

Report on the drainage of Richmond / By Mr G. Donaldson ... July, 1849.

Contributors

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Donaldson, George (Surveyor)

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Metropolitan Sewers.

IN pursuance of the Order No. 478 of the Works' Committee of the 14th of May last—That “the applications in relation to the drainage of Richmond be referred to Mr Donaldson for him to examine and report thereon,”

Order of
Committee.

I have examined into the condition of the town of Richmond as to drainage, water supply, and sanitary condition generally, and beg to submit the following Report.

I have to acknowledge the polite attention and obliging assistance received from a number of Gentlemen connected with the town, while prosecuting my inquiries.

At a Meeting called on purpose, on June the 29th, the following Gentlemen who have taken an active interest in sanitary matters very courteously invited me to meet them, and offered me any information and assistance in their power:—

The Rev. J. D. HALES.

— MEYNOTT, Esq.

HENRY SMITH, Esq.

Mr WHITELY, Surgeon.

Dr HASSALL, M.D.

Mr HILLS, Surgeon.

— BLIZARD, Esq.

— PARKYN, Esq.

O. STONE, Esq., in the Chair.

These Gentlemen informed me of numerous localities to which their attention had been called, as being in want of improvement, and to which they wished my attention to be directed.

Dr Hassall stated that the condition of the town, from the want of drainage and the impurities arising from the numerous cesspools, has been the cause of much disease, and that wherever a case of fever occurred he was in great fear of its spreading owing to these circumstances.

Dr Hills stated that fever and also smallpox had been prevalent in some parts of the town, owing entirely to their unwholesome condition, and also stated that there was no doubt whatever but that the condition of the town from want of drainage was the cause of much illness: he mentioned several cases where the

noxious condition of badly-formed drains, cesspools, and open ditches, had in certain states of the atmosphere been immediately followed by fever in their immediate neighbourhood.

The Rev. Mr Hale, who has an intimate knowledge of the circumstances of the inhabitants of the less favoured localities, gave me great assistance, as he was so kind as to take me to all those closes, courts, and cottages where the evils arising from want of drainage, bad ventilation, and want of water were most conspicuous, and where injury to health had been the result; and the manner in which the poor inmates received him showed that he was no unfrequent or unwelcome visitor there.

I have also to acknowledge the courteous attention and assistance I received from the Vestrymen of the "Town and Parish of Richmond," who, by an Act passed in the 25th of George the Third, are constituted and appointed to manage the parochial affairs of the town and parish. They in a most obliging manner gave me an opportunity of waiting on them, at a Vestry meeting, where they tendered me every information and assistance I might require in prosecuting my examination of the town.

To my inquiry if there were any particular localities to which they wished my attention to be directed, their prompt reply was, "*Yes, the whole town, everywhere.*"

Situation.

The town of Richmond and its surrounding scenery, so well known, I need not attempt to describe. In an Act of Parliament relative to its parochial affairs, passed in the 6th year of George the Third, it is called the *Town* and parish of Richmond.

Soil.

Situate on a rising ground of gentle acclivity, on a light porous soil, upon a gravelly subsoil intersected with veins of sand, it is naturally dry and healthy, and favourably circumstanced for drainage. Water is obtained in abundance from wells of a depth of ten or twelve feet, but of so hard a quality that it is useless for most household purposes. On the high ground towards Richmond Hill the soil is a retentive clay.

Population.

According to the census of 1841, the number of the population then was 7,760, and now it amounts to about 9,000. The number of dwelling-houses of all classes is 1,531.

Parochial Management.

By an Act of Parliament passed in the 25th year of George the Third (1785), the management of the parochial affairs of the town and parish is placed in the hands of vestrymen elected by the householders, together with the minister of the parish, and such acting justices of the peace for the County of Surrey as are or may be resident within the parish. The powers conferred by this Act are for management of parochial matters, repairs of highways and streets, and removal or prevention of public nuisances. It does not appear that the vestrymen have authority to construct drains other than what may be implied in "upholding in repair the roads and streets."

