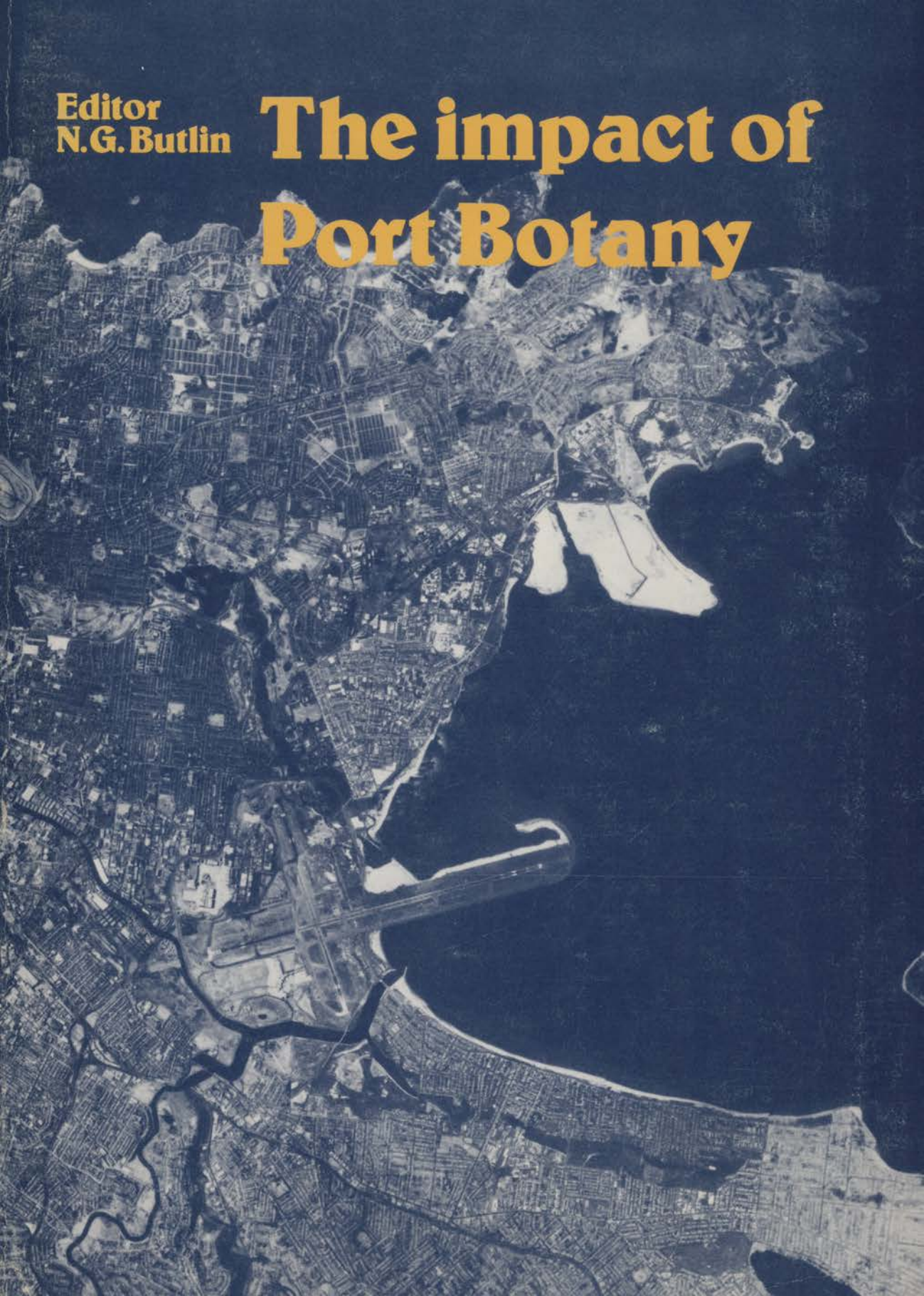
Editor
N.G. Butlin

The impact of Port Botany



The Botany Bay Project Reports
Editor: N. G. Butlin
No. 3 The impact of Port Botany

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Editor N. G. Butlin
The Australian National University

The Consultative Committee of
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Foreword

This Report has been prepared for the Botany Bay Project, an urban environmental study sponsored by the Australian Academy of Science, the Australian Academy of Humanities and the Academy of Social Sciences in Australia. It forms one of a series to be published covering a number of aspects of environmental problems and policies in Australia's oldest and largest metropolitan area.

The decision to investigate environmental policy in Australia followed an earlier joint enterprise of the three Academies concerned with problems of the management of the waters of the River Murray (*The Murray Waters*, edited by H. J. Frith and G. Sawer, 1974). It was believed that the complex nature of environmental issues provided special opportunities for collaboration among the disciplines represented in the three Academies and for a co-operative contribution to national policy. The Botany Bay region was selected for the case study as an area of past and future population growth in which there were large industrial, commercial, transport and residential complexes and in which significant natural resources were in danger of further damage from both population and economic growth. Botany Bay was also seen as the cradle of modern Australian society; as summarising the impact of successive stages of European settlement on the Australian continent.

The original concept of the Project was to attempt, through contract and staff research, to produce a series of studies covering different aspects of the urban environment and development, concentrating on the social values attached to urban environmental amenity. It was intended that these studies should aim at policy needs rather than abstract scientific analysis, and that the separate studies should be drawn together into a final single report on policy findings, relating these findings as far as possible not only to Sydney but also to other Australian urban areas.

Unfortunately, this concept had to be abandoned and the research plans greatly contracted. The Project had received an assurance of funding by the Australian Government in 1973, with the N.S.W. State Government offering access to basic information on the region. In August 1974, however, the N.S.W. Government reversed its original assurance of co-operation and, in consequence, the Australian Government reduced its funding to less than half that originally promised, and substantially reduced the period of time over which these funds were available to the Project. In some respects, at least, the Botany Bay Project was a casualty of the heightened political conflict in Australia during 1974 and 1975.

Despite this, Project contractors and staff members have carried out a considerable amount of investigation that will prove useful. Through the work of contractors, significant contributions to urban planning in New South Wales

have been made in hydrology, water chemistry, meteorology, demography and in legal studies. This work, some of which is continuing beyond the term of the Botany Bay Project, will add considerably to the understanding of environmental problems in the southern half of Sydney, and will form the basis of Reports and papers to be issued during the next year. Staff research by the Project team has been advanced to a stage at which substantial Reports will be published during 1976 on the whole Sydney system of waste management and pollution control, on manufacturing as a source of wastes and pollutants of all types, on the problem of water quality in the Botany Bay Area, on re-development plans in Botany Bay itself, and on environmental aspects of health and mortality in the region.

There are, no doubt, lessons to be drawn from this essay in government-academic co-operation in real-world enquiry. There are also many lessons to be learnt from the positive results of the Botany Bay Project investigations. It is to these positive lessons that this series of Reports directs attention. The Reports are offered in this spirit, as a contribution to the better understanding of a major social and technological problem affecting the great mass of Australians and, indeed, many other countries.

F. H. GRUEN
Chairman, Consultative Committee of the
Academy of Social Sciences in Australia,
Australian Academy of Humanities, and
Australian Academy of Science

Preface

The form taken by this volume has been deeply influenced by the fact that an inquiry into Port Botany proceeded while the research for this volume was being carried out. From its inception, however, the Botany Bay Project foresaw the need to deal with two distinguishable but interrelated problems of city environment. One was the generation of wastes and the degradation of the city environment through pollution. The other was the process of displacement of the 'natural' and social environment through the substitution of man-made structures for the existing environment — buildings, parking lots, roads and other urban assets.

This volume deals with this second type of question. Port Botany is one, but only one, of the many major displacements of the natural and social environment made in Sydney. The process of displacement in a city is as inevitable as the process of waste generation. What is at issue is whether, in the course of establishing large urban facilities, the disturbance to the environment can be constrained within reasonable limits; whether preventive design may avoid serious environmental mistakes; whether the social impact on different groups losing and gaining in environmental amenity can be kept within reasonable bounds and can be dealt with by conscious compensation for 'losses'. In the event, we have become deeply concerned with the manifest planning failure that has occurred in respect of Port Botany development, the need for a radical redesign and administrative and planning reorganisation to ensure that comparable planning errors will be less likely to occur. Because large-scale urban assets are so obviously human in origin and so durable in character, the relevance of human action — and the good or bad design behind it — is plain to see.

As in other volumes of the Botany Bay Project, this study rests on close group co-operation in research planning and in the subsequent development of chapters. Two persons, Dr C. Joy and Mr I. Alexander, laid the foundation of the empirical enquiry. They were ably supported by Mr W. Ryder and Dr H. Kendig who took up the consequential tasks and amplified the issues in assessing the impact of Port Botany. Throughout the planning, research and writing all members of the group participated actively in design of work and progressive criticism.

As Editor, I have been responsible for the attempt to put a series of papers together as an integrated, if still incomplete, assessment of the impact of Port Botany. My own drafts were exposed to round-table examination and criticism and, as a result, this volume is an agreed joint product. The primary authorship of the chapters, as available to me, is:

Chapters 1 and 2	Editor
Chapter 3	Mr I. Alexander
Chapter 4	Dr C. Joy

Chapter 5	Mr W. Ryder with Dr C. Joy
Chapter 6	Dr H. Kendig
Chapter 7	Editor
Chapter 8	Editor and Mr I. Alexander
Chapter 9	Editor

I have also to thank Dr M. Neutze and Dr D. Coward for particular contributions and, above all, for helpful criticism and comment. The research group owes much to Mrs Jean Linnett and Mrs Jan Hicks for the preparation of scripts under considerable pressure. Perhaps, above all, we owe a heavy debt to the Australian National University in providing the conditions that made this study possible.

August 1976

N. G. BUTLIN
Editor

Abbreviations:

Institutions

A.N.L. Australian National Line
A.P.M. Australian Paper Manufacturers
A.T.A.C. Air Transport Advisory Council
D.M.R. Department of Main Roads
I.C.I. Imperial Chemical Industries
L.G.A. Local Government Area
M.S.B. Maritime Services Board
O.C.L. Overseas Containers Ltd
P.E.C. Planning & Environment Commission
S.P.A. State Planning Authority

Other

A.A.D.T. Annual Average Daily Traffic
B.O.D. Biological Oxygen Demand
C.L. Container Loads
D.W.T. Dead Weight Tons
E.I.S. Environmental Impact Statement
ha hectares
P.C.U. Passenger Car Unit

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1 Introduction

The first volume of Botany Bay Project Reports dealt with the city-wide system of waste flows in Sydney, the consequential *degeneration of environmental quality* and the control policies and procedures to limit pollution. The second volume attempted to examine one major source of waste generation, manufacturing, and to relate industrial liquid solid and air-borne wastes to total waste flows and to economic and human activities in terms of particular types of manufacturing.

In this third volume, the task shifts to a consideration of the *environmental disturbances* due to large-scale man-made intrusions into the city environment. The disturbance to the environment arising from city settlement was recognised in the first volume. Here, however, we attempt to deal with one major intrusion, the development of Port Botany, in process of construction beside Sydney Airport, itself a large physical alteration of the natural and the prior city environment.

The requirement for environmental impact statements and subsequent public inquiry in respect of major development proposals, became N.S.W. Government policy in 1972. Detailed planning of Port Botany was carried out during the 1960s and the official decision to proceed with the present port was made in 1969. Hence the major construction activity of the new port escaped the environmental impact procedure, despite local pressures to have the port development investigated.

A metropolitan port, however, is a major facility that may be used for a variety of trade activities and these activities are themselves disturbances. As construction proceeded, proposals for use of the new port were made. The development of a port in Botany Bay was, in part, a recognition of the existence of oil refineries immediately around the Bay, at Kurnell and Matraville. As construction of Port Botany proceeded, proposals were made, first, for an additional refinery in the area, and subsequently for large-scale expansion of existing refineries. In addition, new developments were advanced in the piping of petroleum products from the nearby refineries and from the port itself westward across Sydney. The proposed pipeline construction was examined by the N.S.W. environmental impact procedure. Large-scale export of coal was a second proposed use requiring a coal loader facility at the port. This proposal, also, was subjected to N.S.W. conditions of environmental impact statement and inquiry. A third group of port users emerged in the form of container shipping firms. One was the Australian National Line (A.N.L.), whose potential impact was outlined under Commonwealth environmental provisions. The other scheme for a Seatainer Terminal (Overseas Containers Ltd), has not been clarified.

In addition to these, proposals for an additional oil refinery in the Botany Bay

area were considered by a Commonwealth Royal Commission. The development of additional oil refinery capacity was clearly related to the new port facilities and may properly be treated as an integral part of the total port impact. Strangely, there has been no public indication that expansion of existing refineries might be subject to environmental impact evaluation.

Approval, in principle, of the coal loader proposal and the project for a container terminal, together with the decision to proceed with the oil pipe lines, was made following these impact investigations. There were, however, several crucial weaknesses in the whole procedure:

(i) Port construction, in itself, escaped the environmental scrutiny.

(ii) The separate environmental impact statements were presented as isolated proposals in which the proponents appeared substantially to accept only one location, in Port Botany.

(iii) The proposals were considered separately and in isolation from each other. No significant attempt was made to integrate the potential environmental effects of all the proposed uses to provide an *aggregate evaluation* of the port construction and of all the proposed port uses in the context of the city system and the natural environment into which they were intruding.

(iv) The environmental inquiries in N.S.W. were carried out under the chairmanship of the Director of the State Pollution Control Commission (S.P.C.C.) and the environmental evaluation focused on specific pollution aspects that were physical and local and largely failed to consider wider and, particularly, human problems of environmental disturbance.

(v) These wider disturbances relate to the changing human use of the port hinterland as a response to port development. They extend from the general stimulus to city growth as a whole through changed land use in the metropolitan area to redevelopment of transport facilities and traffic flows that may extend over wide areas. In practice, the impact statements and inquiries concentrated on port location problems — effects on Bay water, noise of ship loading, dust at the port, etc. The broader problems, as distinct from some of the specific Port-site areas, can only be evaluated when the aggregated activities of the port can be seen in the context of the existing hinterland and wider surrounding physical and social environment.

(vi) Specifically environmental evaluation requires that the *total situation* — the whole end result — should be projected and judged. Not only is it necessary to consider the Port and its uses added together, as changes, but these changes need to be incorporated into the total surrounding hinterland situation. *The totality of the resulting environment must be evaluated.* No attempt has been made to consider the desirability or the efficiency of the total outcome.

The procedure of environmental impact investigation, as practised in N.S.W. under the Coalition Government, has been unfortunate. In essence, the port building and operating authority, the Maritime Services Board (M.S.B.), has no powers over hinterland planning and administration of land use nor is it subject to the authority of bodies concerned with this planning and administration. The

environmental inquiries were carried out by a body with some technical expertise in pollution control but no broad powers over or experience in city planning and administration. The users of the port facilities were all business organisations seeking to use a new trading facility to their advantage. In turn, the port authority has been exposed in Port Jackson to the complaints and criticism by these business users about defects in that port's facilities which were rendered progressively less adequate because of the pressures of changing technology in ship and shipping procedures and of the composition of trade arising from the activities of business users. In practice, the M.S.B. has attempted to meet the pressures of shippers and the changes in the composition of trade by seeking to relocate major types of Port Jackson activities in Botany Bay. These activities turn around bulk cargoes.

In the process, however, the M.S.B. has developed in Port Botany an expensive and large-scale facility that in itself needs evaluation. Is the M.S.B. developing a capital asset upon which a reasonable social rate of return may be expected? Is the provision of the Port unduly lavish? Does the particular location point to constraints on port expansion? Can the new port escape its restrictive geographical circumstances?

The official M.S.B. position has been that the development of the new Port would have no significant impact on the hinterland, either in terms of port construction or port use. The official inquiries that have been held have purported to sustain this view at least to the extent that the benefits of the new Port outweigh the social and environmental costs; and that the major costs are capable of adequate amelioration. This judgment needs to be investigated and reassessed.

The case for environmental impact statements and inquiries rests on the fact that major new developments have external consequences beyond the internal business operations involved. Indeed, particular enterprises may avoid costs and hence improve their profitability by passing costs to all or some of the rest of the community. New developments such as the port or proposed major port uses may, however, pass both benefits and costs to different groups so that some may gain and others lose. This conflict of interests from the 'externalities' of major development activities confuses the task of evaluating the net social advantages or disadvantages. This confusion arises particularly in the case of Port Botany in so far as its development implies the possibility of transfers of port functions from Port Jackson: there are clear regional differences between 'gainers' and 'losers'.

External effects may relate only to the *physical* environment. This is the basic assumption of N.S.W. procedure in the environmental impact statements and inquiries. Moreover, the inquiries focused on local, essentially Port-side, problems. The requirement to have these statements prepared and to evaluate them publicly rested also on the assumption that development proposals had been narrowed by their proponents to one possible choice, based on a private calculus. What was sought, therefore, was a test to ensure that there were no *undue* environmental costs, in the case of each user.

The narrow interpretation of environmental costs in N.S.W. practice derives partly from the limited technical perspective of the S.P.C.C. It also has a source in the origin of the procedure, in Australia, in development proposals in 'wilderness' conditions — i.e. where no significant human settlement existed and

where the disturbances were limited to the primitive physical environment. An additional incentive to this interpretation derived also from the parochial interests of particular disadvantaged groups, preoccupied with the specific costs to them of the local changes arising from development.

In a city situation, the essentially conservationist attitude appropriate to 'wilderness' problems have some but only limited relevance. The basic issue is the social costs imposed on and the social benefits accruing to different city residents and more generally to the population of the State. In these social costs, environmental costs are merely one component. No sensible evaluation of development proposals can be made except in terms of a social cost/benefit calculus. In the process, it is unacceptable to consider one proposal in isolation without attention to others or to alternative solutions.

These issues raise another, related question. Port development and port use implies a close association of public authorities and private business, of public and private budgets. The M.S.B. has, traditionally, operated public assets and charged for their services. Increasingly, the public and private sectors have become confused (by no means an undesirable process). Facilities at ports are increasingly being provided by private interests; private enterprises seek other assets — such as roads and railways — supplied from the public purse. As a result, the project evaluation of port construction and use requires a close attention to this interaction of public and private budgeting.

One of the peculiar features of Port Botany development is the extraordinary obscurity surrounding its capital cost, its purposes, and the public costs of social capital to be borne in hinterland development of roads, rail and other facilities along with the extent to which Port-related industrial and distribution developments in the immediate hinterland will be permitted or encouraged.

In this volume, an attempt is made, with the limited and uncertain information available, to suggest, by example, some procedures of evaluation that attempt to come to grips with

(a) the aggregation of related projects
(b) the evaluation of the total environmental effects
(c) the assessment of broader social costs and benefits
(d) the consideration of alternative solutions.

The attempts at evaluation in this study are offered essentially as indicative assessment. This disclaimer is made not primarily because of the methodological problems — which are severe — but because of the uncertainty, confusion and incompleteness of the information about proposals for Port Botany development. The absence of information and understanding is a fundamental criticism to be made of port and city planning in Sydney.

The volume does not pretend to outline the form of a full cost/benefit calculus. Such a calculus should be attempted by planning authorities to whom much more data are available than to us. Basically, we attempt to show the form of a broader and more aggregative impact statement procedure and to suggest possible lines of investigation to ameliorate the impact of Port Botany. Nevertheless, the study is not merely a methodological exercise. The simulations are designed to be realistic; and we believe that some concrete proposals of some significance and practicality emerge.

In essence, the need to make substantial use of Botany Bay as a second port in

Sydney is accepted. Although some emphasis is given, in this volume, to environmental considerations, we do not believe that these issues should be considered in isolation. On the contrary, environmental criteria should be integrated in major planning decisions as one element in the decision-making process. The heat and obstructionism that tend to develop in environmental impact inquiries arise from the fact that they occur in a last-ditch confrontation. In the case of Port Botany, this element of confrontation and local complaint has been particularly obvious. As our investigation proceeded, it appeared to us that *for reasons both of efficiency and environmental considerations*, the proposals for Port Botany were open to fundamental doubt. We believe that the Port should not be developed to its full planned stage; that its use should be significantly altered; and that the mode of interfacing the Port with the metropolitan environment needs major redesign. This judgment is partly based on environmental evaluation. But, in our view, it is supported, with at least equal strength, by basic economic and efficiency considerations. In city planning, for both economic and environmental reasons, the basic need is to avoid costly mistakes that then lead to the demand for costly remedial action.

2 Port Botany and its users

If Port Jackson has a well-earned reputation as the best harbour and the worst port in the world, it may be suggested by the cynic that N.S.W. planners are attempting to make in Botany Bay one of the best ports out of one of the worst harbours. The cynic would not be entirely right. There is a justification for substantial port development in Botany Bay. The nature of and interrelationship between the two ports of metropolitan Sydney and their connection, in turn, with the other major ports of New South Wales need to be understood.

Port Jackson and Port Botany

Port Jackson which, in terms of cargo volumes handled, is the largest Australian metropolitan port, lies roughly in the centre of the eastern perimeter of the city. The only significant river entrant into Port Jackson is the very short Parramatta River. Dense city settlement has extended around Port Jackson and up the spine of the Parramatta Valley, closely constraining possible port development and severely hampering land linkages to and from Port Jackson. These problems appear to be prominent — perhaps unduly so — in the M.S.B. planning of Port Botany and its layout. Because of these land-use constraints, Sydney has much less freedom in redevelopment and up-grading of its port facilities at Port Jackson than has Melbourne or Brisbane where more opportunities for transfer out of the most densely settled metropolitan areas are available. (The redevelopment of the Port of London was similarly achieved by transfer out of the main city area.)

At the same time, while the main port facilities were established and extended close to the Central Business District, Port Jackson has faced four main changes to which it has not made effective response. First, changes in ship and shipping technology have led to much larger ships in world trade, with drafts commonly exceeding the capacity of Port Jackson. Ironically, the deep water and stable harbour floor of Port Jackson have become an obstacle to serving large, deep-draft ships. Second, the progressive containerisation of a great deal of what was formerly 'general cargo' has required new wharf handling procedures and the demand for container terminal space on a scale not readily available immediately adjacent to Port Jackson. Third, there has been a large increase in bulk cargoes inwards and outwards for which neither land transit nor wharf space or deep-water loading can easily be provided. These bulk cargoes include, in particular, oil and petrochemicals, cement, paper, salt, grain, timber, coal and steel. Fourth, the spread of the city westward and particularly the relocation of a great deal of the manufacturing activity of the city has shifted the direction of the land movement of a great deal of the inward and outward cargo.

Increasingly, Port Jackson is poorly located to serve the needs of the growing city.

Pressed by changes in shipping and ship technology and by the composition of trade, Port Jackson's ability to service the city and its wider N.S.W. hinterland has been hamstrung by a city land-use planning failure that has allowed the port to become and to remain tightly enclosed by city settlement. Either drastic hinterland redevelopment and expensive berth and port reconstruction is necessary at Port Jackson or supplementary port facilities are needed in Botany Bay.

This combination of changes has led to the rising protest of near-by residents in opposition to the transit of cargoes, particularly through residential areas, and has generated a powerful political pressure to transfer the transport disturbance elsewhere. This protest has grown as the residential status of more important areas has altered, particularly in Balmain. One other characteristic of Sydney Harbour, as a whole, may also be noted in this political context. Serving as a rough dividing area between the wealthier northern and poorer southern halves of Sydney, the Harbour has become, in the past twenty years, a yachting playground of major recreational importance, particularly to the wealthier half of the city's residents.

The decision to develop Port Botany was made by the N.S.W. Coalition Government in 1969, following several years of preparatory planning by the M.S.B. Lacking control over port hinterland development but with generous legal authority over relevant navigable waters, the M.S.B. appears to have planned a new port to provide for petroleum imports and bulk cargo users. This original conception was developed when containerisation was in its infancy. The rapid growth of container traffic led to the inclusion of these cargoes in Port Botany development plans. But the potentiality for a transfer of *all* types of cargoes out of Port Jackson and into Botany Bay was raised in 1974 when the then President of the M.S.B. was reported as announcing that 'Having satisfied the requirements for land by industries handling bulk cargoes, . . . the board is now in the advanced stages of planning which could provide for the construction of *general cargo* and container facilities in the port to cater for the expansion of these trades "as necessary".[1] The forecast of both general cargoes and containers in addition to bulk cargoes implied consideration of the development of Port Botany as a full-range port and not merely a bulk cargo and oil port. Nevertheless, admitted port uses have been confined to bulk cargoes including containers.

The choice of Port Botany as a supplement to and a possible substitute for Port Jackson implied the selection of a very shallow, sandy and open bay with berths and wharf sites approximately ten kilometres south of the main area of Port Jackson. The new Port was, therefore, placed closer to the southeastern corner of the city, about nine kilometres in a straight line from the centre of the Central Business District, about twenty-five kilometres from the major western centres of Parramatta and Liverpool and some forty kilometres from the growth area of Campbelltown. In all cases, of course, the effective transport distances were much longer and all were across densely settled city areas. In this respect Sydney faces a problem, the difficulty of which has rarely been confronted by other cities in relocating and up-grading its port facilities. *The city's port cannot*

move towards the main locations of city expansion. Indeed, the immediate port hinterland is the Botany Local Government Area, containing some of the oldest of Sydney's manufacturing and representing, on past trends, a declining factory employment area. The problem of the port, in this respect, is highlighted by the port development of San Francisco where relocation and up-grading was possible, within a densely-settled Bay area, by placing the new port closer to major users.

Beyond the Botany L.G.A. lies a larger hinterland of old manufacturing stretching from the Cooks River Valley east towards the Central Business District. Here, on past trends, the new Port has behind it a stagnant manufacturing complex in terms of employment and, moreover, one that is poorly served for road transport of cargoes through it to the growing west. To the south of the Bay (at Kurnell), and on the northern edge (at Matraville) are located two of Sydney's oil refineries whose presence and prospective development are an integral part of the new Port development.

Greatly aggravating the land connection, the Port was designed to link with Sydney Airport located on the northeast corner of and projecting into Botany Bay. The Airport serves as a major physical barrier to land movement of goods westwards and southwest and to new road construction to the west. But because the Airport is a large generator of land traffic moving both west and north, it established a major potential conflict of traffic flow for the Port; and increased traffic generation from the Port may hasten increased congestion for Airport land movements.

There is a low-grade single-track railroad as a spur line extending from Marrickville to the new Port area, ending at the now (largely) inoperative Bunnerong Power Station. This line was constructed in 1921, and was provided with sufficient right-of-way to permit double-tracking. Apart from this low-grade line, the road system of the immediate Port Botany hinterland is relatively poor and is ill-equipped to service a port set towards the southeast corner of the city and serving a metropolis moving increasingly westward.

The powers of the port planning, construction and operating authority, the M.S.B., are limited to the navigable waters and the immediate port area. Within these limits, these powers are virtually complete. In the case of Port Botany, these powers are extensible because the shallow bay required (and permitted) deep dredging to accommodate large ships and provided the opportunity for extensive land reclamation within the Bay. In the full design of Port Botany, reclamation of some 600 hectares (1,500 acres) is envisaged. Nevertheless, the Board's authority over newly-reclaimed port land had little compensation for its lack of broader land-use planning responsibilities. Equally, however, the Board's total authority over the Port area meant that it could design Port facilities for types of users without effective constraint by land-use planning authorities. The Board's view was that the Port would have no significant land-use impact. This reflected its limited statutory responsibility and its powerful statutory rights to the use of navigable waters. It also reflected the Board's lack of appreciation of potential claimants for Port use. *Most of the problems that have arisen with respect to Port Botany derive from the statutory obstacles to the integration of the Port with its hinterland and with the whole of metropolitan land-use planning.* Some of these problems may take the form of

extravagant design possibly reflecting the Board's determination not to be tightly constrained again. If this interpretation has any validity it would imply a serious misunderstanding of the problems faced by Port users from this new southeasterly location.

