

EDINBURGH TRAM INQUIRY

REPORT ON RELATIONSHIP BETWEEN TRAMWAYS AND UTILITIES' APPARATUS

Introduction

1. My name is David John Rumney. My academic and professional qualifications are:

BSc	Hons Engineering Science, Durham University
CEng	Chartered Engineer
MICE (Retired)	Member of the Institution of Civil Engineers
MIHT (Retired)	Member of the Institution of Highways and Transportation
MCI Arb (Retired)	Member of the Chartered Institute of Arbitrators

2. I graduated from Durham University in 1969 and have been engaged in the practice of engineering since that time. In 1978 I was admitted to membership of the Institution of Civil Engineers and became entitled to use the designation of Chartered Engineer through affiliation with the Engineering Council. In 1982 I sat and passed the Institution's examination in Civil Engineering Law and Contract Procedure. The following year I was admitted as an Associate of the Chartered Institute of Arbitrators, progressing to Member status in 1999. I became a member of the Institution of Highways and Transportation in 1992. Since December 2013 I have been retired, but accept occasional commissions.

3. My first professional experience of light rail came when I worked as Senior Measurement Engineer on the Tyne and Wear Metro, between July 1978 and December 1983. This is a fully segregated system and does not share its alignment with rubber-tyred vehicles at any point. In February 1987 I was seconded, by my then employer, to work in the organisation of Greater Manchester Passenger Transport Executive. At that time, they were in the early stages of planning for the construction and operation of the Manchester Metrolink. My secondment, as Senior Project Engineer, lasted until September 1992, shortly after the Royal Opening of Metrolink Phase I on 17 July in that year.

4. My area of responsibility was oversight of the work carried out in Manchester City Centre. I planned, programmed and co-ordinated the work of diverting apparatus belonging to statutory undertakers (utilities), in advance of track construction. I chaired several working parties, including the Statutory Undertakers' Working Party, the Traffic Management Group, the Corrosion Working Party (dealing with stray current issues) and the Highway Design Group. I was fully involved with the design process leading to the initial choice of track construction, and the subsequent modifications. I was in daily contact with the construction process in Manchester, as my remit involved a general supervision of the City Centre construction works.

5. In November 1992 I set up my own consultancy business to advise on the planning, design and procurement of light rail systems. Since then I have provided advice, directly or as a subconsultant, on the Strathclyde, Leeds, Croydon, Midland Metro, Sheffield, Nottingham, Liverpool and Tyne & Wear light rail projects, and continued to be involved in Manchester Metrolink Phases II and III and the Second City Crossing until March 2010.

6. In 1993 I recorded my experience of managing the diversion of utilities' apparatus in a handbook titled *Diversionsary Works for Tramway Promoters*. This was commissioned by the Passenger Transport Executives Group, an organisation that consists of bodies (PTEs) that were formed pursuant to section 9 of the Transport Act 1968.

7. The content of the book was overseen by a small group representing members of PTEG. Editing and production was the responsibility of Strathclyde PTE. It was made available free of charge.

8. The book was updated in 2003 but was not published. A further attempt was made to update it more recently, but at present the original book remains the only version, and it is assumed this is no longer available. As there have been many significant changes to legislation since it was produced, it could not be considered to be reliable as a source of practical advice.

9. In 1994 I was seconded onto a working party of the then Department of Transport. This was to consider a revision to the Sharing of Costs of Works regulations (see paragraph 34 below). The working party comprised representatives of utility companies and actual or potential promoters of rail-bound transport systems. I prepared a report on behalf of the latter arguing the case for retaining the percentage contributions made to the cost of diversions then applying to major transport works.

10. In 2002 the Department for Transport consulted on a proposed revision to the Diversionsary Works Code of Practice. For a number of reasons, the revision has not been published. This issue is expanded on more fully elsewhere (see paragraph 32 below). Subsequently I was invited to join a working party (the Diversionsary Works Working Group or DWWG) set up by the Highway Authority and Utilities Committee (HAUC), an organisation supported by the Department, as the sole member representing transport authorities. This was intended to develop the updated version of the code, but the working group has been unable to reach agreement with the Department on a particular issue. Instead, HAUC produced an Advice Note in 2010 (AN 2010/1), to be read in conjunction with the Code of Practice and giving additional or modified advice as appropriate.

11. At the beginning of 2007 I was invited by UKTram to become a member of their Activity Group 1 focusing on the Protection and Diversion of Apparatus, and was subsequently commissioned to prepare a number of reports on their behalf. The proposed work of the Activity Group was presented in a seminar dated 28 June 2007, the text of which is reproduced in Appendix B as it summarises the aims in some detail. The reports were published in 2010 and presented at a DfT seminar on 30 July 2010. UKTram is considered in more detail below (see paragraph 16 below).

12. Appendix A contains a brief resume of my career in engineering.

Involvement with the Edinburgh tram project

13. I had a minor involvement with the Edinburgh tram project in the spring of 2004. I acted as a sub consultant to Mott MacDonald who at the time was one of the consultants employed by the tramway promoters. I visited Edinburgh on three occasions in that year – 3rd and 25th March, and 5th May – and gave some initial advice on the subject of utilities. At this stage my involvement ceased as Mott MacDonald, along with other consultants, were replaced.

14. Part of the work carried out for UKTram was a series of case studies, one of which was to be of the Edinburgh Tram. On 11th June 2009 I visited a representative of the project management team to gather information about the scheme that would enable me to write the relevant section of the report.

15. As my brief participation did not result in any decision about what utilities' works were to be undertaken or how they were to proceed, I do not consider that my involvement in any way affects my impartiality as an expert witness to the Inquiry.

UKTram

16. Manchester Metrolink was the first “new generation” tramway to be opened in the United Kingdom, closely followed by Sheffield. There was an intention to open new tramways in Leeds, Nottingham and the West Midlands, with other areas planning their own schemes. It was realised that each tramway promoter was likely to adopt their own standards without benefiting from the experience of the pioneers. It became clear that there would be considerable benefit from making available the experience already gained to promoters still in the process of planning and seeking to adopt best practice. One of the consequences of fragmented development of individual systems was that it was leading to an escalation in costs.

17. This led to the establishment of UKTram in 2005. It was initially a limited company owned in equal parts by Transport for London, the Passenger Transport Executives Group, the Confederation of Passenger Transport and the Light Rapid Transit Forum. In 2014 the company was reconstituted and is now funded through various categories of membership and the Department for Transport. It was set up to meet the need for the development of common standards and act as a repository for accumulated knowledge, and represents the promoters, operators and designers of tramways and light railways in the United Kingdom. Standards dealing with significant aspects of tramways are produced by the creation of Activity Groups (now Working Groups) consisting of practitioners having considerable experience in the field of interest. Its main purpose is to carry out research into a variety of aspects of light railway design, construction and operation. It publishes the results in the interests of improving understanding of the factors involved in the development of light railways and uniformly raising standards throughout the industry.

18. UKTram currently supports 21 Working Groups, considering subjects as diverse as Life Cycle Maintenance Costs, to Road Traffic Signal Failure Guidance and Air Quality Impact of Light Rail. UKTram maintains a website containing more information about their role.¹

¹ <http://www.uktram.co.uk/>

19. The first Activity Group established was titled Protection and Diversion of Apparatus, recognising that the cost of diversion of utilities' apparatus was potentially very significant in determining whether a tramway scheme was affordable. The purpose of Activity Group 1 was to review the various approaches that had been adopted by promoters and operators in the UK to the task of protecting and diverting apparatus, and to compare this, as far as possible, to the methods adopted on the continent, where there is a much greater pool of knowledge. An attempt was made to obtain a representative view from the utility companies themselves. The output was to be made available to future tramway promoters, providing guidance on how best to identify the scope of diversion works and the most efficient way to carry them out.

20. The output was produced in three phases. The first was the production of a scope of the work to be carried out, together with a report summarising the legislative background to the relationship between tramways and utilities. Then came the preparation of questionnaires addressed to UK tram promoters, continental tram promoters and UK utility companies. The responses are tabulated in report 1B.

21. The second phase consists of three Guidelines:

Guideline 1 – Standard methodology for assessing utilities' works requirements

Guideline 2 – Mitigation of utility diversion requirements

Guideline 3 – The causes and control of cost creep and cost escalation

22. The third phase report is not included on the UKTram website. This is a set of proposals for amendments to legislation, together with proposals for standard agreements between promoters and utilities that would potentially lead to a reduction in the cost of diverting apparatus. These proposals would in general need to be adopted by the Department for Transport for them to become activated, but it is understood that this has not happened so far. However, it would be possible to negotiate standard agreements between promoters and utilities without the involvement of the DfT. The Phase 3 report is attached as Appendix D.

Legislative background to diversion of utilities

23. Diversion of utilities' apparatus may be governed by either the New Roads and Street Works Act 1991 ("NRSWA") as modified by the Transport (Scotland) Act 2005, or the Town and Country Planning (Scotland) Act 1997. NRSWA is considered first.

24. NRSWA consists of five Parts. Parts 1 and 2 deal with the provision of toll roads in England and Wales, and Scotland respectively. Part 3 governs street works in England and Wales, while Part 4, the relevant part for present purposes, governs road works in Scotland. Part 5 consists of miscellaneous provisions including amendments, repeals and commencement.

25. Section 107 defines a road and defines road works as works carried out in a road for the purpose of placing apparatus in the road or a range of subsidiary actions associated with it. Work of this kind can only be carried out by someone having a statutory right to do so, or someone who has been granted power to do so under s.109 by the road works authority. Only

the road works authority, a statutory undertaker or someone authorised under s.109 may legally carry out road works.

26. It should be noted here that a tramway promoter is a statutory undertaker for the purposes of constructing the tramway once statutory authorisation has been obtained.

27. While all utility companies are entitled to place their apparatus in the road, subject to certain restrictions set out in NRSWA, they are not empowered to require another utility to move its apparatus to allow them to place their own apparatus in a specific place. If the same situation applied to a transport authority, particularly one planning to build a tramway, the positioning of apparatus already in the ground might prevent the tramway from being built if the utility refused to move its apparatus. This situation is overcome by s.143.

28. Section 143(1) states

“(1) Where an undertaker’s apparatus in a road is or may be affected by major works for roads purposes, major bridge works or major transport works, the roads, bridge or transport authority concerned and the undertaker shall take such steps as are reasonably required—

(a) to identify any measures needing to be taken in relation to the apparatus in consequence of, or in order to facilitate, the execution of the authority’s works,

(b) to settle a specification of the necessary measures and determine by whom they are to be taken, and

(c) to co-ordinate the taking of those measures and the execution of the authority’s works,

so as to secure the efficient implementation of the necessary work and the avoidance of unnecessary delay.”

29. By s.150(1)(a) of NRWSA, the transport authority is the “authority, body or person having the control or management of a transport undertaking”. The transport authority, in the case of the Edinburgh Tram network, is the City of Edinburgh Council or any other person exercising relevant powers by agreement. By s.150(1)(b), a tramway falls into the definition of a transport undertaking, while subsection (2) makes it clear that construction of a tramway is classed as major transport works.

30. Section 143(1), quoted above, places a joint obligation on the transport authority and the undertakers. This is to identify what apparatus belonging to the undertaker, if any, will be affected by the proposed tramway. Having done this, they then need to agree on what action should be taken in relation to the apparatus so that it will not be adversely affected by the construction and operation of the tramway.

31. The term “affected” is defined in s.164(4). Apparatus is regarded as “affected by works if the effect of the works is to prevent or restrict access to the apparatus (for example, by laying other apparatus above or adjacent to it).”

32. Section 143(2) provides for the issuance of a code of practice giving practical advice on the operation of this section. Called *Measures Necessary where Apparatus is affected by Major Works (Diversionary Works)*, it was issued in June 1992 and has not been updated since. An attempt was made to produce an up-to-date version in 2003, but this was held up as a result of the court case *BT v Gwynedd Council*. The code is now only available as a

photocopy of the original, but has very little value due to the changes that have been made to subsidiary legislation in the period since it was first available.

33. The organisation known as HAUC (Highway Authorities and Utilities Committee) was initially responsible for the production of the Code, in conjunction with the Department for Transport. As the DfT would not sponsor the update until the consequences of *BT v Gwynedd Council* were resolved, HAUC instead produced an Advice Note, 2010/1, to supplement the Code of Practice in the interim. It should be noted that there are still no plans to update the Code.

34. Payment for the works carried out in consequence of agreements reached under s.143 is the subject of s.144. S.144(1) provides for the making of regulations setting out how the costs are to be shared. These are the Road Works (Sharing of Costs of Works) (Scotland) Regulations 2003. In summary, there are two different sets of circumstances carrying different percentage contributions. Where apparatus is affected directly by the construction of the tramway, the transport authority is required to pay 92.5% of the cost of the works, with the undertaker absorbing the remaining 7.5%. If the work affecting the apparatus could be classed as major works for road purposes, the transport authority will pay 82% of the cost, with the undertaker absorbing the remaining 18%.

35. An example of the second situation arises when the road needs to be widened to accommodate the tramway, and apparatus will be exposed to unacceptable load as a result of setting back the kerblines.

36. There are two other circumstances in which the utility will contribute to the cost of diverting or protecting their apparatus. The first is referred to as betterment. This applies if the utility decides that the capacity of apparatus needing to be diverted is insufficient, for example because of new development in the area since the apparatus was initially installed. The utility will be required to pay the additional costs of the larger piece of apparatus.

37. The other is known as deferment of the time for renewal. All apparatus has a notional design life. If renewal resulting from an agreement reached under s.143 occurs before the expiry of the design life, the utility company will be required to make a further contribution to the cost of the works, based on a formula set out in the Diversionary Works Code. This equation is reproduced below:

$$B = C \left(\frac{(1+R)^b - 1}{(1+R)^L} \right)$$

where C = Cost of undertaker's works

R = Rate of interest

L = Number of years of estimated full life of apparatus

b = Number of years of expired life of apparatus

B = Financial benefit

38. The term R was fixed at 6% during a period of high interest rates, with the proviso that it could be altered by agreement if it ceased to be appropriate. In 2007 it was agreed that

it should be changed to 3.5%, and in future linked to the discount rate in HM Treasury's *The Green Book – Appraisal and Evaluation in Central Government*.

39. Most of Part 4 of NRSWA deals with the way in which road works are to be carried out. As examples, minimum periods of notice are required before work can be carried out in a road, depending on the impact that it will have on traffic. Roads can be designated as traffic sensitive, which means that road works can be prevented during particular hours, on particular days or at particular periods of the year. The roads authority also has separate powers to order that road works can only be carried out at specific times. Roads can, under certain circumstances, be designated as protected, preventing placing of any apparatus in them except by consent of the road works authority or until particular circumstances. Where substantial road works are to be carried out by the roads authority, for example reconstruction or resurfacing, they may give notice to undertakers that no road works may be carried out following the works for a period up to 12 months. This requirement is not absolute and can be revoked in certain circumstances, such as the need to carry out emergency works, or by agreement with the roads authority.

40. The Transport (Scotland) Act 2005 consists of four parts. Part 1 refers to regional transport; Part 3 contains miscellaneous provisions; while part 4 deals with making orders and regulations, interpretation and commencement.

41. Part 2 is in part a modification of Part 4 of NRSWA strengthening certain of the powers. A particularly significant one is set out in s.21, which adds s.115A to NRSWA. The effect of this is to allow the roads authority to prevent the utility from placing apparatus in a particular road, so long as there is an alternative road in which the apparatus can be placed, and this road serves the purpose of the apparatus equally well.

42. The third Act which has significance when considering diversion of apparatus is Part X of the Town and Country Planning (Scotland) Act 1997. This applies where land, which is not on a road, has been acquired for the purpose of constructing the tramway. If this land is classed as operational land of a statutory undertaker, the procedure set out in this part will be followed. This requires notice to be served by the acquiring authority on the statutory undertaker currently in possession of the operational land, that apparatus or rights affecting the land are to be removed or extinguished in a period of not less than 28 days. The statutory undertaker can serve a counter notice within the 28-day period objecting to all or part of the proposals.

43. If there is no agreement between the two parties as to the outcome, either party may apply to the Scottish Ministers for an order determining what action is to be taken. The result could be a very significant delay to works relating to the land to be acquired.

44. All these issues must be considered in planning and programming diversion works.

Determining likely effect of utilities' apparatus on tramway

45. Once a decision has been made to build a tramway, it is vital to begin to understand where utilities' apparatus is in relation to the tramway infrastructure. It is normal at this early stage to have identified more than one possible route for the tramway, and knowing what apparatus is present in each of the routes will form part of the decision-making process, although will only be one of the considerations.

46. Having narrowed down the choice of route to a single option, there will be an application for powers to construct and operate the tramway. At this stage, the New Roads and Street Works Act does not apply to the proposed tramway as the promoter has not yet been granted the powers that are necessary to make them a statutory undertaker. However, it is important that work begins on investigating what apparatus lies below or close to the proposed route of the tramway.

47. This potential dilemma is resolved by the procedure for applying for the statutory powers, at least when they are to be sought through the Transport and Works (Scotland) Act 2007. It is expected that this will be the normal procedure adopted, although the authority for the construction of the Edinburgh tramway was obtained as an act of the Scottish Parliament². The process of applying for a Transport and Works Act order is set out in The Transport and Works (Scotland) Act 2007 (Applications and Objections Procedure) Rules 2007. Under these rules, there is an obligation on the promoter of the scheme to serve a copy of the application and relevant documents on a statutory undertaker where land in which the undertaker's apparatus is installed will be affected by the proposed works³. The fact that the undertakers will be alerted to the scheme by this obligation almost certainly means that they will require to be provided with further details and will then begin to consider what the effect will be on their apparatus. Failure by the promoter to provide the opportunity to discuss the proposals may lead to the undertaker lodging an objection to the scheme.

48. A report is to accompany the draft order which summarises the consultations undertaken in pursuance of the above requirements⁴. This is the correct time to begin discussions with the undertakers to try and assess what works will need to be undertaken and what it is likely to cost. The order process further requires

“(a) the applicant's proposals for funding the cost of implementing the order; and

(b) where the application is for an order containing proposals to carry out works –

(i) the plans and sections described in paragraphs (1) and (4) of rule 10; and

(ii) an estimate of the cost of carrying out the works provided for in the proposed order.”

as set out in rule 8(3). Clearly the cost estimate required by 8(3)(b)(ii) cannot be relied on unless a realistic figure has been derived for the diversion of utilities, which in turn requires an assessment of what apparatus might need to be moved. It can be seen that there is an overlap here between the process of applying for the order, and the procedure set out in the Code of Practice authorised by s.143 of the New Roads and Street Works Act.

² Edinburgh Tram (Line One) Act 2006 and other related legislation

³ Schedule 3 paragraph 13, and rule 11.3

⁴ Rule 8(2)(e)

49. The first stage in this process is to seek to identify which utility companies have apparatus in the area covered by the tramway. While this seems to be a straightforward matter, the Department for Transport currently register approximately 330 utility companies. Many of these only trade locally, while others appear to be no longer trading or have been absorbed by other companies, but this leaves a significant number that may have apparatus in the area affected by the tramway. Some of these will be national companies, including those supplying gas, water and electricity, and collecting sewage, and these can be expected to be present. There are however separate independent companies serving the same market, who might also have apparatus in the same area. BT may also be expected to have apparatus in all areas, but there are several cable companies who could be competing with them.

50. The first approach should be to the local road works authority to ask for any records they have of work carried out by undertakers, or any other record of the presence of utilities' apparatus. At the same time there should be a walk-through of the route to record and identify any apparatus present at the road surface in a location that could imply interference with the tramway. This will mainly reveal sewer and BT manhole and inspection chamber covers, lids of water and gas ancillary valve equipment and evidence of other cabling equipment. Reference can also be made to the Scottish Road Works Commissioner road works plans. The register maintained by the Commissioner "provides a means to...exchange information on the location of underground apparatus..."⁵

51. Having hopefully identified all undertakers having apparatus in the area of interest, they should each be contacted and asked to provide records of their apparatus. Many utilities have now digitized their records and will generally provide access to the database for public bodies, and in this way, it is possible to keep track of changes to their network. Failing this, they should be asked for paper records of the relevant part of their network. Most will provide these without question, but until statutory authority for the tramway has been secured, they have no obligation to do more than make records available at their offices during normal working hours.

52. It needs to be made clear at this stage that knowing the position of the visible parts of utilities' apparatus – generally referred to as ironwork – namely the lids of manholes, chambers and valves, does not provide clear information about the position of the apparatus underground. A BT manhole can have an internal dimension of 3 metres or more, and the cables will always be offset from the direct line beneath the entry at the surface, for reasons of safety. Gas and water valves are likewise generally offset from the main pipe they service, while sewer manholes can have a diameter of several metres and, as with BT manholes, the sewer pipe is always offset from the manhole cover.

53. To prepare plans of the proposed tramway for presentation with the application for the order, it will be necessary to draw up a detailed topographical survey of the route between building lines on either side of the road. A vital part of the survey will be recording the position of all utilities' ironwork. Other road apparatus should also be taken into account, such as road lights, traffic signals, payphone kiosks, road drainage, mobile phone antennae and road furniture generally, including bus shelters, all of which can be relying on hidden utility apparatus.

⁵ <http://www.roadworksscotland.gov.uk/Publications/General.aspx>

54. At this stage it should be possible to link the apparatus shown in the undertakers' records to the outcome of the survey, always having in mind the scope for error resulting from the offset of apparatus below the surface. This can be aggravated further by the likelihood that the apparatus, particularly in the case of cable, may not run in a straight line. This can result from previously installed apparatus causing an obstruction, or in the case of electrical cables in particular, from additions and subtractions to the network causing diversion of the original cable.

