PENRITH-KESWICK RAILWAY

PRE-FEASIBILITY STUDY

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1. Introduction

1.1 *Consultancy & Design* has been jointly commissioned by the County Council's Economy & Environment Department, the Rural Development Commission, Allerdale Borough Council, Eden District Council and the Lake District National Park Authority, to undertake a preliminary study to assess outline proposals to re-open the line between Penrith and Keswick, contained in 'An Outline Development Plan' and 'An Outline Commercial Case' by Mr C. A. Martindale.

1.2 Briefly the assessment involves:

a) estimating the demand for rail travel in the Penrith - Keswick corridor and the effects on demand of various route and service options,
b) discussions with the rail industry regarding operational matters including service levels and costs,
c) assessing Keswick as a railhead and the possibilities of extending the rail network,
d) considering the impact on, and opportunities for, public transport services,
e) assessing the engineering feasibility of establishing the route and the likely costs,
f) considering the effect of the proposed railway on the foot/cycleway between Keswick and Threlkeld,
g) assessing the economic impacts, and
h) assessing the environmental impacts.

1.3 Atkins Wootton Jeffreys have been engaged to assist with estimating the likely passenger demand, as well as providing specialist rail advice to *Consultancy & Design.*

1.4 The location of the line is shown on Figure 1, Appendix A

2. Demand For Rail Travel

2.1 Overall Approach

2.1.1 Data from the National Park Authority 1994 "All Parks Visitor Survey" has been used to populate a demand matrix and to derive existing shares between travel modes. The model was constructed for trips along the A66 corridor between Penrith and Keswick. In addition a model for trips along the A591 corridor between Kendal (Oxenholme) and Windermere was constructed to validate the A66 model.

2.1.2 A zone system covering the UK was adopted based on the areas used in the Roadside Interview questionnaire used for the National Park Authority 1994 "All Parks Visitor Survey". The fifteen by fifteen matrix was then populated by the sample data from the roadside interviews on the A66 and A591 corridors. Separate trip matrices were created for each roadside interview site (A66 and A591), for the duration of the interviewees' stay in the Lakes area (daytrip/longstay), and for the day of the survey (Weekday/Saturday/Sunday).

2.1.3 Factors derived from the roadside interview sampling (including vehicle occupancies) were used to expand flows from the survey period to a 16 hour Annual Average Daily Number of Person Trips by Private Vehicle.

2.1.4 Face-to-face surveys at twelve sites within the Lakes were undertaken as part of the "All Parks Visitor Survey" and interviewees were asked about access mode used. From this data, the proportion of trips being made by train on an average day was ascertained. Care has to be taken in allocating these modes shares because the sample at a site location is not the same as at the roadside interview site and the route used to access the site may not pass through either the A66 or A591 corridor. This issue was particularly relevant for interviewees in Keswick who indicated their main access mode to the park had been the train. From analysis of the station data it became clear that many had entered via Oxenholme and Windermere rather than Penrith.

2.2 Construction and Calibration

2.2.1 Appendix B contains details of the model construction, its calibration and its use in forecasting. The results of using the model in the base year indicate an annual patronage of the order of 169,000 single way journeys per year between Oxenholme and Windermere. We understand that this level of patronage, while not being precisely correct is of the correct order of magnitude. The results also show that there are of the order of 150 single way journeys per day made to Keswick and Bowness (Zones 9 and 10) which travel along the A591 corridor. This would indicate somewhere in the region of 53,000 single way journeys per annum.

2.2.2 The model indicates that the more populous and popular places of Windermere and Bowness are able to attract approximately 5% of traffic to rail along the A591 corridor. The rest of the Lakes are able to attract only around a 1% mode share. Coach patronage is the most significant "public transport" mode and reflects the quantity of coach tours visiting the area. Figures indicate that Keswick is better used by bus than Bowness (approximately 5% as opposed to approximately 1%). This is slightly counter intuitive, one would expect the proportions to be approximately the same. We feel this could be because of the relatively high proportion of coach trips to the Keswick area and statistical variation due to the relatively small sample sizes.

2.2.3 On the basis that the model is a reasonably good approximation to existing travel and mode shares along the two corridors, it has been used as a tool to determine the impact of a heavy rail line linking Penrith to Keswick.

2.3 Existing Service Levels

2.3.1 The number of InterCity services which stop at Oxenholme and Penrith from the South in the Summer 1996 timetable is as follows:

Table 2.1 - Number of Trains per day to Oxenholme and Penrith

	To Oxenholme	To Penrith
From Manchester Airport	3	3
From the Midlands	9	7
From London Euston	7	5
Total	**19**	**15**

2.3.2 A similar number stop from origins in Scotland. In addition Regional Railways North West operate five express services per day between Manchester and Windermere via Oxenholme. All services which stop at Penrith also stop at Oxenholme.

2.3.3 There are seven buses a day which connect Penrith Station with Keswick. An additional service operates in the Summer at 08:03. This compares with the Oxenholme to Windermere rail service which offers 14 services per day at approximately hourly intervals, five of which originate from Manchester as described above.

2.4 Operational Issues

2.4.1 A single track alignment linking to the West Coast Main Line via the freight loop South of Penrith and terminating at Penrith Station would allow a single train per hour to Keswick. A suitably located passing loop with associated signalling would allow two trains per hour to operate and may require additional platform/stabling capacity at either Keswick or Penrith. It is

understood that crossovers are either in place or would be easily designed and constructed to link the line to both the up and down lines. The re-signalling of the West Coast Main Line in the 1970s was configured to allow for these crossovers.

2.4.2 Were the line to be operated as anything other than heavy rail (e.g. light rail or narrow gauge) there would be difficulties with joint running along the freight loop. Even if the freight loop were taken out of commission, there would be difficulties with close proximity running with the West Coast Main Line. We understand that there is a requirement on third party rail operators to insure themselves against acts of negligence on the part of the National Network Operators. This is often at a level which prohibits close proximity running. Design and construction of the vehicles may need to be to the crashworthiness standards required on the National Rail Network.

Operational Costs

2.4.3 A brief financial appraisal of the proposals has been undertaken based on our understanding of costs in the rail industry currently. It is estimated that the annual operating cost would be in the region of £0.8m to run 15 trains per day. The flow required to cover the operational costs would be of the order of 220,000 single way journeys per annum at a fare of £2.00.

2.5 Model Results:- Central Case

2.5.1 The central case model assumes, along with The Outline Development Plan, that an hourly shuttle service will operate between Penrith and Keswick. This pattern of service is similar to that currently operating between Oxenholme and Windermere, if the longer distance direct services from Manchester are excluded.

2.5.2 The model results indicate an annual patronage on the Penrith-Keswick line of the order of 36,000 single way trips per year. This is equivalent to some 20% of the modelled flow between Oxenholme and Windermere and indicates the likely level of use relative to the present Oxenholme Windermere service. The Penrith-Keswick line would have the added effect of reducing patronage on the Oxenholme to Windermere line from 169,000 single way journeys per year to around 144,000.

2.5.3 Operating the Penrith - Keswick line is estimated to increase the overall rail patronage along the two corridors into the National Park to 180,000 annual single way trips. This represents an increase in the rail market of 7%, or 11,000 single way rail trips per annum, above the current patronage on the Oxenholme to Windermere Line.

2.5.4 The model has not taken explicit account of the A591 corridor between Keswick and Carlisle on which we understand there to be an Annual Average Daily Traffic flow of 1600 vehicles. This is some 10% of the flow on the A66. We would anticipate that there is a proportion of this traffic which originates

in Carlisle, who may divert to heavy rail, although that proportion is likely to be less than the mode shift assumptions for the A66 as much traffic will be local in nature. Longer distance traffic from the North East to Keswick is unlikely to route via Carlisle and be represented in this flow. At worst, the estimate presented may under-represent patronage by something less than 10%, which is well within the margin of error of the forecasts in any event.

Network Benefits

2.5.5 Assuming an additional 11,000 rail passengers per annum interchanging to achieve destinations in the Lakes would indicate that, at a rate of £4.00 for a return fare an additional revenue of £44,000. Assuming that these originate in Manchester, being an "average" distance travelled would indicate a further additional revenue of £198,000 (based on a return fare of £18). This would accrue to operators on the West Coast Main Line. Based on Track Access Charges alone at a rate of £9 per train mile, an operating cost of around £1.5million is indicated. The revenue is significantly less than the operating cost.

2.6 Model Results:- Best Case

2.6.1 It is envisaged that the central case would consist of a shuttle service with an hourly departure from the bay platform at Penrith using the existing freight passing loop. It is possible that a number of services could be run directly from Newcastle to Keswick via Carlisle and Penrith on a similar basis to those from Manchester to Windermere. It is a commonly held view that the Northern Lakes are more attractive to the populous regions of the North-East and the Southern Lakes are more attractive to the conurbations of Manchester and Liverpool for day trips. The demand matrices show, however, that for the A66 corridor, the ratio of trips originating in the North East to the North West is 1.00 to 1.24, which indicates that more traffic to Keswick originates from the North West region than from the North East. This is probably explained by the larger population of the North-West region.

2.6.2 The Best Case takes an optimistic view of future levels of demand and assumes that an additional five direct trains per day from Newcastle are provided. This model estimates 68,000 annual single way journeys per year on the Penrith-Keswick line. Assuming that the same level of abstraction from the Oxenholme Windermere service as occurs in the central case, the best case estimates that an additional 43,000 single way rail trips per annum will be undertaken relative to the current patronage on the Windermere line.

Network Benefits

2.6.3 The extra 43,000 rail passengers per annum travelling to destinations in the Lakes would indicate that, at a rate of £4.00 for a return fare, an additional revenue of £172,000. Assuming that these originate in Manchester/ Newcastle this indicates a further additional revenue of £774,000 (based on a return fare of £18, as above,) would accrue to operators on the West Coast Main Line and the Tyne Valley line .

As above, from Track Access Charges, the network benefits arising from the Best Case are still less than the operating cost.

2.7 Effects of Rail Travel Growth

2.7.1 Generally the demand for transport is rising and is very closely linked to rising car ownership and use. The National Trip End Model forecasts substantial growth in car based trip making over the period to 2025. In urban areas, where congestion is the principal mechanism of demand restraint, it is possible to influence mode choice by careful design of facilities for public transport and penalties for car use. Forecasting mode shares for longer distance travel is more difficult because this type of travel is more discretionary, particularly in the Lake District, being based on leisure as opposed to work related trips.

2.7.2 Whilst there is currently a relationship between rail and car mode shares it is likely to alter as a consequence of changes in car ownership. It is not possible to simply assume that the current mode share will remain constant over time given a large expansion of the car based trip matrix. An alternative formulation generally applied to rail based demand would be to use elasticities relating cost changes to patronage and which intrinsically accounts for growth in the rail market. This formulation is used for modelling changes to existing services and is clearly inappropriate for the Penrith-Keswick line where no services exist.

2.7.3 The level of service provided between Penrith and Keswick is likely always to be less than that provided between Oxenholme and Windermere, where the overall travel demand market is much larger. Thus an estimate of future rail travel demand to Keswick can be made from the present level of rail travel demand in Windermere. In the long term an upper limit on demand on the Penrith-Keswick railway would be the current level of demand on the Oxenholme-Windermere line.

2.8 Summary

2.8.1 A demand model has been developed to test the likely demand for rail travel in the Penrith-Keswick corridor. The model has been validated against the current rail demand in the Oxenholme-Windermere corridor. The Central Case model estimates that the likely demand for rail travel is about 36,000 passengers per annum. Using a return fare of £4.00 this level of patronage would not cover the operating costs of the line, estimated at approximately £0.8m per annum.

2.8.2 A best case model based on optimistic passenger demands and direct services from the North East predicts passenger numbers of 68,000 per annum, however the operating costs are still not met.

2.8.3 It is estimated that the Penrith-Keswick service would extract 25,000 passengers per annum from the Oxenholme-Windermere service.

2.8.4 The table, below, summarises the passenger numbers, costs and revenues associated with the Central Case and Best Case models.

Table 2.2 Comparison of Model Results

	Existing	Central Case	Best Case
Passengers between Oxenholme and Windermere	169,000	144,000	144,000
Passengers between Penrith and Keswick		36,000	68,000
Total Passengers	**169,000**	**180,000**	**212,000**
Additional Passengers		11,000	43,000
Additional Revenue		£198,000[1]	£774,000[1]
Additional Cost		£800,000	£2,000,000[2]

Notes:
1. Includes "network" revenue.
2. Assumes £1 per train mile vehicle operating cost and £10 per train mile track access charge Carlisle to Penrith for the 5 direct Newcastle-Keswick trains per day .

2.8.5 The estimates of passenger demand are considerably lower than suggested in the Outline Development Plan. The travel demand model used in this study was based on an assessment of rail demand in the Penrith-Keswick corridor. The estimates in the Outline Development Plan are based on a proportion of all visitors to Keswick using the line irrespective of their journey origin. A significant proportion of the visitors to Keswick are Cumbrian residents who, unless living close to a train station, are less likely to use the line than those travelling from further afield.

2.8.6 There is forecast to be an increase in the demand for leisure travel. Much of the increase will be car based travel, but, with increasing constraints on car travel (costs, congestion, etc.) there will be some growth in rail travel. A reasonable long term upper bound of patronage on the Penrith-Keswick line would be the current level of demand on the Oxenholme-Windermere line.

3. Service Provision

3.1 Introduction

3.1.1 This section considers the effects of different service and interchange options on the proposed rail service.

3.2 Operation by Bus

3.2.1 An alternative to rail operation would be bus. This was modelled assuming timetable and ticket integration with rail services at Penrith together with an approximate doubling in the number of services operating from the Penrith Station forecourt from seven to fourteen per day. The model estimates that an additional 14,000 passenger per annum would use the bus service and would virtually double the number of bus trips to Keswick to 27,000. This is approximately half of the existing patronage on the A591 corridor to Windermere.

3.3 Different Levels of Service

3.3.1 An increased frequency to two trains per hour would require additional civil engineering and signalling costs. The existing number of stopping services on the West Coast Main Line at Penrith is some fifteen per day per direction. While it is recognised that interchange waiting times would be reduced by additional trains, this period is small compared to the overall length of a West Coast Main Line journey. Additional services would need to be justified on the basis of demand between Penrith and Keswick themselves. The annual average number of person trips is of the order of 100,000 single way trips. A proportion of these are assumed to switch to the train based on an hourly service. Assuming two services per hour, would at best increase patronage by only of the order of an additional one or two percentage points, or 2,000 single way trips per annum. This would increase the additional rail patronage based on best assumptions to 45,000 per annum.

3.4 Light Rail and Narrow Gauge

3.4.1 Cheaper options than heavy rail are being considered and these fall into two categories: Light Rail and Narrow Gauge. Based on operation of the system as a public transport concern, we are of the view that the attractiveness of each will be similar and this is based primarily on:

- line speeds for light rail and narrow gauge will be similar to each other and slower than heavy rail, and
- the comfort of light rail and narrow gauge vehicles will be equivalent and generally less comfortable than heavy rail.

3.4.2 There are additional problems concerned with linking into Penrith station revolving around joint running and crashworthiness of the vehicles (para 2.4.2 refers).

3.4.3 It is estimated that an annual single way patronage of 27,000 based on a Light Rail/Narrow Gauge solution, which compares unfavourably with patronage for heavy rail of 36,000 in the Central Case.

3.4.4 A fundamentally different method of operating the line would be as a tourist attraction as opposed to a solely a public transport facility. Operation as a narrow gauge line would likely fall into this category and this is discussed more fully below.

3.5 The Line as a Tourist Attraction

3.5.1 The analysis we present above is based on the operation of the line as a public transport facility. It is assumed that the principal objectives of the line as viewed by the client group is to provide a means of access to the Lake District to compete with the car and provide a more sustainable means of supporting an ever growing tourist market which is broadly in line with overall policy objectives.

3.5.2 An alternative way of viewing the scheme is as a tourist attraction in its own right. As a very approximate yardstick to patronage we may compare the line to the Lakeside and Haverthwaite railway and the Ravenglass and Eskdale railway which carried approximately 140,000 (1993) and 152,000 (1992) passengers per annum respectively and the West Somerset Railway which carried 128,328 passengers in 1995. Single way journeys would be approximately one half of this figure or around 75,000 per annum. This compares with a pure public transport figure of 36,000 from our central case estimate. While this may seem a more attractive proposition we must recognise the differences between the two types of approach:

- It could not be assumed that the patronage on a tourist attraction will all arrive by train, indeed a significant proportion may commence their journey from Keswick, hence not reducing the quantity of travel by car into the park.
- The corollary is that additional revenue to the West Coast Main Line from through ticketing would not be at the same level as for a public service railway.
- It would be more difficult to justify public money and compulsory purchase powers being used for a line which is principally a tourist attraction.

3.5.3 There is a view that it would be possible to operate the line as both a tourist attraction and a public service. The most optimistic forecasts would then indicate a level of patronage of the order of 112,000. This is probably on the high side because some "tourists" would be using the line as an access mode as well. The West Somerset Line is a similar length to the Penrith-Keswick line and the highest return fare is £10.30. If this fare level was used on the Penrith-Keswick line the revenue would be £1,154,000 which would cover the operating costs. At these tourist fares it is not at all likely that there would be the same level of demand for the service from people undertaking pure public transport trips as forecast in the model.

3.5.4 From our understanding of the nature of the operation of private "tourist" lines there would be difficulty in operating the line with a dual role. The principal reason being that fare levels for a tourist line are out of all proportion to normal public transport fares. No fare subsidy is available from the public purse. High fares exist despite often low operating costs as a result of volunteer labour. There are methods of overcoming the fares issue for locals. For example the Ffestiniog Railway have a system of lower fares for pass holding local residents and have a cheap return fare for journeys into Porthmadoc bought from local villages not matched by return fares bought at Porthmadoc. As we have seen however, this level of demand is likely to be very low and these schemes have not been an unqualified success.

3.6 Park and Ride

3.6.1 A Park and Ride site has been suggested close to junction 40 of the M6 at the A66/A592 junction. Park and Ride solutions are often used where there are historic town centres or congested urban areas to ease access to the core of the area. The A66 is a fast trunk road which links the M6 to Keswick. It suffers little congestion along its length. Issues arise principally as a result of conflict in the urban area of Keswick. A suitable location for a Park and Ride site to serve Keswick would be on the outskirts of Keswick. A route for public transport would then be required from the Park and Ride site into Keswick town centre. This could be facilitated by the heavy rail alignment and solutions could be in the form of buses or tracked vehicles. Over such a distance heavy rail is unlikely to be warranted.

3.6.2 The level of use made of the Park and Ride site is in direct proportion to the volume of use of Keswick as a centre and would be of greatest benefit to those visiting Keswick alone. For those travelling further, a Park and Ride site is unlikely to be attractive.

3.6.3 To fully consider a Park and Ride solution for Keswick would require a more comprehensive study of roads and car parking capacity in Keswick and more detailed data than has been possible to obtain as part of this study. The Keswick Traffic Study, which is currently in progress, is considering the need for additional parking in Keswick.

3.7 Summary

3.7.1 The model has been used to assess the effect of operating different service types and levels on the demand for rail travel. Extra buses, light rail or narrow gauge are all shown to attract fewer passengers than heavy rail in the Central Case. Higher heavy rail service frequencies are not estimated to attract significant numbers of extra passengers.

3.7.2 Passenger numbers could be boosted by operating the line as a tourist attraction by using heritage rolling stock. This could, however, generate additional car trips to the corridor and pressure for additional parking which may be difficult to accommodate at the station sites.

3.7.3 The operation of a Park and Ride site at Penrith was investigated. The proposed site is considered to be too far from Keswick to attract drivers to the facility and sites closer to Keswick should be sought. Furthermore an hourly service to Keswick or Penrith is unlikely to be attractive to drivers.

4. PUBLIC TRANSPORT

4.1 Introduction

4.1.1 In this section the possibilities for extending both road and rail public transport networks and the effect of the railway proposal on existing public transport is considered.

4.2 Current Public Transport Provision

4.2.1 Windermere, to the south-east of the Park has good road and rail connections to the national networks. Principal destinations from Windermere into the rest of the Park include Ambleside (and Keswick beyond), Coniston and the principal walking areas to the North. Its location makes it an important gateway to the Lake District. Keswick is by-passed by the A66 which links Penrith to Cockermouth and Workington. Destinations gained from Keswick include the Derwent Fells and areas North of Ambleside. In assessing the effects of a railhead on public transport from Keswick, comparisons shall first be made between the current levels of service from Windermere and Keswick. Subsequently, the discussion will concentrate on the potential for extending these services, and their likely effects on the viability of the proposal.

4.2.2 Table 4.1 over indicates the levels of registered bus services from Windermere and Keswick to selected principal destinations/areas of the Lake District. While registered bus services do not provide the whole picture of public transport (for example taxis and dial-a-ride services are not included) it indicates the overall magnitude of provision from these two centres.

4.2.3 A relatively high frequency of buses currently operate in the immediate vicinity of Windermere to the important destinations of Ambleside, Grasmere, Bowness and Keswick. From Ambleside it is possible to reach the additional destinations of Dungeon Ghyll and Coniston. However, while destinations within a 5-10 mile radius of Windermere are generally highly accessible, public transport provision tails off rapidly beyond this point.

4.2.4 Direct services to other destinations within the Park are either very infrequent, for example Windermere to Rusland: 1 direct service per weekday, or non-existent, e.g. no direct services from Windermere or Ambleside currently run to Whinlatter, Lorton, or Borrowdale. Similarly, centres of population to the west of the park, such as Ravenglass, Gosforth, Egremont and Workington, are served infrequently or not at all by direct services. This does not mean that these destinations are not accessible by public transport but that passengers may have to change a number of times.