The planned configuration and the immediate hinterland of the proposed Port in its full development is shown in Fig II(i). The Port is designed to be constructed in four stages. Stages I and II, yielding some 220 hectares of land reclaimed by dredging, have been proceeded with and are nearing completion. In terms of reclaimed land, therefore, almost two-thirds of the reclamation remains to be done to carry through Stages III and IV. The major physical disturbance to the Bay appears, however, to have been made by Stages I and II,

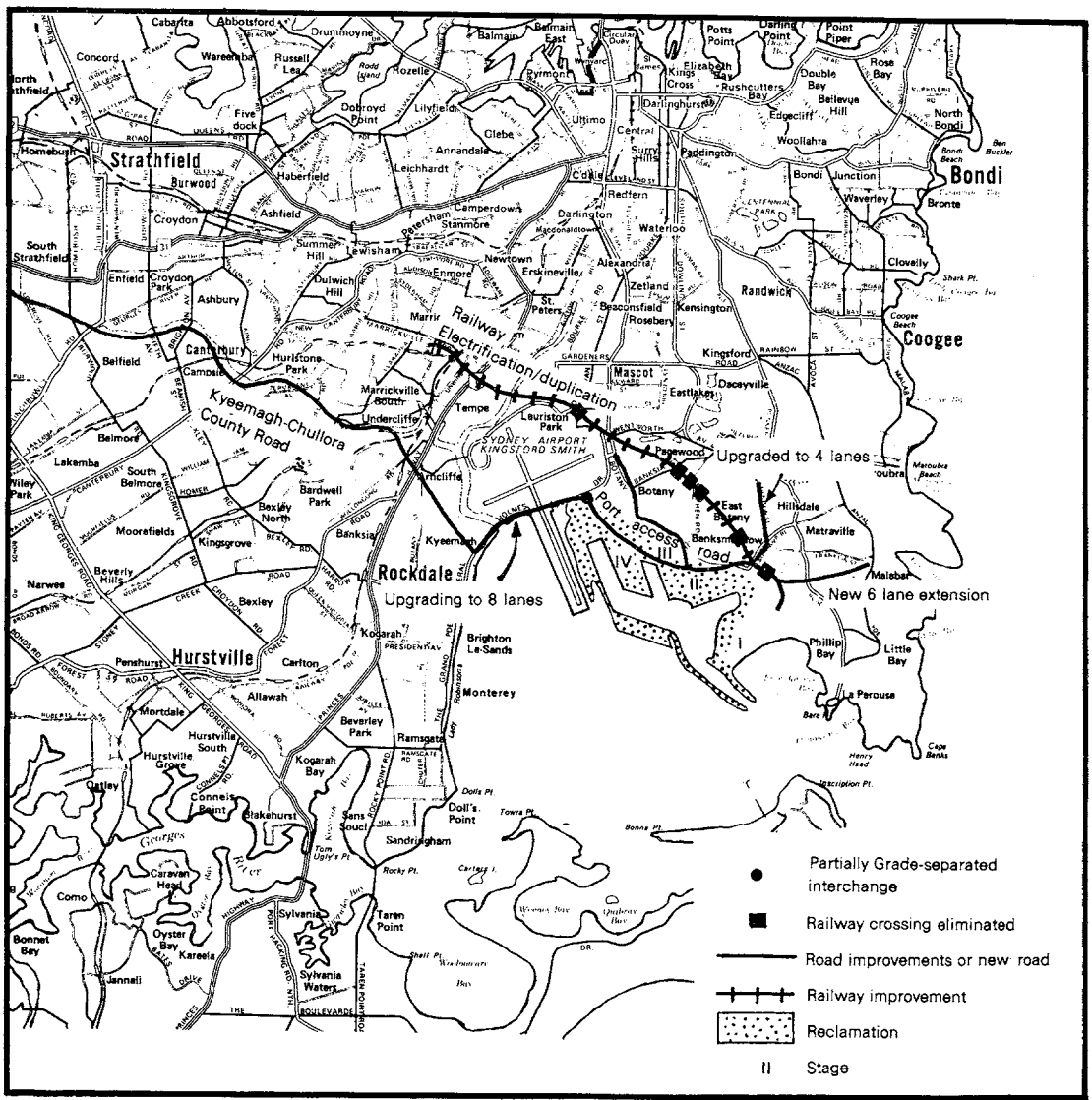

Fig.II (i) Port development and transport proposal

requiring deep dredging of the mouth of the Bay and the construction of an off-shore breakwater to protect the shipping berths and wharf works. The reclaimed land, the wharves, the breakwater, combined with the extension of the Sydney Airport north-south runway, make up a massive intrusion into Botany Bay.

Because they preceded the N.S.W. legislation requiring environmental impact statements and inquiry, none of these works was exposed to public examination until the New South Wales Labor Government, in 1976, appointed the Port Botany Inquiry. Until public concern over the M.S.B.'s intentions became vocal, very little information about prospective uses and users of the Port was available. Even now, a great deal of uncertainty surrounds possible Port functions and hence a great deal of obscurity remains over the possible range and degree of impact of the Port on the Bay and on the city hinterland.

In the circumstances, it is of some importance to present, in some detail, the publicly available information on proposed users of Port Botany. Before doing so, however, a few comments are necessary on other facilities. (We omit here reference to the small oil port on the southern side of Botany Bay.) In practice, Port Botany development is only one component in a massive up-grading of New South Wales port facilities outside Sydney, with outlays required at several hundred million dollars.[2] Unfortunately, no clear statement of expenditure proposals has been made. In 1974, the planned port development at Botany Bay was forecast (possibly to cover Stages I-IV) at $85-100 million. At the same time, major deepening of Port Kembla (some eighty kilometres south of Port Jackson) was then in progress at a cost of $22 millions, and plans in preparation for foreshore development at Port Kembla accounting for an additional $40-$50 millions. Subsequently,[3] the construction of a $55 millions deep-water coal loader at Port Kembla was announced compared with the alleged capital cost of the Botany Bay coal loader at approximately $25 millions. To the north of Sydney (some one hundred kilometres), Newcastle was also being examined for major expansion, beginning with a graving dock at $23 millions and leading to a massive development including provision for a large coal loading facility, the cost of which was not then specified. It is improbable that the total planned commitment, in 1974 prices, could have fallen short of $300 millions, a figure that would be considerably increased by subsequent inflation. It should be noted that these forecasts do not include very large consequential public outlays on ancillary developments, particularly in road and rail transport. It is plain that the development of Port Botany cannot and should not be considered in isolation from these other proposals, one of which could, in fact, require larger outlays than those envisaged in Botany Bay and either of which might partly substitute more effectively for Port Botany.

The port expansion at Newcastle and Port Kembla reflects, in part, the scale of these settlements and particularly the significance of heavy industry in them. But there is one major factor common to all three port proposals. The concentrated grouping of New South Wales population on the 200-odd kilometre strip from Newcastle through Sydney to Port Kembla lies in close association with the massive coal resources of New South Wales. Sydney, in fact, lies in the centre of this rich coal reserve. With the past rapid growth of coal exports to Japan, combined with expected demand from Western Europe and the great

increase in the size of coal ships, one large special pressure on port development to service this coal trade has been felt in all three areas.

If Port Botany is only one among three N.S.W. ports said to be designed for large-scale coal export, N.S.W. is only one Australian State planning for coal export expansion. Queensland, in particular, anticipates a large increase in coal exports to Japan and to Western Europe over the balance of the century. The projections that have been made by the separate States of this coal trade expansion invite some searching investigation into the reliability of their estimates.

What is at issue is the likely yield to investment in coal export facilities along the eastern seaboard and the plausibility of the assumed shares of each State in the future coal trade. Australian States have a long record of separately assuming that each can monopolise an available market and, in consequence, of generating a marked over-supply of supporting capital facilities.

But the decision-making process is not merely one of separate State assessments. There is also the consequence of mixing private and public decision making and the opportunities for the private sector to pass costs to the public sector — in effect to be subsidised through public capital outlays. These costs may include environmental costs; but they are likely to extend considerably beyond these to claims on public capital and current budgets. The *full* costs and benefits for *both* the public and private sectors need to be assessed, and the assessment discounted in the light of the uncertainties involved for large-scale capital projects before any resolution can be reached on the acceptability of particular development projects. It is not merely a question of environmental impact statements and investigations. These are only part of the total social assessment necessary. Accordingly, this investigation makes some attempt to evaluate the economic and not only the environmental rationality of proposals to develop coal export facilities. It is almost incredible, in the circumstances, that not only has Port Botany development been examined in public inquiries in isolation, and not only specific uses of the port have, themselves, been examined separately from each other and essentially only in terms of their attractiveness to the private sector, but also that Sydney planning has proceeded as if the city were an enclave.

Proposed uses and users of Port Botany

The development of Port Botany provides, as indicated above, for two possibilities: the transfer of cargo movements currently passing through Port Jackson; and the handling of trade expansion. These possibilities, combined with incomplete disclosure of planning intentions, make it impossible to be certain of the proposed uses and users of Port Botany. They also make it difficult to determine confidently the *realistic* effects in relation to Port Botany and Port Jackson. After consideration and on reflection, one may well doubt whether some are intended to be taken seriously. In the following outline, the announced proponents for port use have been taken from M.S.B. and other public announcements. These relate entirely to Stages I and II of the new Port. If these are uncertain, the potential uses of the planned Stages III and IV can be

only speculative. Nevertheless, it is possible to project certain types of more probable uses of the last two stages of the Port, if they are developed. It is important, in the circumstances, to separate the first and last two stages of development; and, in particular, to take account of the impact of Stages III and IV, if carried out, and not merely to consider Stages I and II. Throughout, we have attempted to distinguish Stages I and II from Stages III and IV.

Stages I and II

The proposed uses of these two stages, as announced by early 1976, include several distinct storage and shipping facilities, all catering to bulk cargo and container operations. The proposals and their layout in the Stages I and II areas of Port Botany are shown in Fig. II(ii). They cover a coal loading complex, bulk liquid terminals, crude oil tanker berth, dry bulk areas and container terminals. Although the M.S.B. was reported, in 1974, to be at the advanced planning stage to include general cargo handling facilities, these have not been publicly specified for the first two stages. It is assumed, for present purposes, that general cargo operations in Port Botany, if ever allowed, will be deferred until the completion of Stages III and IV.

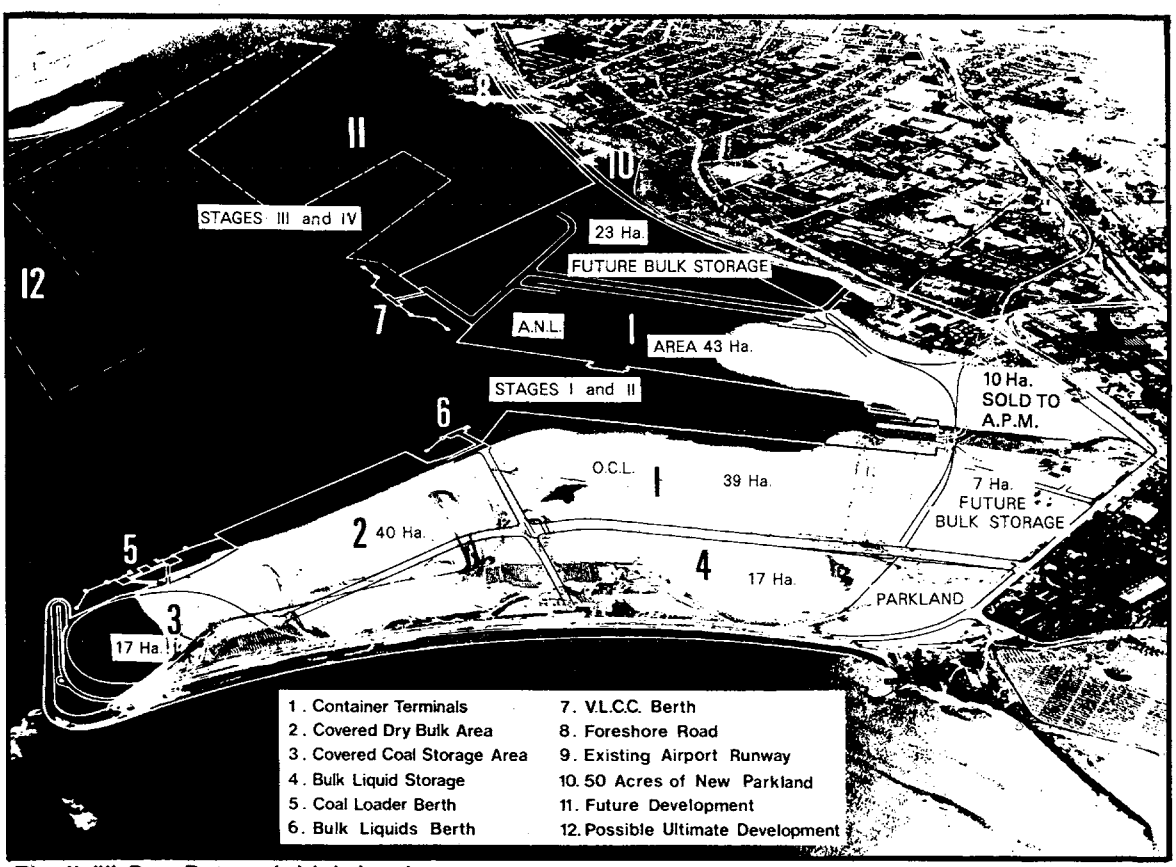

Fig. II (ii) Port Botany initial development

The coal loader The construction of this facility (matching other existing and planned developments at Port Kembla and Newcastle) was proposed jointly by a consortium of three mining companies, Coalex, Austen and Butta and Clutha, with contracts to export coal from the western and southwest coal fields. The western flow is from the Hartley-Lithgow field (about one hundred kilometres from Sydney) and the southwest flow from the Burragorang Valley-Tahmoor area (about seventy kilometres from Sydney). Trunk railway lines pass through or near these areas and focus in Sydney. Despite the distances of some mines from rail, it is said that all the coal would be railed to the Port from the mines. This statement needs to be carefully tested.

The proposed coal loader is designed to provide greatly expanded capacity compared with the small and constricted loader in Port Jackson, at Balmain. Moreover, the new berth provided allows the use of the large ships expected to participate in the trade. The loader is proposed ultimately to comprise thirty-five storage bins (they have been variously described) and to be capable of handling 25 million tonnes of coal annually. It was assigned an area of seventeen hectares at the southern end of the Stage I reclaimed area (Fig. II(ii)), and is designed to be encircled by a rail loop to facilitate unloading. In this design, the loader would absorb a large and very valuable part of Stages I and II of Port Botany.

It was proposed that loading at Balmain would be ended and the existing small volumes of coal exported through Port Jackson would be transferred under this scheme. The implication is that the Port Jackson trade would be terminated. The proponents referred to the possibility that the loader might become government property, raising doubts as to whether the public or private sector would eventually bear the capital costs. The proponents expected to have the loader in operation by 1978-9.

Bulk liquid terminals The storage area is proposed to occupy an area of about seventeen hectares and according to latest statements to cater for 'bulk liquid chemicals the sea transport of which has increased dramatically in recent years'.[4] Earlier publications also refer to petroleum cargoes,[5] and the M.S.B. states in a submission to the recent inquiry into Australian ports[6] that the new facilities will 'permit the transfer to Botany Bay of the major portion of petrochemical cargoes now being handled in Port Jackson'. This would presumably allow the phasing out of petrol storage facilities on the northern shores of Sydney Harbour between North Sydney and Lane Cove. The facility is expected to be operative during 1976, and will connect to the proposed Botany-Clyde pipeline transferring oil to Silverwater in the west of Sydney.

Crude oil tanker berth This facility has not been as definitely planned as others in early stages, being referred to in recent documents as only a 'possible construction by 1980'.[7] However, as the berth is designed to cater for very large crude carriers of up to 200,000 tonnes DWT which are coming into increasing use in the oil trade, it seems likely to be seen as a desirable part of the early Port development. The berth would presumably also connect to the proposed Botany-Clyde oil pipeline via the bulk liquid storage area, and to the submarine pipeline to Kurnell.

Dry bulk areas These three areas might occupy up to seventy hectares of reclaimed land. Uses have not been specified in detail, but according to the

M.S.B. it is likely that the areas would allow for (covered) storage of *imports* such as cement clinker, concrete aggregates, sand, paper pellets and salt, with initial facilities capable of being operative by 1979-80. (The possibility of grain, steel and timber traffic was raised in early M.S.B. publications. However, these appear more likely candidates for Stage III and IV developments than for the initial dry bulk areas (see below).)

It is not entirely clear how much of the traffic to and from the bulk area would be 'new trade' and how much would be transferred from Port Jackson. However the M.S.B. 'envisage that dry bulk cargoes will, in the main be directed from Port Jackson into . . . Botany Bay'.[8] The paper imports — which seem likely to go largely to the A.P.M. mill (which is located behind the new Port and produces packaging paper and cardboards to satisfy 30 per cent of the national market), and other nearby mills — are likely to replace current imports from Port Jackson. According to the Sydney Area Transportation Study, the salt imports — currently handled unsatisfactorily by dumping on to the Pyrmont wharfs — will also be transferred from Port Jackson rather than be simply new cargo at Port Botany. Thus, initially at least, most of the bulk cargo through Botany Bay would be replacing that currently handled through Port Jackson. The existing dry bulk facilities at Port Jackson are regarded as outdated and inefficient.

Container terminals Two container terminals are currently planned to be operative by 1978-81. One is proposed to be operated by Australian National Lines (A.N.L.), the other by Overseas Containers Ltd (the Seatainer Terminal).

A.N.L. Terminal would cover forty-two hectares and become operative between 1978 and 1980. It is proposed in the form of three shipping berths and five container stacking areas with road and rail access. Rail transport is proposed to be used for overseas containers designed for multiple shippers/consignees — that is, for containers whose contents are to be delivered to several different customers. These containers are proposed to be railed to depots for unpacking and delivery. However this rail traffic is estimated at only 20 per cent of the total predicted container traffic, and hence it is envisaged that 80 per cent would be handled by road. This dominant road flow would go to individual industrial and commercial users and to freight forwarding depots. The depots handling coastal and Tasmanian traffic are expected to concentrate in areas near the Port. This is an important secondary land-use impact of the terminal. Completion of the terminal would most probably mean the phasing out of the Mort Bay and Glebe Island operations of A.N.L.: these terminals currently deal with 40 per cent of container traffic handled in Port Jackson. However, continued use of the Glebe Island facilities by other users would seem likely as 'there would not be sufficient capacity to remove all container operations from Port Jackson'.[9] In addition, it has been indicated by A.N.L. that the container traffic generated by the terminal could ultimately be twice 1980 levels. This presumably assumes extension of the terminal into areas earmarked for future reclamation (Stages III and IV) or resumption of activity in Port Jackson.

The Seatainer Terminal has not yet had any detailed plans published for it, and no environmental impact statement has been prepared. However, M.S.B. information indicates that it could be expected to be of similar size and capacity as the A.N.L. Terminal — as shown in Fig. II(ii). This terminal is proposed to be

fully operative by 1981, and would release container berths currently occupied by Seatainers at White Bay, Balmain. Again these would probably be reoccupied by other users as trade increases, though it is difficult to forecast the rate at which this reoccupation might occur.

Stages III and IV

Original M.S.B. plans and the 1968 Regional Outline Plan called for the construction of a 'port-industrial complex' within the reclaimed area. However, according to latest statements from the Department of Public Works 'there will be no manufacturing at the port'. If this is to be believed the 380 hectares of land involved in Stages III and IV seem likely to be devoted to further container and bulk cargo storage and transit areas; it may also include 'general cargo'. This judgment is supported by the S.A.T.S. study which forecasts a tripling of Sydney port traffic between 1971 and 2000. Even though S.A.T.S. population projections may need to be scaled down, it is to be expected that a very large increase in Sydney's trade will occur. On the S.A.T.S. projection, it is suggested that some twenty new longshore berths and thirteen to fifteen new cellular container berths will be required to handle such growth, and S.A.T.S. recommends provision of such facilities in the Botany Bay reclamation area. With forecasts of such large-scale growth in cargo traffic it seems likely that the 'no manufacturing' undertaking *at* the Port will be adhered to in the reclaimed area.

The likely mix of cargo facilities to be provided under Stages III and IV is impossible to forecast with any confidence at this stage. However, based on M.S.B. and S.A.T.S. data, the following are possible candidates; even though some may not be accommodated, it is essential to evaluate their possible impact (our subsequent discussion does not rest heavily on the specific listing):

(i) seven to nine container berths (in addition to the six in Stages I and II)

(ii) a new bulk wheat terminal equipped to handle very large bulk carriers which may soon come into use. Although the capacity of the Balmain terminal has recently been expanded by 50 per cent and is adequate in the short term, it cannot handle the larger ships. Thus the Grain Elevators Board, the authority responsible for wheat loading facilities 'has indicated that it will plan to expand to Botany Bay'.[10]

(iii) a timber import wharf, to replace the existing unsatisfactory arrangements at Glebe Island which require double handling of timber. The wharf would also cater for a large expected growth in timber imports.

(iv) general cargo facilities. It must not be assumed that containerisation will necessarily continue to attract this trade.

The timing of these last two stages of port construction is not yet finalised; according to the M.S.B., development 'will be in accordance with the trade demands'. However it should be noted that considerable reclamation would be required to provide the new foreshore road proposed to connect Stages I and II to General Holmes Drive. This road is said to be scheduled for completion 'before the terminal is operational' (i.e. 1978). If this is to be achieved, the necessary reclamation for the road may mark the start of Stages III and IV.

Social capital facilities induced by Port Botany

The construction of facilities at the Port does not exhaust the total capital asset requirements. These linked assets may be regarded as part of the impact of the Port on the hinterland. It is useful to identify, at this stage, those that have so far been proposed. It should be stressed that a great deal of uncertainty surrounds this matter. The obscurity in the social (publicly budgeted) assets is another basic weakness in the planning procedure and an elementary barrier to any attempt at a proper cost/benefit calculus. But their identification, so far as possible, is relevant also because they help to clarify the mix of public and private commitments and of the locations of and directions along which the major land impact of the Port might be expected.

In making this identification, two basic reservations need to be made. First, not all the land developments specified are needed solely by the Port although some major ones are. In any specific cost/benefit assessment of port development, some attempt to unscramble the various influences of port and other induced change is needed. On the other hand, the impact of the Port particularly in environmental terms cannot be sensibly considered in isolation from other activities. Second, and perhaps most important, the presence of Sydney Airport adjacent to Port Botany and its prospective physical expansion and growth of traffic must be kept in the forefront of any environmental and transport planning. The effect of the Airport on land transport as distinct from air traffic, greatly confuses the appraisal of the Port impact and increases the costs of meeting its land-use needs. Again the point is fundamental that isolated consideration of Port Botany without taking the Airport into account would be meaningless. The total resulting situation has to be identified and evaluated.

The essential facilities that have been proposed as related to the Port's development are transport facilities of both road and rail. It should be noted however, that A.N.L., in 1976 claimed that 'not enough information is known about other port development to draw conclusions about total port traffic' and that 'D.M.R. plans . . . have yet to be finalised'.[11] This may represent special pleading on the part of A.N.L., though obscurity about plans and possibilities is painfully obvious. Based on available plans and statements, the following list (also illustrated in Figure II(i)) appears relatively certain as Port-related, given existing proponents of Port use.

(1) *Duplication and electrification of the Marrickville-Botany railway* to cater for coal and other port traffic. Expected completion 1978. Construction of spur lines to service the container terminals and coal loader complete by 1977 and 1979 respectively.

(2) *Elimination of level crossings* at Beauchamp, Botany and Stephen Roads and Banksia Street by 1977. Elimination of the General Holmes Drive crossings at a later date.

(3) *Construction of a new Port access road* (four lanes, with provision for six) from a partially grade-separated interchange with General Holmes Drive, just east of the Airport runway underpass, along the reclaimed Bay foreshore to the intersection of Botany and Beauchamp Roads.

(4) *Construction of a new arterial road* from General Holmes Drive, Kyeemagh via a county road reservation, largely along the Cooks River Valley to Chullora. The road is planned as an 8-lane highway to the Princes Highway,

thence six lanes to Chullora, and is scheduled for completion by 1985 at a cost of $32.8 millions.[12]

(5) *Construction of a 4-lane extension of Chelmsford Street* south to the Port Road and upgrading of Chelmsford Street to four lanes. (This link is now 'under review'.)

(6) *Upgrading to four lanes of Beauchamp Road-Denison Street and Wentworth Avenue* to Southern Cross Drive.

(7) *Upgrading of Bumborah Port Road and Botany Road* to Port Entrance to four lanes.

(8) *Extension of Botany Road east to Anzac Parade via Burke Street.* Initially three lanes, ultimately six lanes, via a country road reservation.

(9) *Possible, but unspecified upgrading of Botany Road* from Beauchamp Road to Wentworth Avenue (four lanes?).

3 Land use and employment linkages

The Botany Bay port development will have major economic and social impacts upon the entire Sydney region and beyond it. In this chapter, attention is concentrated on the part of the metropolitan area that may be demarcated as the immediate 'Port hinterland'. As shown in Fig. III(i), this is taken to be made up of the areas bordering the Bay — that is Botany, Randwick and Rockdale local government areas and the bayside portion of Sutherland, together with the adjoining industrial areas of South Sydney and Marrickville.

The economic and social impact of the Port within these limits may be assessed first in terms of employment and land use. From these, other assessments flow and they will be used in later chapters. It is a major failing of the environmental impact assessments to date and of the more general and basic port and regional planning that this type of linkage of the Port with its hinterland has hardly been dealt with. The tendency is to assume that some jobs will be created in the area and that these are necessarily advantages. The matter is by no means as simple as this. It is essential to investigate the manner in which changes in employment are associated with changes in land use; the type of new land use induced; the possible social disturbances; and changes in environmental quality that follow. This chapter presents some indicative assessment of these changes.

In what follows, the assessment proceeds in two steps:

(a) The existing, known proposals for use of Stages I and II of the Port are accepted and provide the basis of estimating projections of probable employment and land-use changes in some detail as at 1985.

(b) An approximate extrapolation, beyond 1985, of the projected employment and land-use effects of Stages I and II in order to estimate the impact of Stages III and IV is suggested. It will be obvious that, uncertain as the estimates for Stages I and II must be in the absence of explicit data on proposed Port use, there must be a much higher order of error in this extrapolation.

Existing land use and employment

In order to evaluate these land-use and employment effects, it is necessary to establish the current pre-port nature of land use and employment in the port hinterland and to identify the basic trends in the area. The land use in the port hinterland is mixed. On the northern side of the Bay, large amounts of space are occupied by specific major public facilities, particularly Sydney Airport, Prince Henry Hospital and Long Bay Gaol. Recreation areas are also prominent, including the Lakes golf course to the north and, on a larger scale, the park areas southeast of the Port, extending towards Cape Banks (see Fig. III(ii)).

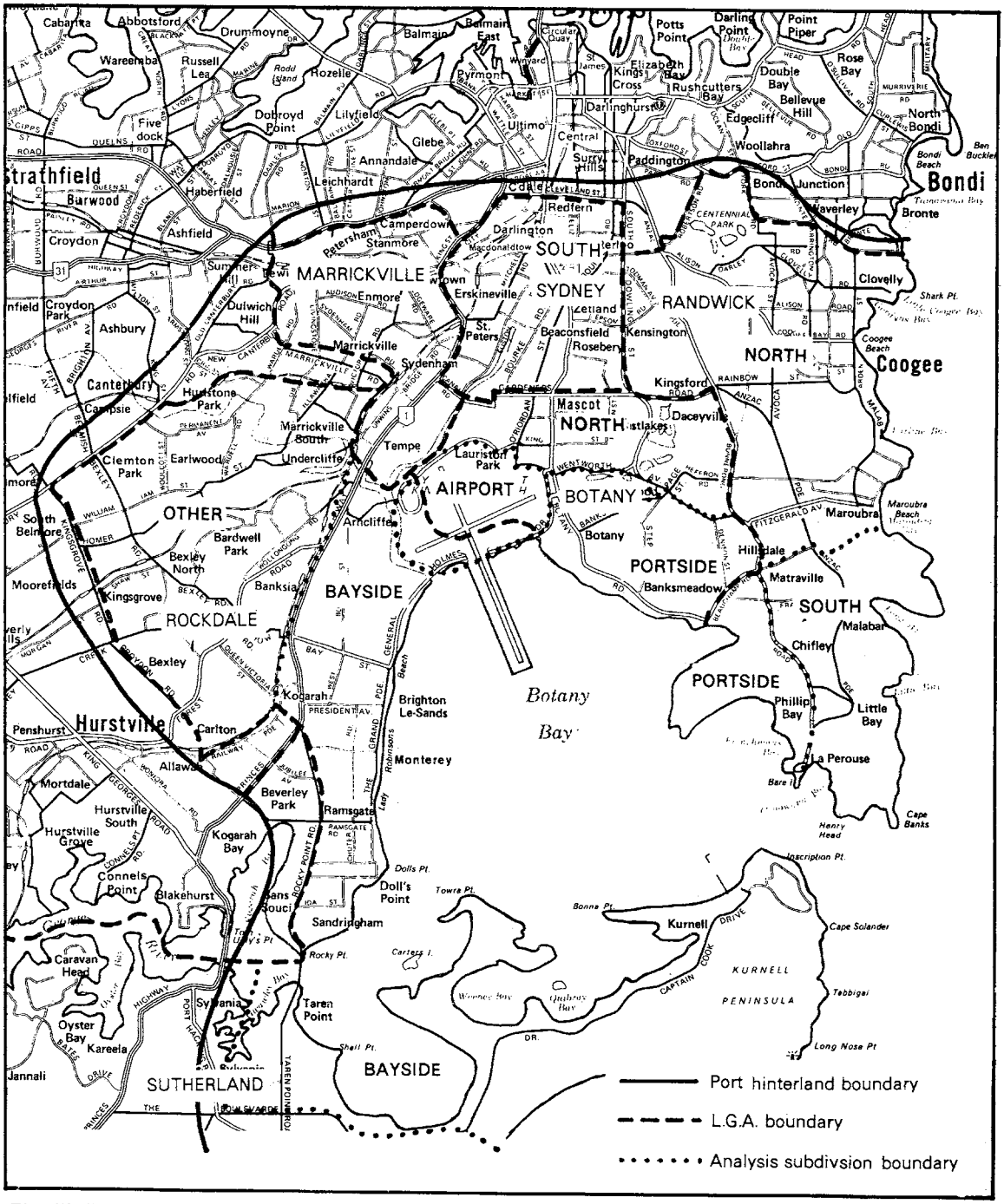

Fig. III (i) Port Botany hinterland

Residential land use accounts for a large amount of space. Some 500,000 people, nearly 20 per cent of the metropolitan population, live in the hinterland area. In the areas to the north and northwest of the port many dwellings are adjacent to factories and commercial structures.