55. The cost of the work carried out so far will have added little to the overall cost of the scheme, and should have produced useful information, though not sufficient for producing cost effective plans for the diversion or protection of the apparatus. There is no accurate information about the exact alignment and depth of the apparatus, or about its condition. It is as well to consider what might be achieved if further information were available.

56. Generally, the costliest items to divert are sewers and BT. In both cases the cost is related to the size of the installation, either pipe size or number of cables. In both cases the larger installations are almost invariably several metres deep, and well below any danger of conflict with the tramway. Consequently, if the manholes providing access to the pipes or cables at each end are clear of the tram infrastructure, there should be no need to move any of the apparatus.

57. This holds well for BT, because the cables are always placed in ducts, and when a cable fails it can be replaced by pulling in the replacement through the ducts between the manholes, which will have no effect on the tramway operation. The situation is different for sewers, because if a sewer fails beneath the tramway, it will be necessary to dig up the road to replace it. Because of the potential cost savings that are generally available by leaving sewers in position, it will be cost effective to carry out an internal inspection of sewers potentially affected by the tramway using CCTV to assess their remaining life. Depending on the condition, the life can be extended to an acceptable degree by fastening a resin coating to the inside of the pipe. This approach was used recently in Birmingham to realise a significant cost and time saving when dealing with sewers. Even where the manholes are close to, or even partially beneath the tracks, it may be possible to create a side entry manhole where the means of access is moved away from the tracks, but still enters the existing manhole from the side. This can only be used when the overall depth of the sewer or cables exceeds around 4 metres, for reasons of safety when evacuating a workman inside the manhole who has been injured or taken ill.

58. The life of gas and water mains is also regularly extended using plastic pipes inserted into the original pipe. The original is frequently made from cast iron, which over time is likely to leak, generally through the pipe joints. The original pipe serves no further role in carrying the gas or water, but provides an easy route for the replacement plastic and also serves to give it solid protection.

59. Modern fibre optic cables, used by communications companies such as Sky and Virgin Media (and to an increasing extent by BT) are generally laid higher in the ground – typically 250mm in the footway and 450mm in the roadway. This will invariably conflict with the slab supporting the tramway rails, but there have been successful agreements allowing the ducts carrying the cables to be cast into the track slab, protecting rather than diverting the cables.

60. To make sensible decisions on the best way of treating the apparatus in conflict with the tramway, it is necessary to have more information. At one time this would have been gathered solely by the excavation of trial holes to determine the exact position of apparatus. More recently a non-destructive method has been used known as GPR (Ground Probing Radar or Ground Penetrating Radar). This is a technique which sends a radar signal into the ground, and the returning signal is interpreted as changes in density. To a skilled operator this provides information about the probable presence of features below the ground. This is helped by knowledge of what is likely to be encountered provided by the records of apparatus obtained from the utilities, but it is usual to also find unrecorded items and other anomalies that can be very useful in planning works.

61. Although GPR was first used shortly after the invention of radar at the beginning of the 20th century, the first commercially viable equipment was not produced until 1985. In 1989 Transport for Greater Manchester was approached with a proposal to use GPR on the first phase of Metrolink. Although it was seriously considered, preference was given to using trial holes in a few complex areas. Later experience has shown that results can be variable and not all operators reach a comparable standard. However, GPR was adopted to survey the whole route of the extension of Midland Metro between Snow Hill and New Street, with very satisfactory results.

62. GPR is generally supplemented by a complementary technique using electromagnetic tracing. The two techniques are used in conjunction, because the electromagnetic method easily detects metallic apparatus, though it does not provide information about the depth, which is however supplied by GPR.

63. On occasions there may be a good use for trial holes, although it should be possible to limit the number of these. GPR surveys can be carried out at night and have limited impact on traffic, whereas trial holes are intrusive and will often have a detrimental effect on traffic. They are also expensive compared with the results from GPR. The use of trial holes will normally be adopted only when other techniques do not provide reliable information about the relationship between apparatus and the tramway alignment and will be best used shortly before diversion works start. Trial holes are also likely to not be useful where there is a concrete layer beneath the road surface. This is due to the potential for damage to apparatus as the excavation breaks through the concrete, as the apparatus may be encased in it.

64. While there are good, available methods of obtaining information about utilities' apparatus, there can be a difficulty in deciding when and whether to adopt them. At the start of a project there is no certainty that it will be pursued to a completion. As a result, there will be a limited budget allotted to investigating it. Even when the promoter has decided that development work should proceed, there is always a possibility that the necessary statutory powers will not be granted, and even when they are, that funding will not be forthcoming. There is naturally some hesitation about spending money on investigations that may be unnecessary in the long run.

65. The question arises as to who should carry out the survey of the utilities' apparatus and begin planning their diversion or protection. Experience has shown that this is best carried out by the promoter, in conjunction with the owner of the apparatus, for the following reasons:

- The works undertaken by the utility companies are carried out at cost, and they are required to substantiate their invoices. If the work is carried out under the control of an intermediary, they will add a mark-up for profit and overheads, resulting in the outturn cost being higher. It is also possible that they may be less diligent in pursuing the cost savings available through application of the Road Works (Sharing of Costs of Works) (Scotland) Regulations 2003. Work carried out by the promoter will normally be absorbed at a lower cost.
- As illustrated above in connection with Manchester Phase 1, diversion and protection of apparatus requires a long period of planning. This includes time to identify all utilities potentially affected, obtain the necessary records, win the trust and co-operation of the utility company representatives, identify apparatus needing to be diverted or protected and agree on the necessary measures. This process can take years rather than months.
- A well-informed promoter is more likely to seek out the most cost-effective solutions than an intermediary contractor, unless he is tied to a fixed price. This is very unlikely to be possible if no work has been carried out in advance to allow a reasonable estimate of total cost to be made. If attempted, it would be inevitable that the contractor would allow for a very high risk-element in the contract.

66. Once planning has reached a stage where the scope of the works has been identified, it may then be appropriate to pass the works on to a separate contractor. While this may be the contractor appointed to construct the tramway, this is unlikely to be cost effective as it will mean carrying the contractor's overheads for a lengthy period before he is able to begin the tramway construction.

67. These issues are addressed in Appendix 4 to the UKTram document Activity Group 1: Phase 1B: Analysis of Responses to Questionnaires Sent to UK Tramway Promoters and Operators, Continental Operators and Utility Companies. The responses from promoters who responded to questions 12 to 15 are included in Appendix E to this document. Note that Transport Initiatives Edinburgh were invited to provide information about the Edinburgh tramway but did not respond.

68. Question 15 to Appendix E dealt with the comparison between the initial expected cost of diverting apparatus and the outturn cost. The responses are summarised below.

- Manchester Metrolink Phase 1 (Manchester City Centre) recorded that the outturn cost exceeded the initial estimate by about 20%. The reason was partly due to an increase in the scope of highway works, and partly due to inflation. In general, the cost estimating was considered to be satisfactory.
- Manchester Metrolink Phase 2 (Cornbrook to Eccles) recorded that the outturn cost showed a significant reduction due to a reduction in the scope of gas works and a larger than expected deferment of renewal from BT.
- Midland Metro Line 1 (Wolverhampton to Snow Hill Station) recorded that the outturn cost was significantly higher than the initial (pre-C4) estimate. C4 estimates came nearer to the outturn cost, although there was insufficient documentation available to allow for an accurate percentage difference. Cost increases were largely due to Network Rail

overruns and charging of 12.5% by the construction joint venture for overseeing the diversion works.

- Midland Metro Line 1 Extension (Snow Hill Station to New Street Station) had not started diversion at the time but expected that the final cost would be less than the intermediate estimates. A number of cost saving methods were adopted in the course of the works which accounted for between 4 and 5 million pounds.
- Sheffield Supertram noted that the outturn cost was “massively over budget”. The reasons given were due to a lack of information, poor estimating by utilities, quality of checking, and the extent of work not directly associated with clearing swept path alignment.
- There was no response to this particular question regarding the Croydon tram. However, it is known that the initial estimate was £42m, while the outturn cost was about £19m. The majority of the difference was a result of BT’s cost estimate based on the assumption that all their apparatus laid in roads containing the tramway would have to be moved.
- Also, there was no response in relation to the Nottingham tramway. This was because the work was handled entirely by the concessionaires, who did not reveal the diversion costs. However, reports at the time indicated that there had been a significant financial loss by Carillion, part of the consortium who were managing the diversions.

69. The responses indicate that costs can go both up and down in relation to the original budget. To obtain accurate estimates, it is necessary to begin planning for diversions at an early stage. It is very helpful, for example, to develop good relationships with the representatives of the undertakers that will be carrying out the planning of the diversion works. There are various ways of reducing diversion costs but getting successful agreement that these should be adopted takes time and trust. Once the statutory powers have been granted to build the tramway, it is essential to set up a working party constituting representatives of the promoter, all utility undertakers, the roads authority and the emergency services. The contractor responsible for the construction of the tramway should be added to this list once appointed.

Planning diversions and payment

70. As noted above, planning and agreeing on what diversions are necessary is a lengthy process. This suggests that plans can be drawn up for a scheme which might change numerous times as it develops and render much of the planning redundant, requiring the process to be begun again. In practice this is less of a problem than it might first appear. Through the Transport and Works process, there is an obligation to provide drawings showing the route of the tramway together with the limits of deviation. While this can imply a reasonable degree of flexibility in the alignment of the tramway, in practice the alignment will be constrained by the need to provide appropriate provision for other traffic using the same road surface. As a result, there are relatively few changes to alignment that have a significant effect on the diversion or protection of apparatus. Consequently, most of the decisions about diversion can have been made by the time the order is granted.

71. Appendix C contains a review of the processes that must be followed during the planning and construction of any tramway. There may be a temptation to think that these stages could be short-circuited to reduce the overall time scale. In particular it is suggested

that apparatus can be exposed and diverted ad hoc. There are many reasons why this is not practical, as reference to Appendix C will show. The process will be costlier and more drawn out than adopting the structured method recommended, for the reasons summarised below:

- Before road works can be carried out, the undertaker must give a minimum of three months' notice to the road works authority of the intention to carry out works defined as major works. This will apply to most works carried out in relation to tramway construction⁶. A further notice of not less than 7 days may be required to be given to the road works authority, and to the owners of other apparatus in sections of road affected by the proposed works⁷. The delay to the works caused by this would be avoided if the work were identified and planned well in advance.
- If apparatus is only to be moved as it is found, there will be a lack of knowledge of the position of other apparatus. Some of this may need to be moved first, but this will not be possible until it has been unearthed.
- Movement of apparatus generally involves traffic management, which takes time to set up. In addition, movement of kerblines to enable work to be carried out may expose other apparatus to excessive loadings, leading to the need to divert or lower it.
- The best solution where diversion of apparatus is necessary may involve moving it into a different road. This cannot be planned until the presence and location of apparatus in the other road has been determined.
- Where diversion of apparatus involves excavating and closing part of the road to traffic, it may be necessary to prepare temporary traffic regulation orders. This will normally take several weeks, and thereby delay the start of the works. TTRO's may be required for a number of purposes apart from a straightforward road closure, such as introducing, reversing or rescinding one-way systems, introduction or lifting of parking restrictions, restrictions on straight ahead or turning movements at junctions, prohibitions on access or driving and so on. None of these can be foreseen and planned for until the presence of apparatus, and the need to move it, has been established.
- It takes time to agree on a specification and timing of agreed works, and identify new locations for diverted apparatus. This is wasted time if it has not been addressed sufficiently in advance.
- It will take time for the undertaker to estimate the cost of carrying out the diversion of apparatus. Unless an advance payment for the estimated cost is made by the promoter to the undertaker, the benefit of the sharing of costs of works will be lost, representing either 7.5% or 18% of the cost (see paragraph 84 below). Additionally, without an overall view of the project it will not be possible to relate ongoing costs of diversions to a budget, and hence be prepared for overruns.

72. The utility companies should be involved from a very early stage of planning the tramway, including as early as deciding which of several possible routes is to be chosen.

⁶ NRSWA s.113 and The Road Works (Scottish Road Works Register, Notices, Directions and Designations) (Scotland) Regulations 2008, reg. 6

⁷ NRSWA s 114 and reg. 7

Before an application for an order is made, the applicant is required to consult with all utility companies likely to be affected by the tramway and must show that this has been done or explain why not.⁸

73. The role of the utility companies in the process of deciding what measures need to be taken in relation to their apparatus is set out in s.143 of NRSWA. This requires a partnership between the tramway promoter and each of the utility companies, in order to identify the work to be carried out, the specification for the work and who will carry it out, and how the work is to be co-ordinated with the construction of the tramway. The aim of this section of the Act is “to secure the efficient implementation of the necessary work and the avoidance of unnecessary delay”. The undertakers are not able, by virtue of the Act, to refuse to co-operate in this process.

74. Payment for diversion and protection of apparatus falls within NRSWA S.144. This is generalised and relies on regulations⁹ to explain how payment is to be shared between the promoter and the utility companies. A code of practice¹⁰ produced pursuant to S.143 expands on the calculation of payments, as well as giving general guidance on the application of sections 143 and 144. However, the code has not been updated since its original publication in 1992, and the advice is no longer entirely correct.

75. A specific example deals with the payment by the promoter to the undertaker for the work carried out by them in preparing cost estimates (see also Payment for Cost Estimates in Appendix D). The Code includes several appendices, including Appendix C Procedures for Necessary Measures in Relation to Undertakers' Apparatus. Section C3 is called Draft Schemes and Budget Estimates. At this stage the promoter should provide the Undertakers with details of the proposed scheme consisting of preliminary alignment and levels. Undertakers are to respond with details of the effect of the scheme on their apparatus. The budget costs provided at this stage were intended to be provided at the cost of the undertakers.

76. Section C4 is called Detailed Scheme and Detailed Estimates. At this stage the promoter sends details of the scheme in sufficient detail, including detailed design with working drawings and an outline programme, for the undertakers to be able to provide a reasonably detailed cost estimate. The intention was that this should be the first stage at which the promoter paid for the information provided.

77. Section C5 is called Scheme Commencement Notification and Settle Specification. This is the point at which the promoter formally notifies the undertakers that the scheme is to proceed and is the opportunity to finalise specifications and programmes.

78. While the intention was that the C4 estimate should be provided free of charge to the promoter, the wording of the Code is ambiguous, a fact that was realised by BT. They disputed the refusal by Gwynedd Council to pay for the work, and eventually the dispute went to court. The case *BT v Gwynedd Council* was settled in favour of BT, with the consequence that it was decided that only the C3 estimate is provided at the expense of the undertaker.

⁸ The Transport and Works (Scotland) Act 2007 (Applications and Objections Procedure) Rules 2007, rule 8(2)(e) and Schedule 3, para.13

⁹ The Road Works (Sharing of Costs of Works) (Scotland) Regulations 2003

¹⁰ Measures Necessary where Apparatus is Affected by Major Works (Diversionary Works)

79. The tramway promoter is entitled to pay only a percentage of the cost of carrying out work to divert or protect apparatus. The utility company's contributions arise from sharing of costs of works, betterment (See para. 36 above and para. 89 below) and deferment of the time of renewal (see para. 37 above and para. 90 below).

80. The percentage rebate allowed to a transport authority differs from that allowed to a roads or bridge authority, with the exception that the transport authority is allowed the same rebate as a roads authority when it acts as a quasi-roads authority.

81. The utilities are required to absorb a proportion of the cost of diverting apparatus (currently 7.5% for works directly attributable to the tramway construction works) subject to certain conditions being met.

82. The regulations require the identification of "allowable costs" on which the calculation is carried out. These are all the reasonable costs of the measures needed to be taken, except the costs of producing the initial set of plans and estimates for the work, which are borne by the utility concerned. Also, where apparatus is placed in a road after notice has been given to the utility by the promoter of his intention to construct the tram system, the utility will be responsible for the costs of moving it if construction work begins within five years of the notice being given. In the case of a tramway project, the promoter cannot give the notice until the order under the Transport and Works Act has been granted (or in some cases an Act of the Scottish Parliament). This may be several years after the roads to be used by the tramway have first been identified.

83. Where road works are carried out as part of the tramway scheme but not in a road directly affected by the alignment, utilities are not entitled to be paid for moving apparatus at their own initiative solely due to a change in the type of road construction, as long as the depth of cover to the apparatus is not varied so that it falls outside a certain range. If the diversion is carried out by the promoter at the request of the utility, he is entitled to recover the cost from the utility.

84. As a condition of receiving the benefit of the cost sharing provisions, the promoter is required to pay the utility company in advance, 75% of the estimated cost of the works to the promoter (that is to say, net of the utility's contribution), either as a lump sum, or in stages as work proceeds where the work is expected to take more than three months. In the latter case, the promoter and the undertaker should agree a schedule of payments to be made by the promoter, to reflect the anticipated programme of works.

85. The proportion of costs payable by the promoter and the undertaker is different when the diversion results from work that would be classed as major works for road purposes if it were not being carried out in connection with a transport project. In this case, the utility contributes 18% of the cost of the works. In simple terms, if apparatus is moved for the purpose of accommodating the tramway infrastructure, the utility is required to absorb 7½% of the cost and will be reimbursed 92½% by the promoter. If on the other hand the diversion is carried out because of roadworks undertaken to accommodate the tramway, the utility will absorb 18% of the cost of the works and will be reimbursed 82% by the promoter. The second scenario will most often be encountered when a carriageway is widened by setting back kerbs, exposing apparatus designed to be in the footway to carriageway loadings. This will lead to the apparatus being diverted or lowered.

86. Note that if the promoter chooses not to make a payment in advance of the diversion works, they will not be entitled to the discounts described above.

87. The two types of work giving rise to different contributions from the utility company should be reflected in the schedules of the Transport and Works order. Schedule 1 of the model clauses lists tramways, tramroads and other scheduled works. Work carried out for the purposes of the first category, tramways, will attract a contribution of 7½%. Tramroads, by definition, are not constructed on a road and the utility companies will contribute nothing to diversions carried out for this purpose. Other scheduled works are likely to consist of construction of bridges and underpasses, or construction of complete new roads or thoroughfares. Construction of new roads generally does not fall within the New Roads and Street Works Act, but new structures are major bridge works and will attract the 18% contribution where appropriate. Alterations to roads are set out in Schedule 3, and diversion works carried out in pursuance of these works will generally also attract the 18% contribution.

88. The overall treatment of betterment, deferment of the time for renewal, and the sharing of allowable costs changed between the initial regulations, introduced in 1992, and the revised regulations now in force. The definition of allowable costs contained in regulation 2(2) of the original version referred to the “costs of the measures needed to be taken”. By definition, betterment results from measures which are not necessary for the purposes of the construction of a tramway system and so the betterment element was excluded from the allowable costs. Now, the definition has been slightly altered, so that the allowable costs of diversionary works mean “all the reasonable costs incurred in executing them.” It is suggested that betterment is thereby included, and the value of betterment is to be subtracted from the reasonable costs after the costs have been apportioned between the authority and the undertaker.

89. While diverting services, it is possible that one or more of the utilities will take the opportunity to improve or upgrade their apparatus. This may arise, for example, because the development of land for housing or business may have begun to overload distribution mains feeding or sewers draining the development. Apparatus would eventually need to be increased in capacity to cope with the increased demand. The regulations provide that, if for the reason that diversion of apparatus coincides with the need to lay mains of increased size, or for any other reason the apparatus that is laid in the diverted positions is of greater capacity than the apparatus in its original position, the extra costs of laying the greater capacity apparatus are to be met by the utility concerned. The apparatus is not considered to have an increased capacity for this purpose if an increased pipe or cable size is enforced due to the nearest available size being greater than the existing, or where the material used, while resulting in an enhanced capacity, is the one now commonly used for the size or duty of apparatus in question. An increase in length of the apparatus is also not considered to be betterment if the increase is necessary to satisfy the needs of the project.

90. The principle of deferment of the time for renewal is that the utility company will be replacing old equipment by new at the expense of the promoter and consequently will not in all probability need to replace it again for a period corresponding to the expected life of that type of apparatus. Where the apparatus to be moved has been in the ground for more than 7 years, the utility is required to bear a portion of the cost of diversion corresponding to the benefit gained as a result.

91. There are conditions attached to the contribution by the utility. An individual piece of apparatus being diverted must exceed 100 metres in length if it is to qualify. In the case of electric cables above medium voltage, but less than 33kV, or auxiliary cables, the length will be 250 metres; for higher voltage cables, the length will be 500 metres; and for fibre optic cables the length must also be greater than 500 metres.

Potential sources of delay in carrying out diversionary works

93. UNJUSTIFIED OPTIMISM

94. There is a well-recognised tendency in projects to believe that it can be achieved more quickly than is realistic. This is well illustrated by a conversation that took place while work was being carried out on the diversion of apparatus for phase 1 of Manchester Metrolink. This was in early 1990 after there had been approximately two years of planning of diversions, and approximately a year of diversion work undertaken. We received a phone call from a company that had just taken on the responsibility for project management of the Sheffield Supertram construction, which was about to start. They were seeking advice on how long it would take to carry out diversions, and rhetorically suggested that 3 months might be enough. It is not clear whether this was expected to cover planning as well as physical work. The cost of diversion works in Sheffield was nearly five times that in Manchester.

95. Reference was made during the inquiry to paragraph 7.78 of the final business case. This says “The physical diversion of utilities commenced in July 2007 and is scheduled to end in winter 2008”. This implies a total duration of approximately 18 months. This bears no comparison to the duration of diversion works in comparable projects. There is firstly the question of whether work would have been allowed everywhere throughout the City during the whole of the winter. Most big cities impose cessation of disruptive works during the Christmas period – generally from the second week of November to the first week of January. It is believed that such a moratorium existed in Edinburgh, at least for part of the duration of the works.

