



Reopening the Beeching Lines

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1. Executive Summary

CECA members have been responsible for delivery of all the recent railway reopenings in Great Britain. Many of these now form a part of the national network, although many are operated as light railways and act as standalone mini-networks. The process of re-opening long closed lines is invariably more complex than is usually assumed and unforeseen events very often delay completion of the schemes and cause cost escalation. This report covers CECA members' experience of reopening railways and aims to indicate where the process can be made slicker and pitfalls avoided.

The principal areas covered are, as follows:

- **Generally** – Beeching closures are, quite rightly, considered as starting from a similar position. In actual fact there are a lot of differences, with several schemes still being open (in a pared down condition) for freight, others are “mothballed” (there is still track laid / structures intact but overgrown) and others have the track lifted and significant gaps where structures are missing. Reopening lines as “light rail” is often easier than providing a “heavy rail” solution although this then can prohibit services running onto the mainline.; although the recently developed tram – train principle (as pioneered in Sheffield) can offer a ‘have cake and eat it’ solution to this.
- **Required Outcomes** – clarity is needed right from the start as to what purpose the reopened line should serve. This needs to be agreed at the beginning, by all stakeholders, and there should be really careful consideration before changes are made to any of the agreed outcomes. A phased approach to any reopening should be considered although appropriate passive provision should be included to make subsequent additions easier to add.
- **Stakeholders** – there will be many stakeholders for any reopening and these should be identified at the earliest opportunity and fully involved in the development and design. These stakeholders should be fully involved in all the decisions (and compromises) involved in the reopening and should not be allowed to subsequently move from the agreed position without good reason. The organisations that will be responsible for the final “sign off” of the completed railway should be involved right from the start and should be fully bought into what is being proposed.
- **Contracting Strategy** - the earliest possible involvement of the contractor / contracting team who will carry out the subsequent work will be invaluable to the success of the project. “Project 13” principles will be important to any project – providing an “enterprise”, rather than “transactional” approach to successfully delivering the reopening.
- **Design Development** – it is all too easy to concentrate on the rail systems aspects of a reopening project and these are complex enough. There are, however a lot of issues that, even if they had been considered adequate when the railway was first opened, may not be adequate for today’s legal requirements. These include highway interfaces and drainage issues. Earthworks, even those that are still standing, may not comply with modern standards and work will often be required, even if the current condition is probably better

than many examples on railways that were never shut. Where through running is required, the interface with the existing railway will be another tricky area.

- **Consents** – this area is a potential minefield for the reopening of railways, even once the prime approval has been reached via the primary consent. Careful consideration should be given as to which primary consent is required this can be via “Hybrid Bill” for larger schemes, “Development Consent Orders” or “Transport and Works Act orders”. Section 7 offers advice on which to choose. “Listed Structures”, mine-workings and various environmental consents are areas where additional consents will be required.
- **Environmental** – a project environmental and sustainability plan will be required and this should be drawn up at the earliest opportunity. Many of the environmental considerations will require surveys (often carried out at different times of the year) in order to identify the “status quo ante” any work being started. Also some work, such as vegetation clearance, is seasonally restricted so may need to be completed ahead of the main works.
- **Construction** - shut railway alignments are narrower than highways and, initially, may not have the infrastructure in place for rail delivery so have unique construction challenges. The early involvement of the contractor will enable the scheme to be designed and developed to facilitate an efficient construction project.

- **Approvals** – obtaining approval to actually opening a completed piece of rail infrastructure can be very difficult, especially where the approval body is coming late to the project. Early agreement of all the outcomes and designed in features by all parties responsible for acceptance of the finished project is essential.

This report has been written around the reopening of railway lines. Some of the schemes listed in the Government’s “restoring your railway” announcement are for station reopenings on live railways. Most of the recommendations mentioned here will apply equally to station reopenings or to other elements of railway restoration.

