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2. Interior of Inlet House, Showing Screen Apparatus.
3. Sand Bank, with Inlet Well at End of Inlet House.
4. Outlet House on Sewage Farm, and Bridge over Cook's River.
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6. Depositing Sludge from Strainers on the Sewage Farm.
7. General View of Farm from Inlet House.
8. Wrought Iron Bridge across Ellis' Creek Flat — Part of Macdonaldtown and Alexandria Branch Sewer.
SUBMITTED AS PART OF THE REQUIREMENTS FOR A

B.A. (Hons) DEGREE IN HISTORICAL ARCHAEOLOGY

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COLLEEN A. CALLAGHAN
THE BOTANY-ROCKDALE SEWAGE FARM

A CASE STUDY IN URBAN ARCHAEOLOGY
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SECTION 1: CONSTRUCTING THE PAST:

Sydney gradually became urbanised throughout the second half of the nineteenth century. As a necessary part of this process, construction commenced in the 1880s on two major components of sewerage and water supply i.e. a comprehensive water scheme, and two comprehensive sewerage systems for the city and suburbs. Current medical views endorsed the necessity for the sewerage systems, and their implementation had been recommended in 1877 by the Sydney City & Suburban Sewage & Health Board, following their investigations into the deplorable sanitary conditions in the metropolis. The SC&SS&H Board had also investigated, and evaluated, overseas methods of sewerage disposal and the technologies that were being employed in these practices, and as a result of these investigations, they recommended that the two systems employ different methods of sewage disposal – one to use ocean outfall – the other to use land treatment at a sewage farm.

The experimental, government-funded sewage farm was situated in the Botany region, on the outskirts of Sydney. This was mainly a market garden area, and it was from the Botany Swamps that Sydney derived its water supply. At the time the isolated and sandy site was considered eminently suitable for its purpose, however future events proved this evaluation to be incorrect. The primary function of the Botany Sewage Farm – later extended and called
the Botany/Rockdale Sewage Farm - was to dispose of the sewage from the southern slopes of the city, using a British method of land treatment called intermittent downward filtration. The secondary function of the Sewage Farm, was to utilise the manurial value of the sewage to produce much-needed vegetables for the household table. In line with the Swiss Family Robinson and the Archaeology of Colonisation, the imported technologies used at the Sewage Farm required considerable modifications before they could be adapted, mutated and eventually 'indigenised,' which makes the parochial Botany-Rockdale Sewage Farm an ideal subject for archaeological study.

In the late 1890s the Sewage Farm was extended to allow for the disposal of the sewage from the Western Suburbs, and by the turn of the century the Sewage Farm was in crisis. There was too much sewage on too little land, and the establishment was unanimously excoriated by Councils and residents of adjacent municipalities. As well, government priorities were changing, and following parliamentary investigations between 1906 and 1908, the decision was made to transfer the sewage to a new ocean outfall at Long Bay. Ocean outfall had always been the preferred system of sewage disposal, as it was considered to be more efficient, more cost-effective and a superior technological method. In 1916 the Sewage Farm was discontinued.

Mark Leone contends that our conceptions of the past are constrained by the past that survives. This is especially true of the fragile archaeological remains of the Botany-Rockdale
Sewage Farm, which are scattered, disparate, insulate and anonymous - a ruined corner of a building, clusters of introduced trees, and a raised earthen platform - separately they signify nothing, and provide few clues as to what came before. It is only when they are translated into the total archaeological site that they assume their composite parts, and it is the actuality of the total site which is archaeologically significant.

Theory:
The eminent French historian, Fernand Braudel considered history to be, at any one time, a continuum of three interlocking levels of reality, as well as the total of all possible histories. Global in its vision, Braudel placed less emphasis on narrative and events, and more emphasis on analysis, longterm structures and trends. Applied to archaeology, and in particular to the Botany-Rockdale Sewage Farm, the single event of the Farm can be viewed as three levels of interconnected archaeological and historical realities.

The First Level equates to the physical, empirical aspect of the Sewage Farm, and incorporates the 'observed behaviour' of the material and technological culture, leading up to, and including, the construction, operation and adaptation procedures of the Farm. This level can be regarded as a singular event in the process of urbanisation. The archaeological remains are also related to this first level of historical reality. They are the
physical manifestation - the 'preserved behaviour' - of the Farm's immediate aspirations, and possible indicators to specific adaptations, or other aspects, of the Farm's history, which may not have been included in the written record.

The Second Level places the Sewage Farm on the periphery of the larger urban context. In the long-term sewerage scheme which was envisaged for the city and suburbs, the sewage farm was regarded as an expendable and exploitable component, and its early demise was precipitated by the intrusion of one aspect of this larger urban system, i.e. the Western Suburbs Sewerage Scheme. Little is written about this period in secondary historical sources, and it is best understood from inspections of the archaeological site. The swampy nature of the terrain at the western, or Rockdale, end of the site, clearly demonstrate why this intrusion caused the Farm to fail.

The Third Level forms the main basis of secondary historical 'writings', and generally contextualises the overall sewerage scheme both diachronically and synchronically. In this level, the resource management philosophy which had motivated the establishment of the Farm, was superseded by a different philosophy of sewage. The latter philosophy was based on the superiority of a technological scheme which would swiftly, and unobtrusively transport all sewage to ocean outfalls for final disposal, via a network of self-regulating and self-cleansing sewers, which underpinned the total suburban landscape. This was a method which, in many respects, was predicated by Sydney's
geographical position. The proximity of the ocean made ocean outfalls the cheapest and most effective method of sewage disposal.

Aim of the Thesis:
It was originally intended that this thesis would include provision for comparison with similar, early sewage facilities in Britain, Canada and the United States of America. However, as it transpires, this paper is the first of its kind: there are no comparative investigations in any of the above countries. As noted by Stanley South, it is "a unique one-of-a-kind project." (Appendix 1)

This thesis examines the Botany-Rockdale Sewage Farm at two levels:
1. As a case study in the archaeology of urbanisation, the location, setting and character of the site of the Sewage Farm will be regarded as an archaeological entity.

When regarded in this manner, the overall physical reality of the site demonstrates more clearly than any of the historical records why the Sewage Farm experienced difficulties and why it eventually failed.

It examines and explains how the archaeological entity of this former large-scale government-funded enterprise affected the present-day landscape, in that the land which it formerly occupied continues to be retained as open space for public amenity, although much of it has subsequently been resumed for
the extension of Sydney airport.

It examines and inventories the above-ground remains e.g. standing structures, earthworks, etc.

It analyses and inventories, as far as possible, what underground archaeological remains could be expected to have survived.

The above and below-ground, archaeological remains are marked in identifying colours on a contemporary map of the site.

2. The thesis analyses the contributing socio/historical factors which led to the introduction of the two sewerage systems e.g. declining sanitary situation; medical views; suburban growth; growing belief in superiority of science and engineering.

It explains why a sewage farm was chosen, what its purposes was, how it operated, what technologies were employed and what modifications were made to them.

This historical archaeological appraisal contributes to understanding changes that have occurred in the community's cultural and behavioural attitudes, with specific regard to matters involving sanitation.

Methodology:

Fieldwork for this thesis consisted of familiarising myself with the site, and then searching the site for archaeological remains and unifying these with plans.

It also included two map-assisted inspections of that part of the archaeological site which is 'air-side' e.g. within the perimeter
of Kingsford Smith Airport. These visits have to be specially arranged with the Federal Airport Corporation, and one is accompanied by an airport official at all times.

On one of these visits, I was accompanied by Mr. Thorpe, a former employee of the Water Board who is most knowledgeable about the Sewage Farm. His first-hand on-site information of what went where and why was invaluable, particularly inside the airport where all distinguishing past landmarks have gone.

Fieldwork also included several inspections of that part of the archaeological site which is not subsumed into the airport complex e.g. The Rockdale end of the Sewage Farm. Mr. Thorpe also accompanied me on one of these inspections.

For the purposes of discussion, this thesis is divided into a phased developmental analyses, using archaeological and historical evidence supported by phased plans and photographs. The final plan is an analysis of the surviving archaeological evidence.

**Documentary Sources:**

This thesis draws on four main sources as the basis for the historical understanding of the Sewage Farm. As a group which ostensibly share the same subject matter, these documents create an interesting juxtaposition. None is impartial, and each document was written from a specific historical viewpoint. Each presents a separate argument, and facts are manipulated to suit the purposes of the particular vested interest. Therefore none can be taken at face value.
Annual General Reports

The control and management of the water supply and sewerage works are the function of the Water Board, and each year this organisation was obliged to present official reports to the Legislative Assembly. Newly appointed by Act of Parliament in 1889, the Water Board was in an invidious position. The Act constituted the Minister for Public Works the "constructing authority" in respect of all major works, and these did not come under the control of the Board until completed. As well, the Board was curtailed in its expenditure to such annual votes as were ultimately passed by Parliament, which were governed at times by the exigencies of governmental finance rather than by the urgency of the contemplated works. This left the Board with very limited and somewhat uncertain powers, apart from maintenance and administrative duties, and imposed limitations which almost brought it within the category of a Government department.

The Annual Reports were therefore formulated therefore with a specific audience in mind, i.e. the Legislative Assembly, and their intent was to impress the reader with the Board's competency and efficiency. They illustrate the perceived governmental priorities of the day, as each Report emphasises the technological progress achieved during the previous year, e.g. additional lengths of water and sewerage mains laid, and numbers of additional houses which were connected to both systems etc. Consequently, these Reports aimed to be as uncontroversial as
possible. They accentuated positive aspects of a given operation, and at the same time, negative aspects were ignored, or glossed over, as far as possible. This approach is evident in the annual resumes of the Sewage Farm, which portray a picture of an experimental project which was being carefully, but successfully, negotiated through its developmental phase. However, it is evident from other sources such as the 1908 Minutes of Evidence, that the Sewage Farm was in difficulties almost from the moment the Board assumed control. When confronted with this contradictory evidence, it can be seen that the language employed in their yearly Reports is guarded in the extreme. In general, the Reports present the facts, but only those facts that the Board wishes to emphasise are made obvious, and by skilful manipulation of words, the Reports generally manage to avoid stating outright that a problem exists. Despite these shortcomings, these secondary sources are the only documents which provide consecutive accounts of the yearly activities at the Sewage Farm.

Minutes of Evidence 1875

These Minutes are associated with the investigations conducted by the Sydney City and Suburban Sewage and Health Board, which was appointed by the Government in 1875 to "inquire into and report as to the best means of disposing of the sewage of the city of Sydney and its suburbs, as well as of protecting the health of the inhabitants thereof". The information collected during these inquiries would eventually be used to endorse this Board’s recommendations that Sydney and the southern suburbs be
immediately supplied with two comprehensive water-carriage sewerage systems. The SC&SS&H Board's inquiries covered a range of topics i.e. - the nuisance with the waterhole on the Sugar Company's premises; the abattoirs at Glebe Island; lands proposed as receptables for night soil; sanitary conditions in the city and suburbs; the crowded state of dwellings in the city and suburbs; and lengthy debates on sewage disposal methods. As well many people from diverse occupations were interviewed such as nuisance inspectors, aldermen, town clerks, medical doctors, judges etc.

The main thrust of the questions were directed toward establishing that the health of the inhabitants of the city and suburbs were jeopardised by deadly miasmas, which were the direct result of inadequate sanitation, and indirectly the result of sub-standard and overcrowded dwellings. It is obvious that those who were interviewed were in sympathy with the SC&SS&H Board's medical views. However, not all were in favour of the introduction of water-carriage systems, and others thought all of Sydney's sewage should be utilised at a sewage farm, rather than being wasted by discharge into the ocean. The 1875 Minutes provide glimpses of extremely personal aspects of life in the city and the suburbs in the second half of the nineteenth century, and horrendous details of the appalling sanitary situation that often went hand-in-glove with a pragmatic attitude towards human waste - an attitude that spanned the class spectrum from judges, to local aldermen, to Chinese market gardeners.

Minutes of Evidence 1906-1908:

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The 1906-1908 Minutes were recorded during inquiries held by the Parliamentary Standing Committee on Public Works into a Scheme of Sewerage for the Illawarra Suburbs. It was originally proposed that this sewerage be treated at the Rockdale Sewage Farm by biological filtration. Evidence was taken accordingly, but no official recommendations were made. Some months later, at a further sitting of the Committee, evidence was taken on an altered proposal. This allowed for the sewerage of the Illawarra Suburbs, but instead of disposal by biological filtration, it was proposed to extend the Western Suburbs Outfall from the Sewage Farm to an ocean outfall at Long Bay, or its vicinity. In effect, the adoption of this proposal meant the closure of the Sewage Farm.

It is these second set of Minutes which are the more valuable from the point of view of this paper, as they are concerned with the actual Sewage Farm. Those interviewed were mainly businessmen, and aldermen, from local suburbs such as Rockdale, Arncliffe, Bexley etc. The Manager of the Sewage Farm, Mr. Brooks, was questioned, and authorities from the Melbourne and Adelaide sewage farms also gave evidence. The evidence from Mr. Brooks is extremely valuable, as he provides first-hand information about the physical defects at the Farm, the day-to-day difficulties experienced in operating the Farm, and why it never was able to produce the anticipated revenue. None of this material is ever included in any secondary source. The information from the Adelaide and Melbourne experts is also valuable. Details of the physical and operational aspects of two
successful sewage farms are provided, which allows a basis for comparison, against which the Botany-Rockdale Sewage Farm can be measured.

As in the earlier 1875 Minutes, the questions are biased in favour of producing answers which could be used to justify the expense of extending the main western sewer to an ocean outfall at Long Bay. It appears from the line of questioning, that the Committee endeavoured to establish that local residents considered the Sewage Farm to be a miasmatic health hazard. This would have provided ineluctable medical grounds as justification for the removal of the Sewage Farm, and its replacement by an ocean outfall system. Generally, the citizens of the area took objection to this line of questioning. They took pride in the fact that the inhabitants in the locality were healthy, and that the district's mortality rate from typhoid and other dangerous diseases was low. They did not consider the Farm to be a specific health hazard, they simply detested it. It was a malodorous blot on the local landscape which severely retarded the progress of the district. They considered it to be unjust that they had the gross inconvenience of having the sewage from the Western Suburbs discharged on their virtual doorstep. They considered the construction of a sewerage system for their locality to be desirable, but saw no reason why the sewage should not be disposed at an ocean outfall, where it couldn't been seen or smelt.

