

1 INTRODUCTION

Moonee Ponds Creek rises some three and a half kilometres to the north of Tullamarine Airport and flows in a south to south-easterly direction to join the Yarra River at Appleton Dock (Fig 1-1). The basin of Moonee Ponds Creek is elongate and narrow, and the tributaries, with the exception of Yuroke Creek, are relatively short. The basin covers an area of 139 km², and drains parts of the Cities of Melbourne, Brunswick, Essendon, Coburg, and Broadmeadows, and parts of the Shires of Bulla and Keilor (Fig 1-2). With the exception of the area to the west of Greenvale Reservoir the basin is located within the Melbourne and Metropolitan Board of Works drainage boundary.

The topography of the basin is closely related to lithology (Figs 1-3 and 1-4). In their upper reaches, Moonee Ponds and Yuroke Creeks flow across the flat to gently undulating surface that has developed on the Younger basalt and the Gellibrand Hill granodiorite. The elevation of this surface ranges from 130 m to 250 m above sea level. To the south of the surface the valleys of both creeks are well defined and follow geological boundaries: the valley of Moonee Ponds Creek is located along the contact of the basalt and the Gellibrand Hill granodiorite, and that of Yuroke Creek along the contact of the basalt and Silurian sedimentary rocks. The valleys along these reaches tend to be asymmetrically shaped, with particularly steep slopes having developed on the basalt. To the south of Gellibrand Hill relatively unresistant Silurian sedimentary rocks have been exposed and a small amphitheatre has developed in the Westmeadows area, hemmed in by steep basalt slopes on three sides and by the Gellibrand Hill intrusion to the north.

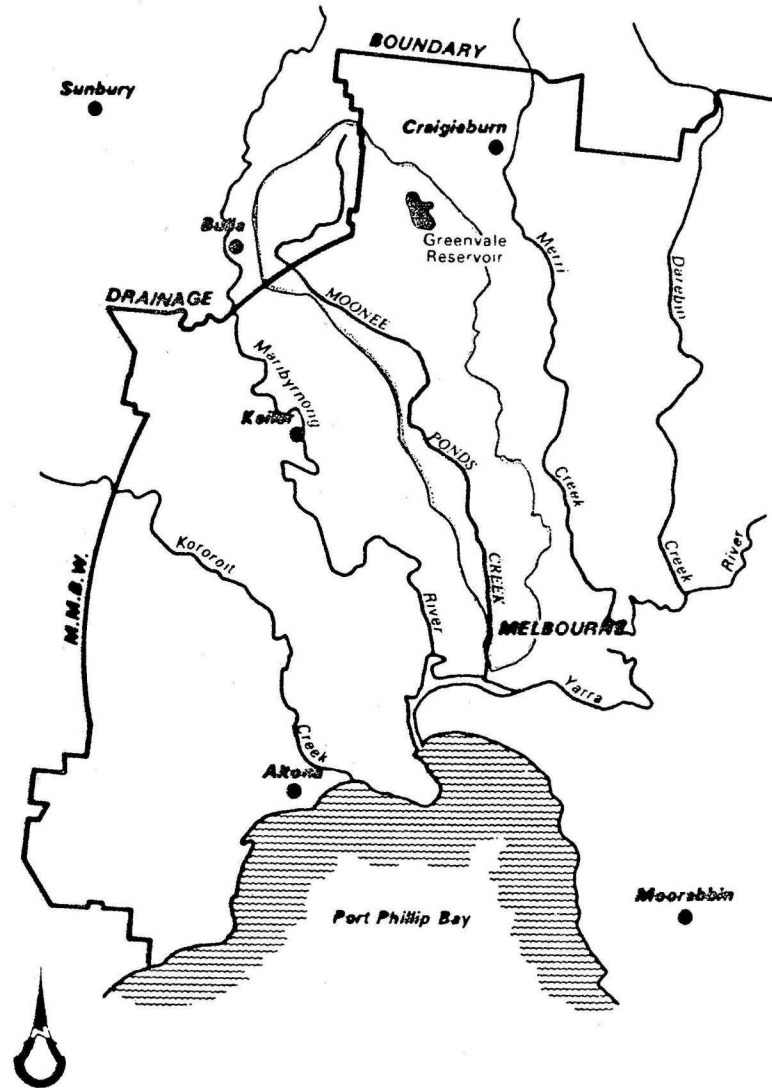
Along its middle reaches, Moonee Ponds Creek has cut through the Younger basalt, giving rise to steep valley sides. Between Broadmeadows and Strathmore the valley bottom is relatively narrow, but downstream of Strathmore it becomes much wider (Fig 1-3). To the south of Essendon Airport the basalt is replaced by Silurian sedimentaries, Tertiary sands and highly weathered Older Volcanics which give rise to a generally subdued topography. The creek is quite deeply incised along a number of reaches in this area, and Silurian rocks have been exposed at a number of locations.

To the south of Ormond Road, the original creek course meandered across a floodplain before flowing into a tidal swamp between the Yarra and Maribyrnong Rivers. However, during the 1870s and 1880s, when reclamation of the swamp was commenced, cuts were excavated to carry water from Moonee Ponds Creek directly to the Yarra and Maribyrnong. This part of the basin is underlain by sands, silts and clays of Quaternary age (Fig 1-4). These sediments form part of the extensive 'Yarra Delta' deposits which accumulated at the head of Hobsons Bay during the Quaternary Period.¹

The gradient of Moonee Ponds Creek downstream of Ormond Road is extremely gentle, the fall in elevation between Ormond Road and the Yarra River being only nine metres. Deposition has been a recurring problem along this length of the creek in contrast to the problems of erosion that have been encountered along the steeper more incised sections further upstream.

Land use within the basin is extremely varied. To the north of Broadmeadows the basin remains in an essentially rural state with most of the area devoted to grazing. Between Broadmeadows and North Melbourne land use is predominantly residential. In the lower part of the basin the creek flows through a mixed residential/industrial area and through land occupied by the Victorian Railways Board and the Port of Melbourne Authority (formerly the Melbourne Harbor Trust).

¹ Descriptions of the 'Yarra Delta' deposits, and a discussion of their relationships to Pleistocene sea-level changes, are given in Refs 1 to 4.



LOCATION MAP

The earliest residential development within the basin took place in North Melbourne during the 1850s (Refs 5 and 6) and by the turn of the century had spread westwards and north-westwards to Kensington, Flemington, and Essendon and northwards to Brunswick and Coburg. Railway lines to Broadmeadows and Coburg were opened in 1878 and 1882 respectively, and tram lines were extended to Brunswick and Essendon during the late 1880s (Refs 7 and 8). Development was particularly rapid during the land boom of the 1880s (see, for example, Refs 8 and 9). By 1931, when the first set of aerial photographs of the Melbourne area were taken, the suburbs of Ascot Vale, Moonee Ponds, Essendon, Brunswick and much of Coburg and Strathmore had been developed (Fig 1-5). During the Depression and the war years urban growth was relatively limited but extensive development took place during the 1950s in the Oak Park, Glenroy, Pascoe Vale, Broadmeadows, and Strathmore areas. In the past two decades residential development has been mainly confined to the Westmeadows and Broadmeadows area. The most significant development in this period, however, has probably been the construction of the Tullamarine Airport complex and the associated freeway works.

Much of the early development within the Moonee Ponds Creek basin was undertaken with relatively little forethought for the potential problems of flooding and erosion, and created a situation in which modifications to the drainage system became essential in subsequent years. Along its middle reaches the creek is quite deeply incised and bank erosion, particularly on the outsides of bends, would have been a naturally occurring phenomenon. Bank erosion was undoubtedly exacerbated by the destruction or modification of the riparian vegetation by the early pastoralists; present-day conditions along the upper rural reaches of the creek are probably indicative of what the situation must have been like further downstream prior to urban development (Plate 1-1).



PLATE 1-1 Erosion along Moonee Ponds Creek near Oaklands Junction

As urban development gradually engulfed the lower and middle parts of the basin, the sections of Moonee Ponds Creek and its tributaries which drain those areas received greater volumes of runoff and experienced more frequent and severe flood flows. As a result, bed and bank erosion was accelerated, often at alarming rates, and sediment was deposited along the watercourses, particularly along the lower reaches of Moonee Ponds Creek where gradients are low.

The twin problems of erosion and flooding along Moonee Ponds Creek assumed far greater significance than they might otherwise have done simply because of the lack of controls upon urban development. During the last decades of the nineteenth century and the early decades of the twentieth century, residential and industrial development was allowed to take place adjacent to the Moonee Ponds channel on the low-lying land that had been reclaimed from the West Melbourne Swamp, even though the area was known to be flood prone. Along the middle reaches of the creek, residential subdivisions extended to the edge of the creek, the local councils at the time apparently considering it unnecessary to create drainage reserves. Economic losses suffered because of the development of the flood prone land, and the damage to private property associated with both flooding and erosion, made expensive drainage works essential.

In an attempt to alleviate flooding and to control erosion, a number of projects have been undertaken along various reaches of the creek during the past forty years. These include the partial hard lining of a number of sections, and the construction of a large retarding basin at Jacana in the middle part of the basin.

This report outlines the history of the Moonee Ponds Creek drainage system from the time of European settlement to the present day. It examines the drainage problems that have arisen in the course of urban development, documents the remedial measures that have been taken, and assesses their effectiveness.

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2 THE MOONEE PONDS CREEK BASIN AT THE TIME OF EUROPEAN SETTLEMENT

2.1 THE FORM OF THE CREEK

On Robert Hoddle's map of 1837¹ (Ref 1), Moonee Ponds Creek is depicted as a sinuous watercourse with water-holes strung along much of its length (Fig 2-1). Hoddle describes the watercourse as a chain of ponds, and gives its name as Monee Monee (Refs 1 and 2)². Hoddle's map indicates that the quality of the creekwater was relatively good in the vicinity of what is now Westmeadows but brackish or bad further downstream. The creek is shown as terminating near the Geelong Road (Flemington Road). To the south, between the end of the creek and the Yarra River, there was an extensive "Salt Water Marsh".

The description of the creek given by Westgarth in 1857 (Ref 5) confirms a number of the features noted by Hoddle :

Two miles from Melbourne, we crossed the Moonee Ponds, by the excellent macadamised road that now aids the traveller. These 'Ponds', as they are called, forming a winding chain of water-holes, afford, close to Melbourne, a genuine specimen of Australian river peculiarities. After a course of twelve or fourteen miles, they terminate in a salt lagoon, having no outlet. This lagoon at its eastern extremity, touches upon the western bounds of the city, from whence the Williamstown railway emanates, skirting the eastern and northern margin of the lagoon flat. The Moonee Ponds have seldom any stream in the winding-bed excepting during very wet weather. The water, in many of the holes or ponds, is brackish; in others, it is fresh, according to the components of the soil on which the waters rest. When there is a stream therefore - generally a very feeble one - the whole has a brackish character, rendering the water unsuitable for drinking to the population, although still available for cattle and for other uses. This little creek meanders through a very fine agricultural country, particularly in its lower course near Melbourne, where there are many new farms, country-houses, and gardens.

Balliere's Victorian Gazetteer of 1865 (Ref 6) also suggests that the creeks flowed only during wet weather.

The chain of ponds that the early settlers found along Moonee Ponds Creek would appear to have been a characteristic feature of many of the watercourses in parts of Victoria and New South Wales.³ Most of the creeks, however, were significantly modified by the hydrological changes that accompanied European settlement and agricultural development. In the Avoca basin of Central Victoria, for example, many of the water-holes were either filled by the deposition of sediment or drained as a result of

¹ Plan showing the Surveyed Lands to the Northward of Melbourne and Allotments contiguous to it.