The Civil Engineering Contractors Association (CECA) is the representative body for companies who work day-to-day to deliver, upgrade, and maintain the country’s infrastructure. With more than 300 members based across six English regions and the devolved nations of Scotland and Wales, CECA represents firms who together carry out an estimated 70-80 per cent of all civil engineering activity in the UK, in the key sectors of railways, other transport, energy, communications, waste and water.

This report has been drawn up with the active participation of the following CECA members: BAM Nuttall, RSK, Volker Rail, Skanska, Morgan Sindall, Murphy and AMCO Giffen. Without the input from these companies this report would not have been possible, so thanks to them all.



2. Introduction

The Government has set aside funding for the reopening of currently disused railway lines. Many of these were closed as a result of the Beeching Report of 1963, which started off a programme of retrenchment. Many of the closed lines were truly uneconomic and are little missed but others, with the benefit of hindsight, would serve their communities well if still available – hence the current interest.

Many lines have been reopened over the past decades including:

- The East London Line, following the routes of former heavy rail & Underground tracks, which runs between Highbury & Islington and New Cross
- The Ebbw Vale branchline in South Wales
- The Borders Railway between Edinburgh and Galashiels
- The Larkhall Branch to the south of Glasgow.

These lines were all reopened as heavy rail and now form part of the national network. However other disused lines have been reopened as part of Light Rail networks, including:

- The network around Croydon
- Manchester Metrolink
- Newcastle Metro.

Light rail or tram lines have three benefits over heavy rail:

- The axle loadings are lighter, so put less load on underlying structures and typically require less track maintenance.
- The signalling requirements are less onerous since the operations are closer to highway principles.
- The vehicles can climb steeper gradients and cope with a more sinuous alignment.

Light rail would in most instances best suit a line where onward running onto the network is not required, although the Tram-Train concept may facilitate this.

The lines being considered for reopening come in various stages of disuse, ranging from being open only for freight use, to being long shut and (in part) built over. By way of a summary, the next page summarises some of the key issues for various types of reopenings.

A compromise between Light and Heavy Rail is possible via the use of “tram train” vehicles. These were pioneered in Germany and have been successfully introduced into service on the Sheffield Tram network. These would allow a line to be reopened as a “Light Rail” network, with all the attached cost savings, but allow connection and onward travel onto the mainline. Now the technology has been introduced into the UK most of the approval issues should be sorted but there may be problems with platform height variance between the different modes and it may be expensive to procure small numbers of appropriate vehicles.

<i>Current condition of the Railway</i>	<i>Reopens as light rail</i>	<i>Reopens as heavy rail</i>
Used for freight only.	Can be challenging to mix light rail passenger vehicles with freight; Unlikely to see any cost benefits from choosing this route.	Probable need to re-signal for enhanced safety; Stations likely to need reinstating; Less planning approval needed because there is no change in use (except stations).
'Mothballed' railway - although this covers a multitude of conditions.	Maybe reuse track but the turnouts (points) may not be suitable for the trams.	The longer the railway has been out of use the more likely that costs will rise to reopen to modern standards.
Shut and the track lifted, but not built over.	As above, but it is probably easier to reuse current assets.	Substantial costs may incur from reinstating to current standards.
Shut and, in part, built over.	As above and easier to divert around obstacles, maybe using street running for part of this route.	As above, but the cost of getting round obstructions could be prohibitive.

Figure 1: Comparisons between light and heavy rail reopenings

Members of the Civil Engineering Contractors Association have been heavily involved in most of the reopenings of recent times and have gathered a lot of experience, which the remainder of this document will describe. This is laid out in chronological fashion, although there is obviously a lot of overlap between the categorisation chosen.

This report has being written around the reopening of railway lines. Some of the schemes listed in the government's "restoring your railway" announcement are for station reopenings on live railways. Most of the recommendations mentioned here will apply equally to station reopenings or to other elements of railway restoration.

3. Required Outcomes

Railway reopenings always start out with the best of intentions and with fairly clear outcomes in mind. Unfortunately, all too often, these outcomes get lost behind a lot of well-intentioned “scope creep” and “preferential engineering” initiatives that massively increase the complexity, scope, and price of the finished product.

