Office of Rail Regulation

HS1 Data Assurance

Review 2011-12

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ARUP

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Executive Summary

Introduction

Last year the Arup team reviewed the data management and assurance arrangements of HS1's Performance and Asset Management Key Performance Indicators (KPIs), and some recommendations were made for their improvement. This year we have reviewed progress made by HS1 and NR (CTRL) and, as described below, have found that all recommendations have successfully been implemented. As a result, the reliability and accuracy of these KPIs have improved significantly and are all now awarded a confidence rating of A1.

In addition, this year we have reviewed the Asset Register for HS1. Based on checking a sample of assets, we found that the accuracy of the data held within the register is sound with only two minor errors identified. We also reviewed the structure of the register against recognised good practice and have identified a number of strengths and weaknesses.

Performance KPIs

The previous audit noted that there was a lack of procedures and automation in place. These have now been put in place and the confidence ratings awarded reflect this.

The confidence ratings are as follows:

- Total number of trains timetabled – last audit was C2. This grade was because of the lack of any procedures. The new procedures now mean this measure has an A for reliability and 1 for accuracy (the 2 for accuracy last time was because of compatibility with a C reliability grade).
- Total number of trains delayed – last audit was C2. The previous C grade was primarily due to inconsistencies in definitions. These have now been clarified. The accuracy score reflected difficulties with double counting of some trains which has been corrected. The measure is now A for reliability and 1 for accuracy.
- Number of trains delayed by an incident wholly or mainly attributable to HS1 - last audit was C2. This grade was because of the lack of any procedures. The new procedures now mean this measure has an A for reliability and 1 for accuracy (the 2 for accuracy last time was because of compatibility with a C reliability grade).
- Number of trains delayed by an unidentifiable incident - last audit was C2. The grade was because of the lack of any procedures. The new procedures now mean this measure has an A for reliability and 1 for accuracy (the 2 for accuracy last time was because of compatibility with a C reliability grade).

Asset Management KPIs

The previous audit noted an overall lack of procedures and definitions. These have now been rectified and the amended confidence ratings reflect this. The overall levels are very small and mean that accuracy levels are always likely to be high.

Track quality induced speed restrictions, broken rails and service affecting defective rails continue to be reported as zero occurrences. ORR and HS1 should consider whether these are appropriate measures for monitoring the management of a new high speed route.

- Overall Fault Levels – last audit was B2. The reliability grade reflected the lack of defined process and the accuracy grade was compatible with this. The revised grade based on the updated procedures is A1.
- Plan Attainment – Backlog – this measure was not graded at the last audit. The measure continues to report very low levels of uncompleted items during the period, routinely below 0.4%. The measures taken since the last audit have ensured this number is reported consistently. The measure is graded A for reliability and 1 for accuracy.
- Track Quality-Induced Speed Restrictions – last audit was BX. The reliability grade reflected the lack of procedure. The X grade for accuracy was awarded due to the lack of a data series. The reliability grade has now progressed to A based on the improved procedures and definitions. The accuracy grade has been adjusted to 1 despite the ongoing reporting of zero events.
- Broken Rails - last audit was BX. The reliability grade reflected the lack of procedure. The X grade for accuracy was awarded due to the lack of a data series. The reliability grade has now progressed to A based on the improved procedures and definitions. The accuracy grade has been adjusted to 1 despite the ongoing reporting of zero events.
- Service-Affecting Defective Rails - last audit was BX. The reliability grade reflected the lack of procedure. The X grade for accuracy was awarded due to the lack of a data series. The reliability grade has now progressed to A based on the improved procedures and definitions. The accuracy grade has been adjusted to 1 despite the ongoing reporting of zero events.

Asset Register

The Asset Register is held in an integrated and flexible Enterprise Asset Management System (eAMS) system. At the highest level it is comprehensive and accurate, but the system does not hold important equipment, condition and degradation data.

The basic data required to define each asset is complete. However, data attribute fields are lacking relevant details at equipment level, for example manufacturer, date of installation, as well as criticality and condition indicators.

Instead of rating the Asset Register, we summarise below the strengths and weaknesses that we have identified:

Strengths

- The source data for the Asset Register is traceable back to the original construction contracts;
- The Oracle eAMS system has the capacity and flexibility to handle the data requirements for the Asset Register and key attribute data; and
- The control systems for managing the Asset Register data are sound and routinely used.