Table 4.1 - Registered Bus Services from Windermere and Keswick

	To: / *From:*	Windermere	Keswick	Ambleside	Penrith
10	Windermere	-	11	47	1Sat
4	Keswick	12	-	12	11
9	Ambleside	47	11	-	1
	Penrith	0	7	1	-
1	Bothel	3	4	3	0
2	Bassenthwaite	4	7	4	1
3	Borrowdale	0	12	0	0
5	Wythburn	12	11	11	0
6	Glenridding	3Sat/3Sun	0	0	6
6	Pooley Bridge	0	1	1	8
7	Kentmere	0	0	0	0
7	Brampton	0	0	0	1
8	Grasmere	42	12	42	1Sat
11	Dungeon Ghyll	0	0	6	0
12	Coniston	2	0	10	0
12	Bowness	36	0	36	0
13	Rusland	2	0	2	0
13	Broughton	1Sat	0	0	0
14	Beckfoot in Eskdale	0	0	0	0
14	Whinlatter	0	4	0	0
14	Lorton	0	4	0	0
15	Ravenglass	0	0	0	0
	Cockermouth	2	14	2	8
	Maryport	0	0	0	0
	Workington	2	13	2	7
	Whitehaven	0	11	2	8
	Egremont	0	1	1Tue/1Fri/1Sat	1
	Gosforth	0	0	0	0
	Millom	0	0	0	0
	Ulverston	2	0	2	0
	Kendal	23	11	23	1

Notes:

1. *Number associated with destination is zone number from "All Parks Visitor Survey".*
2. *Numbers refer to services per day unless day of week on which service runs is shown.*
3. *All services indicated are direct.*

4.2.5 Currently, bus services from Keswick to destinations such as Whinlatter, Lorton and Borrowdale, within a 5-10 mile radius of Keswick, are regular, if infrequent (4 to 11 services per weekday). Other routes are poorly served, with the exception of those along the A66 corridor to Workington (13 per weekday) and the A591 corridor to Windermere (11 per day). Some services are seasonal.

4.2.6 From the current levels of supply it can be seen that Windermere is currently a much more important public transport hub than is Keswick, with many routes along the corridor to Ambleside and Grasmere.

4.3 Potential for Feeder Services

4.3.1 In discussing the potential to extend current levels of feeder services, the simple assumption will be made that a strong relationship exists between the level of demand for public transport and the level of supply. If this is the case, and if one assumes that rail visitors to both Windermere and to a station at Keswick were of a similar order of magnitude, then a great deal can be gleaned from the above service levels.

4.3.2 By inferring demand from current public transport provision, one can conclude that a railhead at Keswick would need to provide regular onward feeder services to destinations within a few miles radius in a similar manner to services operating out of Windermere. The range of destinations from Keswick within such a radius is however more limited. There are already regular services to the West Coast towns of Workington and Whitehaven.

4.3.3 Judging by the current level of supply from Windermere to destinations further afield, demand from Keswick to areas outside the immediate vicinity would be likely to remain largely unaltered. The exception to this would be the A591 corridor (discussed in greater detail in a subsequent section). The A591 corridor links Keswick with several of the most highly visited locations in the Lakes (Grasmere, Ambleside, Windermere, Coniston, and so on). Consequently, frequent feeder services to this sector of the Park would appear important. It should be pointed out however that the distance from trunk routes (the M6 and the West Cost Main Line) to Ambleside via Keswick is longer than via Windermere (approximately 28 miles as opposed to 17 miles). Accounting for the distance travelled on the trunk route between Penrith and Kendal/Oxenholme, it would appear that such a difference would, even for trips originating in the north, appear to offer little advantage.

4.3.4 There are some practical difficulties at the Keswick Station which may limit the interchange between train and bus. The bus and train stations in Keswick are some distance apart and for an effective interchange it will be necessary for the buses to stop at the train station. The station buildings have been acquired by Principal Hotels, the operator of the Keswick Hotel. Agreement would need to be reached with Principal Hotels for bus access to the front of the station and pedestrian access through the station buildings to the buses. If agreement was not forthcoming, services would need to operate from the Brundholme Road side of the station and the suitability of Brundholme Road for regular bus services would need careful assessment owing to the narrowness and poor alignment of the road.

4.4 Effect on the Viability of Proposal

4.4.1 A substantial part of the market for rail services between Keswick and Penrith would be for journeys ending in Keswick. There is still, however, a minority of trips which would travel further and would, in order to be attracted to Keswick as a railhead, need onward public transport services. The proportion travelling on is some 36%, or around 13,000 passengers annually based on the central case estimate of 36,000. This compares with our estimate of the proportion travelling on from Windermere currently as 23% or around 38,900 passengers annually. These figures indicate that public transport links would need to be improved from Keswick to attract 36% of the forecast patronage on the line. The principal areas to which additional services would be required are the Northern Fells, Bassenthwaite Lake, Ullswater and the Southern Lakes (these areas arise from the All Parks Visitor Survey and are shown at Map 2, Appendix B). These destinations are well spread and would be difficult to service effectively by public transport. Glenridding is already serviced by a bus direct from Penrith.

4.4.2 One could reasonably expect the great majority of the 'Longstay' market (both leisure and local/business trippers) to require access to destinations beyond Keswick. The model showed that given a patronage of 36,000 per annum on the Penrith to Keswick line, as many as a quarter of these could be longstayers. Their willingness to use a Penrith to Keswick rail service would be influenced greatly by the provision of, and reliable information about, onward public transport.

4.4.3 It is difficult with a model of this type and at this pre-feasibility stage to be clear on the level of secondary provision of public transport from Keswick to onward destinations. From the model we have built however we would say that, at a very approximate level, there may need to be a doubling in frequency in existing services from Keswick as in table 4.2 below. Further work is needed to more clearly define the level of secondary public transport provision and the wider implications.

Table 4.2: Future level of Onward Public Transport Services from Keswick

	Northern Fells	**Bassenthwaite**	**Southern Lakes**
Number of Services	8	14	22

4.5 Extension Along A591 Corridor

4.5.1 The model identified approximately 1½ million visitors arriving by the A66 corridor in 2011 whose principle destination would be Bowness and its environs. Notably, these figures exceed those for people travelling to Keswick along the A66 corridor. An extension of the line south towards Ambleside would therefore be seen to add additional patronage to the Penrith to Keswick line. There are fundamental difficulties with the operation of a heavy rail line through this corridor linked to gradient and consequent earthworks and also the desirability of creating a further major transport corridor through the Lakes. The additional patronage which would be brought about because of such a scheme would not be such as to overcome the engineering and environmental issues. The line would parallel the West Coast Main Line, which would appear to be a better means of achieving North-South movements by rail around the Lakes.

4.5.2 By providing a direct rail link along the A66 corridor to Windermere, the traffic split between the Oxenholme to Windermere and Penrith to Keswick rail services would be different to that predicted in the model. In general terms, by extending the rail line down the A591 corridor, one could expect concomitant effects in the origins of the users of the two East-West lines. Excepting the influence of through rail services, passenger trips on the Penrith to Keswick line could be expected to originate solely in the northern part of the country; while passengers from Oxenholme to Windermere would be expected to originate from the south. Initial analysis of combined traffic currently passing through the A66 and A591 corridors showed that the A591 carries approximately 40 per cent of the traffic from East to West, compared with 60 per cent on the A66. While these figures don't take into account other factors such as the capacities of the two links, a strong case could be made for saying that by linking rail services from Keswick to Windermere, a considerable abstraction of passengers from the Oxenholme to Windermere line could be expected.

4.5.3 This contrasts with the scenario of leaving Keswick and Windermere unconnected by rail. In this case, one could expect passengers to choose between the two services based on their destinations; i.e. those with destinations in the south of the Lake District would choose the Windermere line; while those with destinations in the north would travel to Keswick. This corresponds with the main modelled scenario, where the split between demand on the two rail lines was approximately 40 per cent on the A66 and 60 per cent on the A591.

4.5.4 The potential for light rail or narrow gauge rests on the ability to service Keswick adequately. As has been shown the patronage for this type of scheme is less than for a heavy rail scheme and the justification appears slender.

4.5.5 Other extensions to the Penrith to Keswick line have also been proposed. Firstly, a study by Mr Douglas Ferreira looked into the possibility of extending the line from Keswick to the Derwentwater landing stages. This part of the line would be narrow gauge, and initial estimates suggest it would incur low capital and maintenance costs. However, its impact on the viability of the overall scheme would seem to be limited.

4.5.6 Extending the scheme from Keswick to Cockermouth and Workington provides greater opportunity for increasing demand for the Penrith to Keswick line. It would primarily facilitate through trips to the West Coast from Penrith and beyond, but, equally it would abstract demand from the existing Keswick to Workington bus services.

4.5.7 The Workington - Keswick section of the original railway has largely been lost to housing west of Keswick Station and to improvements to the A66, principally between Braithwaite and Cockermouth and the A595/A66 Papcastle Roundabout and Bridgefoot. There are possible routes to avoid these stretches but they would be completely new alignments and therefore costly.

4.5.8 Without the Penrith-Keswick Railway, it would be possible to strengthen Windermere's role as a railhead by enhancing public transport links between Windermere and Ambleside- Keswick. This approach warrants further consideration.

4.6 Effect on Current Services and Usage

4.6.1 From the work that we have undertaken it would appear that the only effect with any measurable significance on public transport within the Lakes would be that of reducing patronage on services from Penrith to Keswick and Windermere to Ambleside. In the absence of existing patronage levels it is not possible to provide any firm estimates. The effect will, however, be relatively minor based on the fact that some journeys will not be "end to end". Abstractions on the Windermere to Ambleside service are as a result of some journeys arriving in Ambleside via the Penrith to Keswick rather than the Oxenholme to Windermere railway service.

4.6.2 Effects on demand levels of other public transport modes would follow from extending the Penrith to Keswick line to other destinations. Specifically, a rail line continuing west to Cockermouth would abstract demand from current bus services from Keswick to Cockermouth and Workington. Similar effects would be expected on the regular services from Keswick to locations in the Windermere/Ambleside area, were a rail link down the A591 corridor to be constructed.

4.7 Slapestones and Whinfell

4.7.1 There is a proposal to develop a "Hills of the North" Visitor Centre at Slapestones with ancillary commercial activity such as craft and work shops. It would be very much oriented to the tourist market and is likely to increase the attractiveness of the A66 corridor as a gateway to the Lakes. The extent to which it will increase patronage on the proposed line is however limited. Public transport access to the Lakes will be good for visitors arriving at Penrith by train and interchanging to reach Keswick. An attraction which is relatively inaccessible from Penrith Station is unlikely to result in much cross-fertilisation of visitor demand. Were the line to be developed as a tourist attraction, then there is the greater potential for car access to the line at Penrith given a slightly higher volume of tourist activity in the Penrith area as a result of Slapestones.

4.7.2 At Whinfell a Centre Parks type village is being constructed and is due to open in June 1997. The development will accommodate 3,500 visitors in 750 lodges and 75 apartments for 90% of the year. It is anticipated that 25% of the clientele would make trips outside the holiday park. Assuming an average stay of 3 to 4 days this would be of the order of 40,000 annual additional visitors in the vicinity of the Penrith-Keswick line. Undoubtedly a proportion would sample the Penrith-Keswick line, but again on the basis of it being a visitor attraction. There appears to be limited scope for additional patronage on the Penrith-Keswick line for access to the Lake District based on it being a public transport facility.

4.8 Summary

4.8.1 From a review of the existing bus services it can be seen that Windermere has a more extensive public transport network than Keswick. This is not surprising given the higher local and visitor populations in and around Windermere.

4.8.2 It is estimated that of the 36,000 passengers in the Central Case approximately 13,000 passengers per year will require onward public transport services. A doubling of existing bus frequencies would be necessary on selected routes to sustain the demand for onward movement.

4.8.3 There are some difficulties linking Keswick bus and train stations owing to the distance between them. Access to the Keswick Station forecourt may not be possible as the adjacent hotel has acquired the lease. Careful consideration will need to be given to the suitability of Brundholme Road for buses to access the rear of the station.

4.8.4 Consideration has been given to extending the rail network along the A591 corridor to Windermere and along the A66 to Workington. Both would require extensive new alignments. A more cost effective means would be to enhance Windermere's role as a railhead with the provision of additional bus services.

5. The Rail Industry

5.1 Introduction

5.1.1 As part of the study discussions were held with the main organisations involved in rail travel following the 1993 Railways Act.

5.2 Rail Regulator

5.2.1 An approach to the regulator would depend on whether they are to be involved at all. An exemption to operate the line as a tourist attraction would require no further involvement from the Regulator.

5.2.2 If it were operated as part of the national network then it would require a safety case in order to obtain a licence from the Regulator. The Regulator would consider the access regime based on an operating proposition provided to him. He would take into account the investment funded by relevant parties when considering the proposition.

5.3 Office of the Passenger Rail Franchiser

5.3.1 The Office of the Passenger Rail Franchiser's (OPRAF) starting position would be to designate a route as experimental. In order to limit future liabilities OPRAF would be keen only on this form of designation. The level of service would be a matter between track owner/operator and the train operator and when the franchise is let the contract for those services would be passed onto the franchisee.

5.3.2 Prior to the 1993 Railways Act, station and line closure procedures had been governed by the provisions of the 1962 Transport Act (Sections 54 and 56). The deterrent effect of the complex processes on new station and line initiatives (or re-openings) had been addressed through the 1981 Speller Amendment to the 1962 Act; Section 56A enabled stations or lines to be opened on an experimental basis and subsequently closed again within an experimental period of five years (if commercial or other criteria had not been met) without going through the statutory closure processes. Such designations were carried through into the 1993 Act, and OPRAF has been given power to give experimental designations with a five year limit. So called Speller designations cease to be so at the point of franchising and would thereafter have to go through a closure procedure. On this basis it would not however be possible within the timescales currently being promoted for franchising the remainder of the Train Operating Companies (TOC) and the timescale for the promotion of a scheme for the desired experimental designation to be available.

5.3.3 Support from OPRAF would be paid to a franchisee for all of its operations and would not be line specific, however OPRAF would not be interested in funding "white elephant" services. Long term liabilities would need Treasury approval which is unlikely to be forthcoming presently. Replacement (essential maintenance) of the West Coast Main Line is cost neutral to OPRAF. The capital cost of improvements however would be met by higher access charges. The government recognise that not all of the benefits can be met from fares and such additional costs that it considered justifiable would be channelled through OPRAF to the franchisee to pay for the additional access charges incurred.

5.3.4 At first glance OPRAF would view sympathetically a scheme whose subsidy requirement would be say £½ million per year but which demonstrably would reduce subsidy requirement elsewhere by say £1 million per year. The issue would be how the cash generated say for West Coast Main Line would be accounted for across the boundary to Regional Railways North West. OPRAF are currently feeling their way on these issues. OPRAF would take a view depending on the model of patronage developed.

5.3.5 Were there to be a net subsidy increase, its "amenity" value could be measured against parameters such as economic re-generation, transport policy etc. and could have advocates in government departments such as Environment, Transport, Trade and Industry etc. An approach to the Government Office for the North West has indicated that sympathetic consideration would only be given to a scheme where there were demonstrable non-user benefits identified as part of a section 56 type appraisal and where there is significant private sector financial interest.

5.3.6 Railtrack have a requirement to renew assets at no drain to the public purse. This is different to the Bury to Altrincham Light Rail scheme where renewal formed part of the investment case. There would appear to be little to differentiate Light from Heavy rail options (save for technical/engineering issues particularly where there may be joint or close proximity running) so far as OPRAF are concerned. However they have no money for capital contributions which come from Railtrack, Rolling Stock Companies and EU type grants.

5.3.7 OPRAF believe that DoT economists would need to be assured of the robustness of patronage demand models. OPRAF would be interested to have on-going involvement during any subsequent feasibility studies.

5.4 Train Operating Company

5.4.1 Before becoming interested Regional Railways North West would need to be assured of a market case, analysed in the appropriate way.

5.4.2 They would take a dim view of a scheme which did not cover its costs and would be concerned to ensure subsidy from OPRAF. It would not be desirable from their business point of view to provide services where the longer distance element and cost go to another TOC.

5.5 Railtrack

5.5.1 Railtrack would be interested in any proposals which make an adequate return on investment. They believe that land assembly will be a crucial and difficult first step in the process of promoting a line from Penrith to Keswick. Were the scheme to be promoted as a "heritage" line then agreement would need to be reached on maintaining cross-overs and the appropriate level of access charges for the section from the junction of the line to Keswick with the West Coast Main Line to Penrith station. Were Railtrack to take part in the full scheme i.e. buying the land and investing in infrastructure then they would need to have shown that a return could be made on that network.

5.5.2 Railtrack point out the issues of competition as it affects franchises currently being let. Access to Penrith station is currently limited to Inter-City West Coast and Inter-City Cross-Country. Moderation of competition ends, in its current form, after 1999, thus allowing the potential for other TOCs to operate out of Penrith from that time.

5.5.3 At the feasibility stage, Railtrack would be involved were there something worth pursuing, otherwise they would act as advisors. Post-feasibility Railtrack's approach would be similar; they would participate in a promoting group were there to be demonstrable returns.

5.5.4 Railtrack criteria for involvement in a scheme would be based solely on financial return on investment. This return will be governed by the level of risk taken and Railtrack recognise the regulators position that a share in the benefits has to be in proportion to the share of the risk taken (Investment in the Enhancement of the Rail Network published by the Rail Regulator). Generally the rail industry is conservative and this approach colours the current views of Railtrack, they are relatively risk averse.

5.5.5 Railtrack would feel more comfortable with a service operated with subsidy from the Franchising Director as a revenue stream is more assured. Railtrack would be more concerned with a scheme which ostensibly covered cost and required no additional subsidy.

5.5.6 Safety approval through the Safety And Standards Department is of paramount importance in anything Railtrack contemplates.

5.6 Summary

5.6.1 In order to gain support from the rail industry a clear and robust financial case needs to be demonstrated

6. Route Feasibility

6.1 Introduction

6.1.1 This section consists of a review of the current condition of the track bed and associated structures between Keswick and the West Coast Main Line at Penrith. An estimate of the cost of re-opening the line is also considered. It must be stressed, however, that these estimates are only indicative at this pre-feasibility stage.

6.1.2 The condition of the route was assessed by visual inspection where possible. Access to parts of the route was difficult and not possible for around 25% of the route. However it is considered that the 75% of the route which was inspected provides a good indication of the condition of the whole route.

6.2 Track Bed Condition

6.2.1 The vast majority of the track bed between Keswick and the West Coast Main Line at Penrith is still in place and free of obstructions. There are, however, a number of locations where the track bed has been removed or development has taken place. An overview of the situation at the time of inspection is shown on Figure 2, Appendix A. Significant difficulties are discussed in the paragraphs below.

Big Tunnel

6.2.3 Just to the east of the A5271 bridge over the railway in Keswick (Nos. 2 and 3 in Fig 2) the cutting leading to the Big Tunnel portal was infilled during construction of the A66 Keswick Northern Bypass in 1977 and the Big Tunnel was also infilled. It is believed that the tunnel is still intact needing only excavation. It is estimated that approximately 92,000m^3 of material needs to be removed to expose the railway track bed. The structural condition of the tunnel will also need to be assessed.

Threlkeld

6.2.4 West of Threlkeld the line alignment has been obliterated by the construction of a viaduct carrying the A66 over the River Greta, associated landscaping between the A66 and U2960 (old A66) and removal of Bridge No 77 which carried the U2960 over the railway. East of this bridge the railway alignment is intact

6.2.5 A new 430m section of railway will need to be built to connect the existing track beds. A possible alignment is shown on Fig 3, Appendix A, and differs from that suggested in the Outline Development Plan. The suggested alignment bears left away from the current track at the west end of Bridge No 75, requiring a replacement structure, so that the line can develop a tight 200m radius curve to bring the new railway between the piers of the Greta Viaduct. It then bears right on a 200m radius curve to cross under the U2960

with a new road bridge and connecting with the existing alignment at Bridge No 78 over the River Glenderamackin.

6.2.6 The alignment requires 200m radius curves which would impose a speed limit on trains of 30 mph[1]. The route would need to run on a substantial embankment to maintain track bed levels and the impact of this feature on the flood plain of the River Greta needs to be assessed. The new bridge carrying the U2960 over the railway could have an adverse impact on the nearby Threlkeld Bridge.

Tan Moss

6.2.7 A 580m section of the railway track bed was removed during construction of the A66. A new section of railway alignment is needed through this ecologically important site and early discussions with English Nature are essential. The ground is boggy and fairly level so there is little need for major earthworks. We have allowed for the track to run some 0.5 m above existing ground level to allow for the provision of a firm foundation.

Beckces

6.2.8 A substantial length of track bed together with a number of structures has been lost during construction of the A66 and its associated works and landscaping, in and around Beckces.

6.2.9 A possible 1050m alignment is shown in Fig 4, Appendix A and indicates a high level route for the railway over the A66 and the three crossings of the B5288. A viaduct is suggested in Beckces to minimise the visual obstruction which would be caused by a solid earth embankment. All new structures will need to provide a full height headroom for vehicles. A larger headroom may be needed for the A66 which is an abnormal load route to industrial West Cumbria and BNFL Sellafield.

Penruddock

6.2.10 Penruddock Station has been developed as a housing estate with gardens occupying the track bed. Just beyond the station the line is used as an LPG store. It is suggested that a new 700m section of track bed is constructed between the B5288 and Penruddock Viaduct through agricultural land to the south of the original railway line. The suggested alignment is shown at Figure 5, Appendix A.

Blencow

6.2.11 Blencow Station has been converted into residential use, with the track bed used as a garden, and on the eastern side, into a HGV yard. It may be possible to use the line at the northern edge to minimise impact on the existing uses. Otherwise a new section of alignment will be needed.

[1] Civil Engineering Handbook No. 49:- Track Design, British Railways Board

6.2.12 There are a number of other locations where development has occurred on the track bed for example cattle sheds, stables, a caravan park, gardens, etc. The acquisition of these elements are essential in completing the line either by agreement or by Compulsory Purchase.

6.3 Structures

6.3.1 There are over sixty five significant crossings on the railway where a bridge or viaduct is required. Almost forty of these are still intact but have deteriorated since the railway was closed in 1972. The remaining 26 have either had the bridge deck removed (13 no) or have been completely demolished including abutments (13 no).

6.3.2 The existing structures are constructed using a variety of structure forms. There are plate girder bridges (4 no), inverted and upright bowstring girder bridges (9 no), traditional masonry arched bridges (13 no), lattice girder accommodation bridges (3 no), concrete slab bridges (2 no) and cast or wrought iron girder bridges (5 no). The latter carry minor county roads over the track and are maintained by Cumbria County Council. There are two tunnels, three masonry arch viaducts, and some large masonry retaining walls. The viaduct at Mosedale has twelve arched spans and is clearly a major structure in itself. In addition there are many minor culverts and the like which at this stage are not significant.

6.3.3 The present condition of the existing structures was assessed by site observation. Approximate measurements were taken but no attempt was made to expose hidden parts of the structure, measure section sizes, quantify corrosion or measure residual section sizes. A photographic record was made.

6.3.4 The data from the survey has been tabulated at Appendix C using the original CK&P structure numbers. A location plan is also included at Appendix C. From the table an assessment has been made of the remedial work required to each structure, that is, the work necessary to restore a bridge to a safe working condition and to ensure that it can safely support current loading requirements. The remedial work has been prioritised as :-

E Essential
H High Priority
M Medium
L Low Priority

6.3.5 Clearly, work is essential if a bridge deck has been removed or a bridge completely demolished. High priority has been applied to structures where, for example, steel corrosion is severe or where obvious strengthening is required to ensure structural integrity. At this stage essential and high priority work has been combined into a single category.