96. Comparison with works in Manchester and Birmingham City Centres strongly suggests that the allowance made for diversion of utilities’ apparatus was inadequate. The track length on highway in Manchester City Centre (Phase 1) was approximately 2 km, and diversion works cost £5.6m between 1989 and 1991. The diversion works took approximately 2 years to complete. It is estimated that at a common cost base date, the Edinburgh diversions cost at least 4 times as much as the Manchester diversions.

97. The diversion works in Birmingham also took approximately 2 years. The outturn cost was about £9m in 2013. Both Manchester and Birmingham imposed a Christmas Moratorium, although a relaxation was negotiated in one area of Birmingham which helped to maintain continuity of work. The length of track on highway was approximately 800m.

98. Based on these comparisons, it is suggested that the anticipated completion of diversion works in less than 2 years was a significant underestimate.

99. RIGID RULES ON PROXIMITY

100. There is a tendency to try to set rules about the distance between the tramway and utilities’ apparatus. This is a mistaken approach. Much apparatus can remain where it is without being affected by the tramway. For example, sewers are generally laid well below any apparatus belonging to the tramway, and unless access chambers or manholes conflict directly with the tramway, and if the sewer is in an acceptable condition (or can be brought to such a condition), there is no need to move it. Much of the apparatus belonging to BT similarly lies well beneath the surface and is accessed by manholes. If there is no direct

interference between the tramway and the means of access, there is frequently no need for interference with the cables. Even when a manhole conflicts with the tramway, it is often cheaper to rebuild the manhole than move the cables. Water main pipes are normally placed at least 750mm beneath the road surface to protect them from frost, and this may well result in plastic water pipes crossing the tracks being left in situ. Gas mains not physically affected by the construction of the tramway, if they are cast iron, can sometimes be lined internally with a smaller plastic pipe, avoiding the need for diversion. However, there is a drawback to leaving apparatus beneath the tracks, which will be addressed later.

101. INDIVIDUAL AND CORPORATE RESISTANCE

102. It is not unknown for influential figures in either the utility companies or councils to resist the project, sometimes imposing unreasonable requirements. Even where such resistance might be illegal, it can result in a delay to the works while the issue is resolved, resulting in cost increases.

103. COMPETING DEVELOPMENTS

104. In urban areas there are often many developments going on at the same time, and these can include developments alongside the tram route. Two examples had a significant impact on the recent Midland Metro Line 1 Extension in Birmingham. The first of these was the major redevelopment of New Street Station. This required the closure of sections of the roads intended to carry the tramway, and where utilities diversions were to be carried out. This led to a major replanning of the works, which also had an effect on the construction of the tramway. In another part of the route, a multi-storey building was converted to a hotel while diversionary works were proceeding. This also had an impact on the diversion works, and the combined effect of the two developments led to both diversions and tramway construction having to be modified. Fortunately the decision to begin diversions some time in advance of the start of trackwork meant that it was possible to reschedule without the effects being too serious.

105. UNDISCOVERED APPARATUS

106. Regardless of how thoroughly the investigation of apparatus is carried out, it is almost inevitable that some will be missed. There is always going to be some redundant apparatus in the ground. This applies particularly to electricity cables, where frequently more than 50% are no longer used. In larger cities there can be ducts that formerly carried water which operated hydraulic lifts, wartime fire tanks placed to ensure a supply of water in the event of hits by incendiary bombs, deep underground tunnels with accesses at the surface and a variety of other, now redundant, items of apparatus. These no longer have a purpose, nor presumably an owner. However there can sometimes be apparatus which is still in use but has not been properly recorded by its owner. An example is a British Gas pipe in New Street, Birmingham. A small pipe was known to feed gas to a hotel, but there was no record of another pipe which carried approximately 3 times as much gas to the same hotel. Fortunately this was discovered before it was cut off, but the work required led to several unplanned-for weeks of extension to the diversions schedule.

107. The treatment of apparatus found during the course of the programme of diversions is no different from that identified in advance of the works. The promoter and the utility company will be required to “identify the measures necessary” and carry out the work of

diversion as quickly as possible. Provisions for payment will be the same. There will clearly be a need to expedite the works if at all possible, but finding previously undiscovered apparatus will probably lead to an extension of the overall diversions programme. This may not be too serious given sufficient float in the programmes separating the diversion works from the tramway construction.

108. ZONING

On the face of it, breaking the route into zones and carrying out diversions in one zone at a time, so providing a clear site for tramway construction, appears to be a sensible approach. However, the consequence of this can only be an elongation of the diversionary period overall. This is because each utility will require a different works duration, and ones with a smaller quantity of work will be idle while they could have worked elsewhere. There is also a greater possibility of two utilities conflicting with each other, further extending the work period. Intelligent scheduling of works to reduce the time to the minimum is a more logical approach. Experience shows that it is not necessary to construct the tramway from one end to the other. It also helps if the diversions programme is provided to the tramway contractor at an early stage so that the two programmes can be integrated.

109. NRSWA SS.140 AND 141

110. Section 140 of NRSWA imposes a duty on utility companies to maintain their apparatus in the road to the satisfaction of the road works authority, and any other relevant authority “as regards any land, structure or apparatus of theirs”. This might include periodic renewal of the apparatus.

111. Section 141 requires a utility company to compensate a relevant authority for any damage or loss to them resulting from road works carried out by the utility company on its apparatus, or from an explosion, fire or discharge from the apparatus.

112. The consequence of these sections is that utility companies will be reluctant to leave apparatus too close to the tramway for fear of having to pay compensation whenever they need to work on it, or a failure causes damage and results in the tramway having to stop running (but see paragraph 137, and paragraph 147 below).

113. CHANGES NOT ACCOUNTED FOR

114. Planning the building of a tramway and the associated diversion of apparatus takes a considerable amount of thought and time. Even then, not everything will be foreseen, and this can lead to delays and extension of the duration of the project.

115. An example of something that was only just considered in time occurred in Manchester City Centre. The tramway runs through one of the main bus stations in the city and, as a result, reduced the number of available bus stands. It was realised at a late stage that once the work started, there would be insufficient space for all the buses needing it. This meant that space had to be found in a nearby side street, and a new bus station built to replace the lost stands.

116. Once diversion of apparatus begins, there will be a need for many temporary traffic regulation orders. These will involve closing roads, making roads one way or lifting one-way orders, changing direction of flow and so on. A consequence of these changes will include a

need to modify road layouts, sometimes on roads at some distance from the route of the tramway. This may involve physical changes, including, for example, alterations to road junctions, and narrowing or widening of the roads. Such works will need planning well in advance of being carried out.

117. It would be good to be able to rename this section Incidental changes, hoping that they would be planned for in advance. Failure to do so can lead to major delays to the works, both diversions and tramway construction.

118. FAILURE TO COMPLY WITH AN AGREEMENT

119. The promoter and utility companies are undertakers with powers granted by statute. To this extent they have no need to bind themselves by contract so long as they are carrying out works in accordance with their powers. However, NRSWA provides that they must reach agreement on the works to be carried out by way of diversion or protection. Failing this, the dispute is to be resolved by arbitration.¹¹

120. On the face of it, this suggests that agreement can be reached on how long each element of diversion should take, and if the utility fails to meet the target, that they should be liable to provide compensation. In practice this is unrealistic: firstly because the provisions of subsection (1) are not so specific and utilities will seldom commit themselves to a firm target: and secondly because they can always claim that their legal obligations to provide a public service prevented them from carrying out the work at a specific time. This provision is in any case a double-edged sword, in that the same provision applies to any delay caused by the promoter to the work of the utility company. Finally, taking the issue to arbitration is likely to take longer than simply resolving the problem in the best available way.

121. An example of an unavoidable delay occurred in Birmingham during the diversion of electricity cables for the Line 1 extension to New Street, when a serious fault in a high voltage cable threatened the supply of electricity to a major hospital, which took all available personnel a period of several days to repair. No work was carried out on diversions during this period.

122. It should be noted that NRSWA calls only for “the avoidance of unnecessary delay”¹², and it would generally be difficult to prove that a delay had not been necessary. Experience has shown that utility companies generally co-operate willingly and without prevarication in carrying out their diversions. The responsibility for delays also becomes less clear when some or all the diversion work is being carried out by a contractor employed by the promoter of the tramway.

123. Section 143(1) leaves open the possibility of either the undertaker or the promoter deciding unilaterally what action should be taken in respect of any or all of the items that need to be diverted. In practice this is unlikely to be acceptable to either party, particularly the undertaker as the owner of the apparatus concerned. Section 143(3) implies that agreement should be reached, failing which the issue can be settled by arbitration.

124. Whether agreement can be reached easily can depend on the relationship between the representatives of the promoter and the undertakers. My experience has been overwhelmingly

¹¹ NRSWA, s.143(3)

¹² NRSWA s.143(1)

that agreement can be reached fairly easily, although there have been exceptions. Ultimately agreement must be reached, even if this means that one party concedes to the other, but this may require discussions to be escalated to a higher level.

125. It is sometimes assumed that undertakers will seek to move more apparatus than is strictly necessary. However, this goes against their interests as they make contributions to the costs of diversions, and are unable to make profit from the work. It is therefore in their interests to minimise the quantity and cost of diversions. This suggests that their proposals are genuinely thought by them to be the most cost effective. This does not mean however that it is not possible for the promoter to propose improvements.

126. The main benefit of reaching agreement is that it is in the interests of both parties to minimise the scope and costs of the diversions, and the experience of both parties may help to identify cost saving measures.

127. COORDINATION OF DIVERSIONS WITH TRAMWAY CONSTRUCTION

128. In my opinion coordination is only feasible if the planning has been undertaken by the promoter and a scheme is passed to the tramway contractor to supervise the carrying out of the works. The contract must then stipulate that the contractor takes all risks, but this will inevitably lead to a high-risk element being added to the contractor's costs. A preferable approach is for the promoter to control the diversion work, started well before the start of the tramway construction, and to merge the diversions and construction programmes as soon as the latter is made available.

129. GUIDANCE ON PLANNING AND CARRYING OUT DIVERSION AND PROTECTION OF APPARATUS

130. As mentioned above (see paragraph 74) a Code of Practice was introduced in 1992 giving guidance on best practice in dealing with diversion and protection of apparatus. This contained a number of flaws, one of which was the absence of any guidance in relation to tramways. This was not in fact unreasonable at the time, because there were no new tramways while the code was being developed. Other than British Rail, who were relatively little affected by road works, the working group consisted only of road authorities and utility companies.

131. The Department for Transport proposed to update the code and circulated a consultation document in 2002. The revised document continued to ignore the existence of tramways. A 15-page response was sent in October 2002 on behalf of GMPTE, Merseytravel and Centro¹³. The covering letter from DfT (though in practice from HAUC) had limited the scope of comments to changes made to the original document, and consequently did not allow for the introduction of matters relating to tramways.

132. It was intended that the revised document would be issued in 2003, but this was delayed as a result of the court case *BT v Gwynedd Council*. This was a dispute over the payment of a utility company's costs incurred in preparing an estimate of the costs of diverting apparatus. It was understood that the result of this case could challenge the advice contained in the code, so it was deemed best to hold back from issuing the revised document. The final result of the case, following an appeal, was in conflict with the advice, and with the

¹³ Now known as Transport for West Midlands (TfWM)

intention of the DfT when the document was first issued. Despite the passage of time, the updated document remains on the shelf, pending a decision by the DfT how the issue should be dealt with, and the original document is no longer available except as a photocopy. As a result, current formal advice relies on an advice note issued by HAUC in 2010. This supplements and clarifies the code, as best it can.

133. In 1993 I wrote a document called *Diversionsary Works for Tramway Promoters*. Two attempts were made to update this, but the original document is still the only version. This is no longer produced but has in any case been long out of date.

134. There is a considerable amount of advice available from the documents produced by the UKTram Activity Group 1 in 2010, and these are readily accessible from the UKTram website. While they are still valid, they do not reflect the experiences of Edinburgh, Nottingham Phase 2, Midland Metro Line 1 Extension or Manchester Phase 3.

135. SUGGESTED REFORMS TO THE LAW

136. Several suggestions were made as part of the work carried out for UKTram. These are set out in Appendix E. While the basis of law in Scotland differs from that in England and Wales, the approach of NRSWA is to have the same effect in all areas.

137. COST AND TIME REDUCTION INITIATIVES

138. SHARED TRENCHING

139. A variety of successful initiatives have been adopted in tramway projects to reduce both the cost and the duration of the works. The following examples have been taken from the recently opened Midland Metro Line 1 Extension.

140. Where more than one undertaker was required to divert their apparatus into the same area, arrangements were made, if possible, for a single excavation to accommodate all the apparatus. This applied particularly in New Street and Lower Temple Street, where apparatus belonging to Openreach, Western Power, Vodafone and to a limited extent, Virgin Media was all installed into a trench excavated by North Midland Construction (NMC). The contractual relationship with NMC was not straightforward. While they worked directly for Vodafone as their main contractor, for Openreach they were employed as a sub-contractor through Carilliontelent. Western Power are normally tied to Enterprise as their contractor but agreed that NMC could be used if the promoter employed them directly, and this was seen as beneficial to the project. Virgin Media used Fujitsu for the installation of their cables, but they also were prepared to allow NMC to install ducts where this was feasible. New Street was perceived as an especially sensitive area, and the use of a single contractor to reduce the duration of the works was seen in a favourable light by those most directly affected. A similar approach was adopted elsewhere on the route where this was appropriate, particularly in Bull Street.

141. TEMPORARY HIGHWAY SURFACING

142. Under NRSWA the undertaker has the duty to reinstate the road after carrying out street works. Reinstatement is to be carried out as soon after the works have been completed as is practicable. The reinstatement may be interim or permanent. If an interim reinstatement

is carried out, the permanent reinstatement is to be completed within six months (although this period can be extended by agreement with the roads authority).

143. Since the roads containing the tramway were to be resurfaced between building lines, an agreement was reached with Birmingham City Council that a temporary tarmac finish could be used. This was significantly cheaper than replacing the concrete blocks which formerly covered most of the route, and which are labour-intensive to install.

144. ENCAPSULATION WITHIN TRAMWAY CONSTRUCTION

145. As a general rule, apparatus crossing the tracks was placed at or lowered to a depth of about 1.2 metres. This figure was settled on to take account of three things: the depth of track construction, the possible depth of trackside ducts serving the tramway (containing power booster and communication cables) and an allowance for plant loading at formation level.

146. In some instances, particularly where fibre optic cables were involved, agreement was reached with the undertaker to leave the ducts and cables within the tramway construction zone, although below the concrete track slab. This worked best with Virgin Media and Vodafone. In the case of Virgin Media, insurance ducts were installed at 1.2 metre depth, and associated access chambers were demolished and rebuilt to accommodate the extra ducts. In this way, considerable savings were achieved in both time and money.

147. WAIVERS

148. Section 141 of NRSWA provides for compensation to be paid to a “relevant authority” in the event that damage is caused to their apparatus or that operations are disrupted by road works or emergency works, resulting in a loss. The promoter is (or may be)¹⁴ a relevant authority for these purposes. With this in mind, Severn Trent Water had proposed to reline all sewers crossing or running beneath the tramway to ensure that they would not need to get access to them during the lifetime of the tramway operation. This disregarded the current condition of the pipes, which are graded from 1 (best) to 5 (worst). The promoter took the view that pipes grades 1 or 2 should not need attention within the lifetime of the tramway, and that consequently it would be unnecessary to reline them. There were also several manholes where the access was close to the tramway but sufficiently far away from it not to interfere with its construction. Severn Trent originally proposed to rebuild these to move the access points so that they would not interfere with operation of the tramway, but the promoter preferred that these should not be altered. Making these modifications to the initial proposals by adopting the promoter’s preferred approach was estimated to save in the region of £4 million. To realise the potential savings, the promoter agreed to indemnify Severn Trent against claims arising from S.141 that would not have arisen if the sewers had been relined, or the manholes had been reconstructed, as the case may be. This was agreed in principle, and the waiver document is in place. A similar waiver was given to Western Power Distribution so that they could avoid diverting cables on the east side of Colmore Circus west carriageway, adjacent to the Wesleyan building. The estimated saving to the promoter is £250,000.

149. The measures used in Birmingham could be successfully adapted to any other tramway construction project. In some cases, assistance and possibly permission may be needed from the roads authority for the work to be carried out.

¹⁴ See Appendix D, p.8

150. There has been a longstanding proposal for meetings between UKTram and bodies representing the undertakers, such as NJUG (National Joint Utilities Group), to discuss this in detail and produce standard agreements.

151. STRAY CURRENT

152. The electrical power used in the operation of tramways leads to potentially damaging effects on utilities apparatus in the form of stray current and electromagnetic interference. Special precautions are required in the design and construction of the tramway to ensure that these effects are reduced to as low as is reasonably possible, so that they do not lead to unacceptable consequences. Much is made of the phenomenon of stray current and the need to control its effects in relation to electrically powered tramway systems. This section briefly explains the origins of stray current and its relevance to diversion of apparatus.

153. The normal means of powering a tram system will be by direct current supplied through overhead contact wires. A current collector mounted on the roof of the tram draws current from the contact wires and this energises the motors. The circuit returning to the substation can be completed in one of two ways. The commonest approach is to use the running rails for this purpose, connecting them electrically to the substation supply point. The current supply cables are traditionally maintained at the positive potential, while the rails are connected to the negative. The alternative approach is used for trolley buses and a small number of tramway systems. In this case, a second overhead wire is used to carry the return current, which avoids the problem of stray current.

154. All current which adopts a route other than along the rail is regarded as stray current. One of the aims of track design is to minimise the amount of current departing from the rails by reducing the resistance of the return path along the rail, and at the same time maximising the insulation between the rail and earth.

155. A tramway promoter will invariably have an obligation to minimise the discharge of electrical current into the ground in the course of operating the tramway. This obligation will often be self-imposed through the terms of the authorising legislation. The utility companies have a particular interest in ensuring that suitable steps are taken in the construction, operation and maintenance of the tramway to safeguard their apparatus against the effects of stray current and are certain to object to the granting of an order if they consider that insufficient attention is being paid to this. If the order does not contain specific terms requiring the promoter to minimise stray current, it will normally be necessary to give an undertaking to the utilities to design the tramway in accordance with current best practice.

156. The most significant consequence of stray current is its corrosive effect on metals. The mechanism of current transfer through the earth is electrolysis, in which the water content of the earth breaks down into ions of hydrogen and oxygen that migrate towards the cathode and anode respectively, causing a flow of current. One of the electrodes will be the running rail, while the other will frequently be metallic apparatus belonging to a utility company. The transfer of current may occur once, perhaps from the rail to a gas pipe, before the current leaves the gas pipe to return to the rail closer to the substation negative terminal. However, a number of similar transfers can happen along the stray current path involving several pieces of utilities' apparatus.

157. Corrosion occurs at the anode of an electrolytic cell. Consequently, when the rail is more positive than its surroundings, there will be a tendency for the foot of the rail to be corroded at the point where current leaves it. An adjacent piece of apparatus will be unaffected at the point where the stray current enters it but will experience gradual corrosion at some distant point where current leaves it to return, directly or indirectly, to the substation negative terminal.

158. While there are potential dangers to utilities' apparatus arising from stray current, the dangers are less than are often suggested. While older metallic apparatus could be corroded to a greater or lesser degree, depending on the material from which it is made, newer apparatus is likely to be made from plastic, or if metallic, will be protected at the time of installation by non-conducting coatings.

159. No attempt should be made to solve the problems of stray current by pre-emptive diversion of apparatus, as it is unlikely to provide a fully satisfactory answer, while committing the promoter to greatly increased costs. However sensible precautions should be taken in the use of non-conducting materials wherever possible in the replacement of apparatus. Where apparatus, which must for any reason be formed in metal, passes beneath tracks at right angles, an isolating section should be inserted in the line to provide a high resistance to the passage of electricity.

160. Where possible, the methods to be used in limiting stray current should be agreed with utilities before construction is undertaken. The execution of a formal agreement in appropriate terms may help to limit the promoter's exposure to compensation claims in the event that utility apparatus is found to deteriorate after tramway operation commences.

161. The existence of stray current and its effects are normally monitored during the operation of the tramway. Control of stray current is considered to be satisfactory if certain criteria are complied with. The most important of these are based on measurements of changes in electrical potential measured on items of utilities' apparatus.

162. The liability for the effect of stray current on utilities' apparatus was established in the court case *National Telephone Company v Baker* of 1893 (see report in Appendix F). In summary, it was found that the effect of stray current produced by the operation of an electrically powered tramway did not constitute a nuisance, in this particular case, because the operation was authorised by statute, and the tramway had been designed in accordance with the best available methods at that time.

163. Consequently, it should not be necessary under normal circumstances for utilities' apparatus to be diverted or protected to avoid the effects of stray current.

APPENDIX A

Profile

48 years as a qualified engineer, with 36 years' experience in light rail/tramway engineering. Experience includes consultancy, contracting and local government work, with two years working abroad. Self-employed consultant since November 1992. Specialist knowledge of tramway alignment design, overhead line design, and dealing with conflicts between alignment and utilities' apparatus.

Experience and skills

Nov 1992 – present

SELF-EMPLOYED CONSULTANT

1978 – 1992

MOTT MACDONALD GROUP

1987 – 1992 Manchester Metrolink

1986 Dubai

1985 – 1986 Newcastle Design Office

1983 – 1985 Misratah, Libya

1978 – 1983 Tyne and Wear Metro

OTHER

1975 – 1978 New Forest District Council

1974 – 1975 Oscar Faber & Partners

1969 – 1974 Ove Arup & Partners and John Laing Construction Ltd

Selected projects

Midland Metro Line 1 Extensions – Advised Centro from 1998 to 2014. Responsible for all matters involving utilities in connection with the Birmingham City Centre Extension of the Midland Metro light rail network. Responsible for gathering utilities records, preparation of composite plans, agreeing need for diversions or protections, preparing proposal plans, obtaining C3 and C4 cost estimates, and preparation of master programme to link the diversions to the main construction process.