Weaknesses

- Basic asset attribute data is inconsistently held in the Asset Register; in particular the Asset Register lacks information at equipment level related to the model type and age of each asset;
- Asset criticality is being considered for inclusion, but has not yet been implemented;
- Condition indicator data is not captured in the Asset Register; and
- The above factors are not consistent with a single source of truth and reduce the quality of management reports which can be generated by the system.

Recommendations

A number of new recommendations have been made which are listed in Section 8 of this report.

1 Introduction

1.1 Background

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

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 under an operation and maintenance agreement (known as OA or Operator's Agreement). NR (CTRL) is a discrete entity within Network Rail, but is part of the Kent Route organisation. In practice, therefore, HS1 is reliant upon NR (CTRL) 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.

This audit of HS1 was undertaken within the context of HS1 being a relatively new railway with its planned maximum use of the network only being achieved with the start of domestic Southeastern services at the end of 2009. As a result the systems and processes in use to manage the railway are still in the early stages of development by HS1 and NR (CTRL).

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. We were 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. Our report produced in June 2010 was the first to be commissioned by ORR under this contract.

Since the publication of that report, Network Rail (CTRL) published the HS1 Asset Information Strategy in November 2010, which aims to direct the specification, collection, use and maintenance and disposal of asset information as required by the relevant HS1 asset management decision-making processes. In the light of this document, this year we have been asked to review the Asset Register for HS1 which covers a number of disciplines: Civils, Environmental, Mechanical and Electrical, Overhead Catenary system, Plant Equipment, Signalling, Telecommunications and Track. In addition, we have been asked to review the Performance and Asset Management KPIs that we audited last year, and to check progress against the recommendations that we made.

1.2 Scope

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

1.2.1 Performance

A high level review of the following measures, to include progress against 2010 confidence grading 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; and
- Number of trains delayed by an unidentifiable incident.

1.2.2 Asset management

A high level review of the following measures, to include progress against 2010 confidence grading and recommendations:

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

1.2.3 Asset register

A review of the processes and systems used to maintain and develop the asset register. This includes:

- Track but not stations;
- Some spot checks of assets to compare what is in the register with what is on site;
- Consideration of the method(s) to update the register, to be compared against best practice; and
- A high level review of linkages to other relevant HS1 systems, particularly on maintenance.

2 Data Audit Methodology

2.1 Inception Meeting

The inception meeting for this study was held on the 6th May as described below. The purpose was to agree the scope of work, methodology and work programme.

Subject	Location	Date	Present
Project Initiation Meeting	1 Kemble St	6th May 2011	Commercial Development Manager, NR (CTRL) Performance Analyst, NR (CTRL) Head of Compliance & Assurance, HS1 Ltd Engineering and Asset Director, HS1 Ltd Business Services Director, HS1 Ltd Head of Assets, HS1 Ltd Business Intelligence Manager, ORR Asset Management Engineer, ORR Principal Asset Management, ORR

2.2 Review of Performance and Asset Management KPIs

Both the performance and asset management KPIs were subject to audit in 2010. As part of this year's audit, we were required to carry out only a high level review of these KPIs. In particular this was to check that the recommendations from last year had been progressed satisfactorily and as a result to review the confidence ratings of each of the measures. Detailed source data checks have not been undertaken as these were done last year and not required this year. (We do, though, suggest that some source checks are undertaken during next year's audit to validate the implementation of recommendations is having the expected impact on data reliability and accuracy.) To facilitate this, meetings were held with the data champions for performance and asset management to review progress. The meetings were held as follows:

Subject	Location	Date	Present
Performance KPIs	73 Collier Street	18th May 2011	Commercial Development Manager, NR (CTRL) Performance Analyst, NR (CTRL) Head of Compliance & Assurance, HS1 Ltd
Asset Management KPIs	73 Collier Street	18th May 2011	Head of Asset Management, HS1 Ltd Head of Compliance & Assurance, HS1 Ltd

At each of the meetings the progress on recommendations was reviewed and evidence either examined or requested to support the stated position. As well as evidence against the recommendations, we requested the most recent reports so that we could check that the reporting had remained unchanged.

