains with one or more primary cause. Within the process, a cancellation can only be allocated a single cause, which will then be either HS1 attributable or not, as the case may be. Whilst such occurrences are rare, there is no logical methodology listed within the procedure as to how a 'prime' cause, amongst 2 or more 'primary cancellation events' is to be identified, and appropriately allocated. Currently, the duplicate train entries holding the additional causes are deleted according to the order in which the data is extracted from Business Objects – essentially a random process. See Appendix C for examples which illustrate the issue.

4.3.8 As a consequence, the source documentation holding the cancelled train data was not directly comparable, and could not fully be reconciled with the cancelled train's data within the NR (HS) performance report. The reason for the difference was the duplicate incident removal process. Reconciling the 2 data sets was possible by re-ordering the incidents / causation.

4.3.9 A methodology for dealing with cancelled trains which have multiple causes should be implemented; currently the duplication is dependent on the (random) extraction order from Business Objects.

Observations

4.3.10 Data Extraction from Business Objects works well, with a slight risk which NR (HS) believes is adequately mitigated.

4.3.11 Data extract and methodology for delayed trains works well and reports accurately.

4.3.12 Data extract and methodology for cancelled trains needs reviewing.

4.4 Progress against 2011 Recommendations

Number	Recommendation	Data Owner	Feb 2014 Update
2011.P.1	NR (CTRL) should produce a simple set of records showing the checks carried out each quarter to verify data accuracy.	HS1	NR (HS) has established a regime of sample checking of data each quarter to provide assurance that data is being accurately transposed from source into KPI collation. These sample checks have now been established and incorporated into the quarterly reporting pack **Recommendation Closed**
2011.AM.1	ORR and HS1 should review whether: • Track Quality-Induced Speed Restrictions, • Broken Rails, and • Service-Affecting Defective Rails. are appropriate measures for regulating the route given the on-going predominantly zero attainment.	ORR HS1	ORR has confirmed that the reporting of these KPIs is relevant and appropriate, and will continue. However, the development of additional measures by HS1 through the enhanced asset management processes will further inform ORR of asset performance, and status through the asset life cycle. Target implementation date April 2015 **Recommendation Closed**

4.4.1 NR (HS) now undertakes a small number of random data checks on incidents at the end of each quarter, to verify accuracy and reliability of that data, in line with the recommendation 2011.P.01. The checks, which also include reconciliation against Business Objects raw data and performance regime outputs from BO, are detailed in the Quarterly Report, along with any errors or discrepancies found and an

explanatory script. No errors or discrepancies have been found to date in any of these random checks.

4.4.2 A recent check of train count data has however found discrepancies for Eurostar which have been traced back to a train service code change affecting certain 'non-standard' Eurostar services – mainly the Euro Disney summer extras. This led to an under-count of 16 services in a quarter, and had existed since 2010. Retrospective re-validation of train count numbers was carried out as a result, but this, in fact, made no material difference to the reported KPIs. NR (HS) confirmed that all other non-standard services (ski trains, summer Nice services etc.) were properly captured by the BO query, and that freight services were all uniquely coded 4Qxx, and therefore were also properly picked up. NR (HS) have now established arrangements with train planning teams to ensure any future changes in train service codes and headcodes are advised to them in advance. A recommendation in this regard has been formulated.

4.4.3 One further sense check carried out is to compare quarterly train count data with previous year's actual figures.

5 Review of Asset Register – Findings

5.1 Introduction

5.1.1 In our 2011 report, we made the following observations about the Asset Register,

- each asset should be recorded only once – HS1's Asset Register is compliant.
- the Asset Register should be independent of the organisation structure – again compliant, HS1's Asset Register is organised by asset type.
- the Asset Register should allow the unique identification of a physical asset within the system – compliant, each asset has a unique identification number and name.
- the Asset Register is the primary source of static asset information – partially compliant in that it contains the basic identifiers but does not consistently hold static data such as date of installation, manufacturer, model number, criticality and condition indicator.
- there should be a 'single source of truth' (SSOT) - (this refers to the practice of structuring information models such that every data element is stored exactly once; any linkages to this data element are by reference only) – fails in that the register does not have adequate static information, which instead is held in a number of spreadsheets outside of eAMS.

5.1.2 Our 2013/14 review focused on understanding how HS1/ NR (HS) has responded to these comments. We have included the Asset Register section of our 2011 report in Appendix B..

5.2 Asset Data

5.2.1 NR (HS) demonstrated how track data was now being gathered at a detailed level and held in eAMS. A track section RCF profile was shown as an example, and it was confirmed that the intention is to incorporate this information into the Asset Quality Plan. Within the Asset Register, NR (HS) now identifies fields as mandatory or non-mandatory. This now ensures that important data is captured; the data held within the Asset Register is more comprehensive. The NR (HS) team commented that PAS55 training was now helping people to understand the importance of asset data.

5.2.2 NR (HS) described the Asset Quality arrangements, which are largely a 'virtual' store of dynamic records, and an audit trail of activity associated with each asset. This work is in the early stages of development. NR (HS) also demonstrated the on-going work to measure asset quality data and create a high level dashboard of indicators.

