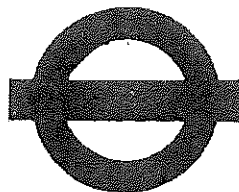


LONDON UNDERGROUND LIMITED

STRATEGIC REVIEW - 1988

NEW LINES AND EXTENSIONS

NORTHERN LINE - SOUTHERN EXTENSION
TO
PECKHAM RYE or STREATHAM



MARKET
ANALYSIS

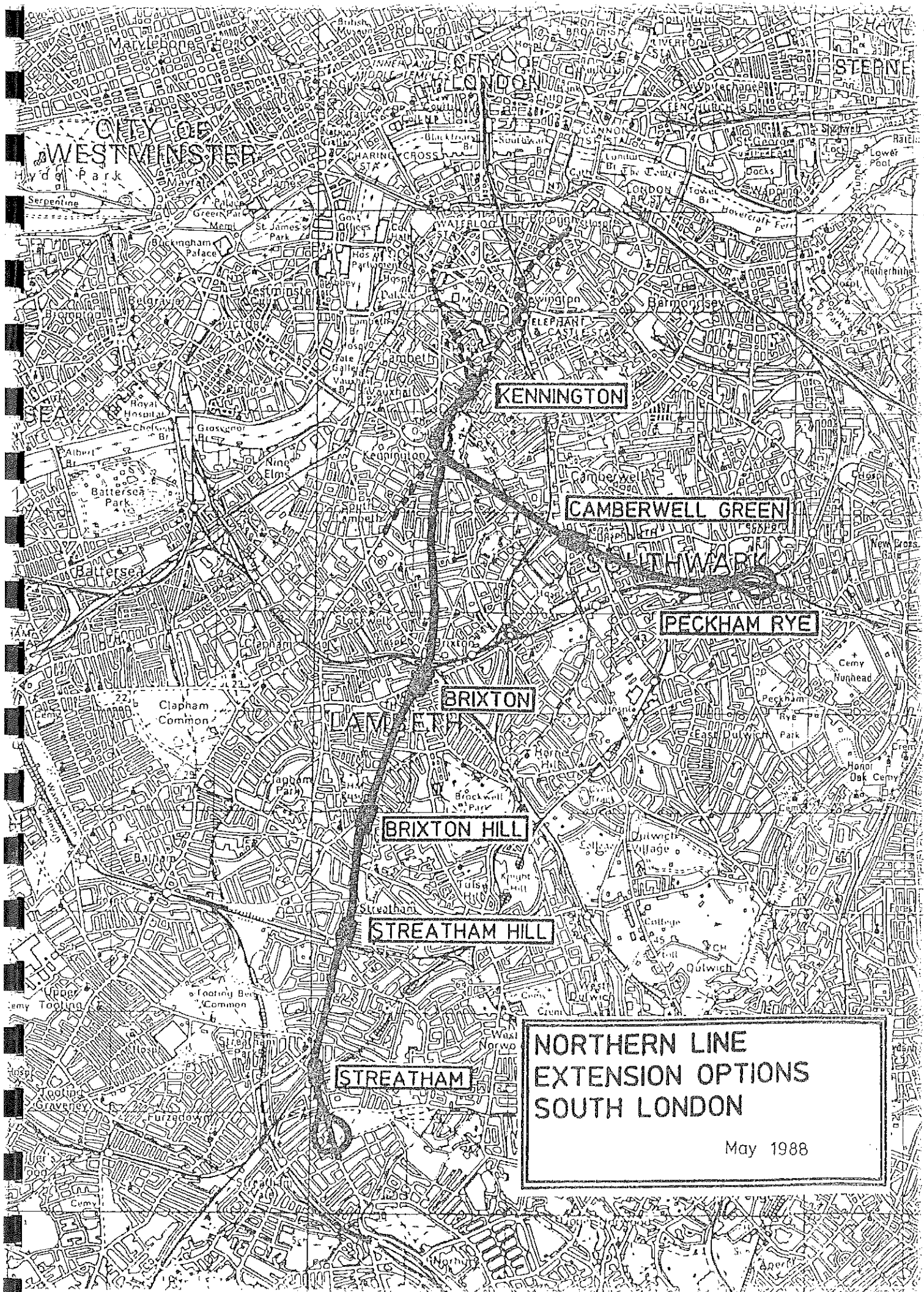
May 1988

D R Mead. C Eng FICE
Principal Civil Engineer
London Underground Limited

Library & Information Services



* Z 0 0 0 4 0 4 0 *



**NORTHERN LINE
EXTENSION OPTIONS
SOUTH LONDON**

May 1988

STRATEGIC REVIEW 1988 - ENHANCEMENT OF CAPACITY
NEW LINES AND EXTENSIONS

NORTHERN LINE - SOUTHERN EXTENSION

1 Introduction

- 1.1 Four routes were initially considered, all connecting with the existing Northern Line just south of Kennington Station.

Route A via Brixton, Brixton Hill and Streatham Hill to Streatham (6.6 km).

Route B via Camberwell Green to Peckham Rye (4.1 km).

Route C via Camberwell Green and Denmark Hill to Herne Hill and Tulse Hill.

Route D At deep level beneath the existing Northern Line to Balham, making use of the existing deep level shelters.

- 1.2 After some initial work, it was decided to carry out engineering feasibility and provide estimates for Routes A and B only.

- 1.3 It is important to note that these proposals assume that ALL trains on the Charing Cross branch would use the new line, and ALL trains on the City branch would use the existing line south of Kennington. The only exceptions might be a few first and last trains from the Charing Cross branch to Morden Depot. There would be no direct connection from the City branch to the new line.

It is also assumed that the full service of 30 trains per hour is to proceed to Streatham or Peckham Rye.

2 Features common to both routes

2.1 Kennington (See Drawing No 3)

With the two branches of the Northern Line separated, there would be a considerable interchange of passengers at Kennington. Fortunately, the main interchanges would be cross platform, and it would be relatively simple to build additional cross passages. It is suggested that up to seven passages could be built (3 No between the northbound platforms, 4 No southbound).

