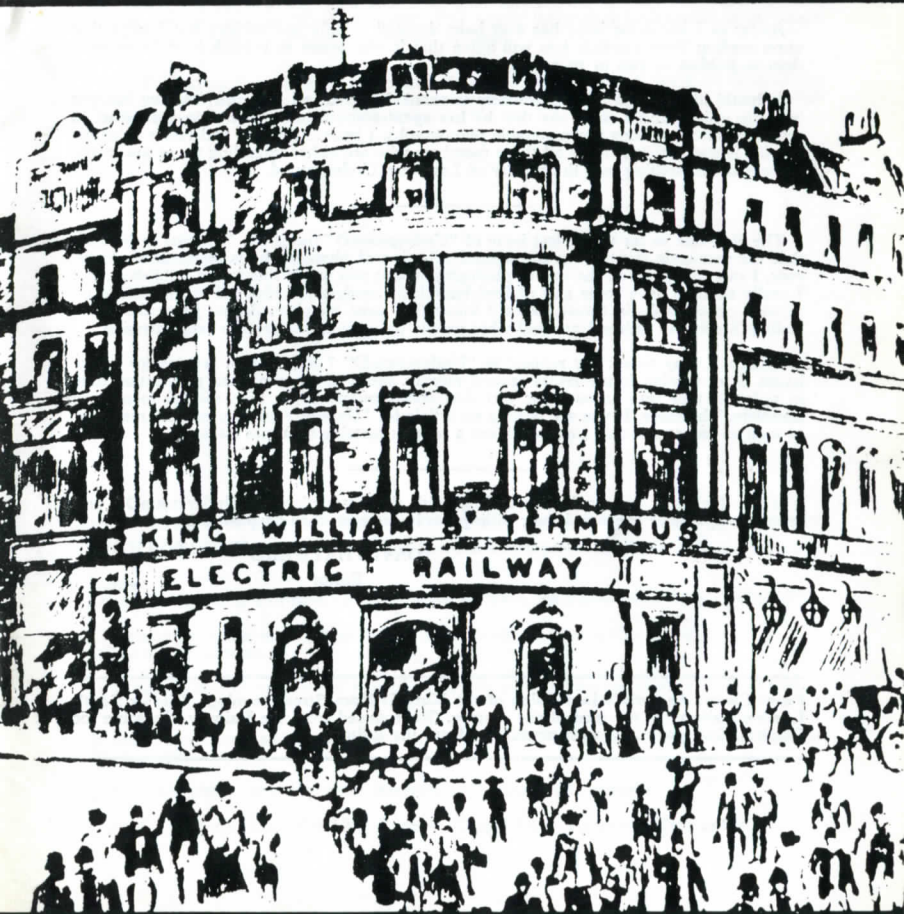


# UNDERGROUND

Number 8

April 1981



# UNDERGROUND

You may have already noticed that this issue of "UndergroundD" is devoted entirely to Peter Bancroft's article on the history of the former City & South London Railway tunnels from King William Street to what is now London Bridge.

As far as I know, no issue has ever been devoted to only one subject, but I hope that upon reading Peter's article you will agree that it was better to publish it in its entirety than to publish in two or more parts.

I should like to take this opportunity to thank Peter for all the effort that he has put into the article, and I must say that he has spent some considerable time and effort in research and in tracking down suitable photographs. I believe that the end result of all his labours is encouragement for all those members who are either intending to, or are in the process of researching into the history of London's Underground.

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The response so far to the last issue of "UndergroundD" (issue no. 7) seems to indicate that the new-style front cover and a good selection of photographs is appreciated. However, I can only guess at the sort of photographs that you would like to see published, and I really need to have some sort of feed-back from readers in order for me to decide on suitable photographs in future issues. I know that some members do not particularly like Rolling Stock, but unless I am told what people do want I will have to keep guessing.

Perhaps I may repeat my request in "UndergroundD" 7 for suitable articles for future issues. I try to plan future issues several months ahead of the projected publication date in order to take into account the fact that contributions might take several months to complete. Therefore, if you are writing an article for "UndergroundD", please let me know as soon as you can so that I can work out a rough timetable of future issues.

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If you feel that you would like to help with the production of "UndergroundD", and several people have expressed their willingness in the past, then drop me a line.

DAVID HAYWARD

Editor

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**Front Cover: An artist's impression of the King William Street terminus, City & South London Railway, at the turn of the century. (Reproduced from the Railway Magazine for October 1934, page 236, with permission from the Editor.)**

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## ACKNOWLEDGEMENTS

I am grateful to a large number of people for their help in producing this work.

I must particularly acknowledge help received from the staff at the Southwark Local Studies Library.

I am also indebted to Mr Finch and Mr Baker of Messrs Mott, Hay & Anderson for their interest and great kindness in answering many questions regarding this account. Also for their permission to reproduce the list of original 1939-42 shelter drawings, the 1959-60 General Plan and the photograph taken during the 1968-69 Ventilation works.

The author, Alan A. Jackson, kindly answered my request for more information regarding an earlier article by him on closed London Underground stations, and generously provided a list of various magazine items relating to the King William Street branch tunnels. Without this help, my account would have been somewhat incomplete.

I must also thank the Editor of the Railway Magazine, Mr J. N. Slater, for permission to reproduce the sketch on the cover of this booklet.

Building (Publishers) Ltd have also provided much help in clarifying details of drawings from "The Builder" magazine and generously given permission to reproduce these drawings and three photographs.

I am also grateful to Mr H. E. Danks for permission to reproduce extracts from letters written by his grandfather, which contain descriptions of journeys on the City & South London Railway, shortly after its opening.

London Transport have kindly given permission for the London Bridge ventilation works drawings to be reproduced, together with the various photographs showing their tunnel property.

Finally, I must thank Douglas Rose for reproducing all the drawings in such a professional manner. Without his most generous offer, I might have attempted these myself, with endless problems, resulting perhaps in a booklet without drawings or, indeed, no booklet at all!

## INTRODUCTION

The abandoned King William Street branch tunnels receive brief mention in a number of books and magazines of railway interest, and the account which follows is very much a combination of these many small references. However, very little information would be found in these references, regarding the use of parts of the tunnels by Southwark Borough Council as an air-raid shelter during World War Two, and almost no detailed information as regards what work was actually carried out in converting the tunnels for that use. There also appears to have been no published map or list of the entrance locations as actually constructed, nor details of the final cost of the shelter works and many other aspects of the shelter's use. In addition, therefore, I have extensively researched the shelter details and the subsequent use of the tunnels and entrances, to provide a more detailed record of their existence.

The King William Street station shelter is also described briefly, together with its subsequent use.

Not everyone reading this account will have detailed knowledge of the early history of the City & South London Railway, or the geography of the original line and the running tunnels. I also cover these subjects to a necessary degree.

I hope that readers will find all this information of interest. However, I would never suggest that I have included all the information which exists, relating to the two air-raid shelters located in the tunnels during the Second World War. I would therefore be pleased to hear from any readers regarding information I have not covered. Please write to me at the address given.

PETER BANCROFT (January 1981).

## THE RAILWAY TO KING WILLIAM STREET AND SOUTHWARK DEEP TUNNEL AIR-RAID SHELTER

### THE OPENING CEREMONY AND AN EARLY JOURNEY ON THE CITY & SOUTH LONDON

The original City & South London Railway was formally opened by the then Prince of Wales, afterwards King Edward VII, on 4th November 1890. The Prince, accompanied by his son the Duke of Clarence, travelled the length of the line, stopping at the Oval to inspect the station on the way. Large crowds had gathered outside the Stockwell station, opposite "The Swan" public house, where a guard of honour from the 4th West Surrey Regiment, Lambeth Cadet Corps, and Mayall College Cadet Corps, also awaited the arrival of the royal party from King William Street station. Luncheon was taken in a marquee after the usual speeches.

The line ran from King William Street in the City to Stockwell, with intermediate stations at Borough, Elephant & Castle, Kennington and the Oval. (The proposed station at London Bridge had been omitted, because the London Brighton & South Coast Railway had declined to make an agreement regarding the construction of a covered way, connecting their station to that of the subway company.)

Public service began on Thursday 18th December 1890, allowing a period of private working to ensure that all equipment and arrangements were ready.

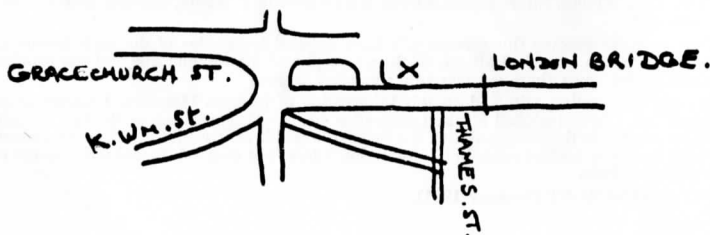
A description of an early journey on the City & South London Railway gives a good idea of the man in the street's reaction to the "tube" and some aspects of public working arrangements. The two extracts given below are from letters written by the Rev. John Danks, a Methodist minister, to his eldest son William Edward Danks, at that time recently emigrated to Chile as a Civil Engineer, working on the construction of a new railway line in central Chile.