Most reopenings will be carried out clear of current railway operations. Even freight line conversions will generally only have light traffic. Despite this the interface with the operational railway will always be one of the more challenging areas. This may initially be limited to the junction area but signalling & control will inevitably have a lot of railway interfaces throughout. With this in mind:

- In the **early stages**, while looking at preferred options, rail systems issues are often ignored. This in turn leads to inaccurate pricing assumptions being applied. We recommend early involvement of contractors to avoid this.
- **Track access** – understanding the types and durations of access to carry out work is a significant programme and cost driver.
- **Signalling** – at some point the reopened line will probably join an existing line. This will require a signalling interface to be designed, often with an interface between old and new technologies. The signalling solution needs to be determined early because most other design decisions are driven from it.
- **Timetabling issues** will be critical to the success of the new line. Modelling must be carried out as soon as possible in the process to avoid abortive costs later. It would be useful to have one point of contact for all timetabling issues that can be used on a call off basis, eg. site surveys, design, etc.

Recently, railways have been reopened with diesel and electric power, generally dependent on the mode of operation of the adjacent infrastructure. The decarbonisation agenda will restrict the ability to choose diesel power in future – so electrification will probably be required. The Office of Rail & Road (ORR) maintain a presumption against new-build or extended third rail, although it should be noted that the East London Line is powered in this manner.

Re-opening lines where there is an expected future increase in demand but limited budget can be opened in a phased manner. In this case the design should plan for structures with sufficient gauge for double track, with consideration for station and platform location. The additional fabrication cost at this phase is minimal in comparison to returning to the line to undertake a double tracking scheme to meet rising demand.

There needs to be clear agreement of what is precisely meant, discipline by discipline, by 'passive provision' for things like future electrification, platform extensions, etc.

A phased approach to opening the project, leaving more complex areas for future development can be beneficial. Recent experience has shown that commissioning massively complex and extensive rail projects as a big bang can be exceedingly difficult and consideration should be given to starting with something basic and adding to this once the infrastructure has bedded in.



4. Stakeholders

There will be many stakeholders for a railway reopening project, and some may not be obvious at the start of the project:

- **Railway** - during the early development phase all rail stakeholders need to be involved to set clear outcomes for the line re-opening. This should include the funder (local authority/ Department for Transport), future asset owner (typically Network Rail or a Regional Transport Authority), future operator (maybe Network Rail System Operator, timetabling – impact of additional route can go much further along the adjacent route), train operator (as understanding what rolling stock will be used is fundamental to design) and the contracting entity that will design and deliver the works. Scope creep, additional “wants”, preferential engineering and future indecision are key reasons for budget increases.
- **Statutory undertakers** – this will include highways, utilities, etc (see design development, below)
- **Entry into Service** of the finished item is one of the most critical points for any rail project and a new railway will have more areas for acceptance than most. The earlier that those who will accept the finished item get involved, the less likely these people are to spring surprises at the end of the project.
- **Environmental consultees**, particularly the Environment Agency and Natural England.

5. Contracting Strategy

CECA strongly recommends the earliest possible setting up of the team that will build the project. The early involvement of contractors, including key specialists, will lead to a more buildable project – which will be completed to time, budget and required outcomes.

We advise that the client sets out their design & assurance strategy at the outset and that all team members are focussed on delivery of this right from the start.

Project 13 is a new approach to delivering infrastructure, based on an enterprise model rather than previous transactional arrangements. Under Project 13, investment in infrastructure focusses on the outcomes that are wanted, and suppliers are selected on the basis of their ability to deliver those outcomes and long-term asset performance, rather than solely on the lowest cost. All parties in the enterprise are aligned with the outcomes that are to be achieved, ensuring fewer disputes, and delivering better, more affordable outcomes.

In the context of a Beeching Reopening, a Project 13 approach would ensure that local promoters get the actual outcomes that they want from their project without unnecessary gold plating, while a dispute-free enterprise delivery model would work collaboratively to deliver the work, potentially then taking that experience forward to other Beeching Reopening projects.