6.3.6 Medium priority work should be carried out within two years as good practice and to minimise future maintenance costs. Low priority work should be done within five years.

6.3.7 If the project proceeds to the next stage further work will be necessary before details can be finalised. It will be necessary to carry out a detailed inspection and load assessment for each existing structure including tunnels and viaducts and confirm strengthening requirements and cost estimates.

6.4 Land

6.4.1 Since closure of the line for freight in 1964 and to passengers in 1972 British Rail has sought to dispose of the surplus railway lands and property through the Property Board. With regard to the Penrith-Keswick line this policy has been successful and now only a few hundred meters of the line are not in private ownership. British Rail Property Board had retained ownership of all significant structures on the line.

6.4.2 The railway land has been disposed of piecemeal to a wide variety of landowners and in a wide variety of parcel sizes. These range in length from tens of meters, to add to the garden of an adjacent house, to several kilometres in the case of the National Park Authority and the railway path. The land has been put to many different uses and these are shown on Figure 2, Appendix A.

6.4.3 Reconstruction of the railway will require assembly of the necessary land. The majority of the land required will be old railway land, but in a number of locations agricultural land is needed for sections of new alignment. It may be possible to acquire some land through negotiation , however there is some anecdotal evidence that some land owners do not favour reopening the line. It will, therefore, be necessary to acquire compulsory purchase powers from Parliament via the Transport and Works Act 1992. The way the line is operated will affect this process as a public benefit will need to demonstrated; this could be difficult in the case of a tourist attraction.

6.5 Cost Estimates

6.5.1 Preliminary budget cost estimates have been prepared for reinstating the track bed and for the remedial work to the structures are presented below. These estimates are only based on a visual inspection of the line and are only indicative at this pre-feasibility stage. The costs are works costs and exclude legal costs and fees.

Track Bed

6.5.2 The costs included in the section are those associated with site clearance, fencing, earthworks and laying 28.16km of track for heavy rail. The costs associated with new structures for those sections which require new track bed are included in the structures section below. The estimated cost of reinstating the track and track bed is shown in Table 6.1 below. The land cost is notional.

Table 6.1 Cost Estimates:- Track Bed

Work	Cost £m
Land	1.00
General Site Clearance	0.05
Earthworks	1.85
Fencing	1.20
Track and Ballast	3.90
Total	**8.00**

Structures

6.5.3 The estimated cost of restoring or providing the structures on the route to safely support current loading requirements for heavy rail operations is given below in prioritised order:

Table 6.2 Cost Estimates Heavy Rail Structures

Remedial Work	Cost £m
Essential & High Priority	
Provide complete new bridges	9.25
Renew bridge decks	0.50
Carry out essential remedial work	3.25
Sub-Total	**13.0**
Medium Priority	0.8
Low Priority	0.2
Total	**14.0**

Light Rail

6.5.3 A light railway imposes a less onerous loading condition on the structures and may lead to lighter and possibly smaller bridges and would be less costly than heavy rail. Savings could be made where a complete new bridge is required and to a lesser extent where a new bridge deck is needed. Some existing steel structures need to be strengthened to restore structural integrity or to reinstate corroded members. Again there is potential for savings but probably not as much as for new build work since many bridges need maintenance painting as a priority.

6.5.4 The work assigned to masonry arches, viaducts and tunnels is necessary to restore structural integrity and is independent of loading condition. At this stage no significant strengthening of these structures is envisaged and therefore any potential savings would be very small.

6.5.5. The cost estimate for reinstating structures for a light railway are given in Table 6.3 below.

Table 6.3 Cost Estimates:- Light Rail Structures

Remedial Work	Cost £m
Essential & High Priority	
Provide complete new bridges	7.45
Renew bridge decks	0.40
Carry out essential remedial work	3.15
Sub-Total	**11.0**
Medium Priority	0.8
Low Priority	0.2
Total	**12.0**

6.5.6 The preliminary budget estimate for reinstating the railway between Penrith and Keswick is £22m for heavy rail and £20m for light rail, excluding legal and professional fees. The overall cost compares well with that in the Outline Development Plan.

6.7 Summary

6.7.1 The present day condition of the route was assessed by site inspection. Access to approximately 75% of the route was possible and gives a good indication of the condition of the whole route. Most of the track bed and structures are still in place but there are several locations where the line has been lost to road improvements and to other developments. New alignments will be needed for these sections. There are a number of other locations where the line is obstructed, and will need to be cleared, or where individual structures have been removed.

6.7.2 Nearly all of the line has been sold to private owners and acquisition of the land either by negotiation or compulsory purchase will be necessary.

6.7.3 Preliminary cost estimates have been prepared to reinstate the track bed and structures, for heavy rail the cost will be in the region of £22m and £20m for light rail. It is emphasised that, owing to the nature of the study, these costs are indicative.

7. Keswick-Threlkeld Railway Path

7.1 The Existing Path

7.1.1 The Lake District National Park Authority own the section of the railway between Keswick and Threlkeld which is used as a footpath and cycleway. The path is well graded, remote from traffic and passes through the attractive scenery of the River Greta. It is popular with walkers and cyclists; in recent surveys upto 300 walkers and 90 cyclists have been recorded on the busiest days[2]. The lower level of use by cyclists is not surprising given that the section over the Big Tunnel has a flight of rough steps where cyclists have to dismount and walk.

7.1.2 Permissive paths from Blencathra and from Castlerigg Stone Circle join the path at a number of points.

7.1.3 The railway is single track between Keswick and Threlkeld Station and is not wide enough to allow joint use of the track bed by trains and the 1.9m wide path. In any case separate routes would be needed at the two tunnels and other structures. A number of alternative options are considered below.

7.2 Path Following Existing Line

7.2.1 It may be possible to provide a new path suitable for cyclists and walkers generally within the boundary of land associated with the railway. There are two options:

i. Widen the formation to accommodate the line and the path. The very close proximity of walkers and cyclists to moving trains would not be very pleasant and this option is not recommended.

ii. Where there are embankments and cutting a path could be provided on the side slopes, requiring the construction of appropriate retaining structures. Where the railway is at grade the path would need to run in adjacent land. At many river crossings new bridges will need to be provided where strengthening works to the upright bowstring bridges prevents attaching foot/cycle ways to existing structure. There are two masonry arch over bridges where careful routing would be needed. At Little Tunnel the path could be taken round the spur on the riverside of the railway and at Big Tunnel the existing alternative path would be used. In Keswick there is a potential advisory cycle route from the Shell Garage on Penrith Road to the town centre via Trinity Way and Blencathra Street. The path would need to cross the railway at several locations to achieve the best alignment. As a safety measure the path would need to be fenced.

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[2] Recreational Use of the Keswick Railway Path Summer/Autumn 1995, May 1996 Lake District National Park Authority.

7.3 A Separate Path

7.3.1 From Keswick town centre an advisory cycle route via Blencathra Street and Trinity Way would give access to Penrith Road. From Penrith Road the existing Public Bridleway along Forge Lane would be followed to the bridge over the river. Here a permissive footpath crosses under the A66 Greta Viaduct and proceeds on the North side of the River Greta through Brundholme Woods. The permissive path exits either onto:

i. Brundholme Road near the road-head from where walkers and cyclists would follow the track to Wescoe and then via the road or Public Footpath to Threlkeld, or

ii. the railway path near a short distance from the Wescoe access point and a new linking section in the adjoining field would be needed to bring the permissive path out at the Wescoe access point. The routes in i. above to Threlkeld would then be followed.

7.3.2 The permissive path through the woods is not suitable for joint use with cyclists owing to its restricted width and steep gradients. A track could be constructed with the permission of the land owner but there would still be some sections with steep gradients and would therefore be less attractive to walkers and cyclists than the railway path.

7.4 Brundholme Road

7.4.1 Brundholme Road from Keswick is mostly metalled and very lightly used by vehicular traffic because it is not a through route for vehicles. The section Between Brundholme house and the Wescoe access point is not metalled and is presumably not a public highway, although there is a footpath to Blencathra from this section. A surface treatment would be required for safe cycling as well as the landowners permission to use the road. The gradients are steep in places which may limit the popularity of this route. From the Wescoe access point the road continues to Threlkeld.

7.5 Summary

7.5.1 A number of alternative routes to the existing railway path have been identified and further work beyond this pre-feasibility study is needed to refine these possibilities, undertake discussions with relevant landowners and estimate costs.

8. Economic Impact

8.1 Principles of Wider Economic Impact

8.1.1 There are two principal mechanisms associated with the wider economic impact of rail investment. The first relates to the improvement in accessibility associated with the provision of rail infrastructure in terms of journey time, cost, reliability, comfort and safety. This results in extended travel to work and customer catchment areas. Businesses gain from improved choice in the labour market, reduction in inefficiencies caused by travel to work difficulties, and ready access to a larger customer market. The labour force (in and seeking work) gain from extended job choice/employment opportunities. The second, is the effect of the rail investment on perceptions of investment risk in the benefiting area. Rail investment provides a signal of the investment bodies' confidence in the area and their commitment, in funding the scheme, to securing an adequate return on investment. In turn this enhances the confidence of businesses, residents and property investors in the area so that investment risk is reduced.

8.1.2 There are two broad effects of these mechanisms. The first, development effects include:

- land/property brought into development/redevelopment that would otherwise not have been, or would not have been in the same time scale, or for the same use or the same standard;
- accelerated/enhanced level of lettings/sales of vacant property to end users; and
- enhanced land/property values.

8.1.3 The second, employment and other economic effects, include:

- the net gains in direct employment resulting from the development effects together with the associated indirect and induced employment (i.e. the multiplier effects of the direct gains);
- increased employment attributable to the expenditure generated by the increased throughput of tourists, visitors and customers;
- a reduction in the spatial structural component of unemployment through enhanced accessibility to job opportunities within and beyond the rail corridor and through widening of job search areas;
- efficiency gains for existing businesses, leading to reduced costs, increased profitability and ultimately increased output (and possibly added employment);
- the retention of employment which would otherwise have left the area;
- improved functioning of the labour market through increased participation rates, particularly in the female and part time sectors;

- improved confidence in an area, such that the initial impetus to increased activity provided by the rail investment is subsequently built upon in ways only indirectly related to rail;
- savings in other expenditure on regeneration which might have been required were it not for the rail investment; and
- increased access to centralised public services (schools, hospitals, libraries, local government services and so on) thereby allowing economies through the concentration of their provision.

8.1.3 The likelihood that rail investment will stimulate these types of economic/regenerative benefits is a function of a number of factors. Where development and wider economic benefits have been achieved certain prior conditions have generally been satisfied, these include;

- the rail service produces significant improvements in accessibility, in both peak and off-peak;
- adequate and growing demand by investors and occupiers for new property (and for uses which are sensitive to public transport access);
- available and developable land in locations suitable for uses sensitive to public transport access;
- the integration of transport planning with land-use planning early on in the development of a scheme;
- mechanisms for securing 'joint development', that is property developments linked to the scheme and taking advantage of the market and locational advantages;
- the existence of support for the scheme from the public and business community

8.1.4 Additionally, development effects and economic benefits tend to be confined to uses which are sensitive to good public transport access, for example, retailing, leisure/entertainment and office-based activity. Development effects tend to be limited to the station site itself and the adjoining area within a short walking distance, they are greatest in the central business district of built-up areas, and significantly more limited and highly localised in suburban areas, where road travel tends to be less inhibited by congestion, car parking costs, etc.. There is little or no development impact on heavier industrial or warehousing activity for which the overriding factor affecting location decisions tends to be road access for freight movement.

8.1.5 It is difficult to demonstrate, with concrete quantitative evidence, the returns from public transport investment which accrue to property owners/investors or the wider economy. The best evidence of impact is of the instances of value capture (contribution by the private sector to costs) that has been achieved, whether voluntary or through planning incentives or fiscal

mechanisms such as a betterment levy. Consultation with individual developers is beyond the scope of this pre-feasibility study but could form a very important part of further investigation of the feasibility of the rail investment. The criteria by which the private sector, in a benefiting area, evaluates the gains realised from rail and other infrastructure investment tend to be different from those exercised by the transport authority or government. Although high patronage levels and the likelihood of regeneration/wider economic benefits are of general concern, local circumstances, including the differentials between development or occupation costs, likely risks and expected returns, against any potential 'betterment' from efficient public transport access, will affect not only fundamental location decisions by property investors and occupying businesses, but also the margins available for value capture.

8.1.6 In assessing the wider impact of the potential Penrith to Keswick rail investment we have considered whether the necessary conditions for the investment to generate wider economic benefits to local economies exist. From the onset, however, we envisage that the principle impact of the railway would relate to the dissipated additional employment associated with expenditure generated by tourist users of the service. We have established in an earlier section of this report that operating the facility as a tourist attraction, as well as a public service, could result with a patronage in the order of 112,000 passengers per annum. Later in this section we will seek to provide a crude quantification of the impact of the expenditure of the tourist users of the service following our initial consideration of the necessary conditions for the rail investment to generate wider economic benefits.

8.2 Existence of the Necessary Conditions For Wider Economic Benefits

8.2.1 For wider economic benefits to accrue to an area from the introduction of a public transport facility there needs to be an improvement in accessibility as a result of the service provision. There appears to be limited evidence that the reconstruction of the heavy rail service will provide improvements in general accessibility in the benefiting area in terms of journey time savings, comfort, safety and reliability. The options for light rail and narrow gauge rail lines compare unfavourably, in terms of accessibility, to the heavy rail option if the system is operated purely as a public transport facility. Therefore the likelihood of impacts on the wider economy will be similarly reduced.

8.2.2 Anecdotal evidence suggests that there is currently a low level of developer demand in the rail corridor and that occupier demand is low and stable. It is difficult at this stage to suggest whether there is available development land in the proximity of the alignment, however it would appear that development options are limited.

8.2.3 In the absence of empirical research into land availability, developers and business demand in the area, the most tangible evidence of low levels of occupier demand is reflected in employment and unemployment figures. Table 7.1 sets out the change in unemployment experienced in the travel to work

areas of Keswick and Penrith compared to the rest of Cumbria between January 1995 and 1996. A small decrease in unemployment suggests some movement in the occupier market, however, there is little evidence to show anything other than the take up of spare capacity in existing premises.

Table 8.1 - Unemployment Change, January 1995 to January 1996

Area of Interest	Unemployed at January 1995	Unemployed at January 1996	Narrow Based Unemployment Rate at 1/96	% change in Unemployment 1/95 - 1/96
Keswick TTWA	261	269	8.0	3.1
Penrith TTWA	850	814	5.4	-4.2
Keswick & Penrith TTWAs	1111	1083		-2.5
Cumbria	19455	18537	9.3	-4.7

8.2.4 Information on the changing levels of employment in the vicinity of the rail line is less up to date and therefore provides a poorer indicator of the occupier market. In general, employment numbers appear to still be below levels experienced in the late 1980s although there does appear to be slow continuous growth in employment.

8.2.5 We have not been able to establish the opinions of the public and business community and are therefore unable to conclude on the existence of support for the scheme.

8.2.6 In conclusion, therefore, there appears to be limited evidence that the conditions exist for the reconstruction and operation of the rail line as a public transport facility to generate wider property and employment benefits to the area of influence.

8.3 Quantification of Tourist Expenditure

8.3.1 We have made some crude calculations to represent the patronage figures for the heritage option of the line as tourist expenditure in the area and, ultimately, jobs. The approximate yardstick of 112,000 passengers using the service as a tourist attraction would comprise day trip and long stay tourists. It is unlikely that longer stay tourists would be undertaking their visits purely on the basis of visiting the railway although this may be the case for some day trippers to the Lakes. We are, therefore, only realistically attributing day trip expenditure to the existence of the railway. Further to this, a proportion of day trippers would have undertaken their visits to the Lakes regardless of the existence of the railway.

8.3.2 Table 8.2 sets out a number of scenarios of tourism expenditure by net additional tourists attracted to the Lakes as a result of the introduction of the railway. The expenditure has been represented as potential employment opportunities in the benefiting area by converting expenditure into jobs on the

basis of £30,000 of expenditure would be required to create one additional job in the wider economy.

Table 8.2 - Expenditure of Net Additional Tourists to the Lakes

Proportion of Net Additional Tourist	Tourist Expenditure Assuming £8 per passenger (£ 000s)	Tourist Expenditure Assuming £16 per passenger (£ 000s)	Full Time Employment Equivalent Assuming £8 per passenger	Full Time Employment Equivalent Assuming £16 per passenger
60%	538	1076	18	36
40%	359	718	12	24
20%	179	358	6	12

8.3.3 In our most optimistic scenario assuming net additional tourist activity equivalent to 60 per cent of the total patronage of the service and each of those tourists spends in the region of £16 in the local economy as a result of their journey on the railway then approximately 36 jobs could be created in the wider economy.

8.4 Summary

8.4.1 The mechanisms of wider economic benefits have been described and an assessment on the extent that these exist in the Penrith-Keswick corridor has been made. It has been concluded that there is little evidence to suggest that the operation of the line as a public transport facility would generate wider economic benefits in the area.

8.4.2 An estimate of the potential number of jobs created by operating the line as a tourist attraction has been made. This indicates that between 6 and 36 jobs could be created depending on the number of additional tourists attracted to the area and how much they spend.

9. Environmental Impact

9.1 Introduction

9.1.1 In this section a preliminary assessment of the likely environmental impacts of re-opening the Penrith-Keswick railway has been made.

9.2 Noise

9.2.1 The railway passes through a residential area of Keswick, and near to the villages of Threlkeld, Troutbeck, Penruddock, Newbiggin, and Stainton. There are also a number of isolated dwellings along the length of the line near enough to be affected by railway noise. The service is likely to be operational between 6am and 10pm. Services running early in the morning and late at night are likely to be particularly intrusive.

9.2.2 There are a number of properties, including old British Rail properties which have now been converted to private residential use, in the immediate vicinity of the line which will be particularly badly affected by noise and some mitigation measures may be needed.

9.3 Air Pollution

9.3.1 The frequency of service is unlikely to be at a level that will cause a significant impact on air quality from train emissions. Diverting car trips to rail could result in a reduction in air pollution associated with road traffic. There may be some localised nuisance from particulate emissions, including soot, smoke and steam from steam trains, and from dust and dirt arising from the movement of trains

9.3.2 If the line is operated as a tourist attraction then it is likely that most tourists will visit the line by car, and then go on to other attractions. Hence the line could generate significant additional car trips to the corridor and have a detrimental effect on air pollution.

9.4 Visual Intrusion and Obstruction

9.4.1 As the proposed alignment follows the original route visual obstruction will be limited to sections which vary in alignment or require new structures or earthworks. The visual effects of the A66 crossing and the route through Beckces will need careful consideration. The effects may be mitigated to some extent by the use of appropriate engineering measures where required, for example the use of a viaduct rather than an embankment will cause less visual obstruction at Beckces.

9.4.2 The railway passes a number of properties in Keswick, the Golf Course and several properties in the rural area which are likely to suffer visual intrusion from the trains themselves.

9.5 Effects on Agriculture

9.5.1 Most of the route is currently unavailable for agricultural use. There are some sections which have been merged with other agricultural land for example at Highgate and at Hoghouse Hill. Sections of new alignment on the route will involve some landtake affecting local farms.

9.6 Heritage and Conservation Areas / Ecological Impact

9.6.1 Between Keswick and Penruddock the line is within the Lake District National Park. As the proposed rail link will improve public transport provision and could reduce the numbers of private vehicle trips, depending on the type of operation, it may be viewed favourably by the Park Authority. It will be necessary to assess the potential impact on important historic sites, natural habitats, and other designated sites of historic, scientific or natural significance along the length of the route, such as Tarn Moss. Liaison with the Park Authority will be essential in identifying any such sites and in assessing potential impact.

9.6.2 Since closure of the line to traffic in 1972 much of the line has been abandoned and has become a home to wildlife. Reintroduction of train services will have an impact on this habitat.

9.7 Summary

9.7.1 The line passes through open countryside for much of it's length, part of which is in the national park. The operation of the railway will cause disturbance in the quiet countryside environment through increased noise, air pollution and intrusion. The line will cause visual obstruction in some locations, principally at Beckces.

9.7.2 Overall the line may reduce levels of air pollution as car journeys are attracted to the service. If, however, the line is operated as a tourist attraction then the levels of air pollution may rise through the generation of new car trips to the corridor.

9.7.3 The line will have disbenefits on agriculture owing to the loss of agricultural land to new section of railway and to loss of the line which is used in parts for agricultural purposes. The effects of the line on Tarn Moss and to wildlife habitats needs careful assessment.

10. Conclusions

10.1 The results of the travel demand model for the A66 corridor indicate in the Central Case an annual patronage of the order of 36,000 single way trips per year. This would abstract some 20% of the present rail patronage between Oxenholme and Windermere to the Penrith-Keswick line. This level of patronage is significantly less than that estimated in the Outline Development Plan in which the passenger estimates are based on a percentage of all visitors to Keswick. The visitor numbers for Keswick include a high proportion of Cumbrian residents who will be unlikely to use the railway unless living close to a train station.

10.2 A "Best Case" model has been developed which takes an optimistic view of future levels of demand and assumes 5 direct trains from the North-East per day. This model forecasts 68,000 annual single way number of journeys per year, which represents an additional 43,000 single way rail trips per annum.

10.3 In both cases the revenue generated by the line (Central Case, £198,000; Best Case £774,000) is significantly less than the estimated operating cost for the line (Central Case, £800,000; Best Case £2,000,000) even accounting for network wide benefits. There is some interest in the rail industry in reopening the line but this depends on being able to demonstrate a sound financial case, which given the passenger forecasts will be difficult.

10.4 Light Rail, Narrow Gauge and bus operation attract less patronage than the Central Case estimates for heavy rail of 36,000.

10.5 Operation as a heritage type line would produce larger patronage and for a return fare of £10.00 would cover operating costs. However operation as a tourist attraction has a number of drawbacks:

- attract additional car borne visitors in to the area
- increasing vehicular pollution levels,
- increase pressure for parking at Penrith and Keswick which may worsen traffic problems in these towns,
- reduce the public benefit of the scheme which could in turn reduce the prospects for acquiring the necessary powers to build the line,
- make funding more difficult, and
- not meet policy objectives of increasing the proportion of travel to the Lakes by public transport.

10.6 For Park and Ride to operate successfully for Keswick the site should be located on the periphery of Keswick and linked by a high frequency public transport route. These essential criteria are not met in the case of the railway with an hourly service linking a site near Penrith to Keswick.