Official Histories of the Water Board:
Two official histories have been published by the Water Board, since the Act of 1924 was passed, which gave the Board sole responsibility for construction of water supply, sewerage and drainage works, as well as maintenance and administration. In both these histories, it is apparent that selective historiographic processes have been employed to emphasise specific ideological messages, which enforce the existing order and, at the same time, 'allow the influence of the present to be felt in the perceived past'.

These volumes do not tell a history of sewage or sewage treatment, instead they are histories about technological achievements, detailing the chronological development of a sewerage system which was, and is, used to transport sewage from the point of entry into the system, to the point of disposal from the system. They relate the cost and size of the system; how the system works; and the constructional difficulties overcome in producing the system. Big is best, and the Sydney system we are told is the largest in Australia, second only in the British Commonwealth to that of London.

The two volumes contain virtually identical information about the Sewage Farm — five pages in the 1939 edition, but only four pages in the 1969 edition. No attempt has been made to present an historical synthesis, and the fact the Sewage Farm was employing state-of-the-art overseas technologies in land treatment of sewage is not recorded. Instead, the Sewage Farm with its sewage-irrigated and manually-manured crops, pig raising...
activities etc., is made to seem like a nineteenth century whimsy, an episode best forgotten when balanced against the ensuing philosophical developments in sewerage technology. This style of historical accounting is underlined by the interplay of two ideologies - 'vulgar' and 'nonvulgar'. The former works by legitimising the state and ipso facto the Water Board 'by applauding its accomplishments and lauding its efforts and showing its future, the second, and more obscure, 'nonvulgar' ideology basically states "we must continually evolve and progress, or else we will never get there." **

It is not possible to confront these historical sources with detailed archaeological evidence, nevertheless, the actuality of the site, when viewed as a total archaeological component, serves to illuminate the contradictions and misrepresentations in the documentary sources. This presents a new aspect of the archaeological actuality, just being at the site animates a comprehension of its environmental context. Without this environmental comprehension it is virtually impossible to gain any appreciation of the Sewage Farm as a working entity in a specific physical location.
Section 1: CONSTRUCTING THE PAST

Footnotes:

1. There are two official Boards which receive frequent mention in this thesis. One is the Sydney City and Suburban Sewage and Health Board, which will be referred to as the SC&SS&H Board throughout this thesis. The second is the Water Board, which is the current title for the organisation which controls Sydney's water and sewerage systems. The original title, in 1888, was 'The Metropolitan Water and Sewerage Department. Since then, this title has been altered several times. To save confusion, this organisation will be referred to by its current title e.g. the Water Board, in the text of this thesis.

2. J. Birmingham The Swiss Family Robinson and the Archaeology of Colonisation pps. 3-14 Australian Historical Archaeology 1983


6. Personal comment from Stanley South - see Appendix 1 for copy of letter, and Appendices 2-8 for additional replies as a result of overseas inquiries.

7. There is a fifth historical source to which this thesis is indebted i.e. The Botany-Rockdale Sewage Farm Railway by N.J. Thorpe, which was written for the Australian Railway Historical Society. Apart from the detailed information which it provides about all facets of the Farm's railway, the article also contains extremely valuable information concerning technical aspects of the Farm's construction, which is not provided in any of the more traditional sources, and would be otherwise extremely difficult, and time-consuming, to obtain. Mr. Thorpe is a former employee of the Water Board, who possesses an encyclopaedic knowledge of the Sewage Farm.
8. Two major volumes have been published to date:
F.J.J. Henry The Water Supply and Sewerage of Sydney 1939
W.V. Aird The Water Supply, Sewerage and Drainage of Sydney 1969

   Academic Press 1981


11. D.J. Meltzer Ideology and Material Culture p.119
    Gould & Schiffer Modern Material Culture: The Archaeology of Us.
SECTION 2: SOCIAL AND TECHNOLOGICAL CONTEXT

Development of sewage treatment in Britain during C19

Throughout the nineteenth century, Sydney was, in most respects, a characteristically British provincial city. As well as sharing many of the same problems, Sydney authorities looked to Britain for solutions to these problems, imported English experts to implement these solutions, and looked to English authorities to justify Australian solutions to problems. Sydney was the first Australian city to adopt a comprehensive sewerage system, and in the mid 1870s when solutions were being sought as to the most suitable methods of sewerage the city and some of the metropolitan suburbs, the Sydney City and Suburban Sewerage and Health Board had no other recourse other than to recommended "an adherence to the principle which has guided many authorities at Home when dealing with the question of the disposal of sewage in the sea-coast towns, which has been to get rid of it at once and for ever in the most effectual manner" i.e. discharging it into the sea."^  

The notion of "public health" as an adjunct of government, as well as the ideas and practices of Sydney's nineteenth century sanitary reformers to the question of public health, derived from Britain, and were shaped by British "sanitary" concerns which had developed during the 1830s and 1840s. The disposal of sewage had commenced to be a major problem in London, and in the manufacturing towns of England, during the first forty years of the nineteenth century. Following the introduction of the factory
system and the influx of workers from the country into the new industrial towns, densely crowded urban areas had developed. Generally, these new towns were inadequately supplied with water and sanitary facilities, and in the poorer areas the provision of only one or two public conveniences for large sections of the population was not uncommon.

Water closets had been in use in better-class properties from early in the nineteenth century, particularly in the south of England, but in the manufacturing towns of the midlands and north of England, conservancy methods or the dry method (Glossary) for the collection of human excreta persisted into the twentieth century. Brick or stone-lined cesspool (or cesspit as they were known in Australia) were one method of conservancy. These afforded a more permanent means of disposal, and because they were often uncovered, chloride of lime, wood ashes, or other substances were sometimes added to reduce the smell.* The complex arrangements which were made for sewage disposal in the nineteenth century, were revealed during excavation of a threatened mediaeval site in the rural town of Maplestead in Essex. The archaeological site was on land adjacent to the Great Maplestead Vicarage, which was built in 1859. Excavation showed that, from 1859, the sewage system consisted of at least two cesspools, which were 150 feet (apprx. 45.5 m) away from the Vicarage, and the material from these cesspools had been used to manure the vicarage vegetable garden. The sewage was emptied into a series of especially dug pits or trenches, which were laid out in a row across the garden. = (Appendix 2)
Space was limited in these new manufacturing towns, consequently cesspools were built close to the houses, sometimes in cellars if no other space was available, and they tended to become receptacles for other domestic refuse. The walls were often purposely not made watertight to reduce frequency of emptying, and the liquid portion often overflowed into yards and streets, contaminating drinking wells and polluting watercourses. Such conditions had drastic results, and the densely populated areas had a high mortality rate from typhoid, cholera and forms of dysentery.

These conditions were brought to the notice of the general public in 1842, when Edwin Chadwick published his *Report on the Sanitary Conditions of the Labouring Population*. Previously, sewers had been constructed of stone and brick made large enough to accommodate deposits, but silting and blockages were common. To avoid this, Chadwick advocated the use of a water carriage system (Glossary) in built-up areas, which would remove waste matter before it decomposed. This was to be done by means of waterproof earthenware pipes to drain houses, and smaller, self-cleansing egg-shaped sewers, which would convey sewage to a suitable point of disposal outside the town—usually the nearest river—provided the gradient was steep enough. However, the use of water for transport increased the difficulties of disposal, and this led to increased pollution of local waterways.

To combat water pollution, Chadwick recommended the use of land
treatment, (Appendix 10) which had evolved as an alternative method for dealing with increasing amounts of sewage. Liquid sewage, which was considered to have the same manurial value as sludge, would be taken from the towns to agricultural areas where it would be used for irrigation purposes to increase vegetables crops needed for the expanding population in the towns.

Chadwick used the Craigentinny Meadows in Edinburgh to demonstrate how land treatment of sewage could be combined with crop production. Sewage from the eastern part of Edinburgh discharged into the 'Foul Burn', and the occupiers of adjoining land had diverted a portion of the sewage flow, and applied it directly to the soil by a system of irrigation. In time about 120 ha. of land was irrigated with sewage, and it was found that this method allowed four or five crops of abundant coarse grass to be produced annually. This was sold to cowkeepers in the city, or alternatively the land was let for grazing. In reality, these Meadows were more an example of intensive crop production by the application of huge quantities of sewage to a limited area of land, and by the last quarter of the nineteenth century the land had become an offensive-smelling swamp, producing a highly polluting effluent.

Sewage as an aspect of urban archaeology:

The city of Sydney gradually became urbanised during the second half of the nineteenth century Sydney, and this urban transition
derived from a combination of many factors. Gas lights had illuminated the city from as early as 1841; dormitory suburbs began to surround the city; the usage of buildings in the city proper was changing from dwellings to shops and offices, the provision of public transport, in the form of trams, trains and buses; and the building and improvement of roads, paving of footpaths etc. was gradually being attended to by the City Council. Australian capital cities had always contained an "abnormal aggregation of the population" from the moment of their inception, and by 1851, the population of Sydney and its suburbs totalled 54,000, and this had expanded to 167,000 by 1876. The spread of settlement also increased, and by the 1890s, metropolitan Sydney extended over one hundred and fifty square miles. (appx. 39,000 ha.) Mass urban living created the same problems in Sydney as it had created in the developing provincial cities of nineteenth-century Britain. In matters of public health, serious problems were caused by overcrowding, sub-standard accommodation, bad sanitary conditions, and inadequate civic administration. These urban factors had to be taken into account when sewerage schemes were being formulated for the city and suburbs in the 1870s.

**Sanitary Situation in the City and Suburbs**

When the town of Sydney was declared a city by Act of Parliament in 1842, provision was made for the constitution of a City Corporation or Council, and one of its most urgent responsibilities was the installation of proper surface and
underground drainage. However, partly due to the limitations of the new Council's financial resources, as well as a general lack of confidence in its ability to deal effectively with these important civic matters, no definite action was taken to discharge this responsibility for several years. In January 1854 the Corporation was dissolved, three Commissioners were appointed to serve in its place, and the Government made provision for the raising of a £200,000 loan to commence a sewerage scheme in the city.

Until 1854 there had only been sporadic attempts to drain the city, and these were mostly confined to a few square stone conduits, constructed by convict labour.\(^1\) (Fig.1 Map 1.) It is worth noting that these early drains have significant archaeological potential. Some major streets possessed drains, in the form of open ditches, but in general, much of Sydney's housing suffered from a lack of drainage. In England, and in Sydney, methods and designs of drains had evolved mainly by trial and error. This was a facet of the civil engineer's repertoire which was slow to develop, and, as late as 1828, drainage came last in the Royal Charter of Civil Engineers.\(^2\)

Topographically, the city of Sydney is divided by a high sandstone ridge which commences on the coast near Benbuckler Point, a little to the north of Bondi, and finishes near Newtown. The northern side of this ridge forms the southern watershed of Sydney Harbour and the Parramatta river, and the southern slopes of the ridge form the watershed of the north side of Botany Bay.
and Cook's river. The crest of this ridge lies much closer to the waters of Sydney Harbour than to those of Botany Bay, and the slopes on the Harbour side are steep and comparatively devoid of soil, while on the Botany side they are much more gentle, and the valleys are filled to a considerable depth with deposits of sand. There were extensive swamps among these deposits of sand, and it was from here that Sydney's water supply derived, prior to the completion of the Upper Nepean Scheme.

During the Commissioners's three year term of office, five main outfalls in brick and stone were constructed, and these were continued when the City Council was reinstated. (Fig. 2 Map 2) In general, the outfalls and tributary sewers of this early water-carriage systems followed the valley lines of the northern slopes of the high main ridge, and discharged into the harbour at Blackwattle Bay, Darling Harbour, Circular Quay, Fort Macquarie and Wooloomooloo. In addition minor sewers were placed in almost every street and watercourse leading directly to the Harbour for outfall. The scheme was constructed on the basis of a combined system, (Glossary) and was built by contractors, under the supervision of the City's first and second engineers, Mr. W.B. Rider and Mr. Bell. (Fig. 3) These sewers were well-constructed oviform-shaped conduits of brick and stone, most of them are 'in tunnel', and the City Commissioners purchased the lease of a brickyard at Newtown, in order to have control of the manufacture and cost of the huge quantities of bricks which would be required. (Fig. 4)
These sewers serviced only a small area of the city. For the rest of the population, including the suburbs, and the over-crowded, lower-lying areas of the city where the majority of the poor lived, the only option for the disposal of excreta was a cesspit. Most of the working population of the city lived in houses which had been built during the 1850s, 1860s and 1870s, most of which were sub-standard to begin with, and simply deteriorated further over time. Paralleling this poor quality and overcrowded accommodation, was a lack of water and sanitary facilities which was exacerbated by indifferent local authorities, and inadequate maintenance by landlords.¹⁷

The overall sanitary situation had worsened by the 1870s. The city still had over one hundred operative dairies within its boundaries (Appendix 11), and each year about 30,000 lambs and calves were killed privately on butchers' premises in the city.¹⁸ The waters in Darling Harbour and Sydney Cove were shallowing, and the harbour bays were labelled "immense cesspools". From Woolloomooloo Bay to Blackwattle Bay, the sewers discharged a miasmatic combination of excreta, household and city wastes, and a rain-induced silt of sand and stones from unpaved blue-metalled streets, which befouled the harbour and the foreshores, and the harbour was usually saturated on all sides with blood and matter which was dumped into the water from the Glebe Abattoir.¹⁹

The suburban population was also increasing. By 1875, the city was ringed by developing suburbs such as Paddington, Redfern,
Waterloo, Alexandria, Darlington, Newtown, Macdonaldtown, Marrickville and St. Peters. The problem of adequately providing for either water supply or sewerage had moved beyond the bounds of the city, and assumed metropolitan proportions, which embracing municipalities other than Sydney. In that year Sydney experienced an extremely virulent epidemic of sickness, which caused the deaths of many children under the age of five years. It was considered that these deaths were either directly, or indirectly, caused by a lack of effective sanitary precautions, and the ensuing surge of public outrage finally forced the Government to take action.

The Sydney City and Suburban Sewage and Health Board:
The Sydney City and Suburban Sewage and Health Board was appointed by the Government in April 1875 "to inquire into and report as to the best means of disposing of the sewage of the city of Sydney and its suburbs, as well as of protecting the health of the inhabitants thereof;". The SC&S&H Board's initial investigations revealed the sanitary situation, in some suburbs, to be quite as parlous as in the city proper. Whereas earlier in the century Surry Hills had been considered one of the most salubrious suburbs in Sydney, by 1876 it was considered the very opposite. Outbreaks of typhoid fever and scarlet fever were commonplace and it was considered that the sickness followed the course of a large open drain which ran through the area from the head of Shea's Creek. In one house, a father and three of his children were suffering from typhoid, and the sanitary arrangements consisted of four privies within three meters of
each other, which straddled a common cesspit. The privy used by
the sick family was also used by the patrons at the adjoining
Exchange Hotel. Similar situations were not just restricted
to the poorer suburbs. Population and pollution marched together,
gradually reaching the suburbs beside the harbour bays, where
the wealthier lived. From 1870, a small sewer had been
discharging into Rushcutter's Bay, and His Honour Mr. Justice
Hargrave complained to the SC&SS&H Board that the lower part of
his garden had been utterly destroyed by the deposits from this
sewer, which had built up into "twenty-three acres (apprx 9 ha)
of foetid sewage sand banks" adjoining the sea frontage of his
property.