Upon a minute examination of each dwelling-house and premises respec-

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tively (in making which, with a very few exceptions, I met with a ready welcome from all classes of the inhabitants, and many earnest wishes for remedial measures, and deplorable accounts from some of the poorer classes of the sufferings to which they are subjected by the filthy condition of privies and cesspools in and about their dwellings), it appears, that some houses of the better class have drains, but they are few, and form the exception to the general rule, of having cesspools for the reception of all foul drainage. Where there are gardens, they are studded with cesspools; in courts and alleys, in back yards, under back kitchens and cottage floors, in cellars—anywhere, everywhere, where there is room, and where there is not room, there are cesspools filled to overflowing with foul matters. Many dwellings of the poorest class—mere hovels (for I cannot call them cottages), have privies with open pits under them, close by their doors and in close proximity to their wells. In such buildings, some in Water lane and at “the back of the Bank,” and in Night and Morning Row, irregularly built, closely huddled together, without any supply of water, without ventilation or any means of obtaining it, the pestilential emanations from the privies and cesspits pervading continually every nook and corner of their dwellings, infested with swarms of flies bred from the stench and foul matter, it would be indeed surprising if disease were ever absent from such sickening scenes of discomfort and degradation.

Great exertions are made by the poor inhabitants to keep up an outward appearance of decency and cleanliness, which they effect to a surprising degree under such deplorable circumstances.

At the Marlboro’ Mews, on the high ground not far from the Richmond Hill, are several cottages (lately built) in a miserable condition, for want of drainage and ventilation, where it would seem as if artificial means had been resorted to on purpose to render an open, airy place unwholesome.

And New Richmond also, where a great number of cottages have recently been erected without any house-drainage, is altogether in a most filthy condition.

The wealthy classes, though suffering less, are by no means exempt from the cesspool system; for the porous soil is saturated with sewage till the wells are everywhere tainted with it. It is true that gravel makes a good filter, and the subsoil being everywhere charged with water, that from the cesspools cannot to any very great degree alter its quality generally; but it is to be recollected that the cesspools are generally situated only a few feet from the wells, and any person taking water from the pump first in the morning may have unmistakeable evidence of its connexion with the cesspool.

To satisfy myself in this matter, I examined the water from several wells, and found it in each case tainted so as to be distinctly perceptible in both colour and smell, and taste also.

And not only is the ground so saturated with cesspool matter as to destroy the purity of the water, but even so as to produce at times emanations from the surface of the earth of a most unpleasant and unwholesome character, particularly

in badly-ventilated localities: this is peculiarly the case with the Green and its vicinities.

Existing
Drains.

In George street, King street, and Hill street, and some other minor streets, drains or sewers have been constructed, some of brickwork, the invert built dry, and some of large horse-shoe tiles. These drains have gullies for receiving the surface and storm waters, and into them a few house-drains have their discharge; but they are nowhere deep enough to drain the basements and cellars, and, owing to their perviousness, are not suitable for conveying away house refuse, but permit the more liquid portion to soak into the soil, leaving whatever sediment there is to accumulate in the drains, and some of them are thereby quite choked up.

In Water lane there are several cottages having little confined back courts, in which are their privies, from three or four of which together a drain is carried by a wooden trough, composed of four boards nailed together, through the basement apartment of the house, about four feet above the floor, into a drain in the lane, the liquid oozing out at the seams along the whole length of the wooden trough, the stench from which was quite horrible, and filled the whole house. Appended is a sketch of one of these cottages, showing this very objectionable arrangement of foul drainage.

Open Ditches.

There are numerous open ditches of a most offensive and unwholesome character, which receive house-drainage, their vicinity being thereby rendered most disagreeable. From near the "Star and Garter" on Richmond Hill, down the roadside to Marsh Gate, a distance of 1,200 yards, there is a most offensive ditch, very much, and not without reason, complained of, discharging into a large pond at Marsh Gate, near the "Black Horse" public-house, rendering that a stagnant putrefactive cesspool, which would otherwise be a pond of clear running water.

The land along the above-mentioned road offers one of the most eligible building sites about Richmond.

Another foul ditch has its origin in the old Worple Way, running across Sir Henry Baker's lawn (there it is covered in), and thence open across the fields towards New Richmond, the smell from it tainting the atmosphere of the whole neighbourhood.