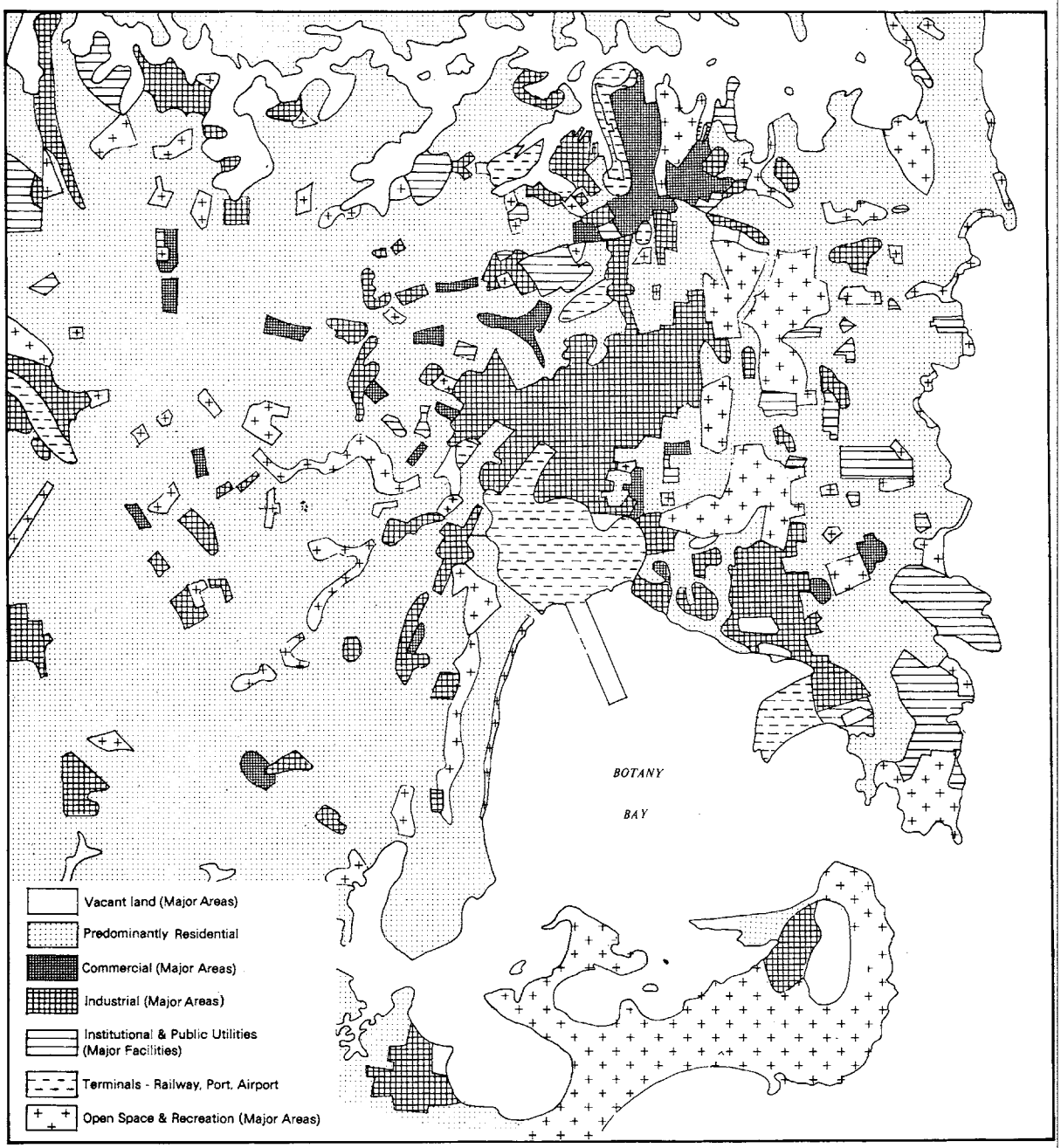

Fig. III (ii) Botany Region - generalised land use

Economic activity in this hinterland is dominated by industrial land use. Large areas of factory activity exist to the north of the Port in South Sydney, Marrickville, Mascot and Botany. Another industrial complex is developing from Kurnell to Captain Cook Bridge on the southside of the Bay. These industrial areas currently account for about 20 per cent of the Sydney region's total stock of land zoned for industry.[1]

These areas are occupied by manufacturing and by distribution-related activities of wholesaling, storage and transport. Employment generated by this mix of activities provides 25 per cent of these types of jobs in Sydney. It also accounted for approximately 20 per cent of all the distribution, transport and storage jobs in Sydney.

Areas bordering the Bay house several large factories. Two of Sydney's refineries lie beside the Bay. Caltex at Kurnell and Total in Matraville. There are large chemical works, particularly I.C.I., and the major works of Australian Paper Manufacturers. Several of these establishments currently rely on the import of goods through Port Jackson or oil through Botany Bay. A few are owners of relatively large land areas with potential for expansion and some have announced plans for expansion, particularly the two refineries.

In general, the hinterland is an area of long-established industrial activity, with a considerable number of old enterprises. In the area immediately beside the Port, in Botany, industrial employment has been declining for a considerable time, with the transfer of establishments westward. Further to the north and northwest, manufacturing employment has tended to be stagnant, also reflecting a long-term shift of industry to the west. Only to the south of the Bay is industrial employment activity expanding.

The westward shift of many industrial establishments and the availability of unused land zoned for industrial use have contributed to allow the growth of storage, warehousing and transport establishments in the hinterland. These distribution-related activities have been supplanting manufacturing in the hinterland as a whole and adding to the inducement of factories to relocate on the metropolitan periphery.

The stock of *vacant* industrial land in the hinterland is relatively small, particularly in the section north of the Bay (see Fig. III(ii)). It is the expansion of these distribution-related activities that is mainly responsible for the continued absorption of this stock. These activities have been attracted into the hinterland because of its strategic proximity to Sydney Airport, to the inner Sydney industrial and commercial area and to Port Jackson. Prominent among them have been freight terminals which are strongly concentrated in the Botany-South Sydney area (Fig. III(iii)).

The hinterland is responsible for a high proportion of Sydney's freight movement which is clearly related to these activities. This has considerable significance for road congestion and air pollution problems in Sydney. There is some evidence that the present position is affected, to some extent, by the expectation of Port Botany's development, with some establishments moving into the area in advance of Port completion.

Table III-(1) summarises the employment and activity composition of the hinterland. As will be seen, 91,700 persons were employed in manufacturing, 18,200 in wholesaling, 14,700 in transport and storage and 81,700 in 'other'

activities in 1971. Between 1961 and 1971, manufacturing employment fell by some 5,000 persons and distribution-related employment increased by approximately 14,000. The dominant manufacturing activities are now in food, paper, chemicals and petroleum.

The potential for change in available land

Despite the decline in industrial employment in the hinterland, the amount of industrial-zoned land actually used has increased, in the past decade, by some 500 hectares.[2] This increase is accounted for by:

(a) increased space per industrial worker
(b) expansion of certain industrial establishments in Botany such as Australian Paper Manufacturers, Davis Gelatine, Imperial Chemical Industries
(c) most importantly, by the use of industrial-zoned land by wholesaling, transport and storage.

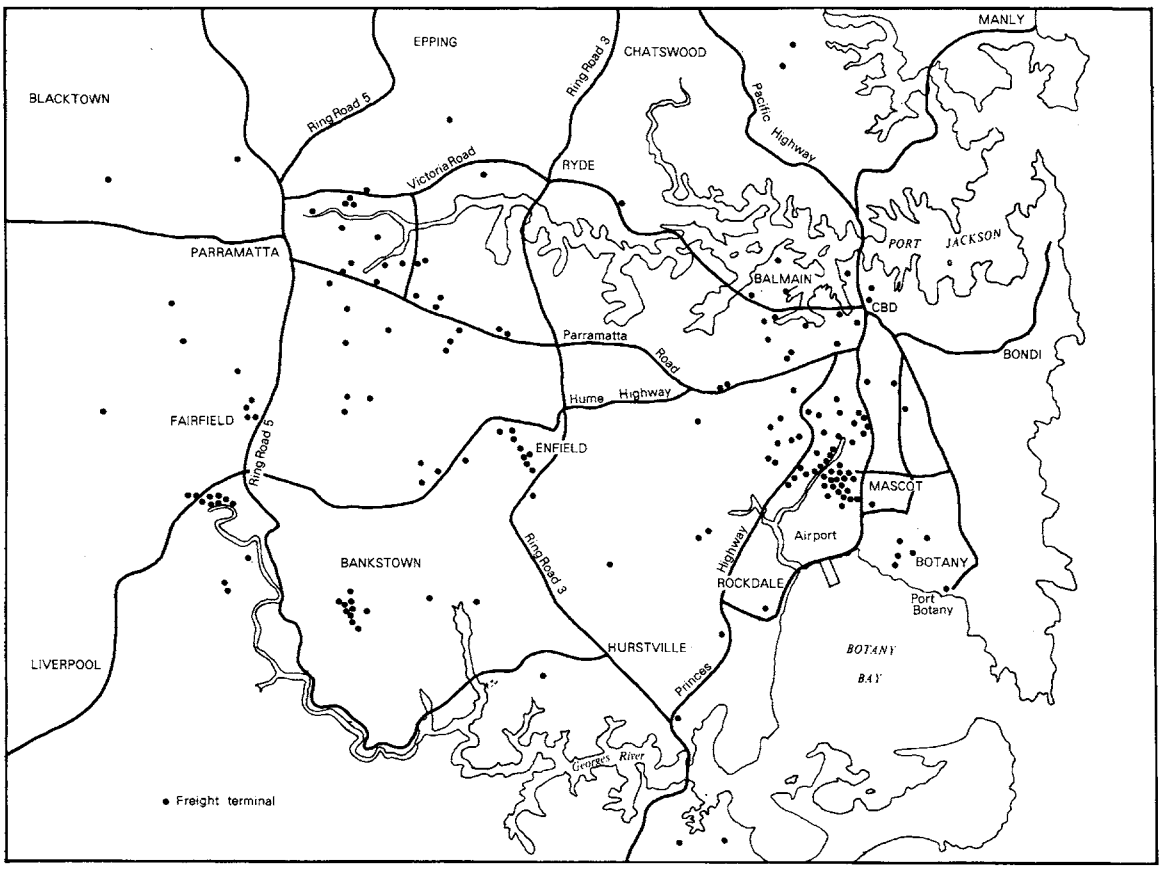

Fig. III (iii) Location of road freight transfer terminals in Sydney, 1971

Table III-(1) Employment structure, 1961-71: Botany Port hinterland ('000)

L.G.A.		Manufacturing		Wholesaling		Transport/ storage		Other		Total	
		1961	1971	1961	1971	1961	1971	1961	1971	1961	1971
Botany		13.5	13.7	1.4	3.0	5.9	6.9	3.6	6.3	24.4	29.9
Randwick		6.8	6.3	0.6	0.9	1.2	1.2	11.9	17.6	19.8	26.0
South Sydney*		48.2	38.6	4.4	8.6	2.9	3.9	15.1	18.5	70.6	69.6
Marrickville		17.0	17.6	1.8	3.3	0.1	1.4	9.5	12.1	28.4	34.4
Rockdale		6.9	7.4	0.3	1.3	0.6	0.7	5.8	9.2	13.6	18.6
Sutherland		4.0	8.1	0.3	1.1	0.6	0.6	8.6	18.0	13.5	27.8
Total		96.4	91.7	8.8	18.2	11.3	14.7	54.5	81.7	170.3	206.3
% Sydney Statistical Division		28.5	26.5	15.1	20.1	17.6	20.3	10.7	11.7	17.6	17.1
Other Sydney Statistical Division	No.	242.1	254.2	49.1	72.2	52.9	54.8	452.6	617.7	796.7	998.9
	%	71.5	74.5	84.9	79.9	82.4	79.7	89.3	88.3	82.4	82.9
Total Sydney Statistical Division	No.	338.5	345.9	57.9	90.4	64.2	69.5	507.1	699.4	967.0	1205.2
	%	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

*1961 figures are estimates for equivalent South Sydney area: the South Sydney municipality was created in 1968.
Source: Calculated from analysis of Journey to Work Data, *Census*, 1961 and 1971.

By 1972, the only areas where any substantial amounts of vacant industrial land remained were in Sutherland and Botany. According to the Australian Institute of Urban Studies,[3] these two L.G.As. had over 900 hectares of unused industrial land. About half (400 hectares) was freestanding, that is was unattached to existing establishments. The balance was attached to existing establishments. On average rates of absorption of industrial land in Sydney as a whole, this vacant land could expect in 'normal' (non-port) circumstances to be fully absorbed over the next ten years. However, once an area becomes mainly settled, absorption rates tend to fall and a more realistic period for substantially complete absorption could, perhaps, be put at forty years.

Table III-(2) shows the details of unused industrial land. The main opportunities for expansion of activities on zoned vacant industrial land are in Botany and Sutherland. Even in Botany, however, the freestanding vacant industrial land is limited. Beyond these limits, the question of rezoning arises.

Table III-(3) shows the composition of land usage in more detail. The two candidates for rezoning to industrial use are essentially 'residential' and 'vacant and non-urban'. In practice, the latter has limited use because of terrain, water and other physical restrictions. The land use most at risk from industrial rezoning is residential land. Despite the heavy industrialisation of much of the hinterland, a large portion of the total land is zoned for dwellings. Leaving aside the special features of Sutherland, the proportion of residential land ranges from one-fifth to well over one-half the total in each L.G.A.

Amongst this residential land, the sections that might be most exposed to risk are those located closest the industry. In South Botany, for example, several

areas of this residential development are literally surrounded by industrial activity (Fig. III(ii)). These residential areas, most immediately those close to the Port, are likely to be prime targets for industrial expansion. Development, in these circumstances, implies not merely 'industrial growth' and 'more jobs' but disturbance that could include the up-rooting of present residents.

Table III-(2) Unused industrial land by L.G.A., Botany Port hinterland (ha.)

	Free-standing	Attached	Other	Total unused	Total zoned	% used
Botany	65.2	132.4	14.5	212.1	473.5	55.2
Randwick	3.2	11.8	5.8	20.8	72.5	71.4
South Sydney	0.8	14.2	43.8	58.8	487.6	88.1
Marrickville	0.4	12.6	18.2	31.2	207.4	84.9
Rockdale	2.4	6.1	17.4	25.9	91.1	71.6
Sutherland	342.2	240.9	14.2	597.3	837.1	28.6
Total	414.2	418.0	113.9	946.1	2169.2	56.4
Other Botany Region	1513.2	543.6	105.8	2162.6	4271.0	49.4
Other Sydney Statistical Division	2069.4	741.9	279.0	3090.3	3982.8	22.4
Total Sydney Statistical Division	3996.8	1703.5	498.7	6199.0	10423.0	40.5

Source: Australian Institute of Urban Studies, *Industrial Land in Sydney*, Appendices K and Q.

Table III-(3) Land usage, Port Botany hinterland (1971)

Zone	Retail		Office and commercial		Residential		Industrial		Other*		Vacant and non-urban		Total	
	Area†	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%
Botany Port-side‡	3	0.4	6	0.9	154	22.3	266	38.7	144	20.9	115	16.7	688	100.0
Airport	—	—	1	0.2	2	0.3	1	0.2	576	98.5	5	0.8	585	100.0
North	7	0.9	20	2.5	303	37.2	156	19.1	291	35.7	37	4.5	814	100.0
Randwick Port-side	3	0.8	1	0.3	74	19.7	179	47.6	97	25.7	22	5.9	376	100.0
South	4	0.0	—	—	279	0.3	3	0.0	587	54.8	198	18.5	1,071	100.0
North	65	3.1	—	—	1,122	52.9	27	1.3	850	40.1	55	2.6	2,119	100.0
South Sydney	6	0.6	28	2.6	275	25.4	559	51.7	196	18.1	17	1.6	1,081	100.0
Marrickville	41	2.5	45	2.7	980	58.6	187	11.1	406	24.2	12	0.7	1,671	100.0
Rockdale														
Bayside	24	1.9	7	0.5	699	54.7	82	6.4	353	27.6	113	8.9	1,278	100.0
Other	31	2.6	7	0.6	861	71.0	37	3.1	203	16.7	73	6.0	1,212	100.0
Sutherland														
Bayside	2	0.1	3	0.1	150	5.4	339	12.1	1,637	58.5	668	23.9	2,799	100.0
Total	186	1.4	118	0.9	4,899	35.7	1,836	13.4	5,340	39.0	1,315	9.6	13,694	100.0
Total Syd. Stat. Div.	1,313	0.3	725	0.2	56,794	14.6	8,107	2.1	114,786	29.7	204,637	52.9	386,362	100.0

*Includes institutional, recreational and public areas.
†Areas in hectares.
‡For definition of areas, see Figure III(i).
Source: Sydney Area Transportation Study (S.A.T.S.) Tabulation (supplied to Urban Research Unit, A.N.U.), and *Sydney Area Transportation Study*, Volume I, Base Year Data p.11-6.

The pressure for Port-induced change in land use

In view of the remarkable confusion about the purposes of the Port and the types of proposed uses, the identification of the Port-induced changes cannot be very certain. It is extraordinary that planning and actual construction of the Port and subsequently acceptance, in principle, of proposed uses could proceed without evaluating these land-use changes and the consequential social costs of land development. Here, we accept the outline of the projected uses of Stages I and II and leave aside any possible variation that might limit the land-use impact. Possible amelioration is considered elsewhere in this report. *It will be seen that the dominant effects on land use derive from containers and bulk cargoes* other than coal. The (dubious) coal proposals have little impact on land use, apart from the proposed use of rail facilities.

In 1968, the Sydney Region Outline Plan suggested that, following the completion of the Port, large areas to the north and south of Botany Bay might be set aside for industry.[4] The port was originally conceived as a Port-industrial development complex. This concept has subsequently been formally denied. Indeed, in the recently drawn up Interim Development Order of Botany L.G.A. (where land use is likely to be most strongly affected by the Port),[5] no provision is made for any substantial industrial expansion. This is the ultimate of confusion.

Port-induced impacts on land use towards accelerated manufacturing and industrial-type development in the Port Botany area are likely to be associated with the type of cargo to be handled at the Port *and the manner of handling and distributing these from the Port*. These cargoes are predominantly containers, bulk liquid cargo, dry bulk cargo and coal as at present envisaged for Stages I and II. We consider each in turn.

Containers

It is important to stress that here we assume as given, the proposed location of actual terminals at the Port. Later we take up alternative possibilities. It has already been shown that warehousing, transport and storage activities are a major dynamic in the changing structure of the Port hinterland industrial areas. Completion of the first two container terminals at Botany bay with a throughput of up to 360,000 container loads (CLs) per annum would be expected to attract further activities of this type into the Port area.[6] According to the A.N.L., fully 80 per cent of this traffic would enter and leave the Port-side terminal by road: such a model split is based on the assumption by A.N.L. that the majority of Container Loads leaving the terminals would be destined to individual users in the Central Business District or South Sydney area. As shown elsewhere, this seems to be an improbable outcome over the long run.

If the A.N.L. forecast were borne out, it is likely that a considerable proportion of this traffic would go via forwarding agents' depots, which as we have seen are already concentrated in South Sydney and Botany. The completion of Port Botany *with container terminals established there*, would attract further depots into the area, particularly into the South Botany area adjacent to the Port. Indeed one company (Mayne Nickless) has recently established a container depot that is likely ultimately to cover about ten hectares (in McPherson Street).

Information from industrial land agents indicates that depot and storage users are most likely candidates for other industrial sites in near-Port locations.

This judgment is verified by experience elsewhere. Studies in Brisbane, for example, have shown that transport terminals, storage and warehousing activities in areas close to the existing port rate proximity to the port as a much more important location factor than do other industrial activites.[7] On this basis it is suggested that they are the activities most likely to be attracted to a new port development. The same appears true of Melbourne's current port expansion: freight terminals were among the activities most attracted to the hinterland area.[8]

The tendency of these enterprises to be attracted into the Port hinterland is likely to be accentuated in Sydney because of the natural locational advantages to these enterprises, previously discussed, of the Botany area, i.e access to the Port and Airport would assist these activities to outprice other potential users of industrial land in the Botany area.

Given the relatively limited amount of vacant land available for industrial expansion in Botany, *it is clear that the greater the proportion of container traffic via road and the greater the attraction of storage/depot activities into the area, the greater will be the pressure of the Port on non-industrial (predominantly residential) land in the Botany area. Contrariwise, the smaller the proportion of containers moved by road, the less the impact of the Port on non-industrial land.*

But other industrial users receiving containerised cargo or cargo from Roll-on/Roll-off vessels are also likely to be attracted to a port location: for example Alfa-Romeo, a big importer of vehicles, has recently taken up an area of 1.5 hectares near the Port as a head office and for the storage and service of vehicle imports.

Other bulk cargoes

The major part of the liquid bulk cargoes proposed to be imported through Port Botany are, according to the M.S.B., 'bulk liquid chemicals'. Given the proximity of I.C.I. and other chemical companies in Botany and the fact that these organisations have vacant land within their existing sites, expansion of this manufacturing sector in Botany is likely to be encouraged by the Port development.

The amount and size of land parcels available in the Botany area, together with its swampy conditions, preclude the attraction of new large-scale extensive chemical factories. In any case new plants of this type seem more likely to be diverted to Newcastle or Wollongong or outer Sydney where suitable land is more readily available. They may even locate outside the State. Any growth in chemicals manufacturing induced by the Port in the Port hinterland is likely to be as a result of the extension of existing plants in the Botany area, which have large parcels of vacant land within their existing sites.

Over the past few years (1968/9 to 1972/3), the basic chemicals manufacturing sector has however declined within Sydney in terms of establishments and employment. On the other hand, the value of production has risen, indicating rising demand and productivity increases within the industry. This fact, together with the long-term trend expansion of the chemicals sector at a faster rate than

manufacturing as a whole,[9] suggests that chemicals companies within Botany would be likely to take advantage of land attached to existing premises for purposes of expansion, especially with the added advantage of a bulk liquids terminal nearby.

The Total Oil Refinery could also take advantage of the Port storage facilities in plans to redevelop their Matraville plant. Caltex at Kurnell also have expansion plans in hand.[10] These two planned expansions, if they occur, are likely to preclude the building of a third refinery in Sydney for some time. However, it is interesting to note that such a third refinery, if built, would quitely likely be located in the Port hinterland area, according to the recent Royal Commission on Petroleum.

Proposed dry bulk cargoes for import include paper, salt and cement. These are likely to be used by existing plants in the Botany area, and could be expected to encourage expansion of manufacturing and storage in the vicinity of the port. For example, a salt importing company, Ocean Salt, has recently set up an office and storage area adjacent to the proposed Port. Similar comments apply to the A.P.M. mills (see below).

Coal

On the assumption that coal is delivered by rail, some servicing facilities for rolling stock may be needed. These are not likely to be large.

The scale of land-use effects in Botany and Randwick

It is to be expected that the strongest impact of the Port development in terms of industrial-type land use would be felt in the South Botany industrial area adjacent to the Port. The extent of industrial zoning in the area is shown in Fig. III(iv). There were a little over 200 hectares of vacant industrial land in this area in 1972 (Table III-(2)). Given past absorption rates of land, this is probably closer to 180 hectares today (Fig. III(v)). Some 60 hectares or so of the land was classified as freestanding, the balance as attached to existing industrial premises. Much of the freestanding land (about 40 hectares) is owned by APM.[11] The company is currently (1976) marketing some 10 hectares north of McPherson Street (see Fig. III(iv)) and is likely to dispose of a similar adjacent area in the late 1970s. In addition the company may dispose of some 20 hectares south of McPherson Street, an area currently used non-intensively for paper storage, while expanding its own operations onto 10 hectares of reclaimed land it is acquiring from the M.S.B.

The areas most likely to be absorbed by industrial expansion following completion of the Port are shown in Fig. III(iv). It is likely that this absorportion would be substantially completed by 1985 and that pressure on residential land would then be intense.

The vacant land that is unattached to existing manufacturing plants would most likely be occupied by container terminals, freight forwarders or shipping service and warehouse facilities in direct response to the Port development. The rate at which activities would be attracted to this land is impossible to predict with full certainty but a doubling of the existing rate of absorption of industrial

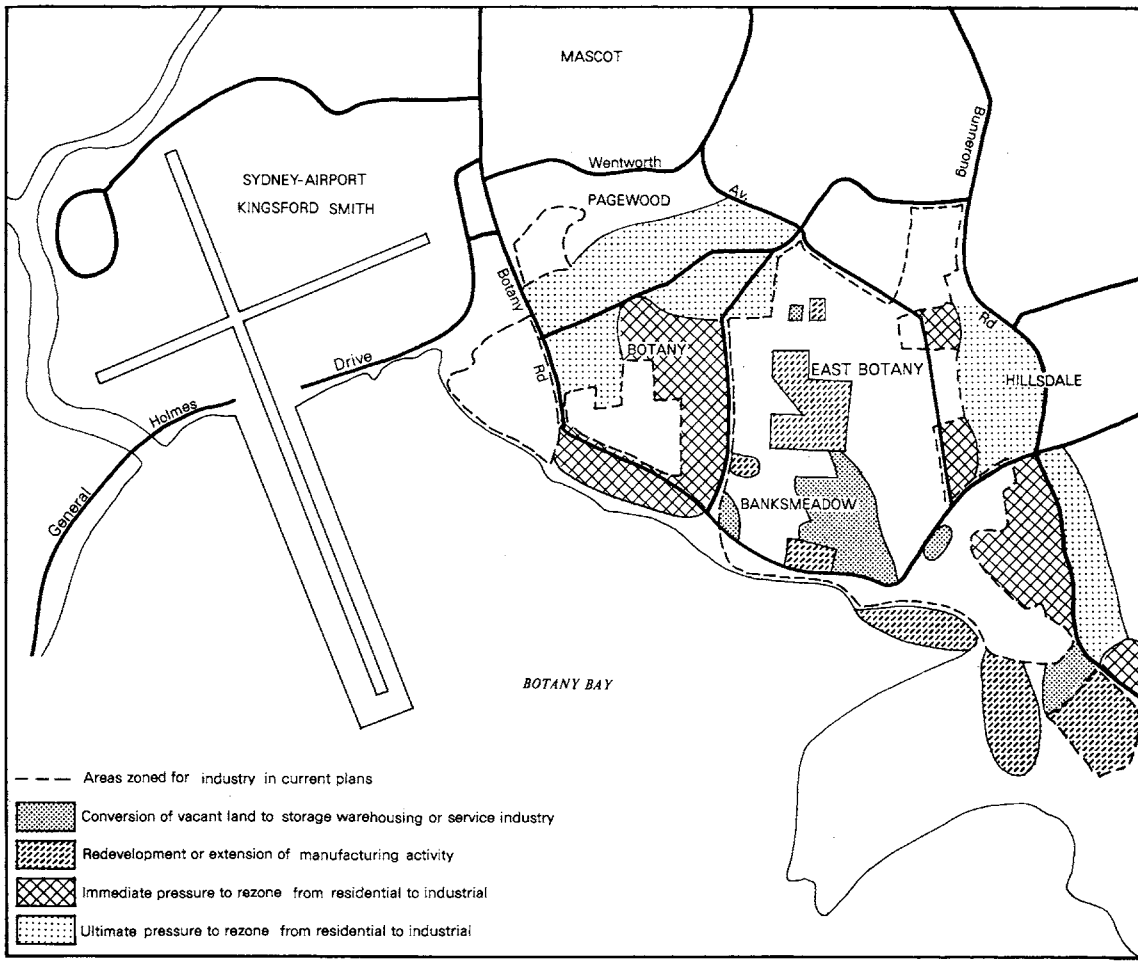

Fig. III (iv) Areas exposed to pressure from industrial expansion

land seems possible. This would lead to virtual *full occupancy of the available land over the 1977-85 period* (see Fig. III(v)). Several container depots (each occupying 5-10 hectares, as does Mayne Nickless) are likely to be established as are other warehousing and transportation facilities and ship servicing organisations. As suggested in Table III-(4), the former facilities are likely to occupy most of the land, as they require large areas of open storage. Other storage-type activities are more likely to infiltrate industrial areas near the Port, displacing existing light industrial premises that have little need for a near-Port location.