² The derivation of the word is uncertain. G Aldous, in his *History of Essendon* (Ref 3), notes that *The Argus* of 1 September, 1934, lists three possible origins for the word: that Moonee Moonee is an aboriginal word meaning 'plenty of small flats'; that the name is derived from John 'Long' Moonee, a British soldier who took up allotments in the area now occupied by the Moonee Valley Racecourse; and that 'Moonee Moonee' was an aborigine attached to the Mounted Police. In L Blake's *Place Names of Victoria* (Ref 4), the following entry appears:

MOONEE PONDS: Part of City of Essendon; Abor. used word as personal n. but it also referred to lizard; in 1841 spelt variously as Monee, Monnie, Moonee Moonee, Mooney, Money; in 1845 Trooper Moonee Moonee of Dana's Native Mounted Police Corps died in Wimmera.

³ Charles Darwin, for example, who visited Australia on the homeward voyage of the 'Beagle' noted, much to his surprise, that the Macquarie River in New South Wales was no more than "a mere chain of ponds, separated from each other by spaces almost dry" (Ref 7).

channel incision (Ref 8). The destruction of the riparian vegetation by stock, and increased rates of runoff resulting from forest clearance, are considered to have been the causal factors in that area. In a study of ponded creeks on the Southern Tablelands of New South Wales, Eyles (Refs 9 and 10) suggests the following sequence of change: chain of scour ponds, discontinuous gully, continuously incised channel, channel containing 'fixed bar' ponds, permanently flowing stream. Although there is no direct evidence, it would seem logical to assume that a similar sequence of events may have occurred along Moonee Ponds Creek during the later decades of the last century.

2.2 THE WEST MELBOURNE SWAMP

The lagoon and surrounding swampy area which was located to the south of Moonee Ponds Creek between the Saltwater (Maribyrnong) and Yarra Rivers was a prominent feature in the landscape of early Melbourne, and proved to be a barrier to the westward development of the city (Plate 2-1). It is clearly marked on a number of early maps of the area: on Grimes' map of 1803 the word swamp appears (Ref 11)¹; on Batman's map of 1835 a small lagoon is indicated, accompanied by the words "Extensive marsh reserved for Public Common" (Ref 12); on Hoddle's map of 1837 (Fig 2-1) the outline of a "Salt Water Marsh" appears; and on Russell's map of 1837 (Fig 2-2) it is referred to as a "Salt Lake", and is similar in shape to the marsh depicted on Hoddle's map.

Early descriptions of the swamp and lagoon are scanty. James Fleming, one of Grimes' party, included the following comments in his journal (Ref 12):

Saw a large lagoon in the distance. Went over the hill to a large swamp. Soil black, eighteen inches, with blue clay at bottom. No trees for many miles.

It is a large swamp between two rivers; fine grass, fit to mow; not a bush on it. The soil is black rich earth about six to ten inches deep, when it is very hard and stiff. It is better further back.

Batman, in his journal (Ref 13), describes the swamp as being:

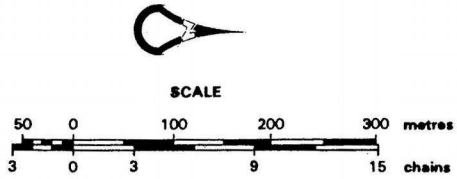
About one and a-half mile wide, by three or four miles long, of the richest description of soil - not a tree. At the upper end of this marsh is a lagoon. I should think, from the distance I saw, that it is upwards of a mile across, and full of swans, ducks, geese etc.

A more detailed description of the area, as it appeared in the 1840s, is given by G G McCrae (Ref 14), who at the time was living in a house near the corner of King and Little Lonsdale Streets:

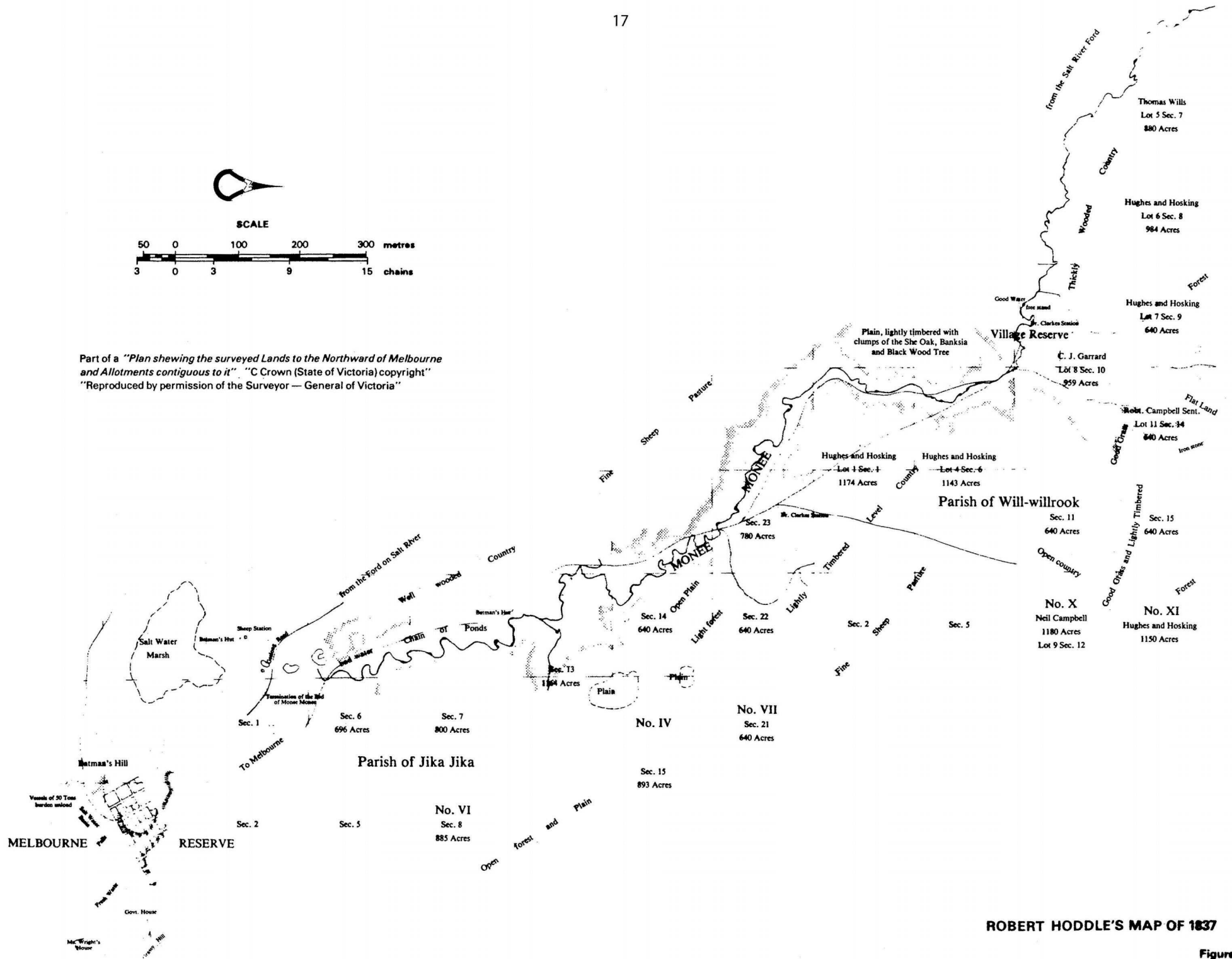
Nearly all the country to south, north, and west of us was at this period in a state of nature, with just a few cottages dotted over it here and there. On our side of Batman's Hill (then a beautiful green knoll thickly covered with round-headed she-oaks) stood the white tents of a detachment of the 26th Regiment, producing a very pretty effect as relieved against the verdant and flowery mead on which they were pitched. To the west of us and just a little to north, stretching away from beyond the base of the Flag-staff Hill, lay a beautiful lake.

You may search for it in vain to-day among the mud, scrap-iron, broken

¹ Grimes and his party were probably the first Europeans to explore the northern part of Port Phillip Bay. In February 1803, some thirty-two years before Batman's arrival and the establishment of the settlement of Melbourne, they journeyed up the Yarra as far as Dight's Falls and also visited the lower reaches of the Maribyrnong River.

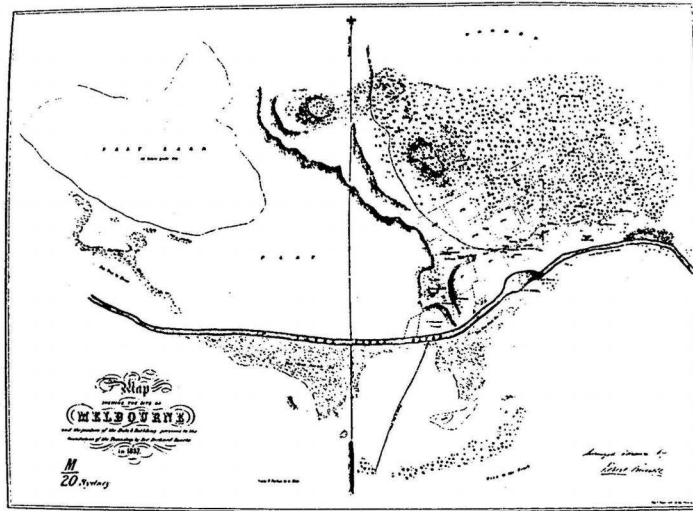


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ROBERT HODDLE'S MAP OF 1837

Figure 2-1



First Map of Melbourne, 1837, by Robert Russell.

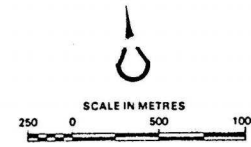
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FIGURE 2-2 Robert Russell's Map of Melbourne, 1837.

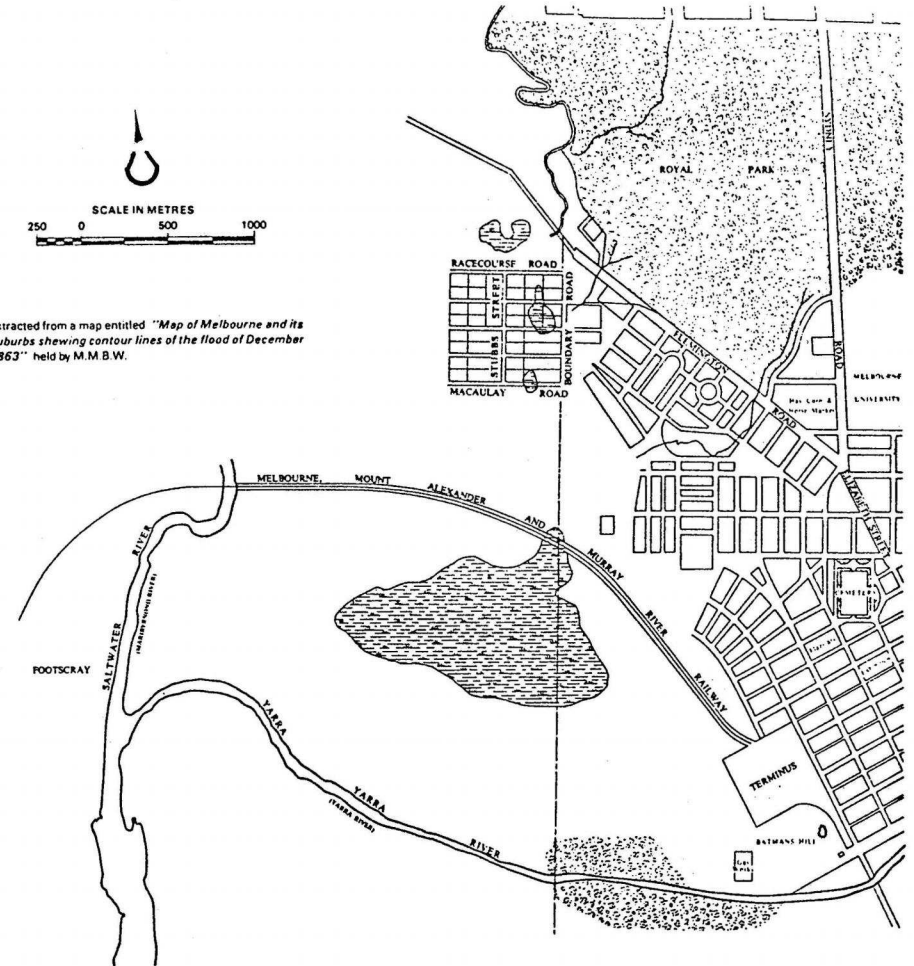
all sorts of red-rusty railway debris - the evidence of an exigent and remorseless modern civilization. Yet, once, it was there: a real lake, intensely blue, nearly oval, and full of the clearest salt water; but this, by no means deep. Fringed gaily all round by mesembryanthemum (vulgo, 'pigs-face') in full bloom, it seemed in the broad sunshine as though girdled about with a belt of magenta fire. The ground gradually sloping down towards the lake was also empurpled, but patchily, in the same manner, though perhaps not quite so brilliantly, while the whole air was heavy with the mingled odours of the golden myrnong flowers and purple-fringed lilies, or ratafias. I often used (this was in 1841) to visit this lake along with my father on his shooting expeditions, in the early mornings, surprising the numerous wild-fowl that frequented its margin or waded about unconcernedly in its waters.