And the black ditch along Mortlake lane, which originally was the main outfall for nearly all the drains about the town, the greater part of the drainage having been diverted from it by the railway drains, whereby the current of water along the ditch is lessened and nearly destroyed, till the ditch has become a filthy stagnant cesspool, 370 yards in length, and upwards of a yard wide, a public nuisance, and injurious to health; I observed the gas bubbling up in great quantities, and received numerous complaints of the great annoyance caused thereby.

Water Sup-
ply.

In 1835 a Company was formed, by Act of Parliament, for supplying the town of Richmond with water from the Thames opposite Richmond Hill; but

of your life. I have not been able to find any other person who has been so successful in his career. I have not been able to find any other person who has been so successful in his career. I have not been able to find any other person who has been so successful in his career.

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their works have been extended as yet to only part of the town. It may be observed that the Thames water, although much less impure here than farther down the river, is yet far from being pure, for apart from its great hardness it contains the house-drainage of towns and villages situated on its banks, containing an aggregate population amounting in 1841 to 59,814, and now to about 70,000. Appended is a list of these towns and villages, and their respective population.

A great proportion of the inhabitants having their supply partly from wells, the water from which is very hard, and partly from the rain, and from people who make a living by carrying water from a conduit near the Marsh Gate, selling it at the rate of $\frac{1}{4}$ d. to $\frac{1}{2}$ d. per pailful; I find that the water so purchased by the working classes for washing costs them on an average 4d. per week per family, being at the rate of 17s. 4d. a year, and washerwomen pay as much as 15s. a week, or upwards of 30l. a year, for a scanty supply for washing only.

Thus I find the town of Richmond to be entirely without house-drainage, properly so called, and its gardens, back yards, courts and alleys, cottages and cellars, polluted with the accumulation of foul matters in cesspools, bog-holes, and open cesspits, the fetid emanations from which taint the atmosphere everywhere, but most perceptibly where there is a want of ventilation.

In former times, when the houses were few and further apart, cesspools might be very convenient, the porous gravelly subsoil allowing the liquid to soak away under the surface; but as houses were multiplied, and the cesspools, getting full, were covered in and others dug beside them, they have at last become too numerous and offensive to be longer endurable.

Of the 1,531 houses composing the town, I find that

196 only have water-closets exclusively.	} All draining into cesspools.
147 have both water-closets and privies.	
927 have privies only.	

198 have no privies, or only one in common to a number of houses, varying from two to eight, having only one privy in common.

And six almshouse foundations, which have one privy in common to several dwellings.

Nearly all the houses have cesspools in connexion with their water-closets and privies; besides which there are 155 cesspools for receiving the overflow from others.

The works or remedial measures I beg to recommend consist of—

- 1st. The construction of an entire system or arrangement of tubular drain-pipes, to carry away the sewage refuse from every house or dwelling in the town, together with, of course, a portion of rain-water from roofs and courts, and from some portion of the lanes and alleys upon which foul matter is constantly being deposited, the water from which being only a more dilute

sewage, ought not to run into the river; excluding from such drains all land-drainage, and rain and storm water generally.

2nd. The construction of tubular earthenware drains to carry off land-drainage, and rain and storm waters. For this purpose the present existing drains would be made available, so far as found sufficient. These would discharge into the river.

3rd. The construction of water-closets in lieu of privies, and converting into water-closets such privies as are fit to be so dealt with, with a self-acting and abundant supply of water.

4th. The abolition of cesspools.

5th. The application of the sewage to agricultural purposes; the revenue from which to be applied in alleviation of sewage rates, and so preventing the pollution of the river thereby.

House
Drainage.

I propose that the house-drainage shall consist of well-formed and well-burnt stoneware or fire-clay tubular drain-pipes, commencing with four inches diameter for a single house-drain, enlarging in size according to the number of houses to be drained thereby; the largest public main drain sewer being sixteen inches in diameter. In preparing the following estimates, attention has been paid to the necessity of properly-constructed inlets to the house-drains, and of having them securely trapped and firmly fixed; and I propose that the size of such house-drain pipes shall not at the inlet exceed four inches, and that the second or third pipe from the inlet, or that from every syphon or trap, shall be a tapering or enlarging pipe, the smaller end being four inches, enlarging to four inches and a half at the other end; the rest of the drain to be $4\frac{1}{2}$ -inch pipe; and so anything that passes through the 4-inch pipe at the inlet will pass without obstruction through the $4\frac{1}{2}$ -inch pipes.