5.2.3 We consider that NR (HS) were able to demonstrate considerable improvements in the quality of asset data.

5.3 Asset Criticality and Condition Monitoring

5.3.1 HS1 has now defined criticality and priority for all assets as part of the Asset Policies for each asset group. Five degrees of criticality (service affecting, safety etc.) lead to an overall criticality assessment based on engineering judgement:

- Very High (A)
- High (B)
- Medium (C)
- Low (D)
- Very Low (E).

5.3.2 'Train Delay' (a lagging indicator) was given as an example of a criticality factor used in the assessment.

5.3.3 NR (HS) have not yet applied a lower level of criticality ratings which take account of location and utilisation, though there is some work being undertaken in this area.

5.3.4 NR (HS) confirmed that these criticality ratings have now been mapped onto the assets in the asset register at a 'system' level of classification, not at a more detailed 'asset type' level. NR (HS) are currently producing 10 Asset Knowledge Standards, segregated by discipline, in which the definitions, amongst other things, would be held. The target for completion of this work is 31 March 2014.

5.3.5 NR (HS) have defined arrangements for Condition Monitoring & Reporting in section 3.3.2.5 of the Asset Management Annual Statement[2] . A 1-5 scoring system has been applied to each asset, where 1 is an 'as new' asset, and 4 is 'degraded asset with high unreliability' and 5 is 'taken out of service until fixed/ restored'. NR (HS) demonstrated that these scores have been recorded in the asset register. NR (HS) advised that the scores have currently been derived through a desk top exercise, the physical condition of actual assets and has yet to be fully assessed. This remains work in progress, and NR (HS) is actively considering how best to represent asset condition in its register in the future. One of the key issues is how best to record track condition over time, in order to establish a degradation profile and timescale.

5.3.6 We suggest there may be a benefit in a review of these further asset data developments at an appropriate time.

5.3.7 In a further development since the 2011 audit, NR (HS) demonstrated that they are now using eAMS to support maintenance activity by providing asset service and maintenance history, and a maintenance database. This is similar to the way which Ellipse is configured in the conventional UK railway.

[2] HS1 - Asset Management Annual Statement

5.4 Asset Register Change Control

5.4.1 NR (HS) provided evidence of asset change requests being reported in maintenance documentation. NR (HS) gave assurance that staff had all been briefed on the importance of reporting when asset status, condition or physical characteristics had changed. They had also instructed that if asset data was found to be incorrectly described, this should also be reported, in order to amend and update eAMS.

5.4.2 NR (HS) are seeking to automate reporting through mobile technology applications, along with other modular applications (such as time & labour cost data), but it is expected that this may take 18 months to 2 years to complete.

5.4.3 The security of the eAMS system was also discussed; NR (HS) described the controls on who can input and change data and records in the system, and the control arrangements over the issue of works orders[3],[4].

5.5 Progress against 2011 Recommendations

Number	Recommendation	Data Owner	Feb 2014 Update
2011.AR.01	Define and agree a programme for adding equipment level data to the Asset records	HS1	Use of mandatory category for important data fields introduced. Asset Knowledge Standards being developed. **Recommendation closed.**
2011.AR.02	Assess options and develop a proposal for migrating the condition indicator and criticality data into the asset register (currently held in eAMS).	HS1	Condition and criticality data is being introduced at system level. Remains work in progress. **Recommendation closed.**
2011.AR.03	To improve asset data quality, take action to ensure that maintenance teams report errors on maintenance reporting forms (e.g. number and location) so as to correct errors in the Asset Register.	HS1	HS1 provided evidence of change requests and staff have been appropriately briefed. **Recommendation closed.**

5.6 Additional Comments

5.6.1 We identified that the areas requiring more work and understanding in the future are degradation rates and profiles, as well as recording this information in a meaningful and user-friendly fashion.

[3] Doc Ref: C/03/SP/39/2005 – Data Maintenance Process Operating Policy for Infrastructure
[4] Doc Ref: C/03/SP/39/2003 – Work Management Process Operating Policy for Infrastructure

5.6.2 Arup questioned how Asset Policies link into the eAMS system. (It was agreed that this was an 'out-of-scope' question). NR (HS) advised that the Quality Plans will contain Asset Policy intervention triggers.

6 Conclusions

6.1 Performance

6.1.1 The issues raised during last year's audit have been closed down appropriately and performance data is now being produced to a set of specified procedures to the standard seen elsewhere in the UK network.

6.2 Asset Management

6.2.1 Asset data processes are now better documented and being produced accurately. Three of the five KPIs continue to report zero occurrences.

6.3 Asset Register

6.3.1 The Asset Register is held in an integrated and flexible eAMS system. At the highest level it is comprehensive and accurate, and NR (HS) have and continue to improve the quantity and quality of important equipment and condition data. The inclusion of degradation data forms part of NR (HS) future plans for data improvement.

6.3.2 We consider that NR (HS) were able to demonstrate considerable improvements in the quality of asset data since our 2011 review. This should be seen as work in progress as part of a continuous improvement process.

7 Confidence Ratings

7.1 Confidence Grading System

The confidence grading system used in this report is based on the approach taken in our Independent Reporter (Part A) work for ORR and Network Rail, whereby a two-character alphanumeric rating (e.g. 'A2') is used to provide a combined assessment of reliability and accuracy, with the letter used as a reliability rating, and the number as an accuracy rating. The rating system used is summarised below. It should be noted that the reliability and accuracy definitions used in our Independent Reporter work have since been amended, and we have agreed with HS1 and ORR to use the present system, shown below in this report, which are not consistent with the grades used in our previous reports.