It was there that, for the first time in my life, I saw snipe killed, and there that I had my first exciting chase on foot after that elusive and noisy bird, the spur-winged plover. Curlews, ibises, and 'blue cranes' were there in numbers, and the alert little black-capped sandpipers scuttled along the brink in pairs. Black swans occasionally visited it, as also flocks of wild ducks in passing. In those times, this sheet of water was termed indifferently 'The Blue Lake' and 'The Salt-water Lake' or 'Lagoon', also I have heard it styled 'Batman's' or the 'North Melbourne Swamp'.

It would appear that in addition to the main lagoon, three smaller lagoons were located between the present day Macaulay and Flemington Roads (Fig 2-3). The extent of the



Extracted from a map entitled "Map of Melbourne and its suburbs shewing contour lines of the flood of December 1863" held by M.M.B.W.



MAP OF THE WEST MELBOURNE SWAMP AREA COMPILED IN 1855

Figure 2-3

lagoons would have undoubtedly varied throughout the year. During periods of high rainfall, flood flows from Moonee Ponds Creek would have filled the lagoons and inundated much of the low-lying swamp area between the Yarra and Saltwater Rivers, and the whole area would also have been inundated during exceptionally high tides. Sir John Coode, for example, reports that the sea level on 17 December 1863 was sufficiently high to submerge virtually the whole of the West Melbourne Swamp to a depth of around three feet (Ref 15).

Apart from occasional fishing and shooting, little use seems to have been made of the swamp area, although one early visitor (Ref 16) to the City thought that the land had considerable potential, stating that :

Though to a stranger the swamp appears unsightly, and apt to lead one to form an unfavourable opinion, yet it is fair to expect, drawing on inference from the rapid growth of this wonderful city, that a very short time will see it form an additional ornament, as it becomes converted into blooming gardens, rich fields, or beautiful lakes.

2.3 FLORA AND FAUNA

Contemporary descriptions indicate that the original vegetation cover of the Melbourne region ranged from quite thickly timbered country in the east to open grassland with

occasional trees to the north and west of the city. The earliest description of the vegetation dates from Grimes exploration of Port Phillip Bay and the lower Yarra in 1803. From a vantage point near Dight's Falls, one member of the party observed a range of "gently rolling hills, clothed with trees", and noted that "The timber in general is gum, oak and Banksia; the two latter are small; the gum two to four feet in diameter, and from ten to thirty high; on some of the low ground they are something larger" (Ref 12). In the immediate environs of Melbourne the timber cover would appear to have been relatively open. A letter written by Thomas Winter of Hobart in the late 1830s (Ref 17) described the area in the following manner :

Melbourne is ... beautifully situated on a gently sloping hill, upon the banks of the Yarra, and surrounded by a lovely country, lightly covered by trees, chiefly eucalypts and acacia ... For some miles around Melbourne, the country bears the same beautiful character - grassy and luxuriant, with trees scattered over it, as in the least woody parts of the old forests in England.

A number of early writers commented on the naturally sparse tree cover characteristic of the basaltic plains to the north and west of Melbourne and pointed out the potential of these areas for grazing (Refs 18, 19 & 20). It has been suggested that the general absence of trees from the basaltic plains can probably be attributed to climatic factors, in particular to the lack of storms of sufficient duration and intensity to wet the soil to



PLATE 2-1 View across William Street to the West Melbourne Swamp and Lagoon, circa 1870

sufficient depths to allow seedlings to escape competition from the spreading roots of grasses and herbs (Ref 21).¹

The original vegetation of the Moonee Ponds creek basin would appear to have been similar in character to that of the surrounding area, with open forest on the sedimentary rocks, and grass cover with scattered trees on the basalt plains. On Hoddle's map (Fig 2-1), the area to the north of Flemington Road, where sands of Tertiary age outcrop, is shown as "well wooded country", and Mattingley (Ref 25) described the North Melbourne area, which is mainly underlain by Silurian sedimentary rocks, as "consisting of undulating land richly carpeted with grass and studded with noble redgum trees, which give it a beautiful park-like appearance". The basaltic areas within the basin are shown on Hoddle's map as being lightly timbered and good sheep country. The only areas of thickly timbered country depicted on Hoddle's map are the granodiorite slopes of Gellibrand Hill. The generally open nature of the original landscape can be appreciated from two contemporary paintings (Plate 2-2), one, painted in 1839, of John Fawkner's property 'Grandview Park' at Pascoe Vale, and the other a view from the Flemington escarpment across the Saltwater Lagoon and towards Mount Macedon painted by Eugen von Guerrard in 1858.

On Gellibrand Hill, and on the areas underlain by sedimentary rocks, the predominant trees were various species of eucalypts, but on the basalt plains casuarinas may well have been equally, or more, common. Batey (Ref 26) mentions that in the 1840s, quite dense belts of sheoaks grew on the uplands fringing Jackson's Creek, which is located only a few kilometres to the west of Moonee Ponds Creek, and Howitt (Ref 27) gives the following description of the vegetation along the Mount Macedon Road in the vicinity of Moonee Ponds during the mid 1850s :

As we advanced ... nearly all the trees were shiaks, - not the eternal gum-trees, - and these interspersed with Banksias, now in fresh foliage, and new pale yellow cones, or rather bottle-brushes, with a sprinkling of gums and golden wattles, give what you rarely see in this country, a variety of foliage and hue.

The vegetation growing along the creeks in the area was probably more varied than that on the uplands. Batey (Ref 26) describes Jackson's Creek as being "nicely timbered with a variety of eucalypts, wattle and other shrubs", and it would seem likely that the watercourses of the Moonee Ponds Creek system were similarly vegetated. The lower floodplain reaches of Moonee Ponds Creek, and the banks of the Yarra, were clothed with stands of Swamp paperbark (*Melaleuca ericifolia*) (Refs 20 and 28), while the West Melbourne Swamp was covered with grasses and moisture loving plants such as pigs-face.

Indigenous vegetation survives in only a few areas within the Moonee Ponds Creek basin. Agricultural development was accompanied by the replacement of many native species by introduced ones, and large numbers of trees were undoubtedly cleared to facilitate grazing (Plate 2-3), or to provide firewood, casuarinas being particularly favoured for the latter purpose (Ref 22). In the lower and middle parts of the basin urban development resulted in the almost complete obliteration of the original vegetation. Significant remnants of the original flora remain on Gellibrand Hill, but elsewhere within the basin only isolated patches are to be found.

The settlement of the area was accompanied by the introduction of a number of plants that are now classified as noxious weeds. As early as 1857, Westgarth (Ref 5) was able to write that in the nearby Keilor area Scotch thistles "waved to and fro like a cornfield".

¹ For detailed accounts of the flora of the basaltic plains, see the works of Forster *et al.* (Ref 21), Sutton (Ref 22), Patton (Ref 23) and Willis (Ref 24).



A Grandview Park, Pascoe Vale, 1839 Reproduced by permission of the Library Council of Victoria



B Eugen von Guerard Australian 1811-1901

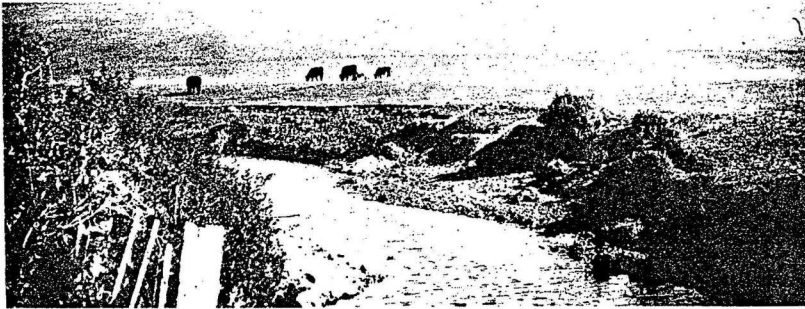
Part of the Saltwater Lagoon and view of Mount Macedon with the Flemington Hills near Melbourne, 1858

Pen, Indian ink and wash drawing, 33.8 x 50.3 cm Purchased 1948

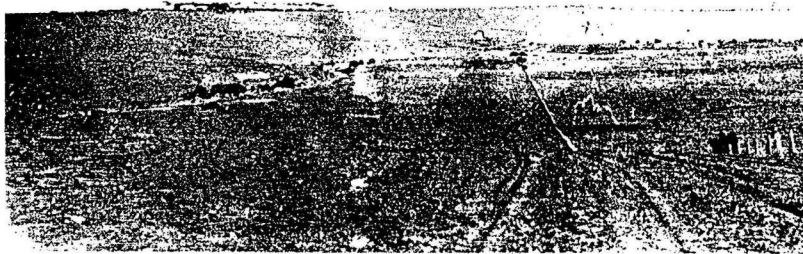
"Reproduced by permission of the National Gallery of Victoria, Melbourne"

Thistles and other noxious weeds such as boxthorn, furze, fennel, and blackberry are today found in many parts of the basin and pose a maintenance problem along the creek courses.

The earlier settlers reported that there was a rich animal and bird life in the area. Kangaroos and emus were undoubtedly common (Ref 20) and large numbers of birds were apparent. Mattingley (Ref 25) reports observing "hundreds of parrots and parrakeets" in the "parkland" around North Melbourne. The West Melbourne Swamp with its thick ground cover and lagoons was a haven for birds such as snipe, curlews, ibises, blue cranes, and ducks (Refs 14 and 15). An extensive list of birds observed during the 1840s in the Jackson's Creek area is given by Batey (Ref 26), who comments that wedge-tailed eagles were common at that time. Predictably as development proceeded within the basin, numbers were drastically reduced.



A The Pascoe Vale area



B Morgan's Paddock, Strathmore

PLATE 2-3 The treeless landscape of the middle part of the Moonee Ponds Creek basin during the 1930s

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3 DRAINAGE PROJECTS PRIOR TO 1892

3.1 INTRODUCTION

The early drainage projects undertaken in the lower part of the Moonee Ponds Creek basin must be viewed as an integral part of the broader changes which took place in the Lower Yarra basin during the latter half of the nineteenth century. The modifications made to the course of Moonee Ponds Creek and to the southern part of the Moonee Ponds basin during this period were closely associated with the expansion of railway and port facilities in the area to the west and south-west of the city, and with related developments, the most notable of which was the drainage and reclamation of the West Melbourne Swamp. An essential task in the early stages of reclamation was the provision of outlet channels to convey the waters of Moonee Ponds Creek directly to the Saltwater and Yarra Rivers.

The reclamation of the West Melbourne Swamp was formally commenced in 1877, but was not really completed until the early 1970s. Prior to 1877, some modification of the Swamp occurred during the course of railway construction.