"Romford Feb. 19 1891

Last Saturday week I went over to Brixton for George to take impressions for a new complete set of teeth. I thought I would try the new Electric Underground Railway, starting from near London Bridge. foot of Gracechurch St. 50 Feet below ground. They let down the batch of Passengers by a lift, & so up again. Arrived at the level of the line there is the station, tunnel shaped, one line, The walls white glazed tiles. lighted by gas. The train arriving, approaches with noise from the darkness, discharges its passengers and you get into a carriage. like a tram car, but twice as long, lighted by Electricity and off you go. there is a great tremor so that when I got off I felt shaken to bits. Last Saturday I went over to George again to try the fit of the teeth, and determined to try the electric once more. and instead of sitting stiff against the backs of the carriage seat to sit loose. I found this to be the right way. and travelled both ways and felt no harm. Tickets are not used. You pays your 2d and there you are a uniform rate. to every place. Borough Road. Elephant Castle. Oval. Stockwell Road, when 10 minutes walk takes you to the Bon Marche."

"Romford Mar. 5 1891

... I went off for Brixton, going by the Electric Railway. The following shows starting point



The cross shows the starting point. There is nothing much seen to the street — one or two shops have been utilised, and you enter by a door, pay your 2d no ticket walk in and are shown into the lift. which can take 40 — the door of the lift is closed. The Attendant opens a narrow door and pulls a rope, when the concern goes gently down and at 50 feet below ground you find the station and the carriages waiting. The 2d the uniform rate to all the stations.”

## **PARLIAMENTARY POWERS AND CONSTRUCTION**

The railway company was originally incorporated as the City of London & Southwark Subway Company on 28th July 1884 (47 & 48 Vic.Ch.clxvii). The Act authorised the construction of a twin-tunnel subway between points at the north end of London Bridge and the Elephant and Castle. James Henry Greathead was the engineer and Sir Benjamin Baker and Sir John Fowler were consultants. Charles Grey Mott became chairman of the company.

The subway would be operated using Hallidie's patent cable system, with ten separate cars giving a two minute headway service. The patents for this type of traction belonged to the Patent Cable Tramways Corporation, and the subway company were obliged to pay for the rights to use the system. (The Patent Cable Tramways Corporation later went into liquidation, and this together with the fact that electric traction had since made its appearance in America and elsewhere, influenced the Board to drop the idea of cable traction and adopt the newer form of electric traction. This would give a higher average speed and greater flexibility of working.)

Additional powers were sought to extend the railway to Stockwell, as the directors felt that the original line was too short to develop sufficient traffic. These powers were granted during the Parliamentary session of 1887 (50 & 51 Vic.Ch.cv).

Another Act of 25th July 1890 (53 & 54 Vic.Ch.civ) granted power to further extend the railway to Clapham. It also allowed the company to change its name to the City & South London Railway Company. This according to the directors, “Being more in harmony with the present nature and object of the undertaking.”

Construction work had begun from a staging erected behind Old Swan Pier on the north bank of the River Thames (just west of London Bridge) in the spring of 1886. A vertical shaft 82 feet deep was sunk at this point and lined to a depth of 73 feet from the top. The remaining 9 feet at the bottom formed a sump for drainage from the main tunnels. From this shaft on 28th October 1886, the up line tunnel (for northbound trains) was driven southwards under the river. The down line tunnel (for southbound trains) was begun in March 1887 from the same vertical shaft, but below the level of the up line, and was made to come alongside and west of the up line tunnel, on the south side of the river. The tunnels continued in a right hand running position until a point between the Borough and Elephant & Castle, where the down tube recrossed underneath the up to give normal left hand running at the Elephant & Castle.

North of the vertical shaft by Old Swan Pier, the tunnels ran one below the other due to the narrowness of Swan Lane. Then under the wider Arthur Street West, the down line was made to come alongside and east of the up line tunnel, both then coming into the 3 feet thick brick lined single station tunnel for the King William Street terminus. The necessity of such a layout was dictated by the need to keep the tunnels beneath public thoroughfares, thus avoiding claims for compensation by property owners, beneath whose land the railway would otherwise run.

The cast iron lined running tunnels on the City section were 10ft 2ins inside diameter, and from the Elephant & Castle to Stockwell were 10ft 6ins inside diameter.

The vertical shaft by Old Swan Pier was bricked up and made watertight over the running tunnels when construction work had been completed.

## **EARLY PROBLEMS WITH THE CITY TERMINUS**

The King William Street terminus was sited in an east-west direction under Arthur Street East (now named Monument Street), crossing under King William Street, and was thus awkwardly placed for any extension to give further stations in the City for distribution of traffic. Also the curves and gradients immediately outside the terminus were severe,

having originally been designed for cable working. This apparently caused a number of derailments, and burnt out armatures on the locomotives due to overload currents.

The station itself was cramped with one single line only, flanked by arrival and departure platforms. This was the only practical arrangement with the original cable working plans. Increased capacity was gained by changing this arrangement to an island platform, flanked by two lines of rails. (This operation was carried out under traffic!) However, this meant that the new island platform was shorter, to allow space for a scissors crossing between the platform end and the start of the two separate single line running tunnels (each at a slightly different level) just outside the station.

There were problems above ground also, as the station building was badly sited, many people having to cross a busy street to get to the station, located down a flight of steps in the basement of number 46 King William Street.

#### **"BYPASSING ITS TWISTED END"**

As early as 1891 therefore, a Bill was deposited for powers to construct a station on the existing line at London Bridge, and to build new tunnels from a point just north of the new station, under the river to a new central station on the corner of Lombard Street and thence to the Angel.

The Bill was held over until 1893 and powers were then successfully obtained (56 & 57 Vic.Ch.cccvii) but, to build the new tunnels from just north of the existing Borough station, with the proposed London Bridge station on the new route.

The new up line tunnel (northbound) left the existing route under Borough High Street, just north of St George's Church, Southwark. The new down line tunnel (southbound) left the existing route, again under Borough High Street, but slightly further north, approximately opposite Halfmoon Yard. Both new tubes then dived down to run below the earlier ones, first to the new station at London Bridge, and then, going east of the London Bridge itself, on to the Bank station and thence to Moorgate.

Special junctions were required to connect the new tunnels to the existing tubes. This work had to be carried out without interruption to the train service, and was completed by forming a series of short tunnel lengths, of increasing diameter, around each of the existing tubes. The smallest size was just enough to accommodate each original 10ft 2ins inside diameter tunnel at one end. The largest size each being able to accommodate one original 10ft 2ins inside diameter tunnel and one new 11ft 6ins inside diameter tunnel, side by side, at the other end of each of the two junctions. Luckily this work was carried out in good ground.

The extension opened on Sunday 25th February 1900, leaving the original line to King William Street as a 1,267 yard branch, from just north of Borough station.

#### **EARLY PROPOSALS FOR USING THE TUNNELS**

On 1st July 1898, the City & Brixton Railway obtained an Act (61 & 62 Vic.Ch.lx) to construct a railway, which would use the soon to be abandoned King William Street terminus, and part of the running tunnels towards Borough, for part of its route. The line would continue under Borough Road, Lambeth Road and Kennington Road to an interchange station with the City & South London at the Oval, then via Brixton Road to a point near the junction with Effra Road.

Further powers were granted in 1899 (62 & 63 Vic.Ch.cccxlvii) for a branch from Ingleton Street (off Brixton Road) to the City & South London Railway depot at Stockwell.

The City & Brixton Railway and the City & South London Railway companies were closely associated from the start, having at least two directors common to the boards of both companies. Thus, when a City & Surrey Electric Railway Company proposed to take over the City & Brixton, to link with its own line to Warlingham and Westerham, together with a branch to Caterham and Reigate, the City & South London Railway quickly reacted against the proposal and took over the City & Brixton powers themselves, by Act of 11th August 1903 (3E7.Ch.clxxxiii). The idea was to eventually ease the gradients on the approach to the old terminus and build another station at King William Street, with a subway connection to the Central London Railway station at Bank. Also a station would apparently have been constructed at London Bridge, below the one on the new line to Moorgate.

However, these proposals were never implemented and the powers eventually lapsed.

## SUBSEQUENT PROPOSALS UP TO THE SECOND WORLD WAR

Within a year of the King William Street branch closing, a paragraph appeared in the Railway Magazine asking whether the disused railway was being maintained in a proper condition, and suggesting that the tunnels should be let for mushroom culture, or bonded warehouses, or some other purpose which would produce additional dividends for shareholders.