Table 7.1: System Reliability Grading System

System Reliability Band	Description
A	Appropriate, auditable, properly documented, well-defined and written records, reporting arrangements, procedures, investigations and analysis shall be maintained, and consistently applied across Network Rail. Where appropriate the systems used to collect and analyse the data will be automated. The system is regularly reviewed and updated by Network Rail's senior management so that it remains fit for purpose. This includes identifying potential risks that could materially affect the reliability of the system or the accuracy of the data and identifying ways that these risks can be mitigated. The system that is used is recognised as representing best practice and is an effective method of data collation and analysis. If necessary, it also uses appropriate algorithms. The system is resourced by appropriate numbers of effective people who have been appropriately trained. Appropriate contingency plans will also be in place to ensure that if the system fails there is an alternative way of sourcing and processing data to produce appropriate outputs. Appropriate internal verification of the data and the data processing system is carried out and appropriate control systems and governance arrangements are in place. The outputs and any analysis produced by the system are subject to management analysis and challenge. This includes being able to adequately explain variances between expected and actual results, time-series data, targets etc. There may be some negligible shortcomings in the system that would only have a negligible effect on the reliability of the system.
B	As A, but with minor shortcomings in the system. The minor shortcomings would only have a minor effect on the reliability of the system.
C	As A, but with some significant shortcomings in the system. The significant shortcomings would have a significant effect on the reliability of the system.
D	As A, but with some highly significant shortcomings in the system. The highly significant shortcomings would have a highly significant effect on the reliability of the system.

Table 7.2 below shows the Accuracy Grading system, incorporating the new 1* accuracy rating.

Table 7.2: Accuracy Grading System

Accuracy Band	Description
1*	Data used to calculate the measure is accurate to within 0.1%
1	Data used to calculate the measure is accurate to within 1%
2	Data used to calculate the measure is accurate to within 5%
3	Data used to calculate the measure is accurate to within 10%
4	Data used to calculate the measure is accurate to within 25%
5	Data used to calculate the measure is accurate to within 50%
6	Data used to calculate the measure is inaccurate by more than 50%
X	Data accuracy cannot be measured

Notes:

1. - Accuracy is a measure of the closeness of the data used in the system to the true values.
2. - Accuracy is defined at the 95% confidence level - i.e. the true value of 95% of the data points will be in the accuracy bands defined above.

7.2 Confidence Ratings Achieved

7.2.1 Performance

Key Performance Indicator	2011 Rating	2013/14 Rating	2013/14 Rating
Total number of trains timetabled	A1	A1*	The procedures which have been checked and deemed sufficient mean this measure has an A for reliability and 1* for accuracy.
Total number of trains delayed	A1	A1*	The procedures which have been checked and deemed sufficient mean this measure has an A for reliability and 1* for accuracy.
Number of trains delayed by an incident wholly or mainly attributable to HS1	A1	A1*	The procedures which have been checked and deemed sufficient mean this measure has an A for reliability and 1* for accuracy.
Number of trains delayed by an unidentifiable incident	A1	A1*	The procedures which have been checked and deemed sufficient mean this measure has an A for reliability and 1* for accuracy.

7.2.2 Asset Management

Key Performance Indicator	2011 Rating	2013/4 Rating	2013/ 14 Rating
Overall Fault Levels	A1	A1*	The procedures which have been checked and deemed sufficient mean this measure has an A for reliability and 1* for accuracy
Plan Attainment – Backlog	A1	A1*	The procedures which have been checked and deemed sufficient mean this measure has an A for reliability and 1* for accuracy
Track Quality-Induced Speed Restrictions	A1	A1*	The procedures which have been checked and deemed sufficient mean this measure has an A for reliability and 1* for accuracy
Broken Rails	A1	A1*	The procedures which have been checked and deemed sufficient mean this measure has an A for reliability and 1* for accuracy
Service-Affecting Defective Rails	A1	A1*	The procedures which have been checked and deemed sufficient mean this measure has an A for reliability and 1* for accuracy

7.2.3 Confidence ratings for the Asset Register are not required. -

8 Recommendations

Number	Recommendation	Data Owner	Due Date
2013.P.01	Review the methodology for extracting "Trains Run" data using train service codes, to mitigate the risk of error (missed trains) when train service codes are changed within the train planning system	HS1	July 2014
2013.P.02	Review the procedures for allocating a 'prime' cause for trains cancelled for more than one primary reason/ cause code, and determine how to report on these. Incorporate the revised methodology into the HS1 Performance Floor Report methodology.	HS1	July 2014

Appendix A

Mandate

A1 Mandate

Draft Mandate

The measures to be assessed during this review are as follows:

Performance (all measures to be subject to a high level review, to include confidence grading and progress against 2011/12 recommendations only)

1. Total number of trains timetabled

2. Total number of trains delayed

3. Number of trains delayed by an incident wholly or mainly attributable to HS1

4. Number of trains delayed by an unidentifiable incident

Asset management (as with performance, measures 1-5 to be subject to a high level review, to include confidence grading and progress against 2011/12 recommendations only)

1. Plan Attainment (Backlog)

2. Overall Fault Levels

3. Track Quality-Induced Speed Restrictions

4. Broken Rails

5. Service-Affecting Defective Rails

6. Asset register – not an indicator, but as part of the review we want assurance that progress against recommendations have been achieved. Specifically, condition indicator and criticality data have been migrated, and errors on maintenance forms are reported such that the Asset register is corrected. We want assurance that the Asset Register, and data quality of information in it, has improved since the 2011/12 review.