Manchester Metrolink Phase 1 – Seconded to GMPTE as Senior Project Engineer, responsible for management of City Centre section. Investigated presence of utilities' apparatus and negotiated with utility companies to agree on the need for diversions and protections. Co-ordinated responses to request for cost estimates, prepared master programme of the works, and supervised the diversions project. Chaired Statutory Undertakers Working Party, Traffic Management Group, Highway Design Group, Stray Current Working Party and was a member of the Public Relations Working Party. Responsible for preparation of temporary Traffic Regulation Orders.

Manchester Metrolink Phase 2 – Gathered utilities' records, prepared composite plans, agreed diversions and costs and prepared outline programme.

The information was subsequently passed to the Concessionaire, who ordered and managed the works.

Metrolink Phase 3 – Gathered utilities' records for parts of the route. Obtained "enhanced" C3 estimates from utility companies. Undertook major exercise to identify possible cost reductions, and agreed in excess of £14 million reduction in scope of works needing to be carried out.

Leeds Supertram and Strathclyde Light Rail Line 1 – carried out initial investigation of the presence of utilities apparatus and the need for diversions for both schemes.

Sheffield Supertram Extensions – Advised SYPTE on possibility of extending Supertram to Royal Hallamshire Hospital in a loop via A57 and Glossop Road.

Leeds NGT and NET phase 2 –

Sub consultant to Mott MacDonald, advising on utility diversion and protection strategies.

Other

Former member of HAUC working party revising Diversionary Works Code. Consultant to UKTram for Activity 1 looking at diversion and protection of utilities' apparatus.

APPENDIX B

Seminar 28th June 2007.

Presentation of work undertaken by Activity Group 1 to-date

My starting point is to ask the question, “What is the Activity Group attempting to achieve?”

The answer in a nutshell is to show promoters how they might minimise the cost of dealing with utilities’ apparatus encountered beneath or alongside a light railway alignment.

Various studies have concluded that the diversion of utilities’ apparatus may account for as much as 25% of the overall cost of constructing a light railway. At this level in this country, and under the present system of financing, there would appear to be very little chance of producing a convincing business case for the introduction of a new light railway.

Where does the problem lie? Is it simply that there is so much apparatus in the streets that large amounts must always be moved to make way for new infrastructure? Or does a large part of the problem lie in a lack of understanding of the relationship between utilities’ apparatus and the light rail infrastructure? As always, the answer will lie somewhere between these two positions. This is well illustrated by the history of utilities diversions in Croydon, where at one point the estimated cost of diversions was in the region of £42million. The outturn cost was in fact in the region of £19m. The main explanation for the difference was the correction of a misconception by BT that all their apparatus in the same street as the Tramlink tracks would need to be moved. In practice, BT was only the third most expensive of the utilities, with the sewer diversions costing five times as much. What this illustrates is that at that time, BT, at least in the London area, were naïve in their assumptions about the effect of a light railway on their apparatus. Possibly the promoter was no more knowledgeable!

The purpose of the present work is consequently to provide a source of reference for both promoters and utilities so that they can gain an understanding of the most economical approaches to diversion and protection of utilities’ apparatus. This work has already started with the production of a short document entitled *Guide to dealing with utilities and their apparatus*. It is intended that this will in due course be placed on the UKTram website. It aims to set out the main characteristics of utilities’ apparatus and the ways in which it might be affected by light railway infrastructure. It contains a summary of the parts of the light railway infrastructure that need to be taken into consideration when considering the possible conflicts between it and the apparatus. It sets out the principal legislation determining the relationships between the promoter of the railway and the utilities, namely the New Roads and Street Works Act 1991, and in England and Wales, the Traffic Management Act 2004. Most importantly, it suggests ways in which it may be possible to avoid the need for diversion of apparatus, or at least ways of reducing the scope of the work. A section of the report considers the implications of stray current and electromagnetic interference, which you will be hearing more about later this afternoon. I only need to say here that apparatus should NOT be moved in anticipation of a possible problem arising from stray current, as a correctly designed railway should itself provide adequate protection.

An appendix to the guide provides a checklist of the procedures that should be adopted throughout the life of the project to divert apparatus. The steps that need to be taken may be assigned to different people at different times – for example the promoter of the scheme,

a project manager, the concessionaire – but each of the steps will be essential to allow the scheme to proceed. The guide is completed with the same advice contained in flow chart form.

The key to any decision to divert or protect apparatus, or leave it unaltered, is access. It should be remembered at all times that the apparatus placed in the streets is serving an essential need of the public at large, whether it be the supply of gas, water or electricity, the removal of sewage or the provision of means of communication. Modern-day life relies on all these, and their provision should not be regarded as a trivial matter, or as a deliberate attempt to frustrate the introduction of street-running railways. When infrastructure for a light railway is installed into the street, it might affect apparatus by destroying a means of access, such as a manhole, or by directly overlying the apparatus. Where access is prevented or restricted, the utility company owning the apparatus is entitled to consider, in conjunction with the railway promoter, what steps need to be taken to ensure that the company, and by extension, its customers, do not suffer a detriment.

Among other things, the following factors will need to be considered:

- Will the apparatus be destroyed in the course of construction? Clearly it will have to be replaced if it continues to be an essential part of the utilities' infrastructure network.
- Will the apparatus be covered over by the light railway infrastructure, and hence not accessible without demolishing or dismantling part of the latter? If this were necessary, could the light railway continue to operate?
- Could work be carried out on apparatus close to the light railway while the railway was in operation? Would equipment used in repairing or maintaining the apparatus be a danger to vehicles on the railway, or would it be endangered by the presence of the live overhead line equipment?
- What is the importance of the apparatus to the utility company, or to the end users? High pressure gas and water pipes, extra high tension electricity cables, large diameter sewers, large diameter copper cables with many pairs of wires, and fibre optic cables forming part of a large ring main will all be crucial to the operation of a utilities' network over a wide geographical area. Loss of the apparatus will need to be corrected immediately to avoid inconvenience to thousands of people. There are also certain facilities that are heavily dependent on the continuous provision of utilities' services, such as hospitals, schools, nursing homes and so on. Police stations and other emergency services may struggle to operate without communications services. The importance of maintaining unobstructed access to apparatus will need to be considered in relation to such matters.
- What dangers will be associated with leaving apparatus beneath or close to the tracks? Some apparatus may actually benefit from being beneath the tracks, as it reduces the risk of it being disrupted by others excavating in the same area. However, there are clear dangers associated with leaving gas pipes beneath or close to the tracks, as a leak from a pipe may be masked over a period, to the point where gas concentrations become lethally explosive. Similarly, a leak from a water pipe might go unnoticed if it is happening beneath the tracks, until a cavity has been created big enough to cause a failure of the track. A leaking sewer can also lead to catastrophic failure of other apparatus by eroding the support from a gas or water pipe, causing it to leak through failed joints.
- How will the utility company expand its network of apparatus in the future? Will they need to make new connections to apparatus left beneath or close to the tracks to supply services to new developments along the railway frontage?

While satisfactory answers need to be provided to all these questions, where the opportunity arises consideration needs to be given to adopting an approach to diversions

based on risk assessment. What will the consequences be of leaving apparatus beneath or close to the tracks? How frequently is the apparatus likely to fail? Can access to the apparatus for maintenance or repair be guaranteed within a timescale that can be tolerated by the utility company? What are the implications of a decision to leave apparatus close to the tracks on compensation provisions contained within the New Roads and Street Works Act 1991?

This leads on to the further work that is planned by the Group. We have distributed a large number of questionnaires to actual and potential tramway promoters and operators in this country, to utility companies, and to tramway operators on the continent. These have been produced both as hard copies and as forms to be filled in electronically. It has to be said that the response to date is not very encouraging, but hopefully with some prodding in the right quarters, this will improve.

The questionnaire sent to UK light rail promoters and operators has been divided into five sections. The first is intended to establish the general approach to treatment of apparatus. The first question seeks to establish the promoter's philosophy when deciding, in their own minds at least, what apparatus should be moved. This was assumed to be either to move everything in the way with a view to avoiding future disruption to operation of the railway, or to move as little as possible to minimise the cost of initial construction, while accepting that there would inevitably be future disruption, which would come at a price. A third suggestion offered is that the promoter might rely solely on the utility companies' assessment of what needs to be moved.

The promoter is asked to comment on the utility companies' co-operation in the adoption of the philosophy, and whether the philosophy needed to be modified as a result of gaining a better understanding of the utility's needs or obligations.

The second section of the questionnaire seeks to establish how well section 143 of NRSWA operates. This section of the Act provides for the railway promoter and the utility company to identify the measures that need to be taken to a) allow the construction of the railway to proceed and b) to mitigate interference by the railway infrastructure with the utility's apparatus. The initial question asks whether the utilities co-operated in the choice of measures to be taken, or whether they considered that they should decide unilaterally in respect of their own apparatus.

The Diversionary Works Code is issued under the authority of section 143, and this calls for the provision of information by the utility companies at various stages of the project. They are initially required to provide records of the positions of their apparatus, followed later by budget estimates, and subsequently by a detailed estimate based on a detailed scheme provided by the promoter. The estimate is also to include a specification of proposed diversion works, and a programme for carrying out the works. The questionnaire asks whether the information provided was complete in relation to the obligation imposed by the code, and whether charges were made by the utilities for the provision of the information. An important issue here is to establish any change in approach to charging following the court case BT vs Gwynedd County Council. In this case, BT highlighted a discrepancy between the legislation (specifically section 85 of NRSWA and the Street Works (Sharing of Costs of Works) Regulations), and the Diversionary Works Code. Whereas the intention of the code was that the detailed cost estimate was to be provided free of charge by the utility, the court established that the only free estimate was the budget estimate, in other words only the first estimate provided is free.

Further questions relate to the timely provision of the information requested, the steps taken by utility companies to accurately establish the position of their apparatus (a requirement of the Diversionary Works Code), the readiness of the utility companies to discuss the proposed measures at suitable intervals throughout the project, and whether any apparatus was allowed to be built into the railway infrastructure.

The third section of the questionnaire considers the planning, programming and implementation of the diversionary works. A possibly sensitive question asks whether the client's staff was sufficiently knowledgeable about utilities to challenge assumptions that might have been made by the utility companies about what apparatus need to be moved. Further questions ask who was responsible for generating and maintaining the programme for the diversions project, what role was played by the client in supervising the work of the utilities, whether any difficulties were experienced in agreeing the final costs, how the final outturn costs compared to the cost estimates at intermediate stages of the project, and to what extent the differences were due to inflation.

The fourth section of the questionnaire deals with the experience of the railway operator after it has come into operation. This aims to establish whether any periods of disruption have been experienced due to the need to repair or maintain utilities' apparatus, how frequently it has been necessary for utilities to take possession of the tracks, whether section 93 or 152 in Scotland, which requires utilities to give notice to the railway operator when they need to carry out work affecting the railway, provides adequate safeguards, and whether in hindsight the scope of diversion works carried out was correct.

Finally, opinions are sought on what aspects of the current legislation should be amended, and whether any innovative solutions were used that could be employed on other schemes.

The questionnaire sent to utility companies obviously tries to look at the issues from the other end of the spectrum. The first question relates to risk assessment, and asks what information is available in the industry represented by the utility to assist in making such an assessment, for example in the form of failure rates of apparatus. The next three questions are aimed at establishing the attitude to co-operation, by way of provision of information, whether the response of the utility differs between promoters seeking, and those having been granted, statutory powers, and whether identification of the necessary measures is seen as a co-operative exercise, or one that is the prerogative of the utility owner of the apparatus.

The second section attempts to bring out attitudes to leaving apparatus in place wherever possible, rather than assuming that it automatically has to be moved. One question asks the degree to which the code of practice *Safety at street works and road works* is taken into account when planning diversions.

The third section deals with costs, programme and implementation, and concerns differences of opinion on the interpretation of the various cost sharing measures, whether costs incurred through overlong occupation of the highway is reimbursable to the utility, who is best placed to maintain the overall programme of works, whether the promoter has a role to play in the supervision of the utility's works, who should undertake traffic management, and who is best placed to manage public relations?

The fourth section concerns experience of repair and maintenance of apparatus in the presence of an operational tramway, while the final section asks for tips on innovative solutions to the problem of conflicts between a railway and utilities' apparatus.

The third questionnaire was sent to light rail operators outside the UK, including Dublin. The particular points of interest here are the way in which the relationship between the utilities and the promoter are governed (i.e. the legislation), how the costs of diversion are divided between the two, and how the need to gain access to apparatus once the railway is operational is managed.

Once a sufficient number of responses have been received, they will be analysed, and a summary report produced. This will be followed by the preparation of a set of guidelines to inform promoters and designers of best practice at the following five stages of a project:

Initial feasibility;
Seeking powers/funding;
Initial tender stage;
BaFo ;
During construction.

A further set of guidelines will then be developed suggesting how promoters, designers, utility companies and highway authorities can take steps to reduce the amount of diversion works that need to be carried out. This will cover, amongst other things, the use of topographical and non-invasive subground surveys, and the influence of the design of the railway on diversion requirements.

The following phase in the development of guidelines will be a report on the causes and control of scope creep and cost escalation, using a set of case studies. This will be a wide-ranging review of factors including the availability of critical resources, the quality of utilities' records, the impact of the drawn-out development and authorisation stages of the majority of projects, the risks associated with traffic management, especially following the introduction of the Traffic Management Act 2004, and opportunities for economising through the use of common trenches and traffic management.

It is expected that the three sets of guidelines to be produced in the next stages of the work of the Activity Group, provisionally titled *Standard Methodology for assessing utilities' works requirements*, *Mitigation of utility diversion requirements* and *The causes and control of cost creep and cost escalation*, will be grouped together into a single document on completion.

The final stage of the Activity Group's work will be a review of shortcomings in the existing legislation, with a view to making recommendations to the Department for Transport to amend primary or secondary legislation and codes of practice as necessary. To a certain extent this will need to be done in conjunction with the Highway Authorities' and Utilities' Committee, who are the main focus for maintenance of the New Roads and Street Works Act 1991 and the Traffic Management Act 2004. Areas to be considered will include the proportion of costs borne by the promoter and the utility, the appropriateness of the definition of a transport authority, and the definition of a relevant authority when it comes to the payment of compensation by a utility to a transport authority for the failure of apparatus affecting a street railway. A major flaw in the existing codes of practice lies in the Diversionary Works Code, supposedly the main source of information and advice for light railway promoters preparing for the diversion of utilities' apparatus. The code was prepared

in the late 80s and early 90s, when little thought was given to issues relating to street railways. Preparation was carried out by HAUC, with the result that the code makes no reference to, nor provision for, street railways. Consequently it has limited use as a reference document, and it is important that it should be revised to reflect the needs of light railway promoters.

APPENDIX C

During the life of a light rail project there will be several bodies taking responsibility for different aspects. These will include the promoter of the scheme, possibly a different client to see it through the construction phase, a designer, a contractor and/or concessionaire and an operator. The allocation of responsibilities may vary from one project to another, and this will apply to the diversion and protection of utilities apparatus. Regardless of how the responsibilities are allocated, the following stages will need to be accomplished throughout the project.

1. Define alignment.

A firm definition of the alignment will be required. Without this, any work on diversion of utilities will potentially either lead to unnecessary cost and time being expended on moving apparatus that does not need to be diverted, or miss diversions that are necessary. If the promoter defines the alignment himself, this will theoretically limit the future Concessionaire's freedom to choose the alignment. In practice this is of no real significance in a congested urban area, where the choice is dictated by external factors such as restraints imposed by buildings, and traffic management considerations. The alignment will in any case be restricted to the streets set out in the order authorising the system.

2. Define changes to highway due to permanent changes to traffic management.

The need for diversions does not only result from the construction of the track, but also from changes to the carriageway alignment. There will be places where the kerbline will be set back in relation to its current position, in order to accommodate the tracks. This is likely to expose shallow utilities apparatus to additional loading, and such items will need to be diverted, protected or lowered. Diversions for this purpose only, will attract a different rate of contribution from the utility companies.

3. Define temporary and permanent changes to highway due to traffic management during construction.

The programme of diversions identified from 1 and 2 above will inevitably result in traffic movement patterns being modified while the diversion work is carried out. A wide range of changes might be introduced, including road closures, one way systems, reversal of one way systems, introduction or lifting of parking restrictions, restrictions on straight ahead or turning movements at junctions, prohibitions on access or driving and so on. In some cases such changes can only be introduced by modifying the highway layout, particularly by junction improvements. This may in turn lead to diversion of apparatus exposed for the first time to highway loadings, at locations quite remote from the tramway.

4. Establish relationship between apparatus and the works identified in steps 1 to 3

Records should be obtained from all utilities identified as having apparatus in the streets affected by the tramway. These should be transposed onto composite plans overlaid by the chosen alignment. The initial composite service plans will make use of evidence of the lines of apparatus provided by a detailed survey of the utilities' ironwork. This is useful for apparatus that breaks the ground, such as BT and other communications and cable companies' chambers and manholes, various valves associated with water and gas pipes, and sewer manholes. There is generally little evidence of main gas and water pipes however, or electricity cables. It will therefore be necessary to refine information about this apparatus, either by digging trial holes, or carrying out non-invasive electronic or radar tracing. Where appropriate, the composite drawings should be modified to reflect the results obtained from these investigations.

5. Develop proposals for managing risk associated with the cost of diverting utilities/long term maintenance by utilities

The preferred solution to any conflict between the light railway and utilities' apparatus will always be to leave the apparatus in place, subject to agreements being reached on the

methods to be used to maintain and extend it when necessary. This will avoid unnecessarily increasing the cost of introducing the railway. It has always to be remembered however that the lifetime costs of the railway must be assessed, and not just those of the construction. A realistic attempt needs to be made to calculate the costs associated with the risks of leaving apparatus beneath or close to the tracks, in terms of the consequences of failure of the apparatus, the frequency and additional costs of maintaining it, the visible and hidden costs of suspending railway operations, and the safety of all involved in working near to an operational railway.

6. Identify all apparatus to be moved as a result of steps 1 to 5

Section 143 of the New Roads and Street Works Act 1991 requires the transport authority and the statutory undertaker owning apparatus affected by the proposed changes to identify the apparatus and the “*measures necessary*” to be taken to allow the tramway construction to proceed. The steps to be taken include agreement on a specification for the works and the timing of the works.

7. Identify new locations for apparatus to be moved.

Having identified what apparatus needs to be moved, it is then necessary to find a new location for it. It may not always be appropriate to replace like for like. For example, there is a considerable amount of electric cabling in any city street that is no longer in use (frequently more than 50%). While this still belongs to the electricity company, and they could theoretically require it to be moved, it would not be economically sensible to do so. In the case of all services, there may be an opportunity to rationalise networks, resulting in one new pipe or cable providing the capacity of several existing. However, this may be moderated by other considerations, including security of supply (for example maintenance of redundant supplies to a hospital) or different purposes served by apparent duplication of supply (for example, separation of potable water supplies from fire fighting supplies).

The new location will not necessarily be in the same street as the existing. Trunk mains may not provide a service to the buildings in a particular street, and the route originally chosen may have simply been the most direct and convenient route available when the apparatus was installed. Other apparatus can only serve its purpose by remaining in the same street. Even then, there may be an opportunity to re-route service feeds to a building to reduce or eliminate apparatus from a particular street or part of a street. This may be possible when a building has access onto two different streets.

8. Prepare composite plans showing positions of new apparatus.

Once the apparatus to be moved, and its new positions, have been identified, a further set of composite plans needs to be prepared locating each item accurately, showing its point of connection to the existing apparatus, and identifying the lengths of apparatus to be decommissioned. This supposes that there is a detailed knowledge of the positions of the existing apparatus, and hence a detailed knowledge of the available space in the ground.

9. Prepare programme of diversions.

The utilities will each provide estimates of the duration of their works. It is unlikely that the utilities’ own initial ideas will be acceptable without modification, so this information will need to be assembled into a master programme, designed to minimise disruption to general users of the highway. The programme will also need to be regularly updated to reflect actual progress.

Apart from items relating directly to the diversion works, the programme will also take account of external factors (various parades and events such as Remembrance Day, as well as development of sites alongside the route), enforced gaps in work schedules such as Christmas blockades, and other schemes affecting nearby highways (e.g. sewer renewals, other works by statutory undertakers, highway improvements, etc).

10. Prepare cost estimates.

Once the extent and duration of the works has been established, it will be possible for the utility companies to provide reasonably accurate estimates of the costs.

11. From programming work, identify apparatus that should be moved before the Concession contract is let.

The programme will be tied into a notional programme of the main construction works, from which it will be possible to identify any specific items that will need to be undertaken before the Concessionaire will be in a position to procure and manage the works (assuming that this is the procurement method adopted). This implies a need to presume a knowledge of the Concessionaire's programme, and may lead to the need to impose an order of working on the Concessionaire.

12. Set up a working group of utilities, highway authority, police and the promoter to oversee the project.

Most of the detailed work of identifying diversions will be carried out in one-to-one meetings with each of the utility companies. However, revision to the programme may be best carried out in a group, which will also need to meet to ensure that general requirements are identified and disseminated.

13. Place orders for diversion works to be carried out in advance and make advance payments in accordance with regulations.