2.3 Asset Register Review

2.3.1 Documents Reviewed

During our work we reviewed several documents, details of which are given in the following list:

1. ORR website - http://www.rail-reg.gov.uk/server/show/nav.2509
2. Infrastructure Asset Management Strategy Version 2.0, November 2010, - Network Rail (CTRL) Ltd
3. Asset Management Annual Statement [Draft], 25 February 2011, – HS1 Ltd, NR (CTRL) Ltd
4. Network Rail (CTRL) Ltd, Asset Management System, Data Maintenance Process Operating Policy, Asset Management, Issue: 5.0 Final, Date: 18/01/2007

In addition we reviewed the HS1 /NR (CTRL) Enterprise Asset Management System (eAMS) database whilst visiting the offices of NR (CTRL) and were provided with reference copies of the procedures used, details of which are given in the following list:

1. 000-GDS-RLESM-00004-02 – Channel Tunnel Rail Link Technical Manual Volume 2 – Labelling of Systemwide Assets on the CTRL Infrastructure, RLE Rail Link Engineering, 1 July 2006
2. C/03/SP/39/2005 – Data Maintenance Process Operating Policy for Infrastructure, Network Rail (CTRL) Ltd, 20 January 2011
3. C/03/SP/39/2001 - Fault Management Process Operating Policy for Infrastructure, Network Rail (CTRL) Ltd, 10 January 2011
4. C/03/SP/39/2003 – Work Management Process Operating Policy for Infrastructure, Network Rail (CTRL) Ltd, 24 January 2011
5. C/03/SP/40/2003 - Works Planning Process Operating Policy for Infrastructure, Network Rail (CTRL) Ltd, 23 May 2011

2.3.2 Meetings

The meetings we held are as follows:

Subject	Location	Date	Present
Asset Register Data Review	73 Collier Street	6th June 2011	Head of Asset Management, HS1 Ltd Head of Compliance & Assurance, HS1 Ltd
Asset Register Data Review	Singlewell Depot	14/15th June 2011	Strategic Planning Manager, NR (CTRL) Asset Knowledge Manager, NR (CTRL) Safety Manager, NR (CTRL)

3 Findings – Review of Performance KPIs

The progress against each of the recommendations was checked with HS1 and the NR (CTRL) team. The recommendations have been managed jointly by ORR and HS1 and a spreadsheet has been used to monitor progress. In most cases ORR had recorded with HS1 that the recommendations were completed and closed. Where this was the case we have recorded whether we agree with this statement given the evidence presented by HS1.

In each of the recommendations reviewed we have signed them off as being closed. Considerable effort has gone in to documenting the arrangements and producing the new Performance Floor model (this has not been subject to detailed review as part of these checks although the literature has been reviewed). In the previous review it was the lack of process that held back the performance confidence ratings and this has now been resolved satisfactorily. The documented processes have been reviewed and found to be appropriate for the task. We suggest that a more detailed check of the Performance Floor model is carried out next year.

The only area where improvement should be made is in the carrying out of data audits. Recommendation 2010.P.7 required a documented checking regime to be created. This has been done in accordance with the recommendation but no auditable records are kept by the NR (CTRL) team to evidence this. A new recommendation has been included to require records to be kept.

The data production processes that NR (CTRL) 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 NR Reporter team, which is currently Arup. The last audit was carried out in March 2011. This reported a high standard of data confidence.

Number	Recommendation	Responsible	Due Date	June 2011 Update
2010.P.1	Review the queries established in Business Objects for performance data to ensure that, when populating the key measures, data extracted is Complete Relevant In the correct form according to the requirements laid down in the Concession Agreement or by the ORR	Martin Llewellyn NR (CTRL)	July 2010	All of the queries have been reviewed against the criteria within the concession agreement. The major concern was the possibility of double counting of trains. The process for extracting trains has now been amended to include a further selection criterion (incident type by delay or cancellation). The revised processes were checked and found to be compliant. This recommendation was closed by ORR. Arup agree with this status. **Closed**
2010.P.2	Develop plans to automate as much of the performance data extraction and manipulation process as possible, with a view to phased implementation over the next 12 months. Where manual intervention remains a requirement, establish guidelines for and use of spreadsheet best practice	Martin Llewellyn NR (CTRL)	September 2010 - Plan April 2011 - Implement	HS1 submitted an automation plan to ORR in November 2010. This was implemented shortly afterwards and the last two Performance Floor reports submitted to ORR were completed using the new automatic Performance Floor model ORR closed this recommendation and Arup concur. **Closed**
2010.P.3	Clarify, and document, the definitions relating to all the key performance measures to improve the consistency of reported measures, notably; Total Number of Trains	Naina Mistry, HS1 Matt Wikeley, ORR	July 2010	The agreed definitions for all of the KPIs are included in the new document – A Guide to Data Production and Review. These have been signed off formally by the ORR in September 2010 and a clarification note was produced and this forms part of the data production guide. The definitions were checked by Arup and found to be consistent and appropriate. ORR has closed this recommendation and Arup concur with this. **Closed**

