

# Minutes

<b>Meeting title:</b>	Industry Steering Group (ISG)	
<b>Date:</b>	31 <sup>st</sup> July 2014	<b>Time:</b> 12 noon -15:30
<b>Location:</b>	University of Southampton, Boldrewood Campus, Burgess Road, Southampton	
<b>Present (21):</b>	<p>Mr David Benton – Tata Steel (DB)          Dr Simon Blainey – University of Southampton (SPB)          Dr Alex Broomsgrove – EPSRC (AB)          Dr Mark Burstow – Network Rail (MBu)          Dr Andrew Cornish          Prof Andrew Doherty – Network Rail (AD) (Chair)          Mr Niall Fagan – HS2 (NF)          Dr Jean-Francois Ferellec – University of Nottingham (J-FF)          Dr John Harkness – University of Southampton (JH)          Mr Francis How – Railway Industry Association (FH)          Dr Andrew Hudson          Mr John Lane – RSSB (JL)          Dr Louis Le Pen – University of Southampton (LLP)          Prof William Powrie – University of Southampton (WP)          Prof John Preston – University of Southampton (JMP)          Dr Vijay Ramdas – TRL (VR)          Prof Clive Roberts – University of Birmingham (CR)          Dr Phil Sharpe – URS (PS)          Prof David Thompson – University of Southampton (DJT)          Dr Fiona Thomson – London Underground (FT)          Dr Martin Toward – University of Southampton (MT)</p>	
<b>Apologies:</b>	<p>Dr Mat Brough – URS (MBr)          Dr Thanasis Makrodimitopoulos – University of Southampton (AM)          Prof Glenn McDowell – University of Nottingham (GMcD)          Prof Andrew McNaughton – HS2 (AMcN)          Dr Joel Smethurst – University of Southampton (JAS)          Dr David Thompson – Balfour Beatty Rail (DT)          Mr Andrew Went – HS2 (AW)          Mr Geoff Watson – University of Southampton (GW)          Dr Paul Weston – University of Birmingham (PW)          Mr Guy Woodroffe – RDG (GW)          Dr Antonis Zervos – University of Southampton (AZ)</p>	
<b>In attendance:</b>	Mr Rod Anderson – University of Southampton (RA)	

## 1. Introductions and Apologies

For apologies, see list above.

## 2. Minutes of previous meeting and matters arising

RA introduced the relaunched programme website, with particular reference to the ISG section. This is password protected. Noted that papers concerning vegetation effects on earthworks have been loaded onto the page for today's meeting. LUL papers are not to be put in the public domain. Feedback and material for the website were invited.

### Actions from previous meeting

**WP:** (Outline guidance on vegetation effects on earthworks.) Papers loaded onto the website page for today's meeting. Our work has been incorporated into eg LUL and NR guidance. The headlines are: avoid high water demand species; leave the trees on the lower third of the embankment; and that it makes a big difference to the winter pore pressures in an embankment whether it's underlain by clay or by a more permeable material.

CLOSED

**DR:** (to find data on loss of continuum stiffness under sleeper ends and forward to LLP.) DR has retired: DJT may be able to source these data. [After the meeting RA contacted Pandrol and a response is expected before the next meeting] ONGOING.

RA

**MBr:** (to let SB have a copy of the URS report on first generation track degradation modelling.) After the meeting it was determined that this is now superseded.

CLOSED

**MBr** (URS undertake many surveys under their framework contract and it should be possible to piggyback for single site visits.) After the meeting it was determined that this is not likely to be productive in the remainder of the programme.

CLOSED

## 3. Note of AOB

None

## 4. General overview and update since last meeting (AD/WP)

**AD:** ERRAC is about to publish an updated strategic rail research agenda which will inform the Commission on rail research priorities. Shift2Rail has now become a legal instrument and will start to spend in the middle of next year. ERRAC is looking at proposals to access funding from other parts of Horizon 2020 eg infrastructure MG.8.1 and particularly climate change MG.8.4. Overall there is a lot of research funding in the pipeline, especially if UK opportunities are included.