The houses to be drained being of every description, many of them in blocks very irregularly built, various methods have to be adopted to meet the requirements of the cases.

Back drainage, in a great majority of cases, is found the most convenient and economical.

The proposed drains are laid down upon the accompanying plan of the town, showing also the outfalls where it is proposed to dispose of the sewage.

Main Sewers.

The main lines of sewers are as follows:—

One from near the Star and Garter Hotel on the hill, down the road to Marsh Gate, and thence along the high road to near Sir Henry Baker's property, and taking the line of the open sewer there across the railway, through an existing culvert into the main sewer in Mortlake lane.

Another main sewer commencing near the top of the Hill street, down that, and along King street across the Green, passing under the railway into the Deer Park.

Another, commencing near Queensbury Villa, and running along the margin

enough, ought not to run into the street, extending from each
drain all back-drains, and into and across water generally.

and. The construction of suitable manholes, drains to carry off
drainage, and also of storm drains. For this purpose the present
existing drains ought to be made available, so far as found sufficient.
These would discharge into the river.

and. The construction of water closets in line of public, and otherwise
into water closets, and public as are fit to be so dealt with, with
a satisfactory and abundant supply of water.

and. The location of manholes.

and. The application of the water to agricultural purposes, the
amount from which to be applied in irrigation of drainage, and
and conserving the pollution of the river thereby.

Plan of
Drainage

I propose that the house-drains shall consist of well-joined and well
laid drains at the city where drainage, connecting with their lower
character for a single house-drain, collecting in each according to the number of
houses to be drained thereby, and the largest number made these drains being strong
tubular in character. In providing the following satisfactory attention has been
paid to the necessity of proper construction, both to the lower drains, and to
having them securely supported and fixed in place, and I propose that the size of
each house-drain shall not be less than four inches, and that the
main or street pipe from the drain, or that from every other drain, shall
be a leading or collecting pipe, the smaller and being four inches, extending
four inches and a half at the street end, the rest of the drain to be, if both pipe
and so anything that passes through the street pipe at the inlet will pass
without obstruction through the street pipe.

The houses to be drained, and of every description, many of them in this
city irregularly built, various methods have to be adopted to meet the various
cases of the city.

Back drains, in a great majority of cases, a lower and more convenient
arrangement.

The proposed drains are laid down upon the accompanying plan of
plan, showing also the outlet where the proposed to dispose of the sewage.

Plan of
Drainage

The main line of drainage is as follows:

This line runs from the lower end of the street on the left, down the street
March Gate, and thence along the right end to near the Henry Baker's property
and taking the line of the open sewer there where the railway, through to the
tag station, runs the main sewer to the outlet.

Another main sewer commencing near the top of the Hill street, down the
and along King street under the bridge, passing under the railway into the
Park.

Another sewer, commencing near the Quaker's Tilt, and running along the main

of the river, receiving the sewage of all the houses on the sloping ground between Hill street and the river, passing under the railway near the new bridge, and turning along the side of the park near the railway, is joined by the Hill street sewer there.

Another, commencing in Mortlake lane, receiving the drainage of New Richmond, and the sewer from the Marsh Gate road and the Worple Way, and the sewer in Kew road, runs along St John's Grove, receiving also the sewage of that neighbourhood, and thence into the park, and there, in conjunction with the other sewers, is carried into a covered tank, near the middle of the park. The sewage to be applied there for irrigation by means of a pump and hose pipes, for which the dry soil and level surface of the park afford an excellent opportunity, while its great extent admits of the application there of all the sewage of the town, without the possibility of any unpleasantness being occasioned thereby to any one.

The soil and subsoil (as before noticed) being of a porous gravelly nature, intersected with veins of sand, and the subsoil being everywhere charged with water to within six or eight feet of the surface, and in rainy seasons often so much more so that it floods the cellars and basements of buildings; I propose that the road-drains should be made deep enough to drain the foundations of all buildings, and constructed of tubular earthenware pipes, into which the water will drain freely from the gravelly subsoil without the necessity of collateral drains, except where a clay subsoil is met with; and that the exclusive control of all gully-shoots, grates, and openings into the drains, shall be under the controul of the Commissioners.