Number	Recommendation	Responsible	Due Date	June 2011 Update
	Timetabled Total Number of Trains Delayed Trains Delayed by an Incident Wholly or Mainly Attributable to HS1 Trains Delayed by an Unidentified incident Average Seconds Delay Per Train			
2010.P.4	Bring forward the plans to document all the primary processes and procedures relating to HS1 performance data collection and reporting	Martin Llewellyn NR (CTRL)	Nov 2010	A new guide titled "HS1 Performance Floor Report – A guide to Data Production and Review" has been issued to all staff involved in the production of the performance KPIs to ORR. Arup has reviewed this document and confirmed it has been issued to all relevant staff. The final version was signed off on the 5th May 2011 although it had been in use for some time prior to that. It covers all of the key requirements including the Performance Floor methodology, a user guide and the KPI definitions. This conforms to the requirements of the recommendation. **Closed**
2010.P.5	Consider the opportunity for improving the visibility of, and understanding about, data refresh in the performance reports produced, for example by expanding the performance commentary to include an indication of the size of the "risk" to the reported Performance Floor measure, and in the results	Martin Llewellyn NR (CTRL)	July 2010	A commentary has been added to the Performance Floor report setting out the risk to the results caused by disputed incidents with the train operator. Overall levels of dispute remain small. The recommendation has been agreed as closed by ORR and Arup concur with this. **Closed**

Number	Recommendation	Responsible	Due Date	June 2011 Update
2010.P.6	Resolve the current difficulty within Business Objects reporting whereby location codes (STANNOX) cannot be recognised, with the potential this brings for inaccuracy in location reporting.	Martin Llewellyn NR (CTRL)	Oct 2010	The Stannox locations are now all recognised (around a 100 required fixing) and listed correctly. The work was completed in early April 2011. The process took longer than required because of the relative levels of priority given to the work by NR IT team given other commitments. **Closed**
2010.P.7	Review the opportunities for instituting managerial data review or audit to improve confidence in the veracity of reported performance information	Martin Llewellyn NR (CTRL)	Nov 2010	Data checks are now built in to the processes and set out in the guidance notes referred to in 2010.P.4. In essence the data is checked against the performance regime data to carry out a high level sense check that the results are similar to that recorded in the Performance Floor data. ORR have agreed this recommendation is closed and Arup concur. The guide sets out the process in compliance with the recommendation. However, at present no record is kept of the checks so a new recommendation setting out this requirement has been added to this report. **Closed**

4 Findings – Review of Asset Management KPIs

As with the performance recommendations, ORR has jointly overseen progress against each of the three recommendations from the previous audit. We have checked the evidence provided by HS1 put forward to demonstrate compliance with the recommendation as shown in the following table. In all cases they have agreed that the recommendations can be formally closed.

A check on the most recent reports was also undertaken to see if the KPIs were still being reported in the same way as previously. In particular at the last review 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.

This is still the case with no instances reported during the last 12 months. Last year they were reported as X for accuracy since no data series existed. We have provided a grade this year because there is now at least two years worth of data for which there has been zero occurrences for all three measures.

However, we would suggest some thought should be given by ORR and HS1 to the value of regulatory measures which appear much better suited to a conventional railway where these events are important indicators and relatively frequent. These are in effect lagging indicators and given the relative age of HS1 are unlikely to give much knowledge of underlying issues. The use of leading indicators are probably more appropriate. It may be that experience from other European high speed routes may offer more appropriate measures for a high speed railway, which would better indicate that the route is being maintained appropriately.