In early 1910, the Right Hon. C. B. Stuart Wortley, M.P. (the Chairman of the City & South London Railway at that time) stated in reply to a question at the half yearly meeting of the Company, that they had received offers for the old tunnels to King William Street, one of which was from a group of mushroom growers. But he felt that better use than this might be made of it and suggested that it could be let to a telegraph or electric power company for carrying their cables.

At the outbreak of World War One, the editor of the "Railway & Travel Monthly" convinced police that enemy agents and explosives might be hidden in the old tunnels and they were, therefore, searched shortly afterwards. Not surprisingly nothing unusual was found and both ends of the tunnels were subsequently boarded up.

In February 1921, two correspondents to the Railway Magazine reported that the tunnels were still in existence with the ends boarded up, but possibly used sometimes for storing permanent way material. The station premises at 46 King William Street were then being used as shops.

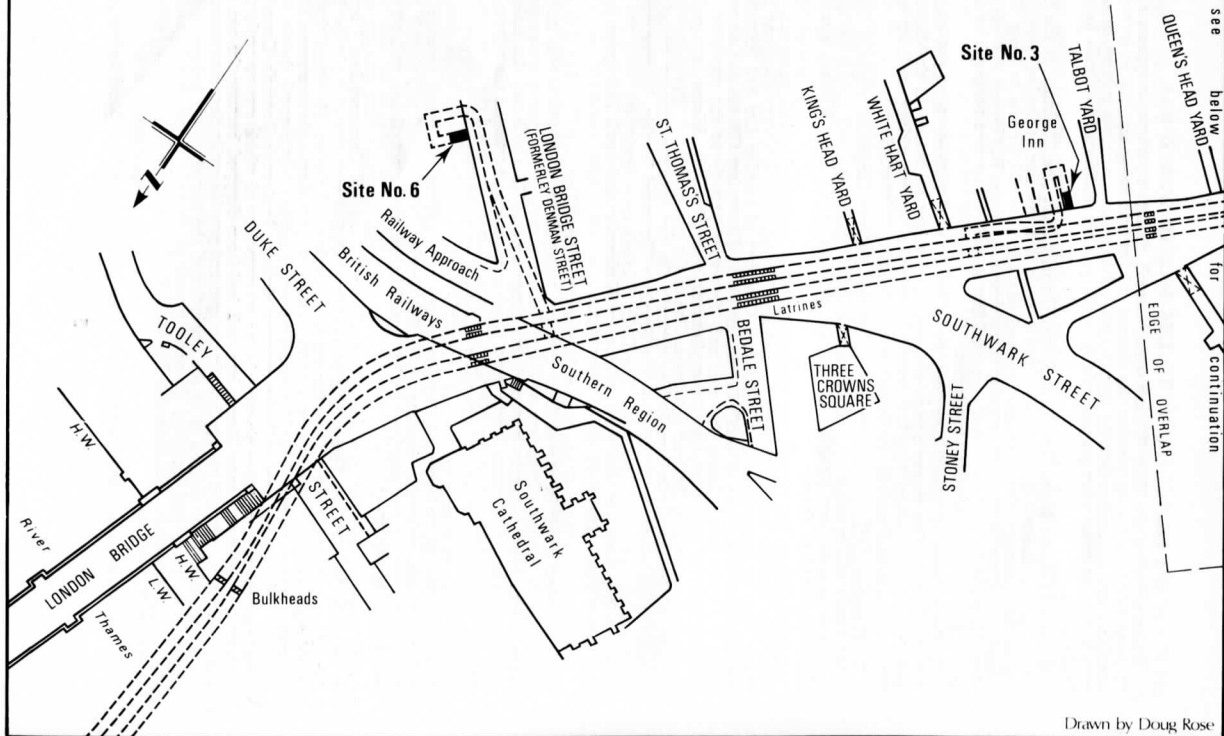
A press visit to the tunnels was arranged in 1930 to publicise their existence, in the hope that someone might make an offer to the Underground Railways Company to buy them. (The Underground Electric Railways Company of London Ltd had acquired financial control of the City & South London in 1913.) The author Charles E. Lee accompanied the press party during the visit and his own report about the condition of the tunnels, together with some interesting photographs by the Daily Mirror, was published in the September 1930 Railway Magazine. One of the pictures, taken approximately from the end of the island platform looking towards the two separate running tunnels, also appears in the magazine "Sphere" — The Empire's Illustrated Weekly, Volume cxxi. No. 1577 of 12th April 1930 (page 74). The Daily Mirror's own report, including the above photograph, appeared in their paper's issue for Wednesday 2nd April 1930 (page 5) being only two photographs in all, and a short text.

Yet another similar view appears in the newspaper the "Star" for Tuesday 17th March 1936, following a visit by one of their reporters, although this later article also includes a picture of the derelict signal box at King William Street. The reporter states that the tunnels were being regularly inspected four times a year. He also heard the rush of an incoming train, but of course it was not a ghost echo, merely a train on the newer Moorgate extension, then part of the Morden—Edgware Line, now called the Northern Line. (This line runs just beneath the middle of the abandoned King William Street station and at right angles to it, on a north-south axis.) The article ends with some suggestions as to its possible use: an underground shooting gallery, wine cellars, mushroom growing, dance hall, night club, pedestrian crossing under the Thames, bomb-proof anti-aircraft tunnel. (This is the first known mention of what would in fact be its actual use, at least during the Second World War.)

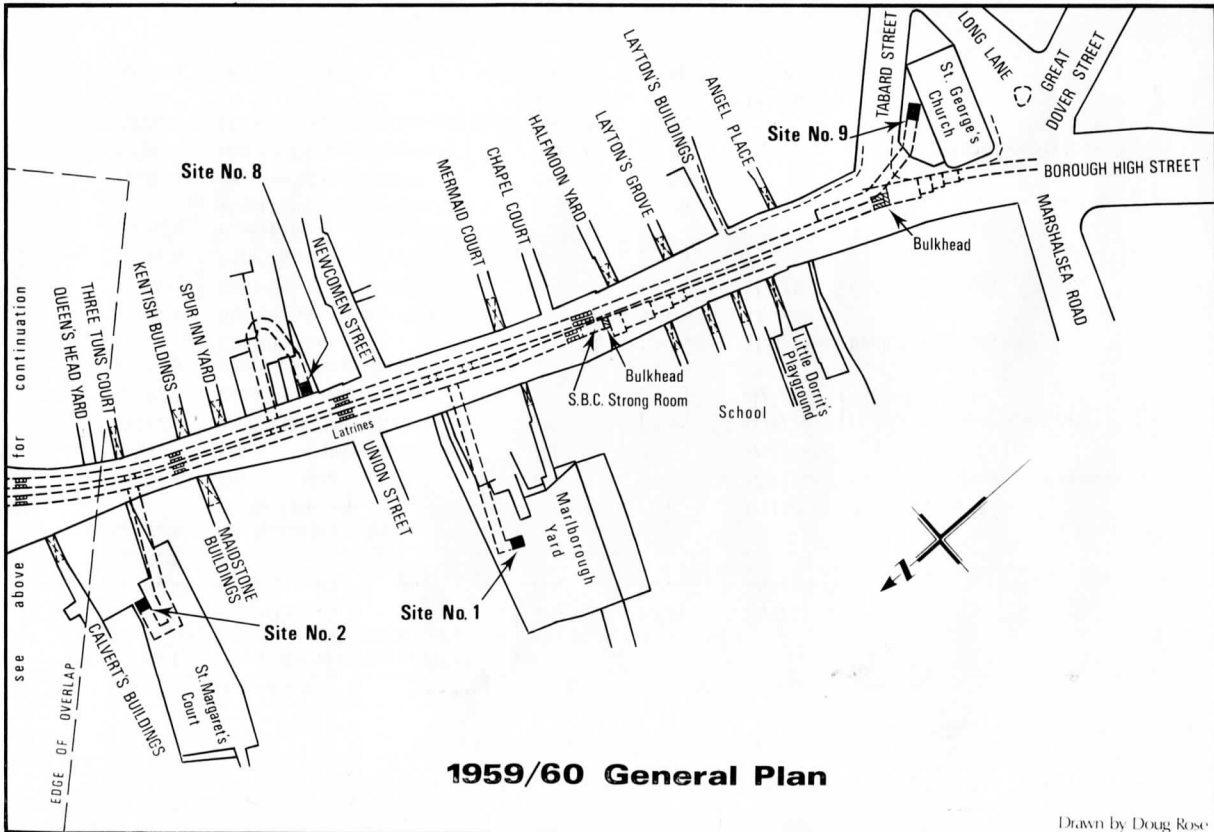
The same reporter (by this time promoted to a "Municipal Correspondent") was able to report in the "Star" on Friday 10th November 1939, that work would begin the following day on converting the tunnels for use as a bomb-proof shelter. He stated that work would take three months, and cost £40,000, including providing eight entrances, air conditioning plant, seats and first-aid posts. This would make a bomb-proof shelter for half the cost per person of an ordinary concrete shelter. Southwark Borough Council had already considered two other air-raid shelter schemes (one of which was an underground garage to be built at Grotto Place), but both had been dropped because the use of the abandoned tunnels would be significantly cheaper and provide really deep accommodation. Naturally the reporter claimed to be the originator of the tunnel shelter scheme, referring to his earlier article and including the same picture of the twin tunnel mouths as before, just for good measure. (His comment that work would begin the following day proved to be somewhat premature.)