Appendix B

Glossary of Terms

B1 Glossary of Terms

BO	Business Objects
CA	Concession Agreement
CTRL	Channel Tunnel Rail Link
eAMS	Engineering Asset Management System
HS1	High Speed 1
KPI	Key Performance Indicator
NR (HS)	Network Rail (High Speed) Ltd.
OA	Operator's Agreement
ORR	Office of Rail Regulation
PAS 55	Asset Management Standard published by British Standards Institution
POP	Process Operating Policy
PSS	NR performance data 'warehouse'/ archive
RCF	Rolling Contact Fatigue (track fault)
SEAR	Safety, Environment & Assurance Report
SSOT	Single Source of the Truth
TOC	Train Operating Company
TRUST	NR train running monitoring system

Appendix C

Examples of Multiple Cause of Cancellations

The data shows two cancellations, the first at St Pancras, and the second at Stratford International.

The two incidents have two cancellation causes (501D and 701E for train ID 631F26MI17 and 502C and 701D for train ID 891F19MC03), these give responsible names of High Speed and Southeastern for both trains.

The data is extracted in the current order then 701 E and 701D will be the cause incidents, indicating Southeastern's cause, if the data is extracted with causes 701E and 701D first then HS1 will be the cause.

Business Objects does not have any sort filters as to how the data is extracted.

C1 Example 1

	Example 1	
	1	2
Operator	Southeastern	Southeastern
Train ID	631F26MI17	631F26MI17
Planned Service Date	17/08/2013 11:22	17/08/2013 11:22
Financial Year & Period	2013/14_P05	2013/14_P05
Incident Number	879375	879375
Incident Start Date	17/08/2013 11:00	17/08/2013 11:00
Incident Description	SPX EVACUATED	SPX EVACUATED
Incident Text	TEL : 085-73716 FAX : 085-73762 MOBILE : 07740561510 EMAIL: KICC_TSM@SOUTHEASTERNRAILWAY.CO.UK ========== ========= ========== 1F26 11.22 SPI-FAV TBA 1J25 09.53 MAR-SPI HELD AT SFI 1F27 10.28 FAV-SPI HELD AT EBS DESCRIPTION*** 17-AUG-2013 11:30:00 *** QMTSCA2 *** *** 17/08/13 11:30 #QMTSCA2 *** AMENDED ** REASON CODE UPDATED FROM RZ TO RH DESCRIPTION*** 22-AUG-2013 16:00:00 *** QMDRC03 *** *** 22/08/13 16:00 #QMDRC03 *** AMENDED KICC LOG STATES: REPORT RECEIVED FROM DCM THAT STATION IS BE ING EVACUATED DUE TO A FIRE ALARM. KICC ALSO ADVISE OF SAME INFORMATION COMING THROUGH FROM STATION STAFF CONFIRMING EVA CUATION. DCM AND KICC ADVISED THAT ALL TRAINS WILL BE HELD A T STRATFORD AND EBBSFLEET UNTIL FURTHER UPDATES ARE RECEIVED . STATION CONTROL CONTACTED FOR SITUATION UPDATE.3 FIRE BRIGAD E APPLIANCES ARE IN ATTENDANCE .AWAITING REPORT BACK FROM LF B.KICC ADVISED AND PLANS TO START TURNBACK OF SE SERVICES AT STRATFORD ARE UNDERWAY. REPORT FROM STATION CONTROL THAT LFB HAVE CONFIRMED INCIDENT AS A FALSE ALARM. STATION TO REMAIN CLOSED TO INCOMING PASS ENGERS UNTIL ALARM CAN BE SILENCED. TRAIN SERVICE WILL NOW R ESUME. ** RESPONSIBLE MANAGER CODE UPDATED FROM RHUZ TO DHUZ RESOLUTION*** 23-AUG-2013 06:51:00 *** HUDAV04 *** * 23/08/13 06:51 #HUDAV04 * ACCEPTED BY USER RESOLUTION*** 19-AUG-2013 07:30:00 *** HUFBE24 *** * 19/08/13 07:30 #HUFBE24 * DISPUTED PARTIAL ACCEPTANCE PLS CODE RH/DHUZ. DAG 4.11.7	TEL : 085-73716 FAX : 085-73762 MOBILE : 07740561510 EMAIL: KICC_TSM@SOUTHEASTERNRAILWAY.CO.UK ========== ========= ========== 1F26 11.22 SPI-FAV TBA 1J25 09.53 MAR-SPI HELD AT SFI 1F27 10.28 FAV-SPI HELD AT EBS DESCRIPTION*** 17-AUG-2013 11:30:00 *** QMTSCA2 *** *** 17/08/13 11:30 #QMTSCA2 *** AMENDED ** REASON CODE UPDATED FROM RZ TO RH DESCRIPTION*** 22-AUG-2013 16:00:00 *** QMDRC03 *** *** 22/08/13 16:00 #QMDRC03 *** AMENDED KICC LOG STATES: REPORT RECEIVED FROM DCM THAT STATION IS BE ING EVACUATED DUE TO A FIRE ALARM. KICC ALSO ADVISE OF SAME INFORMATION COMING THROUGH FROM STATION STAFF CONFIRMING EVA CUATION. DCM AND KICC ADVISED THAT ALL TRAINS WILL BE HELD A T STRATFORD AND EBBSFLEET UNTIL FURTHER UPDATES ARE RECEIVED . STATION CONTROL CONTACTED FOR SITUATION UPDATE.3 FIRE BRIGAD E APPLIANCES ARE IN ATTENDANCE .AWAITING REPORT BACK FROM LF B.KICC ADVISED AND PLANS TO START TURNBACK OF SE SERVICES AT STRATFORD ARE UNDERWAY. REPORT FROM STATION CONTROL THAT LFB HAVE CONFIRMED INCIDENT AS A FALSE ALARM. STATION TO REMAIN CLOSED TO INCOMING PASS ENGERS UNTIL ALARM CAN BE SILENCED. TRAIN SERVICE WILL NOW R ESUME. ** RESPONSIBLE MANAGER CODE UPDATED FROM RHUZ TO DHUZ RESOLUTION*** 23-AUG-2013 06:51:00 *** HUDAV04 *** * 23/08/13 06:51 #HUDAV04 * ACCEPTED BY USER RESOLUTION*** 19-AUG-2013 07:30:00 *** HUFBE24 *** * 19/08/13 07:30 #HUFBE24 * DISPUTED PARTIAL ACCEPTANCE PLS CODE RH/DHUZ. DAG 4.11.7
Incident Location	St Pancras International (HS1)	St Pancras International (HS1)
Delay or Cancellation	CANCELLATION	CANCELLATION
Attribution Status	Attribution Agreed	Attribution Agreed
Incident Category	**501D**	**701E**
Incident Reason	OJ	RH
HS1 Minutes	0	0
ToT Minutes	0	0
ToS Minutes	0	0
Responsible Name	**High Speed**	**Southeastern**
Train ID/Date	631F26MI1717/08/2013	631F26MI1717/08/2013
Train ID / Date / Incident No in ATT	631F26MI1717/08/2013879375	631F26MI1717/08/2013879375
Lookup Incident Allocation	Non Excludable	TOC
Incident Allocation (flag errors)	Non Excludable	TOC
ATT Train?	Yes	Yes