Large blocks of industrial land attached to existing manufacturing plants or storage concerns in Botany that would receive bulk cargo imports through the new Port (i.e. chemicals, paper, salt, etc.) *would most probably be occupied by expansion of the premises between 1977 and 1985.* This postulates the expansion of I.C.I., A.P.M., and the Total Oil Refinery by 1985, as well as other major industrial plants in the chemicals sector (e.g. Hatricks, Laporte — see Fig. III(iv)).

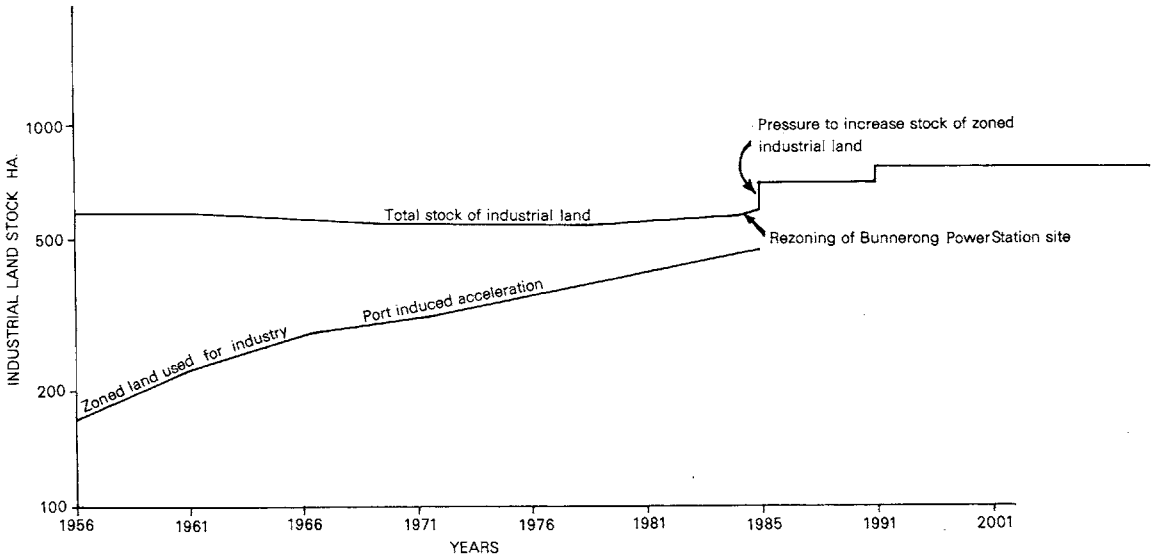

Fig. III (v) Prospective industrial land use in Botany and South Randwick

Table III-(4) Port Botany impact — land absorption by industrial developments, Botany/Randwick industrial area, 1977-85

Land affected	Activity	Area (ha.)
Vacant land, not attached to premises	Freight terminals	30
	Warehousing/storage/ship service activity	15
		45
Vacant land, attached to premises	Manufacturing expansion	35
	Oil refinery expansion (redevelopment)	15
		50
Development of Bunnerong power station site	Mixed industrial and commercial	20
	Total	115

Finally, the phasing out of the Bunnerong Power Station and rezoning to industrial use would allow redevelopment of the site for industrial purposes: a mixture of freight terminal, warehousing/storage and light service industry associated with the Port appears the most likely users for this prime site. Some commercial services for Port employees could also eventuate.

Land-use changes in other parts of the Port hinterland

In other parts of the Port hinterland area, the most significant planned expansion of industrial activity related to the Port is the (Caltex) refinery extension at

Kurnell. The recently announced plans for this extension call for approximately a doubling of existing refinery capacity. It is not clear how many jobs this development would involve, but based on figures supplied by the oil companies it appears likely to be around 150. *This proposed expansion has vital environmental implications* (see Chapter 5).

Pressures for industrial development elsewhere within the Port hinterland are likely to be less intense than in Botany, especially given the fact there is little vacant industrial land except in Sutherland. In any case much of the latter land is likely to be absorbed by expansion of the Caltex refinery at Kurnell. Elsewhere, i.e. in South Sydney, Marrickville, Rockdale and Randwick, the transition from manufacturing to warehousing and storage activities already occurring is likely to be accelerated to some extent by the Port development. It is not possible for us to quantify this with any accuracy. However, it would have the general effect of decreasing further the manufacturing component of Sydney's inner industrial areas. It should be stressed *again that this is based on the assumption of container terminals located at the Port-side.* The projected manufacturing growth in Botany would offset this manufacturing trend to some extent, but the major impact of the Port on industrial areas within the Port hinterland is likely to be in the warehousing/storage sector. Some pressure for rezoning may impinge on residential areas surrounding (areas of) industrial zoned land in South Sydney/Marrickville and Rockdale. Rezoning pressure should more easily be redirected to developing industrial areas on the metropolitan fringe. The effects so far afield become more obscure. It is essential that the authorities in Sydney responsible for land-use planning should investigate them with some care before proceeding far with the Port and committing the scale and mode of Port use.

Employment effects

While the creation of new employment opportunities has been cited by politicians as a major 'positive aspect' of the Port development[12] little specific information is available. But the social and economic benefits and costs arising from the Port — and the impacts on the hinterland area — can only be assessed in the light of such information. It is extraordinary that decisions proceeded without this information, an indication of the failure behind the planning for port development. Here attention is directed to the increase in employment at the Port itself and in the Port hinterland. We do not attempt to assess the wider consequences. This is a much larger task that planners should attempt.

Employment at the Port

Referring to available information, and using some additional estimation, it appears that Stages I and II of the Port development (as earlier described) would directly employ a total of approximately 1,600 persons as detailed in Table III-(5). This specifically assumes container terminals constructed and located at the Port. As far as Botany is concerned, they would be new employment opportunities. But much of this, particularly in the early stages, would not represent new employment so much as transfer from Port Jackson. The Port

and its users cannot claim to develop new job opportunities for Sydney to this extent. They can instead claim to generate significant employment relocation and disturbance.

Table III-(5) Port Botany — summary of major employment/land-use changes in Port hinterland to 1985, if Stages I and II are developed

Development	Activity type	Area taken (ha.)	Jobs created (no.)
1. Port — Stages I and II	Container terminals	80	1,050
	Bulk liquid terminals	17	60*
	Dry bulk terminals	70	240*
	Coal loading terminal	17	60
	Administration and services	2	200
	Sub-total Port	186	1,610
2. Acceleration of industrial development — Botany L.G.A.	Freight terminals	30	750*
	Warehousing/storage	15	195*
	Manufacturing expansion	35	1,330†
	Sub-total Botany	80	2,275
— South Randwick	Oil refinery expansion	15	180‡
— Bunnerong Power Station site	Service industry	10	250§
	Freight terminals/ warehousing/storage	10	250§
— Sutherland	Oil refinery expansion	n.a.	130‡
	Total industrial	115	3,090
	Grand Total (rounded)	300	4,700

*Based on data collected for Brisbane Down-River Transportation Study, 1970.
†Based on existing density of manufacturing employment in Botany L.G.A. and analysis of employment data and from information from business concerns in the area.
‡Based on information supplied by Total and Caltex Oil Companies.
§Based on employment density of industrial areas developed in Sydney over the 1967-72 period; data from *Industrial Land in Sydney* (Australian Institute of Urban Studies, 1975).

It is clear that container terminals would account for most of the jobs at Port Botany under Stages I and II; the only other major employers are likely to be the dry bulk loading facilities. In addition a component of Port administrative employment is likely to provide services related to quarantine, customs, health and general administration.[13]

Port hinterland employment

Until the composition of Port-induced expansion can be known more exactly, we cannot confidently project the possible effects on employment in the hinterland. Again, this is a task for planning authorities. But an approximate indication may be inferred from the nominated land-use changes using employment per hectare ratios experienced for these types of activities. The consequential estimate is limited to the Botany-South Randwick area. This limitation clearly implies that the estimate understates the likely figure for the hinterland as a whole.

The total workforce resulting from these developments is detailed in Table III-(5) — over 100 hectares of land are likely to be developed at an average employee density of about 25 per hectare to give a total additional workforce of over 3,000 by 1985. This is an increase of about 10 per cent over 1971 industrial employment of 31,100 in this area. When added to the 1,600 jobs to be provided in the Port itself under Stages I and II, the total additional employment in Botany resulting from the early stages of the Port development is likely to be about 5,000; the great majority would be blue collar workers. Such an increase is clearly a major economic impact upon the area.

The jobs 'created' by Port-induced expansion of industrial activity can properly be treated as new jobs in these areas. Since, however, a major component would be derived from wholesale, storage and transport transferred from Port Jackson, the increase for total Sydney employment would be significantly less. Again there is contained, in this figure, as in the estimate of Port employment, a substantial degree of relocation and disturbance in transfer from other parts of Sydney.

This relocation of employment opportunities towards the Port Botany area needs to be interpreted in the light of pressure on land zoned for residential purposes. In other words, as more persons are employed in the area, fewer of these workers will be able to live there. The problem of travel to work must be expected to increase significantly and probably much more than merely proportionately to the new jobs created or transferred.

Developments in Stages III and IV

No attempt is made to forecast the consequences of Stages III and IV development in any detail. If our estimates, which can be taken as merely indicative, are reasonably near the mark, the development of Stages III and IV must be expected to exert extreme pressure on residential land use and lead to extensive displacement of dwellings and much greater need for transport to work.

It is essential that planning authorities consider these implications with great care. It is obvious that the task is beyond the responsibilities and capabilities of the M.S.B. On the basis of Stages I and II experience, it is conceivable that employment at the Port itself might be expected to increase by an additional 2,800 over and above Stages I and II. If extensive rezoning occurred, it could be possible that an additional industrial-type employment might be generated of the order of 5,000-6,000 persons in the hinterland. This 'guesstimate' depends, of course, on a very simple assumption of a gearing relationship between employment at the Port and in the hinterland. This assumption could be most easily 'justified' were Stages III and IV to lead to essentially similar Port uses as are proposed for Stages I and II. Only the persons concerned with Sydney planning could have the information that would allow alternative estimates to be made.

The importance of making some attempt to project the figures can be illustrated in the following way: were an additional 5,000 jobs developed in the Botany-South Randwick area, and were the same land/labour ratio assumed earlier to apply, then it could be necessary to rezone some 200-300 hectares of land. *This is approximately equal to half the entire residential area of Botany*

L.G.A. A residential upheaval on this scale implies extremely high private and social costs. It also implies an exceedingly degraded and isolated environment for the balance of the residents.

The rezoning of residential areas to industrial land is one of the biggest environmental risks in the Port area in social terms and this issue is taken up in detail in Chapter 6. Rezoning pressure is likely to be particularly strong once the existing industrial areas reach capacity — this could occur by 1985 according to the preceding analysis. But, even at the present time, both the Botany Council and the P.E.C. report that approaches to them for rezoning have been made for land designated for residential purposes in the Interim Development Orders. *But obviously the rezoning of residential areas to industrial purposes represents a major potential adverse impact of the Port development.* Even if rezoning is not allowed, the upsurge of industrial activity and associated traffic in the area is likely to lead to serious blighting of residential areas as land prices rise to commercial levels in expectation of rezoning. Under such conditions, continued residential land use would become increasingly uneconomic and undesirable. Existing owner-occupiers with little bargaining power are likely to be forced to sell to prospective industrial users while tenants are likely to be forced to relocate as landlords sell out. Selling prices may be above existing levels, but this breakup of residential communities in Botany 'by default' must be regarded as a serious prospect.

As pointed out in the A.N.L. environmental impact statement, the entire Botany area south of Wentworth Avenue is likely to feel that pressure. But since there is some room at the moment for expansion within existing industrial areas, the areas most likely to come under immediate pressure are those residential tracts adjacent to existing industrial areas. Given the current configuration of industrial and residential land in Botany, the areas most likely to be up for rezoning are shown in Fig. III(iv).

In order to minimise adverse impacts, every effort should be made to channel these pressures away from these areas into vacant zoned industrial areas and other nearby potential industrial sites.

This will not, however, be feasible if Stages III and IV of the Port development proceed as planned. If Stages I and II cause acceleration of industrial development in Botany to fill existing industrial zones to capacity, the pressure for rezoning of residential areas is likely to become overwhelming under later stages of Port development.

4 Potential transport congestion

The land-use changes outlined in the previous chapter are an essential point of departure in estimating the probable traffic generated by Port Botany. They also permit a projection that is also essential: the *total* traffic situation that may be expected to arise from the complex of activities of which the Port is one. Traffic generation is important for a variety of reasons. It is a major source of potential air pollution; of congested roads, with heightened risks of accidents; of the increased requirement for public outlays in traffic control; of the demand for road widening and new roads; with associated large public capital expenditures; of accentuated noise; and of a generally degraded environment in which major roads increasingly isolate communities and confine access.

As in the preceding chapter, this discussion proceeds in two stages:

(a) We assume that Stages I and II of Port Botany are completed with existing proposed uses, operating at capacity at the nominated target date of 1985; and

(b) The hypothetical consequences of Stages III and IV of the Port are estimated indicatively by extrapolating the implications of Stages I and II.

It should be stressed that the calculated projections in this chapter can be taken as indicative only and that there must be a significant order of error attaching to them. The purpose is to attempt to convey some likely orders of magnitude of traffic generation. This attempt has not been made in the environmental impact statements and it is a basic failure by Sydney planning authorities that this is so.

The chapter attempts to incorporate the assessments of traffic generation proposed by the proponents of Port use. But, in addition, it attempts to take into account two other elements.

(a) the addition to traffic due to Port-induced changes in hinterland activity

(b) the developments due to the fact that Port Botany is placed adjacent to an expanding Sydney Airport.

These two, together, provide the means of projecting *most* of the *total* traffic generated in the area so that it is possible to observe a projection that sets the Port in its main traffic context. The element of traffic generated that is omitted is what might be termed other 'normal' traffic increase — the flow that is essentially unrelated either to Port Botany or the Airport.

As we shall suggest, the Department of Main Roads may have been as much as 100 per cent in error in its proportion of traffic generation due to Port operation. But the traffic generated by the Airport over the next decade seems likely to be considerably larger than that due to the Port itself and its linked activities. Any attempt to dissociate, as the environmental impact statements have done, the Port from its total traffic environment would be seriously misleading.

In the discussion to follow, we accept the substance of the available environmental impact statements in so far as they purport to establish, for each use, their own traffic flows; as they assume the location of container terminals at the Port; and as they assume coal transport by rail. Later in this volume we discuss possible alternatives.

In the case of traffic flows, however, we have another complication. At the inquiries, during 1975, into users' proposals, various solutions for the adaptation of road and rail transport were suggested. Accordingly, this chapter proceeds on two different assumptions. One is that additional road traffic flows occur on *existing* roads. The other is based on the road developments (see Chapter 2) nominated as likely in the original environmental impact inquiries. This adds to the complexities. It may also serve to warn readers that the issues discussed in this chapter are exceedingly complex and by no means easily solved by one projection. As in the preceding chapter, we begin with an outline of the existing road and traffic situation in the Port hinterland. As far as we can discover, this assessment has not been attempted by the Planning and Environment Commission or by the Department of Main Roads or by the Maritime Services Board. We do not believe that we have reached finality in these estimates. We believe, however, that there has been a drastic failure in planning in not attempting, with the greater information at the disposal of officials, to make appropriate official estimates. This failure is perhaps inevitable while the city planning authorities play no effective role — and while Port planning authorities proceed, under private enterprise pressure, without planning restraint.

Existing roads and traffic conditions

Road traffic is one significant factor in the depressed amenity of Botany and its surrounding municipalities — the hinterland of the new Port. Traffic congestion, traffic noise and high levels of air pollution generated by traffic and manufacturing characterise much of the area. These problems are compounded by a variety of factors. The uneasy and intimate mix of residential and industrial development; a road alignment that bears little relation to today's desired traffic movements; inadequate road capacity; the constricting effect of Sydney Airport and Alexandra Canal on traffic movements to the south and west; the large number of vehicle movements generated by the Airport; the many commercial vehicle movements generated by manufacturing and warehousing activity in the area; the lack of grade-separated intersections; and the restricting effect of parked vehicles on road capacity all intensify traffic problems in the area. Traffic congestion and noise are predominantly confined to the major traffic arteries; traffic and factory generated air pollution is more widespread. However, congestion on the main thoroughfares is forcing an ever-increasing volume of traffic, together with its problems, on to residential streets.

Botany and its neighbour municipalities were settled early in Sydney's history. Today they form part of the inner core of older industrial suburbs.[1] The alignment and capacity of the road network were defined, to a large extent, by conditions prevailing early this century. Today, north-south traffic movements

have been swollen by through traffic to and from the southern municipalities of Kogarah, Rockdale and Sutherland, and by the ever-increasing traffic generation of the Airport. Because of the general lack of grade-separated intersections, this massive north-south traffic flow — estimated at approximately 170,000 vehicle movements daily[2] — is in direct conflict with the ever-growing east-west movement between the Port Botany hinterland area and the manufacturing and residential development in Sydney's western suburbs, a conflict which is intensified by the absence of suitable east-west road links and by the presence of the Airport and Alexandra Canal, which serve to focus the traffic streams into and through each other on the northern, eastern and western perimeters of the Airport. Junctions notorious for their congestion include Gardeners Road with Botany Road and O'Riordan Street; General Holmes Drive with Botany Road; and Canal Street with the Princes Highway. *The conflicts of east-west and north-south flows, particularly related to the location of the Airport are a fundamental problem for Port Botany, as it is located.*

Municipalities such as Botany, Marrickville and South Sydney, which are important centres of manufacturing, warehousing and freight terminal operations, generate a large number of commercial vehicle trips — some 100,000 vehicle movements per day in 1971.[3] Many commercial vehicle trips are made in 'light vehicles', such as pick-up and delivery vans, panel vans and utilities. However, a significant number — about 25 per cent for the whole of Sydney[4] — are made in 'heavy vehicles', the two and three-axle trucks and articulated semi-trailers. The impact of heavy vehicles on traffic problems is typically much greater than their numbers suggest. Because they are longer and have slower acceleration, the contribution of each heavy vehicle to traffic congestion is equivalent to several passenger car movements in the flat terrain of the hinterland.[5] As far as noise and atmospheric pollution is concerned, the relative effects of heavy vehicles may be larger still. Given the already congested traffic conditions throughout much of the hinterland region, these effects may be even greater than the foregoing numbers suggest.

Traffic movements throughout the hinterland area in general and the Botany municipality in particular are hindered by parked cars. In many cases, factories do not provide sufficient off-street parking for employees; the several 'strip' shopping centres along major arterial roads do not provide adequate off-street parking for shoppers. This lack of parking may be due to the development of the area at a time when cars were rare, let alone considered indispensable. Whatever the reason, parked cars have a marked constricting effect on traffic flows along a number of major artieries (such as Gardeners Road, Botany Road and O'Riordan Street). Apart from this, parked vehicles, especially heavy commercial vehicles, reduce urban amenity when parked on residential streets, as they are in Botany.

The new Port developments proposed for Botany Bay will inject yet more traffic into an area already stressed by residential, industrial and traffic conflicts. The transfer of port activities from Port Jackson to Botany Bay, particularly container traffic, will obviously benefit the residents of Balmain and other areas around Port Jackson. But to what extent will the traffic generated by Port Botany further reduce the already depressed urban amenity of the new Port area? By itself, the Airport is expected to generate much higher levels of traffic

in the future. Will the imposition of Port traffic onto an already strained road network be the final straw? To a large extent, the costs of this additional traffic are borne by the residents of the area and by the public purse; the benefits accrue to Port and Airport users. What sort of balance should be struck between these public costs and private profits? It is obviously much more feasible to constrain Port development than to shift the Airport or to limit Airport traffic. Should Port development be constrained? Stages I and II are effectively built; should the users and the location of ancillary facilities be altered; should Stages III and IV be deferred or abandoned? These are the types of questions that need to be asked and answered. Moreover, these are the types of questions that the environmental impact statements of the proposed Port development evade or conceal and that, regrettably, Sydney planners have not asked.

Traffic generation of Port Botany: Stages I and II only

As already indicated, it is necessary to separate three separate components of traffic generation:

(a) traffic due to the Port itself
(b) traffic due to Port-induced hinterland activity
(c) other traffic, essentially Sydney Airport traffic.

Only by attempting these measurements are the over-all traffic conditions of the Port area to be assessed. The environmental impact procedure of the N.S.W. Coalition Government, in avoiding this overall assessment, can only be described as at best a case of myopia and possibly deliberate concealment.

Traffic generation of Port Botany

The Port traffic projection to 1985, with Stages I and II in full operation, can be approximately specified in terms of light and heavy vehicle movements. To

Table IV-(1) Estimated generation of road vehicle movements* in 1985 by the proposed activities of Stages I and II of Port Botany

Activity	Area (ha.)	Employment	Daily vehicle movements per employee: Private light vehicles	Commercial light vehicles	Commercial heavy vehicles	Daily vehicle movements: Private light vehicles	Commercial light vehicles	Commercial heavy vehicles	Total daily vehicle movements
Container terminals†	80	1,050	0.9	0.1	2.13	940	100	2,240	3,280
Liquid bulk terminal‡	17	60	0.9	0.2	2.8	50	10	170	230
Dry bulk terminal‡	70	240	0.9	0.5	2.5	220	120	600	940
Coal loading terminal‡	17	60	0.9	0.2	—	50	10	—	60
Port admin. and related activities‡	2	200	0.9	0.05	—	180	10	—	190
Total	186	1,610	0.9 (av.)	0.2 (av.)	1.9 (av.)	1,440	250	3,010	4,700

*This table shows the *sum* of the daily vehicle movements *into and out of* the port area. The actual number of *vehicles* involved, as opposed to the number of *vehicle movements*, is half the figures shown above.
†Estimated from A.N.L. Impact Statement.
‡Estimated from figures contained in Down-River Transportation Study, Brisbane (private correspondence).

obtain a truer picture of the impact of this traffic it is necessary to convert vehicle movements to 'passenger car unit' movements, a conversion which takes into account the greater size, slower acceleration and additional congestion caused by heavy vehicle movements. Each light vehicle, whether commercial or private, is assumed equal to 1 passenger car unit; each heavy vehicle is assumed equal to 2.5 passenger car units. On this basis, the Port would be expected to generate some 9,200 'passenger car unit' movements daily (see Table IV-(1)).

As can be seen, container vehicle movements dominate the Port total. This assumes that coal exported will arrive at the Port by rail, not road. (Obviously, if coal were to be transported by road, the size of the Port traffic would be correspondingly increased.) The estimate of container vehicle movements is based on the environmental impact statement of the Australian National Line and on the assumption that the proposed Seatainer (O.C.L.) Terminal would be similar in size. Based on past trends and expected new constraints, A.N.L expects to ship 173,000 containers through Port Botany in 1980.[6] However, the number of containers passing through the Port gate will be some 30 per cent higher than this because N.S.W. exports a large number of empty containers (the balance of container trade is strongly 'adverse'). The A.N.L. environmental impact statement assumes that 20 per cent of its containers will move by rail and 80 per cent by road. For the present, we accept this assumption. Currently A.N.L. ships 34 per cent of all containers into and out of Sydney. It is assumed that the second (Seatainer) terminal would be of similar size and that the balance of container trade would remain in Port Jackson so long as only Stages I and II of Port Botany are operative and the A.N.L. distribution between road and rail movements of containers apply generally. (If the rearrangement suggested as possible in Chapter 8 were found to be acceptable, it is possible that larger transfer from Port Jackson might occur even with only Stages I and II of Port Botany.)

Traffic generation of Port-induced activity

Table IV-(2) is derived from the land-use changes projected in Chapter 3 and presents consequential estimates, for the year 1985, of traffic arising out of Port-induced activity. The vehicle movements are based on experience of traffic movements measured in respect of the Brisbane port and industrial complex in 1970.[7] The new down-river port in Brisbane provides physical and industrial conditions that correspond reasonably well to those in Botany and offers a basis for a plausible projection.[8] The Brisbane experience is adjusted for the particular complex of manufacturing, distribution, oil refining and transport projected for the Port Botany hinterland.

As in the case of Port traffic, the projection of total vehicle movement, due to land-use changes, at 7,380 per day in 1985, needs to be converted to 'passenger car unit' movements to permit direct comparison with the Port traffic. This conversion is made on the same basis as for Port traffic and yields a total 'passenger car unit' movements daily of 10,400 by 1985, due to land-use changes. Thus Port traffic and Port-induced traffic are roughly equal in size in the Port hinterland.

It bears comment that our estimate of *Port* traffic is very close to traffic flow estimated by the Department of Main Roads, the latter being 10,500 passenger car movements daily. However, *the Department omitted consideration of traffic*

Table IV-(2) Estimated generation of road vehicle movements*by additional land-use developments in Port hinterland in 1985 (Port Stages I and II)

Activity	Area (ha.)	Employment	Daily vehicle movements per employee: Private light vehicles	Commercial light vehicles	Commercial heavy vehicles	Daily vehicle movements: Private light vehicles	Commercial light vehicles	Commercial heavy vehicles	Total daily vehicle movements
Transport terminals — freight depots	30	750	0.9	2.3	1.2	680	1,730	900	3,310
Warehousing/ storage	15	195	0.9	1.7	0.8	180	330	160	670
Expansion of manufacturing	35	1,330	0.9	0.4	0.4	1,200	530	530	2,260
Expansion of total refinery	15	75	0.9	0.5	2.5	70	40	190	300
Redevelopment of Bunnerong Power Station	20	500	0.9	0.4	0.4	450	200	200	850
Total	115	2,850	0.9 (av.)	0.9 (av.)	0.7 (av.)	2,580	2,830	1,980	7,390

*This table shows the *sum* of vehicle movements *into and out of* the new freight depots, etc. that are expected to establish in the hinterland. The actual number of *vehicles* involved is half the *vehicle movement* figures shown above.
Source: *Down River Transportation Study, Brisbane* (private correspondence).

flow arising from Port-induced land-use change which may approximately double the total traffic flow on our assumptions. Whatever the truth of the matter, it appears that the Department's estimates are drastically in error and understated. Combining Port and Port-induced traffic, we have an approximation of some 20,000 passenger car unit movements daily in 1985.

It should also be stressed that we believe that our assumptions are conservative for several reasons. First, vehicle ownership and use is less in Brisbane than in Sydney. Second, no allowance is made for increase in vehicle ownership between 1974 and 1985. Third, no allowance is made for through traffic that might develop 'internally' over the decade arising from less direct linkages with the Port and Port-induced activity.

Sydney Airport traffic

It would be nothing less than foolish to disregard the prospective increase in land traffic expected to be derived from Sydney Airport adjacent to Port Botany, as part of the totality of the future. One crucial question is the private and social cost of these two facilities — airport and seaport — as bed-fellows. This question has not been confronted in the Port planning proposals. The Airport, in fact, is a basic obstacle for Port Botany.

It is unfortunate, to say the least, that the only data on prospective Airport traffic generation are based on possibly ambitious air travel projections and on population projections that are no longer confidently accepted.

In 1973, the Airport was estimated to generate some 36,000 vehicle movements per day. Based on population growth and air cargo projections, an official estimate puts the 1990 Airport vehicle movement at 123,000. Adjusted to 1985, our target year, the corresponding Airport vehicle movement would be

some 83,500 per day, an increase of approximately 49,500 vehicle movements over the 1973 level. This projected increase could be expected to include approximately 9,400 private light vehicles, 28,000 passenger vehicles (chiefly taxis) and 11,400 commercial vehicles (predominantly light vehicles). On a passenger car unit basis, this converts to about 51,000 movements daily.

It is probable that the official estimate is an overstatement arising from the high metropolitan population projection and that the 1985 projections should be reduced on an average by approximately one-third. This adjustment would yield, in round figures, an increase over 1973 of some 6,000 private vehicles, 19,000 passenger vehicles and 8,000 commercial vehicles or a total of 33,000 additional vehicles of all types. Converted to passenger car units, this implies an increase of approximately 34,000 passenger car movements by 1985 due to the Airport. For the present purposes, we prefer to retain the official estimates as an upper level projection and to use the reduced estimates as a lower, probably more likely, level.

Projection of total road traffic increase by 1985

We may sum the projected increases in traffic flows, converted to the equivalent of daily passenger car unit movements, arising from Port Botany, from Port-induced activity in the hinterland and from the Airport. These are given in Table IV-(3). The columns labelled 'I' adopt the upper level traffic estimates due to the Airport; those labelled 'II' reduce these Airport land traffic estimates by one-third.