Continued on page 21

# 1959/60 General Plan







**1959/60 General Plan**

N.B. Drawings from S.C.S.4 relate to the construction of the Tunnel Air-raid Shelter.

S.C.S. BOROUGH COUNCIL OF SOUTHWARK

No.	Description	Scale	Made By	Date	Remarks
S.C.S. 1	Proposed Raid Shelter and Underground Garage at Grotto Place.	} 8ft = 1in & 40ft = 1in	J.A.H	18/7/39	
S.C.S. 2	Ditto do. do.				
S.C.S. 3					
S.C.S. 4	Southwark Borough Council Tunnel Air Raid Shelter.	88ft = 1in	F.F.	17/11/39	Altered to No. 4A.
S.C.S. 4A	Do. Do.	Do.	F.F.	27/11/39	4E New arrangement of Lav(atorie)s.
S.C.S. 5	Do. Staircase Details.	$\frac{1}{2}$ in = 1ft	F.F.	4/12/39	
S.C.S. 6	9ft 9ins Int. Dia. R.C. Lining.		J.A.H.	21/2/40	} Copies of Kinnear Moodie's original tracings.
S.C.S. 7	Ditto Tapered.		J.A.H.	21/2/40	
S.C.S. 8	Site No. 9. Construction below Church Yard.	$\frac{1}{2}$ in = 1ft	J.A.H.	21/2/40	Preliminary detail.
S.C.S. 9	Site No. 9. Plan (shows hoardings).	20ft = 1in	Webb	21/2/40	
S.C.S.10	Site No. 9. Plan and section.	20ft = 1in	J.A.H.	21/2/40	Preliminary detail.
S.C.S.11	Lighting of Shelter Tunnels.	88ft = 1in	J.A.H.		
S.C.S.12	Plan of area temporarily required in Nag's Head Inn Yard (Site No. 8).	10ft = 1in	J.A.H.		
S.C.S.13	Easement Plan Site No. 8	88ft = 1in	J.A.H.		
S.C.S.14	Site No. 8. Plan and Section.	10ft = 1in	J.A.H.	19/4/40	Preliminary detail (required by G.W.R.)
S.C.S.15	Detail of Precast Concrete step & slab.	$\frac{1}{2}$ in = 1ft & H.F.S.	J.A.H.	18/4/40	
S.C.S.16	Detail of Column.	$\frac{1}{2}$ in = 1ft	J.A.H.	22/4/40	

No.	Description	Scale	Made By	Date	Remarks
S.C.S.17	Site No. 8. Proposed Street Hoarding.		Webb		
S.C.S.18	Detail of entrance to No. 1 Staircase.	$\frac{1}{2}$ in = 1ft	J.A.H.	29/4/40	
S.C.S.19	Site No. 2. Plan and Section.	20ft = 1in	J.A.H.	30/4/40	
S.C.S.20	Site No. 6. Plan and Section.	20ft = 1in	Webb	9/5/40	
S.C.S.21	Site No. 9. Junction at Bottom of Staircase.	$\frac{1}{2}$ in = 1ft & $\frac{1}{4}$ in = 1ft	J.A.H.	21/5/40	
S.C.S.22	Site No. 9. Detail of Entrance to Staircase.	$\frac{1}{2}$ in = 1ft	J.A.H.	29/5/40	
S.C.S.23	Site No. 8. General Layout.	$\frac{1}{2}$ in $\frac{1}{4}$ & 10:1	H.C.W.	4/6/40	
S.C.S.24	Site No. 6. Detail of Entrance to Staircase.	$\frac{1}{2}$ in = 1ft	J.A.H.	18/6/40	
S.C.S.25	Site No. 3. General Layout.	$\frac{1}{2}$ in = 1ft	E.R.B.	25/6/40	
S.C.S.26	Site No. 3. Proposed Street Hoarding.		Webb	28/6/40	
S.C.S.27	Detail of Seats.	H.F.S. & 1in = 1ft	J.A.H.	4/7/40	
S.C.S.28	Site No. 4. General Layout.				
S.C.S.29	Site No. 3. Detail of Junction at Bottom of Staircase.	$\frac{1}{2}$ in = 1ft & $\frac{1}{4}$ in = 1ft	J.A.H.	10/7/40	
S.C.S.30	Site No. 3. Plan and Section.	10ft = 1in	Webb	15/7/40	
S.C.S.31	Site No. 9. Detail of Frame.	$\frac{1}{2}$ in = 1ft & $\frac{1}{2}$ F.S.	J.A.H.	29/7/40	
S.C.S.32	Plan showing concrete wall in Basement of 145 Borough High Street.	10ft = 1in	J.A.H.	14/8/40	<b>Prints only.</b> For use in ascertaining rent to be obtained.
S.C.S.33	Passage between East and West Tunnels to Aid ventilation.	$\frac{1}{2}$ in = 1in = 10ft & 20ft	E.R.B.	8/12/42	

## **SOUTHWARK DEEP TUNNEL AIR-RAID SHELTER DRAWINGS**

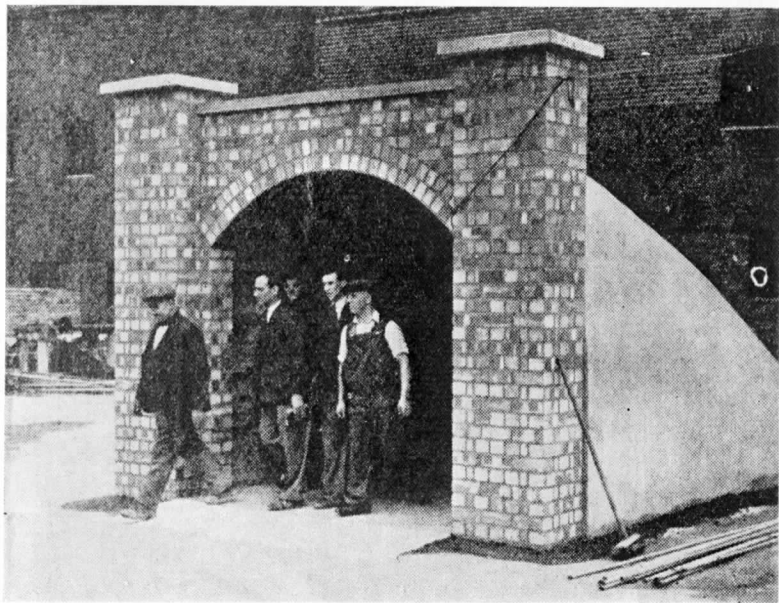
All the drawings prepared by Messrs Mott, Hay & Anderson from 17/11/1939 to 8/12/1942 have not survived for some unknown reason. It is possible that they were referred to at the time of the 1959/60 reinstatement works and not subsequently returned to the archives of the company. A full list is therefore given showing drawing number, title/description, scale, and date drawn, together with the drawer's initials and any remarks. This list is reproduced from the hand written ledgers of Messrs Mott, Hay & Anderson, which do still exist.

### **EXPLANATORY NOTES TO THE DRAWINGS LIST (by the Author)**

The reason why the G.W.R. (Great Western Railway) required some details regarding the location of Site No. 8 is, that the railway company operated a road parcels depot in conjunction with the Southern Railway, at premises whose only access was Nag's Head Inn Yard. The number 8 entrance rose to the surface beneath that access and the railway companies were apparently concerned about any disruption or blockage to that access during construction of the shelter staircase access tunnel.

The site numbers confirm that six entrances were constructed as per the later 1959/60 General Plan. Site No. 4 is also mentioned (S.C.S. 28) but there is no confirmation of whether a drawing was ever produced. It may only have been a provisional sketch and not actually used again.

**Below: One of the Southwark shelter entrances. (Building - 2nd August 1940.)**





Above: View showing descent. (Building – 2nd August 1940.)

Below: View in Tunnel (since provided with flooring and seats). (Building – 2nd Aug. 1940.)