2.2 Connections to Existing Railway

Initially it was suggested that the new line should connect to the Kennington Loop at (or near to) the points marked (A) on drawing No 1. This idea was abandoned for two reasons:

- (1) The curvature on the existing loop is 100 metre radius, and for passenger services, the trains would be restricted to less than 20 miles per hour.

- (ii) The existing crossovers and station, are in "good" tunnelling ground, and the connections would be relatively easy to construct. Further round the existing loop, ground conditions, and hence tunnelling conditions, are bad, and constructing a step plate junction would be substantially more expensive. Accordingly the arrangement shown on drawing No 1 is proposed.

2.3 Ground Conditions

Ground conditions in much of South London are poor for tunnelling, consisting mainly of sand and gravel. In many areas, tunnelling would take place below the water table, requiring use of compressed air (or a slurry shield). In such circumstances the cost of the tunnels may be as much as three times the rate for tunnels driven in clay. Much of the information prepared for an earlier study for a Bakerloo Line extension is relevant to the Peckham extension, and suggests that all parts of that route are in bad ground. On the Streatham route, information available indicates that as far as Brixton, the route will be in waterlogged ground. Beyond Brixton, the line climbs at 1 in 50 (2%). Soils information is very sparse in this area, but it is believed that there is a deep band of clay through which the tunnels could be driven. This has been assumed in the estimate. If this is not the case and the ground is bad, there could be an additional cost of as much as £35m. In view of this variation, it is recommended that a preliminary soil survey costing about £40,000, be carried out before further consideration is given to this route.