3.2 EARLY MODIFICATIONS TO THE WEST MELBOURNE SWAMP : THE IMPACT OF RAILWAY CONSTRUCTION

The essentially natural state of the West Melbourne Swamp did not persist for long into the second half of the nineteenth century. By the 1860s large parts of the Swamp had been transformed into an unsightly and unhealthy mire. Night-soil and refuse were deposited in the Swamp, and hundreds of the city's milking cows were pastured there, or rather "*wallowed up to their bellies in ... mud, sewerage and dumped garbage*" (Ref 1). The first significant modifications to the Swamp were made by the Victorian Railways Department. During the early 1850s there was a scramble to float railway companies in Victoria (Ref 2). Eight companies were launched, but only three, the Melbourne and Hobson's Bay Railway Company, the Geelong and Melbourne Railway Company, and the Melbourne, Mount Alexander and Murray River Railway Company, gained government approval to construct lines (Ref 3). The economic climate of the time did not favour such enterprises, and it became apparent that any company planning to construct country lines would almost certainly fail. A Commission recommended that the Government should be responsible for the construction and operation of such lines, and in March 1856 the Government purchased the Melbourne, Mount Alexander and Murray River Railway Company and formed the Victorian Railways Department.

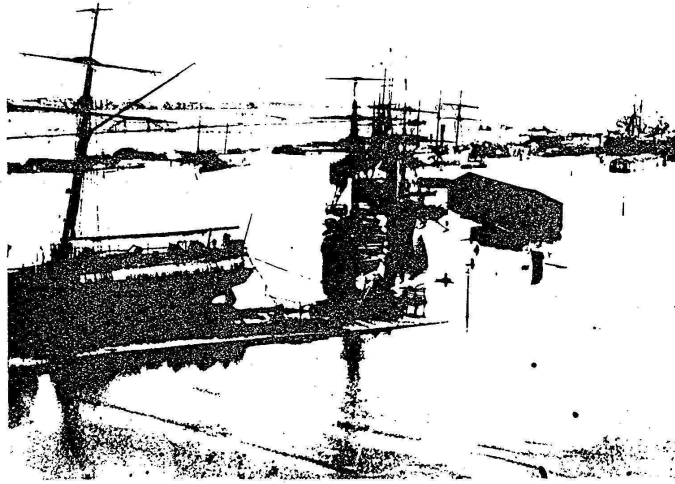
The newly formed Department pressed ahead with the construction of a line between Melbourne and Williamstown that had been started by the Melbourne, Mount Alexander and Murray Valley Railway Company. The Melbourne terminus was located at the southern end of Spencer Street, on the edge of the Swamp, and from there the line extended north-westwards along the edge of the Swamp, crossed the northern tip of the Lagoon, and then proceeded westwards across the northern part of the Swamp to the Saltwater River. Considerable difficulties were experienced in constructing the line across the Swamp, particularly between Dudley Street and the western side of the Lagoon, and a total of some 164 000 cubic yards of spoil excavated from the Swamp were used in the construction of embankments. The line was officially opened in 1859. The eastern margin of the Swamp was further modified with the construction of the Melbourne - Coburg line which was completed in 1884. The line was built across the north-eastern corner of the Swamp necessitating the construction of an embankment between Arden Street and Flemington Road. The embankment, and the drainage channel that was built along its western side, formed a well-defined boundary to the Swamp, and the low-lying land to the east of the line was gradually developed for industrial and residential purposes.

3.3 PROPOSALS FOR THE DEVELOPMENT OF MELBOURNE'S PORT FACILITIES AND THE RECLAMATION OF THE 'LOW LANDS'

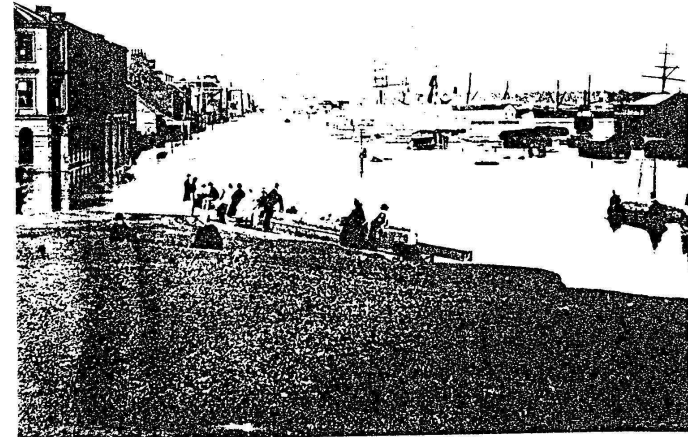
The growth of Melbourne and its hinterland was accompanied by an increasing volume of trade which could not be readily handled by Melbourne's limited port facilities. With the increase in the average size of ships using the port, the narrow and relatively shallow course of the Yarra between Hobson's Bay and Queen's ('Falls') Bridge had become difficult to navigate, and wharfage and dock facilities were generally inadequate. In 1858 the Victorian Parliament appointed a Select Committee "*to inquire into the best means of promoting improved Harbor Accommodation for the Port of Melbourne, and to consider the desirability of instituting a River and Harbor Trust, and the best mode of connecting Hobson's Bay with the City of Melbourne*" (Ref 4). The Committee recommended that a Board or corporate body would need to be appointed to supervise any large scale improvement works, and proposed that a Commission should be appointed to pursue the matter further. The Committee's advice was taken and a Royal Commission, with a brief similar to that given to the Select Committee, was appointed the following year (Ref 5). The Commission recommended, among other things, that a Harbor Trust should be formed, but no immediate action was taken.

Related to the question of the provision of more adequate port facilities was the problem of frequent flooding of the port area and the low-lying lands along the Lower Yarra and between the Yarra and Hobson's Bay. These areas would have been inundated by the severe floods of December 1839, July 1842, October 1842, October 1844, October 1848, and November 1849, and the lowest parts would have been inundated by less severe events and also by high tides. A particularly severe flood in December 1863 almost completely inundated the low-lying areas of South Melbourne and the West Melbourne Swamp causing considerable damage and disruption (Plate 3-1). A Flood Board was immediately established to look into the problem of flooding along the Yarra. The Board made a number of recommendations concerning river improvements and the development of the port area, but again no action was taken. Quite severe floods occurred again in 1868 and 1870, and in August 1872 Parliament appointed a Royal Commission, the Low Lands Commission, "*to enquire into and report upon certain matters connected with the low lands on the south and west of the city*" (Ref 6). The Commission's brief was :

- *To indicate, after consulting existing engineering plans, sections and reports, and after considering evidence of engineers, merchants, shipowners, marine surveyors, and nautical men, what lands ought, in the opinion of the Commission, to be now definitely withheld from sale or occupation for the purpose of constructing on such lands a ship-canal, docks, wharves, or other works for the improvement of the Port of Melbourne, also works for rapidly carrying off flood-water from the Yarra.*
- *To suggest some definite scheme, based on reliable engineering data, for the reclamation of the swamps and other low-lying badly-drained land west and south of the City of Melbourne, and for the improvement of the approaches to Melbourne, by the removal of the present repulsive aspect of such land.*
- *To devise measures for fixing the sand drifts in the Sandridge Bend, and along the beach south of Emerald Hill, and for creating a sward of grass on the land covered by such sand drifts.*
- *To define boundaries of a portion of land to be occupied for the purpose of carrying on noxious trades, subject to the stringent provisions suggested by the late Commission on noxious trades.*



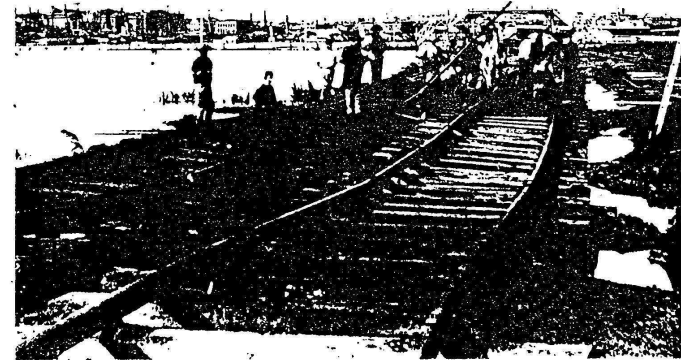
A Flinders Street and Queens Wharf from the top of the Customs House.
Note extent of inundated area to south and west of wharf



B View looking east along Flinders Street from the corner of Spencer Street



D View from Batmans Hill looking south-westwards towards Williamstown.
The ships mark the line of the Yarra River



C The damaged Melbourne-Sandridge railway line

PLATE 3-1 The December 1863 Flood

The Low Lands Commission took evidence from a large number of witnesses several of whom put forward plans for the drainage and reclamation of the West Melbourne Swamp. Nearly all of the plans stressed the need to convey the waters of Moonee Ponds Creek directly to the Yarra River. One witness, Clement Hodgkinson, the Deputy Surveyor-General of Victoria, suggested that a channel should be cut for this purpose and that soil excavated from the channel, and from an accompanying dock, could be used to reclaim the Lagoon and adjacent low-lying land thus "*rendering salubrious and pleasant a disgusting swamp, as repulsive in its present aspect as it is pestilential in its influence*". Hodgkinson envisaged that the reclaimed land in the vicinity of West Melbourne could be used for residential purposes, that stores and factories could be established on land reclaimed along the Yarra, and elsewhere garden crops and animal fodder such as grass, lucerne and sugarbeet could be grown. He also proposed that an extensive area should be reserved for a public park commenting that "*it would be the finest piece of grass land in any park in Melbourne ...*".

In their Progress Report (Ref 6), the Commission stated that :

After careful enquiries relative to the levels of such swamp and cost of raising portions of it to such height as to be above level of flood, we have arrived at the conclusion that it would be inexpedient to incur the enormous expenditure to render any portion of the low-lying ground west of the railway eligible for the extension of the city for purposes of residence. We therefore recommend that the West Melbourne Swamp be enclosed and drained, as to be made suitable for purposes of recreation as a park or for cultivation or grazing, but not in any case for residences or as sites for manufactories.

The plan for the reclamation of the Swamp, which the Commission described as "*a nuisance, injurious to health, and a disgrace to the city*", is shown in Figure 3-1. The Commission proposed that an embankment should be built around the Swamp and that it should be drained by a series of ditches with the land between the ditches gradually being filled. The concept of constructing an embankment around the Swamp was not, in fact a new one, having been proposed some fifteen years earlier by A K Smith, who suggested that water could be removed from the drains by wind-driven pumps supplemented by a steam pump (Fig 3-2; Ref 7).

The Commission acknowledged that if the reclamation and drainage of the low-lying lands was to be a practical proposition it would be necessary to reduce the frequency and severity of flooding along the Lower Yarra. Three river improvement schemes were considered. One scheme involved widening the Yarra from Princes Bridge to the Gasworks and then cutting a new channel south-westwards to Hobson's Bay, the second involved the widening of the river from Princes Bridge to Fishermans Bend and then cutting a new channel across the bend to rejoin the river below the junction with the Saltwater River, while the third proposed that a new channel should be cut from the Gasworks to a point near the mouth of the Yarra. The third alternative was favoured by a majority of the Commissioners. The Commission also recommended that land should be reserved along the north bank of the Yarra between the Gasworks and Princes Bridge for two new docks (Refs 6 and 8). It was envisaged that the material excavated during the construction of the new channel and the docks, and in widening the Yarra, could be used in the reclamation of the West Melbourne Swamp and other low-lying areas.

3.4 MODIFICATIONS TO THE CHANNEL OF MOONEE PONDS CREEK

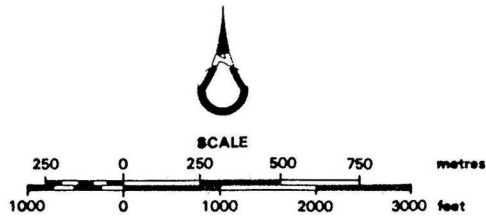
3.4.1 Introduction. In the period after 1877, a number of projects were undertaken to modify or improve the channel of Moonee Ponds Creek and to alleviate the problem of flooding. Some changes to the drainage pattern in the lower parts of the basin were obviously required if the recommendations for port development and reclamation made by the Low Lands Commission were to be put into effect. Other changes to the channel of the creek were necessitated by the construction of railway facilities.