Number	Recommendation	Responsible	Due Date	June 2011 Update
2010.AM.1	Agree a clear and unequivocal definition for "overall Fault Levels with the ORR	Dave White, HS1 Marius Sultan, ORR	July 2010	The definitions have been agreed with ORR and issued to NR. The definitions are: The total number of faults generated per period which consists of: Corrective Faults – those faults found during preventative maintenance each period Reactive Faults – those faults identified by equipment or system failure each period ORR has recorded this as closed and Arup concur. **Closed**
2010.AM.2	Bring forward the plans to document the primary processes and procedures relating to HS1 fault reporting, data collection, categorisation, follow up and reporting	Dave White, HS1	July 2010	The Infrastructure Asset Information Strategy (IAIS) now includes the high level requirements. It also sets out future aspirations to improve further the recording arrangements. This was provided to Arup and was checked. ORR has recorded this as closed and Arup concur. **Closed**
2010.AM.3	Review the opportunities for instituting superimposed data check or audit to improve confidence in the veracity of reported asset fault and failure information	Dave White, HS1	September 2010	An independent audit regime has been agreed which conforms to the Operators Agreement. This sets out the record keeping requirements and the audit regime to be implemented. The audit scope was produced as evidence but was not completed at the time of this audit. The plan will be agreed each year between HS1 and the operator. ORR has accepted the recommendation as closed and Arup concur. It is suggested that the audit records are checked next year to evidence that the audit was actually carried out. **Closed**

5 Review of Asset Register – Findings

5.1 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.'* [1]

5.1.1 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.

5.1.2 Asset Register – Principles

The Institute of Asset Management publishes a Publicly Available Specification, PAS-55: 2008 Asset Management 2 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.

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

[1] http://www.rail-reg.gov.uk/server/show/nav.2509

[2] Publicly Available Specification PAS 55: 2008 Asset Management - Part 2 Guidelines for the application of PAS 55-1

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).

5.1.3 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.

5.2 Asset Register Review

5.2.1 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.

5.2.2 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.

5.2.3 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 5.2.4 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.

5.2.4 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 5.2.5) 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.

5.2.5 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.

5.2.6 Asset Register Content

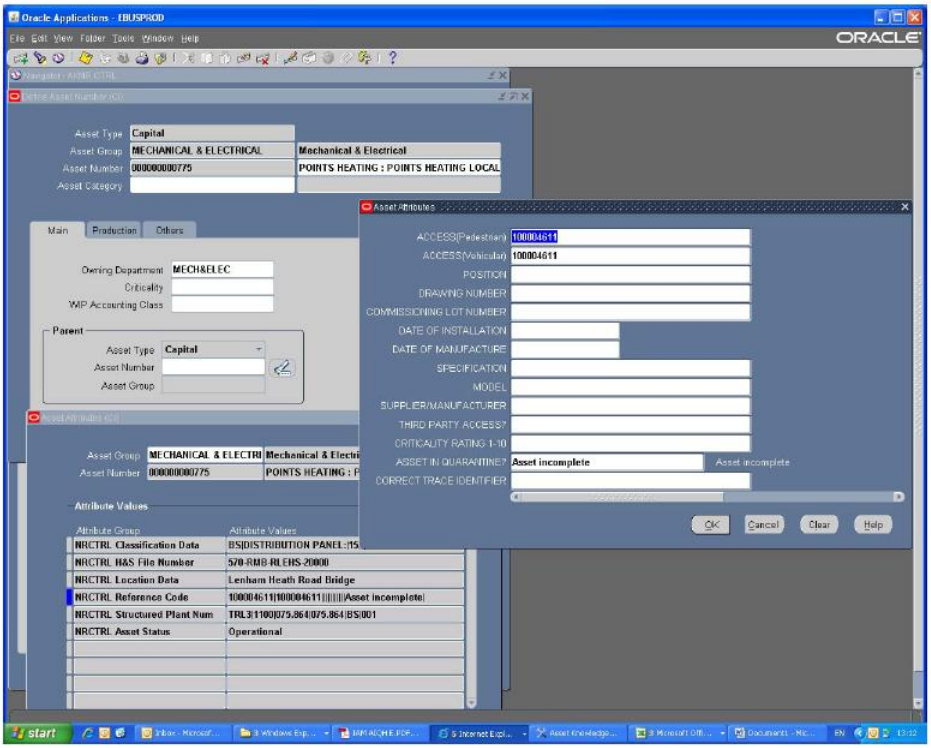
The Asset Register data covers the entire HS1 route from Cheriton to St Pancras, for all rail infrastructure asset classes. Each functional Asset Group is organised differently according to the requirements of the group. For example, the permanent way is considered as two assets – the Up and the Down 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 5.2.3, 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.