2.4 Reversing Arrangements

It is understood that it is not possible to reverse more than about 12 trains an hour in a platform. To cope with 30 trains per hour, the possibility of three platforms has been considered. With the tracks totally segregated to avoid conflicting moves, and including the third platform, with additional escalators, the total extra cost would be over £23m in good ground. A third platform with conflicting movements would cost about £14 million. Adoption of a reversing loop similar to Kennington would avoid conflicting movements and the need for a third platform. However, no layover would be possible if 30 trains per hour are to be dealt with. A 200 metre radius loop, step plate junctions, cross-over tunnel and 300 metre long siding tunnel (with stub for future extension) could be provided for about £12 million (good ground). This proposal has been adopted and included in the total estimate. The siding would be used to withdraw seriously defective trains from service for emergency repairs. For this purpose, part of the siding tunnel would be 4.5 m in diameter and would be equipped with a pit to facilitate these repairs. If and when the line were extended, connections to the end of the siding tunnel and the stub tunnel could be made without affecting train services. The arrangement is shown on drawing No 2. During non-traffic hours, it would be possible to stable up to 10 trains in the loop, with engineers trains using the reversing siding.

2.5 Ventilation and Draught Relief

Ventilation shafts would be provided approximately halfway between each station; also in the overrun tunnels beyond both terminal stations. 2.25 metre I.D. cross passages at 250 metre centres would be provided between the running tunnels, and draught relief shafts at all stations.

2.6 Fire Escape

Following the Kings Cross fire, it may be a requirement to include fire escapes at all new stations. (This could be done by incorporating an emergency stairway within the draught relief shafts.)

3 The Routes

For both routes, there is a gentle gradient from Kennington to pass over the existing Kennington Loop, after which the northbound line dives at 1 in 50, to go under the existing Northern Lines.

3.1 Route A - Streatham

The Streatham route follows the A23, running deep to pass beneath sewers and the Victoria Line at Brixton. There are four new stations on this line, at Brixton - interchange with Victoria Line, Brixton Hill, Streatham Hill - interchange with BR services to West Croydon, and Streatham - interchange with BR services to Sutton. There is a terminating loop at Streatham. After Brixton, there is a sustained 1 in 50 (2%) gradient to Brixton Hill, but as the gradient of the street above is similar, the line remains at about 30 metres below ground level. It should be noted that there are gradients of similar slope and length on the Hampstead Line, so this one will not be a limiting factor on the line, even though it is more severe than is normally recommended. Beyond Brixton Hill, the line can be built on the hump station profile. Most of the alignment can be kept under streets, without introducing sharp curves, except between Streatham Hill and Streatham, near stations and around the terminal loop where it passes under houses.

3.2 Route B - Peckham Rye

The route follows the A202 Camberwell New Road, to Camberwell Green where there is a station. It then roughly follows the old Bakerloo Line extension route to Peckham Rye where there is an interchange with BR and a terminating loop. The ground is fairly level, so the railway could be built on the hump station principle, to assist with energy conservation.

3.3 Station Layouts

With the exception of Brixton (see below), station layouts have not been developed. The estimates allow for escalator connections into extended/reconstructed BR ticket halls at Streatham, Streatham Hill and Peckham Rye, rather than provision

of a new LUL facility on a separate site. At Camberwell Green, a sub surface ticket hall is suggested, ideally linked into new pedestrian subways. Brixton Hill Station would probably lend itself to acquisition of an adjacent building, and conversion/reconstruction as a ground level ticket hall.

3.4 Brixton Station

The attached drawing No D 60746, outlines the proposals allowed for in the estimate. A three way escalator shaft with two escalators and a fixed stair, would connect into the northern side of the existing Victoria Line ticket hall. The rise of this escalator will be approximately 23 metres. A low level stairway connection would be provided between the Northern and Victoria Lines. There would be a 9.5 metre vertical rise, with about 60 steps between the two pairs of platforms. Passengers not wishing to use these stairs, would have to travel via the existing Victoria Line escalators, the ticket hall, and the new escalator (the total vertical travel would be approximately 36 metres).

Acquisition of some property north of the Victoria Line ticket hall would be required, and probably some underpinning to the high level BR viaduct needed.

4 Camden Town

4.1 Interchange

As at Kennington, considerable numbers of people will need to interchange between the two Northern Line services. The alignment of the two pairs of station tunnels does not permit short interchange passenger even at the southern ends of the platforms. Passages 1, 2, 3 and 4 would be more difficult and much more expensive to construct, than passages 5 and 6. The attached drawing No 4 shows three possible solutions, in conjunction with the station congestion relief scheme.