The most vexatious problems facing the SC&SS&H Board, was how to
remove "the immediate and palpable evil" caused by cesspits, "and
indeed of any system by which such refuse is removed by hand". Cesspits were regarded as the greatest health risk, "polluting
the air and sowing death broadcast". As virtual on-site storage
depots for human excreta, their "putrid emanations" gave rise to
"the most frightful sources of disease." They were a method of
conservancy, which afforded "a more permanent means for the
disposal of bodily wastes, and were a development on shallow
trenches or pits which had received the wastes from privies and
chamber pots. As well, they were sometimes used as garbage pits
for household rubbish, a fact which has been amply borne out
during recent excavations at Regentville, where large quantities
of ceramics and glassware etc. were recovered from an early form
The cesspit privy was basically a hole in the ground, which was sometimes lined with brick or stone, but was generally just built from rubble. A seat hung over the top, and to shield the occupant from the weather and the gaze of passersby there was usually some form of enclosure, although often this was no more than a token gesture. In the poorer, more crowded areas of the city, it was not uncommon for a cesspit to be shared one to each group of houses, and these publicly shared privies were usually badly built and badly maintained. In Baldock's Lane, off Sussex Street, a closet had been made from a space left between two of the houses, by adding a few boards at the back. There was no door at the front, and only a board on the other side "separated it from the living rooms in the adjoining shanties."

In many cases cesspits were built badly. They were deliberately not made watertight, which obviated the necessity of cleaning them on a regular basis, and either surface water flowed into them, or in porous soil, water oozed into them. In both cases, they filled up and overflowed with every shower of rain, contaminating adjacent premises and gutters, and producing the most intolerable conditions. One of the first actions of the SC&SS&H Board was to recommend that future cesspits be constructed of moderate size, and be made as nearly as possible watertight. In the case of existing cesspits, changes necessary to health, cleanliness and decency, were to be enforced. However, it was realised that it would take some time to provide an
adequate remedy. (Appendix 12)

Medical Views

Current medical views were formulated around the belief that the majority of diseases were either directly, or indirectly, attributable to the gaseous stenches or miasmas which arose from putrifying matter, be it uncollected household refuse or the contents of cesspits. These views were reinforced by the papers of the day, and in 1875 the Sydney Morning Herald stated that the health of persons in towns were effected by many causes, but the chief cause was from the sewer exhalations of "putrid carbo-ammoniacal vapour" which gave rise to a predisposition to infection. Aerial impurities were considered to act as slow poisons, which were transmitted, via the lungs, to the blood, so that the constitutions of the strong were "gradually undermined, while the weakly and susceptible rapidly succumb." It followed therefore that the greater the quantity of filth the greater the likelihood of disease.

The members of the SC&SS&H Board also shared this miasmatic outlook of disease causation, and they were of the opinion that the filth, neglect, and faulty construction of the receptacles for night-soil, as well as the absence of any control on the part of the City Corporation over the nightmen, was "an intolerable and flagrant nuisance (which) existed on every side, sufficient in itself to breed fever and disease". It was a medical opinion also shared by the majority who presented evidence
throughout the course of the Board's enquiries. During the course of his pastoral duties, the Dean of Sydney, the Very Revd. Macquarie Cowper, had observed that "many of the houses were at the same time exceedingly filthy, and.... a good deal of disease must be generated by the foul air and the impurity of the rooms thus occupied." Such like-minded medical opinions were used to validate the SC&SS&H Board's recommendations to the Government.

Common medical prejudices, such as belief in the miasma theory of disease causation, were firmly embedded and hard to dislodge, despite late nineteenth century microbiological discoveries made by Pasteur, Koch, and their followers, which conclusively established the 'germ' theory of causation. By the turn of the century such emphatic opinions were beginning to be qualified, but in 1875 there were no doubts. This belief in a medical theory convinced Sydney's sanitary reformers that their proposed methods for managing human excreta were essential for "the public good", and ultimately led to the construction of a water-carriage system which used watertight, underground sewerage mains as the method of transport, and placed the final disposal points i.e. ocean outfall and sewage farm, as far removed from human habitation as possible.

To a large degree, this choice of system was reinforced by a change in attitude toward the qualities of water. By the mid-nineteenth century, water was regarded as a healthly, as well as a cleansing substance, and its use helped increase resistance to
which found its way into Port Jackson through existing sewers was to be diverted by means of a system of intercepting sewers into a tunnel discharging at Ben Buckler Point near Bondi. It was

Proposed sewerage scheme for Sydney:

The two systems which the SC&SS&H Board recommended for the disposal of the sewage of the city of Sydney and the southern suburbs, were as follows:

Firstly, that the sewage from the northern slopes of the city which found its way into Port Jackson through existing sewers was to be diverted by means of a system of intercepting sewers into a tunnel discharging at Ben Buckler Point near Bondi. It was
proposed to intercept only the every-day dry weather sewage, as to intercept storm water and turn it into the ocean presented "great engineering difficulties involving an expense altogether out of proportion to the value of the object gained." The system only diverted sewage which could be discharged by gravitation, and did not include the low-lying inhabited areas about Woolloomooloo Bay, the head of Darling Harbour and Blackwattle Bay. 37

Secondly, that the sewage of the southern slopes of the city, which included portions of Surry Hills, Redfern, Newtown etc., estimated to contain a population of about 20,000, 38 be similarly intercepted, collected into a separate system, and taken to Botany. There, at either Shea's Creek or Webb's Grant, sufficient land was to be resumed where the sewage could be treated using a modified form of sewage irrigation known as intermittent downward filtration, (Appendix 10) which would render the sewage inoffensive and perhaps innocuous, before being allowed to escape into the Botany Bay. In recommending this method, the SC&SS&H Board were aware of the latest developments in land treatment of sewage in England, especially the development of the Birmingham Corporation, (Appendix 10) where this method was being used with some considerable success, and in their Final Report, they formally referred to the results of the Birmingham Inquiry to bolster their recommendations. 39 The Board also stated their reasons for rejecting all other methods which were known to them of dealing with sewage matter. (Appendix 13)
The sanitary reformers who constituted the Sydney City & Suburban Sewage & Health Board, included university professors with a knowledge of physical and natural sciences, medical professionals involved in the public health arena, and civil engineers. Originally the Board consisted of nine members, of whom six were government servants viz. Francis Bell, City Engineer; E.O. Moriarty, Engineer-in-Chief for Harbours and Rivers; John Whitton, Engineer-in-Chief for Railways; P.F. Adams, Surveyor General; H.G. Alleyne, M.D. Health Officer and Chs. Watt, Government Analyst. Two members were Professors from Sydney University - Mr. M.B. Pell, B.A., Professor of Mathematics and Natural Philosophy (Chairman) and Hon. John Smith, M.D., Professor of Chemistry and Experimental Physics. The ninth member was Hon. J.B. Wilson. In April 1875, two additional governmental appointees were made - W.C. Bennett, Commissioner for Roads and Bridges and the City Health Officer G.F. Dansey, M.R.C.S. In the following June the numbers was further augmented by the appointment of Messrs. Benjn. Palmer (then Mayor of Sydney) and Alderman M. Chapman, making it 15 members in all.

The civil engineers on the Board were a part of a new breed of professional men, rapidly coming to prominence in governmental matters involving civic planning and administration, who placed their faith in science and technology, to create large-scale solutions to solve large-scale urban problems. The Engineering Committee, headed by Mr. Moriarty, formed a sub-committee of the SC&SS&H Board, and it is apparent from the Debates on Sewage
Disposal that the function of this committee was to employ their expertise to devise the overall technology of the sewerage system, which was a centralised system, cutting across Municipal boundaries, and capable of being controlled by a single overriding authority. This is not to suggest that the rest of the SC&SS&H Board were not in favour of the total system. They were. However, in view of the small population involved, and the additional expense which would be incurred in carrying the sewage of the southern slopes to the sea, the Engineering Committee had simply recommended the sewage from the southern slopes be purified, by taking up only as much land as would be required for that purpose, so as to allow the effluent to filter harmlessly into Botany Bay, or some other place.

The proposal to establish a sewage farm in order to utilise the sewerage of the southern slopes, stemmed from the other Board members. Even though it was considered to be in the nature of a temporary expedient, all members including the Engineering Committee, eventually voted for its implementation. There was one exception to this proposal, the Hon. J. B. Wilson, who considered that sewage could not be profitably employed on a sewage farm; that it would become offensive and dangerous to the health of the inhabitants; that the amount of land available at Webb's Grant was far too small; and a minimum of 3,000 acres (1,200 ha) would be required.

Webb's Grant, the site ultimately chosen, was a tongue-shaped tract of land, consisting of about 300 acres situated at the
mouth of Cook’s River on its southern side. (Fig. 4 Map 3) It fulfilled the Board’s requirements for an isolated, yet accessible, place of deposit. It was almost entirely uninhabited, and “however much then the city and suburbs may extend, it may be made to remain for an indefinite period almost isolated... (with) no possibility of any watercourse being polluted”.

There were only a very few residences on the northern side of the river opposite Webbs Grant, and the area was mainly occupied by Chinese market gardens. However the Botany Swamps, at that time the source of Sydney’s water supply, were also on the opposite side of the River. In the 1850s, the Government had resumed much of Simeon Lord’s original grant to create a series of dams along the Lachlan Stream. An engine pond was excavated, and an engine house constructed to pump water to Paddington Heights, and these factors were to have important effect on future public perceptions of the archaeological site of the Sewage Farm. Later in the 1880s the Botany Swamps were replaced by Nepean Water, as the source of Sydney’s water supply, and the down stream sites were used for heavy water-using industries such as wool scouring and tanning.

**Market Gardens and Green Vegetables:**

The Board knew from their investigations of English and European sewage farms that at Dantzic, “the most surprising fertility” had resulted from irrigating raw sea sand with sewage, and they
were also impressed with "the most astonishing results in the shape of crops", which were obtained from the Craigentinney Meadows in Edinburgh. (Appendix 10) As the soil at Webb's Grant was also light and sandy, they considered it to be well suited for sewage farming. It could be easily cleared, and with proper management and the application of night-soil, they were confident that the land could be made highly productive. Sydney's winters were warmer than Europe, and it was anticipated that 'a luxuriant growth of a great variety of useful plants can be maintained here throughout the year', which would allow vegetables to be grown more quickly and more abundantly, and enable the sewage farm to keep local markets supplied with much-needed cheaper vegetables.

The citizens of Sydney were large meat eaters. In 1876 the average weekly sales of stock transported into the city, and sold at the sale-yards and wharves for slaughter, consisted of 1,600 sheep, 380 lambs, 895 pigs, 490 calves and 50 cows. However, it appears that vegetables did not play such a significant dietary role. There were numerous market gardens around Sydney, mainly kept by "industrious Chinamen", who chiefly supplied cabbages, cauliflowers and green peas. These individual market gardens were not large, but as settlement spread and land use became more intensified, the space needed for such enterprises became scarce and from the 1870s, market gardens were generally to be found on small areas of unwanted land on the periphery of the city. With their reliance on the use of night soil, and 'soup' from boiling downs as manure, they were also regarded as a noxious activity.
that was best carried on in remote regions from the city, and by
the 1890s some were established in the Botany region, then on the
outskirts of Sydney. Consequently there was a shortage of fresh
garden produce, which sold at 'famine prices', putting them
"quite beyond the general demand of our household population."31

This scarcity of vegetables was generally blamed on the poor
quality of the soil. To increase production, it was a relatively
common practice, not only for the Chinese, but also for some home
gardeners to fertilise their plants, flowers and garden produce
with applications of liquid sewage, or dried blood, which was
considered to be "worth its weight in guano."32 His Honour Mr.
Justice Hargrave keenly advocated the use of sewage as a liquid
fertiliser, and considered the proposed disposal of sewage at the
Bondi outfall to be a total waste, rendering it "utterly useless
for every purpose", including horticultural or any other
productive purposes. The gardens and paddocks of his home at
Rushcutters' Bay were kept "in almost perpetual verdure and
fertility" by the application of liquid manure, which was
supplied from his home sewage, and conveyed in earthenware pipes
to covered tubs recessed in various parts of his garden.33
Section 2: Social and Technological Context

Footnotes:

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37
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27. Minutes of Evidence SC&SS&H Board 1875 p.32
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30. Twelfth and Final Report SC&SS&H Board 11 May, 1877 p.4
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40. Twelfth and Final Report SC&SS&H Board 11 May, 1877 p.6
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39
SECTION 3: IMPORTATION AND INDIGENISATION

The main works of the Southern system were constructed by the Public Works Department at the same time as those of the Northern system - between 1880 and 1889 - and on 30th September, 1889 the Metropolitan Water and Sewerage Act Amendment was passed by Parliament. Under this Act control of all existing sewerage systems, both old and new, were transferred to the Board of Water Supply and Sewerage. That portion of the Sewage Farm which was being utilised for the filtration and disposal of sewage was now transferred to the jurisdiction of the Water Supply and Sewerage Board.

How the Sewage Farm worked:

Sewage discharged from the main southern outfall system into the Inlet House, which was situated close to Cook's River on its northern side. (Fig.5 Map4) The only access was through a front door which lead from a path on the high embankment covering the main southern outfall sewer. (Fig.6) In reality the elaborate facade of the building simply served as a protective shield for two large recessed tanks, or screening chambers, and associated mechanisms, which were housed inside the building. Sewage passed into these chambers, and was screened through three sets of circular mesh screens, varying in fineness of mesh from 3" to 1" (7.5-2.5 cm.appx.) They were positioned one behind the other to intercept any extraneous solid matter "such as empty tins and other garbage which somehow do get into the sewers". The screens
operated by a central shaft with the gearing fixed on the platform at the far end, and they could be revolved to allow for cleaning, if they become clogged. The chambers and screens were in duplicate, and controlled by inlet valves, so that when one series was in use, the other could be cleaned out. Through the middle, and partly around the sides of the inlet chamber, were stagings from which inspections could be made of work in progress. At intervals along the side walls of the chamber, and a little above the normal level of the sewage, were openings which acted as small weirs. Following a heavy rainfall, these allowed the ensuing increase in the quantity of sewage to overflow and discharge 'harmlessly' into the river, which was only a few yards away. Any danger of the sewers, chambers, or the syphon, becoming overcharged was thus avoided. (Fig. 7)

From the screening chamber, sewage passed into a circular sand-basin, where suspended sand or smaller solids were allowed to settle, while the liquid flowed easily over the side of the basin and into the mouth of an inverted syphon. The object of this careful separation of solid matter, was to prevent the under-river syphon from becoming choked or otherwise damaged. The sand-basin was cleaned by means of an ejector, which worked within it.