10.7 Selected bus services (to approximately four destinations) from Keswick would need to be improved to about double their current frequency to adequately service Keswick as a rail head. The developments at Slapestones

and Whinfell will have only marginal effect on the line, and even that would rely on it being a heritage line.

10.8 From site inspection of most of the line the majority of the line and structures are still in place. There are several locations where major works will be needed to reconstruct the line. Nearly all of the line has been sold off to a number of landowners and to have any chance of reopening the line assembly of the land is essential. The acquisition of compulsory purchase powers is likely to be necessary. Preliminary budget cost estimates have been prepared which indicate that the line could be reopened for approximately £22m. This figure agrees with that in the Outline Development Plan.

10.9 Reopening the railway will have a significant effect on the Railway path which is very popular with walkers and cyclists. A number of route options have been identified but all are of a lower quality, in terms of gradient, ease of use, views etc. In proceeding with the railway the provision of a suitable alternative path will be important.

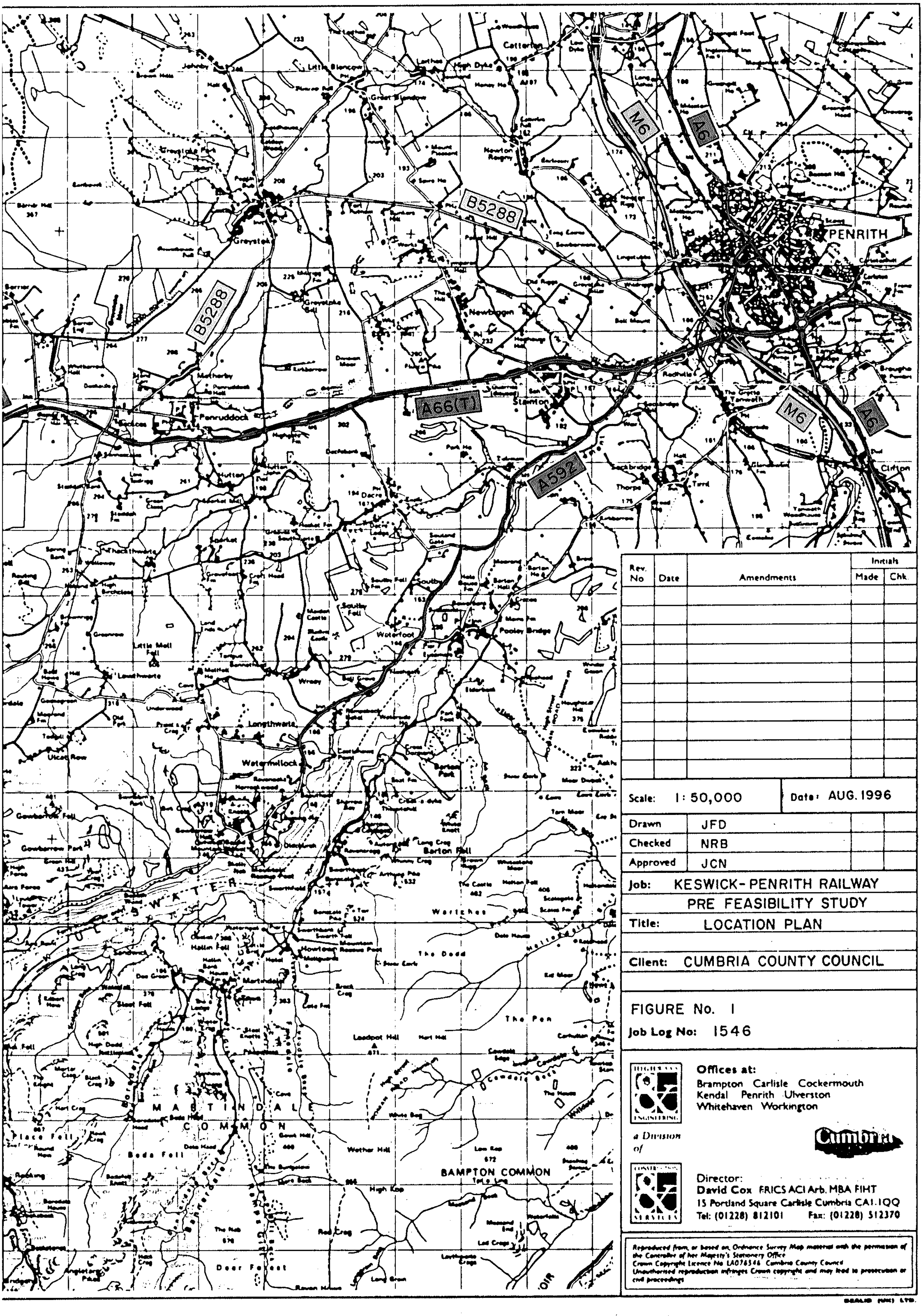
10.10 The line could have a beneficial effect on air pollution if car trips are attracted to the railway. If, however the line is operated as a tourist attraction then the additional car traffic attracted to the line could worsen air pollution. The line will increase levels of noise in the quiet countryside and villages especially with the early morning and evening services. There will be some visual disbenefits from the new alignments and with trains passing to and fro. The railway will require some agricultural land.

10.11 In economic terms the line is unlikely to have a significant effect on the area unless operated as a tourist attraction, in which case between 6 and 36 jobs could be created.

10.12 In summary the line is unlikely to be viable unless operated as a tourist attraction and high fares are charged. If it is operated in this way it may be difficult to acquire the necessary powers. Further development of Windermere as the principal railhead in the Lake District is considered desirable.

Appendix A

Figures



Rev. No	Date	Amendments	Initials: Made	Initials: Chk.

Scale:	1 : 50,000	Date:	AUG. 1996
Drawn	JFD		
Checked	NRB		
Approved	JCN		

Job: KESWICK-PENRITH RAILWAY
PRE FEASIBILITY STUDY

Title: LOCATION PLAN

Client: CUMBRIA COUNTY COUNCIL

FIGURE No. 1

Job Log No: 1546

HIGHWAYS & ENGINEERING

Offices at:
Brampton Carlisle Cockermouth
Kendal Penrith Ulverston
Whitehaven Workington

a Division of

Cumbria

CONSTRUCTION & SERVICES

Director:
David Cox F.R.I.C.S. A.C.I. Arb. M.B.A. F.I.H.T.
15 Portland Square Carlisle Cumbria CA1 1QQ
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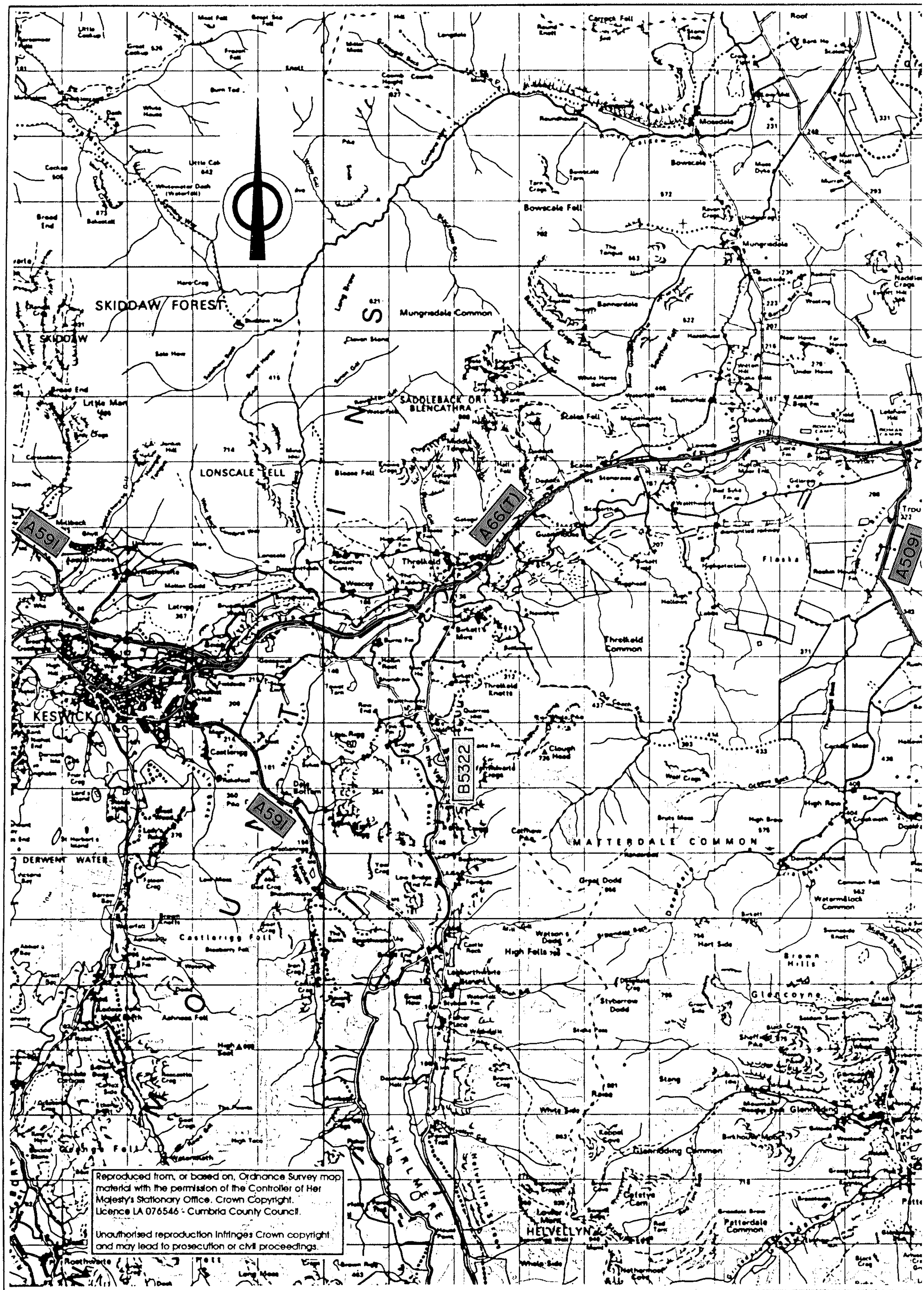

19. Beckces – Rail Bridge over B5288 removed.
20. Beckces – Rail Bridge over B5288 removed.
21. Beckces – Road bridge over railway removed.
22. Penruddock Station and Railway – Housing Estate on line.
23. Penruddock Station – LPG Store on line.
24. Kirkbarrow – Rail bridge over road missing.
25. Division Moor – Road bridge over railway missing.
26. Flusco Quarry – Line used as internal road.
27. Flusco – Rail bridge over road missing (headroom for HGV).
28. N. Flusco – Spoil heap on line.
29. Blencow Station converted to house and garden on line.
30. Blencow Station – HGV yard on line.
31. Blencow – Bridge over road missing.
32. Hoghouse Hill – Stables on line.
33. East of Hoghouse Hill – Stable/cattle sheds on line.
34. Slapestones – Contractor's yard/store.
35. Penrith Golf Driving Range – Embankment removed.
36. Redhills – Skip hire yard.

Rev. No.	Date	Amendments	Initials Made	Chk.

Scale: 1:50,000 Date: AUG. 1996

Drawn	JFD		
Checked	NRB		
Approved	JCN		

Job: KESWICK-PENRITH RAILWAY
PRE FEASIBILITY STUDY

Title: CONDITION OF LINE AT MAY 1996

Client: CUMBRIA COUNTY COUNCIL

FIGURE No. 2

Job Log No: 1546

Offices at:
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Kendal Penrith Ulverston
Whitehaven Workington

a Division of Cumbria

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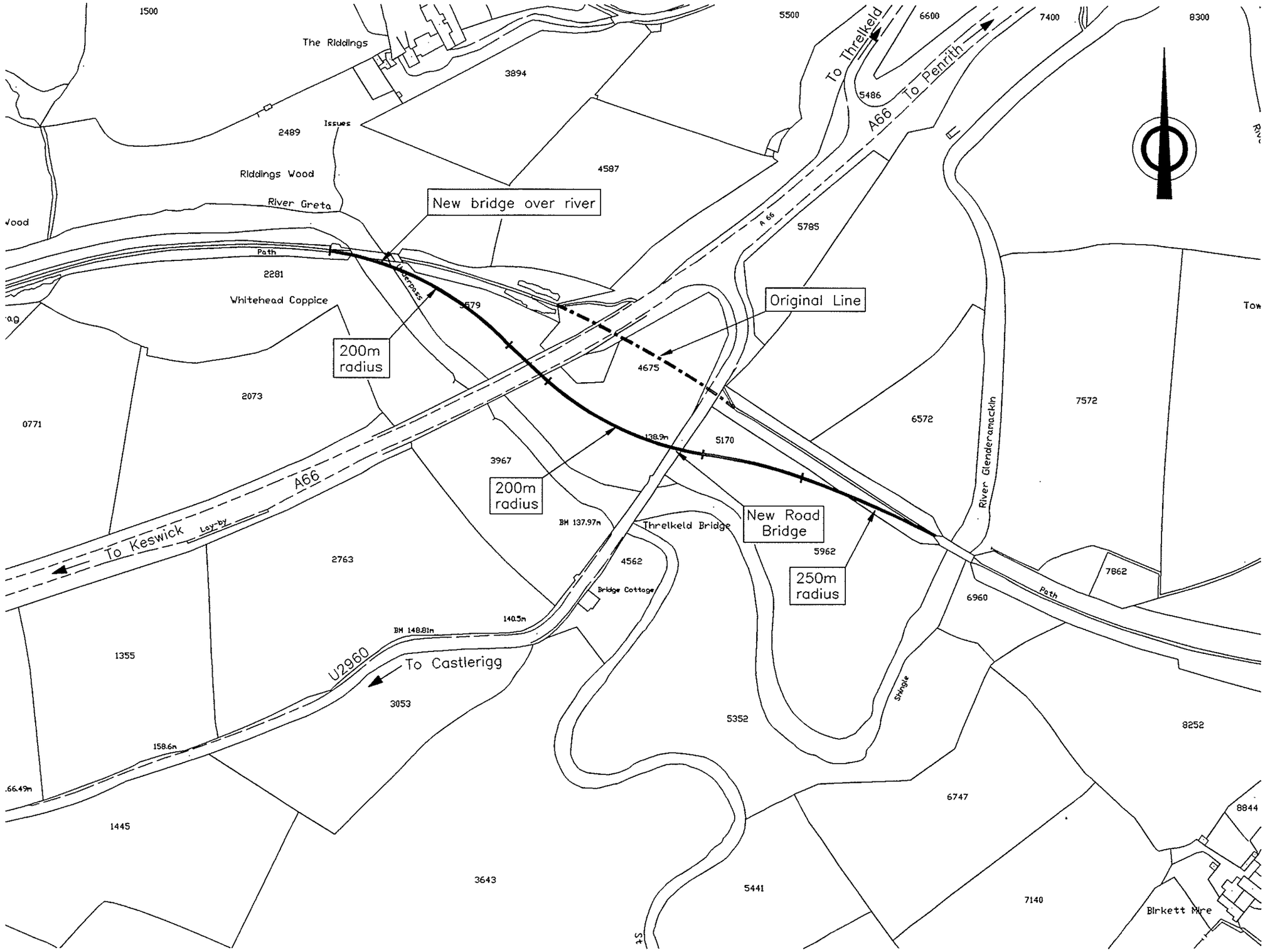
Condition of Line at May 1996

1. A591 Chestnut Hill – Box Culvert to rep
2. Cutting – Back filled.
3. Big Tunnel – Back filled.
4. Threlkeld Viaduct – Alignment and road
5. St John's In the Vale – Rail bridge ove
6. Threlkeld Station – National Park Depot
7. Keswick Golf Club – Groundsman's she
8. Birkett Field – Garden on line by Bridge
9. Highgate Cottages – Garden on line.
10. Gillsrow Bridge 94 – Stable/Cattleshed.
11. Gillhead – Caravan Park on line.
12. Troutbeck – Garden on line.
13. Troutbeck – A5091 Bridge over railway
14. Troutbeck Station – Garden on line.
15. Tarn Moss – Farm Accommodation Brid
16. Tarn Moss – Gap In alignment.
17. A66 and Beckces – alignment removed.
18. Beckces – New crossing of A66 needed

1513-306



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Rev. No.	Date	Amendments	Initials Made	Initials Chk.

Scale:	1:2500
Date:	AUG.1996
Drawn	JFD
Checked	NRB
Approved	JCN
Job:	KESWICK–PENRITH RAILWAY
	PRE FEASIBILITY STUDY
Title:	THRELKELD
Client:	CUMBRIA COUNTY COUNCIL

FIGURE No. 3

Job Log No. 1546

Offices at:
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Kendal Penrith Ulverston
Whitehaven

a Division of

Director:
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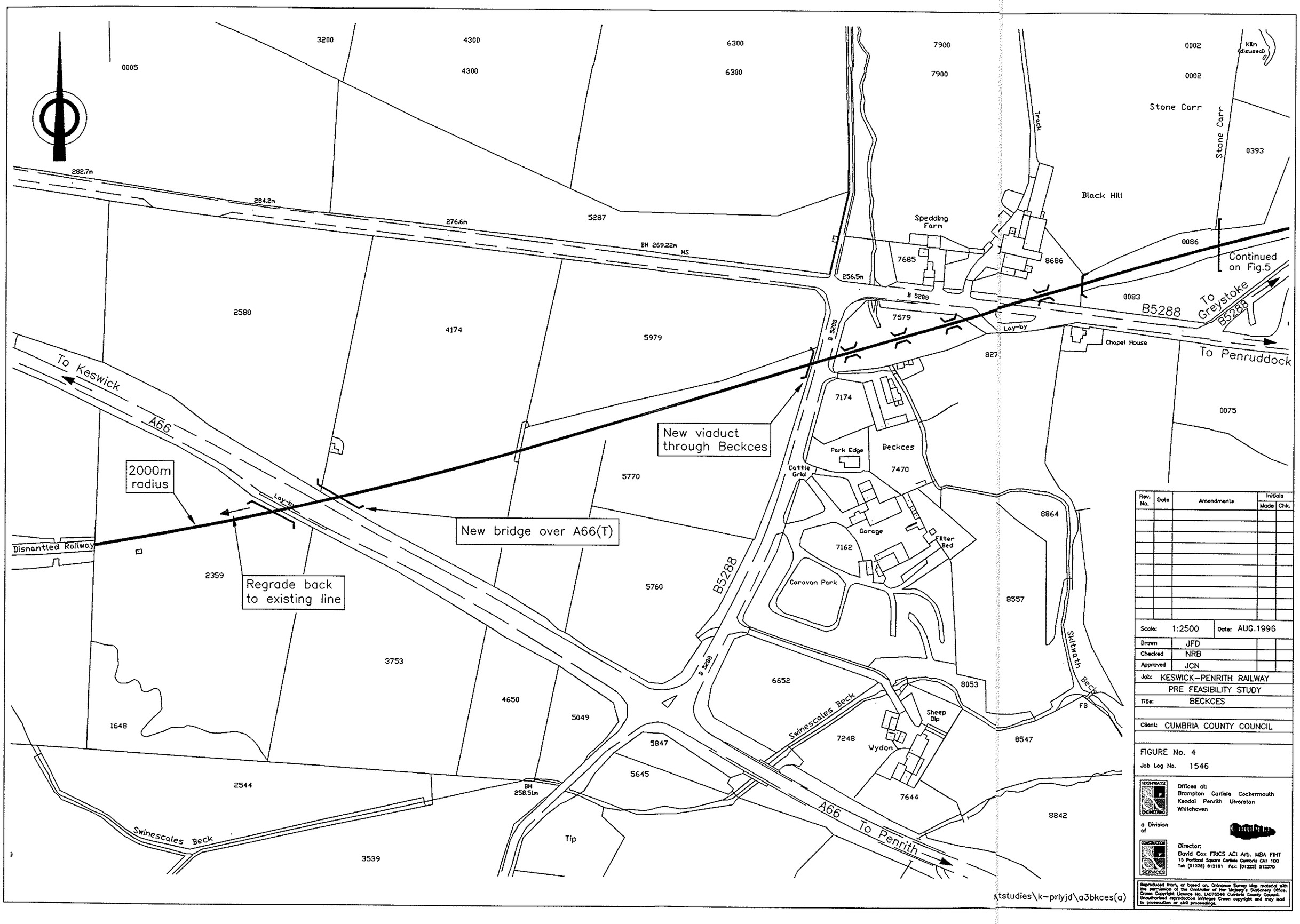

Rev. No.	Date	Amendments	Initials Made	Chk.

Scale: 1:2500 Date: AUG.1996

Drawn	JFD		
Checked	NRB		
Approved	JCN		

Job: KESWICK–PENRITH RAILWAY
PRE FEASIBILITY STUDY
Title: BECKCES

Client: CUMBRIA COUNTY COUNCIL

FIGURE No. 4
Job Log No. 1546

HIGHWAYS CONSULTANCY
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CONSTRUCTION SERVICES
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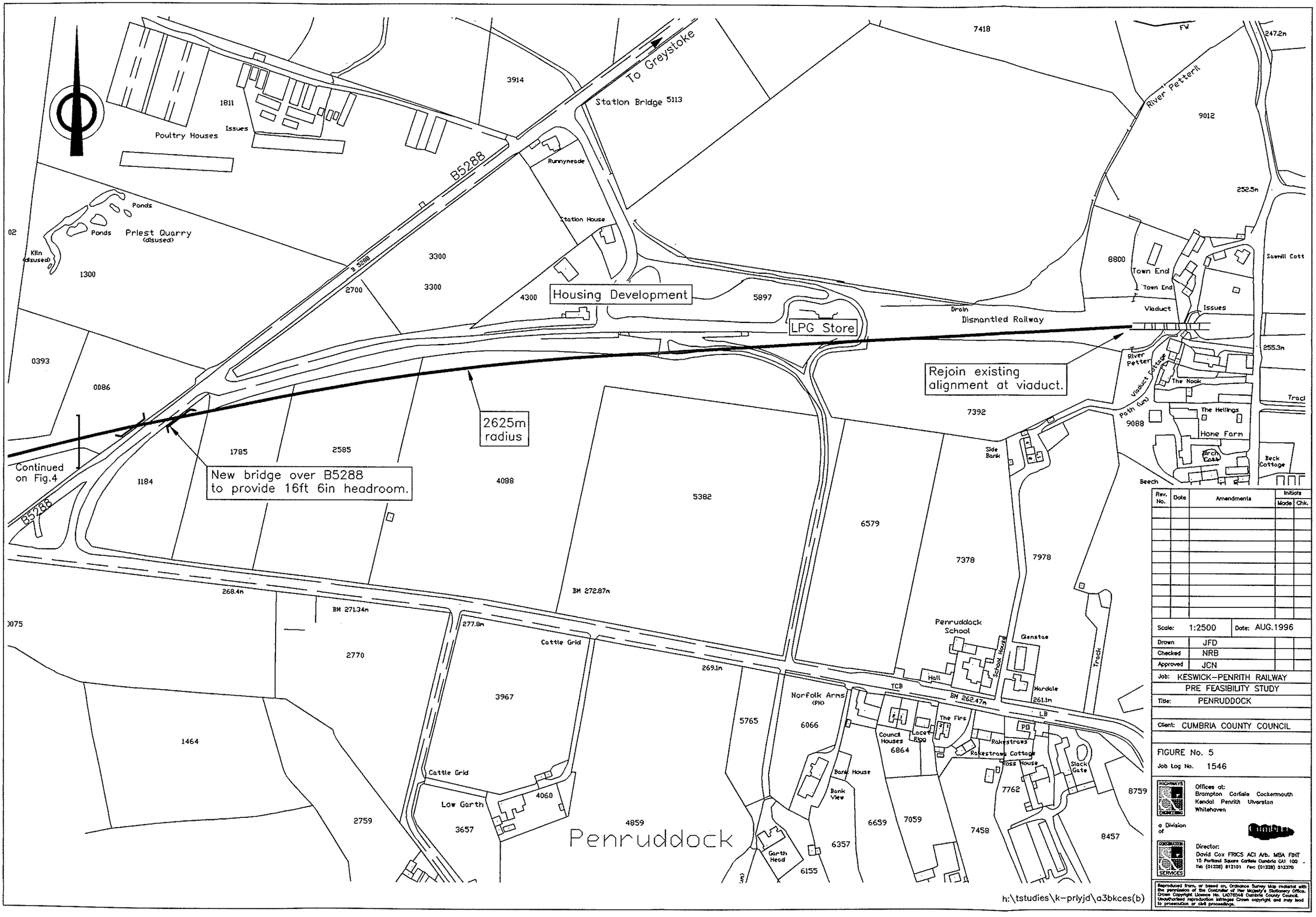

Rev. No.	Date	Amendments	Initials Made	Initials Chk.