C2 Example 2

	Example 2	
	3	4
Operator	Southeastern	Southeastern
Train ID	891F19MC03	891F19MC03
Planned Service Date	03/08/2013 08:28	03/08/2013 08:28
Financial Year & Period	2013/14_P05	2013/14_P05
Incident Number	847897	847897
Incident Start Date	03/08/2013 09:14	03/08/2013 09:14
Incident Description	1J17 UNIT DEFECT XXR XXY	1J17 UNIT DEFECT XXR XXY
Incident Text	DESCRIPTION*** 03-AUG-2013 10:35:00 *** QMTSCA7 *** *** 03/08/13 10:35 #QMTSCA7 *** CREATED CCIL REPORTS: DRIVER OF 1J17 ADVISED AFC SIGNALLER THAT HIS TVM FAILED TO AUTOMATICALLY DISARM ON LEAVING THE TVM SIGNALLED AREA AT TH E EXIT OF LONDON TUNNEL 1. HE RECIEVED A SOS CAB AND IS UNAB LE TO RELEASE HIS BRAKES. KICC ADVISED. UNIT 395010 COACH 39 101. DESCRIPTION*** 12-AUG-2013 11:48:00 *** QMDRC03 *** *** 12/08/13 11:48 #QMDRC03 *** AMENDED INCIDENT RE-CODED DHUZ AS PER AGREEMENT ON 31/03/2013 ** RESPONSIBLE MANAGER CODE UPDATED FROM MHU2 TO DHUZ RESOLUTION*** 15-AUG-2013 08:42:00 *** HUFBE24 *** * 15/08/13 08:42 #HUFBE24 * ACCEPTED BY USER RESOLUTION*** 12-AUG-2013 12:21:00 *** HUDAV04 *** * 12/08/13 12:21 #HUDAV04 * DISPUTED INCORRECT MANAGER CODE PENDING FURTHER DISCUSION RESOLUTION*** 05-AUG-2013 15:50:00 *** HUFBE24 *** * 05/08/13 15:50 #HUFBE24 * DISPUTED PARTIAL ACCEPTANCE IN THE LOG IT WOULD APPEAR A LOT OF DELAY WAS CAUSED IN THE TIME IT TOOK 9O11 TO MAKE THE REVERSE MOVE TO STRATFORD (IN EXCESS OF 20 MINUTES)	DESCRIPTION*** 03-AUG-2013 10:35:00 *** QMTSCA7 *** *** 03/08/13 10:35 #QMTSCA7 *** CREATED CCIL REPORTS: DRIVER OF 1J17 ADVISED AFC SIGNALLER THAT HIS TVM FAILED TO AUTOMATICALLY DISARM ON LEAVING THE TVM SIGNALLED AREA AT TH E EXIT OF LONDON TUNNEL 1. HE RECIEVED A SOS CAB AND IS UNAB LE TO RELEASE HIS BRAKES. KICC ADVISED. UNIT 395010 COACH 39 101. DESCRIPTION*** 12-AUG-2013 11:48:00 *** QMDRC03 *** *** 12/08/13 11:48 #QMDRC03 *** AMENDED INCIDENT RE-CODED DHUZ AS PER AGREEMENT ON 31/03/2013 ** RESPONSIBLE MANAGER CODE UPDATED FROM MHU2 TO DHUZ RESOLUTION*** 15-AUG-2013 08:42:00 *** HUFBE24 *** * 15/08/13 08:42 #HUFBE24 * ACCEPTED BY USER RESOLUTION*** 12-AUG-2013 12:21:00 *** HUDAV04 *** * 12/08/13 12:21 #HUDAV04 * DISPUTED INCORRECT MANAGER CODE PENDING FURTHER DISCUSION RESOLUTION*** 05-AUG-2013 15:50:00 *** HUFBE24 *** * 05/08/13 15:50 #HUFBE24 * DISPUTED PARTIAL ACCEPTANCE IN THE LOG IT WOULD APPEAR A LOT OF DELAY WAS CAUSED IN THE TIME IT TOOK 9O11 TO MAKE THE REVERSE MOVE TO STRATFORD (IN EXCESS OF 20 MINUTES)
Incident Location	Stratford Intl W Jn to York Way South Junction	Stratford Intl W Jn to York Way South Junction
Delay or Cancellation	CANCELLATION	CANCELLATION
Attribution Status	Attribution Agreed	Attribution Agreed
Incident Category	**502C**	**701D**
Incident Reason	QT	M6
HS1 Minutes	0	0
ToT Minutes	0	0
ToS Minutes	0	0
Responsible Name	**High Speed**	**Southeastern**
Train ID/Date	891F19MC03-203/08/2013	891F19MC03-203/08/2013
Train ID / Date / Incident No in ATT	891F19MC03-203/08/2013847897	891F19MC03-203/08/2013847897
Lookup Incident Allocation	Unidentifiable	TOC
Incident Allocation (flag errors)	Unidentifiable	TOC
ATT Train?	Yes	Yes