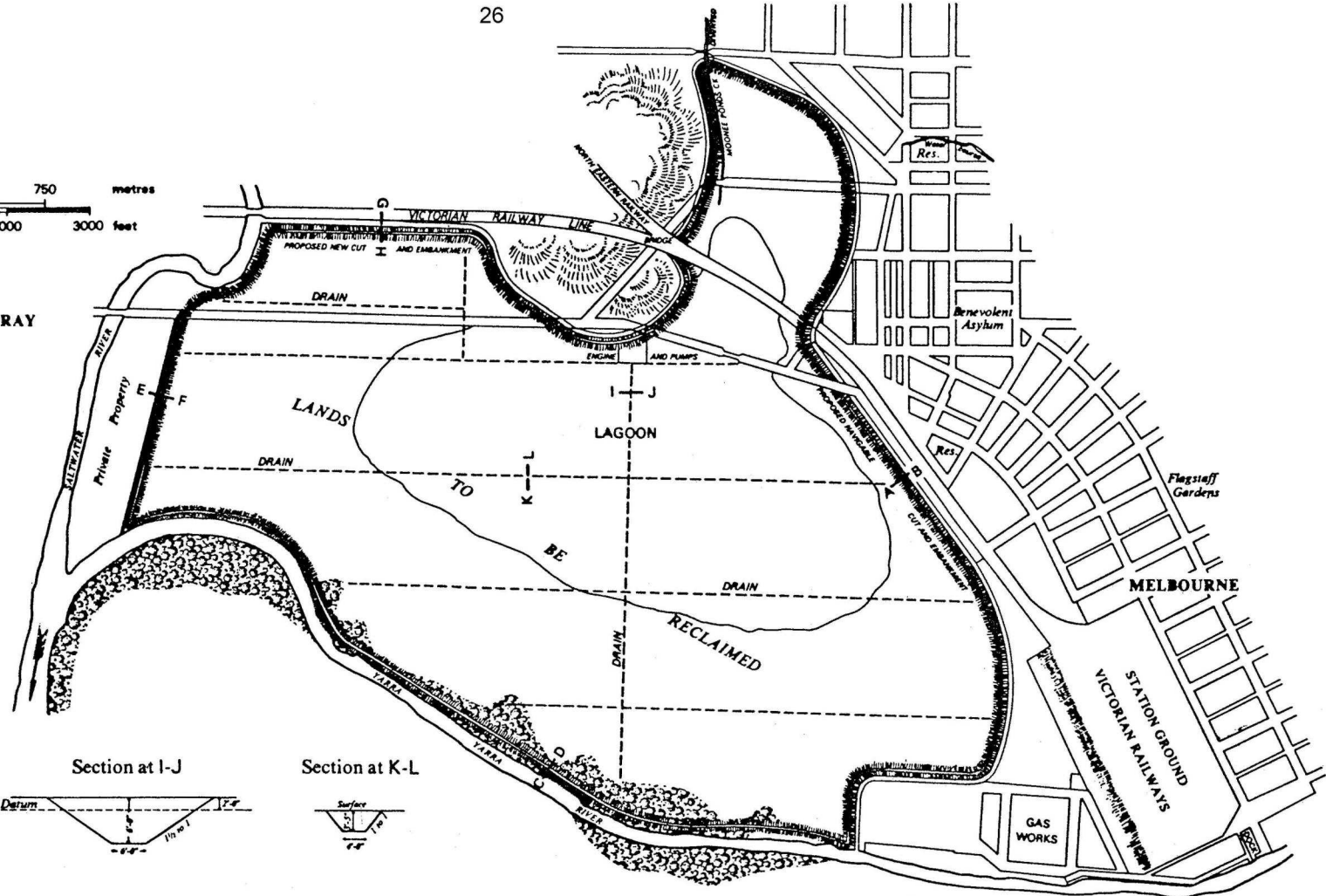
Plate 3-2 The Tidal Canal, Dynon Road
August 1930. View looking towards
the City

3.4.2 The Provision of a Direct Outlet for Moonee Ponds Creek. In 1877 the Public Works Department commenced work on the reclamation of the West Melbourne Swamp. As recommended by the Low Lands Commission, a perimeter embankment was built and a number of drainage ditches were dug. In order to prevent the waters of Moonee Ponds Creek from inundating the reclaimed areas, a channel was excavated between Arden Street and the present Dynon Road Bridge, and from the latter point two cuts were made, one westwards to the Saltwater River, and the other eastwards and then curving south-westwards to join the Yarra (Fig 3-3). The reed-choked Tidal Canal (Plate 3-2) which runs along the southern side of the present Dynon Road is a remnant of the western cut.

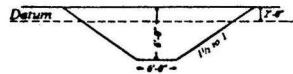
3.4.3 The Realignment and Improvement of Moonee Ponds Creek. During the construction of the Coburg line the Railways Department straightened the channel of Moonee Ponds Creek between Flemington Road Bridge and the cut below Arden Street, using the material excavated to build the railway embankment. It is interesting to note that a contemporary map (Fig 3-4) shows a well-defined sinuous watercourse between Flemington Road and Arden Street, whereas on Hoddle's map of 1837 it is clearly indicated that the watercourse petered out in the vicinity of Flemington Road. The extension of the channel can probably be attributed to increased runoff resulting from agricultural and residential development within the basin. It is also possible that there may have been some excavation, although no evidence for this has been found.



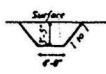
FOOTSCRAY



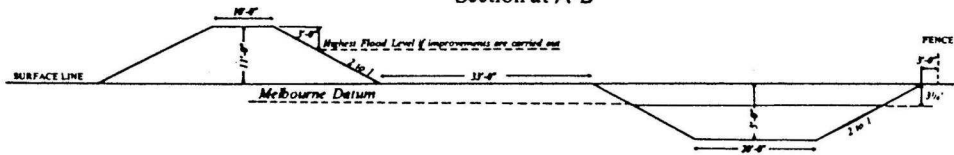
Section at I-J



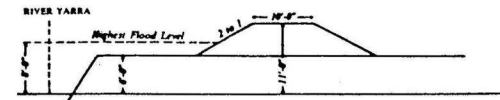
Section at K-L



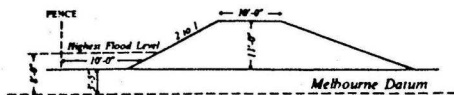
Section at A-B



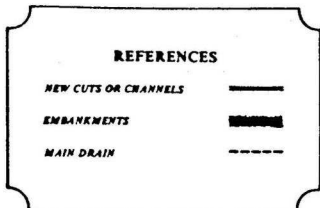
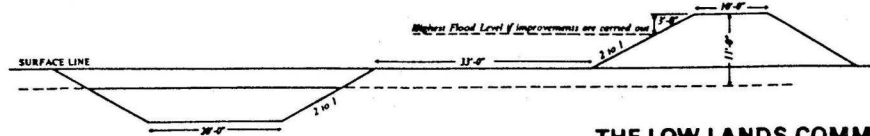
Section at C-D



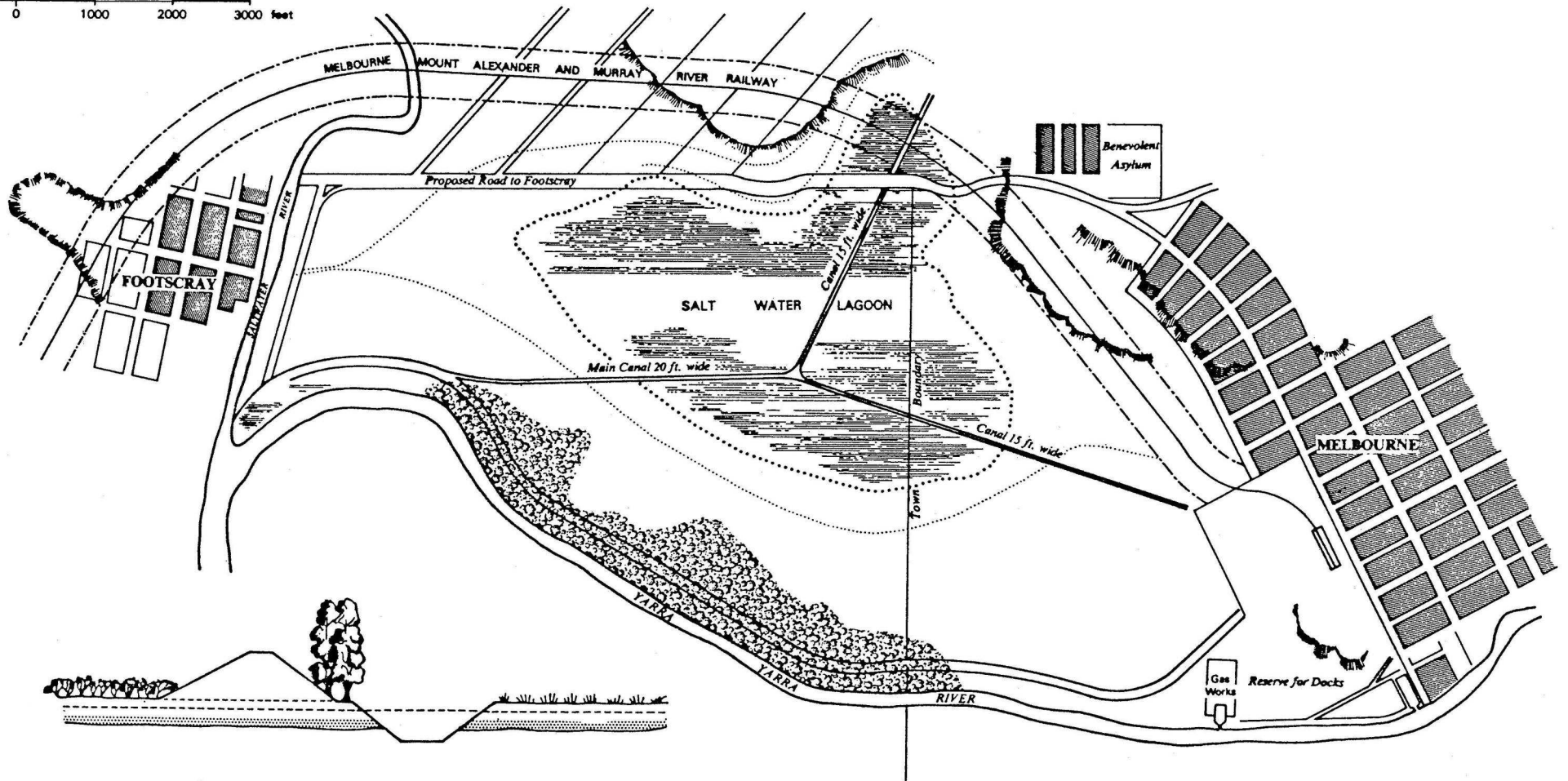
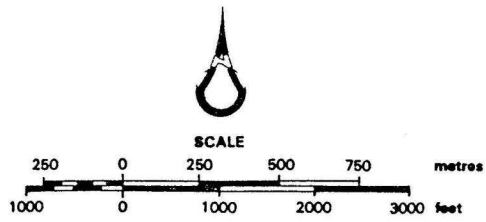
Section at E-F