5.2.7 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[3]. We were shown signed change authorisation records which demonstrated that this process is being followed routinely.

5.2.8 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.

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

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 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.

5.2.9 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.

5.2.10 Summary of Findings

In 5.1.2 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.

6 Conclusions

6.1 Performance

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

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

The Asset Register is held in an integrated and flexible eAMS system. At the highest level it is comprehensive and accurate, but the system does not hold important equipment, condition and degradation data.

In terms of the objectives set out in 5.1.3 our conclusions are:

a. comprehensiveness – the asset register data set includes all of the records that it should;

b. completeness – not all of the data fields are used, lacking relevant details on criticality and condition indicator data, and data at equipment level;

c. consistency –we consider there appears to be a reasonable degree of standardisation in the description of similar items;

d. currency – the data which is held in the register appears to be up-to-date and is updated on at regular intervals. Because equipment level data is not held in the asset register, the knowledge of the history of the asset (past degradation) is not easily accessible for overall management and reporting. This is more significant for asset groups which have a shorter lifecycle; and

e. accuracy – in a limited sample, we found minor inconsistencies between the data in the register and the assets on the ground.

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 a accuracy rating. The rating system used is summarised in **Table 7.1** and, for consistency, is the same system that we used in our review of HS1 Data Assurance last year[4].

Table 7.1: Confidence Grading System

Reliability Band	**Description**	
A	Sound textual records, procedures, investigations or analysis properly documented and recognised as the best method of assessment.	
B	As A, but with minor shortcomings. Examples include old assessment, some missing documentation, some reliance on unconfirmed reports, some use of extrapolation.	
C	Extrapolation from limited sample for which Grade A or B data is available.	
D	Unconfirmed verbal reports, cursory inspections or analysis.	
Accuracy Band	**Accuracy to or within +/-**	**But outside +/-**
1	1%	-
2	5%	1%
3	10%	5%
4	25%	10%
5	50%	25%
6	100%	50%
X	accuracy outside +/- 100 %, small numbers, or otherwise incompatible; or no data yet exists(see Table 9.2)	

Some reliability/accuracy combinations are considered to be incompatible, as shown as 'N/A' in Table 7.2.

[4] It should be noted that the reliability and accuracy definitions used in our Independent Reporter work have since been amended, but we have agreed to continue with the system shown below in this report for consistency with last year's grades.

Table 7.2: Confidence Grading Compatibilities

Compatible Confidence Grades				
Accuracy Band	**Reliability Band**			
	A	B	C	D
1	A1	**N/A**	**N/A**	**N/A**
2	A2	B2	C2	**N/A**
3	A3	B3	C3	D3
4	A4	B4	C4	D4
5	**N/A**	**N/A**	C5	D5
6	**N/A**	**N/A**	**N/A**	D6
X	AX	BX	CX	DX

7.2 Confidence Ratings Achieved

7.2.1 Performance

Key Performance Indicator	**2010-11 Rating**	**2011-12 Rating**
Total number of trains timetabled	C2	**A1** - the new procedures which have been checked and deemed sufficient now mean this measure has an A for reliability and 1 for accuracy (the 2 for accuracy last time was because of compatibility with a C reliability grade).
Total number of trains delayed	C2	**A1** - The previous C grade was primarily due to inconsistencies in definitions. These have now been clarified. The accuracy score reflected difficulties with double counting of some trains which has been corrected. The measure is now A for reliability and 1 for accuracy.
Number of trains delayed by an incident wholly or mainly attributable to HS1	C2	**A1** - The grade was because of the lack of any procedures. The new procedures which have been checked and deemed sufficient now mean this measure has an A for reliability and 1 for accuracy (the 2 for accuracy last time was because of compatibility with a C reliability grade).
Number of trains delayed by an unidentifiable incident	C2	**A1** - The grade was because of the lack of any procedures. The new procedures which have been checked and deemed sufficient now mean this measure has an A for reliability and 1 for accuracy (the 2 for accuracy last time was because of compatibility with a C reliability grade).