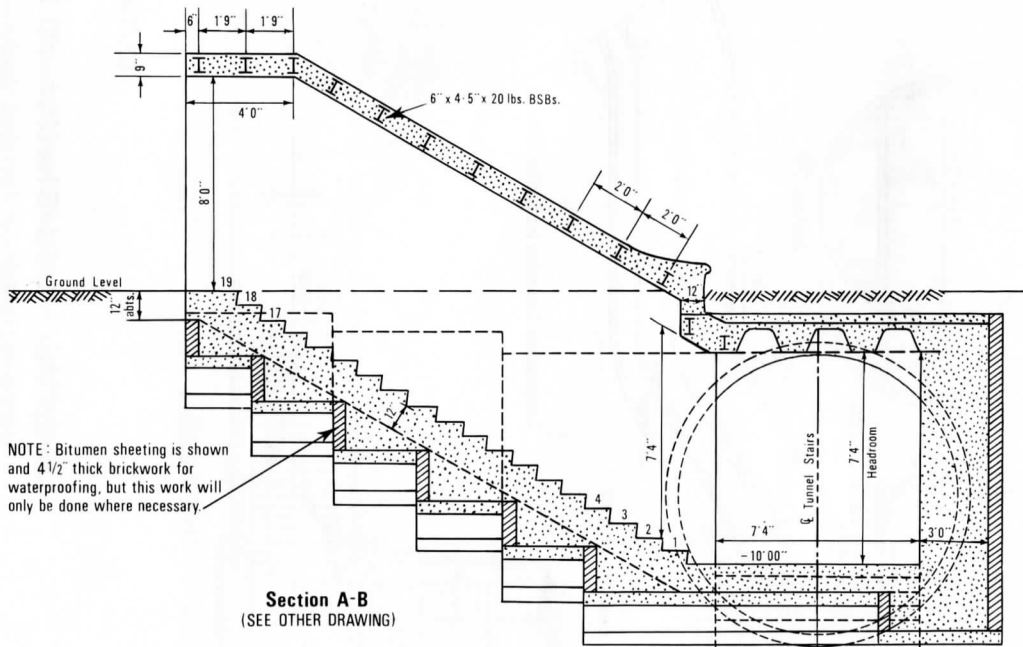




Above: The Mayor and Mayoress of Southwark, Mr and Mrs Arthur Gates, leaving the Marlborough Playground entrance, after formally opening the Southwark air-raid shelter. (Originally published in "The Star", Monday 24th June 1940 — front page. The owner of the copyright has not been traced, despite extensive enquiries. If any person reading this is able to give further information which would establish copyright ownership, would they please write to the Author/Publisher.)



Left: Families sheltering in the Borough Tube tunnel. (Originally published in the "News Chronicle", Wednesday 4th September 1940, page 6. The owner of the copyright has not been traced, despite extensive enquiries. If any person reading this is able to give further information which would establish copyright ownership, would they please write to the Author/Publisher.)

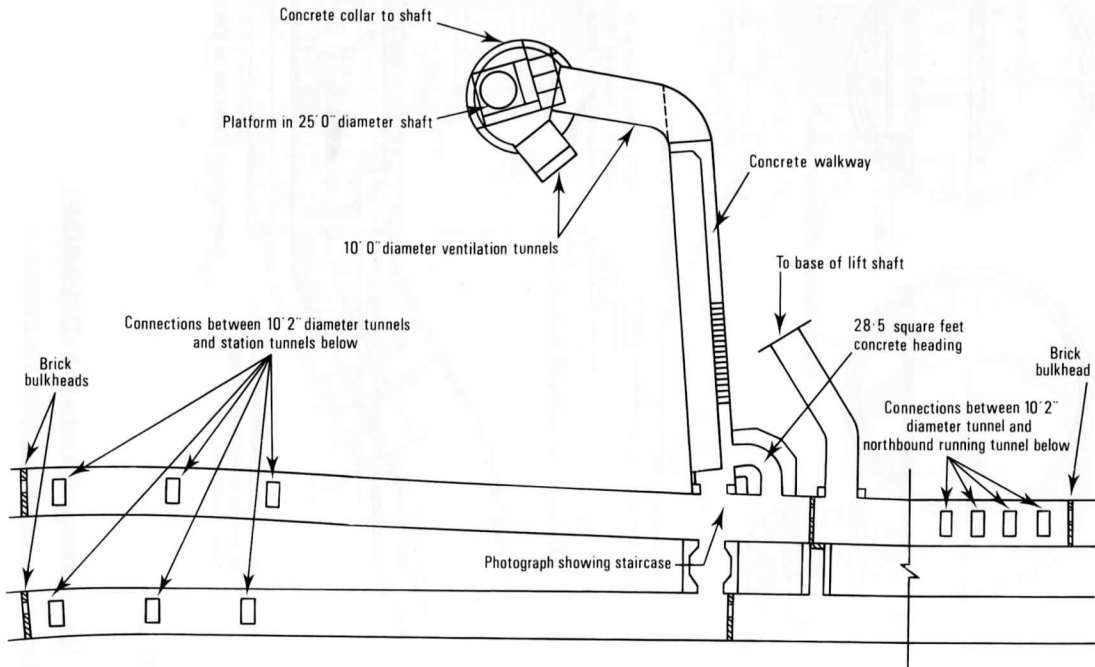


## Deep Air-Raid Shelter at Southwark (Building - August 2 1940)

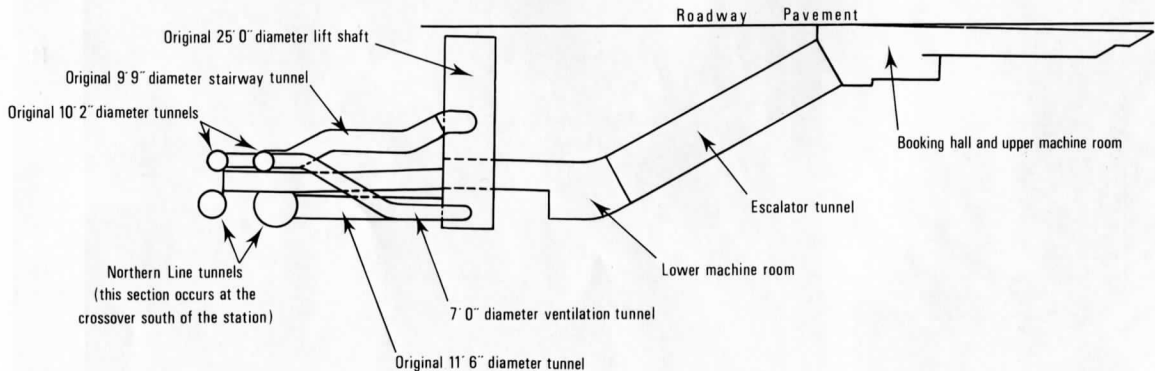


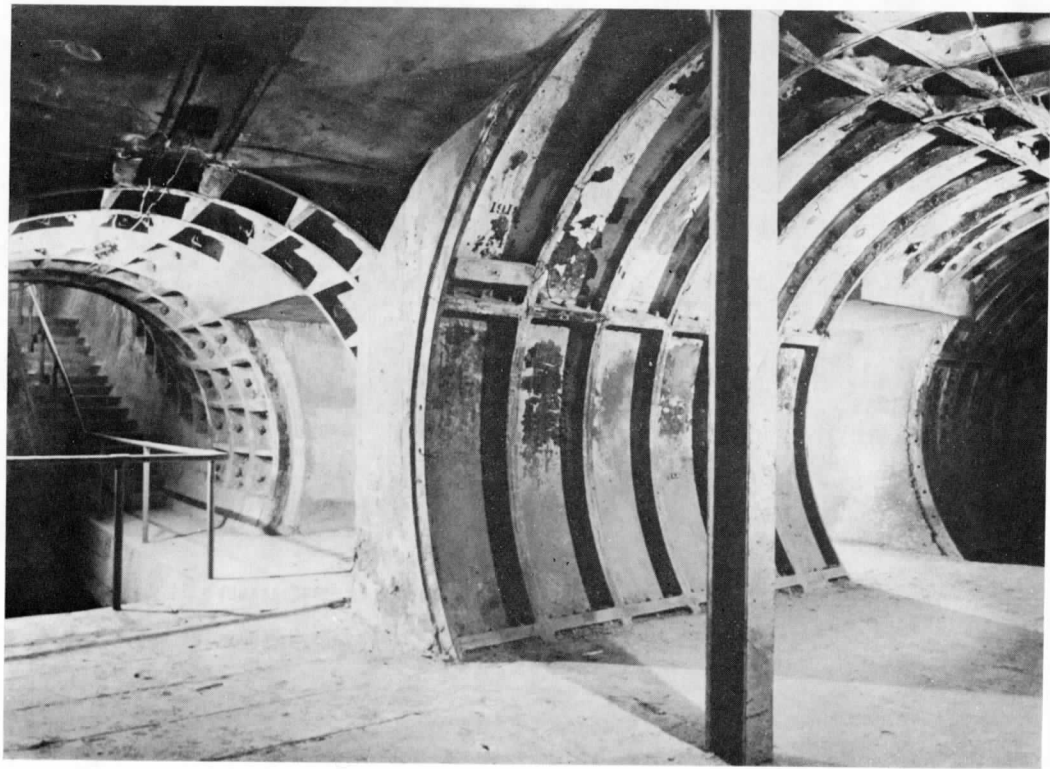


# Ventilation Works at London Bridge



## General Section Showing Relationship of Tunnels at London Bridge Station





Above: This picture shows the junction between one of the original City & South London Railway running tunnels (in the foreground) and one of the shelter staircase access tunnels constructed in 1940. The position is marked on the diagram on page 16. (This photograph is reproduced with the kind permission of London Transport, and by courtesy of Mr K. J. Baker of Messrs Mott, Hay & Anderson.)