From the Inlet House the sewage passed under the bed of Cooks River, via an inverted syphon (Glossary) made of cast-iron pipes, and laid in a trench surrounded with concrete. When this was being constructed, a coffer dam as built across the river,
from above high tide level to below the river bed, and the trench for the syphon was excavated inside this. The concrete for this operation was mixed in a steam driven concrete mixer — the first to be imported into Australia from England. The syphon was connected to a well inside the Outlet House on the south side of the river, and the flow of sewage was controlled by a 24in. (42 cm) sluice-valve. The Outlet House was built in the same architectural style as the Inlet House, and served the same protective function. From the Outlet House, the sewage gravitated across the farm by means of an elevated, open concrete channel, or main carrier, which ran through the centre of the neck of land. (Fig.8) From this carrier the liquid sewage was distributed over the irrigation and filtering beds, where it percolated through the sand and eventually discharged into Cook's River and Botany Bay. The flow of sewage was controlled by means of stop-board grooves and valves, which were of simple construction, and the distribution of the sewage was easily controlled by the farm manager who was able to command a view of the farm from the broad edge of the carrier.

Inside the Inlet House was a Priestman grab, which was operated by a single cylinder oil engine mounted on a travelling gantry. The grab dredged the remaining screened solids, or sludge, from the screening chambers, for delivery into the chutes which were set into the eastern side of the building. The locomotive shunted the skip underneath the projecting chute and the grab, which was manually controlled, dropped the sludge into the chute, and from the chute they were transferred into the waiting skip. (Fig.9) It
was then trucked by the small locomotive over the bridge to the farm beds, where it was collected by the farm labourers and manually dug into the various beds as manure. The locomotive and tipping skips used on the Farm, were originally employed for the removal of spoil and general transport during the construction of the syphon and filtration works, and had been taken over by the Public Works Department when this work was completed.

The wooden bridge spanning Cook's River was one of the most unusual features of the Farm, and was possibly unique in Australian railway practice. It incorporated a railway line across the top, and to allow river traffic to pass through, it had a long sliding span. This was built on two rolled steel girders, and rose up on runners on a steel track toward the northern bank. It was moved by a cable which was operated by a hand winch, situated on a platform under the bridge just above high tide. It was essential to the working of the farm, as it not only provided quick access to the farm, but it also allowed the separated solids to be directly transported to the Farm and used immediately.

History of the Botany Sewage Farm 1880-1898

In theory, the operation of the Botany Sewage Farm was quite straightforward, but in practice it was to be hampered by a number of unforeseen factors. The following section is a melange of information taken from two discrete sets of historical evidence e.g. the Water Board's Annual Reports and the 1908
Minutes of Evidence. These will be used to recreate a history of the enterprise, and the spatial distribution of the Sewage Farm. In the main this information will not be footnoted, except where direct quotations are used.

The Northern and Southern sewerage systems are first mentioned in the 1890 Annual Report of the Water Board. This said that new sewers were being laid as quickly as possible in the City and immediate suburbs, and that 3,804 suburban houses had been connected with the sewers in the first year of their control. The Board were confident that given this rate of progress, it was within the bounds of possibility that the city and immediate suburbs would be in a thorough sanitary state within the course of a few years. This rate of 'sewering' progress was to have a direct effect on the Sewage Farm.

The Sewage Farm had been controlled by a manager, Mr. J.N. Oxley, since its commenced operating in 1887, and seven men were employed as labourers. Considerable time and expense had been spent in turning the sand into soil, and after three years of constantly applying sludge, grabbed from the screening chambers, and raked from the surface of the filter beds, 4 acres 3 roods (approx 8 ha) of land had been built up for cultivation purposes. A contract had been let for levelling and preparing additional irrigation areas, plans were nearly completed for an extension of the filtering beds on the Botany Bay side of the farm, and the laying of subsoil drains, which would to allow
filtration to take place more rapidly. The crops produced, consisted of cabbages turnips, lucerne and sorghum, and these had been sold for £198.0s. 1d., and another standing crop was available for purchase, which was estimated to be worth £50. (Fig. 10) At this early stage, the Government Analytical Chemist, Mr. Hamlet, declared that the effluent was of a high quality, and clearly demonstrated the suitability of the site and soil for purifying the city sewage by land filtration. It was also noted that the character and density of the crops raised from the soil, which was raw sand, was ample evidence of the value of liquid sewage when properly applied.

This observation was later denied by the, then, Manager of the Farm, Mr. Brooks, in his evidence before the Parliamentary Standing Committee in 1908. He told the Committee that prolific growth could only be expected at the Farm when there was 'a good rainy season'. Once crops were established sewage irrigation was excellent, but in general crude sewage was unsuitable for irrigating newly-seeded land, as it was too strong and burnt the plants. Mr. Brooks also pointed out that the excellence of the crops at the Adelaide Sewage Farm was due to the fact that the sewage was filtered through the soil and the effluent was pumped back into flumes by means of a centrifugal pump. Only then was it used to irrigate growing crops.
The system chosen by the SC&SS&H Board for use at the Sewage Farm was intermittent downward filtration, i.e., underdraining and rotation of beds. This method allowed the sewage to be applied and irrigated in a variety of ways, e.g., broad irrigation, ridge-and-furrow irrigation, or, if there was not to be any cropping, by flood irrigation, with the areas being surrounded by low earth banks. The Board's Reports indicate that two of these methods were employed at the Botany Sewage Farm. Crops were grown on the sheltered, northern side of the main carrier, and the land was laid out in a series of terraced, ridged and furrowed irrigation beds. To improve filtration these were gradually being underdrained on the herringbone principle. (Glossary) They were irrigated along the furrows by dry weather sewage distributed from the main carrier, and fertilised with sludge dredged from the inlet house. The indentations from this cultivation method were still visible in a 1947 aerial photograph of the area.

On the southern side of the main carrier, about 10 acres (4 ha) of ground were laid out in filtration beds, which were only partially underdrained. During heavy rainfall, these beds received the surplus sewage which was controlled by mains to distribute it evenly over the surface, on the broad irrigation principle. In accordance with the principle of intermittent downward filtration, this was done on a rotation basis so that beds could be left fallow after each application, in order to
develop and maintain maximum filtering capacity. The effluent water discharged above high-water mark into Botany Bay.

In 1891 Mr. W. Brooks was appointed managing foreman following the death of the former manager Mr. Oxley. Revenue from the sale of crops had increased to £300.19s.11d. To consume unsold crops 16 head of dry cows, and 1 bull were purchased, and this stock increased by 11 calves within a year. A forage shed, and stalls for the cows, were constructed from weatherboard enclosed with galvanised iron. In an attempt to raise additional revenue, some of the land was let for agistment of cattle which proved to be profitable, and there were more applications than could be accepted. Much of this potential revenue was lost because of the lack of suitable means of transport across the river, and the only other access to the Farm involved a wide detour via the Cook's River Dam at Tempe. To overcome this, a special end-loading bogie wagon was constructed for carrying cattle etc. across the river onto the Farm, which also allowed dealers' carts to be taken over so that produce sold directly from the Farm. A considerable amount of work was spent reclaiming foreshore land along the edge of the River, and at the entrance to Muddy Creek, which used to be submerged at high tide. Fascine (Glossary) training-banks were built, and sludge was used as top-dressing on the newly-formed sandbanks to prevent them being demolished by the wind. Despite this work, the Board considered the area to be little better than swamp land. A section of this swamp land has survived into the late twentieth century, and this area forms an important physical component of the archaeological site.
The manager Mr Brooks died early in 1894 and was succeeded by his son William, who was practical farmer and held a diploma from the Agricultural School of the Technical College. In the same year, the Board decided to lease the sewage farm, lock, stock and locomotive equipment, and a Mr. Thomas McGregor’s tender of £200 annual rent for a ten year lease was accepted. Before handing over, everything was put into good order. Fences and gates were repaired and cow sheds lime-washed etc.. The Plant was sold at valuation, the stock was disposed at auction, and the Farm’s labourers were dispensed with. The Board were pleased with this arrangement, as it relieved them of the annual cost for the disposal of sewage, which was between £500 to £600. The rental would cover minor repairs and the salary of the manager, who was being retained to manage the disposal of sewage, and to supervise the lands on the south-western edge of the Farm that were leased to market gardeners, some of whom were Chinese. However, the Board were compelled to cancel the lease after about twelve months, as the Farm was not being operated in a satisfactory manner. The former staff were re-employed, considerable sums were spent on contract work to have banks and roads repaired. As well, the irrigation and filtration beds "which had been sorely neglected by the lessee" were almost inoperative as filtering medias and had to be cleaned, ploughed and harrowed.
Problems at the Farm:

The exposed nature of the Farm was a major problem. Whether the SC&SS&H Board were aware of this when they chose the land is not known, but site inspections testify to the fact that strong breezes sweep across the area, even on the calmest day. Trial and error had shown that the Botany Bay side of the main carrier was too exposed for agricultural purposes. Early attempts at crop growing on this southern side had failed, as the plants were destroyed by sand which was blown across the area by the prevailing winds from the south-east. As a result, these southern areas were only occasionally cultivated, and then with perennial grasses which were fed to the cattle. This limited the available land which could be used to produce crops, and effectively reduced anticipated income.

The wooden railway bridge across Cook's River caused considerable problems. As early as 1891 the wooden piles on the Farm side of the bridge had shifted slightly, and these had to be repaired several times, and in 1892, major repairs had to be conducted, as a large portion of the cross-bracing on the timber work was riddled with toredo marine worms (Glossary). Collisions from the river traffic were also fairly frequent, so it became necessary to strengthen the bridge by affixing fender pieces with wrought-iron stays. If the sliding span was damaged, the Farm was virtually immobilised and so were the activities at the Inlet House. Presumably when accidents like this occurred, the remaining sludge was grabbed out and tipped directly into the river.
One of the vital components in the English method of intermittent downward filtration were the underground effluent drains, which increased the filtering capacity of the land, and stopped the soil from becoming clogged with sewage. This had been one of the deciding reasons for the SC&SS&H Board's choice of method, as they were aware that the land at Webb's Grant was limited in size, therefore maximum filtering capacity was essential. In a way that could not be foreseen, the specific physical conditions at the Sewage Farm were to prove inimical to this imported system, and it was to take some years before the management contrived to overcome the problem, so that the imported system could be successfully adapted to local conditions.

The problem was in the fineness of the sand, which was considered to be "almost as fine as emery powder". It caused unexpected wear to the brasses of the locomotive, but more importantly, because it was so fine, it was extremely difficult to exclude from the underground effluent drains. It filtered through the gaskets, choking the drains, and prevented the flow of the subsoil water into the drains. This impeded the filtration rate of the sewage, and the beds became sewage-logged. Over the years, several attempts were made to try and remedy this fault. In one painstaking attempt, the effluent drains, which were laid over a meter deep, were dug up "and after some trouble a cement joint, made of Nepean sand and cement mixed in proportions sufficient to make it porous, and at the same time, cohesive, was adopted." This was unsuccessful. Around 1894, as a result of a rough-and-ready experiment, it was discovered that "a coir mat wrapped
around each joint and sewn on" would successfully serve the purpose. For over twelve months, some of the coir material "made in the form of a mat", had been buried in one of the sewage filtration beds, and when it was removed it was found "to be as sound as the day it was put in." This is classic example of an Australian 'make-do' adaptation, and the information provided is tantalisingly insufficient. The Board's reports do not explicate any further on the subject, and it is doubtful if there are any other sources which would elaborate on such an intimate detail. We do not know what form of coir was used, and even though the situation was quite critical at the Farm, to wrap, and hand-sew, coir mats around all the joints in all the underground effluent drains, seems an extraordinarily laborious procedure. Perhaps more to the point, it seems too cumbersome a method to keep out fine sand. As it seems likely that many of these effluent drains are still in situ, archaeological excavation is the only method which would explain exactly how this ingenious solution was accomplished.

**Government attitudes to the Sewage Farm:**

In 1896, the Board was able to report that "the high standard of purity hitherto reached is still maintained". Within six years the situation had worsened markedly, and the Reports stated that repeated analyses showed the effluent was "merely clarified sewage", which putrified when it was incubated. By 1901, if not earlier, it had become increasingly difficult to filter the increasing amounts of sewage which were deposited at the Sewage Farm. It was the law of increasing returns. As more and more
houses were connected to ever-increasing sewerage mains, the amount of sewage discharged at the Sewage Farm increased correspondingly. It was expensive to prepare land so that it was in a suitable condition for filtering purposes, and the Government was niggardly with its allocations of monies to the Farm. Consequently, the amount of prepared filtering areas did not keep pace with the demands of the sewage. To obtain maximum filtering capacity the management was sometimes forced to flood all the land with sewage, which killed the crops and reduced the Farm's potential revenue. This situation had a knock-on effect. Too much sewage on too little land caused the land to become sewage sick, and the quality of the effluent deteriorated. In general, this worsening situation was not reported outright in the Board's Reports, and the problem would usually be alluded to in oblique fashion e.g. "The average daily flow of sewage on to the Botany Farm is 2,361,600 gallon (10,627,200 l) as against 2,059,200 gallons (9,265,800 l) last year, the increase being due to extension of sewage system in Erskineville and Alexandria." Many of the problems at the Farm, especially in the 1890s, were the result of inadequate government funding which prevented it from being run as efficiently as possible. It is apparent that the Government was not concerned with the primary purpose of the Farm, which was to produce a non-polluting effluent. The Government's main concern was to effectively sewer
the city and suburbs, and devil take the hindmost with the
sewerage — which in this case was the Sewage Farm. It is also
apparent that the Government was unconcerned with the laudable
intentions of the SC&SS&H Board to utilise the manurial value of
the sewage by raising crops, which would tend "in some degree to
dimish the expenses." The yardstick against which the
Government measured the Farm’s success, was in its ability to
make a profit, and the fact that the Farm was not making a
profit, nor likely to, was to be used as one of the
justifications for recommending its abolishment. However that
was in the future. Meanwhile the SC&SS&H Board, and the
management at the Farm, were forced to resort to many alternative
strategems such as agistment of cattle and pig breeding, in an
tempt to generate additional income.