Section at G-H

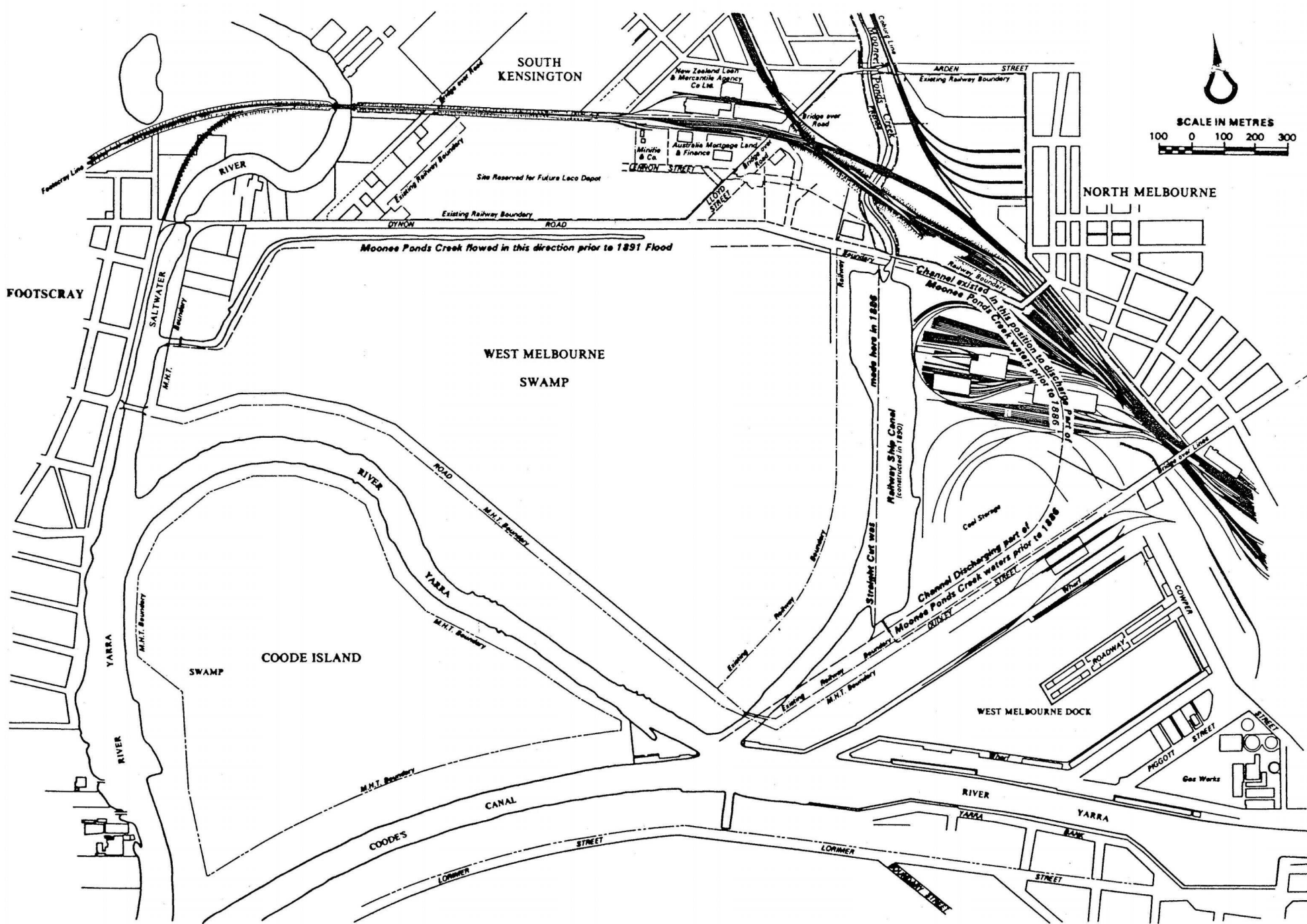


THE LOW LANDS COMMISSION'S PLAN FOR THE RECLAMATION OF THE WEST MELBOURNE SWAMP



SECTION OF EMBANKMENT AND CANAL

A. K. SMITH'S PLAN
FOR THE RECLAMATION
OF THE WEST MELBOURNE SWAMP



**PLAN OF THE LOWER YARRA,
THE RAILWAY COAL CANAL
AND THE MOONEE PONDS CHANNELS**

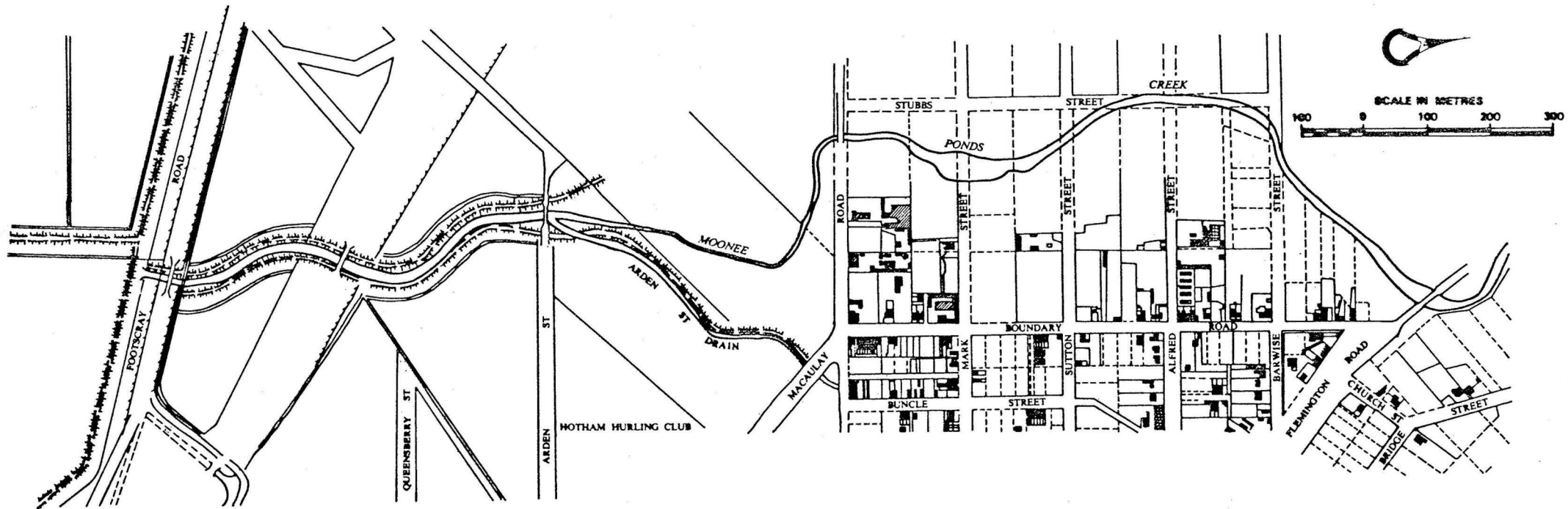
Following the completion of the Coburg line in 1884 the Public Works Department reconstructed the channel between Flemington Road and the cut below Arden Street. A wide channel was excavated (Fig 3-5) and an embankment was raised on its western side and on the eastern side between Arden Street and the cut; between Arden Street and Flemington Road the existing railway embankment was utilised. A central low-flow channel lined with bluestone pitchers was constructed along the length of the embanked section. The form of the pitched channel and the embanked sections can be seen in Plate 3-3 and in Figure 3-6. Although the photographs were taken some fifty years after construction, the general appearance of the area had probably changed very little. For most of its length the lined centre channel was 11 feet wide and the sides were lined with three rows of bluestone pitchers (Fig 3-6), although as Plate 3-3C indicates the sides of the channel between Flemington and Racecourse Roads only had a single row of pitchers in 1929. It is not known whether the original design was modified along this section, or whether two of the rows had been removed by this date. In the vicinity of the North Melbourne Railway Bridge the original plans provided for a wider stepped centre channel (Fig 3-6), but it has not been possible to establish whether this was in fact constructed.

Although the construction of the embanked channel alleviated flooding from Moonee Ponds Creek it aggravated drainage problems in the low-lying areas behind the embankments. Local floodwaters were unable to drain away when Moonee Ponds Creek was in flood, and although flap gates were installed on the drains leading into the embanked channel (Fig 3-5) they persistently malfunctioned, causing the frequent backflooding of a number of areas behind the embankments.

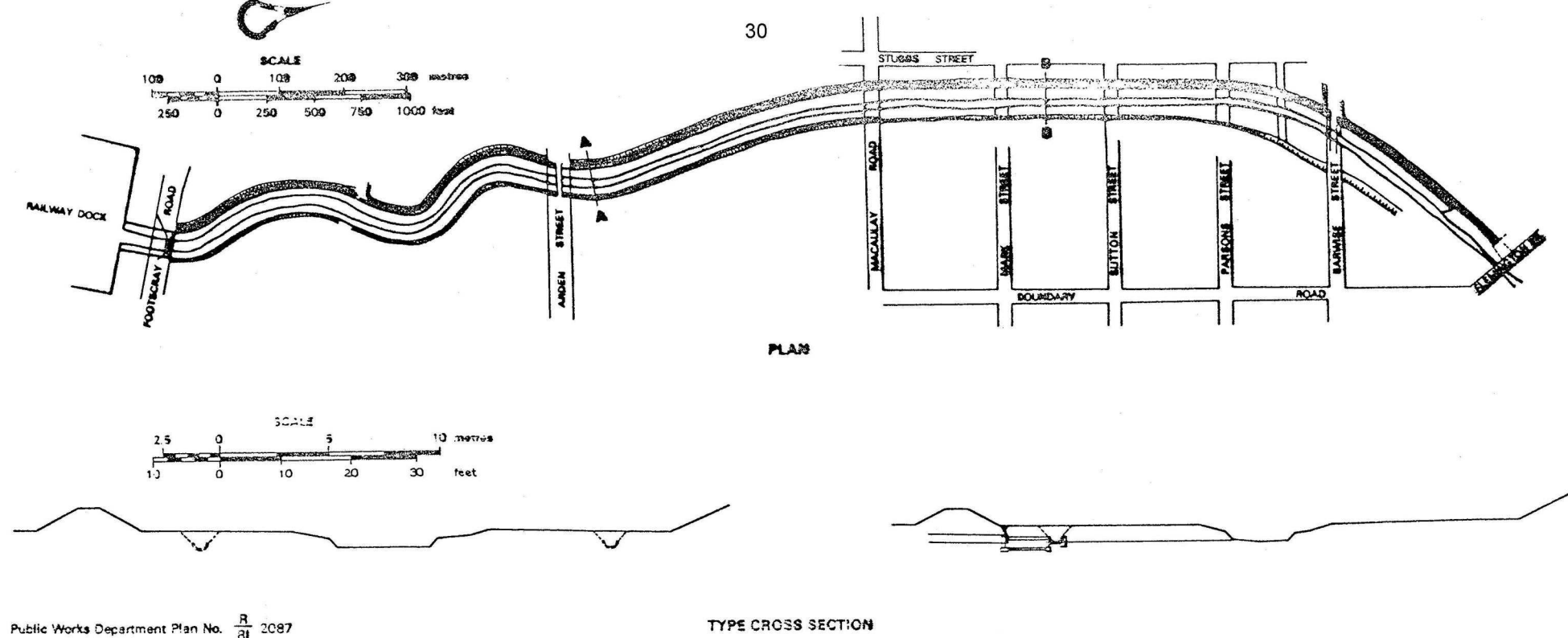
3.4.4 The New Cut and the Coal Canal. The construction of railway locomotive sheds north-west of Spencer Street Station in 1886 blocked the eastern outlet of Moonee Ponds Creek to the Yarra (Fig 3-3; Plates 3-4 A and B). By way of compensation, the Railways Department excavated a 'new cut' to the Yarra running due south from the end of the Moonee Ponds channel. At the same time, the Department improved the unlined section of the channel below Arden Street. The new cut was not, however, connected to the old channel, but was stopped so that only floodwaters above a level of 6.80 feet could discharge into it. In 1889 the Railways Department began to excavate a dock, from which coal could be unloaded, along the line of the new cut. The dock which became known as the Coal Canal, was completed in January 1891 (Fig 3-3). On the night of 12/13 July of that year a major flood along Moonee Ponds Creek breached the bank of the Coal Canal. The creek continued to flow into the Coal Canal after the flood had abated and the channel which had been cut to the Saltwater River in 1877 was abandoned and subsequently partially filled. The outlet of the creek through the Coal Canal has been maintained up to the present day, although filling has altered the original form of the Canal and dock works have considerably modified the form of the creek at the point where it joins the Yarra.