Scale:	1:2500
Date:	AUG.1996
Drawn	JFD
Checked	NRB
Approved	JCN
Job:	KESWICK–PENRITH RAILWAY PRE FEASIBILITY STUDY
Title:	PENRUDDOCK
Client:	CUMBRIA COUNTY COUNCIL

FIGURE No. 5

Job Log No. 1546

Offices at:
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Appendix B

Travel Demand Model

Penrith to Keswick Rail Pre-Feasibility Study **Project No.: AF5391**
Technical Note No.: 1

Development of Spreadsheet-based Demand Model

Graham Long
Atkins Wootton Jeffreys

June 1996
VERSION No.: 1.0

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1 Overview

A model has been developed to predict the potential demand for a rail service running between Penrith and Keswick. Origin and destination data was extracted from Roadside Interview surveys conducted for the National Park Authority as part of the 1994 All Parks Visitor Survey. Having designed a zoning system covering the UK, sample O-D trips were apportioned to a 150 by 15 zonal trip matrix. Surveys from two sites were used. The first, on the A66 between the A592 and the M6, indicated the volume, origin and destination of road traffic between Penrith and Keswick. This data formed the initial stage in the estimation of rail trip-making potential on a re-opened Penrith to Keswick line. Data from the second site, on the A591 north of Kendal, provided travel information for the Kendal to Windermere corridor. A rail service currently operates between these towns, and inferences on the trip making potential of a service from Penrith to Keswick could be made by comparison of modal shares between the two sites. A separate trip matrix was created for each roadside interview site (A66 and A591), for the duration of the interviewees' stay in the Lakes area (daytrip/longstay), and for the day of the survey (Weekday/Saturday/Sunday).

Factors were used to expand flows from the survey period to 16 hour Annual Average Traffic flows. These flows gave the number of private vehicle occupants for either the A66 or the A591 for annually averaged Weekday, Saturday or Sunday. The flows were then averaged, thereby producing matrices for the total number of person trips by private vehicle on an average day in 1994. From this, the proportion of trips being made by train on an average day was ascertained, using information gathered from interview surveys carried out at twelve locations around the Lake District National Park, including Keswick and Bowness, for the All Parks Visitor Survey..

Comparison of the figures for Oxenholme to Windermere and Penrith allowed estimation of potential demand for rail travel into the heart of the Lake District from Penrith. The stages in this process are presented graphically in Figure 1. The model-building process will now be elucidated in greater detail, with consideration given first to the design of an appropriate zoning system.

2 Design of Zoning System

Two factors were paramount in considering the design of the zones. The selection of zone areas would pick up the localised variation in trip-making potential in the vicinity of Penrith and Keswick, while also accounting for potential trips throughout the UK. In addition, the roadside interview data placed limitations on the characteristics of the zones selected. Data for the origin of trip differed according to the length of trip, since the survey disaggregated day-trippers from people staying longer. In all cases, however, the place from which the interviewee started out that day was taken as the origin. This information included postcode references, a County of origin, and/or a pre-specified area within the north-west. With reference to Table 1, zones 1-15 refer to small areas within the Lake District National Park boundary. Zones 101 to 108 correspond to the north-west areas, where 101 corresponds to the amalgamation of zones 1-15. Zones 1061 and 1062 consist of the 'Eden' area, disaggregated, so that 1061 refers to the postcode areas immediately surrounding Penrith, and 1062 is the rest of the Eden area. Zones 109 to 114 cover the rest of the country, and trips were assigned to these zones based on postcode/county replies.

Table 1 Zones for the Penrith-Keswick Model

No.	Description	No.	Description
1	Northern Fells	101	The Lake District
2	Bassenthwaite Lake	102	South Lakeland
3	Borrowdale	103	Copeland
4	Keswick	104	Barrow
5	Thirlmere	105	Allerdale
6	Ullswater	1061	Eden: Postcodes CA11 7, CA11 8, CA11 9
7	Eastern Fells	1062	Eden: All other Postcodes
8	A591 Corridor	107	Carlisle
9	Ambleside	108	Lancs., Merseyside, Cheshire, Gt. Manchester
10	Windermere	109	Durham, Northumberland, Tyne & Wear, Cleveland
11	Langdale	110	Scotland
12	South Lakes	111	N., S. & W. Yorkshire., Humberside
13	Woodland/Rusland/Cartmel	112	Lincs., Derbys., Notts., Leics., Salop
14	Western Fells	113	Other Southern England
15	The Coast	114	Wales

Notes:

1. *Zones 1 to 15 are internal to the Lake District National Park*
2. *Zone 101 represents the whole of the Lake District National Park*
3. *Zones 102 to 114 are external to the Lake District National Park*

External Zones 101 to 108 are shown on Map 1 and Internal Zones 1 to 15 are shown on Map 2.

3 Extraction and Manipulation of Data

The 1994 All Parks Visitor Survey provided detailed information regarding the interviewees' origins and destinations. Several roadside interview sites were used; and for the purposes of this study, those on the A66 between the A592 and the M6, and the A591 north of Kendal were of particular relevance. The former site provided trip data relating to those people making the trip from Penrith and Keswick. The latter gave information about journeys on the Kendal to Windermere route, where a railway line is already in use, thus giving an indication of the trip-making characteristics of a route in this area providing a rail option. The data from these two sites was extracted from the whole, and subsequently split to give a sheet for each site. Within this dataset was material relating to day-trippers and 'long-stayers', and for different survey days (a weekday, a Saturday and a Sunday). Consequently, the data was split further to give records for each trip-duration and survey-day separately. Table 2 shows the 12 types of data which were extracted from the survey.

Table 2 12 Modelled Scenarios

Survey Site	Trip Duration	Day of Survey
A66	Daytrip	Weekday
A66	Daytrip	Saturday
A66	Daytrip	Sunday
A66	Longstay	Weekday
A66	Longstay	Saturday
A66	Longstay	Sunday
A591	Daytrip	Weekday
A591	Daytrip	Saturday
A591	Daytrip	Sunday
A591	Longstay	Weekday
A591	Longstay	Saturday
A591	Longstay	Sunday

Full Origin-Destination information was not available for those people making local business or personal trips. However, their origin of trip was given, as was the duration of their stay in the area (daytrip/longstay), the route upon which they were travelling (A66/A591), and the day of the survey (Weekday/Saturday/Sunday). Consequently, these local and business trips were divided among the 12 scenarios, and destination (and subsequently modal share) proportions were assigned to these trippers in each scenario according to the overall figures for that case.

4 Spreadsheet Modelling

The origin and destination information within each dataset was subsequently used to create a matrix of surveyed trips for each of the 12 cases. The number of trips originating in each zone was found setting up a query in the Access Database, whereby a query matched each postcode/County/Area reference to the appropriate zone, as indicated in Table 1. Thus a total flow originating from each zone could be recorded. These would equate with the row totals in the survey matrices. The destination trip end data gave destinations solely within the Lake District boundary, in the form of 15 zones. These correspond to zones 1 to 15 in Table 1. Survey respondents commonly gave a number of destinations, as the places they had or would be visiting that day. However, the lack of responses to this question made it impossible to create O-D pairs for every trip. Consequently, the visitors to each of Zones 1 to 15 were summed, for each of the 12 model cases, and by dividing the number of visitors to each zone by the total for all zones, a proportion of trips to each of the 15 zones was created. Zone 8 was excluded from the zoning system, since it's location, surrounding both roadside survey sites meant that respondents always included this as a destination. It was felt that the 'significant' destinations within the A591 corridor (Borrowdale, Keswick, etc.) were listed as destinations separately, and that to exclude zone 8 would also reduce the degree of double counting.

Each origin total was then split among the destination zones according to these proportions. For instance, Table 3 shows how 110 trips originating in zone 101 are distributed among the 15 destination zones according to the pre-calculated proportions.

Table 3 Distribution of trips from Zone 101

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Sum
Prop.n	0	0.016	0.016	0.064	0.016	0.048	0	-	0.209	0.387	0.016	0.161	0.032	0.032	0	1.0
Trips	0	1.771	1.771	7.095	1.771	5.324	0	-	23.06	42.58	1.771	17.74	3.553	3.553	0	110

Notably, the surveys only provided information 'inbound' to the Lake District, so that zones 101 to 114 are the Origin Zones, and zones 1-15 are the Destination Zones. A trip from zone 101 to zone 1-15 would be treated as an intra-zonal trip. Since it was highly preferable to have two-way trip data, the inbound flows were transposed to give approximations to outbound flows, whereby zones 1-15 are the origin zones, and 101 to 114 are the destination zones.

Additional interpolation was required to apportion longstay trips among the two Eden Zones (1061 and 1062). This was required because the postcode data on which the assignment of trips to these two zones was based, was not available for trips where the respondent's home was not the origin of the trip. In such cases, the proportional split observed between the two zones for all

trips originating at home (calculated as 0.62 in zone 1061 and 0.38 in zone 1062) was applied to the combined zonal figure for the other trips. For example, where 30 non home-based trips were assigned to zone 106, 18.6 trips (30*0.62) would be allotted to zone 1061 and 11.4 trips (30*0.38) would be allotted to zone 1062.

The next stage in the modelling process involved expanding the flows from the survey total to represent 16-hour private vehicle occupant flows. The survey data included values for vehicle occupancy, so an average occupancy for each modelled scenario would provide the number of person trips by private vehicle. The expansion process was four stage, utilising data from both the interviewed- and passing-vehicle counts undertaken for the All Parks surveys, and long-term ATC data for the same routes. The process was applied to each of the 12 modelled scenarios. The procedure for calculating the expansion factor is described below.

- Stage 1 involved creating a vehicle occupancy factor for the sample. As explained above, this was a simple process of dividing the total number of vehicle occupants by the total number of vehicles.
- In stage 2, the sample total was factored up to a 6-hour total utilising All Parks survey data. The factor was derived by dividing the total vehicles which passed the survey point by the number of vehicles in the sample. Three vehicle types were excluded from the expansion factor; namely PSVs Coaches and HGVs. Both PSVs and Coaches were excluded as they do not come under the private vehicle bracket and will be dealt with in Section 5. HGVs were also excluded, as only trips which might transfer to rail were to be included in the model.
- Stage 4 followed on from this by expanding the 6 hour flows to 16 hours, using ATC data. The 16 hour period selected was from 0600 to 2200. Finally, the product of the 3 factors was applied to the appropriate proportionate matrix to give a 16-hour private vehicle occupant matrix.

5 Modal Split

Site Surveys carried out in 12 locations throughout the Lake District produced data on the number of trips arriving at those locations by different modes of transport. This data was manipulated in a two stage process to give the proportion of trips to a number of locations which were made by rail, bus and coach. Firstly, the data was sorted by site location, and the data for the Keswick site and the Bowness site was extracted from the rest. The number of respondents using one of the above modes was divided by the private vehicle total to give a proportion of visitors travelling by that mode. As with the roadside interviews, respondents could be divided into 'daytrippers' and 'longstayers'. Consequently, separate modal split proportions were designed for each trip type. This proportion was then applied selectively to the 16-hour flows in

the following way. It was felt that the modal share information at each of the survey sites would reflect the accessibility of that site by various transport modes. For instance, a site survey carried out at Windermere could be expected to show a higher proportion of rail users than one in the Western Fells. Consequently, to give a heightened level of accuracy in the area of the study, the proportions for each mode at the Keswick site were applied to origin/destination zone 4 (Keswick). Those at the Bowness site were applied to zones 9 and 10 (Ambleside and Windermere). The proportions at the other 9 sites were determined collectively, and applied to the other 12 Lake District Zones. In applying these proportions, a new matrix was created for each mode, and each cell value was produced by multiplying the corresponding cell value from the 16-hour private vehicle matrix by the appropriate proportion for that mode (Coach, Bus or Rail) and zone (Keswick, Ambleside & Windermere, or 'the rest').

6 Annual Average Flows

Having created matrices of 16-hour flows for the occupants of private vehicles, buses, coaches, and rail, it was necessary to build a matrix of total flows for an annually averaged 16 hour day. Using 12 month ATC Counts for each site, an expansion factor was calculated for each survey day based on the following four stages.

- An adjustment factor from the survey day to the average for that day over the whole month (Required for weekdays, Saturdays and Sundays)
- A factor to adjust the particular weekday average (average Thursday flow for the month of July, for example) to the overall weekday average (Required for Weekdays only)
- A Factor to adjust the daily average for that month to the overall annual average day.

The product of these factors for weekday, Saturday and Sunday were then combined in the following way to produce an annual average daily flow for daytrippers and longstayers on the A66 and the A591.

$$\frac{(5*(\text{Weekday Flow}*\text{Weekday Factor})) + (\text{Saturday Flow} * \text{Saturday Factor}) + (\text{Sunday Flow} * \text{Sunday Factor})}{7}$$

Appendix BI shows this process applied to the flows corresponding to daytrippers on the 14th July on the A66.

By applying the product of these factors to the total 16-hour person trips matrix, a new matrix was created which approximates the flows from zone to zone on an average day in 1994 (the year of the surveys).

As was mentioned previously, local and business trips were not disaggregated from other daytrips and longstay trips. This was advantageous in applying Annual Average factors, since by leaving all trip purposes aggregated, it was possible to apply flow profiles from ATC counts throughout the year to gain an Annual Average Daily Traffic figure. In addition, by limiting the level of disaggregation, expansion factors could be derived from and applied to larger samples, with less chance of random occurrences disproportionately affecting the final result.

7 Model Validation

By selectively aggregating AADT flows, a modelled level of patronage in 1994 on the Oxenholme to Windermere line could be produced for comparison with current flows. Actual rail passenger flows for this service were not available. The model output suggested 1994 levels of patronage for Oxenholme to Windermere at around 169,000 per annum. These are slightly higher than the observed data on flow levels. the model was deemed to be reflecting reality sufficient to be used as a tool for forecasting of flows on the Penrith to Keswick.

8 Calculation of Traffic Growth to Design Year

Figure 2 shows an overview of the procedure for forecasting demand on the Penrith to Keswick rail line.

A design year is commonly set at a point in the future sufficiently far removed to reflect anticipated growth in traffic levels and hence represent a reasonable design case. We have taken a design year of 2011, being 15 years from the present year.

Table 6 Traffic Growth Forecasts: 1994 to 2011

Area of Forecast	Low Growth Factor	High Growth Factor
National	1.318	1.506
Northwest	1.282	1.479
Cumbria	1.308	**1.499**
Allerdale	1.290	1.472
Eden	1.287	1.447

A number of subjective decisions were required in the selection of an appropriate growth factor. Table 6 illustrates those which were considered. It was decided to use a high growth factor, since

this would give an idea of the maximum demand in 2011. Subsequently, the high traffic growth factor for Cumbria was selected, in order to reflect the growth in areas where the majority of Penrith to Keswick passengers would originate. The growth factor of 1.499 may be applied to the overall level of traffic growth in the corridor. We do not consider it realistic however to apply this level of growth to rail travel. The high growth of 1.499 reflects rising levels of car ownership and increased general mobility. Applying this factor to the forecast rail patronage would imply the absolute upper end of patronage at a year 15 years hence.

9 Prediction of Future Rail Patronage

Appendix BII contains the spreadsheets of the forecasts of the different scenarios tested namely:

- Base Year
- Central Case
- Best Case
- Bus Operation
- LRT/Narrow Gauge Operation

The results are fully described in the main text.