Above: The upper level of the King William Street station shelter. (By courtesy of David Ferris.)

Below: 10ft 2ins internal diameter running tunnel, looking southwest under Arthur Street. (By courtesy of David Ferris.)



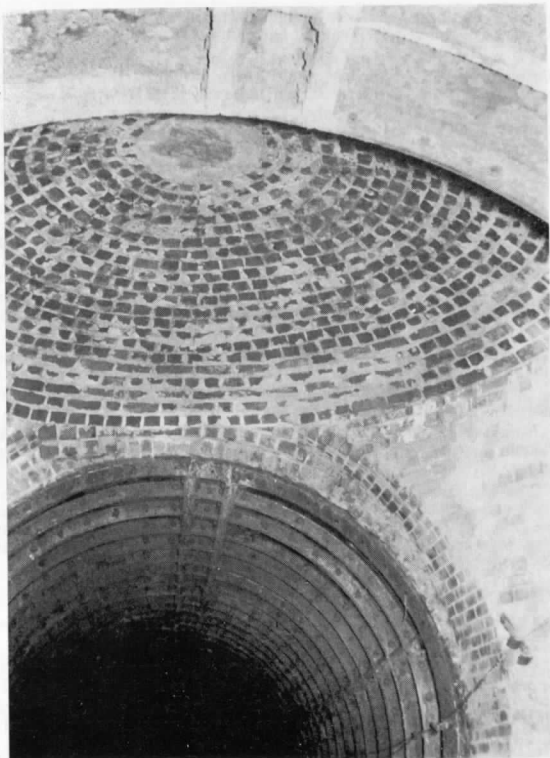


**Above:** One of the concrete plugs fitted with 4ft by 3ft watertight steel doors. The grill is an additional security measure. (By courtesy of David Ferris.)

**Below:** Vertical construction shaft behind Old Swan Pier, at the lower tunnel level. The ladder goes up to the higher tunnel level. The drainage sump is below the walkway. (By courtesy of David Ferris.)



Right: Vertical shaft behind Old Swan Pier, showing method of sealing at tunnel level after construction work had been completed. (By courtesy of David Ferris.)



### **SOUTHWARK BOROUGH COUNCIL AIR-RAID SHELTER**

The idea of adapting the disused tube tunnels to form an air-raid shelter was, at first, considered by the Council's Air Raid Precautions Emergency Committee and later put before a full meeting of the Council of the Metropolitan Borough of Southwark; held at the Town Hall, Walworth Road, London, SE17, on Saturday 9th December 1939. The Council Minutes actually record this as item 16 of the Report (No. 1) of the Finance and General Purposes Committee dated 16th November 1939, as discussed at that full Council Meeting.

The minuted item states that, by this time, the Minister for Home Security had approved the proposal in principle, and the Borough Engineer had already interviewed Dr David Anderson, LL.D., B.Sc., M.Inst.C.E., of Messrs Mott, Hay & Anderson, Consulting Civil Engineers, as to the actual work required to be carried out for conversion to its new use.

It was expected that the main work of conversion could be carried out in about three months, at an estimated cost of £50,000. A large proportion of this would be the subject

of a Government grant. Only eight entrances were now proposed at the sites most convenient for the requirements of the public.

Dr Anderson's original site plan was a drawing number S.C.S.4 entitled, "Southwark Borough Council Tunnel Air Raid Shelters", dated 17th November 1939 and drawn to a scale of 88ft to 1in (1:1056). This drawing was revised shortly afterwards to become S.C.S.4A dated 27th November 1939. (Unfortunately neither drawing has survived, but it seems quite clear that a later drawing of 1959, prepared in connection with the reinstatement of the entrances carried out in 1959/60, was based almost entirely on these earlier drawings. From this it is apparent that a total of nine possible entrance sites were originally suggested by Dr Anderson.)

The Finance and General Purposes Committee were able to report to the next full Council Meeting on 6th January 1940 that the Town Clerk had entered into negotiations with the London Passenger Transport Board, and had advised that the best way of dealing with the matter was for the Council to pay a rental to the Board. The London Passenger Transport Board had stated that a sum of £100 per annum would be acceptable for this purpose. The Council agreed to this and the necessary documents were drawn up, the Common Seal of the Council being attached to them. The first instalment of £40 12s 4d (£40.62) had been paid by July 1940.

The Ministry of Home Security sanctioned the start of the necessary works in January 1940. The shelter was now officially listed by the Council in the summaries of shelters already available, in course of construction or planned, being shown as: "Deep Tunnel Shelter (Bombproof)", and stated to have a capacity of 8,000 people.

Messrs Kinnear Moodie and Company were the contractors and Messrs Vigers and Company were responsible for the survey of all properties adjoining the construction works.

The first entrance to be completed was at site No. 1 as shown on the 1959/60 General Plan, and opened by the Mayor of Southwark Mr Arthur Gates, accompanied by his wife the Mayoress, on Monday 24th June 1940. A second entrance was available by the beginning of August 1940. The entrance sites were requisitioned under wartime emergency powers.

## THE ENTRANCES

The full list of the six entrances which were actually constructed is as follows:

Site Number	Location
1	Marlborough Yard (now Marlborough Playground). The actual entrance was a short distance behind number 116 Borough High Street.
2	St Margaret's Court (between 62 and 64 Borough High Street). The actual entrance was located approximately behind number 60 Borough High Street.
3	On the site of the present Lombard North Central Limited building at 75-85 Borough High Street (called George House).
6	London Bridge Street (formerly Denman Street). The actual entrance was sited adjacent to No. 9 London Bridge Street, approximately opposite the present London Bridge Telephone building. It was down a flight of steps from street level.
8	Number 143 Borough High Street. The actual entrance was between Shears Individual Tailoring (number 141), and Stenhouse Marketing Services Ltd (numbers 145-149).
9	Adjacent to St George the Martyr's Church, Borough High Street. The actual entrance was in the garden beside the church on the Tabard Street side.

The site numbers used were apparently those given originally by Dr David Anderson, for the nine possible entrance sites. The location of the proposed site numbers 4, 5 and 7 has not been determined due to the absence of these on the 1959/60 General Plan, and the fact that the earlier drawings no longer exist. It was clearly only necessary to show the sites which were actually constructed on the 1959/60 General Plan, since only these required reinstatement.

Numbers 1 and 2 entrances were connected with the west tunnel, and the other four to the longer east tunnel. (It will be seen from the general layout plan that the west shelter tunnel is shorter than the east, due to the position of the "step plate" junctions constructed at the time of the City & South London Railway extension to Moorgate.)

Cross passages between east and west tunnels were constructed at or near the bottom of the new staircases, to distribute people evenly throughout the length of both tunnels.

### CONSTRUCTION DETAILS OF SHELTER

The shelter itself extended from the concrete bulkheads installed just north of the "step plate" junctions at Borough, at the time of the Munich crises in 1938, to new 6 feet thick concrete bulkheads fitted with 4 feet by 3 feet watertight steel doors, located in each of the tunnels at points just south of the River Thames. The latter bulkheads were constructed during the winter of 1939/40 and ensured that no flooding would take place in the shelter if one or both of the under river sections were breached by a bomb.

In the former down line tunnel (the west tunnel south of the river), a strongroom was constructed for the Borough treasures and important documents. This was located immediately north of the concrete bulkhead next to the "step plate" junction, where the new down line from Moorgate rejoined the original route.

The new entrance staircases each allowed for a flow of 300 persons per minute. The staircase tunnels were formed of reinforced pre-cast concrete segments 21 inches in width and 9 feet 9 inches in internal diameter. The segments were manufactured by Messrs Kinnear Moodie and Company. Each completed 9 feet 9 inches internal diameter ring consisted of seven large segments and one key piece, usually located near the top. The key pieces were staggered in order to give discontinuous joints, for additional strength. The sections were bolted together and grouted to be watertight. Ground water was encountered at approximately 16 feet below the surface, and this necessitated tunnelling operations being carried out in compressed air. This was not successful at first due to the looseness of the soil and the presence of loose gravel beds, allowing the compressed air to escape.

This difficulty was overcome by using the "Joosten" chemical process to permanently consolidate the soil around the tunnel excavation, thus preventing escape of the compressed air.