Appendix D

Summary of 2011 Asset Register Findings

D1 Summary of 2011 Asset Register Findings

D1.1 Background

ORR requires the following of HS1:

'*A key obligation for HS1 Limited in the concession agreement is the general duty concerning stewardship of the HS1 railway infrastructure. This requires HS1 Limited to secure the operation, maintenance, renewal, replacement and planning and carrying out of upgrades in accordance with best practice and in a timely, efficient and economical manner, to the greatest extent reasonable practicable having regard to all the circumstances.*

In complying with this duty, HS1 Limited must:

- *establish and implement an asset management strategy;*
- *maintain accurate information about the condition, capability and capacity of its assets; and*
- *produce and update an asset register. This register should list all the HS1 railway infrastructure assets and their condition, including renewal and replacement dates.* '[5]

D1.1.1 Arup Remit

Our remit for this work is to review the Asset Register information provided by HS1 and to visit NR (CTRL) to verify data provided, identify any gaps in information and gather appropriate evidence. This is to be carried out by reviewing samples of assets in each discipline and selected subsets. It was agreed that a reliability and accuracy grading would not be given to the Asset Register because these grades have been designed to measure the quality of system outputs (in the form of KPIs) rather than the system itself.

D1.1.2 Asset Register – Principles

The Institute of Asset Management publishes a Publicly Available Specification, PAS-55: 2008 Asset Management[6] which contains guidance on required good practice for asset management. Part 2 provides examples of information which should be held in an asset data system including:

a. - descriptions of assets, their functions and the asset system they serve;

b. - unique asset identification numbers;

c. - locations of the assets, possibly using spatial referencing or geographical information systems; and

d. - the criticality of assets to the organisation.

[5] http://www.rail-reg.gov.uk/server/show/nav.2509
[6] Publicly Available Specification PAS 55: 2008 Asset Management - Part 2 Guidelines for the application of PAS 55-1

The principles of an Asset Register, drawing on good practice are generally considered to include:

a. each asset should be recorded only once;

b. the Asset Register should be independent of the organisation structure;

c. the Asset Register should allow the unique identification of a physical asset within the system;

d. the Asset Register is the primary source of static asset information; and

e. there should be a 'single source of truth' (SSOT) - (this refers to the practice of structuring information models such that every data element is stored exactly once; any linkages to this data element are by reference only).

D1.1.3 Objectives for Arup Review

In reviewing the data held by HS1, we set out to understand the following:

a. - comprehensiveness – does the data set include all of the records that it should?

b. - completeness – of the records that have been populated, how complete are the data fields?

c. - consistency – what is the degree of standardisation that has been used to describe similar items?

d. - currency – is the data up-to-date and is it updated at appropriate intervals?

e. - accuracy – is the data that has been populated correct?

The above considerations form the basis of our review.

D1.2 Asset Register Review

D1.2.1 Introduction

Our primary contact at NR (CTRL) in Singlewell was the Strategic Planning Manager. The review of the Asset Register, which is held in the NR (CTRL) Enterprise Asset Management System (eAMS), was facilitated by the Asset Knowledge Manager at NR (CTRL), and his Assistant. The review of the Asset Register took place on 14th and 15th June, and in addition on the 15th, a trackside asset data correlation exercise was carried out in the company of the NR (CTRL) Site Safety Manager.