Figure 1 Stages in the Penrith to Keswick Spreadsheet Model

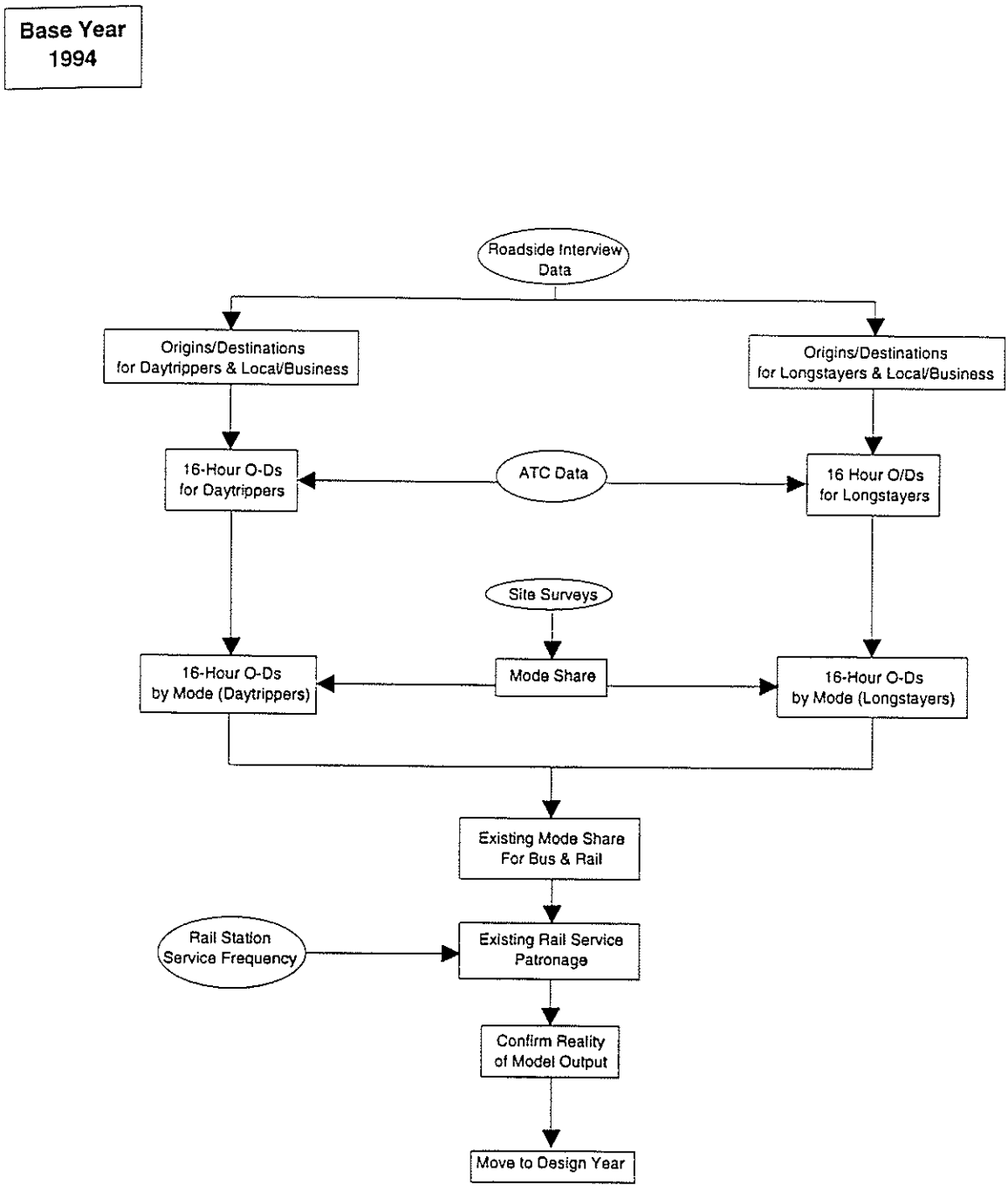
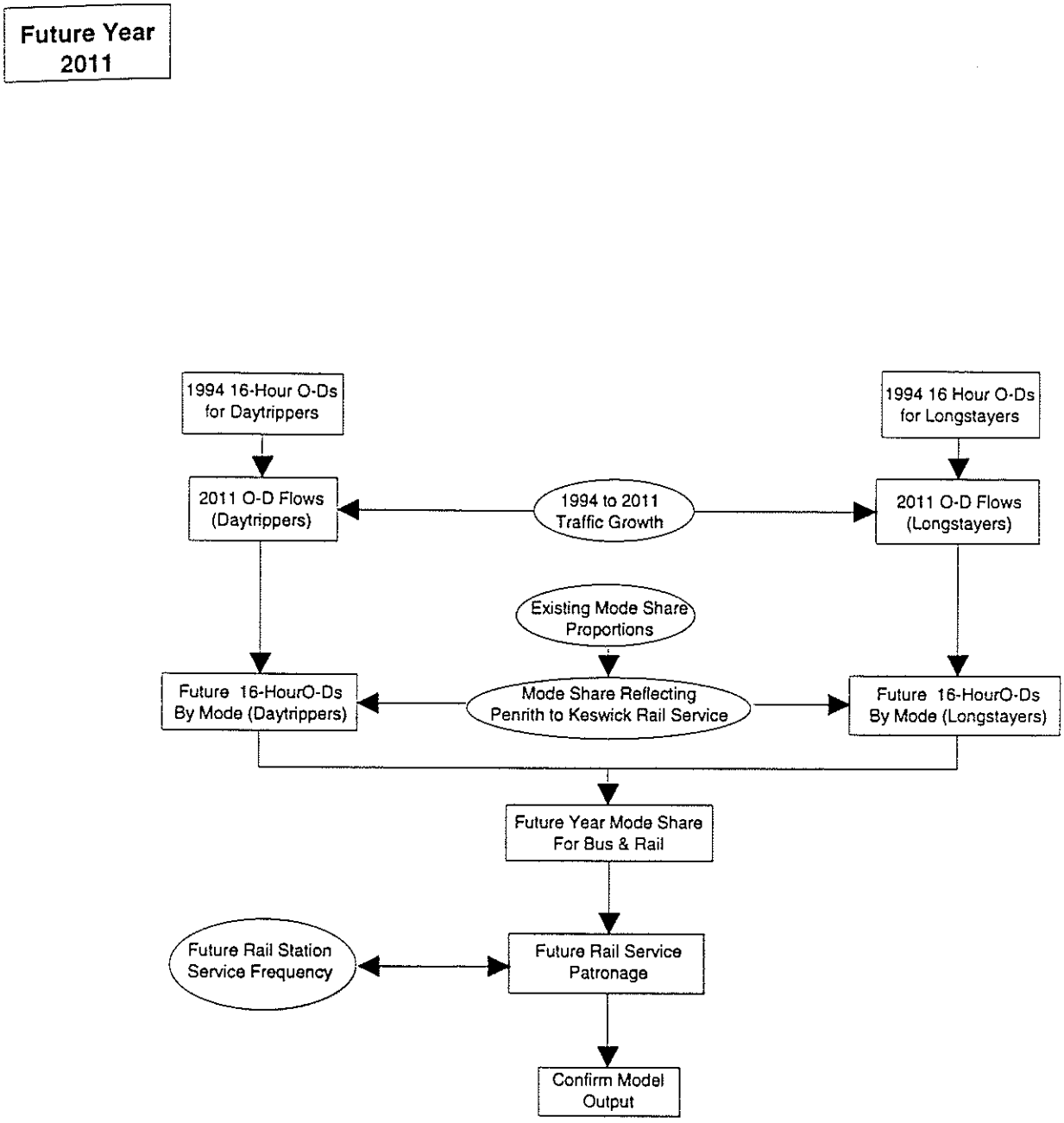
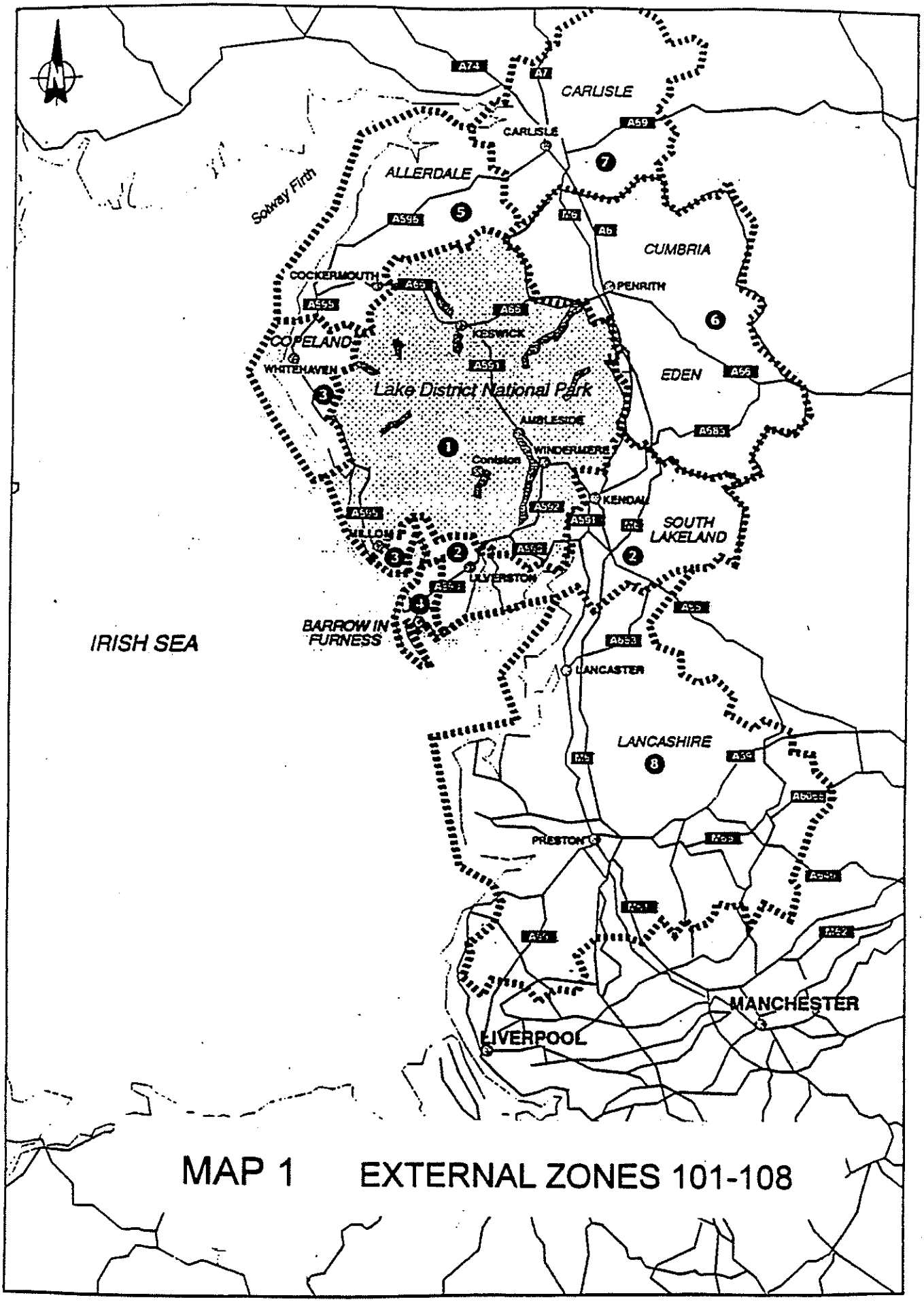
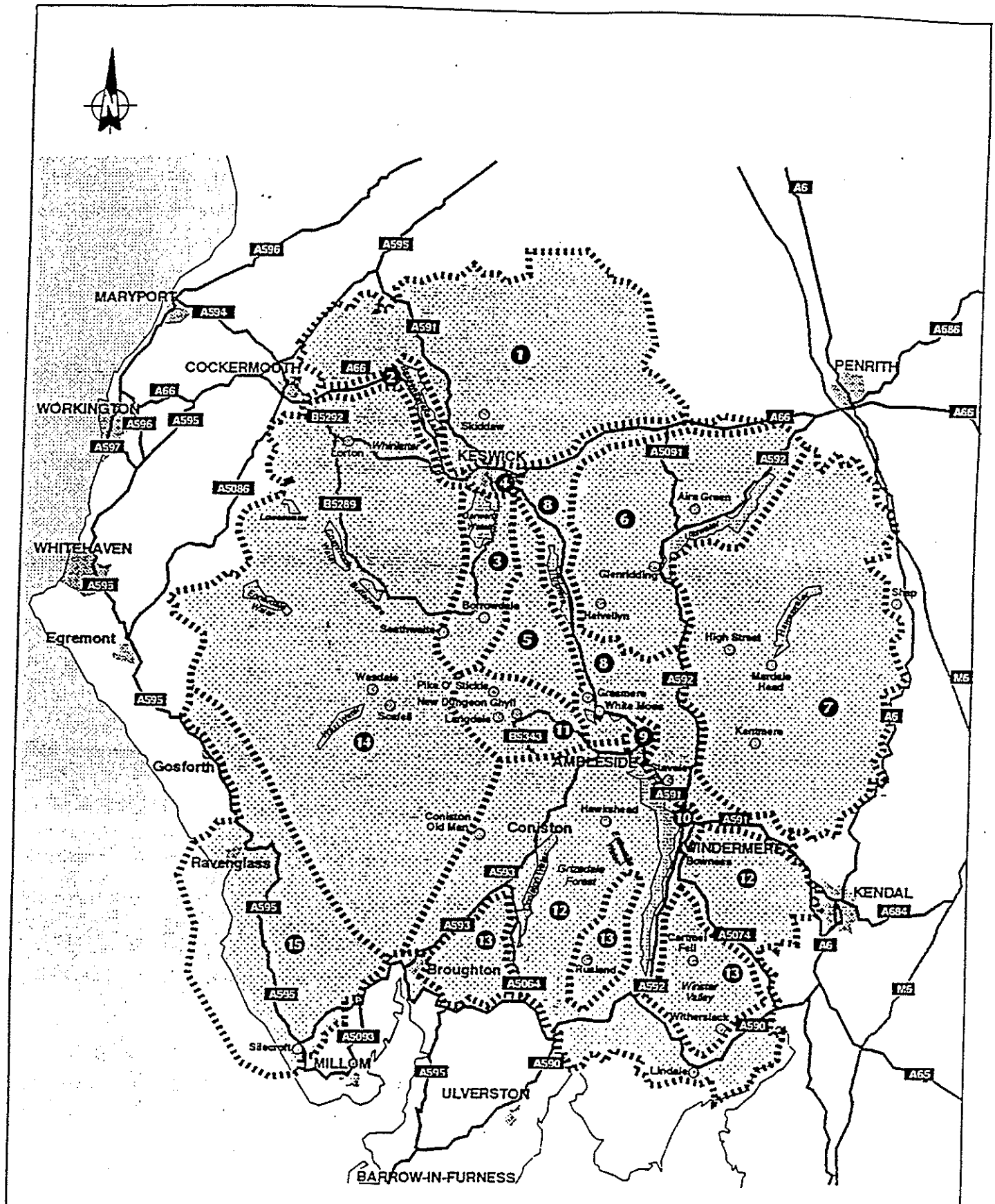


Figure 2 Stages in the Penrith to Keswick Spreadsheet Model





MAP 1 EXTERNAL ZONES 101-108



MAP 2 INTERNAL ZONES 1-15

0 Scale 1 inch

0 5.0 miles (approx.)

LAKE DISTRICT NATIONAL PARK

Map 2

Appendix BI

Appendix BI

Factors adjusting flows from 16-hour to AADT Flows - Thursday 14th July (A66e Daytrip Weekday Scenario).

With reference to ATC Data from All Parks Visitor Survey:

1. Thursday Average for July = Total Observed Flow * $\frac{\text{July Thursday Average}}{\text{Thursday 14 July}}$

$$= 18922.275 * \frac{7321}{7221} = \mathbf{19315.343} \quad (=X)$$

2. Weekday Average for July (Weekdays only) = X * $\frac{\text{Total July Weekday Flow/5}}{\text{Total July Thursday Flow}}$

$$= 19315.343 * \frac{145446/5}{29484} = \mathbf{19056.704} \quad (=Y)$$

3. Weekday 1994 Average Flow = Y * $\frac{(\sum\text{monthly average weekday flow})/12}{\text{July Weekday Average flow}}$

$$= 19056.704 * \frac{572175/12}{54743} = \mathbf{16598.423} \quad (=Z)$$

4. Adjustment Factor = $\frac{Z}{\text{Total Observed Flow}}$

$$= \frac{16598.423}{18922.275} = \mathbf{0.8771896}$$

N.B.: Total Observed Flow is extracted from the spreadsheet, and is the total sum of all flows in the 16-hour total person trips matrix.

Appendix BII

Case: 1994 base year

Growth Factor from 1994 1.00

	coach	bus	rail	car	
Daytrip					
Keswick	10.00%	5.00%	5.00%	80.00%	100.00%
Bowness	22.00%	1.50%	5.50%	71.00%	100.00%
Rest	4.00%	0.50%	0.00%	95.50%	100.00%
Longstay					
Keswick	6.00%	4.00%	4.00%	86.00%	100.00%
Bowness	11.00%	1.00%	1.00%	87.00%	100.00%
Rest	1.00%	0.50%	1.50%	97.00%	100.00%

Rail	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Sum
101	1	2	1	33	1	3	2	0	55	89	4	14	2	3	0	210
102	0	0	0	14	0	0	0	0	42	63	1	2	0	0	0	123
103	0	0	0	1	0	0	0	0	1	2	0	0	0	0	0	5
104	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
105	0	0	0	1	0	0	0	0	1	2	0	0	0	0	0	5
1061	0	0	0	1	0	0	0	0	1	2	0	0	0	0	0	4
1062	0	0	0	0	0	0	0	0	1	2	0	0	0	0	0	3
107	0	0	0	1	0	0	0	0	2	3	0	0	0	0	0	6
108	0	0	0	10	0	0	0	0	33	47	0	1	0	0	0	93
109	0	0	0	1	0	0	0	0	3	5	0	0	0	0	0	10
110	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	3
111	0	0	0	6	0	0	0	0	14	22	1	1	0	0	0	45
112	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	3
113	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	2
114	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
115	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	2	3	1	69	2	4	4	0	155	239	6	20	3	4	0	512

Average Service Provision per Day (Oxenholme - Windermere): 15

Annual Passenger Total (Oxenholme-Windermere) 169,106

Average Patronage per Service (Oxenholme - Windermere): 31

Bus	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Sum
101	1	1	0	33	1	1	1	0	25	40	2	7	1	1	0	113
102	0	0	0	14	0	0	0	0	12	19	1	2	0	0	0	52
103	0	0	0	1	0	0	0	0	1	1	0	0	0	0	0	3
104	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
105	0	0	0	1	0	0	0	0	1	1	0	0	0	0	0	3
1061	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	2
1062	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
107	0	0	0	1	0	0	0	0	1	1	0	0	0	0	0	3
108	0	0	0	10	0	0	0	0	10	14	1	2	0	0	0	39
109	0	0	0	1	0	0	0	0	1	2	0	0	0	0	0	4
110	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	2
111	0	0	0	6	0	0	0	0	5	8	0	1	0	0	0	21
112	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
113	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
114	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
115	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	1	2	1	69	1	2	2	0	56	88	4	13	2	2	0	244

Coach	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Sum
101	2	4	1	55	2	5	4	0	313	508	8	25	5	5	0	934
102	2	2	1	27	1	2	3	0	177	272	5	16	3	3	0	515
103	0	0	0	1	0	0	0	0	7	12	0	1	0	0	0	22
104	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	2
105	0	0	0	1	0	0	0	0	8	13	0	1	0	0	0	25
1061	0	0	0	1	0	0	0	0	6	9	0	0	0	0	0	17
1062	0	0	0	1	0	0	0	0	4	6	0	0	0	0	0	11
107	0	0	0	1	0	0	0	0	8	13	0	1	0	0	0	24
108	1	2	1	20	1	2	2	0	138	201	4	12	2	2	0	389
109	0	0	0	2	0	0	0	0	15	22	0	1	0	0	0	42
110	0	0	0	1	0	0	0	0	5	8	0	0	0	0	0	15
111	1	1	0	11	0	1	1	0	64	103	2	5	1	1	0	190
112	0	0	0	1	0	0	0	0	4	6	0	0	0	0	0	12
113	0	0	0	0	0	0	0	0	3	4	0	0	0	0	0	8
114	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
115	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	6	10	3	122	5	10	11	0	753	1177	20	63	12	13	0	2205

Case: 1994 base year

Growth Factor from 1994 1.00

	coach	bus	rail	car	
Daytrip					
Keswick	10.00%	5.00%	0.00%	85.00%	100.00%
Bowness	22.00%	1.50%	0.00%	76.50%	100.00%
Rest	4.00%	0.50%	0.00%	95.50%	100.00%
Longstay					
Keswick	6.00%	4.00%	0.00%	90.00%	100.00%
Bowness	11.00%	1.00%	0.00%	88.00%	100.00%
Rest	1.00%	0.50%	0.00%	98.50%	100.00%

Rail	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Sum
101	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
102	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
103	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
104	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
105	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1061	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1062	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
107	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
108	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
109	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
110	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
111	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
112	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
113	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
114	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
115	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Average Service Provision per Day (Penrith-Keswick): 15

Average Patronage per Service (Penrith-Keswick): 0

Annual Passenger Total (Penrith-Keswick) 0

Bus	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Sum
101	2	1	1	0	0	3	1	0	7	8	1	6	1	2	0	33
102	0	0	0	0	0	0	0	0	1	1	0	1	0	0	0	3
103	0	0	0	0	0	1	0	0	1	1	0	1	0	0	0	5
104	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
105	0	0	0	0	0	1	0	0	1	2	0	1	0	0	0	6
1061	0	0	0	0	0	1	0	0	2	3	0	2	0	1	0	11
1062	1	1	0	0	0	1	0	0	3	4	0	3	0	1	0	17
107	0	0	0	0	0	1	0	0	2	2	0	1	0	0	0	7
108	0	0	0	0	0	1	0	0	3	3	0	2	0	1	0	10
109	0	0	0	0	0	1	0	0	2	3	0	2	0	1	0	10
110	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
111	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	2
112	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
113	0	0	0	0	0	0	0	0	1	1	0	1	0	0	0	4
114	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
115	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	5	4	2	0	1	10	3	0	23	28	4	22	2	8	1	112

Coach	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Sum
101	7	6	2	63	1	12	4	0	82	104	2	11	1	4	0	299
102	1	1	0	6	0	1	0	0	9	10	0	1	0	0	0	31
103	1	1	1	12	0	2	1	0	10	13	0	2	0	1	0	43
104	0	0	0	2	0	0	0	0	1	2	0	0	0	0	0	6
105	1	1	0	12	0	2	1	0	16	20	0	2	0	1	0	57
1061	3	3	1	25	0	7	2	0	33	38	1	5	0	2	0	121
1062	6	4	2	37	0	10	3	0	45	60	1	8	1	3	0	180
107	2	2	1	14	0	3	1	0	22	29	1	4	0	1	0	80
108	2	2	0	20	0	5	2	0	37	38	1	5	0	1	0	113
109	3	2	1	20	0	6	2	0	34	37	1	5	0	1	0	112
110	0	0	0	3	0	0	0	0	3	3	0	0	0	0	0	10
111	1	1	0	6	0	2	1	0	7	8	0	1	0	0	0	27
112	0	0	0	2	0	0	0	0	2	3	0	0	0	0	0	7
113	1	1	0	8	0	2	0	0	10	10	0	1	0	0	0	34
114	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	2
115	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	27	23	9	231	2	53	17	0	312	376	8	46	4	15	1	1123

Case: Central Case

Growth Factor from 1994 1.00

	coach	bus	rail	car	
Daytrip					
Keswick	10.00%	5.00%	0.00%	85.00%	100.00%
Bowness	22.00%	1.50%	5.50%	71.00%	100.00%
Rest	4.00%	0.50%	0.00%	95.50%	100.00%
Longstay					
Keswick	6.00%	4.00%	0.00%	90.00%	100.00%
Bowness	11.00%	1.00%	1.00%	87.00%	100.00%
Rest	1.00%	0.50%	1.50%	97.00%	100.00%

Rail	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Sum
101	1	2	1	0	1	3	2	0	55	89	4	14	2	3	0	177
102	0	0	0	0	0	0	0	0	42	63	1	2	0	0	0	109
103	0	0	0	0	0	0	0	0	1	2	0	0	0	0	0	4
104	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
105	0	0	0	0	0	0	0	0	1	2	0	0	0	0	0	4
1061	0	0	0	0	0	0	0	0	1	2	0	0	0	0	0	3
1062	0	0	0	0	0	0	0	0	1	2	0	0	0	0	0	3
107	0	0	0	0	0	0	0	0	2	3	0	0	0	0	0	5
108	0	0	0	0	0	0	0	0	33	47	0	1	0	0	0	83
109	0	0	0	0	0	0	0	0	3	5	0	0	0	0	0	9
110	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	2
111	0	0	0	0	0	0	0	0	14	22	1	1	0	0	0	39
112	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	2
113	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	2
114	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
115	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	2	3	1	0	2	4	4	0	155	239	6	20	3	4	0	443

Average Service Provision per Day (Oxenholme - Windermere): 15 **Annual Passenger Total (Oxenholme-Windermere)** 143,960

Average Patronage per Service (Oxenholme - Windermere): 26

Bus	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Sum
101	1	1	0	0	1	1	1	0	25	40	2	7	1	1	0	80
102	0	0	0	0	0	0	0	0	12	19	1	2	0	0	0	38
103	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	2
104	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
105	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	2
1061	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
1062	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
107	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	2
108	0	0	0	0	0	0	0	0	10	14	1	2	0	0	0	28
109	0	0	0	0	0	0	0	0	1	2	0	0	0	0	0	3
110	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	2
111	0	0	0	0	0	0	0	0	5	8	0	1	0	0	0	15
112	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
113	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
114	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
115	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	1	2	1	0	1	2	2	0	58	88	4	13	2	2	0	175

Coach	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Sum
101	2	4	1	55	2	5	4	0	313	506	8	25	5	5	0	934
102	2	2	1	27	1	2	3	0	177	272	5	16	3	3	0	515
103	0	0	0	1	0	0	0	0	7	12	0	1	0	0	0	22
104	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	2
105	0	0	0	1	0	0	0	0	8	13	0	1	0	0	0	25
1061	0	0	0	1	0	0	0	0	6	9	0	0	0	0	0	17
1062	0	0	0	1	0	0	0	0	4	6	0	0	0	0	0	11
107	0	0	0	1	0	0	0	0	8	13	0	1	0	0	0	24
108	1	2	1	20	1	2	2	0	138	201	4	12	2	2	0	389
109	0	0	0	2	0	0	0	0	15	22	0	1	0	0	0	42
110	0	0	0	1	0	0	0	0	5	8	0	0	0	0	0	15
111	1	1	0	11	0	1	1	0	64	103	2	5	1	1	0	190
112	0	0	0	1	0	0	0	0	4	6	0	0	0	0	0	12
113	0	0	0	0	0	0	0	0	3	4	0	0	0	0	0	8
114	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
115	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	6	10	3	122	5	10	11	0	753	1177	20	63	12	13	0	2205

Case: Central Case

Growth Factor from 1994 1.00

	coach	bus	rail	car	
Daytrip					
Keswick	10.00%	5.00%	5.50%	79.50%	100.00%
Bowness	22.00%	1.50%	0.00%	76.50%	100.00%
Rest	4.00%	0.50%	0.00%	95.50%	100.00%
Longstay					
Keswick	6.00%	4.00%	1.00%	89.00%	100.00%
Bowness	11.00%	1.00%	0.00%	88.00%	100.00%
Rest	1.00%	0.50%	1.50%	97.00%	100.00%