Surface and
Road Drain-
age.

Wherever the existing sewers or drains in the streets are found to be deep enough and properly constructed, I propose that they should be made available as road-drains, all sewage being carefully excluded from them, and that the present open ditch sewers in the Queen's road and Mortlake lane be cleared out and tubular drains laid in them with gullies to receive the surface water.

In the system of house-drainage herein proposed, involving the total abolition of all cesspools and privies, and the substitution of water-closets in their stead, an abundant, constant, and self-acting water supply forms an essential and indispensable feature; and fortunately it can be obtained at a comparatively small expense either from the river or from Richmond Park, where water in abundance and of a good quality for domestic use can be obtained thirty feet above the level of the river.

By the formation of a tank or reservoir, either in the park or on the high ground near Richmond Hill, the water could be supplied from it by gravitation to the tops of the houses in the town, with the exception of the houses built on the hill, where it could be supplied to the first floors only.

I have submitted samples of the water from the ponds in Richmond Park, and that from the river, as supplied to the town by the Richmond Water-works Company, to Dr Lyon Playfair, for analyzation, as to their comparative softness

and fitness for domestic uses, and he states that from the park to be eight, and that from the River thirteen degrees of hardness.

Richmond Park presents an excellent water-collecting area of nearly 2,000 acres, containing numerous springs, from which a copious stream of water is produced: the fall of rain there averages twenty-five inches a year, of which ten inches may be reckoned on as what may be collected for use, and which, upon 2,000 acres, amounts to upwards of 450 millions of gallons a year.

The town of Richmond contains at present between 1,500 and 1,600 houses; and assuming that in the course of seven years more they will probably amount to 2,000, the quantity of water necessary to supply them with 100 gallons per house per day is 73 millions of gallons; so that the park would supply six times the quantity of water required in Richmond. The cost of completely draining the park would be about 3*l.* 5*s.* an acre, and a great portion of it being already drained, about 1,000 acres more would have to be drained, and as the cost of the drainage would be more than repaid by the improvement thereby effected on the land, it appears unnecessary here to give any detailed estimate of it, more especially as detailed estimates and all particulars were given in full in my Report on the park in January last.

The advantages of such a supply of water are great: the water being softer and better adapted for domestic use, and being obtained at a higher level, requires less expensive pumping machinery. The advantages of such a supply of water are numerous and important: the water being purer, softer, and better adapted for domestic purposes, its use is attended with a great economy in washing, not merely as requiring a less quantity of soap or soda, but also in occasioning less rubbing and wear of the linen or whatever else may be washed, and less time and labour in the operation. In making tea pure soft water will effect a saving of 20 per cent. over hard or Thames water, and for cooking the pure water is greatly preferable; vegetables cannot be cooked with hard water so as to be either so palatable or so wholesome as with pure water. The Thames water may be rendered less impure and less unfit for washing or for cookery purposes by the addition of soda and by filtering, but still it is not pure.

The best of all filters is a field of a sharp sandy or gravelly soil covered with herbage; such matters as the water holds in suspension are interrupted by the sand, and the growing herbage seizes and uses up the matters held in solution, particularly organic matter, so that the water collected from such land is always found the purest. The field presented by Richmond Park for this purpose is such as can seldom be met with.

The soil is well adapted for it, and the surface conformation is singularly so; 2,000 acres all draining to one point, where a pond of less than a quarter of an acre would serve to collect the water to be raised by pumps to a suitable reservoir on higher ground, from which by gravitation a constant supply would be given to

every house in the town, and sufficient to supply five more towns of a similar size. The constant has many advantages over the intermittent supply, of which one of the first is economy. Tanks, waterbutts, and ball-cocks to each house, and which are continually getting out of order and letting the water run to waste, are dispensed with; and the quantity of water so wasted is often more than half the supply, so that half the cost of pumping necessary for an intermittent supply would be saved, as also the first cost and continual repairs of water-tanks and taps, &c. to the householders.