The "Joosten" chemical process had previously been used elsewhere in Great Britain, by Messrs John Mowlem and Company Limited. Basically, it involved driving a pipe into the ground to the depth from which the treatment was required, then releasing a measured quantity of Sodium Silicate. The pipe was driven a further distance down and more Sodium Silicate released. This process was repeated until the total depth of required treatment had been completed. The system was then reversed, withdrawing the pipe to the same points, and this time releasing measured quantities of Calcium Chloride. The reaction of the two chemicals caused the ground to "set" for a radius of about 1 foot around the pipe, thus forming a solid column of ground. The pipe could then be driven in the same way, about 18 inches from the previous point, and overlapping columns of treated ground formed to provide an eventual "wall". This "wall" would hold the compressed air allowing work to continue until a suitable depth had been reached.

(The "Joosten" system was also used during the construction of the escalator shaft at Knightsbridge station in 1933 and lengthening the platforms at Westminster station between 1962 and 1964. More recently, it has been used during construction of pedestrian subways at Heathrow Airport.)

Concrete staircases were then formed inside these tunnels, leaving a void underneath the steps and landings to accommodate ventilation, lighting cables, water supply, drainage, etc.

The main shelter tunnels, all 10 feet 2 inches internal diameter (there were no stations or crossover tunnels on the shelter section of the original line) were fitted with concrete floors. This was achieved by forming a concrete haunching on either side of the tunnel floor, with the top of the haunching at finished floor level. Reinforced precast concrete planks were then laid between these, and bedded into a rebate  $4\frac{1}{2}$  inches wide and about 4 inches deep, left in the haunchings on either side. The concrete planks were 15 inches wide and  $3\frac{3}{4}$  inches deep, allowing about  $\frac{1}{4}$  inch of mortar bedding to prevent them rocking. Each plank had a small groove on one edge and a tongue on the other to form a seal. This prevented any draughts.



The construction of the floors, therefore, formed a void about 5 feet 3 inches wide and 2 feet maximum depth under the floor, also, to accommodate the ventilation, lighting cables, water supply, drainage, etc.

The average maximum headroom was approximately 8 feet after the floors had been installed.

The shelter tunnels were then provided with some seating on each side. Twelve banks of lavatories, six for ladies and six for gentlemen, were installed at intervals throughout the length of both tunnels.

Each bank of ladies' lavatories comprised three water closets on one side of the tunnel and four on the opposite side. The gentlemen's lavatories were laid out in the same way with the addition of a urinal against one end of the bank of three water closets.

The waste products were fed via 4 inch diameter collecting sewers, to one sump in the west tunnel and three in the east tunnel. Compressed air in a 2 inch air line was then fed to ejectors which were used to force the sewage from the sumps up to ground level, via 4 inch rising sewer pipes, discharging into existing sewers under the roads. The sewage waste arrangements were brought up to ground level only in entrance numbers 1, 2 and 6, which also had 3,000 gallon water tanks located near the entrances above ground level. These fed the water closets, etc., via a network of 2 inch water mains installed in the same entrances. These three supplies were interconnected at tunnel level in case one tank should be damaged.

There were only two air compressors located on the surface near entrance numbers 1 and 6. Each fed two ejectors for emptying all four sumps.

Electric lighting was provided, and as an insurance against failure, each alternate lamp drew its power from an independent supply.

Bunks were installed in the shelter sometime after it opened.

The tunnels were whitewashed early in 1941 at a cost of £150. Bunk numbers were stencilled on the sides of the tunnels, and regular shelterers allocated a bunk number for their continued use.

The extent and type of the ventilation system has not been ascertained, but an item of £2,500 for ventilation plant in the tunnel shelter, is mentioned in the Council Minutes.

## **FINAL COST OF THE SHELTER SCHEME AND ADDITIONAL WORKS**

Although the original estimate for all the work was approximately £50,000, some £72,000 had been spent by February 1941, and the final cost was given as £105,628 in January 1943 (Council Minutes).

An estimate amounting to £201 11s 6d (£201.57½) was approved in January 1942 for drainage improvements which were required. A further estimate of £65 12s 0d (£65.60) was approved at the same time, for construction of a building to protect the compressor plant at the entrance in Marlborough Playground. (The other compressor, at number 6 entrance, was located under the brick arches supporting part of London Bridge Street and hence required no additional protection.) These two amounts are presumed to be included in the January 1943 total cost figure.

Proposed ventilation improvements were discussed at the Council Meeting held on Wednesday 21st October 1942.

In December 1942, approval was given to an estimate for £238 10s 0d (£238.50) for cleaning and painting the metal bunks in the shelter but, this was subject to sanction from the Regional Commissioners, given during the following month. At this time the Commissioners also approved the spending of a further £150 towards improved ventilation, with special regard to the Reserve Control Centre now located in the shelter tunnels.

Another £975 expenditure was approved in the summer of 1943, for the provision of handrails at the entrances and in the staircase tunnels of the shelter. This work was carried out by Messrs Galbraith Brothers Limited of 15/16 Torrington Court, Westwood Hill SE26, and completed by the end of January 1944. The expenditure was approved for grant by the Regional Commissioners.

The provision of handrails was required following the accident on the entrance stairs at

the unfinished Bethnal Green tube station (Central Line eastern extension) which was being used as an air-raid shelter, where 173 persons were crushed to death and 62 injured. The accident occurred on the evening of 3rd March 1943, because a woman carrying a baby fell, near the bottom of the stairs, after a test barrage of anti-aircraft rockets had caused a large crowd to rush the shelter in expectation of an air-attack. Because so many people were hurrying down the badly lit, temporary wooden stairs (located in the present escalator shaft), the woman's fall caused a pile up of falling people, hundreds of others still pushing their way down from the top of the stairs. The police gained control of the situation after about fifteen minutes, but not before such appalling loss of life had been sustained. The situation would probably have been less severe if a central handrail on the stairs, and crush rails at the entrances, had been provided. The Government suppressed news of this disaster for some time, but made sure that additional measures were taken, through Officers of the London Civil Defence Region, to prevent the same thing happening elsewhere. Hence the additional work of providing the handrails for all six Southwark shelter entrances.

Other entrance improvements were carried out in February 1944, at a cost of £1,202 15s 8d (£1,202.78) and also ranked for grant.

### **USE, MANAGEMENT OF THE SHELTER AND FEEDING ARRANGEMENTS**

The shelter came into use during the earliest phase of London area raids, which had begun on 18th June 1940, six days before the first shelter entrance opened. The first bombs on central London were dropped on the night of 24th/25th August 1940. By early September thousands of families were sleeping in the tunnels every night, whether or not an air-raid warning was given. A census taken in the area showed that 11,280 persons would be in Borough High Street during peak hours and all within 300 yards of the shelter entrances. It was estimated that up to 14,000 people could be accommodated without overcrowding. During this period the entrances were opened at 8.00pm every evening to meet the demand. The queues had already started forming up to three hours before the entrances were opened, a practice which the press nicknamed "Tunnellers' Parade".

One old age pensioner, Mrs Caroline Wayling of Roman Road, Bow, had camped out in the shelter since the first day of September, prepared to stay for a fortnight, having brought sufficient cheese and tea cakes for that time. She only left the shelter briefly to get a breath of fresh air. Of course Mrs Wayling was not a resident in the Borough of Southwark and was only one of many "foreigners". This caused the local residents to send a petition to the Council protesting at the use of the shelter by non-residents.

A scheme for feeding users of the Deep Tunnel shelter was in operation by January 1941, and the catering taken over by the Salvation Army in February of the same year. These arrangements were discontinued throughout the summer months, and the Salvation Army were not willing to resume and continue the arrangements for the next winter. However, an alternative scheme was arranged during the summer in readiness.

The Air Raid Precautions Emergency Committee agreed to the appointment of a full time paid Superintendent, as an experimental measure, in October 1941.

In the spring of 1942, the number of shelterers had fallen dramatically and permission was sought from the Regional Commissioners for the west tunnel to be closed together with the St Margaret's Court and Marlborough Playground entrances.

In March 1943, a telephone system was proposed, to give direct communication between the surface entrances and the tunnels. This would assist in the handling of large crowds. The Regional Commissioners approved the idea in principle, but no record appears to exist as to whether this work was eventually carried out.

The medical first-aid post which had been established in the shelter, was reopened in April 1943. It had been closed for some time, presumably because of the drop in the number of shelterers.

### **SCHEME TO RE-OPEN AS A PEDESTRIAN SUBWAY**

After the war, the shelter appears to have been unaltered and unused by its owners. The only serious proposal for the use of any part of the King William Street branch tunnels, appears to have been prompted by the concern of the Common Council of the

City Corporation, regarding pedestrian congestion on London Bridge. They suggested that the tunnels could be used for a pedestrian subway for passengers proceeding to and from London Bridge station (Southern Region of British Railways). It was thought however, that because of the distance to be walked to reach the tunnel, people would be reluctant to use it.