Once the promoter has been granted the status of transport authority by the making of an order, he will have the benefit of the sharing of costs of works regulations. This means that the utility companies will contribute 7½% of the cost of diverting apparatus affected directly by the tramway construction, and 18% of the costs of diverting apparatus for associated highway works. To qualify for this contribution, the utility company must be given an advance payment of 75% of the estimated net cost of the works.

14. Plan temporary traffic management and associated temporary TROs.

The work is likely to proceed most efficiently if roads can be closed while diversions are undertaken. In many cases this is unlikely to be acceptable to the highway authority, although partial closures and other modifications to traffic movements may be. Road closures and other alterations will need to be brought about using temporary Traffic Regulation Orders. The highway authority will prepare these through their powers under the Road Traffic Regulation Act 1984, unless the promoter has specifically taken powers for themselves for this purpose, through the Transport and Works Act order. In addition to the normal methods of advertising these orders, notice of the details of the orders should be provided to an appropriate list of those most likely to be affected by them.

15. Carry out any necessary changes to highway to carry out the works, or changes that are not essential at this stage but that would simplify the process.

The first works carried out as part of the advance diversion project may well be modifications to highway layouts to facilitate movement of diverted traffic. This may include bringing forward works that are due to be carried out in the future that would assist the process.

16. Set up a public relations unit to inform the general public and businesses about the works.

One of the most important components of the work is public relations. Good timely communication of the various stages of the work will generate goodwill that will help the tramway to be accepted and operate to its full potential. This includes talks to a wide variety of organisations about general plans, as well as more specific discussions on the long and short term effects on individual businesses. In particular, businesses will wish to know how servicing will be affected, particularly if the normal servicing routes to their business are interfered with. There should also be an enquiry point located centrally for the general public.

17. Supervise works to ensure that apparatus is located as planned. Revise plans to reflect necessary changes.

Diversion of the apparatus will generally be the responsibility of the utility company concerned. They will in some instances allow other approved contractors to carry out certain works (e.g. installation of ducts for cables to be pulled into subsequently). However, the promoter will need to provide an overseer of the works to monitor progress and ensure that utilities do not alter agreed routes without justification and approval of the modification. Quality of works carried out will not generally be the concern of the promoter, except where it might affect the integrity of works carried out under the main contract.

18. Update programme during process of diversions to reflect actual progress.

It is unlikely that the initial programme will be adhered to in all its details. The initial programme will be based on an estimate of the duration of many individual items, not all of which will be accomplished in the estimated time. Other incidents that might affect the programme include the discovery that the movement (particularly lowering) of apparatus is temporarily prevented by the presence of other apparatus in the same location. Events external to the project might also have an impact, whether pre-planned or arising during the currency of the programme.

19. Finalise accounts and make final payments.

Advance payments will have been made, amounting to 75% of the net estimated cost (i.e. 69.4% of the gross estimated cost of diversions for tramway construction works, and 61.5% of gross estimated costs of diversions for associated highway works). The actual costs will have to be established once the work is finished, and the balance paid by (or to) the tramway promoter, or the Concessionaire if the works have been ordered and paid for by him.

The tramway promoter, or the Concessionaire, will be entitled to audit the costs to establish that a fair charge has been made. Ideally, the basis for charging, particularly in respect of overheads and supervision charges, will have been agreed before work is ordered.

The promoter will also be entitled to compensation if agreed programmes are not achieved and this has a cost implication. The converse is also true, in that the undertaker is entitled to compensation if the failure to meet the programme is the fault of the promoter.

APPENDIX D

UKTram Phase 3 report

**Support to UKTram Activity Group 1
Protection and Diversion of Apparatus**



Phase 3

**Stakeholder
Acceptance**



August 2010

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Preface

UKTram is an organisation that represents the promoters and operators of tramways and light railways in the United Kingdom. It is a limited company owned in equal parts by Transport for London, the Passenger Transport Executives Group, the Confederation of Passenger Transport and the Light Rapid Transit Forum. Its main purpose is to carry out research into a variety of aspects of light railway design, construction and operation. It publishes the results in the interests of improving understanding of the factors involved in the development of light railways and uniformly raising standards throughout the industry. It is supported in its activities by the Department for Transport.

Its purposes are achieved by the establishment of Activity Groups consisting of practitioners having considerable experience in the field of interest. Twelve such groups have been established, and the subjects they cover are listed in Appendix 1. The remit of Activity Group 1 is to review the various approaches that have been adopted by promoters and operators in the UK to the task of protecting and diverting utilities' apparatus.

This document is the final output from the work undertaken by the group. Its purpose is to make recommendations for further action. In particular, it proposes amendments to the New Roads and Street Works Act 1991 and associated documents to clarify or resolve anomalies, and to assist in simplifying the introduction of tramways into the United Kingdom.

Introduction

The work of Activity Group 1 has been arranged in three phases. Phase 1 was concerned with the collection and analysis of data provided by the promoters and operators of current and potential tramway schemes in the United Kingdom, UK utility companies, and tramway promoters and operators on the continent. Phase 2 concentrated on the production of guidelines based on the work carried out in Phase 1. This is the output from Phase 3, and considers how to ensure that the findings of Phase 2 will be adopted, through changes to relevant legislation and co-operation with the Highway Authorities and Utilities Committee (“HAUC”) and National Joint Utilities Group (“NJUG”) to obtain general acceptance of the proposals.

The brief for this phase was as follows:

“Phase 3 shall comprise the making of recommendations for further action and will require active DfT support to assist in restarting of the DfT/HAUC review body considering:

- *Changes necessary to NRSWA and the associated codes of practice*
- *Changes to the Transport and Works Act and associated guidance*
- *Actions to be taken, including consultation with HAUC and NJUG, to obtain utility company and highway authority acceptance of the draft guidelines”*

Since the brief was written, the HAUC sub-committee considering the Diversionary Works Code has reconvened. While the Code has not been re-issued in its entirety, an Advice Note is expected to be issued by the committee which will complement and in some areas correct the guidance given in the Code. This will be referred to again later in this report.

In the same time period, a new set of model clauses for railways and tramways has been introduced, as well as new rules governing the applications and objections procedure applying to applications for orders under the Transport and Works Act 1992. No further changes to the Transport and Works Act procedures are proposed at this time.

The majority of the report concentrates on highlighting changes to legislation that would help to improve the business case for the introduction of tramways. The final section also proposes ways in which UKTram could co-operate with NJUG to their mutual benefit.

In this report, reference to the Act means the New Roads and Street Works Act 1991, unless the context requires otherwise. Similarly reference to the Regulations means the Street Works (Sharing of Costs of Works) (England) Regulations 2000 (and to corresponding regulations applying to Scotland and Wales) unless the context requires otherwise. The word authority is used to mean the promoter or operator of a tramway (or where appropriate a highway authority or bridge authority), while the utility companies are collectively referred to as undertakers.

Update Diversionary Works Code

The Issue

The Diversionary Works Code is more correctly referred to as *Measures Necessary Where Apparatus is Affected by Major Works (Diversionary Works)*. It is a Code of Practice issued on behalf of the Secretary of State for Transport, further to section 143 of the Act. Its purpose is to give practical guidance on the implementation of the measures to be undertaken to allow major works to proceed.

The Code was issued in 1992, and has not been revised since that time. It is now only available to new purchasers as a photocopy of the original document. Since the document was first published, there have been many changes to secondary legislation, and it consequently no longer reflects current requirements or best practice.

A revised document was produced in 2002 by HAUC on behalf of the Secretary of State. This was circulated for consultation and comments in the summer of that year. The closing date for comments was 18th October, and it was intended that the revised document would apply from 1 April 2003. The document was shelved before publication. The reasons for this were never given publicly, but the delay was initially, at least in part, due to waiting for the outcome of the court case *BT v Gwynedd Council* (see Payment for Cost Estimates below).

Background

The Code is sanctioned for use to explain and facilitate the implementation of section 143 of the Act:

“143(2) The Secretary of State may issue or approve for the purposes of this section a code of practice giving practical guidance as to the matters mentioned in subsection (1) and the steps to be taken by the authority and the undertaker.”

Section 143(1) states:

“Where an undertaker’s apparatus in a road is or may be affected by major works for roads purposes, major bridge works or major transport works, the roads, bridge or transport authority concerned and the undertaker shall take such steps as are reasonably required—

(a) to identify any measures needing to be taken in relation to the apparatus in consequence of, or in order to facilitate, the execution of the authority’s works,

(b) to settle a specification of the necessary measures and determine by whom they are to be taken, and

(c) to co-ordinate the taking of those measures and the execution of the authority’s works,

so as to secure the efficient implementation of the necessary work and the avoidance of unnecessary delay”

A response to the consultation was provided jointly by Greater Manchester Passenger Transport Executive, Merseytravel and Centro. This made the following major points:

- The original document and the proposed revisions contained numerous inaccuracies;
- It dealt with issues outside its remit, particularly in relation to financial matters. It was pointed out that this might result in ambiguity where inconsistencies existed between the Code and the Regulations. This subsequently proved to be the case

when the relationship between the documents was tested in *BT v Gwynedd Council* (see Payment for Cost Estimates below);

- The document had made no attempt to address the specific issues relevant to transport works, particularly tramways.

The HAUC Working Party on the Code was reconvened and is expected to publish an Advice Note by the end of 2010. This will supplement and provide some corrections to the Code. While it includes some advice related to major transport works, more work is required before this can be considered to adequately address all the issues.

Recommendation

The Department for Transport is urged to address the need to consider the implications of the Appeal Court case “*Gwynedd Council v BT*¹⁵” and sponsor a revision to the Diversionary Works Code. The remit to the drafting committee should include an obligation to adequately address issues relating to major transport works and major bridge works, in addition to major highway works. The advice relating to transport works should take account of the Guidelines produced in Phase 2 of the current Activity.

¹⁵ Note that the order of the parties to a court case may be reversed when it is referred to a higher court

Payment for Cost Estimates

The Issue

When utilities' apparatus has to be moved or protected to make way for the introduction of a tramway, the cost involved is shared between the authority and each of the undertakers affected by the works. While the majority of the cost is borne by the authority, the remainder is absorbed by the undertaker. This is explained in more detail in the section Sharing of costs of works below.

The calculation of the cost share is based on the allowable costs of the works. These include all the reasonable costs incurred by the undertaker, with two exceptions. The exception considered here is the costs incurred in preparing the initial set of plans and estimates, while the second exception is considered below in the section headed S.144(2)(a) notices.

The cost of the works includes the cost of the design effort applied by the undertaker in establishing what work is required, and preparing a specification, drawings and programme. The undertaker is required to bear the cost of preparing the initial set of plans and estimates, this being one of the exceptions referred to above. The cost of preparing a second or any subsequent cost estimate is an allowable cost, and therefore shared between the authority and the undertaker in the prescribed way.

There had been disagreement between authorities and undertakers over the meaning of "the first estimate". This was resolved in 2004 in the Court of Appeal in the case of *Gwynedd Council v BT* [2004] EWCA Civ 942. The judgement of the court differed from the intention of the drafters of the Act, Regulations and Code of Practice. It is now necessary to amend one or all of these documents to ensure that they are consistent with one another, and allow the law to be applied in the intended manner.

Background

The Act provides that the costs of carrying out diversionary works are to be shared between the undertaker and the authority in a manner that is to be set out in detail in Regulations:

"144 (1) Where an undertaker's apparatus in a road is affected by major works for roads purposes, major bridge works or major transport works, the allowable costs of the measures needing to be taken in relation to the apparatus in consequence of the works, or in order to facilitate their execution, shall be borne by the roads, bridge or transport authority concerned and the undertaker in such manner as may be prescribed.

(2) The regulations may make provision as to the costs allowable for this purpose"

The Regulations expand on this statement. Regulation 2(2) clarifies what costs are allowable:

"2(2) For the purposes of these Regulations "allowable costs" means, in relation to diversionary works, the sum of all the reasonable costs incurred in executing them, except—

(a) costs incurred in preparing the initial set of plans and estimates in relation to those diversionary works (but not in preparing any further plans and estimates which the authority may require);...

The Code, in Appendix C, seeks to clarify what is meant by the initial set of plans and estimates. Paragraph C3 states:

“The authority should submit details of the proposed scheme to undertakers. They will respond with preliminary details of the effects on their apparatus together with budget estimates for the necessary works and an indication of any special requirements involved...”

Paragraph C4 continues:

“Following joint discussions, the authority should submit to each undertaker details of the final design with working drawings and an outline programme. The undertakers should respond, normally within 25 working days, by providing details of their requirements (if there is a requirement to provide more than one detailed estimate, the utility may charge for such additional estimates) as follows:...”

The implication, and intention, of the last paragraph quoted is that the first C4 estimate should be provided free of charge, and any subsequent detailed estimates could be charged for by the undertaker. The Court of Appeal decided that the wording of the Act and Regulations meant that the C3 estimate was to be considered to be the first estimate, and that any estimate provided after this was to be deemed to be an allowable cost. This meant that the cost of preparing it could be shared between the undertaker and the authority.

There is clear evidence that the Department for Transport, at the time of preparation of the legislation and Code intended that the first C4 estimate should be provided free of charge.

Recommendation

The Department for Transport should be requested to amend the legislation and ancillary documents as necessary to implement their original intentions as to payment for preparation of plans and estimates of the cost of carrying out diversionary works.

Point of creation of transport undertaking and transport authority

The Issue

Section 143 only applies to major works. Major transport works are carried out by a transport authority, who is “the authority, body or person having the control or management of a transport undertaking...” It is generally accepted that the transport undertaking does not exist until it has been authorised by legislation – normally an order made under the Transport and Works Act 1992. At present, it is only at this point that the transport authority comes into existence.

Several of the advantages of the Act to the authority only become available once the authority is created, and yet these are frequently needed as part of the process of creating the authority. For example, it is necessary for the applicant for an order under the Transport and Works Act to make an estimate of the cost of the proposed scheme, including the cost of diverting apparatus belonging to undertakers. However, the aspiring authority has no power to require an undertaker to co-operate in the provision of records of their apparatus, or in making an estimate of the scope or cost of diverting apparatus.

Background

The definition of a transport authority is set out in section 150 of the Act:

“150 ((1) In this Part—

(a) transport authority” means the authority, body or person having the control or management of a transport undertaking; and

(b) transport undertaking” means a railway, tramway, dock, harbour, pier, canal or inland navigation undertaking of which the activities, or some of the activities, are carried on under statutory authority.

(2) In this Part “major transport works” means substantial works required for the purposes of a transport undertaking and executed in property held or used for the purposes of the undertaking.”

Physical work cannot be carried out until authorised by statutory powers of some description. For example, it is illegal to excavate in the highway in the absence of statutory authority. This is made clear in section 110 of the Act:

“110 (1) It is an offence for a person other than the road works authority—

(a) to place apparatus in a road, or

(b) to break up or open a road, or a sewer, drain or tunnel under it, or to tunnel or bore under a road, for the purpose of placing, inspecting, maintaining, adjusting, repairing, altering or renewing apparatus, or of changing the position of apparatus or removing it,

otherwise than in pursuance of a statutory right or in accordance with a permission granted under section 109.”

There are circumstances under which there is a need to adopt the role of a transport authority before an order is made authorising the construction. Two such are having the right to require a C3 estimate to assist in preparing the business case, and serving notice under section 144(2)(a) of the Act (see S.144(2)(a) notices below).

Sections 143 and 144 apply to highway, bridge and transport authorities. While the first two are generally acting under pre-existing powers (Highways Act 1980 in the case of the highway authority, and the specific powers that authorised the construction of the bridge in the case of the bridge authority) the promoter of a tramway does not become a transport authority until the Transport and Works Act order comes into force. By this time, it will have been necessary for the promoter to have established the cost of carrying out diversions with a fair degree of accuracy. Up to this point, the utility companies are entitled to charge for any input they make to the scheme. It is suggested that the definition of a transport authority should be widened to include an Integrated Transport Authority that has ratified a decision to seek powers under the Transport and Works Act to build and operate a tramway. This would not serve to authorise physical works in the highway, but would allow certain administrative jobs to be carried out at an appropriate time.

Recommendation

The definition of a transport authority should be amended so that it includes an Integrated Transport Authority having made a formal decision to seek powers to construct and operate a tramway. The following wording is suggested:

“An Integrated Transport Authority seeking or proposing to seek statutory authority for a transport undertaking within the meaning of s.150(1)(b) shall be deemed to be a transport authority for the purposes of s.150(1)(a)”

Relevant authority

The issue

The Act uses the term “relevant authority” to identify particular types of bodies that are granted rights under the Act. These relate to the receipt of notices under section 114; maintenance of undertakers’ apparatus under section 140; and payment of compensation under section 141. The definition encompasses a transport authority. In the case of a tramway operator, the definition is ambiguous, and should be clarified.

Background

When an undertaker places apparatus in the street, it has an obligation to ensure that the apparatus is properly maintained so as to avoid creating a dangerous environment, or prejudicing the integrity of the street. The undertaker must satisfy the street authority as to the standard of maintenance, and in addition, certain other authorities are entitled to a say in the matter:

“140(1) An undertaker having apparatus in the road shall secure that the apparatus is maintained to the reasonable satisfaction of—

(a) the road works authority, as regards the safety and convenience of persons using the road (having regard, in particular, to the needs of people with a disability), the structure of the road and the integrity of apparatus of the authority in the road, and

(b) any other relevant authority, as regards any land, structure or apparatus of theirs;

and he shall afford reasonable facilities to each such authority for ascertaining whether it is so maintained.”

If the undertaker causes damage to the property of another undertaker, the street authority or a relevant authority, they will be liable to compensate them for the damage caused. In the case of a street authority or relevant authority, the compensation would also include losses resulting from the damage (e.g. loss of profit). The cause of the damage may be a failure of the apparatus, but may equally arise in the course of normal street works carried out to install new or maintain existing apparatus:

“141(1) An undertaker shall compensate—

(a) the road works authority or any other relevant authority in respect of any damage or loss suffered by the authority in their capacity as such, and

(b) any other person having apparatus in the road in respect of any expense reasonably incurred in making good damage to that apparatus,

as a result of the execution by the undertaker of road works or any event of a kind mentioned in subsection (2) below.”

The term relevant authority applies to a transport authority, but only where the property (or apparatus: it is not clear whether a difference of meaning is implied), crosses or is crossed by a street:

“108(6) References in this Part to the relevant authorities in relation to any road works are to the roads authority and also—

- (a) where the works include the breaking up or opening in the road of a public sewer, Scottish Water;
- (b) where the road is carried or crossed by a bridge vested in a transport authority, or crosses or is crossed by any other property held or used for the purposes of a transport authority, that authority; and
- (c) where in any other case the road, not being a public road, is carried or crossed by a bridge, the bridge authority.”

This appears to create an anomaly in the case of a tramway. At a crossroads, the tram will cross one street while running along another. It cannot have been intended that the authority would be entitled to compensation for damage and loss in the one case, while only entitled to recover for damage in the other. Apart from anything else, there is no indication whether the entitlement to compensation is dictated by the point of generation of the damage, or the point where it occurs. In the case of damage arising from failure of the undertaker’s apparatus, the two points could be some distance apart, and in different legs of the crossroads.

It seems clear that it is the intention of the Act to give tramways and other transport undertakings a special degree of protection. The infrastructure can be protected by designating the streets in which it is laid as streets with special engineering difficulties:

“122(1) The provisions of Schedule 6 have effect for requiring the settlement of a plan and section of road works to be executed in a road designated by the road works authority as having special engineering difficulties.”

while the effect of road works on the operation of the tramway can be minimised by means of the provisions of section 152:

“152(1) This section applies to road works at a crossing of a railway on the level or which affect a tramway.

In this section “the relevant transport authority” means the authority having the management of the railway or tramway undertaking concerned.

(2) An undertaker proposing to begin to execute works to which this section applies shall give the prescribed notice to the relevant transport authority notwithstanding that such notice is not required under section 114 (notice of starting date).

The provisions of subsections (2) to (7) of that section (contents of notice, when works may be begun, &c.) apply in relation to the notice required by this subsection as in relation to a notice under subsection (1) of that section.

(3) An undertaker executing works to which this section applies shall comply with any reasonable requirements made by the relevant transport authority—

- (a) for securing the safety of persons employed in connection with the works, or
- (b) for securing that interference with traffic on the railway or tramway caused by the execution of the works is reduced so far as is practicable;

and, except where submission of a plan and section is required, he shall defer beginning the works for such further period as the relevant transport authority may reasonably request as needed for formulating their requirements under this subsection or making their traffic arrangements.”

“114—(1) An undertaker proposing to begin to execute road works involving—
(a) breaking up or opening the road, or any sewer, drain or tunnel under it, or
(b) tunnelling or boring under the road,
shall give not less than 7 working days’ notice (or such other notice as may be prescribed) to the road works authority, to any other relevant authority and to any other person having apparatus in the road which is likely to be affected by the works.”

It seems likely that the provisions of section 141 were intended to encompass the tramway as a whole, not just the points where it crossed a street. The simplest approach would appear to be to synchronize the definition of a relevant authority, where it refers to a transport authority, with the definition of relevant transport authority contained in section 93.

Recommendation

It is recommended that the definition of relevant authority, as applied to a transport authority, should be aligned with the definition of relevant transport authority.

S.144(2)(a) notices

The issue

The financial burden on proposed tramways represented by the presence of undertakers' apparatus in the highway is often a significant proportion of the construction cost. It is desirable that this burden should not be increased by the addition of new apparatus once a decision has been taken to build the tramway.

A mechanism exists in the form of section 144(2)(a) of the Act, which provides that any new apparatus installed on the route of a tramway after a notice has been served on the undertaker installing it, must be moved at the expense of the undertaker so long as construction of the tramway starts within 5 years of the date of service of the notice.