Rail	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Sum
101	3	3	2	22	1	5	2	0	0	0	1	5	1	2	0	47
102	0	0	0	2	0	1	0	0	0	0	0	0	0	0	0	5
103	1	1	0	4	0	1	0	0	0	0	0	1	0	0	0	9
104	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	2
105	0	0	0	4	0	1	0	0	0	0	0	1	0	0	0	8
1061	0	0	0	13	0	1	0	0	0	0	0	1	0	0	0	15
1062	0	0	0	18	0	1	0	0	0	0	0	1	0	0	0	22
107	0	0	0	7	0	0	0	0	0	0	0	0	0	0	0	8
108	0	0	0	10	0	0	0	0	0	0	0	1	0	0	0	12
109	0	0	0	11	0	0	0	0	0	0	0	0	0	0	0	12
110	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	2
111	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	4
112	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
113	0	0	0	3	0	1	0	0	0	0	0	1	0	0	0	6
114	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
115	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	6	6	4	98	2	12	4	0	0	0	3	11	1	5	1	153

Average Service Provision per Day (Penrith-Keswick): 15 **Annual Passenger Total (Penrith-Keswick)** 35,882

Average Patronage per Service (Penrith-Keswick): 7

Bus	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Sum
101	2	1	1	22	0	3	1	0	7	8	1	6	1	2	0	55
102	0	0	0	2	0	0	0	0	1	1	0	1	0	0	0	6
103	0	0	0	4	0	1	0	0	1	1	0	1	0	0	0	9
104	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
105	0	0	0	4	0	1	0	0	1	2	0	1	0	0	0	10
1061	0	0	0	13	0	1	0	0	2	3	0	2	0	1	0	24
1062	1	1	0	18	0	1	0	0	3	4	0	3	0	1	0	35
107	0	0	0	7	0	1	0	0	2	2	0	1	0	0	0	14
108	0	0	0	10	0	1	0	0	3	3	0	2	0	1	0	20
109	0	0	0	11	0	1	0	0	2	3	0	2	0	1	0	21
110	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	2
111	0	0	0	3	0	0	0	0	1	1	0	0	0	0	0	6
112	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
113	0	0	0	3	0	0	0	0	1	1	0	1	0	0	0	6
114	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
115	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	5	4	2	98	1	10	3	0	23	28	4	22	2	6	1	210

Coach	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Sum
101	7	6	2	63	1	12	4	0	82	104	2	11	1	4	0	299
102	1	1	0	8	0	1	0	0	9	10	0	1	0	0	0	31
103	1	1	1	12	0	2	1	0	10	13	0	2	0	1	0	43
104	0	0	0	2	0	0	0	0	1	2	0	0	0	0	0	6
105	1	1	0	12	0	2	1	0	16	20	0	2	0	1	0	57
1061	3	3	1	25	0	7	2	0	33	38	1	5	0	2	0	121
1062	6	4	2	37	0	10	3	0	45	50	1	8	1	3	0	180
107	2	2	1	14	0	3	1	0	22	29	1	4	0	1	0	80
108	2	2	0	20	0	5	2	0	37	38	1	5	0	1	0	113
109	3	2	1	20	0	6	2	0	34	37	1	5	0	1	0	112
110	0	0	0	3	0	0	0	0	3	3	0	0	0	0	0	10
111	1	1	0	6	0	2	1	0	7	8	0	1	0	0	0	27
112	0	0	0	2	0	0	0	0	2	3	0	0	0	0	0	7
113	1	1	0	8	0	2	0	0	10	10	0	1	0	0	0	34
114	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	2
115	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	27	23	9	231	2	53	17	0	312	378	8	46	4	15	1	1123

Case: Best Case

Growth Factor from 1994 1.00

	coach	bus	rail	car	
Daytrip					
Keswick	10.00%	5.00%	7.00%	79.50%	101.50%
Bowness	22.00%	1.50%	1.00%	76.50%	101.00%
Rest	4.00%	0.50%	1.00%	95.50%	101.00%
Longstay					
Keswick	6.00%	4.00%	3.00%	89.00%	102.00%
Bowness	11.00%	1.00%	1.00%	88.00%	101.00%
Rest	1.00%	0.50%	2.00%	97.00%	100.50%

Rail	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Sum
101	5	5	3	38	1	9	3	0	6	7	2	9	1	4	0	92
102	0	0	0	4	0	1	0	0	1	1	0	1	0	0	0	9
103	1	1	1	7	0	2	0	0	1	1	0	1	0	1	0	16
104	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	3
105	1	1	0	7	0	2	1	0	1	1	0	2	0	1	0	16
1061	1	1	0	17	0	2	1	0	2	2	0	2	0	1	0	30
1062	2	2	1	25	0	4	1	0	2	3	1	3	0	1	0	45
107	1	1	0	9	0	1	0	0	1	1	0	1	0	0	0	17
108	1	1	0	13	0	2	1	0	2	2	0	2	0	1	0	24
109	1	1	0	14	0	2	1	0	2	2	0	1	0	0	0	23
110	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	4
111	0	0	0	4	0	1	0	0	0	0	0	0	0	0	0	7
112	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	3
113	0	1	0	5	0	1	0	0	1	1	0	1	0	0	0	11
114	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
115	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	14	13	7	147	3	28	9	0	18	22	5	25	3	9	1	301

Average Service Provision per Day (Penrith-Keswick): 15

Average Patronage per Service (Penrith-Keswick): 12

Annual Passenger Total (Penrith-Keswick) 68,036

Bus	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Sum
101	2	1	1	38	0	3	1	0	7	8	1	6	1	2	0	71
102	0	0	0	4	0	0	0	0	1	1	0	1	0	0	0	7
103	0	0	0	7	0	1	0	0	1	1	0	1	0	0	0	12
104	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	2
105	0	0	0	7	0	1	0	0	1	2	0	1	0	0	0	13
1061	0	0	0	17	0	1	0	0	2	3	0	2	0	1	0	28
1062	1	1	0	25	0	1	0	0	3	4	0	3	0	1	0	41
107	0	0	0	9	0	1	0	0	2	2	0	1	0	0	0	17
108	0	0	0	13	0	1	0	0	3	3	0	2	0	1	0	24
109	0	0	0	14	0	1	0	0	2	3	0	2	0	1	0	24
110	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	3
111	0	0	0	4	0	0	0	0	1	1	0	0	0	0	0	7
112	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	2
113	0	0	0	5	0	0	0	0	1	1	0	1	0	0	0	8
114	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
115	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	5	4	2	147	1	10	3	0	23	28	4	22	2	8	1	259

Coach	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Sum
101	7	6	2	63	1	12	4	0	82	104	2	11	1	4	0	299
102	1	1	0	6	0	1	0	0	9	10	0	1	0	0	0	31
103	1	1	1	12	0	2	1	0	10	13	0	2	0	1	0	43
104	0	0	0	2	0	0	0	0	1	2	0	0	0	0	0	6
105	1	1	0	12	0	2	1	0	18	20	0	2	0	1	0	57
1061	3	3	1	25	0	7	2	0	33	38	1	5	0	2	0	121
1062	6	4	2	37	0	10	3	0	45	60	1	8	1	3	0	180
107	2	2	1	14	0	3	1	0	22	29	1	4	0	1	0	80
108	2	2	0	20	0	5	2	0	37	38	1	5	0	1	0	113
109	3	2	1	20	0	6	2	0	34	37	1	5	0	1	0	112
110	0	0	0	3	0	0	0	0	3	3	0	0	0	0	0	10
111	1	1	0	6	0	2	1	0	7	8	0	1	0	0	0	27
112	0	0	0	2	0	0	0	0	2	3	0	0	0	0	0	7
113	1	1	0	8	0	2	0	0	10	10	0	1	0	0	0	34
114	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	2
115	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	27	23	9	231	2	53	17	0	312	376	8	46	4	15	1	1123

Case: Bus Operation

Growth Factor from 1994 1.00

	coach	bus	rail	car	
Daytrip					
Keswick	10.00%	5.00%	2.00%	83.00%	100.00%
Bowness	22.00%	1.50%	0.00%	76.50%	100.00%
Rest	4.00%	0.50%	0.00%	95.50%	100.00%
Longstay					
Keswick	6.00%	4.00%	0.50%	89.50%	100.00%
Bowness	11.00%	1.00%	0.00%	88.00%	100.00%
Rest	1.00%	0.50%	0.50%	98.00%	100.00%

Rail	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Sum
101	1	1	1	9	0	2	1	0	0	0	0	2	0	1	0	17
102	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	2
103	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	3
104	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
105	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	3
1061	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	6
1062	0	0	0	7	0	0	0	0	0	0	0	0	0	0	0	8
107	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	3
108	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	4
109	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	4
110	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
111	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
112	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
113	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	2
114	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
115	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	56
Totals	2	2	1	37	1	4	1	0	0	0	1	4	0	2	0	

Average Service Provision per Day (Penrith-Keswick): 15

Average Patronage per Service (Penrith-Keswick): 2

Annual Passenger Total (Penrith-Keswick) 13,669

Bus	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Sum
101	2	1	1	9	0	3	1	0	7	8	1	6	1	2	0	42
102	0	0	0	1	0	0	0	0	1	1	0	1	0	0	0	4
103	0	0	0	2	0	1	0	0	1	1	0	1	0	0	0	7
104	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
105	0	0	0	2	0	1	0	0	1	2	0	1	0	0	0	8
1061	0	0	0	5	0	1	0	0	2	3	0	2	0	1	0	16
1062	1	1	0	7	0	1	0	0	3	4	0	3	0	1	0	23
107	0	0	0	3	0	1	0	0	2	2	0	1	0	0	0	10
108	0	0	0	4	0	1	0	0	3	3	0	2	0	1	0	14
109	0	0	0	4	0	1	0	0	2	3	0	2	0	1	0	14
110	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
111	0	0	0	1	0	0	0	0	1	1	0	0	0	0	0	4
112	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
113	0	0	0	1	0	0	0	0	1	1	0	1	0	0	0	5
114	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
115	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	150
Totals	5	4	2	37	1	10	3	0	23	28	4	22	2	8	1	

Coach	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Sum
101	7	6	2	63	1	12	4	0	82	104	2	11	1	4	0	299
102	1	1	0	6	0	1	0	0	9	10	0	1	0	0	0	31
103	1	1	1	12	0	2	1	0	10	13	0	2	0	1	0	43
104	0	0	0	2	0	0	0	0	1	2	0	0	0	0	0	6
105	1	1	0	12	0	2	1	0	16	20	0	2	0	1	0	57
1061	3	3	1	25	0	7	2	0	33	38	1	5	0	2	0	121
1062	5	4	2	37	0	10	3	0	45	60	1	8	1	3	0	180
107	2	2	1	14	0	3	1	0	22	29	1	4	0	1	0	80
108	2	2	0	20	0	5	2	0	37	38	1	5	0	1	0	113
109	3	2	1	20	0	6	2	0	34	37	1	5	0	1	0	112
110	0	0	0	3	0	0	0	0	3	3	0	0	0	0	0	10
111	1	1	0	6	0	2	1	0	7	8	0	1	0	0	0	27
112	0	0	0	2	0	0	0	0	2	3	0	0	0	0	0	7
113	1	1	0	8	0	2	0	0	10	10	0	1	0	0	0	34
114	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	2
115	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1123
Totals	27	23	9	231	2	53	17	0	312	376	8	46	4	15	1	

Case: LRT Operation/Narrow Gauge

Growth Factor from 1994 1.00

	coach	bus	rail	car	
Daytrip					
Keswick	10.00%	5.00%	4.00%	81.00%	100.00%
Bowness	22.00%	1.50%	0.00%	76.50%	100.00%
Rest	4.00%	0.50%	0.00%	95.50%	100.00%
Longstay					
Keswick	6.00%	4.00%	1.00%	89.00%	100.00%
Bowness	11.00%	1.00%	0.00%	88.00%	100.00%
Rest	1.00%	0.50%	1.00%	97.50%	100.00%

Rail	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Sum
101	2	2	1	18	1	4	1	0	0	0	1	4	0	1	0	34
102	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	3
103	0	0	0	3	0	1	0	0	0	0	0	1	0	0	0	6
104	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
105	0	0	0	3	0	1	0	0	0	0	0	1	0	0	0	6
1061	0	0	0	9	0	0	0	0	0	0	0	0	0	0	0	11
1062	0	0	0	13	0	1	0	0	0	0	0	1	0	0	0	16
107	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	6
108	0	0	0	7	0	0	0	0	0	0	0	0	0	0	0	9
109	0	0	0	8	0	0	0	0	0	0	0	0	0	0	0	8
110	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
111	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	3
112	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
113	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	4
114	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
115	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	4	4	3	75	1	8	2	0	0	0	2	7	1	3	1	111

Average Service Provision per Day (Penrith-Keswick): 15 **Annual Passenger Total (Penrith-Keswick)** 27,338

Average Patronage per Service (Penrith-Keswick): 5

Bus	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Sum
101	2	1	1	18	0	3	1	0	7	8	1	6	1	2	0	51
102	0	0	0	2	0	0	0	0	1	1	0	1	0	0	0	5
103	0	0	0	3	0	1	0	0	1	1	0	1	0	0	0	8
104	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
105	0	0	0	3	0	1	0	0	1	2	0	1	0	0	0	9
1061	0	0	0	9	0	1	0	0	2	3	0	2	0	1	0	20
1062	1	1	0	13	0	1	0	0	3	4	0	3	0	1	0	30
107	0	0	0	5	0	1	0	0	2	2	0	1	0	0	0	12
108	0	0	0	7	0	1	0	0	3	3	0	2	0	1	0	18
109	0	0	0	8	0	1	0	0	2	3	0	2	0	1	0	18
110	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
111	0	0	0	2	0	0	0	0	1	1	0	0	0	0	0	5
112	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
113	0	0	0	2	0	0	0	0	1	1	0	1	0	0	0	6
114	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
115	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	5	4	2	75	1	10	3	0	23	28	4	22	2	8	1	187

Coach	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Sum
101	7	6	2	63	1	12	4	0	82	104	2	11	1	4	0	299
102	1	1	0	8	0	1	0	0	9	10	0	1	0	0	0	31
103	1	1	1	12	0	2	1	0	10	13	0	2	0	1	0	43
104	0	0	0	2	0	0	0	0	1	2	0	0	0	0	0	6
105	1	1	0	12	0	2	1	0	16	20	0	2	0	1	0	57
1061	3	3	1	25	0	7	2	0	33	38	1	5	0	2	0	121
1062	6	4	2	37	0	10	3	0	45	60	1	8	1	3	0	180
107	2	2	1	14	0	3	1	0	22	29	1	4	0	1	0	80
108	2	2	0	20	0	5	2	0	37	38	1	5	0	1	0	113
109	3	2	1	20	0	6	2	0	34	37	1	5	0	1	0	112
110	0	0	0	3	0	0	0	0	3	3	0	0	0	0	0	10
111	1	1	0	8	0	2	1	0	7	8	0	1	0	0	0	27
112	0	0	0	2	0	0	0	0	2	3	0	0	0	0	0	7
113	1	1	0	8	0	2	0	0	10	10	0	1	0	0	0	34
114	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	2
115	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	27	23	9	231	2	53	17	0	312	376	8	46	4	15	1	1123

Appendix C

Route Details

KESWICK - PENRITH RAILWAY PRE-FEASIBILITY STUDY APPENDIX C CONDITION OF STRUCTURES

Structure No	DESCRIPTION			DIMENSIONS		REMEDIAL WORK REQUIRED	
	Superstructure	Deck	Abutment & Wing Wall	Span (m)	Width (m)	Description	Priority
U58	7 No plate girders	Footway	Masonry	9.1	8.6	Complete repaint	M
U59	Inv bow girder & 1No plate girder	Timber footway	Masonry	23.4	3.1	Decking + parapet + local strengthening Complete repaint Clean + patch repoint masonry	E M L
U60	Plate girder edge beam Steel crossbeams Concrete deck Tubular Parapet	Concrete footway	Masonry	12.5 o/a length on skew	3.9	Complete repaint Repair impact damage Clean + patch repoint masonry	M H L
U61	Masonry Arch			2.7	5.0	Rebed copings + patch repoint Repair long crack under spandrel	M H
O62	R C Box culvert			3.3	2.6	Remove exg box culvert New deck on exg abutment	E
BIG TUNNEL	Brick tunnel (currently blocked)					Remove fill and inspect Repoint tunnel lining Retaining walls	E E E
62B	Masonry retaining wall			60 long	7.0 high max	Inspect Clean and patch repoint masonry	E M
O63	Masonry/Bwk Arch			4.3sq	4.8	Repair bulging spandrel Repair diagonal/longitudinal cr in barrel	H
U65	Inv bow girder + 1No plate girder Steel crossbeam	Timber f/w	Masonry include pier	17.5 sk	3.0	Decking + parapet + local strengthening Complete repaint Clean + patch repaint masonry	E M L
U66	As 65			30.5 sk	3.0	Decking + parapet + local strengthening Complete repaint Clean + patch repoint masonry	E M L
U67	As 65			27.5 sk	3.0	Decking + parapet + local strengthening Complete repaint Clean + patch repoint masonry	E M L

KESWICK - PENRITH RAILWAY PRE-FEASIBILITY STUDY APPENDIX C CONDITION OF STRUCTURES

Structure No	DESCRIPTION			DIMENSIONS		REMEDIAL WORK REQUIRED	
	Superstructure	Deck	Abutment & Wing Wall	Span (m)	Width (m)	Description	Priority
U68	Concrete slab		Masonry	3.4 sk		Renew concrete deck Local rebuild w/w Clean + patch repoint masonry	E E M
U69	Upright bow girders Cross members Timber rail beams No plan bracing	Timber deck f/w	Masonry	24.4	4.8 outside	Decking + plan bracing + general strengthening Local strengthening Complete repaint Clean + patch repoint masonry	E E H L
U70	Deck removed	Timber f/w		1.8	3.0 say	Provide concrete deck	E
U71	Upright bow girder Cross member Plan bracing Addit vert + crossbeam Inclined bracing Timber rail beams	Timber plank f/w	Masonry	30.5	5.0 to outside	Decking + local strengthening Complete repaint Clean + patch repoint masonry scour protection	E H M M
U72	Masonry arch			7.3sk	4.8sk	Local rebuild spandrels Local repoint masonry	H M
U73	Inv bow girder + 1No plate girder Steel crossbeam	Timber f/w	Masonry	24.7	3.9 approx	Decking + local strengthening Complete repaint Clean + patch repoint masonry	E M M
LITTLE TUNNEL	Brick tunnel		Bwk			Local repoint barrel Repair drainage/seepage	M M

KESWICK - PENRITH RAILWAY PRE-FEASIBILITY STUDY APPENDIX C CONDITION OF STRUCTURES

Structure No	DESCRIPTION			DIMENSIONS		REMEDIAL WORK REQUIRED	
	Superstructure	Deck	Abutment & Wing Wall	Span (m)	Width (m)	Description	Priority
U74	Upright bow girder Cross member Plan bracing Addit vert + crossbeam Inclined bracing Timber rail beams			36.1sk	4.96o/a	Decking + local strengthening Complete repaint Clean + patch repoint masonry Scour protection	E H M M
U75	Upright bow girder Cross member Plan bracing Addit vert + crossbeam Inclined bracing Timber rail beams			existing 30.2sk		New bridge + 1No abutment	E
U76	Masonry arch			2.4		No work required	
77	Bridge removed					Complete new bridge required	E
U78	Plate girder edge beam concrete deck	Concrete	Masonry	26.5	6.7	Complete repaint Clean + patch repoint masonry	M L
U79	Deck removed			6.0sq	12.7o/a	New deck on raised abutment Clean + patch repoint masonry	E M
80	Masonry arch					Unblock and inspect	E
Over 81	Lattice edge girders Steel cross beam	Timber deck (2T)	Masonry			Complete repaint Clean + patch repoint masonry	M L
Over 82	Cast iron edge beams Cross girders Bwk jack arches	(5T)	Masonry			Complete repaint Clean + patch repoint masonry	
U83	Masonry arch			2.75		No work required	
Over 84	Lattice edge girders Steel cross beam					Complete repaint Clean + patch repoint masonry	M L

KESWICK - PENRITH RAILWAY PRE-FEASIBILITY STUDY APPENDIX C CONDITION OF STRUCTURES

Structure No	DESCRIPTION			DIMENSIONS		REMEDIAL WORK REQUIRED	
	Superstructure	Deck	Abutment & Wing Wall	Span (m)	Width (m)	Description	Priority
U85	Masonry arch					No work required	
U86	3 x plate girders Cross beams	Steel plates	Masonry	6.0	9.0 o/a	Complete repaint Local strengthening Waterproof	H H H
U86a	Masonry arch			2.1		No work required	
Over 87	Cast iron edge girder Interned girders Bwk arches			7.5	8.0	Complete repaint Clean + patch repoint masonry + rebed copings	M M
U88	Masonry arch			2.3		Renew parapets Clean + patch repoint masonry	H M
U89	Mosedate Viaduct Bwk barrel Masonry spandrels Masonry piers Bwk parapets	12 No arches		9.0 clear 1.6 pier thickness 125mo/a length	7.8 inside parapets	Repoint parapets (both faces) Remove fill waterproof refill Barrels:- exam long cr + repair (tie) renew blown bwk patch repoint Piers:- tie piers where full ht cracked (6 No) install fill drainage system Remove vegetation and trees	H E E E
Over 90	Lattice edge girders Timber cross beam			19.0	3.4	Complete repaint Clean + patch repoint masonry	M L
Over 91	Cast iron edge girder Interned girders Bwk arches					Complete repaint Clean + patch repoint masonry	M M