Table IV-(3) Total increase projected for road traffic 1973-85

	Daily passenger car unit movements		Shares in traffic increase (%)	
	I	II	I	II
Port Botany	9,000	9,000	13	17
Port-induced hinterland changes	10,000	10,000	14	19
Airport	51,000	34,000	73	64
Total increase	70,000	53,000	100	100

Thus it would appear that using the higher traffic figure the Airport would be expected to generate about three-quarters of the projected traffic increase by 1985 while Port Botany and its hinterland changes might be expected to account for one-quarter. The Airport is, on these projections, the major contributor to prospective traffic increase. But Port Botany and its induced hinterland development are by no means insignificant and their significance lies in the fact that they are not yet committed. There is scope for significant amelioration of consequential traffic problems in adapting the plans for Port Botany and the *induced changes in land use*. Using the lower Airport traffic estimate, the Airport would account for slightly less than two-thirds; the Port and the related land-use changes account for over one-third of the projected traffic generation. It must be recognised that Sydney Airport, whatever may be done about its eventual location or development, is a fact of life of 1985 and beyond. Improvements in the flow of Airport traffic may be possible. But we may have to face the

question whether Sydney Airport, with its projected expansion, can sensibly be joined by a seaport that generates a great deal of additional land transport from a point to the east of the Airport. The essential question is then, what can be done about Port Botany's and its hinterland's land transport?

In approaching this question, we may usefully add an additional element in a complicated jig-saw. We need to try to assess the direction of flow of this projected traffic increase from the three sources: Airport, Port Botany and induced hinterland changes. Based on estimates made of container movements, journey to work census data and official estimates of Airport passenger flows, we have an approximate designation of the direction of those movements as shown in Table IV-(4).

Table IV-(4) Distribution of origin-destination of vehicle movements by type of vehicle (%)

Sector	Commercial vehicles*	Private vehicles†	Airport passenger vehicles‡
North	30	25	55
South	10	25	20
West	50	25	20
Local	10	25	5
Total	100	100	100

*Based on a survey of the origin and destination of full container load contours, as reported in *Ports and Urban Systems: A Study of Seaports/Land Use Interaction* prepared by Rendel and Partners, Consulting Engineers. Report prepared for the Commonwealth Department of Environment, Housing and Community Development, Feb. 1976, p. 263.
†Journey to Work data, *1971 Census.*
‡From figures prepared for the Benefit/Cost Study of Second Sydney Airport (private correspondence).

It is important to observe the variety of direction in these movements. There is no dominant flow towards the north into the direction of the Central Business District. Although more than half the Airport passenger vehicles move north, the figure is only slightly over half. Less than one-third of the commercial vehicles move to the north; half flow west. It may be expected that, by 1985, the western and southern flows would become more significant. There is, however, a major conflict in the flow pattern with the major Airport flow moving north and the major Port flow moving west and south (the latter movement requiring a passage around or under the Airport).

The implications for road congestion. Adaptation to these traffic projections might be sought by:

(a) allowing congestion to develop on existing roads
(b) developing new and improved road systems
(c) amending the Port Botany proposals, the uses of the Port and the facilities established at the Port-side.

In fact, the environmental impact inquiries were conducted on the assumption that new and improved road systems would be supplied. It is doubtful if this assumption took adequate account of budgetary constraints that confront

the N.S.W. Government, or of the time to be taken to carry out these road proposals. It may be appropriate, therefore, to make some assessment of the implications for congestion on the existing road system.

(a) *Congestion on existing roads*

Table IV-(5) shows the 'level of service' along existing major roads in the Port Botany and Airport area at 1973 and simulated for 1985[9] on the basis of projected traffic generation and movement direction.

Table IV-(5) Current and projected levels of service on the existing road systems in areas adjacent to Port Botany, 1973 and 1985

	Current level of service	Service vol. capacity ratio	AADT* (1973) (service vol.)	Estimated capacity (AADT)	Additional P.C.Us. (1985)		(1985)	
					High estimate	Low estimate	High estimate	Low estimate
Anzac Parade								
(i) N. of Kingsford Junction	B	.60	33,400	55,500	5,000	4,670	B	B
(ii) S. of Junction to Beauchamp Road	B	.69	22,500	32,500	1,800	1,470	B-C	B-C
Beauchamp Road								
Botany Road to Dennison Street	B	.60	6,000	10,000	4,600	4,600	F	F
Bourke Road	B	.69	7,700	11,000	800	630	B-C	B-C
Botany Road								
(i) N. of Gardeners Road	C	.79	23,600	30,000	1,300	970	C	C
(ii) Gardeners Rd - Wentworth Av.	E	.95	22,200	23,500	2,700	2,030	F	F
(iii) Wentworth Av. - Beauchamp Rd	B	.55	12,200	22,000	9,700	9,200	F	F
Bunnerong Road								
(i) Kingsford Jn.-Wentworth Av.	B	.72	14,000	19,500	6,000	5,670	F	F
(ii) Wentworth Av.-Beauchamp Rd	B	.69	18,000	26,000	2,400	2,230	C	C
Denison Street	A	.50	4,100	8,000	3,200	3,200	D	D
Gardeners Road								
(i) West of Botany Road	E	.95	21,900	23,000	1,700	1,530	F	F
(ii) Botany Road to Maloney Street	D	.85	18,000	21,000	2,900	2,570	F	F
(iii) Maloney Street to Kingsford	C	.77	24,900	32,500	2,900	2,570	C-D†	C-D†
General Holmes Drive								
Around airport	A	.60	55,500	92,500	25,000	19,900	D†	C†
Marsh Street								
Over Cooks River	B	.70	18,600	26,500	14,500	9,700	F	F
O'Riordan Street								
(i) N. of Gardeners Road	B	.75	20,100	26,500	700	530	C	C
(ii) S. of Gardeners Road	D	.85	19,500	23,000	4,700	3,130	F	F
Princes Highway								
Between Canal Street and Cooks River	D	.90	46,000	51,000	8,900	6,050	F	F
Canal Street — Alexandra Canal	D	.87	33,000	38,000	4,300	3,070	F†	E-F†
Southern Cross Drive	A	.50	34,000	68,000	14,300	9,970	B	B
Wentworth Avenue								
(i) W. of Southern Cross Drive	B	.66	43,000	65,000	15,900	11,070	D†	C†
(ii) E. of Southern Cross Drive	B	.69	15,800	23,000	4,400	3,900	D	C-D

*Derived from figures shown in *Traffic Flow Maps, 1973,* Dept. of Main Roads, N.S.W.
†These roads are those whose grade changes.

The degree of traffic congestion along a road is defined to a large extent by the 'level of service' the road provides. Level of service is a qualitative measure of the effect of a number of factors which include speed, travel time, traffic interruption by controlled and uncontrolled intersections, freedom to manoeuvre, safety, comfort, convenience, etc. The higher the level of service, the faster the traffic flow and the less the degree of congestion; as the number of vehicles using a road increases, so the level of service decreases, other factors remaining constant. S.A.T.S. specified the characteristics of the six levels of service, A through F, as applied to Sydney.[10]

In reading Table IV-(5) it should be noted that S.A.T.S. regarded level 'C' as the desirable objective but was compelled to treat 'D' standard as the practicable objective in its projections to the year 2000. Without wishing to rely closely on this source, we adopt level 'D' as reasonable. There are many uncertainties in allocating particular traffic flows to particular roads. Obviously, it would be important that Sydney planning authorities should carry out more extensive and exact simulations to arrive at more alternative projections before firm policy conclusions are reached. The official view is, however, to disregard major components of our projected traffic increase by the year 1985, and it does not appear that meaningful official simulation has been attempted. This is a serious shortcoming.

Despite the uncertainties attached to our simulation (which is only one among a variety of possible simulations), the basic message of Table IV-(5) is that almost half the major roads would fall to the lowest standard 'F' designated by S.A.T.S. Moreover, in peak-flow conditions, it would be expected that the level of service on other roads would fall below those shown in Table IV-(5). Level 'F' implies a highly congested condition with road systems operating at full or near full capacity, leading to unstable flows, long delays, traffic queues and low speeds. It should be stressed that we regard these projections as understating rather than overstating the prospective congestion. On the other hand, as congestion develops, traffic would tend to seek alternative roads to find relief from competing vehicles. What Table IV-(5) implies is that, by 1985, there could be widespread transfer to minor roads, invading residential areas, reducing the efficiency of movement in warehousing and industrial areas and generating widespread intersection conflicts.

(b) New road development

In the prospective congestion projected in Table IV-(5) lies the necessity for Port Botany either to reduce its demands for road transport or to cut new and improved paths through substantial sections of southern Sydney. The crux of the problem that Port Botany faces is not merely this general problem but, as cannot be repeated too often, the fact that it lies directly to the east of Sydney Airport. The Airport serves as a block. Road solutions for the currently proposed users of Port Botany would have significant impact on the Airport, on the Airport users and on substantial areas beyond. These solutions would also have very considerable implications for the State's budget and for environmental amenity of residents elsewhere (particularly along Cooks River Valley).

Since much of Port Botany road traffic must escape west and south, the announced road development programs to service the total traffic flow are

(i) The construction of a new foreshore road westward from Port Botany.
(ii) The widening of General Holmes Drive to eight lanes (cost not known but entailing expensive tunnels under Airport runway).
(iii) The construction of the Kyeemagh-Chullora Road (estimated to cost $33 million), to collect traffic from General Holmes Drive.
(iv) The widening and up-grading of several roads in Botany L.G.A. as indicated in Chapter 2. (Cost not known.)

The first two can be related directly to the Port; the last two are partly but clearly dependent on the Port. We can consider the first two separately.

The scrappy capital cost information makes economic assessment impossible. *Provided* the technical problems of passing under the Airport runway can be adequately dealt with (they are major problems), the construction of the foreshore road and the widening of General Holmes Drive would resolve the problems of *immediate* congestion that arises from westward movement of container trucks. Nevertheless two other major difficulties arise. First, this is a very expensive 'solution' *imposed by the road transport of containers*, and one that copes with *at most* some 13-17 per cent only of the increased traffic (arising from the Port itself). Second, although it will have a significant bearing on congestion problems arising from Port-induced change in land use in the hinterland, the diversion of this traffic to these roads would mean that it would merge with the main container truck flow. Both flows would debouch into the residential areas of Rockdale.

The solution to the latter problem that has been proposed is, therefore, to construct the $32 million Kyeemagh-Chullora road. Some use for a road along this line may be made for other reasons. The effect of container trucking would go far towards destroying the environmental amenity of the residents of the Cooks River Valley. The road would displace significant sections of scarce 'green areas' including valuable playing fields and would also displace some 70-100 dwellings. Noise from heavy trucks would be likely to be very serious particularly for the considerable number of residents in the steeper sections of the Valley. It would conflict with proposals by the State Pollution Control Commission to improve the water amenity of Cooks River.

The need for successive attempts at solution of these series of problems derives basically from the road transport of containers. The 'solutions' contribute comparatively little to the traffic problems of the area north of Botany Bay. It may be possible to discuss amelioration of some of the road transport problems by reference to specific detailed measures: penalties for on-street parking of vehicles, better traffic control systems, etc. *The crucial question is, however: Must the containers be moved by road transport? This is the key issue of amelioration of congestion and road construction costs that we discuss in Chapter 8.* Provided this problem can be resolved it may be possible greatly to scale down the total social capital costs and to make a basic contribution to the protection of the environmental amenity of the area from Botany L.G.A. through Rockdale and the Cooks River Valley. Before dealing with this possible option, it is necessary to note some problems implied by another transport matter, the carriage of coal exports to Port Botany.

Rail carriage of coal

The initial proposal for a coal loader at Port Botany was for a loading capacity of 10-12 million tonnes per annum. This was subsequently raised to a capacity target of 25 million tonnes, though the date at which this capacity was to be attained was never specified.

In either case, the colliery proprietors of the western and southwest coalfields proposed to move the coal effectively from the pithead to Port Botany by rail. The proposal depended on the upgrading of the existing inferior single-track railway, now some fifty-five years old, running from Marrickville to the new port.

Not much attention can be paid to the various estimates of the number of trains involved. The eventual numbers specified were twenty-three trains per day in each direction. This specification appears to have depended on relatively long, standardised trains that were filled while moving below coal shutes at or near pithead, travelling along main and suburban lines into and through Sydney, joining the Marrickville-Botany line and unloading while in motion at the Botany coal loader. It is doubtful if this smooth, continuous flow of standard-sized trains can be taken as more than a dream on an engineer's drafting board.

There are many questions to be raised in relation to this proposal, even if we were to accept the advisability of a coal loader at Port Botany. The severity of these questions depends on volumes of coal movements and the extent to which the coal trains depended on running to a relatively tight schedule. The larger the annual shipment, the tighter the schedule to allow continuous unloading. The more the unloading is delayed, the greater is the likelihood of coal trains occupying the line for undue periods. On the other hand, the stronger the pressure for maintaining the coal trains schedules, the less the feasibility of sidetracking trains to allow any competing trains to use lines on schedule.

These problems would create no *external* difficulties where coal trains do not compete with other trains. So long as large numbers of containers or other bulk cargoes do not make major claims on the Botany-Marrickville line no problems should arise in this section. (Elsewhere, we discuss the *necessity* for other claims.)

Conflicts could occur, however, at two different levels. One is the possible congestion on lines carrying suburban commuters. Some complaints are already reported as a result of conflicts between coal trains and commuter trains at Campbelltown. Significantly increased coal traffic above the present small flows into Sydney seems almost certain to risk extending these conflicts into the city at least to Lidcombe and possibly further towards the city centre. It should be recognised that with the progressive westward expansion of the city, commuter travel from the western perimeter will increase as coal traffic increases. From both points of view, the frequency of conflict could arise.

Similarly, substantially increased flow of coal traffic from the Lithgow area would compete for line space with commuter trains from the Blue Mountains to Penrith. Here, too, any growth of coal traffic may be expected to occur along with the increasing residential settlement in the Blue Mountains area and the consequential increase in commuter traffic.

The bigger the throughput of coal the greater will be the risks of conflict with

commuter services because it would be less acceptable to consider sidetracking of coal trains to give priority to commuter trains. A 'solution' would be provided by constructing extra tracks. But should the coal export manage to approximate target capacity, extra tracking must extend far beyond the construction merely of sidings and more complex signalling. It would appear that relatively expensive construction of additional tracks would be required to cope with the risks of rail congestion. The question must be asked: is this investment worth while?

The carriage of the particular coal involved, in massive quantities, right through the metropolitan area is a curious concept. There is a strong case for developing Sydney as a 'twin port city'. This case depends basically on the servicing of *the city's* trade in conditions of shipping technology and ship size in and settlement congestion around Port Jackson. The case becomes of doubtful validity where a massive new (coal) cargo movement is injected, seeking to use Sydney as a funnel to find an exit point. Does this coal, from these particular fields, have the significance for the economy of New South Wales in the future that would be implied by accepting this large public investment outlay? The whole rationality of the coal loader proposal needs independent reassessment. This is taken up in Chapter 7.

Traffic implications of Stages III and IV of Port Botany

As in the preceding chapter, we attempt only indicative extrapolations of the above road transport projections to account for the assumed completion of the final stages of Port Botany. The lack of specific information on potential users makes it impossible to take this projection for road transport very far. Assuming that Stages III and IV were constructed to replicate bulk cargoes other than coal, the road traffic flow generated by the Port itself might at least treble and possibly quadruple. At the same time, Port-induced changes in land use could be expected to grow beyond 1985, to at least twice the Stages I and II traffic flows. Accepting the ***higher*** Airport traffic flow estimates we might expect orders of magnitude of traffic flows at the levels shown in Table IV-(6).

Table IV-(6) Increase in road traffic, Port Botany Stages I-IV

	Daily passenger car unit movements	Shares in traffic increase %
Port Botany	25,000	20
Port-induced hinterland changes	28,500	22
Airport	73,500	58
Total	127,000	100

It must be assumed that westward expansion of the city would be drawing a considerably increased fraction of container trucks from the Port to the west. The proportion moving westward cannot easily be projected except with more

planning information than is at our disposal. However, it would appear that, under these conditions, the proposed westward trucking routes that appear to offer a partial solution to freight movements for Stages I and II of Port Botany are likely to become, through noise and congestion, a very serious disturbance at least from the Port as far west as Chullora. In any event, the volumes of traffic implied in Stages I, II, III and IV, with the Airport, would appear to require drastic redesign of the entire road and vehicle flow system.

5 Waste generation and pollution

When we turn to the implications of Port development *as at present proposed*, we have to build on the assessments of the previous two chapters, particularly for purposes of air-borne and noise pollution. So far as water pollution is concerned, the precise types of use of Port Botany are less critical to several major effects on the Bay. This chapter deals, in turn, with water quality and water resource changes; with the generation of air-borne wastes; and with problems of noise. Accordingly, the chapter is set out in these three distinct sections.

I The impact of Port Botany on the water and marine resources of Botany Bay

The impact of Port Botany on the aquatic environment may seem to be overshadowed by the magnitude of potential air quality problems arising from the Port, Airport and industrial expansion. This attitude would be unfortunate because it is the total influence of the Port on the environment that is important. Problems encountered concerning water will range from those of an aesthetic and recreational nature to biological and ecological breakdowns which, in the end, are related to social aspects. But it is essential to recognise that the effects on Bay water, as such, need to be considered in the light of the more general environmental degradation.

Accessibility to recreation

Perhaps the most immediately affected will be the population in the Port vicinity. The area where the Port is being constructed is not of high amenity, except perhaps to local residents who value the view across the bay. The northern beaches and waters of the area are degraded by rubbish, by factory wastes discharged into the several drains that flow into the northern waters of the Bay, and by intrusions such as the Airport and oil terminals. On the southern side of the Bay, Kurnell peninsular is grossly degraded by rubbish dumping, mangrove stands are silting up, trail-bike riding is disturbing sand dunes, and sand mining on a large scale is threatening the stability of the dunes. However, with proper management the southern area has considerable recreational potential. This is the more important because of the overall lack of accessibility of the Bay particularly on the north side, a lack of accessibility that will be significantly reduced by Port construction.

According to M.S.B. proposals, some sixty acres of new 'open space' is to be created on the northern edge between Botany Road and the proposed Port road. While this appears attractive, the so-called 'open space' would be separated from the water by the Port itself and the proposed Port road. Access to this space would be restricted by the greater volumes of traffic using Botany Road

and the Port road, and its southern aspect would consist predominantly of Port structures, perhaps without even a glimpse of the Bay. While the preservation of such space is to be commended — it is far more desirable than a further blighting of the area with additional factories — the actual attractiveness, usability and amenity and the open space may be considerably less than is forecast. In certain respects, it reflects inappropriate priorities and appears more likely as at present designed, to serve as a 'free' zone which provides long-run opportunities for the Port to extend its activities. Were this area to be joined by reclamation for recreational purpose *in the area* of Stages III and IV of the proposed Port, the accessibility of Botany Bay would be transformed. This is not contemplated but might *seriously be considered as a possible major consideration in substitution for Stages III and IV.*

Quite apart from its localised impact, the Port will displace, restrict and interfere with existing or potential future recreational amenity over a considerable portion of the Bay. Presently, some forty-five fishing and three sailing clubs surrounding the Bay generate a very large number of boat excursions onto the water. The Port, by its very intrusion and by its operation, will significantly reduce the area for these activities. Some recreational value will be lost due to decreasing water quality levels (discussed below). Traffic generated by the Port will heighten already congested conditions around many parts of the Bay and must be expected to interfere with access to and the amenity of various small but very important public beaches around the Bay.

The current water quality of Botany Bay

The Port and its activities must be expected to have some detrimental effects on the quality of water in Botany Bay. We need, therefore, to note the present (i.e. recently measured) quality of water in the Bay and the base-line condition of marine life, so far as these have been established. Table V-(1) shows the level of

Table V-(1) Water quality in Botany Bay between October 1971 and February 1974

Quality Parameter	Measure	Station in Botany Bay (see Fig. V(i)) 10	20	30	40	50	60	70	80	90	100	110	120	130	150	160	170	180	No. of Samples
Dissolved oxygen (% saturation)	min.	81	87	72	69	83	89	88	84	87	88	86	88	87	87	79	84	62	
	mean	97	99	94	91	94	97	96	99	98	98	97	99	100	99	91	94	85	7
	max.	122	121	118	115	113	111	118	127	129	114	114	131	132	131	103	112	125	
Biochemical oxygen demand (mg/l)	min.	0.4			1.2		0		0.6	0		0			0			0	
	mean	1.5			1.6		1.6		1.0	1.4		1.1			1.1			2.0	4
	max.	2.1			1.7		2.6		1.5	2.2		2.4			1.4			3.5	
Turbidity (Jackson Turbidity Units)	min.	2.5			3.0		2.5		1.2	2.5		3.0			2.8			5.0	
	mean	6.4			9.5		6.1		10	7.6		9.8			6.0			15	4
	max.	10			21		10		28	18		23			10			42	
Suspended solids (mg/1)	min.	0.2			1.6		3.4		0	1.8		2.6			0			2.0	
	mean	4.0			5.3		4.8		7.0	4.1		5.0			3.2			8.7	4
	max.	7.2			8.2		6.8		11	6.2		6.8			6.0			22	
E. coli (per 100 ml)	min.	0			0		0		0	0		0			0			0	
	max.	52			16		68		200	560		16			560			800	7

Source: Water Pollution Control Branch Surveys on 13 Oct. 1971; 3 Feb., 6 April, 6 July 1972, 24 Jan., 14 June 1973, 17 Jan. 1974.

five quality parameters measured around the Bay in the period 1971-4. These measurements, although limited, indicate that the Bay waters are, at the moment, generally of very high quality. The poorest quality station, in terms of maximum levels of B.O.D., turbidity, suspended solids, and *E. coli*, is Station 180, that is close to the northern shores of the Bay in the area being reclaimed for Stages I and II of the Port (see Fig. V(i)). These higher maximum levels probably reflect the effect of discharges from the various industries around this area as well as Port construction. Although no monitoring station exists near the mouth of Cooks River, it could be expected that upstream industrial discharges would ensure below average water quality. Table V-(2) shows *E. coli* levels measured at various beaches and baths around the Bay, the locations of which are shown in Fig. V(i). In its regulations, the Clean Waters Act aims to achieve levels of fewer than 200 *E. coli* per 100 mls in water used for bathing and recreational purposes. From Table V-(2) we can see that over the bathing seasons of 1972/3 and 1973/4, the *E. coli* levels were greater than this standard about 10-20 per cent of the time, although often the standard was not greatly exceeded. The higher maximum values at Dolls Point and Sandringham Baths in 1973/4 may have been recorded after a storm when urban run-off and sewer overflows

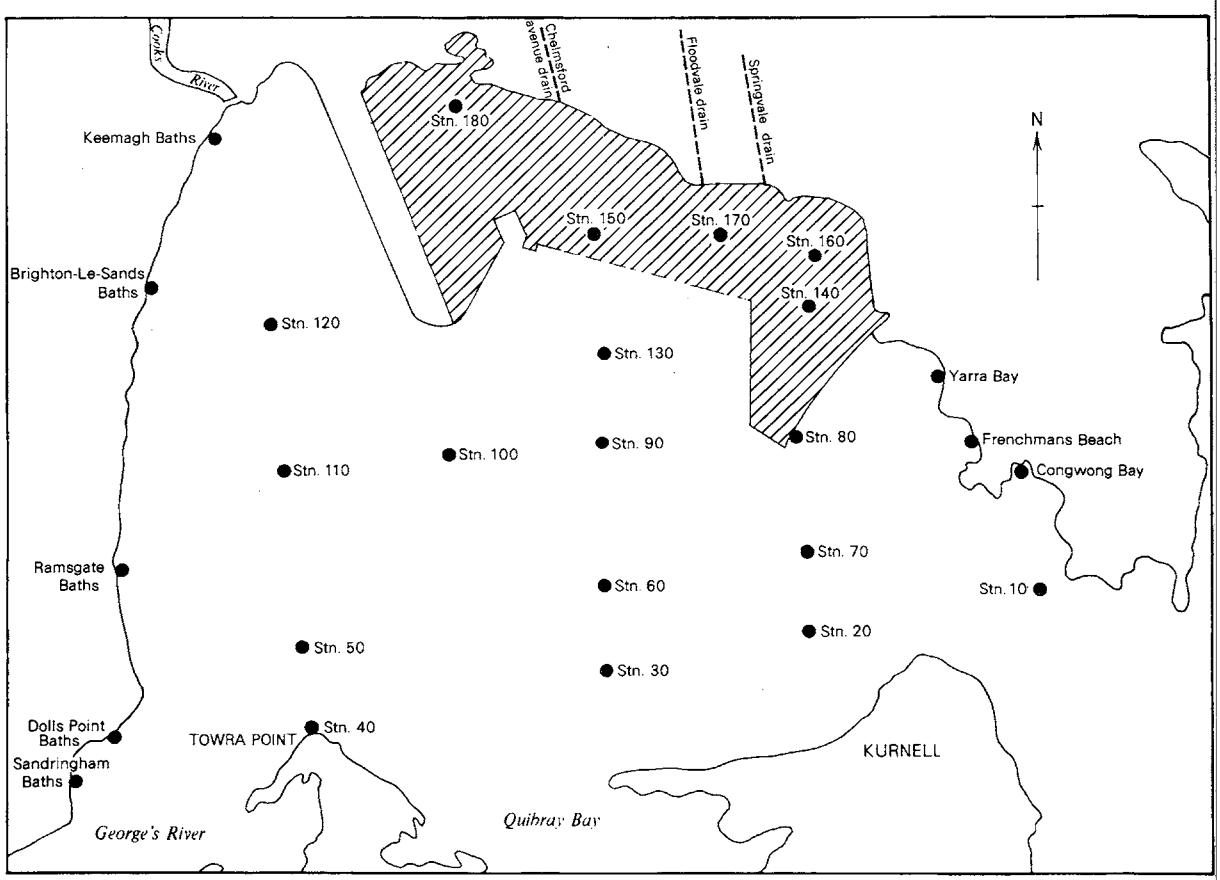

Fig. V (i) Location of water sampling stations

contribute to higher levels. Similarly, the higher maximum values recorded at Kyeemagh Baths in 1971/2 and 1973/4 may be due to the influence of sewer overflows into Cooks River. The high value recorded at Frenchmans Beach in 1971/2 may be due to sewer overflows and leachate from a nearby (completed) garbage tip. With the possible exception of the cases mentioned, the maximum *E. coli* levels shown in Table V-(2) are not excessive and swimming in these waters should not constitute an unacceptably high health risk.

The CSIRO conducted an extensive series of nutrient surveys in the Bay between 1943 and 1954. A comparison of these results with the admittedly far more limited surveys made for the M.S.B. in 1973 does not indicate any significant change in the nutrient balance of the Bay. Although algal blooms are a relatively common occurrence in the Georges and Cooks Rivers, there is no indication as to their frequency and intensity in the Bay itself. It appears that they are far less frequent and less intense.

What of toxic materials that can be concentrated in seafoods and may present health risks to human consumption? Given the many industries around Botany Bay using these materials, do fish and shellfish from these waters present a risk? Figure V(ii) shows the frequency distribution of the concentration of mercury in fresh fish and shellfish taken from Botany Bay between 1970 and 1973 as recorded in a study by the Water Pollution Control Branch.[1] Of the forty-six samples analysed, five had levels above the recommended upper limit of 0.50 ppm. On the basis of these samples, the consumption of fish from Botany Bay should not present a significant health risk. However, the study does not appear

Table V-(2) E. coli levels at beaches and baths around Botany Bay

Location (see Fig. V(1))	1971/2 Bathing season			1972/3 Bathing season			1973/4 Bathing season		
	Samples no.	Samples > 200 per 100 ml	Maximum level	Samples no.	Samples > 200 per 100 ml	Maximum level	Samples no.	Samples > 200 per 100 ml	Maximum level
Conwong Beach (Randwick)	10	1	300	12	0	48	11	2	480
Frenchmans Beach (Randwick)	10	2	15,300	12	0	160	11	2	980
Yarra Bay (Randwick)	10	4	760	12	0	20	11	0	72
Kyeemagh Baths (Rockdale)	11	1	18,000	10	1	230	10	2	3,400
Brighton-Le-Sands Baths (Rockdale)	11	3	4,000	10	1	210	10	1	670
Ramsgate Baths (Rockdale)	11	2	1,800	10	1	400	10	2	460
Dolls Point Baths (Rockdale)	11	1	376	10	1	1,100	10	2	5,000
Sandringham Baths (Rockdale)	11	4	1,600	9	1	330	10	4	4,200

Source: Health Commission data.