Besides and independent of the supply of hard water from wells and from the river, soft water is purchased at a great cost for washing; and assuming that two-thirds of the families in the town so pay for soft water, or have their washing done by a Laundress who does so, and taking the amount so paid by each family at an average of only 6d. per week, it amounts to about a thousand pounds a year, so that a constant supply of soft, pure water, at an average of upwards of 50 gallons per house per diem, can be obtained at a less cost than is now paid for water by dribbling bucketfuls for washing only, and the first cost and constant expense of repairs of wells and pumps would be saved also. As these numerous advantages belonging to this proposed district cannot be so well shown by a common map, I would beg to recommend that a model map may be procured after Mr Carrington's method, by which its numerous advantages and capabilities as a water-collecting ground would be fairly presented to view, and greatly tend to facilitate the works necessary in rendering them beneficial to the public. As a means of convenience and also of economy in carrying out the works, it is desirable that the water supply for domestic use should be combined with that for water-closet apparatus, and that the water-pipes may be laid down at the same time, as far as practicable, in the same trenches with the drain-pipes, thereby effecting a considerable saving in time and cost of labour.

In order to show more distinctly the present condition of the premises and the proposed method of drainage, I have prepared enlarged plans of two groups of buildings, the one at New Richmond, recently erected, where, although every facility exists for a complete drainage, the cesspool system has been adopted with all its disadvantages. In the gravelly subsoil through which water percolates freely, cesspools and wells are placed in close proximity. The wells being generally deeper, the water in them is invariably rendered impure and unwholesome.

The other enlarged plan is that of a crowded locality comprising Clarence street, St John's Grove, and Night and Morning Row, where there are some buildings of a rather superior, and many of a very inferior description, and numerous cesspools, from which the filthy fluid matter is to be seen oozing through the foundation walls into cellars and basement apartments, which are thereby rendered damp and disgustingly uncomfortable and unwholesome. A general want of ash-pits and dust-bins is apparent from the numerous heaps of dust, ashes,

and refuse rubbish lying about wherever there is room to throw it down. There is no drain or water supply in this place.

This state of matters appears to have arisen from the crowding of urban dwellings together with only such arrangements for decency, cleanliness, and domestic accommodation, as in single isolated cottages in country places, but without their privacy; and the consequence is, a state of matters quite inconsistent with the habits and ideas of English society, imposing on the inhabitants much discomfort, labour, and expense, in struggling to maintain cleanliness, decency, and self-respect, often ineffectually, till at length, with the means, the hope and the love of decency are lost.

It is desirable that each dwelling, however humble, should be furnished with a water-closet, a supply of water, a dust bin, and a drain into the common sewer. I propose to lay down drains to each house, as shown on the plan.

The cesspools all to be cleaned out, and filled up. The privies to be removed and replaced with water-closets, with a constant self-acting water supply. Wherever there is water to be had sufficient for its dilution, the cesspool matter may be inoffensively removed by pumping it into closely covered waggons or casks.

There are cases where a number of small cottages have only one privy in common, and where there is not room to construct a water-closet to each cottage. In such cases I propose the construction of a sort of water-closet for the common use of these cottages, having under the seat a trough containing a quantity of water sufficient to hold in suspension and flush away at once the accumulations of one day, of which a drawing is appended; the key to such flushing-pipe being kept by the policeman in charge of the district, and regularly let off by him at least once a day in the evening.

Appended are estimates of the cost to each house, divided into four classes of—

Drainage,
Water-closets, and
Water supply ;

showing also the amount payable

Per annum,
Per month, and
Per week,

if paid for by an improvement rate spread over twenty-two years.

The probable cost of the entire works herein recommended I have estimated as follows: I believe, however, that they will be got for less, if the work is done by contract, which I would recommend as the preferable mode.

There are—

1,171 cesspools to be cleaned out and filled up, which at 8s.	
each amounts to	£468 8 0
414 privies to be converted into water-closets, at 2l. 8s. 6d.	
each	903 17 0
718 privies to be removed and water-closets to be constructed instead, at 4l. 7s. each	3,123 6 0
13 water-closets to be constructed for the use of a number of houses in common, at 6l. 14s. each	87 2 0
13 miles nearly of house-drains	3,500 7 7
7 miles nearly of public main sewers and drains	5,057 8 6
4 miles nearly of road drains	1,700 0 0

No side entrances nor air shafts are required; and with a plentiful supply of water, the inlets to house-drains being well trapped, no unpleasant smells can be produced from the drains, and the atmosphere throughout the town will then be as pure as that in the fields; and Richmond be restored to its former condition, and well-deserved high character for salubrity and beauty, so well expressed in its old Saxon name—Sheen (*i. e.* brightness—fairness—splendour). The value of property will be enhanced, and the adjacent land increased in value for building purposes.