6. Design Development

There are several hazards in this area. If you think of a 200-year-old house that has never been unoccupied – it will have any number of oddities & imperfections that its inhabitants will work around. If the same house had been boarded up, lost its roof and was then being rebuilt – it would have to comply with modern planning and building regulations, and would be entirely different for those living in it. A reopened railway will be similar.

Drainage Outfalls - The original railway would have had outfalls into local watercourses, without any need for consent. Reinstating the railway will require these to have formal consent. Early agreement will be needed with regulators in relation to flooding and drainage, for example:

- Required number of Sustainable Drainage System (SuDS) levels
- How green-field run-off flow rate limits will be applied – does it consider that the railway's physical features have been there since Victorian times? For example, existing culverts beneath the embankment may need replacing with a greater flow capacity
- If the historical vertical alignment is below flood levels, it may not be practicable to raise the railway without acquiring additional land to broaden the embankment, or by use of relatively expensive sheet-piled walls where space is not available.
- Attention is needed in the detail of secured consents to ensure any impracticable requirements are not specified

- Red-line boundary/land made available needs to include for SuDS ponds, if the drainage design strategy/requirements are likely to require them, and if additional land is required for floodplain compensation works.

Noise and vibration control – Traditionally, noise and vibration from our railways had to be tolerated by lineside neighbours but this is no longer the case with reopenings, particularly in built-up areas. The installation of permanent acoustic barriers requires sensitive stakeholder engagement over their alignment and design and additional land may be needed or earthworks modified to accommodate them.

Interface with public and private roads, as well as other footpaths. Examples here include:

- Road Restraint Systems (RRS) will be required both on the approach to road over rail bridges and where roads run close to the railway – early assessment necessary to ensure costs are correctly foreseen
- Early agreement with road authority as to ownership and maintenance of RRS
- Construction of RRS will be complicated by existing public utility assets that invariably run in the verge – implications need to be understood
- Requirement for 1.8m high parapets imposes significant costs, since existing parapets will be lower

- Where existing roads are likely to receive heavy use by construction traffic, it may be more cost effective to improve them before the main works rather than have them deteriorate and then require reactive measures
- Challenge of keeping roads clean if large muck-shift works involve road-based haulage – consider upgraded specification for temporary access points and / or whether permanent access points can be specified and constructed to be suitable for early use
- Old Level Crossings may not be allowed to be reopened; the team will need to identify if sufficient land space is available to build an over/under bridge.

All railways need power, always for signalling and stations, but often for traction as well. This can be a big issue and needs to be considered at the earliest opportunity. Some branch-lines are fed as spurs from the mainline (the Watford to St Albans branch for instance) but in all cases more power will be needed, and this is a lengthy process.

Again, based on experience, earthworks on the former lines will be in poor condition, often exacerbated by countless animal burrows. The top edges of the embankments and toes of cuttings will have degraded over time through lack of maintenance. The extent of the remedial work tends to be overlooked.

Easy access for the mobility-impaired will be required. This can create additional challenges and add cost.

GRIP is a Network Rail process for their own governance. Agreement is collectively needed as to what governance and assurance processes must be used. If Network Rail are the client or will take over the project they will mandate this. If the railway is being reopened as a stand-alone entity, then a different governance structure for design control may be appropriate.

Scope control – one of the earliest reopenings, at Larkhall, suffered from scope creep from GRIP 4 into GRIP 5. The Contractor tendered on GRIP 4 Designs that were not signed-off by the asset management teams, the designs hadn't been through any Assurance process. It was taken on trust that the GRIP 4 Designs were adequate.

Buildability – it is important that railways are designed so they can be readily and affordably constructed. Points to consider include:

- Set out the logistic strategy at the outset – plan, design & build a linear project having set the logistics around people, plant & material movements (e.g. materials by rail rather than road where possible) access points to minimise public & ecological hotspots.
- De-risk projects with enabling works ahead of commercial & programme commitments (such as ecology, mining, utilities) that all have a high probability of delaying projects or driving out of sequence & inefficient delivery.
- Split major linear projects into manageable sections – do not stretch your teams, fit the sections to suit logistical planning.