There can be little doubt that the Water Board was not aware of
the inadequacies of the Sewage Farm. By 1888, the Adelaide Sewage
Farm was operating successfully and using the same filtration
methods as Sydney i.e. intermittent downward filtration combined
with broad irrigation. However, the Adelaide system was superior
in all respects. Not only was it satisfactorily disposing of its
sewage, but it was also making a profit. As early as September
1891, the Board recommended that the Secretary visit the Adelaide
Sewage Farm to report on "its farming and financial prospects", with a stop-over to examine the Melbourne water supply. The
report of this visit was tabled at the Board meeting on October
17. However, the Board’s Minutes only record that the Secretary’s
report be adopted. The contents of the Report are not recorded,
nor are any of the Board's opinions of the situation at Adelaide vis-a-vis Sydney. No mention of either the Secretary's visit, or of the information gained, appears in the relevant Annual Report.

Civic pride in the Sewage Farm:

Nothing is ever completely straightforward, and the history of the Farm, particularly in the last decade of the century, is a curious paradox. On the one hand, there is the parsimony of the Government in denying the Board sufficient monies to execute tasks which were essential for the efficient running of the Farm, on the other hand, they allocated monies to the Board specifically to improve the appearance of the Sewage Farm, when it must have been obvious that the land was inadequate and unsuitable for its allotted task, if not in the present, certainly in the near future.

The money spent on the original construction of the Sewage Farm is understandable. The painstaking, architectural detailing of the facades of the Inlet and Outlet Houses are an expression of civic pride in the establishment, an elaborate, external indication of the importance placed on the modern technological equipment which these buildings housed. It is harder to understand why the government acceded to the Board's request in 1898 and erected five attractive workmen's cottages, "brick with tiled roofs to neat design" on resumed land at Lady Robinson's Beach. (Fig.11) They were intended to "conduce the appearance of the place", and were rented to the labourers at the Farm. In
keeping with this sentiment, the foreshore bank of the Bay was trimmed and grassed, and the land enclosed by a substantial fence, with entrance gates to keep trespassers out. One ruined corner of this row of houses survives alongside General Holmes Drive, which may be the only above-ground bricks and mortar archaeological remains of the Sewage Farm. Following the construction of these houses, the railway was extended across the new area of the Farm, to Eve Street at Rockdale, spanning Muddy Creek on a simple wooden girder bridge. This extension allowed for more efficient working of the Farm, but its principal function was to provide a twice-daily 'school special' for the farm employees' children, who travelled to and from Arncliffe Public School in a 4-wheel passenger saloon car.

Harder to understand, is the deliberate tree-planting programme the Board embarked upon. Tree planting tends to indicate long-term plans, particularly in the quantities that were planted. A annual sum was set aside for the purchase of ornamental trees and shrubs, and 1500 were purchased in the first year from the Director of the Botanical Gardens. This continued until 1908 at least, when the Board noted in their yearly Report that tree planting was continuing. They were intended to enhance the appearance of the Farm, provide useful and ornamental windbreaks, and afford shade for the cattle. After some trial and error, it was found that Norfolk Island pines and Moreton Bay Figs did especially well, and these were provided with tree guards to protect them from the stock. A stand of the Norfolk Island pines
still survive near the location of the Western Suburbs screening chamber, at the perimeter of the Rockdale Sewage Farm, near what is now a Municipal Council truck depot. Another cluster of well-established native fig trees at the Botany end of the Farm, have survived the diversion of Cook's River and the extensions to the airport, although these could be endangered by the proposed third runway. From their location, it seems possible that these trees were planted to provide a windbreak for the filtering beds on the exposed southern side of the main carrier.

Over 6,000 basket osiers, or willows, were also planted. Although none of these survive. Apart from the attractive appearance of the trees, their introduction had a two-fold purpose. They were mainly planted in the water-logged areas along the edges of Muddy Creek, where their water-absorbing capacities would be most beneficial, and it was intended that the branches from these trees would eventually be sold commercially. Apparently the branches were used for basket making, and this material was imported from a 'neighbouring colony'. As there was already an established local market, the Board were confident they could obtain "some tangible result from the cultivation".

Summary

It is obvious that the long-term prospects of the Sewage Farm were never promising. Nevertheless, during most of the 1890s, the Sewage Farm managed to fulfill its predetermined goals. The primary purpose of the Farm, to absorb by irrigation all of the sewage matter discharged by the main southern outfall sewer, was
being satisfactorily achieved. The Farm’s secondary purpose, to develop revenue-producing activities in order to diminish expenses, was also being realised.
SECTION 3: IMPORTATION AND INDIGINISATION

Footnotes

1. Illustrated Sydney News. 7 May, 1892. p.10


4. Mr. Brooks, Manager Botany Sewage Farm. Minutes of Evidence PSC on PW Scheme of Sewerage for the Illawarra Suburbs February 1908 p.252


6. H.H. Stanbridge History of Sewage Treatment in Britain Land Treatment Vol. 5 p.18


8. Eighth Report of the Metropolitan Board of Water Supply and Sewerage 1 July 1895, to 30 June, 1896 p.7

9. SEVENTH ANNUAL REPORT Metropolitan Board of Water Supply and Sewerage 1894 p.62

10. SEVENTH ANNUAL REPORT Metropolitan Board of Water Supply and Sewerage 1892 p.61

11. ELEVENTH REPORT Metropolitan Board of Water Supply and Sewerage 1899 p.20

12. ELEVENTH REPORT Metropolitan Board of Water Supply and Sewerage 1899 p.83


15. Mr. Brooks Manager Botany Sewage Farm Minutes of Evidence
    PSC on PW Scheme of Sewerage for the Illawarra Suburbs
    February 1908 p. 253

16. Ninth Report of the Metropolitan Board of Water Supply and
    Sewerage 1896 to 1897 p. 66

17. Twelfth and Final Report SC&SS&H Board May 1877 p. 10

18. Minutes of the Metropolitan Board of Water Supply and
    Sewerage September - October 1891.
    These are held in the Archives Section of the Water Board.

19. F. J. J. Henry The Water Supply and Sewerage of Sydney
    1939 p. 173

20. Ninth Report of the Metropolitan Board of Water Supply and
    Sewerage 1896 p. 6
    Current investigations have not revealed the plans of these
    cottages.

20. Eleventh Report of the Metropolitan Board of Water Supply and
    Sewerage 1899 p. 83
SECTION 4: EXPANSION AND OVERLOAD

The Western Suburbs Sewerage Scheme:

In 1889 Acts of Parliament authorised construction of sewerage mains for the north shore municipalities of St. Leonards, East St Leonards and Victoria, a separate scheme for Manly, as well as one for the western suburbs which had been drawn up during the 1880s. During the eighties, overall population had increased in the metropolitan suburban area, and this was most marked in the western suburbs which had achieved a 100% increase since 1881. It was estimated that the population in this area had increased from over 41,000 in 1881, to over 164,000 in 1888.¹

The Western Suburbs Sewerage Scheme was ambitious, in that it not only proposed to drain portions of nineteen municipal districts, but also the capacity of the main sewer and submains were designed to meet the future requirements of the entire area. (Fig.12 Map 5) The nucleus of the huge network of sewers which was to form this Western Suburbs Sewerage Scheme commenced during the 1890s, and the decision was taken to discharge the outfall of this system onto an area of land adjacent to the Botany Sewage Farm, as "it would not be possible to provide a better position for the outfall and for the efficient and economical purification and disposal of the sewage of the Western area".² An additional 309 acres (124 ha) to the west of Webb's Grant was resumed specifically for this purpose, and the Rockdale or Arncliffe Sewage Farm was formed. (Fig.13 Map 6) The
Western Suburbs outfall was completed in 1897, and control of the Rockdale or Arncliffe Sewage Farm was handed over to the Water Board.

This decision was to have a drastic effect on the combined Botany-Rockdale Sewage Farm. There were two major preconditions for the successful establishment of any sewage farm were. Firstly, that it be in a suitably isolated location to avoid any possibility of nuisance, in the sense of the Act, and secondly, that the amount of available land should always be in excess of the bare requirements. This with a view to extensions, and to ensure that no one section of the land be over-burdened with work. Both preconditions were negated when the Farm was extended to allow for the sewage discharge from the Western Suburbs Scheme. The western perimeter of the Farm was now adjacent to the populated Illawarra suburbs of Rockdale, Arncliffe and Bexley, at the same time Botany Sewage Farm was automatically deprived of any land for future expansion - and - as the authorities were well aware, the quality, and quantity, of the resumed land at the Rockdale Farm was, in every way, unsuitable to cope with the amount of sewage to be expected from the Western Suburbs Sewerage Scheme.

The original philosophy, based on anti-polluting and resource-management, which had motivated the construction of the Botany Sewage Farm was now outmoded. It had been replaced by a philosophy which was dominated by centralised, large-scaled and cost-efficient technologies. The decision to extend the Sewage
Farm was to have a marked effect on the archaeology of the site. Site inspections demonstrate that the Rockdale end of the Farm is the one which has been least modified, and the material remains, as well as the nature and character of the terrain, are integral component of the archaeology of the site.

The Rockdale Sewage Farm:
The sewage from the Western Suburbs discharged at the western edge of the Sewage Farm. It was conveyed across the land via an open concrete carrier built on brick arches, which were (and still are) supported on turpentine piles driven into the watercharged sand, and the original position of Muddy Creek was crossed by a plate girder aqueduct. (Fig.14) On the banks along each side of the main carrier, the sandy soil was regularly covered with sludge to prevent the sand being shifted by the wind, and the surfaces were gradually covered with grass to set the banks. To accommodate the sewage, a filtering area about 127 acres (51 ha) was underdrained and divided into beds. Paper and rags were separated from the sewage at a screening chamber, before it was distributed over the filtering beds which were flooded in rotation to a depth of about 1 foot (approx one third of a meter), to prevent the surface being dried out and demolished by the wind. This continuous flooding caused the surface of the beds to become coated with an 'impervious filament' which diminished the rate of filtration, and to overcome this, the beds needed to be regularly ploughed and harrowed. Improvements were made to the land on the western side of Muddy Creek, which were
impregnated with salt, and about 70 acres (28 ha) were cleared, surface drained, trenched and thrown up into beds to allow rain to free them of saline matter.

Cost was always a factor at the Sewage Farm, and clearing and grading the land to make it suitable to receive sewage for filtration was one of the major expenses, yet at the same time, sufficient amounts of suitably prepared land were vital to its efficient running. Out of a total area of approximately 700 acres (280 ha), only 200 acres (80 ha) were ever prepared for sewage filtration.* 200 acres (80 ha) were below high-water mark and therefore were useless for filtration purposes. The remaining portion of swamp land, now known as the Eve Street Wetlands, must have formed a part of this low-lying land. By 1898 only 71 acres (28 ha) had been prepared for filtration purposes, which was totally insufficient to receive the daily discharge of sewage which then in excess of 2,500,000 gallons (11,750,000 lt). At the Adelaide Sewage Farm, over 400 acres (160 ha) was used to take the daily distribution of 3,000,000 gallons (7,500,000 lt) of sewage - six times the amount of land at the Sydney Farm. According to the manager, Mr. Brooks, the work of clearing and grading the land was let to outside contractors, and the cost varied according to the topography of the land. In the early years, the easier levelling had cost $100 per acre, plus an additional $100 for underdraining. As the available land became more hilly, this charge rose. By 1908 the cost was $600 per acre, with underdraining.
Another heavy expenditure at the Farm, was the use of lime for precipitation purposes at the Inlet House. The amount needed increased each year, eleven tons were used in 1898, as against two tons the preceding year. The Board attempted to discontinue its use, except for cleansing purposes, but it was found that the lack of lime in the sludge adversely affected the growth of crops, and so its use for partial precipitation was renewed. The increased quantity made the sewage more adaptable for cultivation purposes, and it was noted that the appearance of the crops since its renewed use, more than justified the increased expenditure.

In the final years of the century, the Board were forced to act on complaints received from adjacent residents about smells arising from the Rockdale end of the Farm. The Board attributed this to restrictions on the supply of water for domestic purposes, which had caused the sewage to arrive at the Western outfall in a more concentrated form, but to reduce the smell as much as possible, a considerable length of the main carrier was covered in. (Fig.15) By 1901 the difficulties of managing the day-to-day disposal of sewage had become critical. The daily flow had increased to 3,250,000 gallons (14,625,000 lt), and a local resident described the Farm, as a foul nightmare which looked like a 'big sheet of water' in wet weather. Annual Reports stated that chemical analysis of the sewage effluents from the Botany and Rockdale Farm showed only negative results.

**Biological Treatment:**
While taking all precautions to minimise this potentially dangerous situation, in an attempt to find a solution the Water Board looked to overseas developments in sewage technology, as had the SC&SS&H Board twenty-five years earlier. Hopes of dealing with the increasing sewage outfall were pinned on the application of English developments in the biological treatment of sewage. These new developments were based on modern scientific principles, which recognised that micro-organisms were essential to the purification process, and the Board considered that a solution would only be effected through the conversion of the intermittent downward filtration mode of disposal to that of biological treatment. With this system, sewage was applied intermittently at much shorter intervals of time, so that aerobic conditions were maintained almost continuously as it percolated through ‘artificial filters’. As with the original intermittent downward filtration method, the system was also attractive, in that the filters required a smaller area than conventional land treatment. This attribute was of particular value as so much of the available land was unsuitable for the treatment of sewage.

Between July 1900 and June 1901 a series of brick and cement tanks for the experimental treatment of sewage were constructed at the Rockdale end of the farm, on the Scott-Moncrieff principle, with coke and coal filter beds fed by a rotary sprinkler. (Fig.15A) The Western carrier was tapped about half a mile from where it entered the farm, and experiments commenced in December, 1900. The results were presented in a separate report prepared by the Government Analyst W.M. Doherty and
included in the annual Report covering the year July 1901 to June 1902. The filtrate from these sources was used to irrigate about 2 acres of reclaimed land at the western end of the farm which had been specially prepared for agricultural purposes. The cultivated crops contained oats, wheat, barley, rye, mint, onions, radish, beetroot, white turnips, swedish turnips, parsnips, celery, cabbage, lettuce, tree onions, eschalots, leeks, mustard, endive, thyme, marjoram, parsley and sage, all of which thrived. In 1903, the same filtrates produced cabbages which weighed 161b (appx 7 kg). These results were extremely pleasing to the Water Board, and they considered that the system would prove to be an important factor in the efficient and economical working of the Farm.