For info

**WP:** There is just under a year to go for Track 21, and individual progress reports come later on the agenda. We are now in the process of making sure we deliver what we said we would in Track 21. Progress reports follow: AZ on ballast and sleepers, and lab integration; DJT on Noise and Vibration, which is something of a back-end loaded activity in the programme; CR will talk about field work. A key message is that we still need for more study sites. Modelling getting to a stage where it is beginning to do something that will be quite useful and a key element of T2F will be to try to address the modelling in a more rigorous and a more

technically detailed way than has been possible under T21. There will have been a lot of achievements in terms of direct contributions to knowledge, identifying areas to look at in more detail or at a larger scale in T2F, and also synergies that bring with them new problems for investigation.

Other than that, key challenge is to make sure that we can continue the work through another tranche of EPSRC funding, which itself attracts other funding. Four side Outline submission for Track to the Future (T2F) is being made today (stage two of a three-stage process. If invited, a full proposal will be submitted end October/early November. Challenge has been to explain what is different from Track 21. Some new things have come about, thanks in part to *TRACK21*: the industry and state of knowledge have moved on hugely and our vision is now looking further: Rail Tech Strategy talks about vision for 22<sup>nd</sup> century.

#### **5. Presentation: WA2/WA5 Ballast and sleepers/Lab integration (Annex A) (AZ)**

AZ rehearsed the objectives and methods of WA2 & 5 (slides 2 & 3. The objectives are to understand the role and requirements of ballast grading; to investigate soft improvement techniques; and to investigate the effect of different sleeper types and interface modifications.

Slides 4 - 9 set out the conclusions and possible further work identified for objective 1 (role and requirements of ballast grading).

Slides 10 – 14 set out the conclusions and possible further work identified for objective 2 (soft improvement techniques, viz fibres, bags, gluing, resins and geogrids). Fibres and geogrids are identified as worth further work.

Slides 15 – 17 set out the conclusions and possible further work identified for objective 3 (effect of sleeper type and USPs).

Slides 18 & 19 set out outputs to be delivered by the end of the grant, in the form of PhD theses and journal publications.

The following matters were discussed:

It would be possible to test in the lab the effect of ballast gradation on drainage. This would have to be large scale and involve a lot of effort, space and water. It is not clear that it would be worthwhile. Correlation and common sense should tell us all we need to know. While we could project life lost due to reduced permeability caused by increasing fines, the fines are not clay fraction but small gravel. The effect is not expected to be significant compared with the drainage characteristics of adjacent material and will be outweighed by the reduced settlement already observed.

Increasing the proportion of fines in fibre reinforced ballast is likely to improve performance or reduce the required number or size of fibres, because there will be more contacts in a finer material.

The maintainability of fibre reinforced ballast was discussed. We have a student who will look at tamping, which is normally followed by a lot a plastic settlement. We can investigate the effect of fibre on this phenomenon and its potential to

reduce maintenance.

The risk of damage to fibre reinforced ballast during maintenance was discussed, for example, the creation of a discontinuous boundary. It is likely that this can be overcome with appropriate training.

There is a difference between Southampton and Nottingham tests. These are telling not different stories but different aspects of the same story – an issue with the rigs that should be sorted out before the next meeting, when the rigs have been calibrated.

The next big issue will be how practically to scale up fibre reinforcement for use on site. The plan is to have a post-doc work on this for two years, which, will fit well with T2F and SHIFT<sup>2</sup>RAIL.

## 6. Presentation: WA3 Noise and Vibration (Annex B) (DJT)

DJT summarised the objectives of WA3, noting in particular that three new objectives had been added to the original three (slides 2 & 3).

Objective 4 is fairly significant (quantify typical UK wheel and rail roughness and track decay rates, and carry out field measurements for validation of noise and vibration models). Objective 3 (track support stiffness variation) is the subject of an NR/UoS Strategic Partnership project. Objective 5 (time domain FE models) was recently presented in Beijing.

Slides 4 – 11 summarise for each objective the achievements to date, conclusions reached so far and work remaining to be done.

There will be outputs in the form of papers and PhD theses. Journal papers have yet to be decided.

The following matters were discussed.

AD - we know that grinding has reduced noise by 6dB and roughness has been reduced. The point of a crossing is always the worst place.

FT - is there more detail on what affects absorption? DJT – not yet – it goes with ballast gradation and is proportional to the square root of scale factor. Not really affected by material type: it's associated with the arrangement of air gaps.