- When designing a solution take cognisance of local materials e.g. quarry or excavated materials that can be used in permanent works.
- When designing a solution also consider regionally available labour skills, capability & capacity.
- The need to evaluate different options and determine a preferred option means that there is need for pricing detail and accuracy – which is often not supported in the early stages.
- In the early stages again there tends to be a lot of focus on disciplines that are never likely to drive the price and programme (e.g. station design standards options and road junction designs).

There are many “railway issues” that can make railway projects quite different to conventional, linear, civil engineering work. This includes:

- Have early civils input into signal sighting and positions of associated assets such as cabinets etc. Once the sighting is signed-off it will not be possible to move assets, whereas if suggested early enough, it can sometimes be agreed to move assets 10 or 20m where that would make a significant impact on the required civils solution.
- A way needs to be found to ensure the maintainer as well as the Route Asset Manager (RAM) are willing to get involved in the early stages to agree a maintenance plan. This will include gaining access to the track via permanent access points. On a recent project there was misunderstanding between the

definition of access points that were places a Road Rail Vehicle could be on / off tracked; places a lorry could make deliveries to the track; and places someone could access the cess on foot. Some access points required one, two or all three of these. The cost and programme impact of late agreement of this was significant.

- Agreement on provision of safe walking routes along the railway cess for maintenance, including which side will be used for access on foot and whether it is used when trains are running. It is also important to determine where workers should cross the line as this requires sighting). This is significant as it affects earthworks design, which is an early deliverable.
- There is always a tension between the standards of any remaining infrastructure and the standards to be applied to the new upgraded section. This is an area where there is a significant risk of unnecessary ‘gold-plating.’
- The future operator will seek betterment where they can and may resist contributing towards the replacement of life-expired or costly to maintain assets. Local authorities often end up carrying the burden of this.

Modern design criteria mean that the line/level of the original railway cannot be mirrored into the re-opening for the following reasons:

- The new railway is likely to be electrified meaning clearances through overbridges will be increased resulting in track lowers if road profiles cannot change.
- Stations should have straight platforms at a level grade, historically the stations were built to mirror the idealised track alignment.
- Designed line speeds are likely to be higher in the modern railway requiring larger radius curves.

All these issues need to be incorporated into the land-take made available via the planning process.

Tie-ins - This is where the new modern railway ties into the 'old' existing railway. It is quite easy for the work content to escalate particularly around the systems engineering. The boundaries of scope need to be defined clearly. The re-opening could be the excuse to upgrade the existing railway. Who pays for this then becomes contentious between the funding parties. The maintainer will be expecting historic problems to be corrected but paid for by the funding body responsible for the re-opening and not their own budget. The tie-in work is best programmed early in the design and build process. The critical path is likely to go through this section of work. It will be possession driven rather than 'greenfield' too. Existing Infrastructure will most likely require moving, while staged commissionings will be required too.

7. Consents, including Planning

Various consenting routes are available for rail projects.

Transport and Works Act Orders (TWAOs) are statutory instruments that are brought forward either by public authorities or private companies and “made” by the relevant Secretary of State in England or the Welsh Government, usually after a public inquiry process.

Development Consent Orders under the Planning Act 2008 are available for certain types of Nationally Significant Infrastructure projects (NSIPs) including Energy, Transport, Water, Wastewater, Waste, and Business or Commercial developments, where National Policy Statements exist. The Act applies mainly in England.

Hybrid Bills are legislative bills where some aspects affect everyone equally (public bills) and others affect some individuals more than others (private bills). They are scrutinised through a parliamentary process by a select committee of MPs. Hybrid Bills can take approximately 18 – 24 months to complete the parliamentary process. This would only be applicable to major schemes of national interest.

A comparison of the advantages of each of these methods is set out in the table overleaf.