For the disposal of the sewage refuse, the Lower Park, which is now let and occupied as meadow and pasture land, affords one of the best and most convenient fields possible. Comprising upwards of 300 acres of grass land, away from any buildings, with a dry gravelly soil and level surface, it lies convenient for receiving the drainage of the town, and is large enough to take the whole of it at all times when fit to be manured at all.

I estimate the improved rent value of this land by the use of liquid manure at 3l. an acre in the course of three years, and it would thereafter be greatly increased; and assuming that the sewage of the town returned a revenue equal to only 3s. per inhabitant, it would amount to the sum of 1,350l. a year, to go to the credit of the rates.

In order to the carrying out of the works herein recommended, the formation of a new district, comprising all the property to be affected by them, is necessary; and after carefully considering this matter, it does not appear desirable to confine the district to Richmond and its immediate vicinity only.

Your attention has already been called to the extensive area drained by the Latchmere Brook, which includes a portion of Kingston-on-Thames, where a want of drainage is complained of; and Mortlake, Kew, Barnes, and Putney also require attention.

I beg, therefore, to recommend the formation of a separate sewerage district, in conformity with the 34th section of the Metropolitan Sewers Act, com-

prising all these localities as coloured on the accompanying Ordnance Map; bounded eastward by the water-shed line east of and draining into the Priory Stream, which runs into the River Thames between Putney and Barnes, and bounded westwards by the water-shed line west of and draining into the Hogsmill River above Kingston, and by the Thames from Kingston to Putney: to be called the Sheen, Richmond, and Kingston District.

And that the smaller drainage area, comprising Ham, Petersham, and Richmond, be formed, under the 35th section of the Act, a subdivision, and called the Richmond Division.

And that a special sewers rate be made, under the 81st section of the Act, upon the Richmond Division, to defray the expenses of the road-drains and main sewers.

And that an improvement rate be made, under the 82nd section of the Act, for house-drainage, &c.; and that the requisite amount of money be borrowed, in conformity with the 106th section of the Act, upon the credit of the rates.

I beg here to remark, that in obedience to the Order of Committee of the 4th June, No. 529, with reference to my Report on Latchmere Brook, I have conferred with the landowners along its course with respect to the payment for its improvement, and with the inhabitants of Petersham with respect to the house-drainage there, and the improvement of the brook through Petersham; and both parties appear desirous that the work recommended in my Report thereon should be done under the authority of the Commission, and paid for by a sewers rate. My estimate of the probable cost of this work, as described in my Report thereon, is 1,135*l.* 6*s.* 9*d.*, of which 351*l.* ought to be defrayed by Petersham—and the entire house-drainage of Petersham would cost about 680*l.* I would therefore recommend that Petersham be included with Richmond in the special sewers rate recommended for works of drainage, and that the drainage of Petersham be executed in connexion with that of Richmond: and that an improvement rate, under the 82nd section of the Act, be made for the improvement of the Latchmere Brook upon the property along its course.

SUMMARY OF EXPENSES.

	Expenditure.		Amount required to repay the amount expended, with five per cent. interest, in 22 years.	
	£ s. d.	£ s. d.	£ s. d.	£ s. d.
<i>Special Sewers Rate.</i>				
Main Sewers (Richmond) -	5,253 4 6		341 8 11	
Do. (Latchmere Brook)	1,135 6 9		73 15 6	
		6,388 11 3		415 4 5
<i>Improvement Rate.</i>				
House-drainage - - -	3,920 18 1		254 16 0	
Abolition of Cesspools - -	468 8 0		20 8 5	
Construction of Water-closets	4 114 5 0		267 8 3	
		8,503 11 1		542 12 8
Road-drainage, about - -	1,700 0 0		110 10 0	
Water Supply, about - -	4,500 0 0		292 10 0	
		6,200 0 0		403 0 0
Total - - -	- - -	21,092 2 4		1,360 17 1
After three years the amount received for Sewage Manure would have to be deducted from the amount of Rate required per annum, viz. -	- - -	- - -	- - -	1,360 17 1
Deduct income from Sewage Manure - - -	- - -	- - -	- - -	1,350 0 0
Amount then required - -	- - -	- - -	- - -	10 17 1

RECAPITULATIONS OF RECOMMENDATIONS IN THIS REPORT.