There are three aspects of this that require further consideration:

- the definition of transport authority currently means that notices cannot be served before the tramway has been authorised;
- the period of validity of the notice of 5 years is generally insufficient to be of benefit in the case of a tramway scheme.
- consideration needs to be given to the method of service;

Background

Definition of transport authority

It is proposed above (see Point of creation of transport undertaking and transport authority) that, if the promoter is an ITA, the transport authority should come into being when the authority has taken the decision to seek an order under the Transport and Works Act 1991. This will then allow them to issue a notice under section 144(2)(a) of the Act safeguarding the route for a period of five years. In setting out the mechanism for allocating the sharing of costs, the Act says:

“144(2) The regulations may make provision as to the costs allowable for this purpose.

Provision may, in particular, be made for disallowing costs of the undertaker—

- (a) where the apparatus in question was placed in the road after the authority had given the undertaker the prescribed notice of their intention to execute the works,...

There is in fact no prescribed form of notice, although the Street Works (Registers, Notices, Designations and Directions) (England) Regulations 2007 provides for a notice under this section of the Act to be lodged by the transport authority with the street authority, to then be recorded in the street works register. The current specification for EToN specifically excludes provision of a mechanism for serving notices under section 144 (see section 2.2 of the Technical Specification for the Electronic Transfer of Notifications (EToN) version 5.0.1.) The effect of the notice is explained in the Regulations, at regulation 6:

“6 (3) In calculating an undertaker's allowable costs there shall be disallowed costs incurred in respect of apparatus placed in the street after the authority has given to the undertaker—

- (a) in the case of major works consisting of major bridge works comprising a replacement of the bridge, not more than 10 years;

(b) in the case of any other major works, not more than 5 years, notice of their intention to execute the major works.”

Period of validity

The validity of the notices served has different durations, depending on whether the notice is served in respect of major bridge works (i.e. the replacement, reconstruction or substantial alteration of a bridge), when the validity is 10 years, or in respect of major highway or major transport works, in which the case the validity is 5 years.

A validity of five years for major transport works will rarely be sufficient to safeguard the route of a tramway. Examples can be found in Greater Manchester and Birmingham. In the former case, the street-running section of the Oldham extension of Metrolink is authorised by the Greater Manchester (Light Rapid Transit System) Act 1994. Notices were served on all undertakers affected by the proposed works immediately after the Act came into force. They were re-served after the first ones expired. Construction is only now about to commence, some 16 years after the Act came into force. In Birmingham, the order authorising the construction of the first extension of the Midland Metro system into the centre of the city came into force in July 2005. The notices were served immediately, and lapsed in July 2010. A second notice has now been served, but apparatus installed during the currency of the first notice will now need to be diverted at the cost of the authority rather than the undertaker. Construction of the extension is not expected to begin until Spring 2012. It would be unusual for tramway construction in the UK to begin within five years of authorisation. There would therefore appear to be a reasonable case for the notice period to be extended to ten years, to align it with the period for major bridge works. It should also be noted that major transport works can include major bridge works, where the transport authority is also the bridge authority for a bridge that needs to be reconstructed or substantially altered, and so different notice periods could apply to different aspects of the same project.

Method of Service

Regulation 6(3), quoted above, requires the authority to give notice to the undertaker. This presents some difficulties. Firstly, there is not always an accurate, or complete record of the undertakers who have apparatus in any given street, so it is not possible to be certain that the notice has necessarily been served on all relevant undertakers. At a later date than the initial service of notices on the undertakers known to have apparatus along the route, a new undertaker may become known to the authority, or information may come to hand about an existing undertaker that was not known to have apparatus on the route. The notices will need to be re-served on each such occasion. The same notice may therefore be valid for different periods of time depending on when it was served.

For these reasons, the service of notice directly on each undertaker separately is impracticable. The possibility of confusion arising as to who has been served and who has not, the date of service in any given case, the lack of a mechanism for service under ETON, and the frequent uncertainty over the most suitable part of the organisation to receive the notice generally means that there is a real possibility that the purpose of the notice will not always be achieved.

It is suggested that it should be sufficient for the service of the notice to be advised to the street authority, with copies being sent to as many of the undertakers as are known to the

authority serving the notice. Once the notice is recorded on the street works register, it should then be deemed to have been served on all undertakers.

Recommendations

The Department should consider revising the legislation authorising the issue of notices under section 144(2)(a) of the Act so that the notice is deemed to have been served on an undertaker if it is recorded in the street works register, with the date of registration. They should further consider increasing the validity of notices served by a transport authority to 10 years, in line with the period for major bridge works.

Deferment of the time for renewal

The issue

When undertakers' apparatus is affected by major works (whether highway, bridge or transport), the consequence will normally be one of three things: either that the apparatus is replaced in a new position, that it is protected in its existing position, or that it is refurbished to allow it to remain where it is. This latter action could serve one of two main purposes: either it will strengthen the apparatus sufficiently to allow it to remain where it is, or it will reduce or eliminate the need to maintain the apparatus in the future (e.g. by relining a pipe with resin or a smaller plastic insertion).

The Act recognises that the undertaker gains some benefit from the actions taken under the first and third categories above, because the need to renew the apparatus has been deferred. Where the apparatus is diverted, and hence replaced, the procedure for assessing the benefit is clearly defined. However, there is no established method for calculating the benefit that accrues from refurbishing existing apparatus that is retained.

Appendix E of the Code sets out a method for calculating the benefit accruing to the undertaker as a result of renewal of apparatus. This benefit is offset against the amount payable by the authority to the undertaker in respect of the necessary measures. However, the information required to make this calculation is incomplete, and the Code also fails to provide guidance on the valuation of the benefit to the undertaker of refurbishment of apparatus.

The valuation relies on an assumed real rate of interest. This percentage is given in the Code as 6%, a figure which is no longer appropriate. The latest advice from HAUC, given on their website, is that the figure to be adopted should be the same as the discount rate in the contemporary version of the Treasury's Green Book (currently 3½%). While the advice is clear, it may be missed by people looking for guidance, who will more naturally refer to the Code. The next version of the code should consequently amend the guidance to refer to the Green Book.

Background

Section 144 of the Act provides that:

"144(5) The regulations may require the undertaker to give credit for any financial benefit to him from the betterment or deferment of renewal of the apparatus resulting from the measures taken."

The Regulations expand on this at regulation 7:

"7. — (1) In a case where, under these Regulations, an undertaker is liable to make a payment to an authority or an authority is liable to make a payment to an undertaker in relation to diversionary works there shall be taken into account in favour of the authority—

- (a) if those measures result in a betterment of the undertaker's apparatus, a sum equal to the benefit which the undertaker gains as a result of the betterment, calculated in accordance with Appendix F to the Code;
- (b) if those measures result in a postponement of the need to renew the undertaker's apparatus, a sum determined in accordance with Appendix E to the Code."

The method of calculating the value of deferment is therefore left to be defined in the Code. This suffers from several drawbacks.

Firstly, the equation used to calculate the value relies on an assumption about the lifetime of the apparatus. A table within Appendix E sets out the number of years of life to be assumed for categories of apparatus including pipes constructed from various types of material and diameters, and cables used in electrical and telecommunications installations. The table is incomplete, and fails to provide design lives for sewers, or pipes over 12" diameter. These are said to be "by agreement". It is difficult to see how agreement is likely to be reached at a local level on a reasonable expectation of the life of apparatus if industry experts were unable to agree for the purposes of the Code.

Secondly, the basis set out in the Regulations for requiring the value of deferment to be taken into account, is that the need to renew the undertaker's apparatus has been postponed. While replacement of the apparatus, largely at the expense of the authority, is the most obvious way in which this might happen, the life of the apparatus may equally be extended by repairing or refurbishing it in some way. There is no recognition of this in the Code. As a result of this, sewerage authorities in particular have sought to use the Act as a means of repairing their apparatus at the expense of authorities, while at the same time maintaining that their apparatus lasts indefinitely so that a contribution to deferment should not be payable.

Finally, the equation used to calculate the value of deferment uses an assumed rate of interest. The value of 6% was adopted at the time of issue of the Code, and is effectively built in by reference, and by forming the basis of a ready reckoner.

The rate was set at a time when inflation was particularly high, and has been inappropriate for many years as inflation has been progressively brought under control. The Code states that the interest rate "may be reviewed at the request of either side but not more frequently than three years." The rate was seen to no longer be consistent with the true position, and was altered by agreement early in 2008. The decision was made to adopt the discount rate in the Treasury Green Book, currently 3½%. This is publicised on the HAUC website in an advice note, with a revised ready reckoner. However, it is possible that people seeking guidance will not be aware that a change has been made, or where to look for information about the change. The Code therefore needs to be amended to incorporate the revised guidance.

Recommendations

The Department is recommended to commission a revision to Appendix E of the Code to:

- **Expand the table of design lives to provide guidance on the more complex issues relating to pipes and sewers;**
- **Provide guidance on deferment of renewal for apparatus that is retained but refurbished to extend its life;**
- **Alter the guidance on rate of interest so that the current value taken from the Treasury Green Book is adopted.**

Sharing of costs of works

The issue

When apparatus is protected or diverted in preparation for the construction of a tramway, the cost of the diversionary works is apportioned between the authority and the undertaker. The same situation applies to major highway works and major bridge works, but the undertaker's contribution to these categories of work is greater.

The undertaker's contribution to the cost of moving apparatus for major transport works was reduced in 2000, having previously been set at the same level as for the other two categories of work. Events over time have shown that this was not properly justified, and that the decision taken in 2000 should now be reversed.

Background

Section 144(1) of the Act says "Where an undertaker's apparatus in a road is affected by major works for roads purposes, major bridge works or major transport works, the allowable costs of the measures needing to be taken in relation to the apparatus in consequence of the works, or in order to facilitate their execution, shall be borne by the roads, bridge or transport authority concerned and the undertaker in such manner as may be prescribed."

The manner in which the costs are to be borne is prescribed in the Regulations 3 and 4. These have the same effect, but describe the situation where the work is carried out by the undertaker and the authority respectively. Regulation 3 says:

"(1) Where, because of major works initiated by an authority, an undertaker executes diversionary works, the authority shall pay to the undertaker—

(a) where the major works are major transport works (other than major bridge works or section 145(3)(a) to (f) works) and payment is made in accordance with regulation 8(1), a sum equal to 92.5 per cent of the allowable costs of the diversionary works;

(b) in other cases where payment is made in accordance with regulation 8(1), a sum equal to 82 per cent of the allowable costs of the diversionary works;"

Regulation 8(1) provides that the undertaker is only required to make their contribution to the works if the authority pays 75% of the net cost of the works in advance of them being carried out.

The effect of regulations 3 and 4 is that an undertaker is required to absorb 18% of the cost of diversionary works carried out for major highway or major bridge works, but only 7½% of the cost of diversionary works for major transport works. There is a proviso, which is that if the works carried out in connection with the transport undertaking are of a type that would be classed as major highway works if they were carried out by the highway authority, or they are carried out on a bridge owned by the transport authority, then the undertaker's contribution to these works only, will be 18%.

The current Regulations were preceded by the Street Works (Sharing of Costs of Works) Regulations 1992. Under these regulations, no distinction was drawn between the three categories of major works (i.e. highway, bridge and transport), and the undertakers were

required to absorb 18% of the cost of the diversionary works in each case. The current Regulations were introduced following an extensive period of lobbying by the undertakers, who were concerned about the possible cost to themselves represented by the building of tramways. This was at a time when it appeared that tramway building might be taking place all over the country.

The process by which the percentage contained in the original regulations was arrived at was described in a paper given to the conference NJUG89. In this, it was revealed that the cost of carrying out diversionary works for highway schemes during the financial year 1986/7 was £87 million. The way in which this amount was apportioned between the different reasons for diverting apparatus was used in arriving at the percentage contribution made by the undertakers to the works cost.

In retrospect, the undertakers' concern about the burden on them represented by their contributions to tramway schemes has proved to be unfounded. The following table shows the costs of diversions for tramways schemes carried out between March 1989 and the present time, a period of 21 years. The costs have been backdated to 1986/7 at an assumed 5% per annum to reflect average construction cost inflation over the period. This shows that more money was spent on diverting apparatus for highway schemes in a single year than has been spent on tramway schemes over a period of 21 years.

Project	Cost of diversions (£m)	Approx base date	Deflator to Q3 1986	Est. cost 1986/7 (£m)
Manchester Metrolink Ph 1	5.6	Q1 1990	1.186	4.72
Sheffield Supertram	27.1	Q2 1992	1.324	20.47
Midland Metro Line 1	4.33	Q3 1996	1.629	2.66
Manchester Metrolink Ph 2	9†	Q2 1998	1.774	5.07
Croydon Tramlink	19.14	Q1 1998	1.753	10.92
Nottingham Express Transit	9.95	Q1 2002	2.130	4.67
Edinburgh Tram	55†	Q4 2008	2.961	18.57
Metrolink Ph 3A	26†	Q1 2010	3.147	4.77
			TOTAL	71.85

†Estimated: figure not confirmed

Recommendation

The average amount spent per year on diverting apparatus for tramway schemes, on the evidence, amounts to less than 4% of the cost of diverting apparatus for major highway works. This does not appear to justify the differential between the proportions for cost share for major highway and bridge works on one hand, and major transport works on the other. This is particularly so since major bridge works and highway works that would be major highway works if carried out by the highway authority, when carried out as part of major transport works, already qualify for an 18% discount.

The Department for Transport is requested to consider revising the Regulations to once again have a single cost share percentage covering major highway, bridge and transport works.

Liaison with HAUC and NJUG

Inevitably, the proposals made above, while they would be to the benefit of tramway promoters, will mainly be seen as disadvantageous to undertakers. It is consequently unlikely that agreement could be reached on their implementation outside of a working party chaired by the Department. In addition, most of the proposals require changes to legislation, which can only be achieved through the Department.

The best opportunity for co-operation between UKTram and NJUG would be in the development of standard forms of agreement, to be used in preparation for an application for an order under the Transport and Works Act 1992. It is suggested that the following areas could be usefully explored.

Stray Current

Obtaining statutory powers to construct a tramway will safeguard the promoter against claims for nuisance, so long as they have used their powers reasonably. It was established that this applied to the production of stray current in the court case *National Telephone Co v Baker*¹⁶, as it did to other aspects of construction and operation of a tramway. It is normal for promoters and undertakers to enter into agreements relating to stray current as a result of consultation preceding the order inquiry. A standard agreement should be developed, based on the principles arising from the court judgement, with sufficient flexibility to accommodate future developments in techniques and materials.

Emergency Access

The Act and the Street Works (Registers, Notices, Directions and Designations) (England) Order 2007 provide for undertakers to carry out emergency works, without giving notice, while requiring them to notify persons who would normally receive advance warning of street works no more than two hours after work has started.

“116 (1) Nothing in section 113 (advance notice), section 114 (notice of starting date) or section 115 (directions as to timing of works) affects the right of an undertaker to execute emergency works.”

(2) An undertaker executing emergency works shall, if the works are of a kind in respect of which notice is required by section 114, give notice as soon as reasonably practicable, and in any event within two hours (or such other period as may be prescribed) of the works being begun, to the persons to whom notice would be required to be given under that section.”

In the case of a tramway operator affected by the emergency works, notice must be given whether or not a notice would normally have been served.

“152(3) An undertaker executing works to which this section applies shall comply with any reasonable requirements made by the relevant transport authority—

- (a) for securing the safety of persons employed in connection with the works, or
- (b) for securing that interference with traffic on the railway or tramway caused by the execution of the works is reduced so far as is practicable;

¹⁶ See Court Report, Appendix F

and, except where submission of a plan and section is required, he shall defer beginning the works for such further period as the relevant transport authority may reasonably request as needed for formulating their requirements under this subsection or making their traffic arrangements.

(4) Nothing in subsection (2) or (3) affects the right of an undertaker to execute emergency works.

(5) An undertaker executing emergency works shall give notice to the relevant transport authority as soon as reasonably practicable of his intention or, as the case may be, of his having begun to do so notwithstanding that such notice is not required by section 116 (notice of emergency works).

The provisions of subsections (3) and (4) of that section (contents of notice and penalty for failure to give notice) apply in relation to the notice required by this subsection as in relation to a notice under subsection (2) of that section.”

The presence of a tramway presents particular dangers to undertakers’ workers working close to or on the tramway, from the operation of the trams and from the electrified overhead line. In the case of failure of gas and water pipes, there is a danger of an explosion caused by sparking, or conduction of electricity through water in contact with the wire. The tramway needs to be shut down quickly, but without trams being left in a place of danger. The process of shutting down therefore needs to be properly controlled. This process should be the subject of an agreement reached before trams begin operating. It should be possible to standardise the procedure using a model form of agreement developed jointly by UKTram and NJUG.

Guidelines on the operation of Section 152 of the Act

When an undertaker proposes to carry out street works that might affect a tramway, they are required to give notice to the tramway authority, and comply with any reasonable requirements they may have concerning safe operation of the tramway and the safety of the undertaker’s workers. Section 152 of the Act states:

“152(3) An undertaker executing works to which this section applies shall comply with any reasonable requirements made by the relevant transport authority—

- (a) for securing the safety of persons employed in connection with the works, or
- (b) for securing that interference with traffic on the railway or tramway caused by the execution of the works is reduced so far as is practicable;

and, except where submission of a plan and section is required, he shall defer beginning the works for such further period as the relevant transport authority may reasonably request as needed for formulating their requirements under this subsection or making their traffic arrangements.”

Some tramway systems in the UK have reached agreement with undertakers on the way in which this provision can best be satisfied in the interests of all parties. It is proposed that standard rules should be developed between UKTram and NJUG that could be included in any agreements between the parties. These would include the actions to be adopted in the case of emergencies (see previous paragraphs).

Waiver of compensation entitlement under particular circumstances

It is not always in the interests of a transport authority to pay for the removal of all apparatus from the vicinity of the tramway. There are occasions when apparatus is close to or beneath the tramway path, but can be left in place if refurbished or protected. The

principle of leaving it in place may be acceptable to the undertaker, but may leave him open to claims for compensation under section 82 of the Act if work needs to be carried out on it in the future, resulting in loss or damage to the tramway (see Relevant authority above).

An agreement for a waiver of compensation under certain circumstances may therefore be in the interests of both parties. Work should be undertaken to develop a standard form of agreement. This would need to consider the condition of the apparatus at the time the tramway was constructed, the contribution made by the tramway authority to its improvement, the likely need to extend the undertaker's network in the future in a way that might affect the operation or infrastructure of the tramway, and voiding of the waiver in the case of any events resulting from the negligence of the undertaker.

C4 Estimates

When the Act and Code were first introduced, it was the intention of the drafters that the first C4 estimate should be provided by the undertaker, free of charge to the authority. The wording of the Code is inconsistent with the Regulations, and the courts judging the case of *BT v Gwynedd Council* determined that the Regulations took precedence. The consequence was that the C4 estimate would, under most circumstances, be an allowable cost. Consequently the cost of producing it would be shared between the undertaker and the authority in accordance with the Regulations.

This decision, while correct in law, does not reflect the original intentions of either the drafters or the Department. It has exposed the inconsistencies in the legislation and Code, which now need to be amended to give effect to an outcome agreed between all parties. This may either be an enactment of the original intention, or a confirmation of the court's judgement.

UKTram and NJUG should combine to put pressure on the Department to resolve this matter, which is currently preventing the revision and reissue of the Code.

APPENDIX E

Reponses from UK Tramway promoters

	Question 12: Who was responsible for generating and maintaining the diversions project programme—promoter, Concessionaire, highway authority or the utility companies, individually or together?
Manchester Metrolink Ph 1	The utility companies provided initial programmes of their identified works. All the programmes were then adapted into a master programme prepared, maintained and updated by GMPTE. The overall programme, and all modifications to it, were discussed and agreed with the utility companies at the Working Group meetings.
Manchester Metrolink Ph 2	The initial development was carried out by GMPTE, based on individual programmes supplied by the utilities, but the responsibility for maintaining the programme was taken over by the Concessionaire when he was appointed to carry out the main works.
Merseytram	The promoter's project team in consultation with utilities companies and local authorities
Midland Metro Line 1	The diversionary schedule was developed by the contractor with input from all of the utilities. The contractor acted as Highway Authority for the duration of the street running construction works.
Midland Metro Line 1 Extensions	Up to the present time, all programming work has been carried out by Centro inhouse. At a later stage, individual programmes will be obtained from each utility company, and these will be built into a master programme by Centro.
Nottingham Promoter	<p>A composite programme was initially developed by the Promoters based on duration information prepared by the utility companies, the overall project programme, and practical constraints (e.g. traffic management, resource availability). This was then progressively developed and refined in collaboration with the utility companies.</p> <p>The programme was developed iteratively with the scope and cost estimates, such that the resulting engineering solutions were optimized to contain costs whilst reflecting the scope of the necessary works and the available duration and programme constraints and implications. In some case the available duration was the key driver to the engineering solution adopted and therefore influenced the scope and cost of the necessary works.</p> <p>Once the proposed Concessionaire became involved in the Working Party, it was identified that time, cost and risk reductions could be achieved by utilising Carillion's expertise to undertake joint trench working and for civil works. Carillion were already approved contractor for all of the main utility companies and undertook and coordinated the civil works for many of those parties.</p> <p>The responsibility and risks associated with the utility diversion were fully passed to the Concessionaire. During the implementation, the Concessionaire and the utility companies jointly maintained the programme utilising the continuing Working Party.</p>
Nottingham Express Transit	-
TfL Major Projects	Promoter managed co-ordination design development

Croydon Tramlink	The promoter (LRT) took full responsibility for production of the co-ordinated programme. Highway Authority established zonal rules and utilities provided works package programmes.
Sheffield Supertram	Promoter held master programme and co-ordinated - stats provided micro programmes for work packages.