<i>TWAO</i>	<i>DCO</i>	<i>Hybrid Bill</i>
Public Inquiries can be long and can re-hash the reasons for the scheme.	Should not need to cover the 'need' for the scheme as this should be set out in National Policy. Examination can therefore be more focussed on the specific issues.	Should not need to cover the 'need' for the scheme as this is decided at parliamentary level. Examination in committee can therefore be more focussed on the specific issues.
Decision by Secretary of State.	Decision by Secretary of State.	Powers of Parliament are more extensive than those of the decision-maker under the usual regulatory regimes, which gives greater flexibility in terms of amending legislation.
Generally slower and less certainty of programme milestones.	Timescale of the entire process is specified, giving certainty of programme.	Can be quicker than DCO, but no certainty of programme.
Anyone is able to raise an objection and be heard at PI.	The Examination is controlled by the Inspector. Most submissions are written and only relevant additional information (clarifications) will be handled orally.	Select Committees will not hear from anyone without locus.

Figure 2: Comparison of consenting routes for rail projects

In addition to the primary consents (described above) reopenings will require secondary consents and licences, typically from bodies including local authorities, Environment Agency, Historic England and Natural England. Depending upon circumstances, either an Act, DCO or TWAO will be required where the site ownership or previously consented operational railway boundary, i.e. the 'red line' boundary, needs to be increased and/or new land acquired.

Wherever possible ensure the 'red line' boundary (development consent/land acquisition) is pushed out several metres beyond the historic toe of embankment/crest of cutting. This additional land is useful:

- To allow permanent drainage to be installed.
- To give the option of slackening slopes as an alternative to construction of hard retention structures such as gabion walls.
- To provide access for construction and subsequent maintenance (access / arrangements for inspection and maintenance of boundary fencing is a contentious issue with the maintainer and RAM if they are simply located where they were historically). Sufficient land acquisition was also noted as being fundamental for efficient construction methodology. While a solution can be found within a narrow footprint, the implications will increase programme, risk, and cost.
- Ensure development consent conditions or other commitments do not require trees to be planted, if that will be resisted by the maintainer due to the implications for leaf fall.

All consents have timescales associated with them, usually 10 years. A 'meaningful start' must happen on-site within these timescales. This can be challenged legally and work can cease if the meaningful start isn't substantial enough. The contractor was in this position at Larkhall. The contractor had to occupy the site and do works before design was complete. This involved site clearance and demolition of structures. Unfortunately, and unbeknown to the contractor, these structures were not owned by Railtrack. This ended-up in a Sheriffs Court with the contractor accused of destroying third party owned property. The Structures were owned by councils and BR Property. This mis-understanding cost the contractor about a month delay whilst it was all sorted-out. The Councils and BR Property believed the structures had monetary value. The Contractor had to pay them a monetary sum in compensation.

Listed Structures - There will often be listed structures, predominately overbridges, which will have to be refurbished to modern standards. Local authorities may get involved in the approvals which drives delay and increased risk. These structures also dictate overhead line wire heights, and hence the track through these structures needs lowering from its historic position undermining the abutments. Lowering of the order of 800mm can be required. This affects the longitudinal track profile including drainage, requiring potentially pumped systems or very deep cess drainage (a combined stacked drainage system was adopted at Larkhall) to a new outfall. On occasion, there may be no alternative to rebuilding a bridge.

Mine-workings - many railway re-openings include the need for mineworking remediation. This is a major risk for the overall project. At Larkhall the contractor had to prove to Railtrack all mine-workings had been remediated to the satisfaction of the earthworks asset manager. All the Risk was with the Contractor. This was seriously underestimated. There was historical rumour that Larkhall Station itself had been subject to 'shallow unrecorded' mining activity. This proved to be correct following site investigation. There was only 3m of rock cover to voids of 1.5m. Once found the contractor had to deal with the issue. The design process then had difficulty justifying the existing masonry retaining walls supporting the station platforms. This resulted in the need to cast new bored piled walls around the perimeter, clad in sandstone. This issue cost the contractor around £7m. The risk on the adequacy of ground/site investigation for mine-workings needs to be understood.