- 1st. That the Court declare that part of the area under their jurisdiction described above, to be a sewerage district, called the Sheen, Richmond, and Kingston District; and part of the said district, comprehending Richmond, Ham, and Petersham, to be a subdivision, to be called the Richmond Division.
- 2nd. That a special sewers rate be prospectively made upon the Richmond Division, of an amount sufficient to defray the cost of the main drains and sewers, including the Latchmere Brook, with interest thereon, in twenty-two years.
- 3rd. That an improvement rate be made sufficient to defray the cost of house-drains, &c., &c., with interest, in twenty-two years.
- 4th. That the amount of money necessary be borrowed on the credit of the rates.

- 5th. That a system of tubular pipes be constructed, as shown on the accompanying plan, for house-drainage.
- 6th. That tubular drains be laid down, as shown on the plan, for road and surface drainage.
- 7th. That a supply of water be procured, in conformity with the 66th section of the Metropolitan Sewers Act, for the purpose of cleansing the sewers and drains, and for water-closets, &c.
- 8th. That the sewage manure be disposed of for agricultural purposes, and the proceeds carried to the credit of the rates.

I have the honour to remain,

My Lords and Gentlemen,

Your obedient humble servant,

G. DONALDSON,

Assistant Surveyor.

APPENDIX, No. 1.

A List of Towns and Villages which drain into the Thames above Richmond, and the Number of their Inhabitants.

TOWNS AND VILLAGES.	Number of their Inhabitants.
Great Marlow	4,480
Little Marlow	927
Cookham	3,676
Maidenhead	1,838
Windsor	7,787
Datchet	922
Egham	4,448
Staines	2,487
Laleham	612
Chertsey	5,347
Walton-on-Thames	2,537
Sunbury	1,828
Hampton	4,711
East Moulsey	690
Thames Ditton	2,169
Kingston-on-Thames	8,147
Twickenham	5,208

59,814

APPENDIX, No. 2.

AN ESTIMATE of the Probable Cost per House, in Four Classes, of a Rate to Repay the Outlay, with Five per Cent. Interest, in Twenty-two years.

	CLASS I.			CLASS II.			CLASS III.			CLASS IV.		
	Per Annum.	Per Month.	Per Week.	Per Annum.	Per Month.	Per Week.	Per Annum.	Per Month.	Per Week.	Per Annum.	Per Month.	Per Week.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Main Sewers	0 12 0	0 1 0	0 0 3	0 8 0	0 0 8	0 0 2	0 4 0	0 0 4	0 0 1	0 2 0	0 0 2	0 0 0½
House Drains	0 7 10½	0 0 8	0 0 2	0 5 3½	0 0 5½	0 0 1½	0 2 7½	0 0 2¾	0 0 0¾	0 1 3¾	0 0 1½	0 0 0¾
Water-closets	0 9 3	0 0 9½	0 0 2½	0 6 2	0 0 6½	0 0 1½	0 3 1½	0 0 3½	0 0 0½	0 1 6½	0 0 1¾	0 0 0¾
Water Supply	2 11 6	0 4 3½	0 1 0	1 14 4	0 2 10½	0 0 8	0 17 2	0 1 5½	0 0 4	0 8 7	0 0 8¾	0 0 2
Road Drains	0 4 0	0 0 4	0 0 1	0 2 8	0 0 2¾	0 0 0¾	0 1 4	0 0 1½	—	0 0 8	0 0 0¾	0 0 0¼
Total	4 4 7¾	0 7 0¾	0 1 8½	2 16 5½	0 4 9¾	0 1 1½	1 8 2½	0 2 4½	0 0 6½	0 14 1½	0 1 1¾	0 0 3½

REPORT

ON THE

DRAINAGE OF RICHMO

BY

MR G. DONALDSON.

Assistant Sure

JULY, 1849.