	Question 13: Did either the promoter or the Concessionaire play a role in supervising the diversions project? What was the extent of the role and the powers given to supervisors? Was the role agreed with, or otherwise acceptable to, the highway authority and the utility companies?
Manchester Metrolink Ph. 1	The majority of the diversion works were carried out before the appointment of the Concessionaire, and remained the responsibility of GMPTE. GMPTE appointed an experienced Clerk of Works to observe the works being undertaken. However, there is no contractual relationship between the transport authority and the utility companies, so the CoW was not in a position to directly influence the works carried out. His main role was to record progress and ensure that replacement apparatus was located away from the future line of the tracks. Under PUSWA the utility companies could only make temporary reinstatements of the highway after excavating a trench, the permanent reinstatement being carried out by the highway authority, or very often in this instance, by the tramway contractor. Consequently the role of the CoW was very limited.
Manchester Metrolink Ph. 2	The Concessionaire supervised the works to the extent that this was consistent with the statutory right of the utilities to work on their own apparatus within the framework of the New Roads and Street Works Act. The role adopted was acceptable to both the utilities and the highway authority, and was not intended to overlap with the street authority's rights of inspection of reinstatement.
Merseytram	Specialist utilities consultants were appointed by the promoter to plan, programme and supervise the diversion works. The consultants role was to programme co-ordinate and supervise the works including attending planning meetings with designers, utilities companies and local authorities and on-site recording of progress and as-built apparatus
Midland Metro Line 1	The utilities supervised their own work under the direction of the contractor when the works were within the boundary of the site.
Midland Metro Line 1 Extensions	Not applicable.
Nottingham Promoter	The Promoters passed the procurement and implementation of the utility diversion works and all associated risks to the Concessionaire. The Concessionaire's contractor (Bombardier Carillion Consortium) were ultimately responsible for procuring and supervising the diversionary works. The Working Party, however, continued with the Concessionaire and BCC attending. BCC utilised the Working Party to continue to coordinate and monitor the overall diversionary programme permitting a forum in which issues and delays could be resolved or mitigated across parties. It is also worth noting, as Carillion were also coordinating and undertaking

	the vast majority of the associated civil works (including joint trenching) on behalf of the main utility companies, they were much more closely involved in the delivery and supervision of the works than may otherwise have been the case.
Nottingham Express Transit	-
TfL Major Projects	Not known at this stage of development
Croydon Tramlink	The promoter supervised the works through a team of engineers, planners and site inspectors. This team managed the overall programme and instructed utilities re: timing of works and changes to plans/programmes. In addition LRT agreed with the HSE to appoint a principal contractor reporting to LRT. The approach was agreed with all stakeholders and worked well.
Sheffield Supertram	Only at programme level - no technical or quality work. Did oversee reinstatements.

	Question 14: What difficulties, if any, were experienced in agreeing the final costs, and the way in which costs were to be shared, referring in particular to standard sharing of costs of works, deferment of the time of renewal, betterment, and overheads percentage? Comment on phasing of advance payments for lengthy projects, and recognition of the distinction between cost share at 7½% for railway-related works, and 18% for highway-related works.
Manchester Metrolink Ph 1	There were no cost sharing provisions under PUSWA. Agreement of the utilities' invoices did not present a problem.
Manchester Metrolink Ph 2	At the time work was carried out, there was no distinction between railway- and highway-related works: the utilities' contribution was then a uniform 18%. The final costs were audited by an independent consultant to GMPTE, the latter having made the initial orders and remained responsible for payment for the works, despite handing the job of controlling the works to the Concessionaire. All final accounts were agreed, with the exception of that for Transco, where the level of overheads was disputed by the consultant. This led to Transco withdrawing their co-operation with GMPTE during the initial stages of preparation for Metrolink Phase 3. The majority of accounts were paid on an interim basis, as phasing of advance payments was agreed between GMPTE and the utilities due to the duration of the project.
Merseytram	No particular difficulties. All diversion projects undertaken were subject to 75% advance payment. Almost all work undertaken was tram related subject to cost share at 7.5%. Cost sharing at 18% was agreed for the small amount of work which was purely highway-related.
Midland Metro Line 1	18% contribution retained for Midland Metro Line 1 works which took place in 1995-98. Corderoy consultants were appointed by the Concessionaire (Altram) to audit utilities' accounts, but not all accounts paid were finally agreed and legal action has not been taken to reclaim possible overpayments.
Midland Metro Line 1 Extensions	Not applicable.

Nottingham Promoter	The Promoters are unaware of the precise arrangements made by the Concessionaire/ BCC with respect to the final costs and cost sharing. We are aware, however, that BCC adopted an open book arrangements with the utility companies, with individual accounts for each major diversion, and for each street for more minor diversions. These appear to have contributed to a progressive approach to final accounting. The Promoters were aware that the cost sharing arrangements was an area of extensive negotiation between BCC and the utility companies. We were aware that BCC favoured an approach of agreeing with each utility company the application of a fixed percentage (presumably somewhere between 7.5% and 18%) which could be applied to all that utilities diversions for that company. We are, however, unaware of the outcome of these discussions.
Nottingham Express Transit	-
TfL Major Projects	Not known at this stage of development
Croydon Tramlink	A lessons learned paper was prepared and is available if required. Agreement of final accounts was variable particularly w.r.t. agreement of rates (some used "minor works" rates which could have been cheaper) and overheads which utilities were reluctant to disclose.
Sheffield Supertram	<ul style="list-style-type: none"> • Extreme difficulties - utilities did not accept NRSWA cost sharing provisions. • Approach to recovery was very crude - unaware of rights to info at the time. • Early estimates done by highway designers - were inadequate.

	Question 15: Costs of the diversions work will have varied throughout the life of the scheme. How did the final outturn costs compare with the initial estimates, business case estimates and C4 estimates? What steps were taken to reduce costs by reducing the scope? To what extent was the increase due to inflation?
Manchester Metrolink Ph 1	Initial cost estimates were carried out by GMPTE's consultants some years before the scheme was constructed. These were very low. Initial estimates were received from the utility companies as the scheme progressed, and these were exceeded at outturn by approximately 20%. This was partly due to an increased scope of works, related to modifications to highway layouts not initially allowed for, and partly to inflation. In general the utilities' cost estimating was considered to have been satisfactory.
Manchester Metrolink Ph 2	The outturn cost of the diversions showed a significant reduction against earlier estimates, largely due to a reduction in the scope of works undertaken by Transco, and a large deferment of renewal contribution from BT which was not initially anticipated.
Merseytram	Final out-turn costs varied from the initial and C4 estimates for many reasons. Some final costs were significantly under the estimates due to value engineering and tram alignment adjustment. This was achieved by early engagement of the utilities consultants' team with the utilities companies, local authorities and tram design consultants together with the advanced trial holes and survey programme resulting in identification of preferred diversion route alternatives, elimination of diversions, protection measures, shared trenches and traffic management, etc. Final costs for projects which exceeded the estimates were in almost all cases due to

	unpredictable events such as underground obstructions, delays in obtaining local authority approvals and, to a lesser extent, late design changes. Very little increase was due to inflation due to the ability to provide indicative programmes at C4 stage. A small inflation cost was incurred due to increases in commodity prices, e.g. copper cables
Midland Metro Line 1	Advance estimates provided to Centro from utility companies (including Railtrack/Network Rail) for the estimated costs of their protection/renewal/diversion works amounted to £3.65M. The Concession Deed made a number of provisional sum allowances totalling £3.65M for these items, and also established a jointly-funded contingency sum of a further £4.7M, contributed to by both Centro (£1.7M) and the Concessionaire (£3M), to meet possible cost over-runs. In the event that cost over-runs were contained within this contingency sum the concessionaire was able to retain the balance of the contingency sum. If costs had exceeded £8.35M (ie £3.65M + £4.7M) then further cost over-runs would have reverted to Centro. Whilst the cost of the works remained between £3.65M and £8.35M the concessionaire was therefore incentivised to minimise the cost of the works, and it is understood that the final outturn cost was under £8M, providing a benefit for the concessionaire and endorsing the efficacy of the approach taken. Over £1M of the cost increase was attributable to Railtrack/Network Rail cost increases (the single largest increase over estimate) and all provisional sum utility costs were further increased by the construction joint venture adding a 10% "attendance charge" and a further 2.5% concessionaire's "overheads" charge to the actual outturn costs. The C4 estimates had been obtained by the construction joint venture, and although copied to Centro have now been archived and are not readily retrievable. From memory, they were a reasonable guide to the outturn costs of the works, the C4 estimates being (largely) higher and more accurate than the pre-tender estimates supplied to Centro. It should be noted that only 2km of the 20km route of Midland Metro Line 1 is situated in highway, so utility costs per km for the route as a whole would be at the low end of the scale, the only utility costs on the segregated sections of the route relating to plant alterations at bridge locations and power supplies to sub-stations and tram stops.
Midland Metro Line 1 Extensions	The final cost is expected to be less than intermediate estimates at a consistent base date. It is not possible to estimate at present how the outturn costs will compare.
Nottingham Promoter	The Promoters were not responsible for procuring the diversions, and are unaware of the final outturn costs.
Nottingham Express Transit	-
TfL Major Projects	Not known at this stage of development
Croydon Tramlink	-
Sheffield Supertram	Outturn costs massively over budget due to the lack of info, poor estimation by utilities, quality of checking, extent of works not directly associated with clearing swept path alignment.

APPENDIX F

Report of Court Case

ICLR: Chancery Division/1893/Volume 2/NATIONAL TELEPHONE COMPANY v. BAKER. [1892 N. 2.] - [1893] 2 Ch. 186

[1893] 2 Ch. 186 [CHANCERY DIVISION]

NATIONAL TELEPHONE COMPANY v. BAKER. [1892 N. 2.]

1892 Dec. 13, 14, 15;

KEKEWICH, J.

1893 Jan. 12, 13, 17; Feb. 4.

Nuisance - Electricity - Damage - Telephone Company - Tramway Company - Right of Action - Statutory Powers - Provisional Order.

A man who creates on his land an electric current for his own purposes, and discharges it into the earth beyond his control, is on the principle of *Fletcher v. Rylands* as responsible for damage caused by that current as he would have been if, instead, he had discharged a stream of water. Where the act is done in pursuance of a provisional order of the Board of Trade, it is protected to the same extent as other nuisances under statutory authority.

A tramway company, acting under a provisional order and using the best known system of electrical traction, caused electrical disturbance in the wires of a telephone company acting under license from the PostmasterGeneral:-

Held, that the tramway company are protected from liability for nuisance.

THIS action was brought by the National Telephone Company, Limited, and by Charles Lupton, one of their telephone exchange subscribers at Leeds, to restrain the Defendant from so working his electric tramway as to occasion a nuisance to the Plaintiffs' telephone lines, and for damages.

The Plaintiff company carried on an extensive business throughout the United Kingdom, under license from the Postmaster-General for a term of years, in supplying telephonic communication, principally by what was called the "Telephone Exchange" system. The system was worked on what was known as the "single-wire" system, the electric circuit being completed by the earth - that is, each end of the wire passed into the earth, which thus acted as a return conductor.

The company's exchange at Leeds had been in operation since 1880, and there were now 1200 subscribers and separate wires.

By a provisional order called the Leeds Corporation Tramways Order, 1888, confirmed by the Tramways Orders Confirmation (No. 1) Act, 1888, the provisions of the Lands Classes Acts (except with respect to the purchase and taking of lands otherwise than by agreement, and with respect to the entry upon lands by the promoters of the undertaking), and of the Tramways Act, 1870, were (sect. 2) incorporated with that order, except where expressly varied. By sect. 6 the corporation of Leeds, therein called "the promoters," were authorized to construct certain specified tramways with all proper rails, works, and conveniences.

Sect. 16 was as follows: "The carriages used on the tramways may, subject to the provisions of this order, be moved by animal power, and, with the consent of the Board of Trade, to be signified in writing, during a period of seven years after the opening of the same for public traffic, by means of haulage with wire ropes or other appliances placed underground, or by means of electric power, pneumatic power, and steam power, or any mechanical power, and, with the like consent during such further periods of seven years as the said board may from time to time specify in any order to be signed by a secretary or assistant secretary of the said board, by means of any such motive, drawing, or propelling power as aforesaid;" with a proviso that the use of any power other than animal power should be subject to the regulations in Sched. A to the order (that schedule dealing with the break-power and fittings of engines, safety of carriages, inspection of engines and carriages, and speed), "and to any regulations which may be added thereto or substituted therefor respectively by any order which the Board of Trade may and which they are hereby empowered to make from time to time as and when they may think fit for securing to the public all reasonable protection against danger in the exercise of the powers by this order conferred with respect to the use on the tramways of any such power as aforesaid other than animal power."

Sect. 51 enacted that, in the event of any tramways of the promoters being worked by electricity, "it shall not be lawful for the promoters to lay down any line or rail, or to do any act or work for working such tramways by electricity, whereby any telegraphic line of the Postmaster-General is or may be injuriously affected;" the section going on to provide for notice being given to the Postmaster-General of any work to be done within ten yards of any telegraph line. And the section contained the following sub-section: "(5.) For the purposes of this section a telegraphic line of the Postmaster-General shall be deemed to be injuriously affected by an act or work if telegraphic communication by means of such line is, whether through induction or otherwise, in any manner affected by such act or work or by any use made of such work."

By the Telegraph Act, 1878, s. 2, the expression "telegraphic line" includes anything whatsoever used for maintaining telegraphic communication.

Under their provisional order the corporation constructed a line of tramway from Roundhay Park into Leeds, consisting of two miles of double line along the Roundhay Road, and a mile and a half of single line along the Harehills Road and Beckett Street within the borough. This line of tramway was opened for traffic on the 29th of October, 1891. It was worked by the Defendant, William Sebastian Graff Baker, a contractor or engineer employed by the Thomson-Houston International Electric Company, under an agreement between himself and the corporation dated the 6th of May, 1891, by the terms of which he undertook, for a limited period and paying a certain rental, to provide the oars, rolling-stock, and plant necessary for working the tramways on the system of electrical traction adopted by the Thomson-Houston International Electric Company, the Defendant being responsible for all damage arising out of accidents or injuries in consequence of the working of the tramway, and the corporation undertaking to keep the tramway itself in repair. The written consent of the Board of Trade to the use of electrical power on the tramway for seven years was given on the 15th of December, 1891; but this consent did not specify the particular method to be used. The Thomson-Houston system of electrical motive power adopted by the Defendant was what was commonly known as the "single-trolley system," which consisted of a single overhead conducting wire connected with the tramcar by a trolley and line carrying the electric current to the car, which current operated a motor or motors on the car causing it to travel, the current returning by the rails

and by an uninsulated copper conductor running under the roadway parallel to the rails and connected with each rail.

The Plaintiffs complained that the effect of the working of the tramway was to cause such an electrical disturbance to the Plaintiff company's telephone lines as to render them practically useless; and they accordingly issued the writ in this action for an injunction to restrain the Defendant from using the said tramway, or any other tramways in the borough of Leeds, in such a manner as to occasion a nuisance to the Plaintiffs as owners or users of telephone lines and electric circuits within the borough, or as the owners or users of the telephone exchange system established in the borough, or in such a manner as to injure, disturb, or interfere with the property or business of the Plaintiffs.

In their statement of claim the Plaintiffs alleged that the effect of the working of the tramway was to interfere with and disturb the Plaintiffs' electric circuits in its neighbourhood, and the currents in such circuits, and to render the wires owned or used by the Plaintiffs in the neighbourhood of the tramway useless for telephonic communication, and so constituted an intolerable nuisance to the Plaintiffs and to the subscribers of the Plaintiff company; and that unless such nuisance was forthwith abated the business of the company in Leeds would be seriously damaged, and the use and enjoyment of the Plaintiff Lupton of the wire rented by him entirely destroyed; that the electrical disturbance caused by the Defendant's system could be readily prevented by the adoption by him of a different method of completing the electric circuit from his cars to the generating station in Harehills Road. The Plaintiffs further alleged that the Defendant was intending to extend the tramway through Leeds, and that if such intention were carried out, the Plaintiff company's exchange system in the borough would be destroyed.

In his statement of defence the Defendant alleged that the tramway had been constructed under the statutory authority above mentioned; he also pleaded the agreement and the consent of the Board of Trade, under which agreement and consent he was working the tramway, and denied the alleged electrical disturbance; and he contended that, even if there was such a disturbance, it did not infringe any right of the Plaintiffs, and could not be prevented by the adoption of a different method of completing the electric circuit from the cars to the generating station; that the Plaintiffs could easily obviate such alleged electrical disturbance by the adoption of some other method of completing their electric circuit than by the earth return adopted by them. The Defendant also denied the alleged nuisance.

In their reply, the Plaintiffs denied that the agreement of the 6th of May, 1891, authorized the Defendant to work the tramways in the manner in which they were being worked; or that such working was authorized by any provisional order or consent of the Board of Trade.

After the action had been set down for trial, his Lordship, with the consent of both parties, directed Mr. Macrory, Q.C., to proceed to Leeds to ascertain by inquiry and experiment, in the presence of representatives on each side, and to report to the Court, how far, if at all, the Plaintiffs' telephonic system had been interfered with by the Defendant's tramways, with liberty to employ an assistant.

Mr. Macrory accordingly visited Leeds in company with Mr. Henry H. Cunynghame, barrister-at-law, as his assistant, and conducted a series of experiments there in the presence of representatives from both sides; and he ultimately presented a written report, dated the 11th of January, 1893, which, after detailing the experiments by means of which, he said, he had been enabled to form a decided and accurate judgment on the question, concluded thus: "I report as follows. That the Plaintiffs' telephone system is seriously interfered with by the works of the Defendant. In some cases the

disturbance is so great as to render speech quite inaudible. By 'inaudible' I mean that, though the sound of the speaker's voice may be heard, the words being transmitted are entirely unintelligible. In other cases speech was to some extent audible, but an effort on the part of the listener was required to distinguish the words being transmitted; and there cannot be a doubt but that the effect produced by the working of the Defendant's tramcars and line is such as greatly to interfere with the efficiency of the telephone by creating noise which in all cases impairs, and in some cases entirely destroys, the power of transmitting speech." The disturbances were stated to consist sometimes of a buzzing or whirring noise; sometimes the noise assumed a uniform character like the rushing of water from a tap; while at other times it was similar to a musical note rising or falling, or to the sighing of the wind through trees.

The action now came on for trial.

Several English and American electricians of eminence were called as witnesses on both sides. The merits of the various systems of supplying electrical power for tramway purposes were fully discussed by different witnesses, the weight of evidence being, as his Lordship held, in favour of the Defendant's system, which had stood the test of considerable experience in the United States of America. Upon the question of the use by the Plaintiffs of the ordinary "earth return" for their telephonic system, it clearly appeared from the evidence on both sides that the use of a "metallic return," that is, of a second wire, unconnected with earth, to carry the current back, would afford a complete cure for the disturbance complained of, though it was proved that nearly the whole of the Plaintiff company's telephone business throughout the country was carried on by means of the single-wire system.