8. Environmental

Critical environmental issues that must be factored into the scope, programming and cost budget include:

- **Air quality and dust control** – generally a concern for the construction stage only, unless diesel traction is proposed for the operational railway.
- **Arboriculture and landscape design** – there is a balance to be struck between cutting back or felling trees to enable works, to ensure adequate lines of sight and to control leaf-fall onto the track, against modern environmental objectives to create diverse habitats. Any new structures would be subject to visual impact assessment.
- **Ecology and the management of protected species** – including seasonal windows for carrying out both surveys and enabling works such as revegetation and the provision of new ponds. Mothballed and disused lines may have developed significant value for nature conservation and time must be allowed in the programme for obtaining necessary consents from Natural England. Network Rail requires all projects to deliver a net gain in biodiversity.
- **Flood risk and drainage** – this is a complex topic best handled through early engagement with the Environment Agency and where appropriate the Internal Drainage Board to agree a joint strategy and practical, affordable solutions that meet current standards and provide future resilience against the consequences of climate change.
- **Heritage and archaeology** – Listed bridges, station buildings, signal boxes and other railway assets can impact design and construction works. The scheme promoter should have a role here in helping to facilitate stakeholder engagement with the interested parties to find positive outcomes for all concerned
- **Invasive species** – Japanese knotweed and other invasive species are present along many railway corridors and are likely to be time-consuming and expensive to deal with. This issue can affect the programme from the very earliest stages of site investigations.
- **Land quality and decontamination** – ‘Railway land’ is a recognised category of potentially contaminated ground, but need not be a major hazard or cause for delay if the right protocols are followed in its timely investigation, assessment, and remediation.
- **Noise and vibration** – these potentially impact both construction and future railway operations and has proved to be a highly contentious issue on certain projects.
- **Waste and materials management** – Typically, projects seek to achieve a high degree of materials reuse on site, to minimise the need to remove waste offsite. Contractors are now adept at planning and executing waste and materials management plans to achieve this.

- **Effects on local communities**, including loss of amenity land and impacts on pedestrians, equestrians, and other non-motorised users because of, for example, removal of level crossings.

In some cases, re-opening a closed or mothballed railway may constitute Environmental Impact Assessment development and an Environmental Statement may need to be produced. This should be factored into the planning of the Scheme and may have a significant bearing on the programme.

All the above environmental issues can be addressed within the framework and guidance of a project Sustainability/Environmental Management Plan, updated through the various design development and construction stages, a Construction Code of Practice and independently verified through excellent schemes such as BREEAM, the world's leading sustainability assessment method for masterplanning projects, infrastructure and buildings.

9. Construction

For rural lines there is a choice to be made between accessing along the rail corridor using expensive rail plant or temporary land costs to access with non-rail plant from roads that may be some distance away.

Access to the Works - Ideally the construction process needs an access point every 1.5/2km along the length of the Route. Any early contractor involvement should concentrate on establishing these access points.

Earthworks and Cess Drainage will be the controlling disciplines, and will be best managed by civil engineers with appropriately sized plant. Due to the limited width of solum, excavators should only be 13 tonne max and dump trucks should only be 12 tonne max. Production rates are therefore quite restricted.

Delivery Methods - Ideally this should be as mechanised as possible, i.e. track laying plant NTS and wiring trains. This needs programming nationally to ensure windows of availability are planned and the construction programme is built around the availability of this plant.

Must be Right first Time, no snags, or remedial works, these must be undertaken as the work progresses. Too many projects have 'battered-on' regardless to achieve programmes leaving work behind with no possessions available to do the work. This can delay the commissioning of the project.

10. Approvals/Entry Into Service (EIS)

At Larkhall the client's asset managers sought exceptionally high standards. This made it harder to sign off the designs. In this case, early involvement of the maintenance people in the development would have helped.