4.2 Signalling

No alterations would be required to the existing signalling or the proposed routes, however, the estimate also provides for additional signalling, to provide for the increased level of service.

4.3 Civil Engineering

It should be noted that no Civil Engineering works are required to separate the two Northern Line services at Camden Town. It is intended that the existing track connections should be retained for use by early and late trains travelling to and from the depots, engineers trains, and other non service requirements.

5 Stabling at Highgate

5.1 Additional stabling can be provided on the area of the disused operational sidings north-east of Highgate Depot. As these sidings are not currently due to be commissioned, action may need to be taken to prevent sale of this land.

5.2 Cost of stabling has not been allowed in the estimate.

6 Cost

6.1 The notional estimates for the two routes are:-

	£m
Route A Streatham	264
Streatham (omitting Brixton Hill Station)	230
Route B Peckham Rye	175
Minor works at Kennington and Camden Town	2

6.2 Detailed cost breakdown with assumptions, also estimates prepared by the Signal and Electrical Engineers, are appended.

APPENDIX 1

NORTHERN LINE EXTENSION TO STREATHAM AND PECKHAM RYE

NOTIONAL ESTIMATE

GENERAL NOTES

- 1 Unless specifically stated otherwise, all costs exclude
 - (a) Rolling stock.
 - (b) Depot works and additional stabling.
 - (c) Implications of interworking BR and tube stock (where relevant)
 - (d) Signalling immunisation on existing railways if 'chopper' control stock to be used.
 - (e) Any other works required elsewhere on the existing railway associated with the extension.
 - (f) Any design changes arising as a consequence of Kings Cross inquiry.
 - (g) Total power supply exceeding "Future Power Supply Project" provision.
- 2 All Costs Include
 - (a) Civil Engineering.
 - (b) Permanent Way.
 - (c) Signal and Electrical Works.
 - (d) Static Plant (escalators, pumps, fans etc).
 - (e) Service diversions.
 - (f) Temporary passenger, and traffic arrangements.
 - (g) Architectural works.
 - (h) Design, site supervision and consultants fees (10% on (a) - (g)).
 - (i) Allowance for land acquisition/compensation/working sites.
- 3 All costs as at January 1988 price levels, and have a (notional) tolerance of $\pm 35\%$.

A STREATHAM OPTION

		To Brixton only *
	£m	£m
2 No step plates built under traffic	4.0	4.0
2 No tube tunnels and cross passages 4.0 km compressed air/slurry shield	50.0	37.0
2 No tube tunnels and cross passages 2.6 Km mixed ground	30.0	-
2 No stations mainly in poor ground	60.0	30.0
2 No stations in mixed clay	50.0	-
Ventilation Shafts	5.0	2.0
Turning loop at Streatham in mixed ground including siding	12.0	12.0
Permanent Way	9.0	4.0
Signal & Electrical	14.0	6.0
Land acquisition and Compensation, allow	5.0	1.0
Contingency 10%	<u>25</u>	10
TOTAL	£264m	£106m

B PECKHAM RYE OPTION

2 No step plates	4.0
2 No tube tunnels and cross passages in compressed air/slurry shield	52.0
2 No stations mainly in poor ground	60.0
3 No vent shafts	3.0
Turning loop at Peckham in poor ground including siding	24.0
Permanent Way	5.5
Signals & Electricals	9.0
Land Acquisition and compensation allow	1.0
Contingency 10%	<u>15</u>
TOTAL	£175m

C Additional cross passages at Kennington	0.5
Additional cross passages at Camden Town	1.0
Additional signalling at Camden Town	<u>0.5</u>
TOTAL	£ 2m

* Assuming turning loop provided at Brixton.