FT – does the state of drainage have any discernible effect. DJT – if you fill ballast with water I imagine it would.

## 7. Presentation: WA4 Field Integration (Annex C) (CR)

CR described the field integration strategy and rehearsed the aims agreed at ISG in August 2012, when the direction of the second half of the *TRACK21* programme was agreed (slides 2 & 3).

Objectives 1 to 3 (slides 4 & 5): Prototype monitoring systems have been completed. Initial algorithms to detect and diagnose short and long wavelength

defects, and detailed degradation monitoring at specific locations, have been done, although more work is required.

Objectives 4 to 6 (slides 6 – 8): Work is progressing on local differential track stiffness measurement (Obj 4). The bulk of the remaining work for WA4 is in objectives 5 and 6, evaluating remediation performance, and integration with existing and advanced data streams and modelling.

MBu asked if data depends on the orientation of the train (ie is the box leading the train, mid or rear?). CR said we have not had the opportunity to test that but we can look into it.

NF noted the volume of data to be processed and asked if slick processing is part of the research. CR said yes, it has to be autonomous. The system can pick up location but is not as good at matching up (in a spatial sense) data from a subsequent run. It is currently semi-automatic but is expected to be fully automatic soon. Ultimately the system will be defect focused and will therefore be able to discard a lot of the data, once thresholds have been set. The task is monitoring not inspecting.

## **8. WA6 Modelling integration (Annex D) (JMP)**

JMP said that the first initial objective (a model linking the effects of the sub-base, ballast and track system to vehicle ride quality and dynamic loading) has been sidelined to concentrate on objective 2: (modelling the comparative whole-life financial and social costs and benefits, including carbon, of the sub-base, ballast and track systems proposed) (slide 2).

Slides 3 and 4 set out where we are and tasks planned for the fifth and final year, and slide 5 identifies interdependencies with WA2 and potentially with industry stakeholders. Slide 6 covers site selection and data sources to be used.

Slide 7 sets out the modelling strategy to achieve objective 2, noting that whole life cost data for new treatments will be needed. Slide 8 concludes with plans for recruiting a researcher, for linking to other research. It identifies the need for a dissemination strategy including a paper or papers in JRRT.

The following matters were discussed:

MBu asked if it was intended to use TrackEx at all. JMP said there is an aspiration to build a “son of” TrackEx.

WP commented that the T2F proposal has a modelling aspiration. *TRACK21* is concerned with populating existing models with better data, whereas T2F proposes to develop substantial new models.

NF said that TrackEx uses Vampire outputs. We need a “BallastEx” for new work. He then asked what we mean by “passenger comfort” (slide 4). JMP responded that we had planned to match track quality to ride quality, linked in the model to an uplift in patronage and income. The assessment of passenger comfort would be related to verbal descriptors.

## 9. Publication and Dissemination (WP)

WP opened a discussion on publication and dissemination, suggesting that we should consider academic publications and trade journals and also a possible dissemination event. This could be at UIC, although this would potentially be very expensive, or maybe at Milton Keynes.

Our target is to engage industry more than academics. FH commented that the supply side is only one part of the industry. How can the research outputs be used? What is the gap we need to bridge? Possible routes to impact are guidance notes, software, written summaries; the FutureRailway initiative should act as a focus for infrastructure development in the UK.

NF said an industry partner will ask, "What good is this to me?" We can simply tell an industry partner what we have produced and leave it there, or engage with them to take it to the next stage [ie a higher TRL].

AD identified three pathways to impact:

1. Academic learning
2. Production of guidance notes, CoP, Standards (eg NR and LUL), UIC track experts' group and benchmarking across Europe
3. Industry to develop processes and machinery to deliver new designs and standards – taking it forward from TRL 3 or 4 right through, for example via IN<sup>2</sup>RAIL

Other comments:

An event at Milton Keynes would enable us to talk to good innovative engineers  
Industry and suppliers would be another target

RIA conference would be another route (there is one next March)

FH also sits on the steering group for the IMechE Stephenson Conference in April.

UIC – AD can organise entry

FT said the PWI London branch would welcome a talk (by AZ?) on ballast and beyond.

## 11. Date of next meeting

30<sup>th</sup> January 2015 was set for the next ISG.

RA/All