D1.2.2 Review methodology

The review was carried out by interrogating the database to build up an understanding of the structure, content and detail of the information relating to the HS1 assets which is held in the asset register. We then reviewed the origins of the data, the processes for updating data, and the connections to the inspection, condition and maintenance data records.

The findings have been developed during our analysis of the evidence and comparison with best practice, and were not identified during our review.

D1.2.3 Asset Register within the Asset Data System

The Asset Data is held in two related forms: the Asset Register is held on an Oracle eAMS system (described in more detail in C1.2.4 below). The eAMs also contains all the maintenance records for all the assets and some additional asset data. The remaining asset information (e.g. condition monitoring and inspection reports) is held and maintained by discipline leads in spreadsheet and other electronic formats as well as paper records. eAMS is used to generate a range of management reports for the discipline leads. We restricted our data review to the eAMS system because this is the system that holds the Asset Register.

D1.2.4 Creation of the Asset Register

We were advised that the original dataset for the Asset Register was provided by Union Railways in two tranches corresponding to the two phases of construction and handover for operations.

Certain asset data fields (see C1.2.5) were mandatory and were populated. Other fields, for example manufacturer details were included by some contractors but not by others. Where this data was supplied it is held in eAMS, but there is no consistent pattern, and the missing data has not been systematically identified and added subsequently.

The datasets, organised by function were cleaned and then checked and signed off by discipline heads before being loaded into eAMS which allocated the unique Asset Number. A copy of one of the datasets for Section S1 was provided to us. Spot checks on this data (e.g. Asset 57030746, Earthing Pillar at km 42.073 Up) showed consistency between the two datasets.

D1.2.5 Asset Register - Structure

The NR (CTRL) Enterprise Asset Management System (eAMS) used by NR (CTRL) is an Oracle application running on an Oracle server. The full asset register is held within the eAMS, for all asset function groups. For each asset, data is held in the following four fields:

1. - Asset Type
2. - Asset Group
3. - Asset Number & Asset Name (directly linked data)
4. - Asset Category

Additional fundamental asset data is held for each asset in the form of various attributes, which include:

1. - Engineer's Line Reference and Location (measured in kilometres)
2. - Eastings and Northings
3. - Health & Safety File number
4. - Asset Status
5. - Equipment Class – used to sub-divide the Group into sub-groups (e.g. BB is the equipment class for Bridges).

6. Inspection frequency

There are also base fields for criticality, which are not yet populated. At the present time, inspection frequency is a proxy for criticality but HS1 are investigating the possibility of using the criticality fields. We endorse the concept of holding criticality data in the Asset Register. Similarly, we understand that NR (CTRL) are considering including a condition indicator for some of the asset groups, which would also be a significant improvement in accordance with the principle of SSOT.

There are a large number of possible attributes for each asset available in the Asset Register, many of which are optional, and most of which are unused. In this respect, the Oracle system is powerful and very flexible if fully utilised as it allows the user to set up new data fields as required.

D1.2.6 Asset Register Content

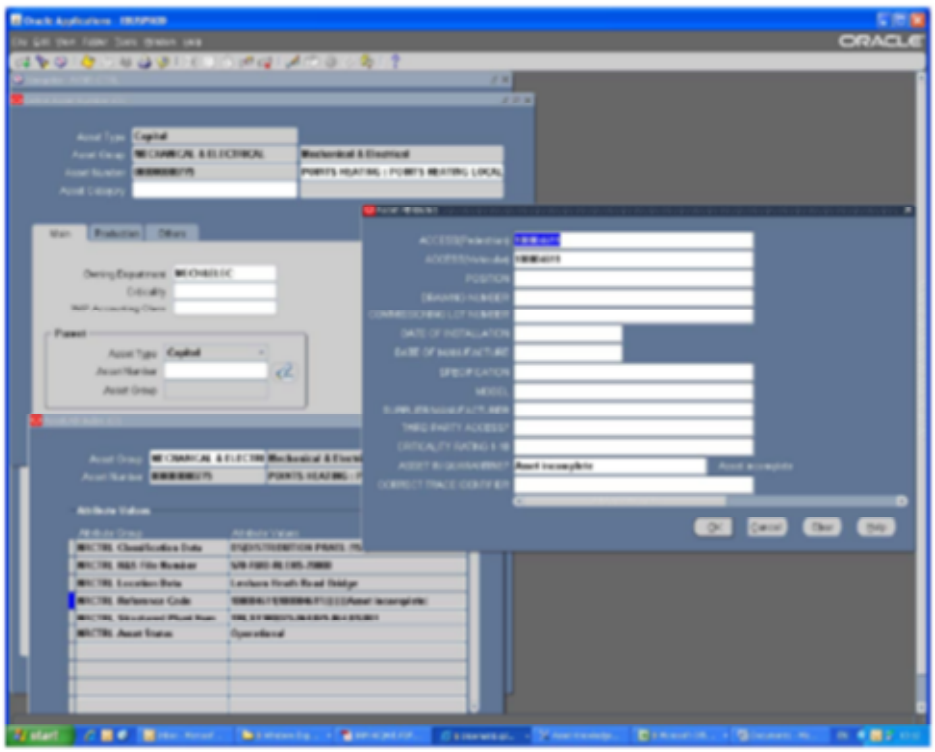
The Asset Register data covers the entire HS1 route from Cheriton to St Pancras, for all rail infrastructure asset classes. Each functional Asset Group is organised differently according to the requirements of the group. For example, the permanent way is considered as two assets – the Up and the Down for the total length of the system. Other elements of the track system, for example Switches and Crossings are 'overlaid' on this asset. Each asset group records each asset in the same way using the four key fields, but the attributes will vary by group, and at a lower level of hierarchy by asset depending on the data which is available. There are many thousand assets in the system – for example there are approximately 12,000 civils assets.