KESWICK - PENRITH RAILWAY PRE-FEASIBILITY STUDY APPENDIX C CONDITION OF STRUCTURES

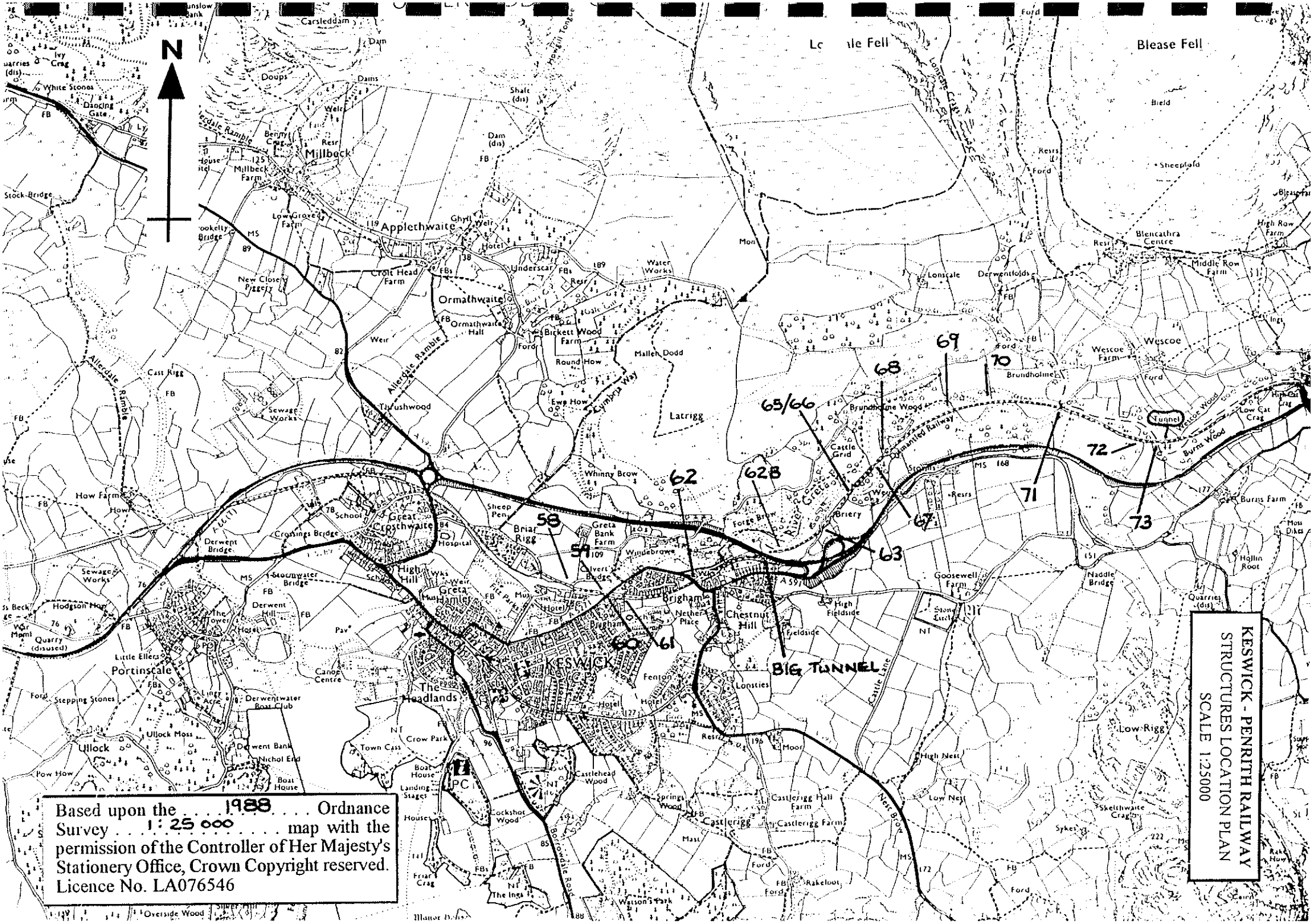
Structure No	DESCRIPTION			DIMENSIONS		REMEDIAL WORK REQUIRED	
	Superstructure	Deck	Abutment & Wing Wall	Span (m)	Width (m)	Description	Priority
Over 94	Cast iron edge girder Interned girders Bwk arches					Complete repaint Clean + patch repoint masonry	M M
95	Steel girder		Masonry			Renew deck Clean + patch repoint masonry	E M
U96	Gillhead Viaduct	4 No arches		6.6 clear 1.1 pier thickness 30m long o/a	7.7 inside parapets	Local repoint parapets Remove fill waterproof refill Barrels:- exam long cr + repair (tie) renew blown bwk patch repoint Piers:- tie piers where full ht cracked (3 No) install fill drainage system Remove vegetation and trees Scour protect	M E E E E E
Over 97	Bridge removed					Complete new bridge required	E
Over 98	Bridge removed					Complete new bridge required (possible crossing)	E
U99	Masonry arch			2.6		Renew parapet Clean + patch repoint masonry	E M
Over 100 Over 101 Over 102 Over 103	Bridge removed (Beckes)					A66 complete new bridge Beckes complete viaduct B5288 complete new bridge	E E E
U104	Deck removed? (not inspected)			6.1?		Renew deck	E

KESWICK - PENRITH RAILWAY PRE-FEASIBILITY STUDY APPENDIX C CONDITION OF STRUCTURES

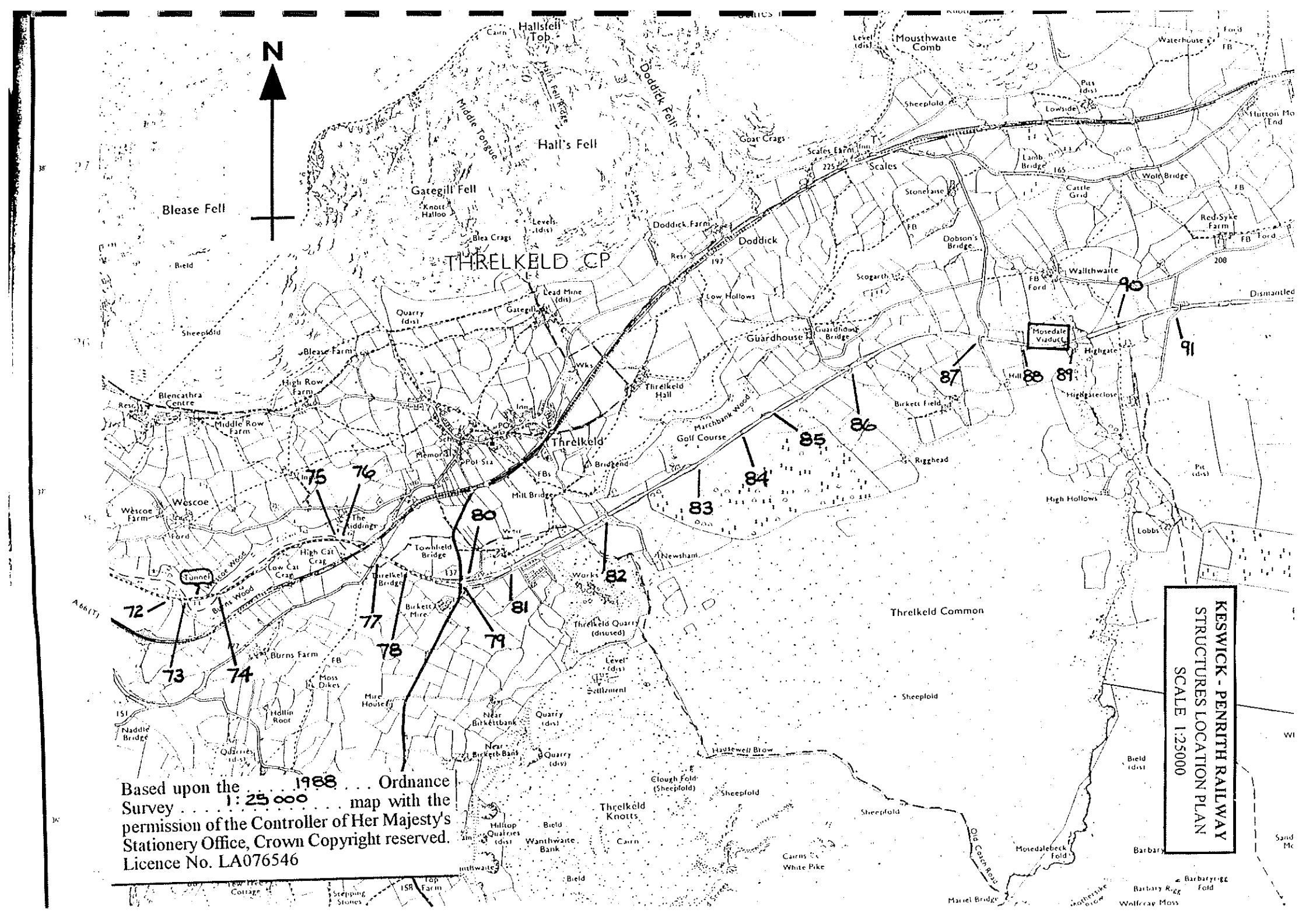
Structure No	DESCRIPTION			DIMENSIONS		REMEDIAL WORK REQUIRED	
	Superstructure	Deck	Abutment & Wing Wall	Span (m)	Width (m)	Description	Priority
105	Penruddock Viaduct Masonry thro'out	6 No arches				Remove fill/waterproof/fill Barrel: examine long cr repair cr (tie) Piers: install fill drainage	E E E
U106	Bridge removed					Complete new bridge required	E
U107	Concrete deck					No work required	
U108	Bridge removed					Complete new bridge required	E
U109	2No rail beams + edge	Timber rail beam	Masonry	5.2	5.3	Renew rail beams Local rebuild wingwalls	E E
Over 111	Bridge removed					Complete new bridge required	E
U112	Masonry arch			4.6		No work required	
U113	Bridge removed					Complete new bridge required	E
U114	Concrete deck		Masonry			No work required	
U117	Deck removed		Masonry	8.9sk	12.2sk	Renew deck Patch repoint masonry	E M
U119	Deck removed		Masonry			Renew deck Patch repoint/repair abutment	E E
U122	Deck removed		Masonry			Renew deck Patch repoint masonry	E M
Over 125	Steel girders		Masonry			Complete repaint	M
U127	Deck removed		Masonry			Renew deck Patch repoint masonry	E M
U128	Deck removed (assume)					Renew deck Patch repoint masonry	E M
U129	Masonry arch			2.4		No work required	
U130	Masonry arch			5.9		No work required	

KESWICK - PENRITH RAILWAY PRE-FEASIBILITY STUDY APPENDIX C CONDITION OF STRUCTURES

Structure No	DESCRIPTION			DIMENSIONS		REMEDIAL WORK REQUIRED	
	Superstructure	Deck	Abutment & Wing Wall	Span (m)	Width (m)	Description	Priority
U131	Deck removed		Masonry	6.3sk		Renew deck Local repair/repoint abutment	E E
U135	Bridge removed					Complete new bridge required	E



KESWICK - PENRITH RAILWAY
STRUCTURES LOCATION PLAN
SCALE 1:25000



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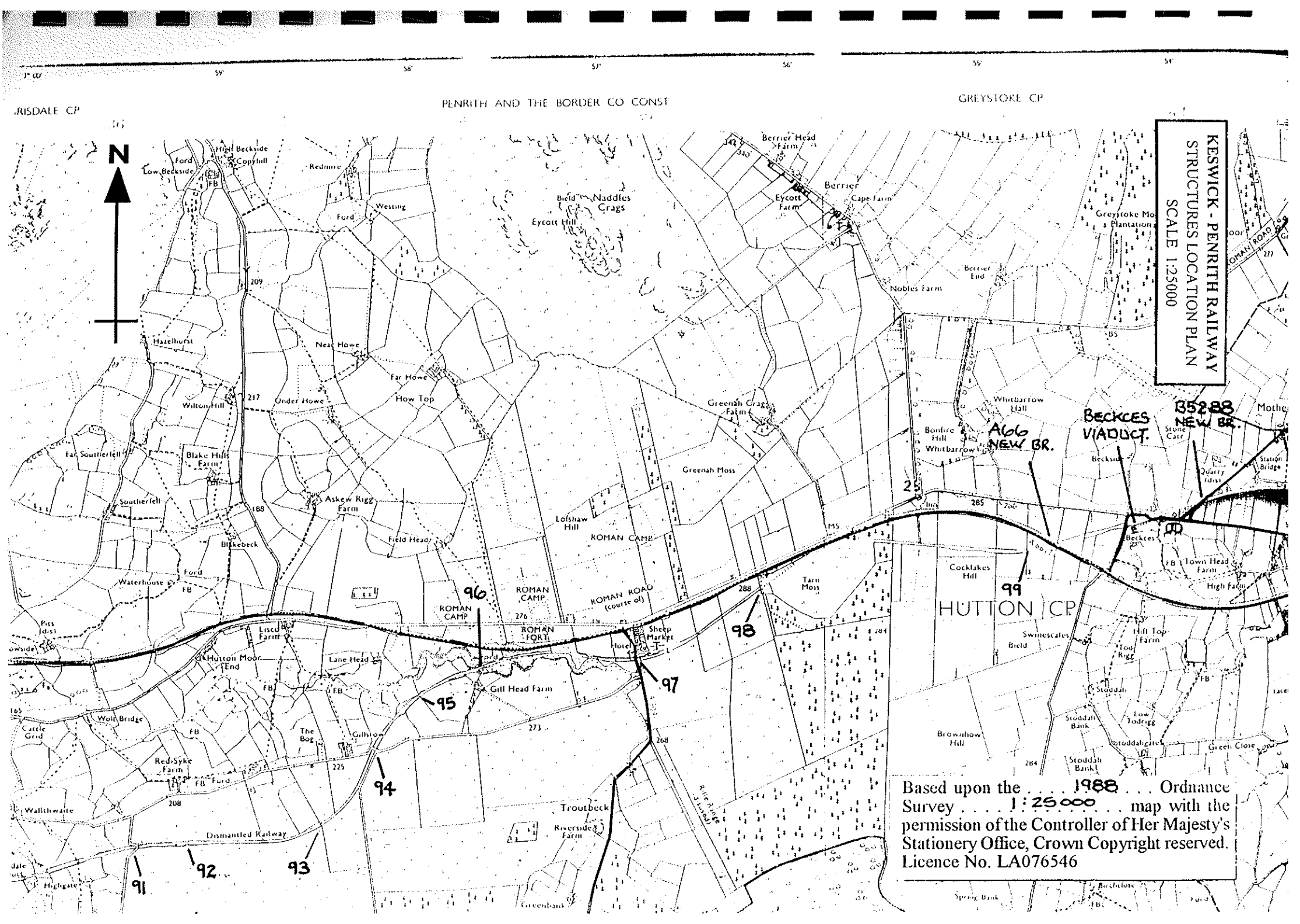
KESWICK - PENRITH RAILWAY
STRUCTURES LOCATION PLAN
SCALE 1:25000
N
PENRITH AND THE BORDER CO CONST
GREYSTOKE CP
HUTTON CP
A66 NEW BR.
BECKCES VIADUCT.
B5288 NEW BR.
ROMAN CAMP
ROMAN ROAD (course of)
ROMAN FORT
Dismantled Railway
91
92
93
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99
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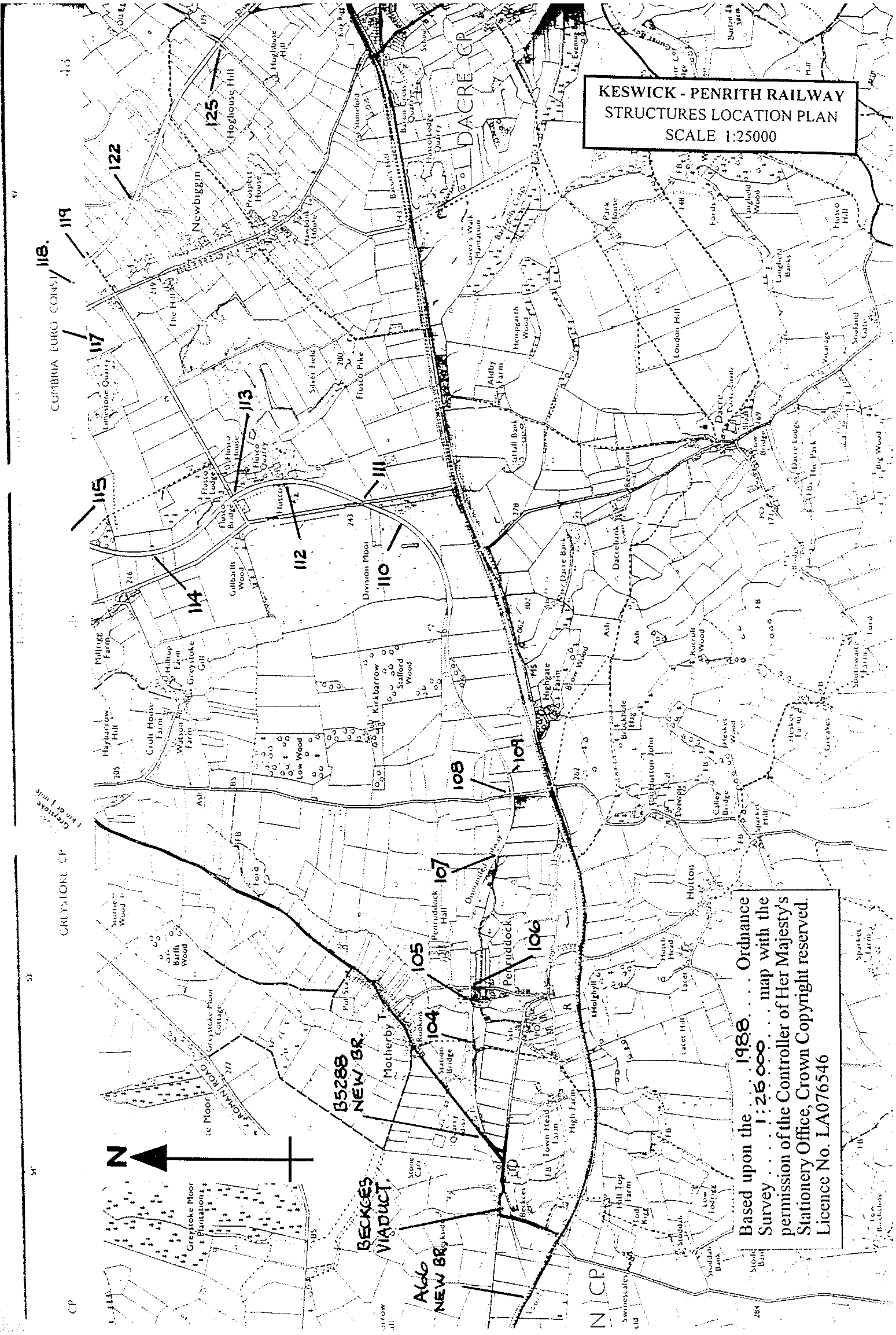
KESWICK - PENRITH RAILWAY
STRUCTURES LOCATION PLAN
SCALE 1:25000
N
104
105
106
107
108
109
110
111
112
113
114
115
117
118.
119
122
125
B5288 NEW BR.
BECKCES VIADUCT
A66 NEW BR
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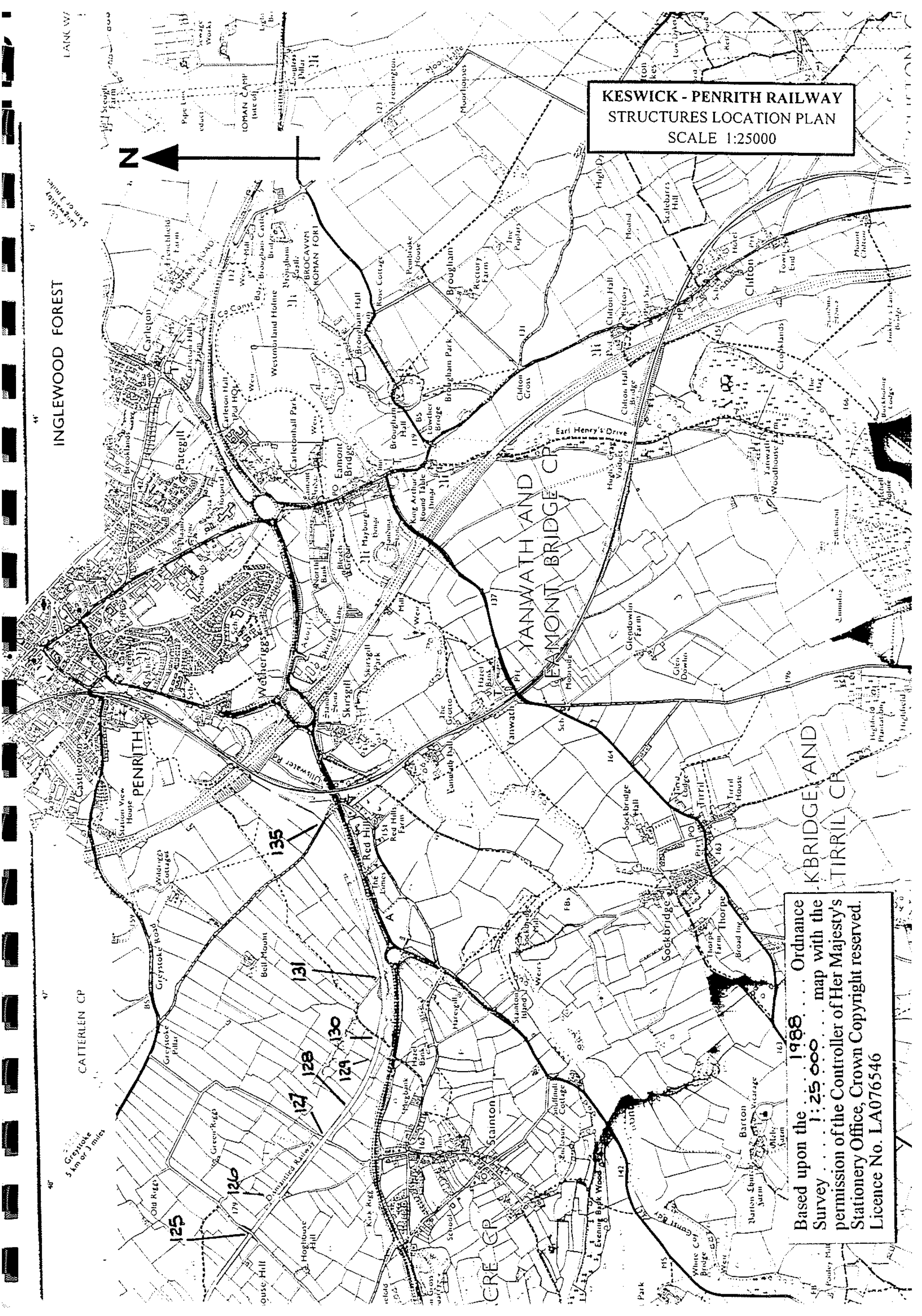
DACRE CP
GREYSTOKE CP
CUMBRIA EURO CONSI
Newbiggin
Penruddock
Motherby
Hutton
Dacre


KESWICK - PENRITH RAILWAY
STRUCTURES LOCATION PLAN
SCALE 1:25000
N
INGLEWOOD FOREST
CATTERLEN CP
YANWATH AND EAMONT BRIDGE CP
PENRITH
Eamont Bridge
Brougham Hall
Clifton
Wetheriggs
Skirsgill
Yanwath
Red Hill
Sockbridge
Tirril
Stainton
Earl Henry's Drive
Dismantled Railway
125
126
127
128
129
130
131
135
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Cumbria