7.2.2 Asset Management

Key Performance Indicator	2010-11 Rating	2011-12 Rating
Overall Fault Levels	B2	**A1** - last year's reliability grade reflected the lack of defined process and the accuracy grade was compatible with this. As a result of the new processes which have addressed the concerns expressed previously the grade is now A1.
Plan Attainment – Backlog	Not graded	**A1** - the measure continues to report very low levels of uncompleted items during the period, routinely below 0.4%. The measures taken since the last audit have ensured this number is reported consistently. The measure is graded A for reliability and 1 for accuracy.
Track Quality-Induced Speed Restrictions	BX	**A1** - last year's reliability grade reflected the lack of procedure, and the X grade for accuracy was awarded due to the lack of a data series. The reliability grade has now progressed to A based on the improved procedures and definitions. The accuracy grade has been adjusted to 1 despite the ongoing reporting of zero events, since there is now more than 2 years worth of data.
Broken Rails	BX	**A1** - last year's reliability grade reflected the lack of procedure, and the X grade for accuracy was awarded due to the lack of a data series. The reliability grade has now progressed to A based on the improved procedures and definitions. The accuracy grade has been adjusted to 1 despite the ongoing reporting of zero events since there is now more than 2 years worth of data.
Service-Affecting Defective Rails	BX	**A1** - last year's reliability grade reflected the lack of procedure. The X grade for accuracy was awarded due to the lack of a data series. The reliability grade has now progressed to A based on the improved procedures and definitions. The accuracy grade has been adjusted to 1 despite the ongoing reporting of zero events since there is now more than 2 years worth of data.

7.3 Asset Register

The Confidence Ratings System has been designed to measure the reliability and accuracy of system outputs such as Key Performance Indicators. This review has focussed on the Asset Register itself rather than the output it produces, and so we have not awarded it a specific Confidence Rating. This is in accordance with similar reviews of Network Rail systems that we have undertaken in our role as Independent Reporter.

Instead, we summarise below the strengths and weaknesses of the Asset Register that we have identified during the course of this work.

Strengths

- The source data for the Asset Register is traceable back to the original construction contracts;
- The Oracle eAMS system has the capacity and flexibility to handle the data requirements for the Asset Register and key attribute data; and
- The control systems for managing the Asset Register data are sound and routinely used.

Weaknesses

- Basic asset attribute data is inconsistently held in the Asset Register; in particular the Asset Register lacks information at equipment level related to the model type and age of each asset.
- Asset criticality is being considered for inclusion, but has not yet been implemented;
- Condition indicator data is not captured in the Asset Register; and
- These factors are not consistent with a single source of truth and reduce the quality of management reports which can be generated by the system.

8 Recommendations

Number	Recommendation	Data Owner	Due Date
2011.P.1	NR (CTRL) should produce a simple set of records showing the checks carried out each quarter to verify data accuracy.	Naina Mistry HS1	July 2011
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 ongoing zero attainment.	Chris Fieldsend ORR Naina Mistry HS1	Dec 2011
2011.AR.01	Define and agree a programme for adding equipment level data to the Asset records	David White HS1	December 2011
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).	David White HS1	December 2011
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.	David White HS1	October 2011

Appendix A

Mandate

A1 Mandate

The mandate for this work was provided in an e-mail from the ORR dated 14th March 2011, and is set out below.

Scope

This remit is a clarification of the 2011-2012 requirements of the HS1 data assurance review (specification for three year call off consultancy attached). This remit is intended to be read in conjunction with the attached (for context) and highlights where the scope and timescales differ.

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

- Performance (all measures to be subject to a high level review, to include progress against 2010 confidence grading and 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 progress against 2010 confidence grading and 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 - we require a review of the processes and systems used to maintain and develop the asset register, along with a review of linkages to the maintenance system. We also require a review of the quality and accuracy of data held within the register, including an inspection of reported assets against those observed by your assessors. Please see Appendix B of the attached Infrastructure Asset Information Strategy for Asset Type. The detailed register will be made available at the start of the review.

Appendix B

Glossary of Terms

B1 Glossary of Terms

BO	-	Business Objects
CA		Concession Agreement
CTRL		Channel Tunnel Rail Link
DAG		Delay Attribution Guide
EAMS	-	Engineering Asset Management System
EMMIS		Electrical & Mechanical Management Information System
HS1		High Speed 1
KPI		Key Performance Indicator
NR		Network Rail
OA		Operator's Agreement
ORR		Office of Rail Regulation
PSS		Performance Systems Strategy
STANOX		Numeric location code
TOC		Train Operating Company
TRUST		NR train running monitoring system
TSDB		Train Service Database
WTT		Working Timetable