For the reasons noted in C1.2.3, the Asset Register does not contain full or consistent (by type) descriptions of all assets; asset data related to the manufacturer, age and condition indicator is either held in eAMS or in the spreadsheets referred to above. Because this information is static or slowly changing, we consider that all this information should be held in the Asset Register.

For example, if an asset is replaced like for like, the HS1 process does not require the event to be recorded in the Asset Register although there would be an associated maintenance record of it within eAMS. HS1 hold the view that the asset remains unchanged at the level of the register and therefore this data is not needed in the Asset Register. If the new asset was different in some way, for example a different manufacturer, then the data change process would ensure that this was recorded in the Asset Register. This means that this information is held in two different places depending on whether the asset has changed or not.

In our opinion, if condition is the driver for replacement, condition indicator data should be held in the Asset Register; at present, it is held within standalone databases and spreadsheets outside the Asset Register (and so not reviewed in this Mandate). Whilst this may not be a problem for a comparatively new railway, as the railway and its assets age the need to analyse the condition indicator will become more important. The Asset Register forms the basis of the Asset Management system and planning process. If basic equipment data is held in the Asset Register, it is visible to all the other systems. Efficiency is therefore improved, and the enlarged asset register would be a more reliable single source of truth.

The screenshot of the asset register data for a points heating set illustrates the above:



Points heating asset with Attributes.

The Asset Register therefore lacks completeness, and the fact that basic information about the asset is held outside eAMS reduces the effectiveness of the Asset Register.

D1.2.7 Updating of Asset Register

Only two NR (CTRL) employees have authority to edit the asset register; this is to safeguard the integrity of the data. Editing the Asset Register is carried out in accordance with the Data Quality Standards and Data Governance Procedures; these processes are set out in Data Maintenance Process Operating Policy[7]. We were shown signed change authorisation records which demonstrated that this process is being followed routinely.

D1.2.8 Validation of Asset Register

At our request, NR (CTRL) prepared a complete list of assets for a 1.5 km length of the railway in the vicinity of the Singlewell Depot. This list was 17 pages in length, representing about 1000 assets.

Working inside the boundary fence but from behind the trackside safety barrier, we carried out spot checks to check the completeness and positional accuracy of the data listed.

This process identified minor errors in two of the assets – the location of a set of points (Asset Number 2217) was recorded incorrectly (by about 60 metres), and

[7] Network Rail (CTRL) Ltd, Asset Management System, Data Maintenance Process Operating Policy, Asset Management, Issue: 5.0 Final, Date: 18/01/2007

the register held information related to three Locations Cases at kilometrage 042.300 Up whereas only two Location Cases exist here. We confirmed that there were no maintenance records associated with the phantom Location Case. In all other cases we were able to verify the position and description of the assets we checked, across the range of functions. These errors are not considered to be significant, but our verification sample was not (by prior agreement) statistically significant. The maintenance report forms used clearly instruct the maintainer to report any inconsistencies between information on the form and observations in the field; these instructions are not followed in every case.

D1.2.9 Connections between Asset Register and Inspection Reports and Condition Data

eAMS has the facility to hold records and reports about each asset through the attribute system; we were advised that this is not widely used because of the access restrictions on the use of the system.

Condition and degradation data is held in standalone databases and spreadsheets which are managed by the discipline heads. These are related to the Asset Register through the Asset Number & Asset Name fields of the asset record.

According to NR (CTRL)'s Asset Information Strategy, NR (CTRL) recognises the importance of considering the best way to integrate this with eAMS so that data is consistent and of high quality. We support this opinion because spreadsheets are not robust enough for these applications, for the following reasons:

- there are likely to be quality issues with change control; and
- particularly for spreadsheets, there are difficulties in managing traceability, changes and errors, and with formulae becoming corrupted.

We consider NR (CTRL) should have assured tools for managing this important supplementary data, for example implementing a Condition Monitoring System within eAMS.

D1.2.10 Summary of Findings

In C1.1.2 above we set out a set of principles for an Asset Register, and our findings in relation to these are summarised below.

a. - *each asset should be recorded only once* – HS1's Asset Register is - compliant. -

b. - *the Asset Register should be independent of the organisation structure* – again compliant, HS1's Asset Register is organised by asset type.

c. - *the Asset Register should allow the unique identification of a physical asset within the system* – compliant, each asset has a unique identification number and name.

d. - *the Asset Register is the primary source of static asset information* – partially compliant in that it contains the basic identifiers but does not consistently hold static data such as date of installation, manufacturer, model number, criticality and condition indicator.

e. - *there should be a 'single source of truth' (SSOT) - (this refers to the practice of structuring information models such that every data element is stored exactly once; any linkages to this data element are by reference only)* – fails in that the register does not have adequate static information, which instead is held in a number of spreadsheets outside of eAMS.