3.5 THE RECLAMATION AND DEVELOPMENT OF THE SWAMP

Fill for the reclamation of the West Melbourne Swamp was obtained from river and port improvement works. The improvement works were carried out by the Melbourne Harbor Trust which was formed by an Act of Parliament in 1876. One of the first actions of the Trust was to engage Sir John Cooke, an English engineer, to prepare a comprehensive plan for the development of Melbourne's port facilities. Sir John's report was submitted



THE OLD COURSE OF MOONEE PONDS CREEK BETWEEN FLEMINGTON ROAD AND ARDEN STREET



Public Works Department Plan No. $\frac{R}{RI}$ 2087

TYPE CROSS SECTION

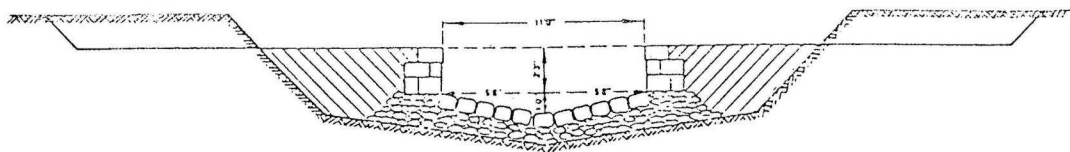
PLAN AND TYPE SECTIONS OF THE EMBANKED CHANNEL CONSTRUCTED BY THE PUBLIC WORKS DEPARTMENT

Figure 3-5

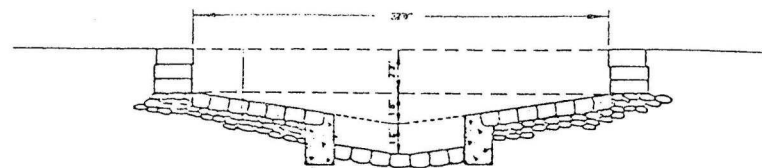
to the Trust in April 1879. He recommended that the course of the Lower Yarra should be maintained, except for the Fisherman's Bend loop (Humbug reach) which should be by-passed by a new cut (Fig 3-7), and that the river should be deepened to accommodate vessels with a 25-foot draft (Ref 9). Sir John also recommended that the south-eastern part of the West Melbourne Swamp should be developed as a dock complex. His plan was accepted, although subsequently slightly modified, and work commenced on the excavation of the new cut in 1884. The cut, which became known as the Coope Canal, was officially opened in 1887. It was estimated that some 700 000 cubic yards of earth were removed, most of which was used for the reclamation of the West Melbourne Swamp.

The excavation of the Victoria Dock (Fig 3-7) also provided a considerable volume of fill for the reclamation of the Swamp. Work on the Dock commenced in April 1889 and was completed in January 1891 (Ref 9). Some of the fill was used in the construction of a new road across the Swamp from Dudley Street to Footscray, and to raise the height of the Harbor Trust's land located between this road and the old course of the Yarra (Refs 9 and 10).

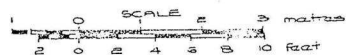
Although the Low Lands Commission had recommended that the Swamp should not be developed for residential purposes, there was considerable pressure for the extension of the city westwards beyond Spencer Street Station. In 1887 the Government appointed a Royal Commission to report on the advisability of such a development, and on the best means of connecting the city with the proposed dock complex west of Spencer Street Station. The Royal Commission recommended that the city should not be extended westwards, but a minority of three Commissioners strongly disagreed and proposed that Spencer Street Station should be relocated further north to facilitate the westward extension of the city. In addition, they proposed that some 550 acres of the Swamp should be developed for residential purposes (Fig 3-8). The Government upheld the recommendation of the Royal Commission, but only after a heated clash in Parliament between the Premier and the Leader of the Opposition, with the Leader of the Opposition arguing that the extension of the city was financially sound and in the best interests of the Colony and the Premier intimating that the vested interests of land syndicates were involved (Ref 11).



CROSS SECTION AT 4000 FEET
1800' NORTH OF WILLIAMSTOWN LINE RAILWAY BRIDGE



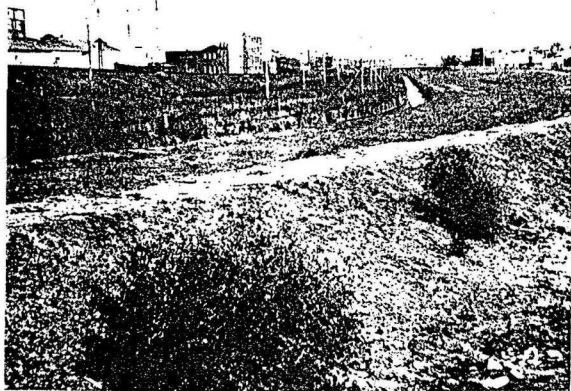
STONE PITCHING CONCRETE WALLS
NEAR RAILWAY BRIDGE NORTH MELBOURNE



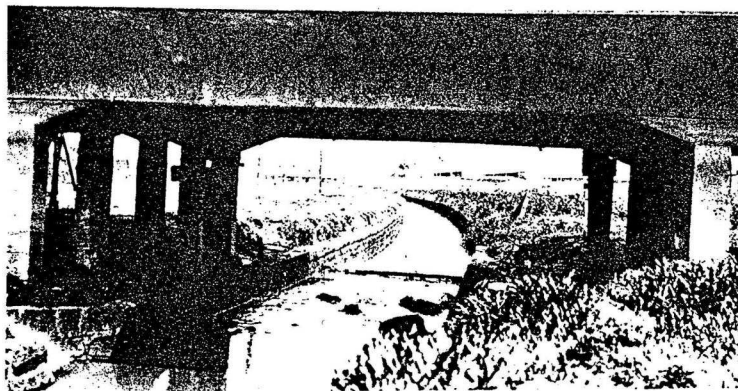
Public Works Department Plan No. $\frac{R}{24}$ 2100

TYPE SECTIONS OF THE PITCHED CENTRE CHANNEL CONSTRUCTED BY THE PUBLIC WORKS DEPARTMENT

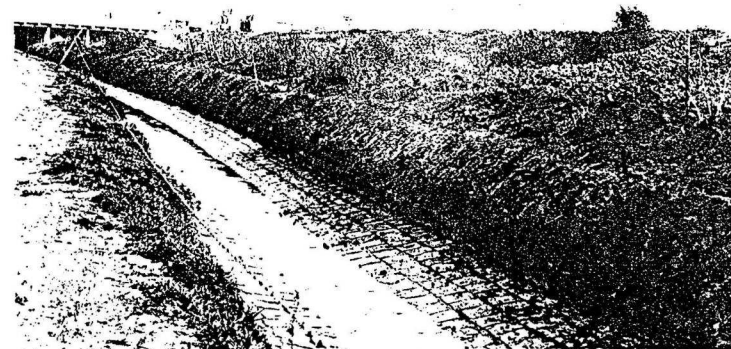
Figure 3-6



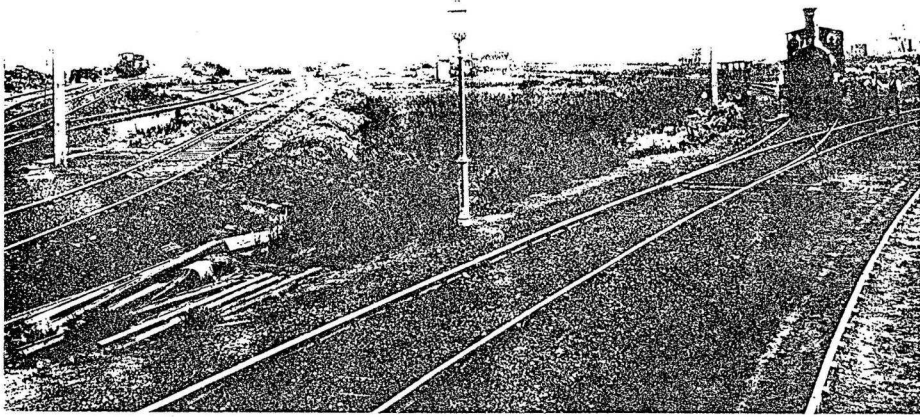
A Between Racecourse and Macaulay Roads (1936)



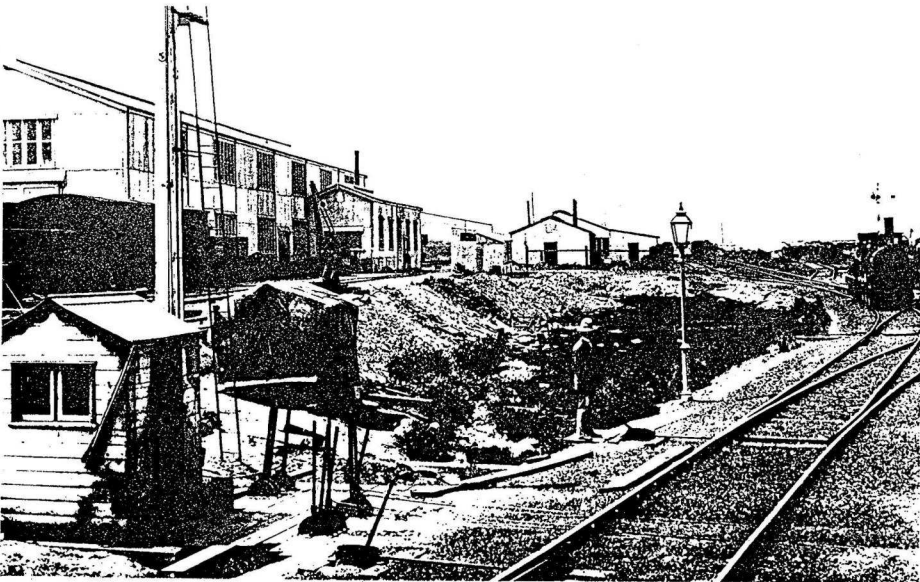
B The pitched centre channel — looking downstream from the Macaulay Road Bridge (1925)



C The pitched centre channel between Flemington Road and Racecourse Road (1929)



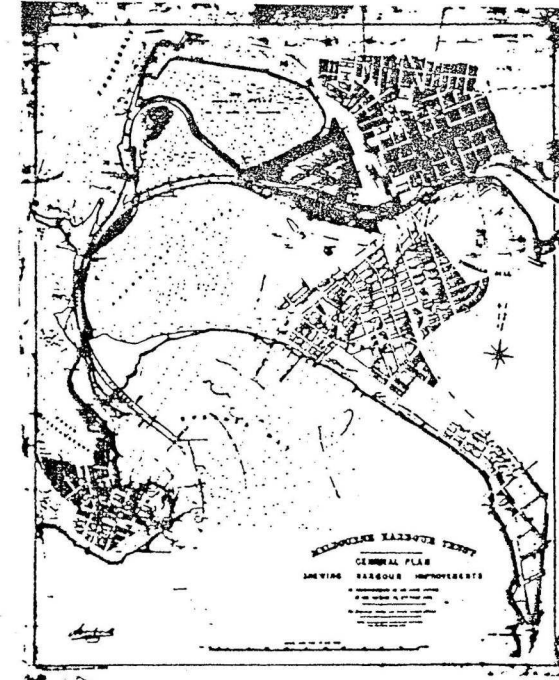
A Low-level sidings to the north-west of Spencer Street Station



B Truck Repair Shop, North Melbourne. Ten feet of fill was required to raise the buildings above the Hobson's Bay high water mark

PLATE 3-4 Land reclaimed by the Victorian Railways' Department in the eastern part of the West Melbourne Swamp