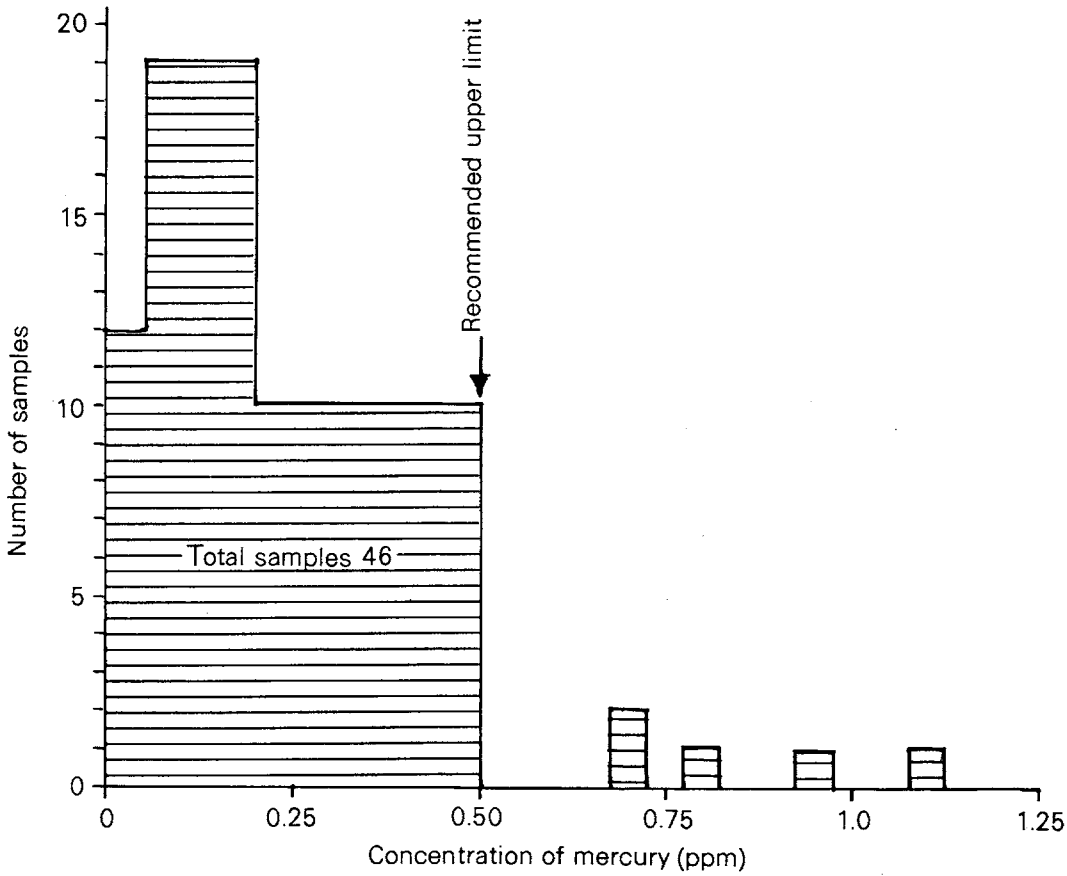

Fig. V (ii) Distribution of mercury levels in fresh fish from Botany Bay

to have included any fish from Cooks River and Alexandra Canal, the two water bodies that are probably most affected by toxic discharges.

The average mercury level in fish from Botany Bay — an area representing 'significant industrial pollution' according to the study — was 0.23 ppm, a value significantly higher than the average level of 0.14 ppm recorded in fish from the open ocean. It seems that industrial pollution may be the reason for the higher mercury levels in fish in Botany Bay. The M.S.B. made an extensive survey of mercury levels in the waters of Botany Bay in 1971. Most other levels were barely above the detection limit of the instrument used in the analysis (0.0002 ppm). The considerable difference between these levels and the levels recorded in the fish may give some idea of the ability of marine organisms to concentrate these toxic materials. Consequently, it might appear more relevant and possibly more accurate to monitor the fish rather than the water. But it is, perhaps, most important to monitor the inputs of pollutants into the Bay as a more control-oriented procedure.

Another recent survey has examined the concentration of heavy metals in oysters from the Georges River.[2] With the exception of copper, the recorded

levels of other heavy metals were all less than the recommended upper limits. The concentration of heavy metals increased the further upstream the oysters were raised — probably indicative once again that pollution is having a measurable effect on the concentration of toxic substances in fish and shellfish from around the Georges River and Botany Bay areas.

To sum up, in broad terms the present waters of Botany Bay are of reasonably high quality. This reflects the extent of the Bay, tidal flooding and the volume of water it contains and its ability to assimilate waste materials. Although *E. coli* levels at beach and baths around the Bay exceed the standard of 200 per 100 mls on occasions, the water is suitable for bathing and recreational purposes. The variety and amount of trash and flotsam and jetsam on the beaches is likely to be having greater detrimental effect on amenity than is water quality. Although the level of toxic substances is elevated in fish and shellfish from the area, the levels are generally below the recommended maximum limits and should not constitute undue health threats. The action of the Water Pollution Control Branch in diverting industrial discharges to sewer should further reduce these levels in the future.

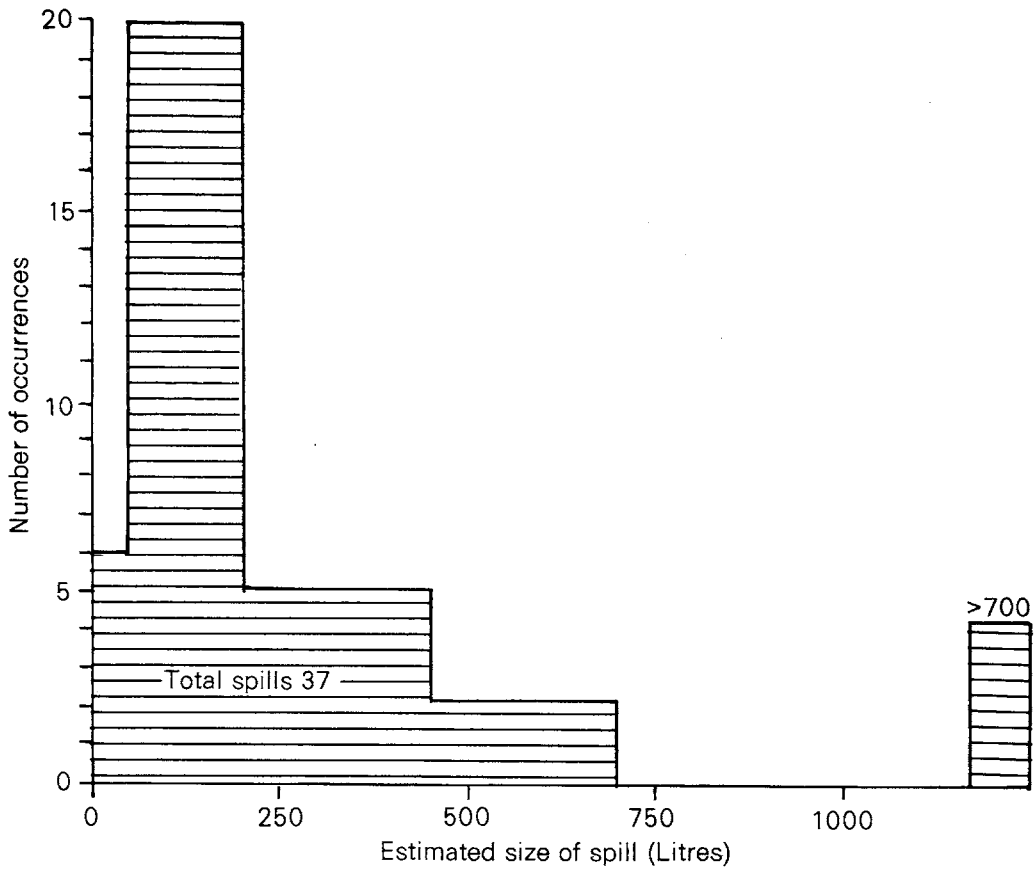

Fig. V (iii) Size distribution of oil spills in N.S.W. ports

Potential Port pollution

What then are the possible detrimental effects of the proposed Port on water quality? Perhaps the most immediately obvious is a potential for increased frequency of oil spills. On the basis of the number of oil spills in the four main ports of New South Wales during 1972/3 and 1973/4, there are approximately ten spills per 1,000 vessels. By 1985, the number of vessels using Stages I and II of Port Botany might increase from the present number of about 500 to some 1,100 annually.[3] In these conditions, unless extra precautions are taken, the frequency of oil spills would be expected to double by 1985 to some ten spills per year. Most oil spills in port waters are due to accidents during bunkering operations and generally involve less than 500 litres of oil (Fig. V(iii)). These numbers depend very much on changing ship size. If Botany Bay accommodated predominantly large ships, the numbers would alter and the risks change. With increasingly larger shipments of oil, greater size of vessels, and the development of Botany Bay as the sole oil port for Sydney, *the potential for a massive oil spill* would be expected to increase. The M.S.B. is the authority responsible for the prevention and mitigation of oil pollution in port waters. With significantly increased potential for oil spills, it may be necessary to establish a more effective means of mitigating oil pollution, as in Melbourne, where there is a core group of trained personnel on duty twenty-four hours a day, to act quickly and decisively when a spill occurs.

Emission of coal dust from a coal loader and its effects on water quality would be a second potentially important problem associated with the Port development. Because of lack of data it is not possible to estimate with any degree of certainty the volume of dust that might be generated. Were the Port to develop to its proposed coal loading capacity, the escape of dust would be significant. An initial approximation has been made, in predicting potential air quality problems, of about 1,000 tonnes each year or around three tonnes each day. The proportion of this dust that might settle on Botany Bay waters is not possible to calculate. It seems inevitable, however, that a gradual blackening of the Port area around the location of the loader is to be expected. A considerable volume of dust, that might otherwise have been emitted, is proposed to be trapped with water and flushed into treatment facilities. Provided the water is carefully recycled, major problems with effluent discharges can be controlled, although overflows are apparently to be discharged to sewer. The close oversight of this recycling and purification system would be essential. Stormwater from the coal loader would be passed through a settling basin before discharge into the Bay. This may not be an effective way of removing the finer portions of coal dust, and unless more efficient treatment processes are installed, significant quantities of dust may be carried into the Bay via this route. If not adequately controlled, coal dust could lead to increased turbidity levels in Bay waters and a gradual blackening of beaches.

Over the period 1971-4, limited measurements have suggested that increased turbidity levels have occurred at most of the monitoring stations in the Bay. Dredging for port construction and vessel passage has probably been an important source of this change, although urban run-off and storm activity in the Bay have intermittent effects. Following dredging operations and construction, it appears likely that shipping movements in the relatively shallow Bay waters will

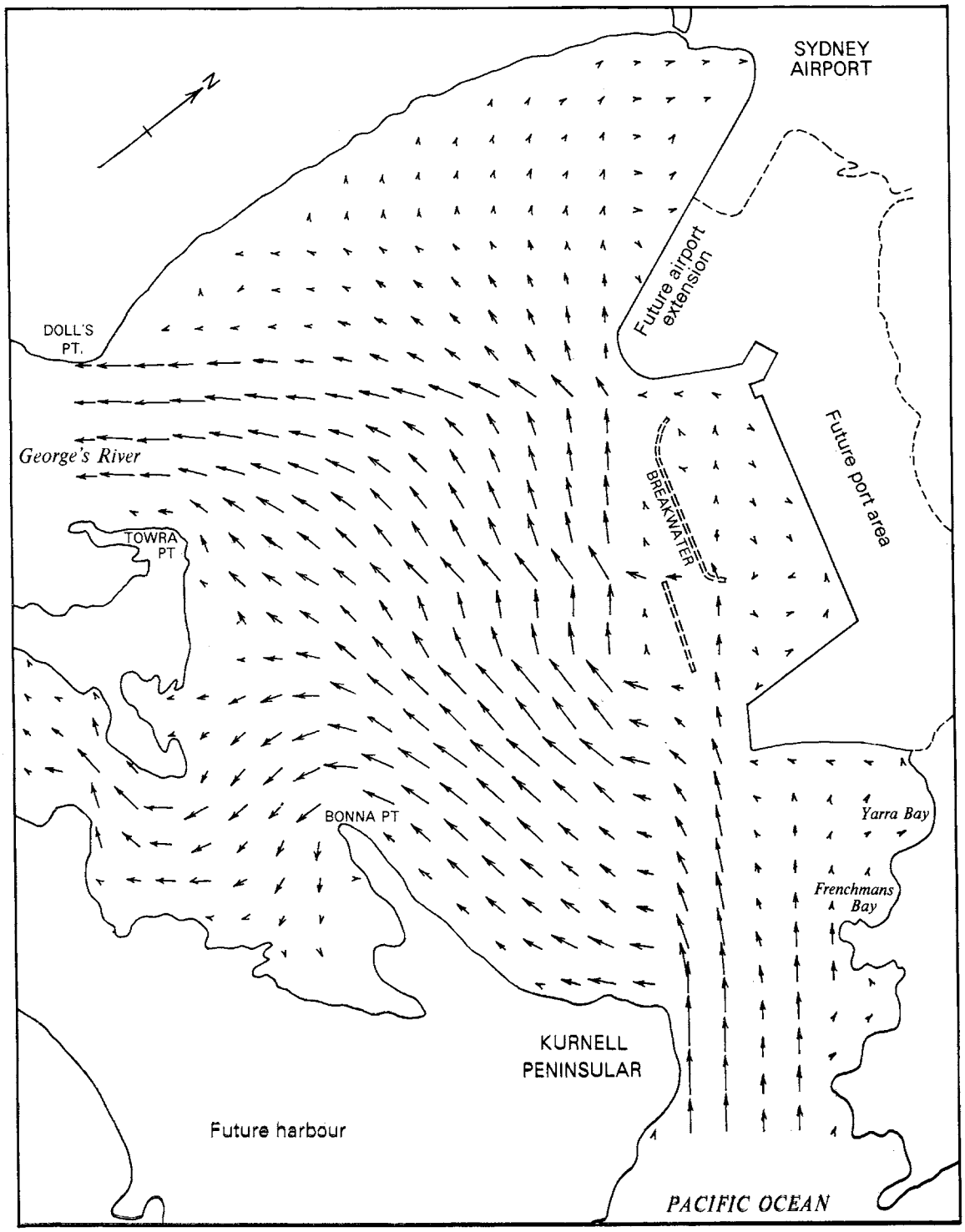

Fig.V (iv) Predicted tidal currents at half tide for developed harbour

ensure elevated turbidity levels as ships' propellors stir bottom sediments. The subsequent effects on the Bay's amenity are difficult to quantify. Should the changes persist and become detectable to the human eye, the aesthetic value of the Bay could change considerably. Secondly, increased turbidity will most probably become a source of difficulty to marine fauna populations as some clogging of gills will occur. Perhaps most important, it is likely that increased turbidity levels could lead to a decline in the Bay's fisheries productivity. Elevated turbidity levels would reduce the penetration of sunlight which could lead to reduced growth of food sources, and reduction in the volume of food available for fisheries of commercial and recreational interest.

But it appears that this would be less important as a source of productivity reduction compared with other changes. Construction of the Port and breakwater has considerably altered wave patterns and the distribution of wave energy in Botany Bay (Fig. V(iv)). Although erosion of Lady Robinsons Beach has occurred at various times during Port construction and storm activity, it appears that a potentially greater threat is posed by wave action in and around the Towra Point area and, to a lesser extent, the Yarra Bay-Frenchmans Bay vicinity. The danger at Towra Point is twofold. Increased wave activity has already eroded considerable sections of the beach and greater erosion can be expected to occur as the land mass seeks to align itself at right angles to the new and increased wave action.

Under water, large areas of seagrass (*Posidonia*) have been removed and it is here that dangers to the Bay's productivity lie. Seagrass areas commonly act as 'nurseries' for juvenile fish, spawned at sea. In this area, food and shelter were relatively abundant. Historically, some part of this nursery function was performed by a region in the north of the Bay, but for various reasons, including industrial pollution, the area no longer exists. Hence, the importance of the southern area is critical. Once decimated, *Posidonia* is extremely slow to re-establish communities and it appears that it could be necessary to encourage replacement by other seagrass species (especially *Zostera* or *Habphila*) if the Bay's productivity for marine life is to be protected. This, in itself, is an extremely hard task given the number of winter storms in the Bay and the guttering of the undersea landform in the critical areas. In any case, it will almost certainly be a considerable time before the nursery function of the seagrass beds could again be adequately fulfilled. Some commercial oyster fishermen believe that dredging in the Bay has reduced oyster growth rates by increasing salinity levels in Woolooware Bay and other oyster-farming areas. The total annual fisheries catch from Botany Bay has remained fairly steady over the past fifteen years, although considerable changes have occurred in some species caught. The Bay and Georges River are responsible for about 30 per cent of the State's 1971/2 catch of crustacea and oysters, almost all mussels and some 230 tonnes of scale fish. Given that Botany Bay supports a substantial number of professional fishermen in addition to many amateurs, a marked decline in productivity may well force some out of the local industry. This must be regarded as one of the possible employment costs of the Port.

There are other implications for the redistribution of wave energies. Degeneration of seagrass beds would affect not only aquatic populations but a considerable number of species of migratory wading birds for which Botany Bay

is the main wintering ground in N.S.W. Storm damage has occurred, affecting the human use of the Bay. The altered wave energy distributions also tend to cause problems in the vicinity of Frenchmans and Yarra Beaches. In addition, waste, ballast and bilgewater discharges from ships are potentially damaging. Several new species of fish have already been caught in Botany Bay and may have been introduced through bilge water discharge, thus altering the ecological balance.

II The development of air-borne emissions

In attempting to project the emissions of air-borne wastes, it is necessary to do more than build on the preceding chapters. In using the earlier projections, it is necessary also to take into account the strategy of control adopted by the air pollution control authorities in Sydney and the progression of controls to be applied, according to schedule, to motor vehicles, factories and other waste sources. The point is simply that, were no changes of *any other sort* to occur in the Port hinterland between now and the target date of 1985, it would be expected that a significant reduction in major air-borne wastes would be achieved as a result of control. Accordingly, in projecting the volumes of air-borne emissions, we must assume that this developing control system will come into force with respect to existing waste sources, to sources that might be expected to develop in the absence of Port Botany and to sources that are established in and as a result of Port Botany development.

In this section, we deal only with the generation of air-borne wastes. Because of the importance of photochemical smog development in Sydney, special attention is given to nitrogen oxides and hydrocarbons. Difficult as the projection of air-borne wastes may be, it would be highly unwise to project specifically from these estimated waste flows to the likely influence on smog formation. The process of smog development is inadequately understood. What we need to do, however, is to investigate the likely flows of the primary wastes, nitrogen oxides and hydrocarbons, that form one part of the potential for smog formation.

In making approximate projections, the reservations made earlier are repeated. Projections are not predictions; and they must be based on a series of assumptions. The attempts at projections made represent one relatively simple simulation. It is vital that Sydney authorities should attempt alternative evaluations. In this respect, the failure of individual environmental impact statements to incorporate this matter properly is not simply a criticism of the proponents of Port use. It is one case where aggregation is essential and can only be done effectively by the authority responsible for air pollution control. That the whole issue did not emerge at the inquiries is surprising in that the Director of the S.P.C.C. (which is the air pollution control authority) conducted the N.S.W. inquiries and could have been expected to attempt the necessary aggregation.

For purposes of our projections, we confine attention to the area already designated as 'Port hinterland'. There are, however, two qualifications to note. First, we include the waters of Botany Bay and the wharves and berths since some air-borne emissions of significance must be expected to come from these areas. Second, in estimating air-borne emissions from motor vehicles, aircraft

and trains we confine the emission sources to the limited region of the Port hinterland and Botany Bay itself. In addition, we include as an integral part of the Port the Caltex Refinery at Kurnell. Our projections, therefore, do not include the total of emissions that are yielded for the whole metropolitan areas as a result of the Port and Port-induced changes; the volumes estimated are limited to those generated within the restricted, defined area.

Current air-borne emissions in Port and its hinterland

The area to the north of Botany Bay is a major source of air-borne wastes in Sydney. The Botany L.G.A. has perhaps the most degraded air in the whole of Sydney. It is the most seriously affected by dust deposition. The highest measured concentrations of sulphur dioxide in Sydney's atmosphere occur at Kurnell Peninsula and slightly to the north of Botany L.G.A. These sites are influenced by industrial establishments expected to expand to 1985. Botany L.G.A. has about the highest levels of smoke of any area in Sydney. The ozone concentrations in nearby Marrickville are the highest recorded in Sydney.

The factory complex in the area makes up one of the most serious sources of air-borne emissions of almost every type. It is a major source of nitrogen oxides and hydrocarbons. But, in addition, because of the importance of refining, chemicals and particular types of food production and the location of paper manufacturing in the area, the Port hinterland is affected locally by a large variety of toxic irritant and offensive emissions as process wastes of the local manufacturing. The area is the location of a large part of Sydney's most 'noxious' industries. Because of the physical relationship between residence and factories, those noxious emissions that are predominantly local in incidence affect immediately the residents of the hinterland directly.

By contrast, the hinterland is not a major source of air-borne emissions due to motor vehicles, despite the flow of vehicles to and from Sydney Airport. Aircraft add a special supplement to the total air-borne wastes generated in the area. But, in contrast with the rest of Sydney, it is stationary sources that provide the major air-borne waste flows.

The Port hinterland lies in the track of the sea-breezes that 'arrive' at Botany Bay. Accordingly, the degraded air and its resident wastes tend to spread more widely and more frequently over wide areas than occurs in other industrial locations. The hinterland, like much of the southern half of Sydney, is affected by temperature inversions at night, trapping emissions and limiting their vertical dispersion. The combination of cumulating nocturnal wastes (compare the proposed 24-hour operations of the Port), morning waste emissions and sea-breezes moving north and west over large areas of Sydney make this hinterland area one of the potetially most dangerous area sources of emissions to the rest of Sydney.

We cannot relate secondary pollution measurements elsewhere in Sydney directly to the emissions of primary wastes in the Port hinterland. Nevertheless it is relevant to note that, on the *northwest* limits of the hinterland, in Marrickville, the concentrations of photochemical oxidants measured most recently are among the highest in Sydney and appear to have been as much as five or more times the World Health Organisation goals. It is also symptomatic that a grey-brown 'smog' is frequently present over the Botany Bay hinterland and extends towards the Central Business District. This smog is not confined to these areas

but appears to be particularly obvious there. The cause of brown smog is not yet known. Its presence is thought to be a function of relative humidity and relative concentrations of a large range of elements in the atmosphere including sooty carbon particles, various inorganic crystals and acid droplets. Significant sources of all these occur in the Botany hinterland area.

The air-borne waste problems of the Port hinterland appear increasingly to be matters of concern to a considerable proportion of Sydney residents far beyond the geographical limits of the hinterland. If this is the case *currently*, it is to be expected that the proposed Port development may have a significant impact on the air quality of persons a long way from the emission sources. The problem is general, not local.

It is essential to note the approximate distribution of major waste sources in the Port hinterland. The following estimate for 1973 (Table V-(3)) shows the comparative dominance of manufacturing, including oil refining, wastes in the air. This contrasts with Sydney as a whole where the motor vehicle is by far the dominant source of air-borne emissions, particularly combustion wastes. The principles of calculation are given in Reports Nos. 1 and 2 of the Botany Bay Project. In Table V-(3), a summary representation of the main measured emissions is given for 1973 covering particulates, carbon monoxide, sulphur oxides, nitrogen oxides and hydrocarbons.

Manufacturing air-borne emissions derive predominantly from a relatively small number of sources. The Port hinterland suffers in this respect by having a strong representation of the major factories generating large volumes of emissions, in refineries, chemicals, paper and food processing.

The impact of the Port and Port-induced changes

For purposes of an approximate simulation of the likely effects of air-borne emissions by 1985, we accept Stages I and II of the Port hypothetically in full operation as at present proposed. We assume, in accordance with the chapter on land-use changes, the expansion of Caltex and Total refineries (whose grwoth will be greatly facilitated by the Port) and the development of existing major

Table V-(3) Major sources of air-borne emissions in Port and Port hinterland, 1973

Sources	All measured wastes (tonnes p.a.)	Shares in waste flows (%)
Mobile		
Motor vehicles	24,000	31
Other mobile	1,800	2
Stationary		
Combustion wastes:		
Manufacturing	28,000	37
Other	1,700	2
Process wastes:		
Manufacturing	16,000	21
Other	5,000	7
Total wastes	76,500	100

concerns that possess attached vacant land to fill the available factory land sites are to be treated as Port-induced. We assume, also, that road transport develops as specified in the chapter on transport congestion. Here, however, two important adjustments are made. First, expansion of Airport traffic is regarded for the purposes of these calculations as unrelated to Port Botany, and consequential emissions are included as a separate component in the 1985 total emissions, as projected. Second, we assume that United States Environment Protection Authority 1976 standards for vehicle emissions are applied in N.S.W. in 1980 and that prior controls extend back in time according to the application of design rules and legislation already applied. In applying these assumptions, we have taken the vehicle age structure as given by A.T.A.C., and adjusted for vehicle weight, and have assumed that the vehicle population at the Port and in the hinterland conforms to this frequency distribution.

Table V-(4) shows the estimated vehicle kilometres travelled in the Port hinterland area in 1973 and the 1985 projections, distinguishing Port-derived and non-Port travel. In non-Port travel, increase due to Airport traffic is included. As will be seen, Port-induced travel is a relatively small component of the total projected increase in the hinterland. (It may be noted, in passing, that this does not appear to be the case for Cooks River Valley.)

Table V-(4) Estimated vehicle kilometres travelled — Port hinterland 1973 and 1985 ('000 km)

Type of vehicles	1973	*Increase to 1985:* Port	Port-induced	Airport and other	1985 Total
Light vehicles	838	8	20	555	1,421
Heavy vehicles	93	18	9	34	154
Total	931	26	29	589	1,575

The emissions due to these vehicle miles travelled have been adjusted to '1980 control standards' as new vehicles join the hinterland fleet.

With these assumptions, we project to the estimated 1985 air-borne emissions from mobile and stationary sources in the Port hinterland as shown in Table V-(5), covering the total of particulates, sulphur oxides, carbon monoxide, nitrogen oxides and hydrocarbons.

Projections of this type are exceedingly difficult and it must be expected that considerable opportunities for error arise. We repeat that relevant control authorities should attempt these estimates *and should have done so in the process of evaluating proposed Port development*. It would be unwise to rely too closely on our results. Nevertheless, the implied increase of some 40 per cent in total emissions on the base of 1973 cannot be regarded as other than alarming. In the circumstances of the rest of Sydney, where extensive efforts are being made to reduce air-borne wastes, the reasonable expectations are that significant improvements might be expected by the late 1980s. Some 'improvement' is shown in Table V-(5) since the projections for vehicle emissions are estimated as declining substantially thanks to *assumed* controls. Total waste flows, allowing

Table V-(5) Estimates of total measured emissions 1973 & 1985 Port and hinterland (tonnes per year)*

Waste Sources	1973	Port	Port-induced	Airport	Other†	1985 totals	Change due to Port & hinterland on 1973 base (%)
Mobile							
Motor vehicles	24,000	300	300	1,400	-11,100	14,900	+ 2
Other	1,800	1,200	—	—	1,100	4,100	+66
Total mobile	25,800	1,500	300	1,400	-10,000	19,000	+ 7
Stationary							
Combustion Waste:							
Manufacturing	28,000	—	12,000	—	—	40,000	+40
Other	1,700	—	—	—	- 1,000	700	—
Process Wastes:							
Manufacturing	16,000	—	11,500	—	—	27,500	+80
Other	5,000	—	2,700	—	—	7,700	+55
Total stationary	50,700	—	26,200	—	- 1,000	75,900	+50
Total emissions	76,500	1,500	26,500	1,400	-11,000	94,900	+37

*For methods of estimation of this and subsequent tables see p. 67.
†This represents predominantly the effect of emission controls on motor vehicles

Table V-(6) Projected nitrogen oxides emissions Port and Port hinterland (tonnes per year)

Waste Sources	1973	Port	Port-induced	Airport	Other	1985 totals	Change due to Port & hinterland on 1973 base (%)
Mobile							
Motor vehicles	1,000	30	30	140	400	1,600	+ 3
Other	100	300	—	—	100	500	+300
Total mobile	1,100	330	30	140	500	2,100	+ 30
Stationary							
Combustion Waste:							
Manufacturing	6,700	—	4,600	—	—	11,300	+ 70
Other	400	—	—	—	-400	—	—
Process Wastes:							
Manufacturing	600	—	400	—	—	1,000	+ 67
Other	—	—	—	—	—	—	—
Total stationary	7,700	—	5,000	—	-400	12,300	+ 65
Total emissions	8,800	330	5,030	140	100	14,400	+ 60

for these controls and for Port and Airport traffic and industrial development could increase by 'only' one-third over 1973. But this implies, notwithstanding the assumed severe vehicle controls, that the currently degraded air of the Port hinterland would be expected to degrade markedly over the next decade *if the proposed Port developments proceed.*

In this context, it may be noted that a significant number of potential emissions have not been included in these calculations — coal dust from trains, other particulates and dust from dry bulk goods, hydrocarbons from oil spillages, etc.

Moreover, we have assumed only published American rates of deterioration of vehicle emission controls. We believe that the projected increase of 40 per cent is likely to underestimate the consequences of Stages I and II of the Port development *as proposed* (no projections for Stages III and IV are made).