The 1903 Annual Report contains lengthy scientific reports on the Rockdale and Botany treatment plants. Samples of the effluent were tested by an officer of the Board of Health, who considered the results to be most satisfactory. Even though the sewage at the Rockdale end of the Farm contained excessive quantities of disinfectants e.g. carbolic acid, which interfered with the filtering process, the effluent yielded 75% purification. In a report to the Board in April 1901, the Government Analyst, Mr. William M. Hamlet opined "That the success of the experiments with this sewage is such as to justify the entire treatment of the Sydney sewage by zymolysis" (Glossary) The Manager of the Farm, Mr. Brooks, was satisfied that the system could be applied with advantage to the whole of the flats, about 200 acres, for
market gardening purposes. However the estimated cost for the system exceeded £20,000, and it was necessary to remit the proposal for inquiry by the Parliamentary Standing Committee on Public Works.

The biological experiment at the Sewage Farm, was not an isolated instance. Urbanisation, or sub-urbanisation, in the form of sewerage systems, had spread throughout Sydney in the 1890s. At the turn of the century, the North Sydney Sewerage System drained towards treatment works at the head of Willoughby Bay in Middle Harbour - generally referred to as Folly Point, and the Willoughby-Chatswood System drained towards Scotts Creek, Middle Harbour. In 1900, in an effort to reduce escalating expenditure, similar biological systems to that at Rockdale were installed at each disposal point.

Sewerage Scheme for Illawarra Suburbs:

At the turn of the century, a scheme was proposed by the Department of Public Works to sewer the Illawarra Suburbs, which was to be treated by means of septic tanks and filter-beds at the south-western corner of the Botany Sewage Farm. The suburbs intended for sewerage, included portions of Arncliffe, Rockdale, Kogarah, Carlton and Hurstville which constituted parts of the municipalities of Rockdale, Kogarah and Hurstville. The scattered nature of the locality had begun to change with the construction of a railway from Sydney to Wollongong, and stations were marked out for Arncliffe, Rockdale, Hurstville and Kogarah. In 1884, land sales commenced in earnest, with the majority of new homes being built within comfortable distance of the railway.
stations. Population increase can be gauged from the yearly increases in revenue from railway fares. In 1884, Arncliffe station received £165, which increased to £762 in 1885, and in 1884 Rockdale received £271, which increased to £2,889 in 1885. Gas became widely available from the mid nineties, and reticulated water was available from 1888. The area was undergoing its own process of sub-urbanization, and civic feeling was strong. In 1886 a new, and more commodious, Town Hall was built, which became the location for vigorous public meetings protesting the abominable odours from the Sewage Farm, and the need for an efficient system of sewerage.

Rockdale still had fifty-six operative cess pits, but for the majority of residents, excreta was removed by the open pan system. These were emptied weekly into a night-cart, and returned uncleansed to the privies. Council provided the pails, which cost 3s. 6d. per week, and although by-laws forbade the use of any other, makeshift containers in the way of kerosene-cans etc. were often used. The night soil from Rockdale was trenched into sandy ground on a portion of the Botany Sewage Farm, and that from Kogarah went to a market garden about a mile from the railway station, where it was used as fertiliser. The allotments in the area were small, household slops discharged into street gutters, and as there was no system of drainage the slops simply collected haphazardly onto any low-lying surface. Despite these generally poor conditions, and the sentiments of the local population, the Goverment’s proposed plan for sewerage the area
was left in abeyance. The necessary money for the work was not available, and the matter was stood over for a further five years.

Changing Medical Opinions:
Medical opinions were beginning to change from those of the mid-nineteenth century, and these changes were reflected in the Board’s Annual Reports, which noted that personal cleanliness and proper lighting of dwellings were no longer private matters, but key factors in the maintenance of public health. By 1903, medical statements about the dangers of miasma-induced diseases were being qualified, e.g. "as the constitutions of individuals differ, disease may enter through the simple vulnerability of the respiratory mucous membrane..." The justification for the system of sewerage, as recommended by the Board of Water Supply and Sewerage, was now based on three issues; dangers from zymotic diseases; overall falls in death rates; and the general improvements in health to be gained, with subsequent greater resistance to the attacks of diseases. To bolster these assertions the Board was now able to quote their own statistics demonstrating higher and lower death rates before and after public sewerage in specific areas.

The Botany-Rockdale Sewage Farm:
Regardless of biological filters etc., the day-to-day running of the Sewage Farm had to continue. The Farm was the only place close to Sydney where grass could be obtained for agisting cattle, in itself an indication of how urbanisation was changing
the pattern of land use in Sydney, and there were always more applications than could be accommodated as the available croppings would not accommodate more. Improvements were still being carried on in reclaiming marsh land around Muddy Creek, and the Board considered that in view of the number of applicants, there would be little trouble in leasing this for grazing land at a figure sufficient to pay the interest on the outlay. In 1900, revenue received from agistment of horses and cattle, sale of produce and pig-raising had increased from £197 8s 6d ($395 appx) in the previous year, to £210 0s 3d ($420). The pigs were fed on the produce of the farm, and the Manager had built up a good connection for the sale of clean-fed pork. Unfortunately, this income was lost when swine fever struck the herd. The infected animals had to be destroyed, the balance were killed and disposed of, and the practice was not resumed. Many of the subsoil drains were taken up, cleaned and relaid, which increased their efficiency. Tree planting was still continuing, and the workmen's cottages were repainted.

The cost of keeping the bridge in an efficient state of repair became too expensive, and it was demolished and replaced by a boat service in 1908, but it had ceased being used for railway purposes in 1903. The silt from the Inlet House was now forced under the bed of the river, by means of compressed air through a cast-iron inverted syphon, which was laid in a trench and surrounded with concrete. The pipe-line was of the ball-and-socket type, and discharged the silt into a new wrought-iron silt tank on the western side of the outlet carrier, from where
it was still distributed over the farm in the skips drawn by the small locomotive. The ejector plant, which was 22' (7m appx) below the level of the sewage flow, was made entirely in N.S.W., and was modelled on the Shone system. (Glossary) According to the 1902-3 Annual Report, the ejector chamber on the northern side of the river was a massive underground concrete structure, which, apparently, was housed beneath the Inlet House. At the same time, the original railway line was relaid from the southern bank of the river to the start of the 1899 extension, using new rails, points and equipment. There is much about this modification to the Botany end of the Sewage Farm that is not fully explained in the historical sources, e.g. the exact position of the ejector chamber on the northern side of the River, and the position and nature of the silt tank on the southern side. Archaeological excavation would be only way to explain these gaps in the historical records.

Local objections to the Sewage Farm:
The enclosing of the main western carrier had little effect on the noxious smells coming from the Farm, and since 1900 local opinion had coalesced into strong opposition to the Sewage Farm. The land resumed for the extension to the Sewage Farm had originally belonged to Rockdale Council. This had resulted in a considerable loss of revenue, and had always been a source of grievance. In 1904, the local paper, The St. Seoge Call, detailed the extent of the grievances in a series of articles e.g. the denser population in the district demanded an efficient sewerage system; procrastination would lead to disaster should an epidemic
of infectious diseases strike the district; any reputation for unhealthiness would seriously retard the progress of the district; a modern system of sewerage would bestow immense advantages on the district; and it warned of the evils and discomfort of the miasmas from the Sewage Farm. Complaints about the Farm were not restricted to the Illawarra suburbs. The Mayor of Newtown considered the Farm was a breeding-ground for mosquitoes, and Alderman Laycock from North Botany considered the Farm to be an 'umitigated nuisance'. He particularly objected to the under-river syphon across Cook's River, which was so "near the surface of the water" vessels of any draught were denied access to the River, and therefore to Shea's Creek which was further upstream. Consequently the proposed industrial development planned for Shea's Creek, which was in the North Botany Municipality was at a standstill, even though deputations had been made to the Minister of Public Works, and to the Water Board. At the same time, Shea's Creek had silted up because the syphon blocked the tidal scour. It should be noted that this information does not appear in any of the Board's Reports.

The authorities in the Rockdale area were originally in favour of the proposal to treat the sewage from the Illawarra Suburbs at the Rockdale Sewage Farm by biological filter. However, a deputation from Rockdale and Arncliffe accepted an invitation to visit the Folly Point septic tank installation and a thunderstorm occurred during the visit. To cope with the increased volume of sewage the sluices were opened "to run the water right into the bay". The visitors were not impressed with these defects in the
system, and decided against the installations of septic tanks at the Sewage Farm to treat the sewage from the Illawarra suburbs. The only solution they felt, was that the Farm should be abolished and the sewage taken out to sea. Following a letter from Rockdale Council to this effect, the Standing Committee reconvened, and proposed that the scheme for sewering of the Illawarra Suburbs be constructed, but that the question of sewage treatment stand over until the practicability or otherwise of conveying the sewage to the ocean was ascertained.

Statistics from the Melbourne and Adelaide Sewage Farms:
In 1907 the Parliamentary inquiry was reopened, and continued from where the previous investigation had been discontinued. It was deemed advisable that the sewage farms at Melbourne and Adelaide be personally inspected, as well, expert witnesses from these establishments were interviewed.

The Melbourne and Metropolitan Board of Works controlled the Werribee Sewage Farm in Melbourne. It was 8,847 acres (35,539 ha) in extent, and disposed between 22,000,000 to 25,000,000 gallons (99,000,000 – 114,500,00 1t) of sewage daily; it employed 120 men, and 365 people lived on the farm; the land was graded and underdrained; lucerne and prairie grass were grown for stock grazing; sheep and cattle were fattened for market – in 1906 they had 62,800 sheep; about 30 acres (12ha) was given over to mixed fruit growing, which was sold at the local market and the bulk of the apples were exported; bacteriological analyses of the effluent were carried out every quarter, which were generally
highly satisfactory, the last showing 98\% purification. Some complaints were made about the smell from the outfall sewer at the Werribee township but these were largely ignored as nothing could be done. The Werribee/Melbourne Sewage Farm was regarded as the cheapest method of disposing of Melbourne's sewage, and it was not intended to make a profit. In concluding his evidence, Mr Calder, Acting Engineer-in-Chief of the Melbourne and Metropolitan Board of Works noted that had conditions been the same in Melbourne as in Sydney, he would have had no hesitation in adopting an ocean outfall - "I should say get rid of your sewage in the ocean as quickly as you can."

The Adelaide Sewage Farm was a success almost since its inception in 1881, and was everything that its Sydney counterpart was not. Situated 4 miles (6.4 k) from the Adelaide G.P.O.; it was 41' (11m appx) above sea level; it had 620 acres (251ha) of land, of which 442 acres (176 ha) were irrigated by a successful combination of broad irrigation and intermittent downward filtration; 57 acres (23 ha) were leased at an annual rental of £10 per acre; the balance consisted of roads, plantations and land which had not yet been graded or irrigated; it had 18 acres (7ha) of orchards, and vegetables of various kinds were grown among the fruit trees; their main source of income came from paddocks for grazing cattle, cows, and horses, which earned £1645 in 1906; pig breeding was carried on profitably; and they had a large business in fattening cattle and sheep, which earned £1467 in the same year. The farm was satisfactorily leased, sewage had always been satisfactorily disposed of, and although there were
many dwellings in the vicinity, complaints had ceased owing to
the satisfactory manner in which the farm was worked. In
concluding, Mr. Bayer, Hydraulic Engineer, Department of Public
Works, Adelaide stated that the aim of discharging sewage should
be to do it in the most economical way, and "if the land is
affected by the tide and the soil becomes saturated to within 2' (appx 70cm) of the surface, it would be a very risky thing indeed
to attempt to dispose of sewage on it."

Why the Sewage Farm Failed:
The above information highlights the deficiencies of the Botany­
Rockdale Sewage Farm, and demonstrates that the reality of the
situation was vastly different to that portrayed in the Board's
Annual Reports. The information provided by the Manager, Mr.
Brooks is perhaps more pertinent. In evidence, he stated that the
Farm " was unsuitable in every respect". It was too exposed, it
was only six to eight feet (appx 2 - 2.5 m) above high tide, and
the sand was too hungry. Much of the land was subject to tidal
influence, and at high tide, saltwater could be found about 8 or
9 inches (20-22 cm) underneath the surface of the sand.
Consequently the land had become saturated with salt water and
sewage, which made effective filtering impossible. The average
daily flow of sewage onto the Farm was 6,000,000 gallons
(27,000,000 lt), and despite the laying out and under-draining of
additional beds, the constant application of these quantities of
sewage onto such a relatively small acreage had caused the land
to become sewage sick, and the filtering beds had to be
continually harrowed to prevent the soil clogging. When the
sewage flow increased during periods of wet weather, it had to be turned onto the irrigation beds where crops were growing, and sometimes the overflow went directly into Cook's River. To the question "Even if the septic tanks were installed and you had the effluent, it could not be made profitable? He replied "It is doubtful." When asked if the Farm could ever be made to pay as the Adelaide farm did, his answer was "No, we have not the soil, excepting 20 acres, and we are in too exposed a position."
Section 4: EXPANSION AND OVERLOAD

Footnotes


3. Information about the aqueduct over Muddy Creek, and illustration provided by N.J. Thorpe

4. Mr. Brooks Manager Botany Sewage Farm Scheme for the disposal of the Sewage from the Western, Southern, Illawarra and Botany districts Parliamentary Standing Committee on Public Works 1908 p. 255

5. Charles Albert Bayer M. Inst C.E. Hydraulic Engineer Department of Public Works, Adelaide Scheme for the disposal of Sewage from Western, Southern, Illawarra and Botany Districts. Parliamentary Standing Committee on Public Works 1908 p. 235

6. Arthur Goddard, Land and Estate Agent Arncliffe PSC on SW Scheme of Sewerage for the Illawarra Suburbs Parliamentary Standing Committee on Public Works 1905 p. 70


8. H.H. Stanbridge History of Sewage Treatment in Britain Biological Filtration vol. 6

9. It would appear that an experimental, biological tank was also erected at the Botany end of the Sewage Farm. Apart from scientific reports on filtering experiments, the Board's Annual Reports provide no additional information, and its approximate location is never mentioned.