### **REINSTATEMENT OF THE ENTRANCE TUNNELS**

Work began on 30th November 1959 to reinstate the staircase entrance tunnels, in order that the running tunnels could be handed back to London Transport Executive, and the surface entrance sites de-requisitioned. The contract was carried out jointly for the London Transport Executive and the Ministry of Works.

All the structures above the floor level of the shelter tunnels were demolished and removed. Then five feet thick waterproof concrete plugs were constructed in the staircase access passages of entrance numbers 1, 2, 3, 8 and 9, where they joined the shelter tunnels. The number 6 entrance was dealt with in the same way, but the staircase tunnel was plugged some distance from its connection with the shelter tunnels, for the purpose of maintaining an underground access from within the London Bridge station premises. Some 4,000 cubic yards of lean mix concrete were then used to fill the staircase tunnels. The surface entrance structures were demolished and cleared away.

All six surface entrance sites could then be de-requisitioned.

The Resident Engineer for this work was Mr B. C. Dudgeon of Messrs Mott, Hay & Anderson, and assistance was given by Inspector W. T. D. Elson, and Inspector W. Pritchard (Junior) who came from the Public Cleansing Depot.

The work took approximately seven months to complete, that being sometime in June 1960.

### **LONDON BRIDGE UNDERGROUND STATION MODERNISATION**

Extensive alterations were made to the London Bridge Northern Line station starting in 1965. This work involved constructing a new sub-surface ticket hall, nearer to the Southern Region Main Line station, and replacing the lifts with escalators from this new ticket hall. The escalators were designed to reach the level of the bottom lift exits just east of the lift shaft. This meant that the existing way out passage from the platforms had eventually to be projected across the lift shaft to connect with the bottom of the new escalator shaft. (An excellent three dimensional illustration of all these works appears just inside the cover of the monthly magazine Railway World for September 1965.) This was done by forming a bridge across the lift shaft. The width of the new bridge was rather less than the lift shaft diameter, leaving a sector on either side. These works were brought into use in November 1967.

The first part of the station modernisation did not affect the old King William Street branch tunnels. The significance of mentioning them however, is to show that after the completion of the ticket hall and escalators in 1967, the lift shaft was no longer used, remaining empty except for the way out passage bridge running across.

### **1968-69 VENTILATION WORKS AT LONDON BRIDGE**

The second part of the modernisation works did utilise sections of the former shelter tunnels and therefore requires some more detailed description.

A connection was made from the remaining length of the shelter staircase access tunnel (the former number 6 entrance) to the lift shaft at a level above the exit bridge. Three vertical connections were made in each of the shelter tunnels, down through the precast concrete floors, through the bottom of the cast iron tunnel lining, and made to break into the top of both London Bridge Northern Line station tunnels, running directly below. With these various connections, a passage for air then existed from each station tunnel up to ground level. This arrangement could then be used to relieve the draught pressures that approaching trains created inside the station. Brick bulkheads isolated the shelter tunnels beyond the various connections to encourage the upward passage of air, via the stair tunnel and lift shaft. For a more effective flow it was also found necessary to construct a short heading to bypass the staircase passage/shelter tunnel connection (see photograph and diagram).

A second separate ventilation system was also created to relieve pressures in the northbound running tunnel some distance south of London Bridge station. Four vertical connections were made at this point to the northbound running tunnel, again running beneath the east shelter tunnel. The east shelter tunnel was then connected to the bottom of the lift shaft via a new 7 feet diameter tunnel. Brick bulkheads were again constructed in the shelter tunnel to isolate the required length. Extractor fans were then installed in the lift shaft to aid all the various air flows mechanically. The air flow from the running tunnel ventilation system could, of course, pass around the exit bridge in the lift shaft, using the remaining space either side.

Other works were constructed at the same time, but do not require any detailed description, their having no direct connection with the former shelter tunnels.

The tunnels south of the River Thames are therefore in use, for part of their length at least, only for the purposes of ventilation. The other sections remain derelict.

## **KING WILLIAM STREET STATION SHELTER**

The Southwark shelter occupied the complete section south of the River Thames and the under river sections were isolated by the concrete plugs and watertight doors either side of the river. This left the brick lined King William Street station tunnel, 26 feet wide by 20 feet high, together with a further length of brick lined crossover tunnel, somewhat smaller in diameter, before the start of the two separate cast iron lined running tunnels. The running tunnels were also empty down as far as the concrete plugs on the north side of the river, actually located beneath Upper Thames Street. At this point the tunnels have just become aligned one beneath the other to run under the narrow Swan Lane.

Most of the platform and the tracks had been removed after the station closed (see picture in the Railway Magazine for September 1930, page 197) and no use was made of the tunnels until 1940. Various press visits have already been mentioned.

But the surface station premises at 46 King William Street were used before 1940. They were converted back to shops sometime after the station closed, the lift shaft having been covered over for this purpose. Then in 1933 the whole corner block including 46 King William Street was redeveloped to provide one new office block called Regis House. This involved filling the 25 feet diameter lift shaft, right on the corner of King William Street and Monument Street, with concrete. The lift shaft was totally within the building line and was apparently required to be filled in to give adequate foundation to that corner of the new building. The emergency stairs, in a 15 feet diameter shaft, came up to the top station level beneath the road, outside the building line and were not required to be filled in. A basement corridor connection to these stairs was retained in the new Regis House development.

Then early in 1940, the owners of Regis House secured a tenancy to use the station tunnel and the crossover tunnel to form an air-raid shelter. Various works were required to convert the tunnel to its new use. A mezzanine floor of reinforced concrete was constructed to provide twice the area for use as a shelter. A new floor at track level was also constructed. Electric lighting was installed together with toilet facilities and emergency ventilation. An additional 10 feet 6 inches diameter shaft, 64 feet deep, was sunk in Arthur Street with direct access from the basement of King William Street House (on the opposite side of King William Street from Regis House). This connected with the south side of the former crossover tunnel a short distance from the point at which the two separate running tunnels started. The whole works then formed a private shelter for the office employees of Regis House and King William Street House with the two basement access points. The capacity was stated to be 2,000 persons.

The tenancy was continued after the war so that the tunnels could be used for storage.

## **1959 VISIT TO THE TUNNELS**

In February 1959, a group of people from the Railway Club visited the tunnels. They walked down the white tiled emergency stairs to the station tunnels, and down into the under river sections glistening with stalactites. The watertight steel doors were closed again after the visit.

### **1964 VISIT TO THE TUNNELS**

On Saturday 11th April 1964 the London Underground Railway Society (L.U.R.S.) made a visit to the abandoned King William Street branch tunnels. They entered them from Regis House, descending the spiral stairs to the old station. Having examined the private shelter they then walked through the under river section, using the upper tunnel, in order to walk the old Southwark shelter tunnels as far as the connections to the Northern Line just north of Borough station. They returned to King William Street station and made their exit through Regis House. An amount of 5/- (25p) was requested from participants, apparently to purchase special insurance cover as required by London Transport.

### **1971 VISIT TO THE TUNNELS**

An item entitled "Exploring London's 'Lost' Tube" appeared in the June 1971 issue of London Transport Magazine. The B.B.C. had been filming in the tunnels for two days in connection with a documentary film "Underground London", in the "World About Us" series, for showing that autumn. Three pictures appear in the magazine, two showing Liz Frazer and explorer Ranulph Fiennes inside the tunnels and showing one of the water-tight steel doors. The other is of Jim Stockdale, Building Inspector, in the under river section showing the thin stalactites which have formed in the tunnels.

### **1975 VISIT TO THE TUNNELS**

On Saturday 13th December 1975, the L.U.R.S. made a further visit to the tunnels, this time entering via the London Bridge side of the river. They walked the whole branch, but were only allowed as far as the bottom of the spiral stairs to Regis House.

**CITY & SOUTH LONDON RAILWAY HISTORY** — further reading:

The City & South London Railway by T. S. Lascelles (Oakwood Press) 1955.

The Underground Story by Hugh Douglas (Robert Hale) 1963.

A History of London Transport, Volumes 1 and 2, by T. C. Barker and Michael Robbins (George Allen & Unwin) 1963 and 1974.

The Romance of London's Underground by W. J. Passingham (Sampson Low, London 1932, and Benjamin Blom Inc., New York 1972).

Note: No previous comprehensive work relating to the Southwark shelter appears to exist, but readers are referred to the account in "The Builder" magazine for 2nd August 1940. Of course the pictures and diagrams from that account are already produced, in their entirety, in this issue of "Underground". The rest of the shelter information is the result of research carried out over a long period of time.

"The Railway to King William Street and Southwark Deep Tunnel Air-Raid Shelter" by Peter Bancroft, will also be available as a separate book, with a bibliography, shortly after the publication of this issue of "Underground".

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