Many of these emissions would be local in incidence and would locally degrade the currently poor air quality of an already poor immediate environment. But it is essential also to look beyond the local emissions to examine the likely effects of hydrocarbons and nitrogen oxides. As indicated, these wastes, which are the precursors of photochemical smog, could have important implications for large parts of Sydney. We do not and cannot project the consequences because of the complexities and uncertainties of photochemical smog formation. But it would appear that if the Port-induced changes generate significant volumes of these two waste types the Port hinterland is probably the worst possible area from which they should originate. Table V-(6) presents the projections of nitrogen oxides and Table V-(7) the projections of hydrocarbons for the target year of 1985, based on Port Stages I and II development.

The projected increases of almost 50 per cent in hydrocarbons and about 60 per cent in nitrogen oxides, as estimated, give cause for the greatest concern. These increases are projected, on our assumptions, to be offset by *gross* reductions due to the spread and tightening of controls. Control reductions, however, would make comparatively small offsets to the effects of the Port and Port-induced activities. *It will be seen that the overwhelming contributions come from Port-induced stationary sources.* This conflicts with the strategy of photochemical smog prevention in Sydney, *concentrating on hydrocarbon emissions of vehicles.* The Port hinterland would need to be reappraised in control terms to give much closer attention to these stationary sources. To date, manufacturing and refineries have escaped close control, partly because of the expected high costs of the relevant factory controls. *It would appear that one of the costs*

Table V-(7) Projected Hydrocarbon emissions, Port and Port hinterland (tonnes per year)

Waste Sources	1973	Port	Port-induced	Airport	Other	1985 totals	Change due to Port & hinterland on 1973 base (%)
Mobile							
Motor vehicles	2,800	30	30	140	-1,500	1,500	+ 1
Other	400	—	—	—	300	700	—
Total mobile	3,200	30	30	140	-1,200	2,200	+ 1
Stationary							
Combustion Waste:							
Manufacturing	300	—	200	—	—	500	- 67
Other	—	—	—	—	—	—	—
Process wastes:							
Manufacturing	11,400	—	7,700	—	—	19,100	- 68
Other	4,700	—	1,700	—	—	6,400	- 36
Total stationary	16,400	—	9,600	—	—	26,000	+58
Total emissions	19,600	30	9,630	140	-1,200	28,200	+49

of Port development, as at present designed, may be the imposition of costly controls on a related range of manufacturing establishments. Provided the Port continues as currently envisaged, this change in control policy may become inescapable. Polluting factories in the area may have to bear the brunt of Port development.

The critical feature of this projection arises from the concentration of oil refining and storage around Botany Bay and the development of the Port as an oil port. These are the dominant sources of both hydrocarbons and nitrogen oxides. Moreover, to underscore the point, it is their location as much as the volumes involved that cast doubt on the wisdom of present development plans and the existing location of refineries on the edges of Botany Bay.

The point may be expressed in homely, illustrative terms. Were the Port to develop with its storage and berth facilities and ship arrivals, were the two refineries (Total and Caltex) to expand as proposed along with other land-use changes specified in Chapter 3, and were containers to be moved by road as planned, *the consequential total emissions of hydrocarbons and nitrogen oxides would be of the order of at least 500,000 motor vehicles subject to present (1976) controls* with average Sydney vehicle mileage per year. With vehicle controls (USEPA) assumed to be applied to Sydney vehicles in 1980, these refineries would be expected to generate nitrogen oxides and hydrocarbons equivalent to approximately 1.5 million vehicles — equal to more than all of the present Sydney vehicle population, crowded in the Port hinterland. The development of refineries around Botany Bay must be recognised as an integral part of Port Botany design. This Port design makes nonsense of the strategy of photochemical smog prevention, imposing expensive controls on residents' motor cars on the one hand while, on the other, locating Port, storage and refineries in such a manner as to restore a very large part of the whole of Sydney's flow of smog precursors through bad planning. Some relatively drastic amendment in existing plans appears essential. It is, indeed, very much in the interests of large hinterland factories that these changes be made.

III Likely noise problems

Introduction

In many ways the problem of noise has been important in the Botany and nearby areas for a long period. This is partly due to road traffic and factory noise. But it has arisen primarily because of Sydney Airport which is under Commonwealth Government control. This Commonwealth control adds to the confusion of planning and in dealing with prospective Port Botany noise. Community opposition to aircraft operations at night has forced curfews on jet aircraft movements between 11 p.m. and 6 a.m. each night, although propellor aircraft may still operate in this period. In the absence of 'hard' data on many other environmental aspects of Port development, communities to be affected by Port development have seized on potential noise problems as a means of objection. Partly this has been due to the existence of some quantifications of present noise levels, and some predictions. But perhaps the main reason is that noise is one aspect that people can comprehend — the monitoring system

needed is the ear; they can gauge it by their own experience. In the case of air pollution, human understanding may easily mislead. Increases in atmospheric concentrations of some toxic gases are not immediately apparent to the ordinary citizen. But increases in dust or smoke levels, which people can gauge from their own experiences, are quickly condemned. In the case of noise from Port and adjacent developments, the human monitoring system is less likely to be wrong. Already, construction of the Port has led to considerable disturbance of local residents. It appears that quite large increases in noise levels, from many more sources and in many locations, will occur as the Port begins operations and aircraft and traffic movements grow.

The comments to follow are not based on expert understanding. We profess no expertise concerning noise problems. Basically, this section is intended to assemble relevant material that is available from a variety of sources.

The base condition (1973-6)

In the base years, the sources of noise are numerous — aircraft movements, road traffic, rail traffic, some shipping movements and noise emission from industrial activities. The Port establishment and growth in adjacent areas will ensure that the levels of noise from all these will increase, in varying degrees.

Some quantitative measures are available for base years' noise levels in the vicinity. Most recorded levels have been compared with the Australian Standard 1015-1973 (AS-1055), 'Noise Assessment in Residential Areas',[4] in which acceptable noise levels are varied according to the nature of activity in the region — high or low industrial or transportation activity. This seems to be the only environmental standard where the acceptable level (of physiological and psychological health) varies from region to region. But it should be established that AS-1055 is not a legal standard. It is a set of standards recommended by the Standards Association of Australia. The N.S.W. Noise Control Act does not subscribe to the concept of ambient standards. It prefers to rely on a rather broad definition of 'offensive' noise,[5] which may solve relatively minor problems but, it appears, will be difficult to apply to major community problems. But, in the absence of other acceptable standards, AS-1055 is taken as the guide.

The Sydney Area Transportation Study examined noise generated by traffic movements in terms of a Traffic Noise Index (TNI) which 'reflects the level of disturbance caused by noise'.[6] It concluded that the area of Botany Road from the new Port area to Gardeners Road, and the Gardeners Road area itself, had amongst the highest levels of 'disturbance' in Sydney. The Australian National Line environmental impact statement concluded that the present daytime noise levels in the Botany area 'generally agree' with AS-1055 recommendations with the levels varying as a function of the monitoring location and traffic density.[7] Refinery operations and other industrial activity, traffic noise and aircraft operations are the main contributors, the last being dominant in the 6 p.m.-10 p.m. period. The averaging daytime levels are reported to be in the range 50-55 dB(A), decreasing to 40-45 dB(A) at night, although peaks occur with aircraft movements; some levels already exceed AS-1055 recommendations.

The influence of aircraft noise (commonly expressed in terms of Noise Exposure Forecasts (NEF)), in the southern areas of Sydney is considerable. Noise Exposure Forecasts combine intensity of noise, its duration and aircraft type and

frequency in a single index. The limiting NEF value at '30' is frequently taken as the point at which some complaints and interference with some activities are considered possible. In Sydney, at present, some 67,000 people are said to live within the 30 NEF contour.

A reasonable summary of the base year conditions would probably be that, according to AS-1055, the present overall noise levels are not excessive on these standards, but that the limit is exceeded along traffic arteries and during aircraft movements. At affected locations, considerable disturbance to normal communication and to some activities would then be common.

The 1985 condition

In respect of Stages I and II of Port Botany development various impact statements and reports have attempted to evaluate aspects of the potential noise levels.[8] The coal loader environmental impact statement does not deserve lengthy consideration. The proponents' submissions have been changed and from many points of view appear unrealistic. The claim of the original statement was that the resulting noise levels *might* be some 5dB(A) above the existing levels for those residents most exposed. Upon further investigation at the S.P.C.C. inquiry, the proponents undertook to limit noise from the loader and associated activities to 35dB(A) at the nearest residence. Ironically, this guarantee is one of the major problems in separate consideration of the individual statement: *the sum total of all activities (loader, containers and others) has not been considered.* No single 'undertaking' to limit noise can be treated seriously.

The A.N.L. environmental impact statement was more extensive in its evaluation, giving credence to noise from some traffic and rail operations as well as shipping movements. This statement predicted that A.N.L. traffic would result in noise from traffic on the new Port road increasing from 50 to 62dB(A), an increase of 12dB(A). Increases in other areas are predicted to be up to 3dB(A) but these 'should not result in any noise annoyance'.[9]

A report prepared for Rockdale Municipal Council[10] attempted to overcome the problem of analysing the separate developments in isolation. Despite the fact that it is restricted to the emission of noise from the Port area only, and its potential impacts on Rockdale only, several suggestive conclusions were reached. It appears that effects on the Rockdale area would probably be greatest in the evening and night, although the area would almost certainly be subject to increased noise levels throughout the day. It appears that under temperature inversion conditions, *which occur on about 75-80 per cent of nights*, quite large increases in noise levels would occur. The degree of 'excess' noise increases with inversion strength (°C/100 metres). But the fastest increase in noise levels occurs with relatively weak inversions: i.e. the mere presence of an inversion increases noise levels considerably. For example, for an area such as Rockdale an increase in noise level of about 25 per cent can occur with an inversion strength that occurs on about 35 per cent of nights. The Rockdale report proposed a concept of 'power sharing' for noise emissions from the whole of the Port area. It is predicted that complete Port development (Stages I-IV) would increase nighttime levels by about 50 per cent and that this may double under extreme inversion conditions. For about 50 per cent of all nights, roughly an 80 per cent increase may occur. In total, community reaction would range from 'very strong' to

'extreme'. For stages I and II, the effect would be perhaps a 60-70 per cent increase in noise on about 50 per cent of nights. Community response could be expected to be widespread complaints. Given the conditions of inversion formation, worse conditions can be expected to occur in cooler months.

The Rockdale report does not appear to include mobile sources that might also be relevant at night. Some ship loading and unloading and some rail operations could be important. Road traffic would, however, mostly be limited to daylight hours. On the occasions of inversion conditions lasting throughout the day, or for several days, the noise levels might be considerably elevated. The problem of rail noise is not considered in depth in any report, the major reason perhaps being the apparent isolated treatment of the coal proposal.

More generally, however, it appears that the increase in vehicle traffic that would occur as a result of 'natural growth' and the Port, Airport and hinterland activity is also likely to produce considerable increase in noise levels. The noise level changes due to traffic flow and composition (ratio of light to heavy vehicles) are more critical at low traffic flows. Noise from peak hour flows would increase slightly but it would be the noise level changes due to increase in off-peak periods which would be most noticeable. Noise levels would be higher for longer periods. As road congestion increases and average route speed decreases, it is common to find many vehicles resorting to residential minor roads in an effort to save time (see Chapter 6). The vehicles using these roads are likely to be those driving to a time schedule — the larger and heavier commercial vehicles. It is likely that residential areas off major arteries would become increasingly familiar with the noise levels of these heavy vehicles in small local roads. (One study has concluded that road traffic is responsible for house price depreciation in Marrickville to the extent of about 6 per cent.)[11]

The expansion of Sydney Airport is perhaps the most neglected of the likely changes in the Botany hinterland area. Its impact is potentially the equal of some Port developments. The rather moderate predicted rate of increase in number of aircraft movements to 1985 (roughly 17 per cent) belies the impacts likely to occur. The difference lies in the explanation that growth will increasingly be represented by greater capacity international jets, with a significant proportion also being accounted for by use of present excess capacities. Together they will ensure that an increase of far more than 17 per cent occurs in cargo and passengers. The result can be expected to be a considerable increase in car and truck movements with added noise. This is, however, a complex area which we hesitate to enter.

Conclusion

This section on noise has made no attempt to quantify the likely ambient and peak noise level conditions that might exist in 1985 as a result of the Port and adjacent developments. We do not profess to have sufficient expertise in this field. Rather, it has sought to identify the multitude of sources from which noise will arise and to point out, where data exist, the extent of increases. What appears certain is that a considerable increase in noise levels will occur to 1985, as a result of Port activities, industrial expansion, and shipping, rail, traffic and

aircraft movements. Although daylight hours will be subjected to the greatest increases it seems likely that the most noticeable changes would occur during the night, in the presence of certain atmospheric conditions. It also appears that the resulting levels would exceed any generally accepted ambient community noise levels.

Given that noise levels would be excessive, the question is: what action can be taken to limit noise emission? This is probably the most intransigent problem and the one least capable of amelioration. It appears that the Port area could be classified as scheduled premises under the N.S.W. Noise Control Act. In this instance, the S.P.C.C. might establish acceptable noise levels for its operation which may not be exceeded. Although the establishment of such levels may be a contentious issue, once established, excessive noise would be the responsibility of the control authority to whom complaints could be made. If Port activities are not classified as scheduled premises, responsibility for control would rest with various groups including Botany Council. This could be contentious. It raises a further question that needs to be resolved: will the Port area be under the control of local government or M.S.B. or some other authority?

Estimation Notes (Tables V-(5), (6) and (7))

(1) *Mobile Source Emissions:*
Controls assumed to be applied to new vehicles were crankcase controls (1968), exhaust emission controls (1972 and 1974), evaporative emission controls (1975), reductions in exhaust emissions (1976), and assumed application of the 1976 American control standards in the year 1980. Rates of deterioration taken from Australian Transport Advisory Committee.

Heavy vehicles were assumed to be uncontrolled. Emission factors were taken for average speed of 31.4 km per hour and adjustments made for cold starts.

Aircraft emissions are based on W. L. Bourke, 'Air Pollution from aircraft operations at Sydney (Kingsford-Smith) Airport', *Clean Air*, Nov. 1974, p. 74 and applied within a radius of five miles from the Airport. Rail emissions were based on A.P.C.B., *Oxidants and their precursors in the atmosphere. A case history for Sydney*, (O.E.C.D., Nov. 1973), and similarly for shipping.

(2) *Stationary Sources:*
Estimates confined to scheduled premises in hinterland, including Kurnell Peninsula (Caltex Refinery). No estimates included for non-manufacturing establishments such as schools, hospitals, commercial and domestic heating, etc. United States Environment Protection Authority *AP-42* emission factors (2nd ed.) adopted for combustion and non-combustion wastes. Two variations were made. Particulates from coal consumption were held to 95 per cent control; sulphur in fuel used in new plant held to max. 1 per cent. Process emissions were calculated according to *AP-42* for a controlled situation. The process emissions for 1985 were all reduced by 15 per cent to allow for new technology.

For the coal loader, very high levels of control efficiency were assumed with percentage dust escapes held to 5 per cent in unloading, 2 per cent in transfer to and from silos and 3 per cent in ship loading. The environment impact statement on the coal loader is extremely obscure.

(3) *Area:*
Port and hinterland is Botany Bay, Botany L.G.A., Randwick L.G.A. south of line extended from Gardeners Road to coast, and Kurnell.

6 The social impacts of Port Botany

The nature of the problem

In any major change generated by a development project on the scale of Port Botany, there are losers and gainers. The way losses and gains are distributed between different groups in society confuses the process of project evaluation because political judgments are needed to evaluate the equity implications. This confusion has been used in the Port environment impact statements and inquiries to justify the stand that these issues may be disregarded. Because opinions differ, it has been argued, the problems involved cannot be dealt with. In opposition to this view, the issues to be presented in this chapter are that the conflicts between gainers and losers are central to Port Botany project assessment; and that the consideration of equity leads to the need for policy to plan in a preventive manner, to take steps to ameliorate disadvantageous effects and to provide for compensation where prevention and amelioration fail.

The discussion in this chapter is designed to indicate the types of social effects that need to be considered in evaluating the total impact of Port Botany development on the everyday lives of groups of individuals. No attempt is made to quantify these effects though, with some hesitation, we attempt to distinguish some of the main groups concerned. In a few cases it seems possible to suggest some order of magnitude of the scale of these development consequences. A great deal more information is needed than is available to us in order to quantify these social effects of the Port. The disadvantages that flow to considerable numbers of people because of Port or Port-induced disturbances are major considerations weighing against the types and scale of Port development. It is essential that Sydney planning authorities explore these problems in detail. It would appear that they have so far given them little, if any, attention.

The individual environmental impact statements by specific Port users were helpful in bringing some particular issues into prominence. But they were mainly related to disturbances arising at the Port itself and, as indicated in relation to other aspects in preceding chapters, each statement considered each proposal in isolation. We need to build on the type of assessment of the preceding three chapters to establish the total social impact that can be expected to spread widely. As in the preceding chapters, the following discussion incorporates the developments proposed at Port Botany itself and the Port-induced land-use and traffic changes in the Port hinterland. But because the evaluation of social impacts is more complex than it is for land-use change and traffic generation, most attention is concentrated in this chapter essentially on small areas, using as example the Botany Local Government Area. Some references are made to problems likely to arise in other areas, including Rockdale and South Randwick and the Cooks River Valley. The purpose is to illustrate, not to

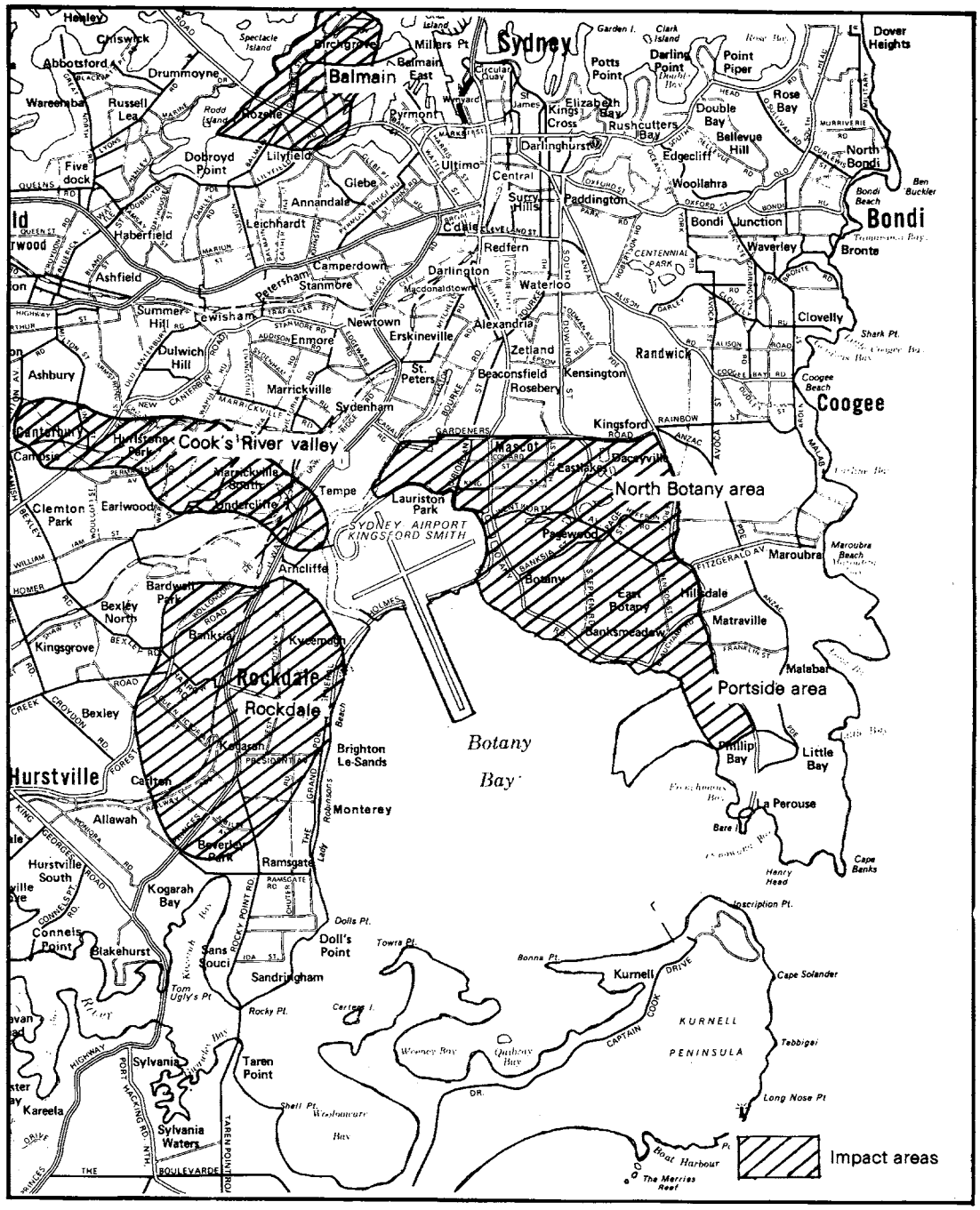

Fig. VI (i) Primary impact areas of Port Botany

be definitive. However, unlike the preceding chapters, a little more attention is given to other areas that may be designated gaining or advantaged areas, the interests of whose residents conflict with those in Botany. These are, particularly, areas adjoining parts of Port Jackson.

Selected areas

We have chosen three areas where the most significant effects may be expected. Two are disadvantaged; one is advantaged. They are shown in Fig. VI(i).

(A) disadvantaged areas

(i) one area likely to be severely disadvantaged is the Portside area in the southern half of Botany and in the western portion of Matraville

(ii) a second potentially disadvantaged area is North Botany which is away from the Port but lies along the railway line and the main road arterials through Mascot, East Lakes and Daceyville.

(B) advantaged areas

the third area is in Balmain and Rozelle adjoining the section of Port Jackson most directly concerned with present container and coal cargoes.

It bears reiterating that other areas, particularly in Rockdale and in Cooks River Valley, need investigation. There problems appear to be different but not necessarily less serious. In Rockdale, risks to land values may be significant because of Port disturbance or — what is the relevant issue — the attitudes to Port disturbance. The sights and sounds of the Port may offend some. Physical disturbances to the beach areas on the western side of Botany Bay may reduce recreational amenity. The diversion of traffic flows, particularly heavy container trucks to the southwest of the Airport, would add to congestion, traffic noise, air pollution and the risk of traffic accidents. If this traffic were diverted, *eventually*, by a new major road along Cooks River Valley, residents of the Valley, in large numbers, would be significantly disadvantaged by heavy vehicle noise particularly in the narrow, steep sections; and access to the limited but valuable recreational facilities in the 'green areas' along Cooks River would be reduced by the road barrier and, in part, by the actual displacement of these areas by the road. The way of life of some Cooks River Valley residents would be most obviously disturbed by resumption of residences to provide for the proposed road.

In this chapter however, we concentrate on the three areas, two disadvantaged and one advantaged, as specified above. The first two illustrate the risks of significantly increased problems of everyday living in a degraded environment, of exposure to considerable financial hardships, to powerful pressures to displace dwellings and to problems of considerably more commuting to work.

The nature of the affected areas

Table VI-(1) describes the people, their dwelling characteristics and tenure,

Table VI-(1) Some housing, demographic and occupational characteristics of selected impact areas of Port Botany (1971)

	Dwellings:						Residents:				Workforce:	
	total occupied (No.)	houses (%)	flats (%)	owned (%)	Average weekly rent: houses ($)	flats ($)	total (No.)	children (0-17) (%)	Aged (65+) (%)	non-British migrants (%)	total employed (No.)	Engaged in manuf. & transport (%)
Port-side area (Botany, Hillsdale and East Matraville)	5,734	61.7	36.7	63.2	16.25	22.86	19,478	28.6	6.3	26.9	9,627	50.7
North Botany area (Mascot, East Lakes and Daceyville)	7,739	65.2	33.7	50.2	14.94	17.40	24,762	26.3	8.5	27.2	11,962	48.9
Port Jackson area (Balmain and Rozelle)	7,578	69.9	25.0	48.5	17.62	17.72	21,665	23.0	10.0	14.5	1,084	36.7
Sydney metropolitan area	824,003	74.4	25.3	68.5	17.86	21.56	2,724,160	29.0	8.5	15.2	1,235,045	33.9

Source: *1971 Census*

their age and migrant structure, the proportions employed and their dependence on manufacturing and transport jobs.

The first and basic feature is simply the number of people in each area. In the Port-side area, 20,000 people, and in the North Botany area, 25,000, a total of 45,000 residents, are most directly exposed to the disturbances of the Port and Port-induced land-use changes. By contrast, some 22,000 residents of Balmain and Rozelle, the 'Port Jackson area' may be expected to be advantaged by the transfer of container traffic and possibly coal traffic to Port Botany. The 20,000 people in the Port-side area are most directly affected by Port noise, odours, dust, congestion and, most importantly, displacement. In other words, about the same numbers as those advantaged by reduced traffic noise and congestion in Balmain and Rozelle could expect, at best, to confront at the Port-side a drastically degraded environment and, eventually, possibly extensive uprooting, disadvantages that appear much more severe than the road congestion and noise of Rozelle and Balmain. There are residents other than those in Rozelle and Balmain that are affected by container traffic from Port Jackson. But the dimension of the wider population likely to be affected by transfer of containers to Port Botany is indicated by the fact that in the North Botany area almost 50 per cent, or more persons than in Rozelle and Balmain, would be expected to suffer serious environmental disturbances that appear different in some respects and more extensive than those experienced in Rozelle and Balmain.

The people in the Port-side area have relatively low incomes, and most of

them are blue collar workers. Half of the total resident workforce is engaged in manufacturing and transport. Almost two-thirds own their own homes, each of which, on an average, houses more persons than do those in Rozelle and Balmain. By contrast, in the latter areas, there is a much lower representation of blue collar workers, and a much lower proportion of the resident population is made up of non-British migrants. In addition, a much lower proportion of the Balmain-Rozelle residents, less than 50 per cent, own their dwellings (compare 63 per cent in the Port-side area); in other words, a significantly lower fraction have property interests that commit them to the Balmain-Rozelle area. Unlike the Port-side area, the Balmain-Rozelle population includes white collar workers who have moved into the newly-fashionable terrace houses and into an area with fewer flats, fewer house owners and higher house rents. The combination of characteristics may lie behind their effective vocal opposition to container movements through their streets.

House rents in the Port-side area are lower than those either in Rozelle-Balmain or the entire metropolis. Since low cost rental houses tend to be the most exposed to risk of rezoning and redevelopment, their occupants are most exposed to financial risks. Tenants, when and if displaced, would find considerable difficulty in being resettled at comparable rents.

The characteristics of the North Botany area have some similarities both with the Botany Port-side area and with Balmain-Rozelle. As in the Port-side area, almost half the resident workforce are blue collar workers and there is a similar representation of non-British migrants. There is a much lower proportion of owner-occupation of dwellings and, in this respect, the social characteristics conform more to those of Rozelle and Balmain. But the rented dwellings are occupied at relatively very low rents, implying many low value dwellings. These dwellings tend to be very close to factories and have a poor environment at present and the greatest risk of rezoning in this area. It may be noted that flat rents in the North Botany area are also low. In this case, a large part of the explanation is due to the presence of new flats in East Lakes, many of them government-owned.

Transfer of Port activity and Port-induced land activity from Port Jackson to Botany Bay appears, then, to threaten to disadvantage relatively low income groups in favour of higher income groups; to disadvantage groups more committed by ownership of dwellings to their residential locations and less able to relocate without cost — and to advantage those less committed and more able to shift; and to disadvantage groups with relatively high non-British representation.

The Port-side and North Botany areas have a considerable surplus of jobs over resident workforce. It would be important to note — and planning authorities need to recognise this — the extent to which the resident workforce in these areas actually work in the area. In 1971, the number of local jobs for every 100 residents in the Port-side area was 127; in North Botany it was 105. (Local jobs are those within 3 km of the zone of residence.) Over 50 per cent of the resident workforce in these areas had local jobs. Extensive commuting in Sydney is adequately implied in the fact that in all the L.G.As. west of Parramatta and Bankstown, only 39 per cent of resident workforce had local jobs in 1971 — a figure much lower than the corresponding one in the two Botany areas. Many of

the workers in the Port-side and North Botany areas commute from the middle and west of the metropolitan area. To service their needs (and any additional jobs created by Port Botany and its induced land-use changes), the Botany area has exceptionally poor bus and train services. Existing commuting and future increased commuting to this area must depend on private road transport in the absence of up-graded public transport facilities.

In the light of this commuting process, it should be noted that we need to avoid any undue simplification in contrasting Balmain and Rozelle with the two Botany areas. It would be important that planning authorities seek the help of trade unions related to Port Jackson to establish the place of residence of the workers who would have their jobs transferred to Port Botany. It is to be expected that these may, in some respects, account for significant numbers of of losers in Balmain-Rozelle due to the Port Botany development. This possibility should not be obscured by the general designation of Rozelle-Balmain as a gaining area.