10. Annual Report MWS&B Board 1903 p.82

11. Annual Report MWS&D Board 1903 p. 73


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18. St. George Call 9 January & 6 February, 1904

19. This refers to the first under-river syphon, which was being built when the gentleman went to Botany '24 years ago'.

20. Scheme of Sewerage for the Illawarra Suburbs Parliamentary Standing Committee on Public Works 1907 pps. 140-143

21. Scheme of Sewerage for the Illawarra Suburbs Parliamentary Standing Committee on Public Works 1907 p.10

22. Arthur Edward Lester manager, Werribee Sewage Farm, Melbourne PSC on PW Scheme for the disposal of the Sewage from the Western, Southern, Illawarra and Botany districts. Parliamentary Standing Committee on Public Works 1908 pps. 238-245


24. Mr. Brooks, manager, Botany Sewage Farm Scheme for the disposal of the Sewage from the Western, Souther, Illawarra and Botany districts. Parliamentary Standing Committee on Public Works 1908 pps. 252-255
SECTION 5: PARTITION AND DISAPPEARANCE

The Southern and Western Outfall Sewer No.1:

In June 1909, the proposal to divert the sewage from the Southern Western and Illawarra suburbs into the ocean in the vicinity of Long Bay was adopted. The sewerage of the eastern Illawarra Suburbs was completed, and the main joined the Main Western Carrier near the Eve Street branch junction at the western edge of the Farm in 1909. From 1912 the growing of crops at the Sewage Farm was abandoned, and the whole area was used for filtration, although large numbers of stock continued to be received for agistment. The Botany-Rockdale Sewage Farm ceased operating in September 1916, when the construction of the Southern and Western Suburbs Ocean Outfall Sewer (S.W.O.O.S) No.1 was completed.

S.W.O.O.S. was constructed in box section, in aqueduct, and carried on piers and arches of reinforced concrete. It intercepted the flow from the Western and Southern main sewers near the screening chamber at the Rockdale end of the Sewage Farm, passing under Cooks River by an inverted syphon. This connection between the Western Suburbs main and the commencement of S.W.O.O.S. is quite apparent, and serves as an indicator for the approximate archaeological site of the old screening chamber, which was situated possibly within or near a Council building in that vicinity. The southern main sewer, which had terminated at the Inlet House, was linked to the outfall system on the
northern side of Cooks River. All of the sewage previously disposed at the Sewage Farm was now conveyed to the Pacific Ocean, and discharged through a bifurcated outlet in a submerged cliff at the northern headland of Long Bay.

The ocean outfall sewer line traversed the length of the Sewage Farm, and its construction would have created considerable ground disturbance. Therefore any archaeological survivals paralleling the path of its construction are unlikely. Aerial photographs, taken in 1947, do not indicate the presence of the main carrier which lead from the Outlet House, and it seems probable that it was demolished to make way for the ocean outfall line. (Fig.16) Although it is possible that some sections of the concrete foundations from the main carrier could still exist in archaeological form. The same photograph indicates that the Inlet and Outlet Houses were left standing, as presumably were the two sets of syphons under the bed of Cook's River.

Following the closure of the Farm, the workmen's cottages at Lady Robinson Beach were vacated, and let to non-employees. The lands were retained by the Board for a number of years, some areas were leased for grazing or recreation grounds, and in 1918 a portion of the former filter beds at the Sewage Farm were subdivided into 5 - 8 acre lots (appx 2-3.5 ha) and leased to Chinese market gardeners. This last enterprise did not engender the revenue the WS&D Board had hoped for, as analysis showed that the soil had quickly returned to raw sand, notwithstanding years of flooding.
with raw sewage, and constant manuring with sludge. In July 1918, the plant and railway was advertised for sale by tender, and this was sold in July 1919, when the Board accepted an offer from Sir Allen Taylor to purchase lifted track, and track still in the ground. The only archaeological evidence of this enterprise is a small strip of a flat-topped dirt embankment, near the Western sewer line at the Rockdale end of the Farm. This embankment was raised to carry the railway line past the swamp lands at the western edge of the Farm to its termination point at Marsh Street. This former swamp area is now known as the Eve Street Wetlands, and a plan of management is being prepared by the Water Board's Environmental Science Unit to restore the area to its "original condition".

First Partition:

Direct access to the land became available in 1928, when Mascot bridge was completed across Cook's River. This connected the suburb of Ascot on the northern side of the river to the southern suburb of Brighton-le-Sands, along the new General Holmes Drive, built by the Public Work Department along the eastern edge of the land. The whole of the lands which had been incorporated into the Botany-Rockdale Sewage Farm, (Fig. 17 map7) with the exception of about 45 acres (approx. 18 ha) retained by the Water Board to accommodate the main outfall sewer, were disposed during the 1930s as follows:
<table>
<thead>
<tr>
<th>Acres</th>
<th>Roods</th>
<th>Perches</th>
<th>Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>215</td>
<td>3</td>
<td>24</td>
<td>North Brighton Suburb Estate Co Ltd. (86ha)</td>
</tr>
<tr>
<td>56</td>
<td>1</td>
<td>1</td>
<td>N.S.W. Polo Association 'Kyeemagh' (22.4ha)</td>
</tr>
<tr>
<td>29</td>
<td>2</td>
<td>8</td>
<td>N.S.W. Cricket Association (11.6ha)</td>
</tr>
<tr>
<td>61</td>
<td>3</td>
<td>22</td>
<td>W.C. Allen (24.4ha)</td>
</tr>
<tr>
<td>88</td>
<td>2</td>
<td>0</td>
<td>Lands Dept. for park purposes, being land between General Holmes Drive and the shores of Botany Bay. (35.2ha)</td>
</tr>
<tr>
<td>79</td>
<td>0</td>
<td>0</td>
<td>Rockdale Municipal Council and Lands Dept. for park purposes (31.6ha)</td>
</tr>
<tr>
<td>19</td>
<td>1</td>
<td>22</td>
<td>Dedicated for road purposes - (7.6ha) General Holmes Drive &amp; Marsh Street</td>
</tr>
<tr>
<td>43</td>
<td>1</td>
<td>10</td>
<td>Leased to Rockdale Council (17.2)</td>
</tr>
</tbody>
</table>


The peninsula was now traversed by the outfall sewer and General Holmes Drive, which separated the northern half of the land from the southern half. The exposed southern side, abutting Botany Bay where the filtering beds had been situated, was declared a public area, designated Cook Park. The northern, more sheltered side of the peninsula, where the irrigation areas for crop growing purposes had been situated, was taken over by the North Brighton Golf Links. (Fig. 16 Map 7)

To the south and west, the intersection of Muddy Creek and the main western outfall sewer divided the Rockdale Sewage Farm into four separate areas. These were occupied by the Kyeemagh Polo ground, the Sydney headquarters of the New South Wales Polo Association; Kyeemagh, a new residential suburb between Bestic
Street and Muddy Creek, which acquired its name from the Polo Association; the Bonnie Doon Golf Links, which occupied a sizeable portion of the land northwest of Muddy Creek; and Rockdale Council acquired 120 acres of low-lying swamp land in the south/west corner. It was reclaimed by the Council and converted into a sports and recreation area, designated Barton Park. (Fig.16 Map 7) Originally this area was a major swale which drained northward from sand dunes along the Bay frontage to become Muddy Creek, where it broadened to form extensive mudflats in its lower course and junction with Cooks River.

Cook Park and the two golf links occupied the main areas of activity at the Botany Sewage Farm i.e. irrigation and filtration beds, and while it is difficult to know exactly what land modifications were made to create these areas, any major ground disturbance seems unlikely. With the formation of Cook Park, it seems likely that the land was simply left as it was, and attempts made to grass the area. In view of the sandy nature of the soil, as well as the nature of the game, a similar scenario probably applied to the formation of the golf links, with the ground grassed over where possible for fairways, and built up where necessary for greens etc., with, perhaps, the addition of a few sand bunkers. That this is a reasonably accurate scenario, seems indicated by the fact that crop marks from the ridge and furrow cultivation methods in the irrigation beds are visible in an aerial photograph taken in 1950. (Fig.18) That being so, it seems reasonable to expect that some below-ground archaeological remains would have survived. In particular, the filtration
drains which were laid over a metre deep, it would have been unnecessary, and a needless expense, to dig them up.

The Southern and Western Outfall Sewer No.2:

Between 1924-36, it became apparent that in order to cope with increasing demands, the Southern and Western Suburbs Ocean Outfall Sewer would need to be duplicated. Completed in 1941, and also terminating at Long Bay, the Southern and Western Suburbs Ocean Outfall Sewer — S.W.O.O.S. No.2 was constructed in aqueduct, supported on concrete piles and crosswalls, and paralleled the earlier system on its southern side. This development probably caused damage to any archaeological deposits along the course of its construction.

Second Partition & Disappearance:

Prior to 1947, Kingsford Smith Airport (then Mascot Aerodrome) was located on the northern side of Cooks River, opposite the former site of the Botany Sewage Farm. Between 1947 and 1956, due to the increasing use of air transport, the Airport engaged on a programme of reconstruction and expansion which was carried out by the Commonwealth Department of Works and Housing. The area required for this proposed airport extension included natural as well as man-made structures, embracing old works and landmarks closely associated with the early history of Sydney's water supply and sewerage. The land reclaimed on the northern side of Cook's River, opposite to the Sewage Farm, included Ascot
Racecourse, and to the east, the Mill Pond and Engine Pond were reclaimed. These Ponds were the downstream outlet for the Lakes section of the Botany Swamps, and had originally been built by Simeon Lord early in the nineteenth century. Later in the century, they formed an integral part of Sydney's old Botany Swamps water supply scheme. Adjacent to these, were the brick remains of a sewage pumping stations with grit-and-silt arresting chambers, and the sandstone remains of the Botany Swamps water pumping station, and smokestack. In the same general locality, there were also buildings, soak pits, etc., of two wool-scouring establishments, which used large quantities of water from the ponds for their processing operations.

To acquire the requisite land to the south and west of the airport, much of the site of the Botany-Rockdale Sewage Farm was resumed. Cook's River was diverted over half a mile south of the original mouth to a new outlet into Botany Bay, at the northern end of Lady Robinson's Beach. This diversion allowed the additional land to be incorporated into the confines of the proposed greater airport. A considerable amount of engineering work, both direct and indirect, was involved in the construction of the new canal, which enabled the existing lower reaches of the natural water course to be filled in to form part of the expanded aerodrome area. The diversion also involved widening Muddy Creek, and the demolition of both Nos. 1 and 2 sewer aqueducts over the Creek, and the construction of a replacement, triple barrelled aqueduct across the new river. As well, the flow of
Muddy Creek which joined Cooks River about 3 kilometers from its mouth, was reversed and incorporated into the river.

These major civil engineering works, plus the extensive earthworks which were required, obliterated the remaining standing structures associated with the Sewage Farm, including the Inlet and Outlet Houses. Aerial photographs taken during the course of the extensions to the airport, show that these structures were still standing in 1947 and had gone by 1951, although the workmen's cottages were still standing. (Fig. 18)

Apart from the creation of the new course for the river to the south, the project did not involve any major excavation work in the vicinity of the primary activity area of the Sewage Farm i.e. the original Webb's Grant. Instead, the ground-level in this area was raised, and is now mainly covered by the east-west runway. This makes it possible that foundations and any other associated archaeological deposits from the Sewage Farm would be undisturbed. It also seems logical that advantage was taken of the nearness of the Inlet and Outlet Houses to the River, and the rubble from their demolition used as fill in the river bed.

Using the same yardstick, the two under-river syphons were probably left in situ in the old river bed, along with other archaeological deposits. Some of which could be of considerable antiquity, as the upstream section of the River had been silting since the installation of the original inverted syphon in the 1880s.
In 1963, to cater for the projected growth in air traffic, the perimeters of Kingsford Smith Airport were further expanded. Part of Botany Bay was reclaimed, and a sand peninsula was extended into the Bay to accommodate the extended north-south runway. Sand was dredged from the Bay to create the peninsula, and rock walls were built to protect it from wave damage on the seaward side. The project was complicated by the need to cross the main ocean outfall sewers and General Holmes Drive. A new section of sewer was built immediately north of the existing one, to form part of the pavement over which the aircraft would move, and General Holmes Drive was deviated south, closer to the edge of Botany Bay and widened to six lanes. A tunnel was built to take the new road, and the top of this formed part of the extended runway, taxiway and airport perimeter road. (Fig. 19 Map 8) This final extension to the airport complex destroyed Cook Park and probably any archaeological deposits which may have survived its original establishment, although the five workmen's cottages were still standing in 1976 after the runway extensions into the Bay had been completed. (Fig. 20)

The Site Today
In its original course, Cook's River had served as a natural demarcation, isolating the Sewage Farm from the lands of the city proper. However the new course of the River had a more dramatic impact on the site of the former Sewage Farm, and it is no longer possible to walk, or take the train, from Webb's Grant to Rockdale, across the full length of the Sewage Farm. The new
course of the River has bisected the former peninsula, alienating the land of the Botany Sewage Farm from the land of the Rockdale Sewage Farm. This alienation is intensified as the River also demarcates the southern boundary of the airport, and this area has restricted access. Apart from the physical separation of the site which the River creates, there is also a mental separation which is caused by the knowledge that the public have access to one side of the River, they do not have access to the other. The site of the Botany Sewage Farm has become doubly disconnected from its original location, and from the remains of the workmen’s cottages, which are now located outside the perimeter of the airport. With one exception, these have since been demolished. The only remaining above-ground structure is the corner of the most southern cottage, which stands eight brick courses high (Fig.21). This archaeological site is also discernable by demolition rubble, possibly from the former cottages, which is scattered between fairly dense native shrubbery, resulting from natural revegetation. (Fig.22 Map 9)

Maps explain that the east-west airport runway now superimposes the original course of the river, however orientation at this end of the site is extremely difficult. Apart from the ocean outfall sewers, and the cluster of Moreton Bay fig trees which were probably part of the Farm’s tree planting programme, there is no other evidence to indicate that this particular area was once the hub of an enterprise. The area is now a stretch of level tarmacs surrounded by sandy wastelands, as well as a dumping area for...
demolition rubble in preparation for a heliport. Orientation is further complicated by the fact that the associated above-ground archaeological remains of the Botany water works and Mill Pond which were once on the opposite of the river, have now been now incorporated into the site, through extension of the airport to the north/east. These form part of the Botany Wetlands Heritage Study, which is now under review.

Nevertheless site inspections of the area within the airport confines are invaluable. Away from the 'cultivated' area of the tarmac and surrounds, the parlous nature of the soil, the scrubby vegetation, and the exposure of the land to the breezes sweeping in from Botany Bay, clearly demonstrate the total unsuitably of the location and the difficulties that must have been encountered in attempting to turn this type of ground into soil, and to attempt crop growing. A visit to this part of the site also provides some understanding of the size of the Sewage Farm. The Rockdale end of the Farm is far away, and the area would appear to be far too large to be successfully attended by a manager and seven labourers. The indication of size also demonstrates the necessity for the locomotive train with its various functions, and its school special, is apparent, it also seems too large an area to be cared for properly by only seven farm workers and a manager.