Common Safety Method (CSM) requirements should not be underestimated. Hand-back arrangements and ultimate sign-off by the Office of Rail & Roads can take an additional up to 6 months at the end of the construction. CSM needs dedicated resource throughout the Design and Build process. In terms of getting the final approvals: Assessment Body (AsBo) and Notified Bodies (NoBo) appointments need to be made early. 'Significance' test must be agreed with the National Certification Board (NCB).

In conjunction with CSM the hand-back process and opening to public traffic can be protracted, especially if the operator's personnel are not incentivised to do so. This whole process takes up to 6 months, including sorting the paperwork to AsBo/NoBos to allow the route to be 'tested' initially with rolling stock, then final open to public traffic. There is a considerable amount to do in all disciplines to get certification in-place. Dedicated commissioning personnel are required.

The process of Assurance should be started as early as possible in the project in order that the Assurance bodies are brought in to the design choices and decisions as they are made. All too often Assurance is treated as a sort of 'Final Exam' (in educational language) whereas 'Continual Assessment' would guard against surprises at the end of the process.

11. Case Study:

Borders Railway

Contractor: BAM Nuttall

Borders Railway is the longest new domestic passenger railway to be constructed in the UK in over 100 years. On time and to budget, the £250m (construction value) project delivered 50km of railway, 7 new stations, 160 bridges & crossings, 196 retaining walls, 11 road schemes, signalling & telecommunications. The re-opened railway between Newcraighall in Edinburgh and Tweedbank in the Scottish Borders, offers passengers a 55 minute journey at half hourly intervals throughout the day.

Construction began in April 2013 and completed in June 2015, with the first passenger services running in September 2015. At its peak, >1000 people worked on the project in a myriad of roles.

Design followed two key sustainable and affordable principles; to re-use existing assets from the closed 1969 railway where possible and to use repeatable, standard design for new assets. In total, over 700 design packages were used to build the railway.

BAM Nuttall's involvement was unique for this scheme. Originally planned to be procured through a 'Design, Fund, Build and Operate' contract, BAM Nuttall had been undertaking early design development and stakeholder engagement along the route together with our equity and investment company.

When Transport Scotland made the decision to cancel the novel procurement and engaged Network Rail to deliver the scheme, BAM Nuttall subsequently entered the procurement process

again, this time with Network Rail seeking to procure a design and build construction partner. Success was due to the company's knowledge of the project to date – turning the usual process on its head and creating construction led engagement and design. This factor drove a more efficient design and construction process, with the 50km railway designed, built and in operation in an unprecedented time.

12. Case Study:

East-West Rail Phase 2

Contractor: VolkerRail

VolkerRail, as part of an alliance with Network Rail, Atkins and Laing O'Rourke, has been awarded the design and construction of the East West Rail Phase 2 (EWR2) scheme.

Part of Network Rail's Railway Upgrade Plan, this scheme will link Oxford to Bedford and Milton Keynes via Bletchley, and Milton Keynes to London Marylebone via Aylesbury.

The alliance is currently tasked with continuing the development of the outline design and the construction programme for the scheme, which will include a new station at Winslow, two new platforms at Bletchley, 18 new overbridges, 22 new footbridges or subways and changes to 97 railway crossings.

Split into two phases, the East West Rail scheme involves upgrading and reconstructing underused and mothballed sections of the railway linking the Great Western, Chiltern, West Coast and Midland main lines north of London and providing a strategic east-west route connecting key centres. It will deliver significant economic, social and environmental benefits to Oxfordshire, Buckinghamshire and Bedfordshire.

Once complete, this work will enable increased capacity for freight services and train journeys from:

- Oxford – Bedford (calling at Oxford Parkway, Bicester, Winslow, Bletchley, Woburn Sands and Ridgmont)
- Milton Keynes – Aylesbury – London Marylebone (an extension of the existing service between Marylebone and Aylesbury Vale Parkway, with stops anticipated at Bletchley, Winslow, Princes Risborough and High Wycombe).
- Oxford – Milton Keynes (calling at Oxford Parkway, Bicester, Winslow and Bletchley)