Sir R. Webster, Q.C., Moulton, Q.C., Warmington, Q.C., Micklem, and R. W. Wallace, for the Plaintiffs:-

The Defendant pleads that he and the corporation are acting under statutory authority in working the tramway in the manner we complain of; but the statutory power extends merely to the making of the tramway. The consent of the Board of Trade is required only for the purpose of providing for the safety of the public; the board cannot confer a statutory right to interfere with our telephones, neither as a matter of law does the statute authorize the use of electrical motive power in any defined manner. The principle established by the authorities is this, that no statutory authority to do certain acts will justify an interference with private rights, unless the interference is a necessary consequence of that statutory authority, through the impossibility of exercising the statutory powers without causing the interference; and that, if by a reasonable exercise of the statutory powers damage can be prevented, the omission to make a reasonable exercise of such powers is "negligence": *Vaughan v. Taff Vale Railway Company*; *Gas Light and Coke Company v. Vestry of St. Mary Abbott's, Kensington*; *Metropolitan Asylum District v. Hill*; *Evans v. Manchester, Sheffield, and Lincolnshire Railway Company*; *Geddis v. Proprietors of the Bann Reservoir*; *Rex v. Pease*; *London, Brighton, and South Coast Railway Company v. Truman*; *Mersey Docks and Harbour Board v. Gibbs*; *Harrison v. Southwark and Vauxhall Water Company*. Further, we rely on the well-established principles that a man cannot bring or collect upon his own land that which will do mischief if it escapes, and that no one has a right to use his own land in such a way as to be a nuisance to his neighbour: *Fletcher v. Rylands*; *Ballard v. Tomlinson*. The principle of *Fletcher v. Rylands* seems not to have been altogether accepted in America: *Pollock on Torts*; but at all events it is well-established in this country. Our right to be protected against the nuisance caused by the Defendant's mode of working the tramway is a common law right which the Court will protect by injunction. Sir J. Rigby, S.G., *Bousfield, Q.C.*, and *Dunham*, for the Defendant:-

We submit that the Plaintiffs cannot establish a case of what is, at common law, a "nuisance." A nuisance is an interference with an easement, or with the enjoyment of a corporeal hereditament. The definition is given in *Yool on Waste*, thus: "Injuries to easements, and such injuries to natural rights of property as do not directly interfere with the possession of the soil, are nuisances." Now, in the present case there is no ground for saying that the Plaintiffs have, in carrying on their business for the last twelve years, acquired an easement or right by prescription. They have no prescriptive or other right to use their property as a telephone exchange. Even a twenty years' user would give them no property in such an easement as they are virtually claiming. An easement or right to the uninterrupted use of an electric current passing through the earth cannot be established, any more than in the case of a current of air, or of underground water, or of water flowing in an undefined channel. No exclusive right of property can be claimed in electrical forces or phenomena, the use or enjoyment of which is common to all. There is no law saying that the use of a delicate scientific instrument, such as the telephone, upon one man's land, can in any way interfere with the primâ facie and lawful rights of his neighbour on his own land. In working our tramway we are not doing anything on, so to speak, the Plaintiffs' land which is in any way perceptible to the senses, or which can in fact be ascertained or known except by means of scientific instruments of great delicacy. The effect of our working is so impalpable that no one is conscious of it until he proceeds to use these delicate instruments. The Plaintiffs are in a totally different position from that of a plaintiff who has the fee simple of all the land between the exchange and a subscriber's house. In carrying their wires over the properties of other people, they do not acquire any right as against any one; to complete their electric circuit they use any property that comes in their way, but it is open to any one over whose land their wires pass to interrupt them, and not allow them to remain. They exercise their so-called right simply because no one objects, and there is no harm done; but that cannot be the basis of an action of nuisance. This is the first instance, at all events in this country, in which a telephone company has set up such a common law right as is now claimed. Cases such as *Reinhardt v. Mentasti*, where it was held that, although the defendant was, in doing the act complained of by the plaintiff, acting reasonably in the use of his house, yet the plaintiff was entitled to protection, only apply to the ordinary user of property. To establish nuisance, you must shew an interference with the ordinary enjoyment of life or the ordinary use of property: per Lord Justice Cotton in *Robinson v. Kilvert*. "A man who carries on an exceptionally delicate trade cannot complain because it is injured by his neighbour doing something lawful on his property, if it is something which would not injure anything but an exceptionally delicate trade": per Lord Justice Lopes. In that case it was held that, as the defendants were not doing anything which would injure an ordinary trade, they were not liable on the ground of nuisance. Here the Plaintiffs are not carrying on an "ordinary trade," and we are certainly not doing anything which can interfere with an ordinary trade. *Cooke v. Forbes* was a case of a noxious trade, and is dealt with by the Court of Appeal in *Robinson v. Kilvert*. Upon the question of nuisance, therefore, we submit that the Plaintiffs have no ground for maintaining this action. But there is another and, as we say, a fatal objection to the Plaintiffs' case. The Defendant is not in the position of an ordinary owner of property; he is acting under compulsory powers conferred by Parliament to use, through the corporation of Leeds, these streets for the purpose of tramcars, and to use electrical power. We rely on the statutory authority of the provisional order, especially on sect. 16, and also on sect. 51, which, in providing expressly for the protection of the wires of the Postmaster-General, indicates that we have power to interfere with other wires; and we submit that, so long as we are not using our statutory powers unreasonably or negligently, we are not responsible for the consequences of our exercise of them. Upon the question of the exercise of statutory powers of working an electric tramway, there has been no case yet reported in this

country; but there are reported American cases, in which it has been decided that a telephone company has no vested interest in or exclusive right to the use of the "ground circuit" or "earth return" as against an electric street railway company incorporated by statute: Cincinnati Inclined Plane Railway Company v. City and Suburban Telegraph Association; Hudson River Telephone Company v. Watervliet Turnpike and Railroad Company; Cumberland Telephone and Telegraph Company v. United Electric Railway, where it was also held that, in the present state of electrical science, a telephone company could not maintain an action against an electric railway company for injury sustained by the escape of electricity from the rails; and that where a person was making lawful use of his own property, or of a public franchise, in such a way as to injure another, the question of his liability depended upon the fact whether he had made use of the best means then known to science. In every case of alleged nuisance the surrounding circumstances and the considerations of time and place are all-important: Garrett on Nuisance, citing Clarke v. Clark: Sturges v. Bridgman. As to the effect of statutory powers in such cases as this, the law is summed up in London, Brighton and South Coast Railway Company v. Truman. Gas Light and Coke Company v. Vestry of St. Mary Abbott's, Kensington, does not apply, since there was no statutory authority to use the steam-roller there complained of. So in Metropolitan Asylum District v. Hill there was no express statutory authority, but only a power to build and maintain a hospital, provided it could be done without creating a nuisance. The distinction between a mere power of that kind and an express statutory authority, as in the case of a railway company, is pointed out by Lord Halsbury in London, Brighton and South Coast Railway Company v. Truman. Vaughan v. Taff Vale Railway Company comes really very close to the present case, because there, as here, the use of a dangerous apparatus was authorized or contemplated by statute. Here, by sect. 16 of the provisional order, the possible danger arising from the use of electric power is expressly recognised, and provisions are inserted for the protection of the public against it.

[KEKEWICH, J.:— I had to consider this point, as to the effect of the statutory powers of a tramway, in the recent case of Rapier v. London Tramways Company; and also, as to the effect of the statutory powers of an electric railway company, in the Stockwell Orphanage case, Allison v. City and South London Railway Company, where I held that the company were, by reason of their statutory powers, absolved from any liability for

nuisance for injury by vibration to the plaintiff's premises, but that such absolution did not operate until they had done their very best to abate the nuisance.]

In that case your Lordship practically followed the decision in London, Brighton and South Coast Railway Company v. Truman, upon which we rely. Then the only remaining question is whether we have been guilty of negligence in the use of our statutory powers. Upon that the evidence shews that our system of electrical traction is the best and most approved system at present known to science, though the experience of it has hitherto been confined mainly to America. The disturbances caused by our tramway are, at the present day, necessarily incidental to every large town, and they are disturbances which the Plaintiffs themselves can and should, from the very nature of their business, protect themselves against.

If it should be held that we have in fact infringed any legal right of the Plaintiffs, the case is rather one for damages than injunction: Holland v. Worley.

[KEKEWICH, J.:— That case has not commanded the approbation of the profession.]

At all events, Lord Cairns' Act (21 & 22 Vict. c. 27) was passed for the purpose of enabling the Court to grant damages in lieu of an injunction.

Sir R. Webster, in reply:-

There is no analogy between this case and a case of underground water, such as *Chasemore v. Richards* (4). This is not a case of both Plaintiffs and Defendant drawing a natural supply from the reservoir of the earth. Each party is bringing about a non-natural state of things upon their or his own property - that is to say, for their own purposes they are lawfully producing, by the necessary machinery, currents of electricity, the Plaintiffs producing small currents which do harm to nobody, and the Defendant producing violent currents. I submit that the Defendant, in allowing these violent currents of electricity, produced by himself, to escape from his own property, and cause damage to his neighbours or their trades, renders himself liable to an action, just as much as if the disturbance had been caused by the vibration of the steam-engine driving the dynamos by which the currents are generated. A person who lawfully, for his own purpose, creates a nonnatural state of things which may cause injury to his neighbours, does so at his peril. I say that our right of speech through these telephones is a property which gives us a right of action, and that we are entitled to protection under the doctrine, "*Sic utere tuo ut alienum non lædas*," which is the foundation of *Fletcher v. Rylands* and that class of cases. But the Plaintiffs have more than a mere right; they have property to which that right is attached, for they possess buildings and plant for carrying on their business. Upon the question of novelty of trade, there is no law that a man may interfere with his neighbour's trade because it is a new one, or that one particular trade, still newer (as the traction of tramcars by electricity is), should be allowed to interfere with the earlier trade because that earlier trade is of a delicate nature. Upon the question of statutory authority, sect. 16 of the provisional order is permissive, not compulsory; it merely says that electrical power "may" be used as an alternative mode of traction. That distinguishes the case from *London, Brighton and South Coast Railway Company v. Truman*, where the purpose there in question was expressly authorized by statute as incidental and necessary to the use of the railway. The object of the section was to protect the promoters from being liable for consequences such as those in *Metropolitan Asylum District v. Hill*, *Fletcher v. Rylands*, and similar cases. *Holland v. Worley*, as your Lordship has pointed out, has never been followed. As to *Cumberland Telephone and Telegraph Company v. United Electric Railway*, that was decided only on the same principles as were applied in *Vaughan v. Taff Vale Railway Company* and *Rex v. Pease*; and, moreover, there the Court declined to adopt the principles of *Fletcher v. Rylands*, which, however, is the law here. *Hudson River Telephone Company v. Watervliet Turnpike and Railroad Company*, when examined, is really in our favour. [Dunham:- In that case, there was a subsequent decision of the Court of Appeal, dated the 11th of October, 1892, in favour of the tramway company.]

Turning to the English cases, the law laid down by the Court of Exchequer in *Fletcher v. Rylands* and recognised by the House of Lords is as follows: "We think that the true rule of law is, that the person who for his own purposes brings on his lands and collects and keeps there anything likely to do mischief if it escapes, must keep it in at his peril, and, if he does not do so, is *primâ facie* answerable for all the damage which is the natural consequence of its escape. ... And upon authority, this we think is established to be the law whether the things so brought be beasts, or water, or filth, or stench" - to which, for the same reason, may be added, at the present day, "or electricity." The principle is further recognised in *Hurdman v. North Eastern Railway Company*, *Grump v. Lambert*, and *Fleming v. Hislop*.

The proposition that we must alter our system in order that the Defendant may let loose his electricity with impunity cannot be seriously maintained. We ask your Lordship to lay down no harder rule than that the Defendant is not so to conduct his business as to interfere with the business of the Plaintiff company lawfully carried on.

1893. Feb. 4. KEKEWICH, J. :- As between the National Telephone Company, whom I shall treat as the sole Plaintiffs, although another is associated with them, and the Leeds Corporation, whom I shall treat as the real Defendants, although not appearing on the record, there is no question of title, and no question but that each is lawfully exercising undoubted rights; nor is there any question but that the acts of the Defendants interfere with the exercise by the Plaintiffs of their lawful rights. This would, I think, have been undoubtedly true if the case had been threshed out on evidence without the advantage of Mr. Macrory's report; but that report renders it unnecessary to deal with the evidence on this point; and the interference is of a serious character, so that, if actionable, the remedy would properly be by injunction rather than by damages. The real and only question in the case is whether the interference is actionable. It was practically admitted by the Plaintiffs, and my own view certainly is, that if they can maintain the action against the Defendants at all, it must be on the application of the principle now well known as that of *Fletcher v. Rylands*. That principle, for the purpose of application to the case in hand, may conveniently be stated by reference to the second of four propositions set out in the 5th chapter of Mr. Garrett's book on the Law of Nuisance, which I have consulted in connection with more than one point in this case, and gladly take this opportunity of mentioning as a work of uncommon merit. I will read the proposition in the author's own words, but think it capable of improvement by the substitution for "nonnatural" of "extraordinary," which is the term employed by Lord Kingsdown in defining somewhat analogous water rights in his well-known judgment in *Miner v. Gilmour*. The proposition is thus stated by Mr. Garrett: "If the owner of land uses it for any purpose which from its character may be called non-natural user, such as for example the introduction on to the land of something which in the natural condition of the land is not upon it, he does so at his peril, and is liable if sensible damage results to his neighbour's land, or if the latter's legitimate enjoyment of his land is thereby materially curtailed."

The land into which the Plaintiffs and Defendants alike discharge their electric current does not belong to either of them; but, for the reasons above indicated, there cannot, as between them, be any question that the principle ought to be applied, if it be applicable at all, on the basis of their being absolute owners. That principle has never yet been applied in English law to such a matter as is now under consideration; and perhaps it would not be too much to say that those who enunciated the law in *Fletcher v. Rylands*, and have commented on and followed it in other cases, never had present to their minds the application of the doctrine to an electric current and the possible consequences of its discharge into the earth.

The question has been carefully considered in America, and I have studied with deep interest the case of *Cumberland Telephone and Telegraph Company v. United Electric Railway*. The judgment of the Court in that case, though in no wise binding on me, has commanded my earnest attention and respect, and, but for one circumstance, I should not hesitate to allow my own conclusion to be guided by the powerful arguments there set forth. That one circumstance is the want of full adoption of the principle of *Fletcher v. Rylands*. American law apparently holds the owner of land used for a non-natural or extraordinary purpose responsible for the consequences of such user to his neighbour only when they result from that owner's negligence; and if he can satisfy the Court that he has not been guilty of negligence, the resulting damage to his neighbour is not actionable. It

seems to me that if the principle of *Fletcher v. Rylands* had been fully adopted in America, the conclusion of the Court in the case just cited must have been different. I believe that in Scotland, too, the principle of *Fletcher v. Rylands* has not been accepted, and is not regarded as consistent with justice between man and man. It does not fall to me to consider so large a proposition. The principle is thoroughly well settled here, and my duty is merely to consider whether it is applicable. It would be easy, of course, to point out differences between all the cases to which it has hitherto been applied and the present; and I have already said that injury arising from such a case as the discharge of electric current can scarcely have been contemplated by any Judge in previous cases. But after reflecting much on the novelty of the case, on the argument addressed to me, and on the peculiarity of an electric current as distinguished from every other power, I fail to see any reason why the principle should not be applied to it. I cannot see my way to hold that a man who has created, or, if that be inaccurate, called into special existence, an electric current for his own purposes, and who discharges it into the earth beyond his control, is not as responsible for damage which that current does to his neighbour, as he would have been if, instead, he had discharged a stream of water. The electric current may be more erratic than water, and it may be more difficult to calculate or to control its direction or force; but when once it is established that the particular current is the creation of or owes its special existence to the defendant, and is discharged by him, I hold that if it finds its way on to a neighbour's land, and there damages the neighbour, the latter has a cause of action. At any rate, I think that if a distinction is to be taken between this and other forces for this purpose, that distinction must be made by a higher tribunal, and not by a Judge of first instance. It was endeavoured to be argued on behalf of the Defendants, that the current injuring the Plaintiffs was only part of the general body of electricity which may be now said to exist everywhere and to be proceeding in every direction; but the effect of the Defendants' operation is to collect a particular portion of this body and to discharge it into the earth at a particular spot, and there can be no doubt that the disturbance of the Plaintiffs' telephone system is caused by the particular quantity thus discharged.

Assuming the action to be maintainable on the principle of *Fletcher v. Rylands*, the Defendants rely on two answers to the Plaintiffs' claim. First, they say that the Plaintiffs might by an alteration of their system; that is by the adoption of what is known as the metallic return, prevent the disturbance complained of; and, secondly, they say that they the Defendants are acting under statutory powers, and that if in the proper exercise of those powers they injure the Plaintiffs they are free from blame. The first answer is, to my mind, without foundation. The man who complains of his land being thrown out of cultivation by the incursion of water escaping from his neighbour's reservoir, must not be told that he has no right of action because if he had interposed a wall, or otherwise taken care to protect himself, the water would not have reached his land. He is using his land in a natural way, and is not bound to take extraordinary precautions, and is entitled to rely on his neighbour also using his land in a natural way, or, if he uses it otherwise, taking extraordinary precautions to prevent damage to others therefrom. There is, no doubt, a body of evidence to shew that a system different from that adopted by the Plaintiffs has been adopted elsewhere with advantage, and may, possibly, prove to be the most convenient though more expensive for them; but the evidence also proves that their present system has been largely adopted and is received with favour by many competent to form an opinion. It also has the merits of economy. They are carrying on their own business lawfully and in the mode which they deem best, and I cannot oblige them to change their system, because they might thereby, possibly, enable the Defendants to conduct their business without the mischievous consequences now ensuing. True it is, that the analogy introduced above fails to this extent, that the Plaintiffs are using the land for an extraordinary purpose; but, admittedly, it is a lawful purpose, and, though under an obligation to obviate mischief from their

own operations to their neighbours, they are under none, in my judgment, to protect themselves from the Defendants or others. The outflow from one reservoir might easily destroy another; but, so far as I am aware, there is no principle or authority in English law for rejecting a claim for damage by the owner of the latter on the ground that his user, as well as that of the neighbouring owner, is extraordinary.

The second answer of the Defendants to the Plaintiffs' claim has required more examination. Having recently had occasion in *Allison v. City and South London Railway Company*, and again in *Rapier v. London Tramways Company*, to consider such a plea as is here put forward, and to consider many authorities, and in particular the cases of *Metropolitan Asylum District v. Hill*, and *London, Brighton and South Coast Railway Company v. Truman*, and their application to different provisions and circumstances, I do not find it necessary again to state my view of the law or of the lines by which I ought to be guided in applying it to a particular case. Therefore, I shall but briefly explain the reasons for my conclusion that the Defendants' plea is good in law, and that they are not responsible to the Plaintiffs for the mischief caused by their works. The Defendants' authority is derived under a provisional order confirmed by Act of Parliament. Such provisional orders in connection with tramways and many other undertakings of a public character are now common, and, I think, must be treated as "a well-known and recognised class of legislation" equally as much as the Railway Acts, which were referred to in those terms by the Lord Chancellor in *London, Brighton and South Coast Railway Company v. Truman*. The Railway Acts (again using the language of the Lord Chancellor in the same case) were assumed to establish the proposition that the railway might be made and used whether a nuisance were created or not; and, in my judgment, a like proposition must be assumed to be established by the provisional orders, one of which is here under consideration.

The Defendants are expressly authorized to use electrical power, and the Legislature must be taken to have contemplated it, and to have condoned by anticipation any mischief arising from the reasonable use of such power. A distinction was endeavoured to be made between cases where extraordinary powers are directly sanctioned by the Legislature, and those where it is left to some other authority (in this instance the Board of Trade) to determine whether, if at all, they may be brought into operation. It is within the competence of the Legislature to delegate its authority; and, when once that delegated authority has been properly exercised by the agent to whom it is entrusted, the sanction is that of the Legislature itself, just as much as if it had been expressed in the first instance in an Act of Parliament. The Defendants relied on the 51st section of the provisional order. They argue that the exception there made in favour of the telegraphic - which would include telephonic - lines of the Postmaster-General, indicates that interference with any other like lines was intended to be permitted. The reference supports the more general argument, and I have, therefore, mentioned it; but I rest my decision more on the established principle laid down in many of the cases, and ultimately ratified by the House of Lords in *London, Brighton and South Coast Railway Company v. Truman*.

To this plea of statutory power the Plaintiffs have a rejoinder. They say that such power cannot avail the Defendants unless they have acted reasonably in the exercise thereof, and have done their best to avoid injury to their neighbours. The argument being sound in law, one is compelled to examine the facts. The Defendants work their tramways on what is called the "single-trolley system." There are other systems which have from time to time been used, and it seems are still in use elsewhere, and there are at least some good reasons for the conclusion that by the adoption of one or other of these systems the Defendants might wholly or partially avoid the mischief which they now occasion. There is a contest on the evidence whether any of these other systems can be regarded as good apart from comparison with that of the Defendants, and there is a further conflict of evidence

whether, if good, they are comparable in merit with that of the Defendants. My conclusion from the evidence is that the Defendants' system is, on the whole, the best which practical science has yet discovered; but there is no occasion really to go as far as this. It is enough to say, and about this I entertain no doubt, that it is at least as good as any other, and has been proved by experience, especially in the United States, where there have been larger opportunities for experiment and consideration, to be as likely as any other to meet the requirements of traffic and the convenience of all concerned in the protection of the site of tramways for the use of legitimate purposes other than those of the tramway undertaking. It cannot be that, in the application of the law which I am now considering, the Court is bound to hold a railway or other company liable for the consequences of acts done under statutory powers, because it has not adopted the last inventions of ever-changing, ever-advancing scientific discovery. It is surely impossible, with any regard to that common sense which after all is the foundation of this and many other branches of law, to say that a railway which was not liable last year, last month, or even yesterday, because until then its undertaking was carried on according to rules acknowledged to be the best, is liable now - not because those rules have been proved to be altogether wrong in practice, or unscientific in principle, but because some diligent worker in this department has discovered what is held for the moment to be a large improvement but may to-morrow turn out to be only a step in the progress of further advance; and yet this might be the necessary conclusion in many cases, and indeed might be the necessary conclusion here if I were driven to support the Plaintiffs' claim on the ground that the single-trolley system, so largely approved where it has been largely tried, does not avail the Defendants as a proper exercise of their statutory powers, because another system is in use and apparently successfully used at Buda Pesth or elsewhere. I do not wish to prejudice the question whether a charge of negligence in the exercise of statutory powers can be supported by cogent evidence that the company exercising those powers has failed to adopt alterations or precautions which sufficient experience has shewn to be of large, indisputable, and permanent value. That question may easily arise in many of the disputes which are likely enough from time to time to occur between public companies and those whom their operations injuriously affect, and it may even arise between the parties to this litigation. Suffice it to say that it does not arise now.

Holding, on the above grounds, that the Plaintiffs cannot maintain an action either for an injunction or for damages against the Defendants, I must order them to pay the general costs. If ever there has been or can be a case to which the distinction between the two scales of costs is properly applicable, this is the one, and the costs must be taxed on the higher scale. But it remains to make an exception, and that of some extent. I have already stated that the interference with the Plaintiffs by the Defendants is beyond doubt. I do not think that this ought to have been litigated. Mr. Macrory's report shews that one fair experiment would have proved the facts about which there was really very little doubt independent of his report, and that much time was uselessly spent on evidence. Not only must the Plaintiffs be excused payment of the Defendants' costs of this issue - which must be defined to be the issue whether the Plaintiffs' telephonic system was in fact interfered with by the Defendants' operations - but the costs thus excepted from the general costs of the action must be borne by the Defendants and set off. Those costs will, of course, include those incurred in the experiment conducted at Leeds under Mr. Macrory's superintendence. I am glad to think that the course pursued with the concurrence of both parties of sending him down to make experiments and report was not only successful in finally settling an issue of fact, but also shortened the trial, and saved the further costs which further dispute on this point would necessarily have involved.

There will be judgment for the Defendants with costs, modified in the manner I have expressed.

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