LONDON UNDERGROUND LIMITED

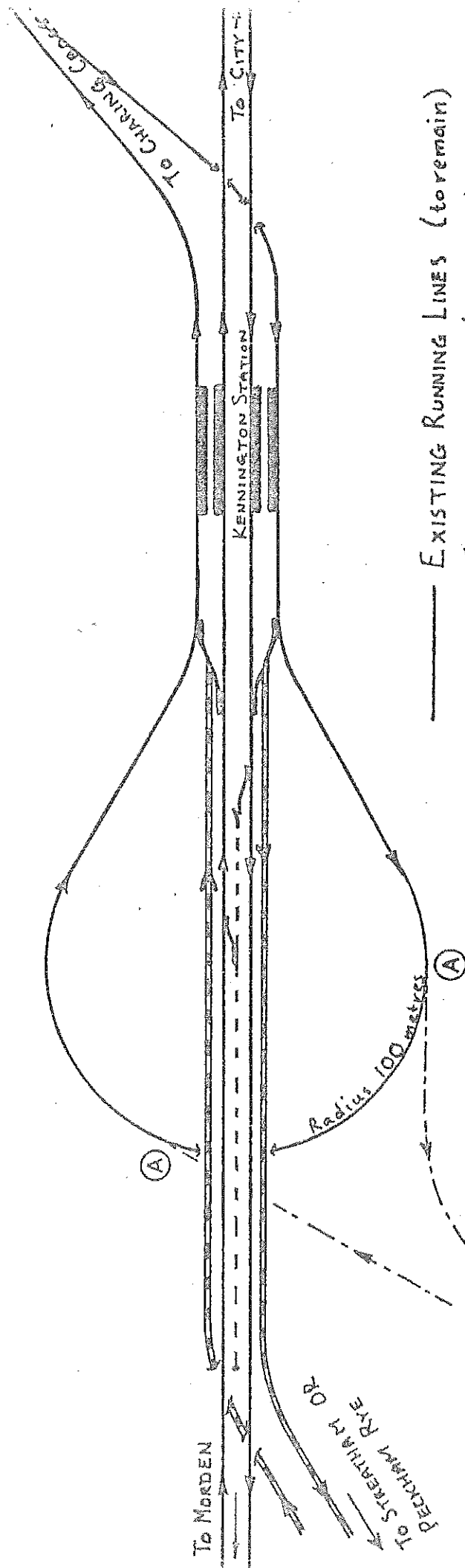
NEW LINES AND EXTENSIONS - STRATEGIC REVIEW 1988

NORTHERN LINE EXTENSIONS FROM KENNINGTON

DESCRIPTION OF WORK	TO STREATHAM		TO PECKHAM	
	20 TRAIN/HR TO STREATHAM (ITEM 6) £M	30 TRAIN/HR TO STREATHAM (ITEM 7) £M	20 TRAIN/HR TO PECKHAM (ITEM 8) £M	30 TRAIN/HR TO PECKHAM (ITEM 9) £M
<u>SIGNALLING</u>				
SIGNAL EQUIPMENT AND CABLES	3.5	3.9	2.5	3.0
CABLE RUNS	0.3	0.3	0.2	0.2
CENTRALISED CONTROL	0.3	0.3	0.3	0.3
<u>LIGHTING AND POWER</u>				
STATION SERVICES	1.9	1.9	1.2	1.3
TRACTION POWER DISTRIBUTION	6.0	6.0	4.0	4.0
TUNNEL LIGHTING	0.5	0.5	0.3	0.3
<u>COMMUNICATIONS</u>				
PROVISION OF CCTV, PA, TRAIN RADIO, TELEPHONES, ETC	0.8	0.8	0.4	0.4
TOTAL ESTIMATE	13.3	13.7	8.9	9.5

NOTE (1) THE ABOVE ARE FEASIBILITY ESTIMATED COSTS AT JANUARY 1988 PRICE LEVELS AND HAVE A TOLERANCE OF +/-35%.

NOTE (2) ROUTES ARE TAKEN FROM MARKED DRAWINGS AS SUPPLIED
A:ITEM.6-9 140188



- EXISTING RUNNING LINES (to remain)
- - - - EXISTING SIDING (to remain)
- == NEW TRACKS
- . - . - . ALTERNATIVE NEW ALIGNMENT (NOT RECOMMENDED — SEE TEXT)

NOT TO SCALE

Drawing No. 1

DRAWING No.2

PROPOSED LAYOUT OF REVERSING SIDING & LOOP