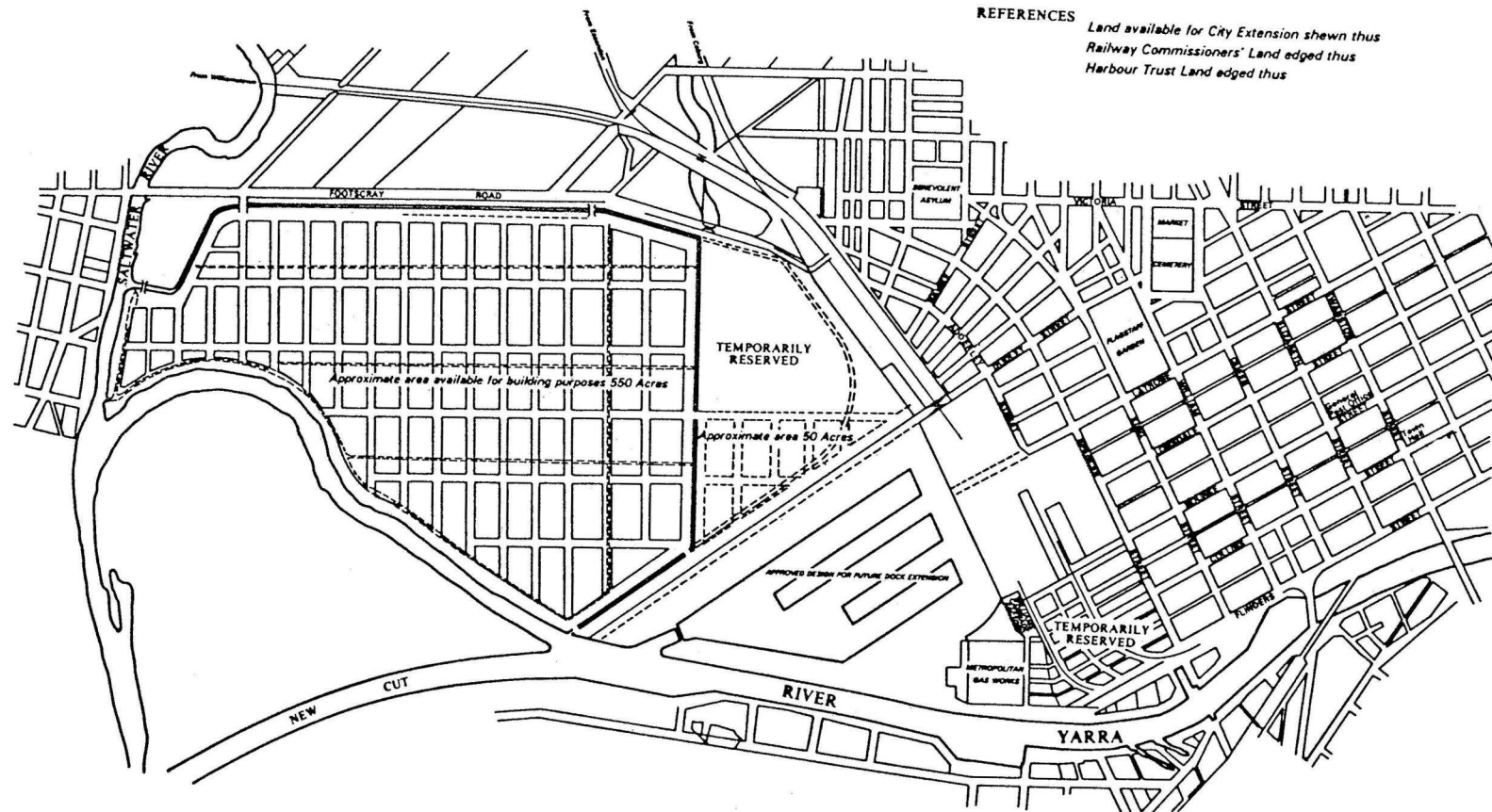
The reclamation of the Swamp was a long drawn out process that was not finally completed until the 1970s (Plates 3-4 and 3-6). In the initial stages of the project, a network of drainage ditches was dug in the eastern part of the Swamp and the land between the ditches gradually filled. Sediment dredged from the Yarra and from Hobson's Bay by the Harbor Trust was used as fill. Progress during the early decades of the twentieth century was relatively slow. The construction of the New Footscray Road in the late 1920s further compartmentalised the Swamp, but by 1931 extensive areas still remained to be filled. Even as late as 1960 much of the area remained in an undeveloped state, although by this date the area to the north of the New Footscray Road had been filled, the Dynon Road and South Dynon Freight Terminals built, the area to the north of the old course of the Yarra had been developed, and the Appleton Dock constructed. Between 1960 and 1966 the northern part of the area was further developed with the construction of the Interstate Freight Terminal, and an oil and bulk liquid storage terminal had been built along the Maribyrnong River. By 1976 the transformation of the Swamp was virtually complete (Plates 3-5 D and 3-6 D). During the decade between 1966 and 1976, the Swanston Dock complex was completed, obliterating what remained of the old course of the Yarra, the extensive Wholesale Fruit and Vegetable Market was built to the north of the New Footscray Road, and the vacant land behind the Appleton Dock was developed as a container terminal and for warehouses. The only vestige of the Swamp that now remains is a small poorly-drained, undeveloped piece of land lying between the eastern end of the Appleton Dock and Moonee Ponds Creek, although even this area is covered by fill.



SIR JOHN COODE'S PLAN FOR HARBOUR IMPROVEMENTS

Figure 3-7

— EXTENSION OF —
 THE CITY OF MELBOURNE WESTWARDS
 — ROYAL COMMISSION —
 — PLAN SUBMITTED BY CITY SURVEYOR —



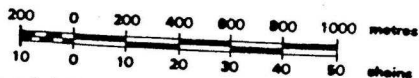
REFERENCES
 Land available for City Extension shewn thus
 Railway Commissioners' Land edged thus
 Harbour Trust Land edged thus

Photo lithographed at the Department of Lands
 and Survey Melbourne by J. Noone 2.9.87

Accompanying my evidence before the
 Royal Commission for Extension of the
 City Westwards, 29th April & 27th May 1887
 City Surveyor



SCALE



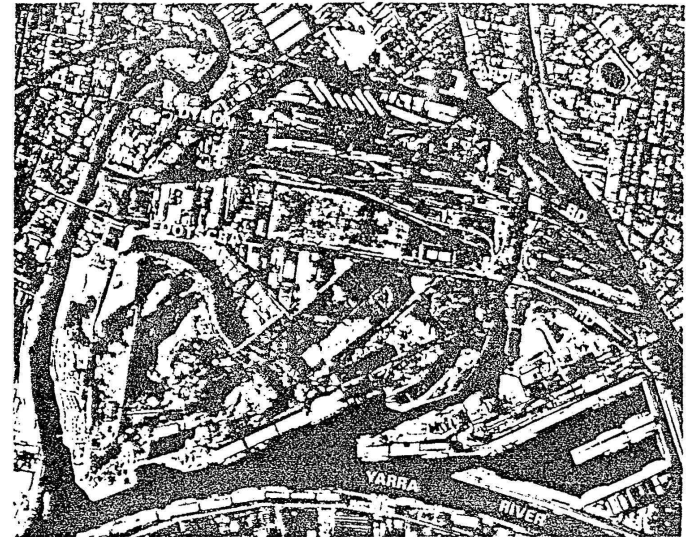
Source: Ref 12

PROPOSED PLAN FOR THE
 WESTWARD EXTENSION OF MELBOURNE

DEVELOPMENT OF THE WEST MELBOURNE SWAMP



1931



1965

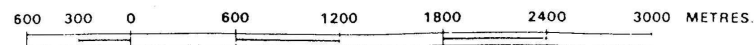


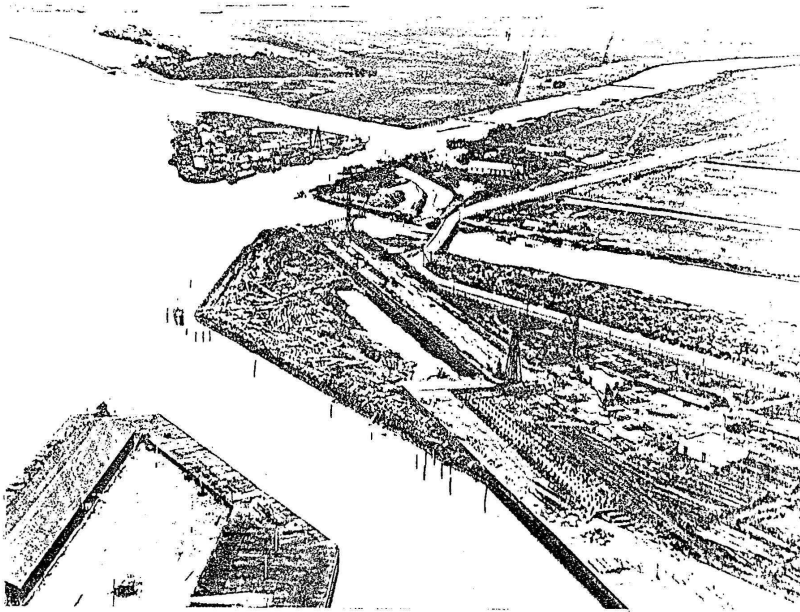
1960



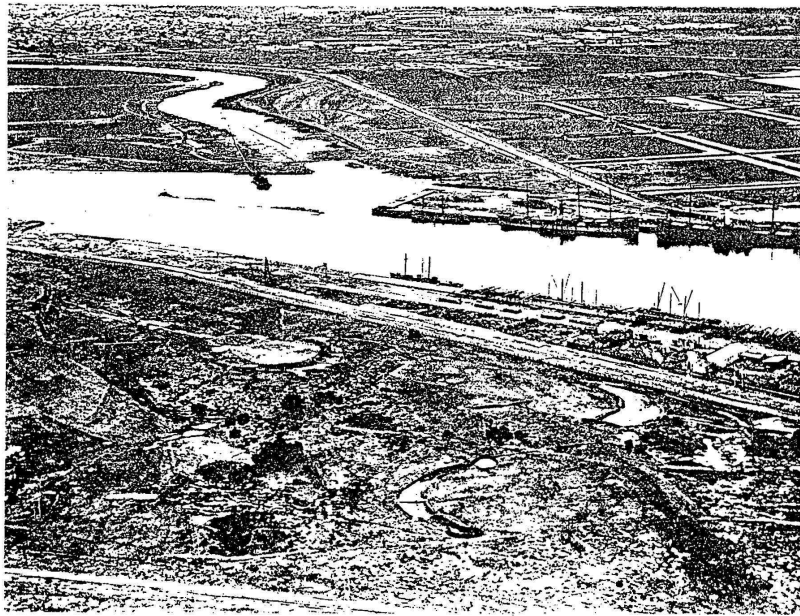
1976

Approximate Scale 1:30,000

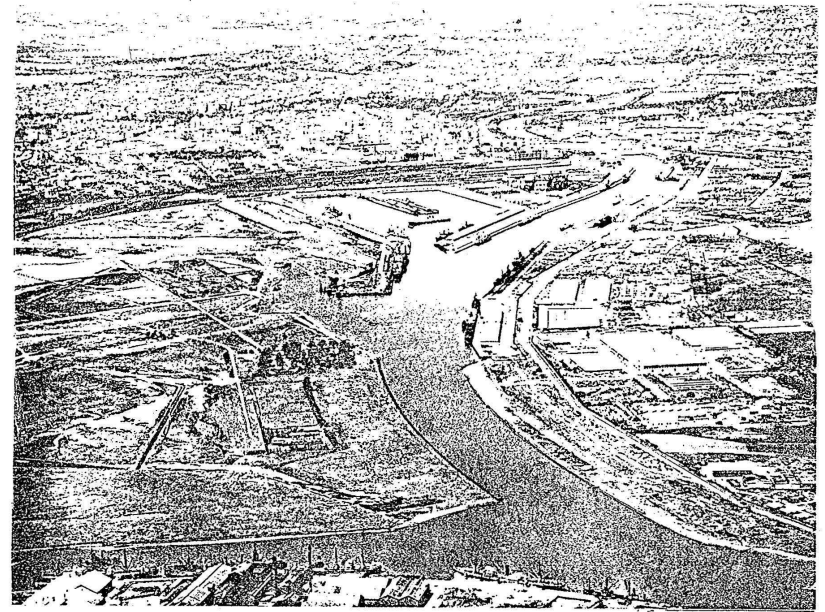




A 1925 - The old course of the Yarra can be clearly seen. Work on the extension of the Victoria Dock and the construction of the Appleton Dock is in progress in the foreground



B 1925 - The old course of the Yarra and drainage ditches in the eastern part of the Swamp. The line of the New Footscray Road can be seen to the east of the old course of the Yarra



C View across the Swamp towards the City in 1948. The clump of trees on the Swamp marks the site of the Old Quarantine Station



D The same view as in C in 1977

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