On the unrestricted side of the River, Kogarah Golf Club occupies a large proportion of land to the north of the sewerage mains, and on the southern side much of the land is occupied by Barton
Park, and other sporting facilities. Sandwiched in between these public spaces are the Eve Street Wetlands, which may possibly be surviving remnants of a pre-European landscape. (Fig. 23) Certainly they are the only relic of much larger water system along the western margins of Botany Bay, which drained northward to become Muddy Creek and broadening to form extensive swamps in its lower courses. At least a part of these swamp lands were incorporated into the south western area of the Rockdale Sewage Farm, and were left largely untouched by the Water Board because their very nature made them inoperable as a filtering medium. This area of land is a valuable archaeological indicator, not only to the physical difficulties that must have pertained at the Sewage Farm in attempting to drain, desalinate, and raise the level of the land, so some could be used for filtration purposes, but the low-lying nature of the land also illustrates the magnitude of filling that was carried out during, and since, the closure of the Farm, which increases the survival-rate of archaeological remains. This small area of land also contains surviving physical remains from the Sewage Farm, in the form of the railway embankment, and the stand of pine trees. It is possible that the brick building in this area, which is now used by Rockdale Council, could contain archaeological evidence of the screening chamber used at the Rockdale Sewage Farm. The building is situated almost directly where the screening chamber was originally located. The low-lying nature in this area also explains why, apart from the suburb of Kyeemagh, only the southern perimeter of the former Farm lands was subjected to
intensive land use. The rest remains as open spaces.

Throughout this period of dynamic urbanisation, which saw the Sewage Farm come and go, one system has remained constant on this section of land. Marginalised both socially and physically, and operating outside the mainstream of public affairs, market gardens were leased to Chinese and Europeans along the south western perimeter of the Sewage Farm, near Muddy Creek by 1892. They were active in the Botany region, and the move to the south side of the River may have been precipitated by construction of the bridge for the Sewage Farm, which would have provided the market gardeners with direct to city markets, and in 1888, the newly-established Botany Municipality abolished the use of night-soil as a fertiliser. The swamps in the south western section of the Sewage Farm would have made the area suitable for market gardening purposes, as they provided natural irrigation. In the late twentieth century, amid suburban housing, and beside a busy roadway, an unobtrusive group of small Chinese market gardens still operate alongside Muddy Creek, on land that was formerly a part of the Sewage Farm. (Fig.24) Little would seem to have changed since the nineteenth century. Their houses are patched-up shanties, the work is labour intensive and untechnological, the soil is sandy, and the land is low-lying. Despite intensive land-use, this is land that has been bypassed. In the urban sense, it was unwanted in the last century, and is still unwanted today.
SECTION 5: PARTITION AND DISAPPEARANCE

Footnotes


5. *Outlook* pub. by Water Board Southern Region September 1990 ed. Leanne Kelly

6. This roadway was named after a former secretary of the WS&D Board who was killed on active service during WW1.


8. N.J. Thorpe *The History of the Botany Water Supply* *Sydney Water Board Journal* Vol 3 No 3 October 1953 pps.74-86


12. Oral information supplied by N.J. Thorpe

CONCLUSION:

Although the Botany-Rockdale Sewage Farm was only a short-lived event in the terms of Sydney's overall sewerage system, the questions it raises are germane to the historical archaeologist, whose interests lie in the study of the processes and inter-relationships by which human social and economic organisations developed and evolved in the modern world. Ninth century pragmatism acknowledged human excreta, and saw nothing amiss with utilising this human byproduct at either a domestic, or a commercial level. At the commercial level, it was recognised and accepted that Chinese market gardeners in Sydney used either human or animal waste to fertilise their crops, and at the domestic level the utilisation of the manurial value of sewage was something to be proud of, an indication of good husbandry. And, contradictory as it may seem, such an attitude often went hand-in-glove with the prevalent sanitarians' miasmatic-based medical opinions, which a priori demanded the removal of human waste products to some distant point from the city and suburbs. To such a society, the introduction of a government-funded sewage farm, which had as its secondary purpose the utilisation of the manurial value of sewage, in order to produce, and sell, much needed vegetables for the household table, was neither unusual nor unacceptable. In many respects, this proposal was simply an extension of a relatively common domestic activity.

This lack of embarrassment towards the functions of the body, and its byproducts, was a public lack, as well as as private
lack. It has been shown in the course of this thesis, that in 1875, privacy and lavatories had not yet become synonymous. In fact it was quite the reverse. In the, not uncommon, situation, where several privies shared a common cesspit, the evacuation of the body's waste products must have been, in many cases, a group activity. The public lack of embarrassment towards these functions is evidenced in two articles which were published in the Illustrated Sydney News in April and May 1892. As the name implies, the magazine was well illustrated; it catered to Sydney's upper and middle classes; it was orthodox and probably right-wing. Yet it is obvious that the editor did not consider the readers of the magazine would be offended by the publication of two well-illustrated, articles entitled 'The Sewerage Systems of Sydney', which describe the Northern and Southern Sewerage Systems in considerable detail. (Fig. 25) Ostensibly written in response to 'public prejudice' over the proposed extension of the Sewage Farm, the articles are more a public apologia for the technological achievements of science and engineering, which had provided Sydney with a "proper system of sewerage", a work of "immensity and importance ... that sooner or later must be met in every civilised community."*

The two articles describe the Northern and Southern Sewerage Systems in considerable detail, and note that the Sewage Farm had not yet become a fashionable tourist resort. Nevertheless it improved on closer inspection, and was well worth a visit. The best time to visit the Sewage Farm was after a heavy storm had
passed over the city. As the effects of this were not felt at once at the Farm, there was almost time to leave town during the downpour and reach Cook's River ahead of the increased volume of sewage. Then one could see how the "inky tide within the carrier swells and threatens to become a banker"!

It is one of the wider concerns of Historical Archaeology to understand and explain the differences between human cultural and behavioural attitudes in the past and the present, and the two sets of Minutes provide a clear insight into the opinions and attitudes of Everyman, as they register the recorded words of those whose opinions do not generally formulate government policy. It is obvious, that in the thirty year span which separated the taking of these Minutes, changes had occurred in cultural and behavioural attitudes, particularly with regard to perceptions of human excreta. By 1906, medical opinions had changed, and miasmas from decomposing matter, or household slops, were no longer regarded as a direct threat to personal health. Human excreta and other waste products were no longer perceived in the same personal manner as they had been in 1875. Instead they were beginning to be perceived in a more abstract fashion, as something undesirable in the broader terms of the general welfare and prosperity of a particular community, which it was best not to see or to smell.

It is not the contention of this paper that the Sewage Farm was the sole cause of these changes in attitudes, that would be an oversimplification. The event of the Botany-Rockdale Sewage Farm
did not occur in a vacuum, but was only a portion of a more complex reality, and other factors such as stringent sanitary legislation, certainly contributed toward changing these specific public perceptions. However this paper does contend that the actual existence of the Sewage Farm played a pivotal role by providing a legitimate outlet in the form of a public inquiry, whereby private inclinations for change were given public utterance for the first time.

At the same time, these local changes in attitude may have had some bearing on the ultimate fate of the remains of the Sewage Farm, if only in an indirect manner. As has been demonstrated, the sight and smell of the Farm was an anathema to the people in the local district. It follows therefore, that any action on the part of any authority to replace or obfuscate the Sewage Farm with an 'respectable' alternative would have been actively encouraged. It seems significant that the one major action on the part of Rockdale Council was to create a large park in the south west corner, by raising the level of the land to such an extent that the swamplands with their miasmatic associations, were almost completely obliterated. An action which could be regarded as vindicative, as by totally changing the landscape, former landmarks with their unpleasant associations were effectively eradicated.

In the late twentieth century the majority of Sydney's sewage is disposed via ocean outfalls, and these have become an accepted, and acceptable, cultural fact of urbanised living. Despite present-day publicity concerning the sewage pollution of the
city's beaches, via these ocean outfalls, it is seldom that the actual method of disposal is called into question. So far has the pendulum swung from the more fundamental nineteenth century attitude to the subject, that sewage has not only been swept out-of-sight and out-of-mind, it has also been swept out of the vocabulary. It has evolved, in effect, into a kind of contemporary taboo, with all the attendant prohibitions and proscriptions. Social custom, and private spaces, set it apart, and it is seldom discussed, except in abstract terms. We do not discuss the disposal of excreta, or even the disposal of sewerage, instead we discuss the disposal of waste products, an all-encompassing term, that avoids specific personal associations. We still use fertiliser for the garden, but it now comes anonymously in sterile plastic bags. We do not visit the handsome Renaissance-style building, now squashed beneath Sydney's monorail, which housed Sydney's No.1 low level pumping station, and was used to clear the accumulated deposits of excreta and scum from the low-lying areas and foreshores of Darling Harbour, but, we do visit the Power House Museum, now splendidly revamped and revitalised, which was built to generate electricity for Sydney's trams. There is no longer a social structural tie between past sewage events and the present, and the organisation which has control of the water and sewerage systems of Sydney, has deleted the word sewerage from its title. It is now known as the Sydney Water Board.

In line with the model proposed by Birmingham and Jeans in The
Swiss Family Robinson and the Archaeology of Colonisations, the Farm complex also serves as an example par excellence of the complexities which were inherent in the direct importation of technological ideas and the ensuing difficulties which were experienced in adapting these to local conditions. Although, depending one's view of imperialism, it possibly could be said that the site has more in common with Allen's study of frustrated imperial plans for settlement at Port Essington, not just in terms of imported technologies gone wrong, but also in terms of being the right idea in the wrong place.

The Sewage Farm was a small, self-contained and individually controlled cog in a much larger, centralised urban wheel. A socio-environmental experiment which mutated imported theory into an indigenous enterprise by home-grown empiricism. For a time it served as a component of the system. It was then destroyed by the historically emphasised, large-scale system, as choices changed, and policies were shaped, which reflected more general desires, tastes and strategems. This dismissive historical attitude finds its reflection in the paucity of above-ground archaeological remains of the Sewage Farm. As Mark Leone contends, our conceptions of the past are constrained by the past that survives, and it is probably fair to say that most people have no conception that Sydney once had a Sewage Farm. There no obvious material remains of the Sewage Farm to keep it in the collective consciousness, and the past has been reinterpreted to buttress modern identity, and there is no place in this modern identity for the Sewage Farm. In many respects this paper is not
so much about the formation of an archaeological site per se, but about how changing attitudes and opinions allowed one to be formed. The Botany-Rockdale Sewage Farm did not become an archaeological site through neglect or disuse, but by dislike, and deliberate changes in official policies which caused it to become defunct.

It is timely that the Botany-Rockdale Sewage Farm is being reappraised. The world is beginning to question the positivistic notions which have been upheld since the late nineteenth century, and which found scientific solutions for growing urban problems in the large-scale technologies of the newly emerging professional engineers. Concomitantly, there is an increasing awareness of the need to husband the world's resources. This wider shift in contemporary thought has found its reflection in a more responsible attitude toward waste management. One aspect of this awareness, is the acknowledgement that sludge, the renewable by-product of the human cycle, is a viable and beneficial commodity which can be utilised in a variety of ways.

By subjecting the Sewage Farm to an historical archaeological appraisal, and not just a simple historical analysis, a wider range of information can be brought to bear on the subject, and the larger story is considerably enriched by investigation of the on-site material remains of the Sewage Farm. This comes closer to Braudel's 'total of all possible histories'. The Botany-Rockdale Sewage Farm was Sydney's only sewage farm, as well as the
earliest major government-funded project which attempted to conserve and utilise waste products. The site embraces a two-fold archaeological dimension. On the one hand, it is an expression of an urban process i.e. to dispose of city and suburban sewage by land filtration; on the other hand, it is an expression of an ideology i.e. to eradicate health-destroying miasmas, human wastes must be transported to an isolated place as quickly as possible. That it was an enterprise which failed makes it no less important. In fact should the occasion arise in the future, we could correct possible errors, by using the site to learn from the past.
Conclusion

Footnotes

1. K. A. Deagan, *Neither History Nor Prehistory: the Questions that Count in Historical Archaeology.*, pp.7-12, *Historical Archaeology* Vol 22 No 1 1988

2. Illustrated Sydney News, May 7 1892

3. Illustrated Sydney News, May 7 1892

4. K.A. Deagan, *Neither History Nor Prehistory: the Questions that Count in Historical Archaeology*, pp.7-12, *Historical Archaeology* Vol 22 No 1 1988


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Glossary:

Broad Irrigation: By this method, sewage flows continuously over the surface of the land, and only the top layer of soil is involved in the treatment process. The sewage is distributed over gently sloping land by earth carriers or gutters, with temporary earth dams, or metal plates, being used to divert the sewage over the surface of the ground.

Combined system: Sewers which conveyed stormwater and surface drainage, as well as sewage.

Conservancy system or Day Method - In this system the drains carry only the waste waters. Animal organic matter e.g. urine and faeces are kept out, and are generally collected and used, possibly as manure. This means that earth closets, privy middens or pails are employed in connection with the houses. They have to be emptied and cleaned at regular intervals. (Babbit p.5)

Fascine - long faggots used for engineering purposes for filling ditches, lining trenches etc.. In this case, it was technique used to reclaim land along the banks of Cook's River and Muddy Creek which had formerly been submerged at high tide. Single branches were laid across the banks to create a kind of formwork, which was gradually filled in and built up, with sludge etc., and then grassed over.

Herringbone principle - A series of side drains, acutely-angled to the flow, which are connected to a central drain - like the end of an arrow

Inverted syphon - basically a reversed U-shaped syphon which would have been at a slightly higher level at the Inlet House

Shone system - A system which uses air pressure to pump sewage

Toledo - worm-like molluscs. Cook's River was, and still is, an
estuary into Botany Bay. The piles on the bridge provided a natural home for toredo, which ravage most timbers when in estuarine waters within the tide range.

**Water Carriage system** — The mixing of human excreta with sufficient water to act as a vehicle to create sewage, and the collection of sewage in a system of pipes through which it is conducted by the buoyant effect and scouring velocity of water, is known as the water-carriage system. (Babbit p.5)

**Zymotic** — of fermentation — regarded as caused by multiplication of germs introduced from outside

**Zymolysis** — 1. the fermentative action of enzymes

2. fermentation or other changes resulting from this