Social implications of change in physical environment

As a dominantly factory area, with many old factory structures in the locality, the standard of physical amenity in the Port-side and North Botany areas is, at present, poor. Offensive odours, brown smog, and toxic air-borne emissions are not uncommon. Roads are ill-designed and inadequately serviced. Social facilities are of low standard. The attitude of some environmental impact statements has been that, because the standards of the physical environment are poor, the introduction of proposed facilities such as coal loaders would not make matters different. This attitude obviously ignores the possibility of an alternative attitude: that an environment that is at present poor may claim high priority for improvement.

The prospects of Port and Port-induced development must be expected to degrade this poor environment even further — noise, air-borne emissions, congestion would be expected to increase significantly, as indicated in preceding chapters. Widened roads would tend to isolate communities. The spread of industry or distribution and storage activities could be expected to press more closely on residential areas and to encircle more. The existing degraded conditions in these two areas would tend to become considerably worse. The passage of coal trains and of container trucks in large numbers would be expected to intensify noise and visual problems and symbolise further the attitude to these areas as Sydney's dumping ground for its least attractive activities.

One must question whether the alienation and isolation of communities implied by Port Botany development proposals should be tolerated in a modern, wealthy community. The pervasiveness of the environmental problems can be illustrated in many ways. Increased traffic flows, congestion, wider roads, bigger vehicles can be expected to affect particularly the young and the old. It is no argument to contend that externally assessed risks are less than they are perceived to be by old and young residents. Activity is restricted by *fears* of accidents and the *felt* need to be more cautious. Some older car owners may be expected to decide to give up driving and some without cars will hesitate to cross

major streets, visit friends or join senior citizens' activities. Parents are less likely to allow children to walk home from school or play sport in small streets, even if they are only occasionally used by large trucks. Indeed, to a very real extent, the variability of entry into residential streets by large trucks increases risks and enhances fears. Areas provided for recreation — they are few — such as Heffron Park, may become less accessible to many children of migrants and others living in dense flat settlements. It is likely that traffic would be particularly heavy in the late afternoon at times when children, in particular, would be most exposed to risk and constraint. These problems have been loudly voiced in Rockdale. They are likely to be much more serious in the two Botany areas. Problems of this type have had political influence in Rozelle and Balmain. The Port development proposes to impose them in Botany.

Noise is discussed in Chapter 5. The environmental impact statements have suggested that the problem of noise would be limited. One claim in support is the fact that very few dwellings lie close to the Marrickville-Botany railway line. It appears the case that only 173 Botany dwellings lie adjacent to the line. But there are several hundred more within 100 metres of the line and the frequency and time of train passage may mean some disadvantages to their occupants. (Thousands of other dwellings lie beside the lines as traffic passes further westward.) Many of these noise problems could be ameliorated by heavy ballast, quieter engines and wheels. (Indeed, as we shall suggest later, this amelioration is vital because there appears to be a strong case for the use of rail transport in the area.)

Road traffic, particularly of heavy trucks, can be expected to add considerably to noise problems in the two disadvantaged areas. These noise issues have generated strong complaints in Rozelle and Balmain and there is no special reason to believe that Botany residents are less susceptible. Noise from road transport is a major issue throughout Sydney and represents one of the most widespread sources of reduced amenity. The form of Port development proposed can be expected to raise the noise level in the two Botany areas considerably at a time when policy in Sydney is to attempt to reduce 'noise pollution'. Present noise levels are recorded at 50 to 60 decibels along main streets in the area. Noise levels about 55 decibels are generally regarded as excessive for areas of single family housing which make up almost two-thirds of the two Botany areas.

The prospective increase in road traffic in these areas appears almost certain to raise noise levels beyond this excessive limit unless new controls are introduced and enforced. It is important to realise the social and personal implications. If noise increases from 50 to 60 decibels, the distance range of normal speech falls from twenty feet to a mere seven feet. At 60 decibels, relaxed conversation in a living room is not possible unless windows are completely closed. Obviously the problems are enhanced at night when noise conflicts with sleep. It is probable that residents in the Port-side area would be most affected, in this respect, by port activities and train and truck movements. It needs to be recognised that one of the main arguments for Port Botany is that it provides opportunity for activity over seven days a week, twenty-four hours a day.

Perhaps the main effect of Port Botany development would be to drive residents out of the area — if they are able to move. It is to this social problem of

uprooting that we need to turn. Residential disturbance is, however, not merely a matter of a more blighted environment. We need to look at broader economic issues.

The property market and redevelopment

The effect of Port development on the value of residential property would depend closely on expectations about changes in zoning. If, as has been stated by the Botany Council, residential zoning is to be maintained in all the present residential areas, and potential buyers expect it to be maintained, the value of the housing would fall relative to the value of housing elsewhere. The Port-side area might be expected to suffer the greatest losses, but North Botany and possibly Rockdale would also be affected to a less extent. Residents may be more anxious but less able to move away. If owners decide to sell, because of the loss of amenity, they are unlikely to get enough from the sale to establish themselves elsewhere in a similar house. As a result low income owners may be forced to stay and put up with the loss of amenity. If tenants are forced to move out they probably will have to pay higher rents elsewhere and may be further from work, friends and relatives. The aged, who comprise a disproportionate share of the household heads and houseowners, would find difficulty in adjusting to new living conditions. Any population loss in the area, along with the congestion and parking difficulties, also would severely shrink the market and profitability of the local businesses.

If rezoning of residential land for industrial purposes were obtained (or expected) the value of some, but not all, is likely to increase dramatically. Freight forwarding and warehousing firms would pay substantial premiums for locations near the Port. Most existing large industrial firms appear to want to remain in the area, and those that could move westward often are on very small parcels (often as little as 40-foot frontage) that would be difficult to amalgamate. Thus, even though most existing houses are on small lots of only 40- or 50-foot frontages, there would be substantial pressure for profitable sales of residential land for higher uses.

Owners (often landlords, not occupiers) of residences rezoned for industry would make a capital gain and would find themselves almost forced to sell. Tenants would make no gains but would be forced to leave and the disruption of the community could be severe. Demolition and industrial incursion would gradually force out even those owner-occupiers who value the location highly. Because the residential areas near the Port have a variety of housing types, values and tenures, the displacement would be slow and piecemeal and would have a damaging effect on the environment of the remaining residents. If a property were not redeveloped for industrial use, then as the amount of residential land shrank, remaining owners could face the prospect of very low values for their properties. However, so far as market values influence the short-term outcome, most flats would probably remain because of the value of the structures and because flats can compete for land with industry; but the physical and social environments of their occupants would be very poor.

Conversions would be most profitable where the parcels are large, because

larger size lowers the transaction and financial costs of aggregating land. Single-family detached housing, especially if it is affected by the poor environments and if the structures are of little value, would be sold more often than either flats or commercial properties. Non-resident owners would be less inclined than owner-occupiers to have sentimental or other reasons to reject profitable offers of sales. *Thus, the dwellings most vulnerable to redevelopment are the old, low-cost, rented houses that already are in very short supply in inner areas.*

The Botany Council may decide to prevent any modification of the planning scheme that would dislocate residents or reduce their living conditions. But if permission for industrial redevelopment is contemplated, this redevelopment would need to be limited and directed by strong public regulations. If large tracts of land were rezoned initially, redevelopment would be likely to be haphazardly located and would generate heavy traffic and degrade the environment of those who could not or did not sell out.

It is also essential for planning authorities to estimate future demand and designate any areas to be rezoned in the near future. This would ensure that in-

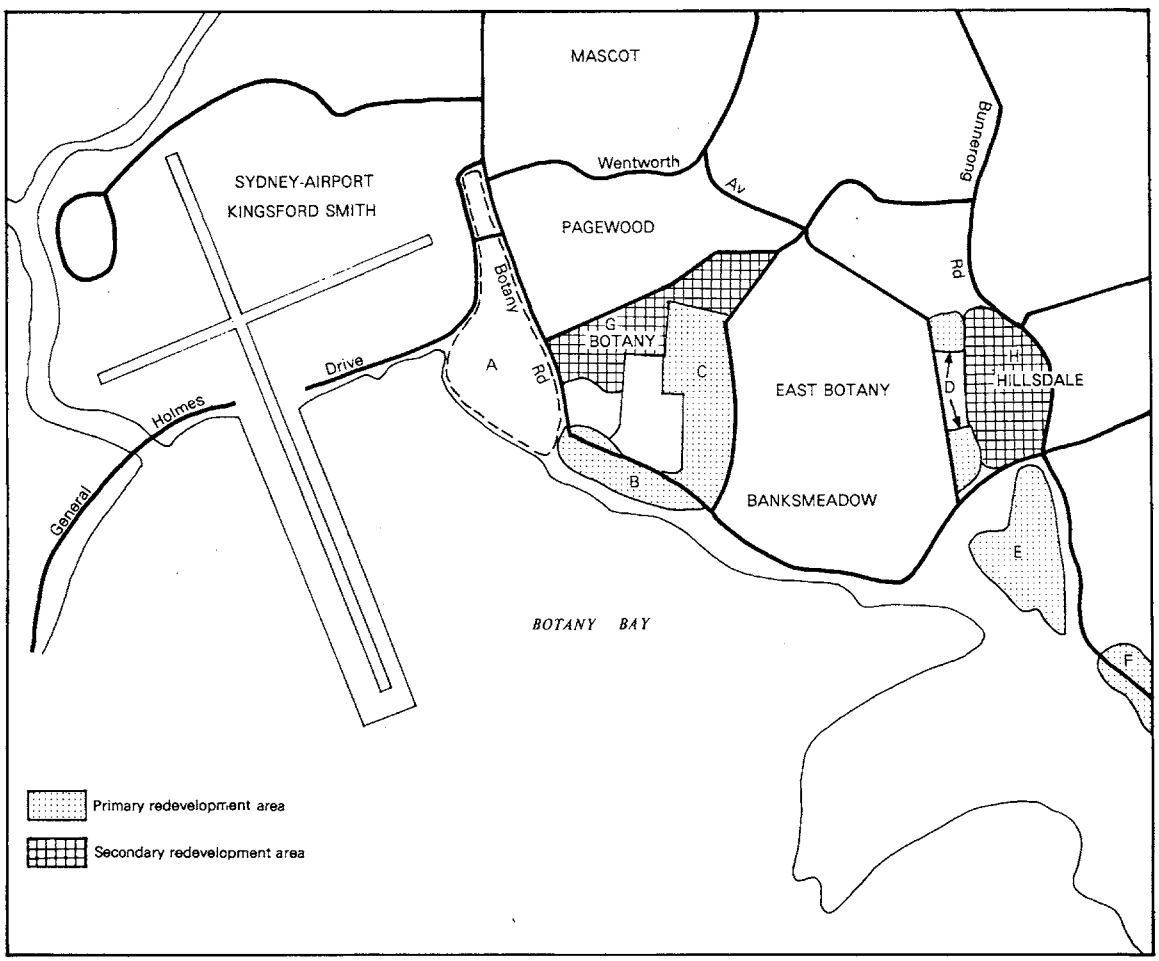

Fig. VI (ii) Areas of potential land use change

vestment in and maintenance of housing would be minimised in areas of eventual redevelopment. Equally important, properties not to be rezoned could be improved without threat of noxious developments nearby. Finally, a firm, well publicised land-use policy backed by the State would limit action by speculators and ease political pressure on the local council for rezoning.

Of course it is not possible to know how many people would be influenced by redevelopment until and if the planning schemes were to be modified. Even then the rate of change would depend on many variables in the private market that cannot easily be predicted. But the potential number of people affected is large: there are over 2,600 housing units and nearly 9,000 people in the areas which appear to be primary targets for redevelopment (see Fig. VI(ii)). An additional 2,000 housing units and 7,000 people are in areas considered as secondary targets. Figure VI(ii) locates these areas and Table VI-(2) describes the houses and people in them.

The areas most likely to come under immediate pressure for redevelopment are areas A and B, which are immediately west and south of Botany Road, and area C which is west of Stephen Street north of Botany Road. The 2,800 people in these areas, especially those in areas A and B, are now next to heavy traffic and industry, and the Port development would add to environmental problems that already are severe. Because these areas have few flats (especially area C), but include old wooden structures, and relatively low rents, redevelopment would not involve the destruction of much valuable housing with high market values. However, these areas have relatively high percentages of tenanted dwell-

Table VI-(2) 1971 Housing and population characteristics of potential redevelopment areas near Port Botany

	Housing:						Residents:				Workforce:	
					Average weekly rent:							
	total (No.)	house (%)	flat (%)	owned (%)	house ($)	s.c. flat ($)	total (No.)	children (0-17) (%)	aged (65+) (%)	non-British migrants (%)	total employed (No.)	Industry (manuf. & transport) (%)
Primary redevelopment area												
A	265	71.7	24.2	57.7	14.38	23.58	863	24.1	9.2	18.7	451	57.0
B	353	63.4	32.6	58.6	12.74	20.70	1,133	23.8	9.9	23.0	592	56.8
C	459	97.2	2.4	57.5	18.15	16.25	1,156	26.6	7.8	18.7	768	58.7
D	459	53.4	45.5	73.4	14.58	14.27	1,558	28.7	5.4	25.2	808	42.3
E	787	81.7	17.0	66.5	19.98	23.60	2,724	27.8	9.1	33.8	1,260	48.7
F	284	95.7	3.2	79.6	15.84	5.71	1,059	34.6	12.3	7.6	481	39.1
Total	2,607	77.4	20.8	65.8	17.04	18.91	8,903	27.7	8.7	23.7	4,360	50.2
Secondary redevelopment area												
G	607	61.4	38.6	51.1	16.30	22.17	2,113	27.5	4.5	33.7	1,093	60.5
H	1,455	12.9	85.2	50.2	21.80	23.90	4,689	31.9	3.8	33.1	2,359	49.8
Total	2,062	27.1	71.5	50.5	18.15	23.62	6,802	30.5	4.0	33.3	3,452	53.1
Port-side area (Botany, Hillsdale & East Matraville	5,734	61.7	36.7	63.2	16.25	22.86	19,478	28.6	6.3	26.9	9,627	50.7

Source: *1971 Census.*

ings (about 40 per cent) and house mostly manufacturing and transport workers (nearly 60 per cent). If dislocated, tenants would normally receive no compensation and manufacturing and transport workers would have to make longer journeys to work. Nevertheless, it if were necessary to rezone land for redevelopment, it is probable that these should sensibly be the first areas. This change would at all events consolidate non-residential uses so that they would do the least damage to residential areas as a whole. The losers would be fewer in number and more identifiable as a group for whom compensatory arrangements should be made.

Compared to the massive dislocation that might result from private redevelopment, very few persons would be dislocated directly by public development related to the Port. Proposed rail and road expansion will take little housing at all. Approximately twenty-five homes would be resumed for the extension of Botany Road east to Anzac Parade. These areas have single-family houses that should not be too expensive to acquire (70-100 houses would be taken for the Kyeemagh-Chullora county road along Cooks River).

One of the serious effects of displacement is that those displaced will have to compete for the very limited supply of low cost housing in the Sydney region. There are few other places where housing can be obtained as cheaply as in Botany. The already tight market for low cost inner city housing would become tighter. While the relatively low income residents of Botany suffered dislocation or a decline in the value of residentially zoned housing, richer homeowners in Balmain and Rozelle should enjoy a capital gain as their environment improved with the removal of container traffic from the residential streets. (Residents in Rockdale and along Cooks River Valley might also suffer capital losses.)

Public action

If Port Botany proceeds as at present proposed, the most important requirements are to establish land-use schemes in Botany and Randwick that take full account of the Port development and that provide for adequate compensation for disruption. The scheme should be based on careful research and, once completed, should be firmly enforced. Extensive redevelopment would seriously decrease the stock of low cost housing, increase journeys to work, and reduce residential amenity. However, if more redevelopment is considered necessary, it is imperative that rezoning not take place on an *ad hoc*, 'each case on its merits' basis or without provision for compensation. These actions would produce substantial uncertainty among residents and encourage speculation, political payoffs, and a dispersal of rezoning and industry throughout existing residential areas. Low income tenants would have no early warnings which could allow them to apply for public housing and move there before forced dislocation. If redevelopment is approved, harmful effects could be minimised by a land-use scheme that consolidates land uses by rezoning only the areas adjacent to existing industry or major traffic arterials.

With eventual land uses established, action should be taken to provide for adequate compensation through ameliorating the harmful effects of the Port on the remaining residential areas. There are some direct methods to compensate

residents for losses of amenity by transferring to them some of the substantial gains that the Port-using companies and Balmain residents would receive. Charges should properly be incorporated on Port uses to fund this compensation. This is the elementary meaning of the principle that 'the polluter pays'. In addition, some of the rental payments for space at the Port could be diverted to the Botany Council, or appropriate State departments, to diminish local noise and improve traffic conditions.

Ways of ameliorating noise and traffic problems should be extensively explored and implemented before the problems emerge. Noise-deflecting walls and shrubs can be located along railways and major roads. Air conditioning in the schools would enable children to learn in comfort even when windows must be closed to keep out noise. It is essential that industrial and commuter traffic, especially large trucks, be prohibited from travelling on small residential streets. The laws should be reinforced with restricting signs and with frequent police patrols especially after school hours. It might be necessary to close some streets to all through traffic, although this would inconvenience residents. On major streets, crossing guards could be hired on routes to schools, traffic lights timed so that old people could cross easily, and pedestrian overpasses constructed over particularly congested roads (e.g Bunnerong Road so children in Hillside flats could get to Heffron Park). In addition to the direct benefits of these policies, residents need to be reassured that government is prepared to take adequate action on their behalf. Beliefs that the government had abandoned the residents have heightened sensitivity to the environmental hazards and created substantial opposition even to the more acceptable aspects of the Port.

These procedures are, however, palliatives. They are essential elements of policy if, after taking these costs into account, it remains important that Port Botany should proceed as proposed. There is, then, the question whether preventive rather than palliative action can be more effectively taken. The argument in the rest of this volume is that there is a great deal of scope for prevention. In fact the preventive possibilities turn on avoiding certain Port uses; in part, the mode of Port operations may be varied. *The thrust of these preventive proposals is not to stop development. It is, rather, to prevent the concentration of massive disturbing impacts in one limited area. A central issue in environmental policy is to disperse, and hence to lessen, the stress of human activity, not to concentrate it so heavily in the manner at present proposed at Port Botany.*

7 The problem of the Port Botany coal loader

There can be little doubt but that Australia faces a very large prospective increase in its exports of both coking and non-coking coal. World oil prices have provided, since 1974, a stimulus to convert to coal on a short-run basis, particularly in Japan, thus adding to the rising market due to economic growth. In Western Europe, the same influences have been at work and they have been supplemented by the increased costs of mining less economic coal deposits in several European countries.

In the somewhat longer run, it appears probable that the United States may become a declining source of coal supplies to the world market and that other significant competitors of Australian coal may also be expected to begin reducing export coal supplies. Australia's primary competitor in the latter part of this century seems likely to be Canada. Canadian coal is located mainly in western Canada but chiefly to the east of the Rocky Mountains so that its export confronts considerable land transport costs. By contrast, Australian coal is located relatively close to the coast, with more limited land transport problems. In terms of sea carriage, distance is less significant as a cost factor. Canadian coal lies somewhat closer to Japan but is considerably disadvantaged for exporting to Western Europe.

It may be expected that by 1985-90 Australia will have moved into much greater prominence in the world coal market, gaining a considerably increased share of the trade in coal used as coal. Beyond this horizon there is the longer-run prospect of gasification or liquefaction of coal which might offer very large long-run prospects for the disposition of Australian coal. Here, because the issues, both of markets and technology, are uncertain, we refrain from any projection. It may be noted, however, that in any long-run consideration, a different issue, relevant to coal loader provisions, becomes important. Coal gasification may have relatively less appeal in Australia where supplies of natural gas are already very large and may become available on a national scale by pipeline transmission. Liquefaction — or gasification — may however be carried out in Australia prior to export; or coal may be exported for liquefaction elsewhere. The choice has an obvious bearing on the type of port facilities to be provided.

With these longer-run possibilities in mind, we may approach the prospects of the next 10-15 years with the purpose of attempting to clarify the likely need for carriage of coal to Port Botany.

Based on projections of probable increased coal consumption in Japan and Western Europe in the light of demands due to economic growth and of substitution of coal for oil, it seems likely that in the second half of the 1980s Australian coal exports could lie within the range of 65-85 million tonnes per annum.[1] This represents roughly a doubling or trebling of present coal export

levels, i.e. an actual increase of the order of 35-50 million tonnes. The demand for coal divides, broadly, between coking and non-coking coal and it is expected that coking coal might account for about two-thirds of the 1985-90 export total and non-coking coal the remaining one-third. It seems likely that Western Europe will account for a rising fraction of the coking coal, though Japan is expected to continue to absorb the greater part of the total.

The development of a mass coal trade on this basis depends basically on open-cut mining (liquefaction prospects appear to depend even more crucially

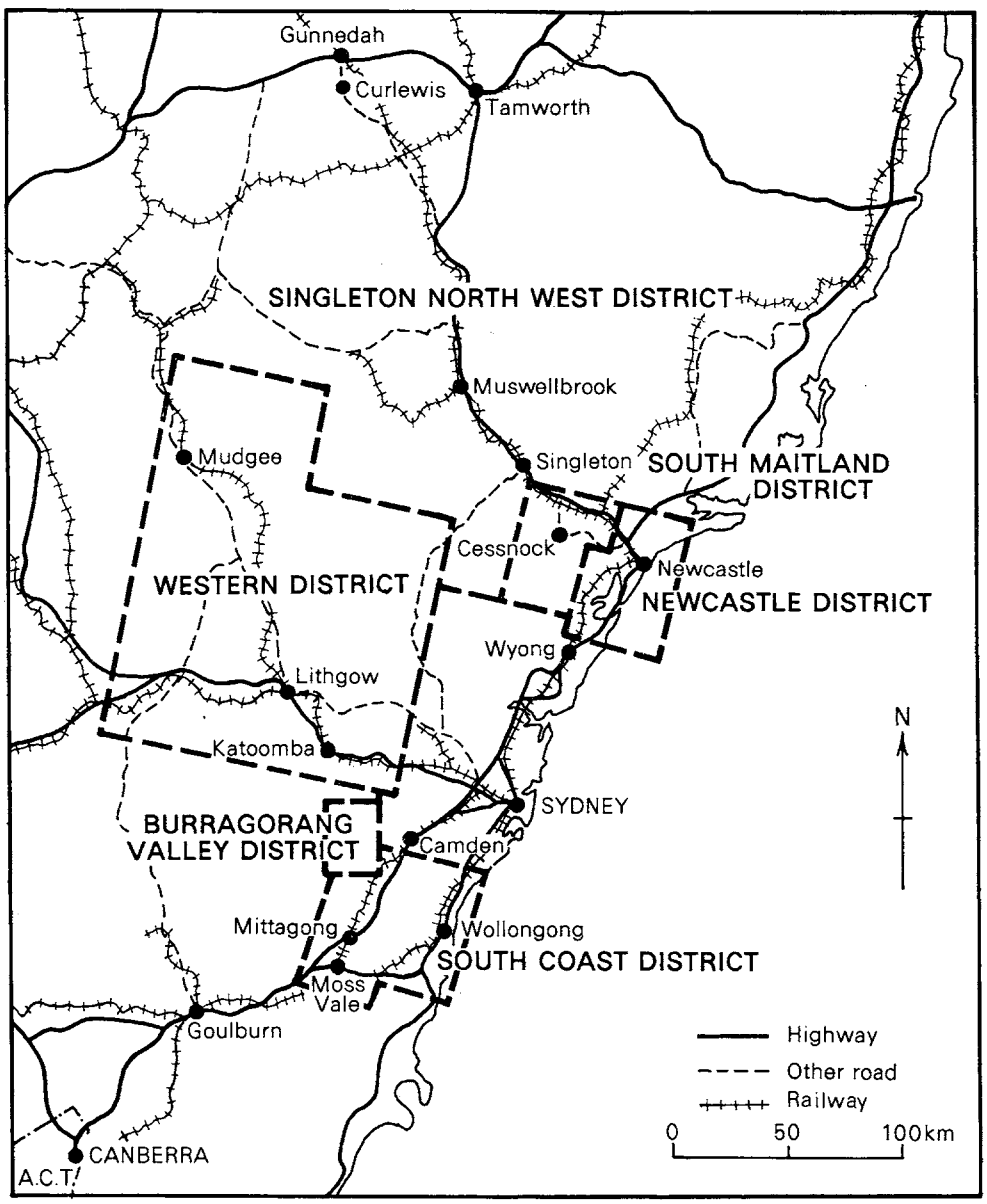

Fig. VII (i) N.S.W. coal districts

on open-cut operations).[2] At present N.S.W. accounts for approximately half of the total Australian coal exports.[3] It is possible that this share might rise a little to 1980; if so, the increase is likely to be slight. Nevertheless, until about 1980, N.S.W. coal exports would be expected to keep pace with the over-all growth in demand for Australian coal.

After 1980, however, the competitive position of N.S.W. coal will be seriously altered as a result of massive coal developments under way in Queensland. The development of large-scale open-cut mining operations will provide both the volume flow and price competition that will strongly favour Queensland. The N.S.W. fields (see Fig. VII(i)) would be able to compete, in the area of open-cut mining, essentially only in the northern fields, in the Hunter Valley adjoining the Port of Newcastle. Assuming Hunter Valley operations do develop on a substantial scale, it is expected that the N.S.W. share in Australian coal exports would fall heavily from around half in 1980 to about one-third in the second half of that decade. The net effect is that, despite the very large increase in total coal exports, N.S.W. coal exports, in absolute terms, would most probably taper off to a ceiling figure, perhaps for the rest of the century. On present expectations they cannot be confidently expected to grow markedly after the early 1980s. The main qualification is in the rate and scale of development of Hunter Valley open-cut coal.

This prospect has a direct bearing on the wisdom of providing, in the immediate future, substantial exporting capacity at *all* the N.S.W. ports very much above the current level. The total coal export *capacity* at the major N.S.W. ports, *as reputed to be planned*, is:

Newcastle	30
Port Kembla	15-18
Port Botany	25
Port Jackson	4
Total:	74-77

As will be seen, this total capacity is approximately equal to the total projected export of black coal from the whole of Australia in the second half of the 1980s. It approximately matches the planned port export capacity of Queensland. Hence, the two States are planning loading capacity equal to about twice the expected export level. Each appears to be assuming that it will account for the lot. This is a very old Australian story.

It is possible that, by the end of the 1980s, N.S.W. coal exports may double over their present figure, but this is likely to be an optimistic forecast. Whether this is so or not is much less relevant, however, to the question of the capacity of coal transport and coal loading facilities at Port Botany, compared with the other major N.S.W. coal exit points at Port Kembla or Newcastle. To recognise this we need to note the distribution of coal exports as between the northern, west and southwest and the south coast N.S.W. fields, and the prospects of their development.

The south coast coal district supplying most of the export through Port

Kembla appears to have an assured future in world markets because of the high quality coking coal supplied. Moreover Port Kembla is inescapably the port exit because of the narrowness of the coastal strip and the nature of the escarpment that surrounds the area. The coal produced is yielded by relatively deep mining and this remains its future prospect. The rate of increase in output is constrained by these physical limits and the consequential economics.

The Hunter Valley fields provide a mix of good quality coking and non-coking coals. But, most importantly, they alone in N.S.W. to any significant extent offer opportunities for large-scale volume flows through open-cut mining. So far as N.S.W. is concerned, this appears to be the area of major future expansion. It would appear to follow that major expansion of coal export facilities would appropriately be located at Newcastle.

The south and northern fields account, at the moment, for about 85 per cent of the total N.S.W. exports, leaving the remaining component of 15 per cent to be supplied from the western and southwestern fields (Lithgow and Burragorang Valley areas). It is possible that these fields could sustain a growth rate to the second half of the 1980s that would leave them with a share of the increased trade at about the same level, but a realistic assessment suggests that their share would more probably fall to around 10 per cent.

A very large part of the western field coal is relatively low grade. It is mainly cheap non-coking coal, with prices at about half the good quality coal in the Australian trade. In the Burragorang Valley, valuable coking coal deposits are being mined and developed. Currently, the western and southwestern coalfields export approximately 4.5 m. tonnes of which about half is exported through Port Kembla (by road transport) and the other half by way of the Balmain coal loader in Sydney. Projected but not committed expansion of these fields suggests that output could be lifted by the second half of the 1980s to about 10 m. tonnes.

It is important to stress that a high proportion of the western coal, in particular, is low-grade and costly to mine. There are vast deposits elsewhere in N.S.W. — let alone Queensland — that are of higher quality, more accessible and more capable of larger volume flows. The companies concerned in the west and southwest fields are established companies in these areas. ~~One is wholly foreign-owned; one has very substantial foreign equity~~ It would be difficult for them to develop coal projects elsewhere because of the ownership of coal-bearing land. They employ directly some 750 men. In 1985, were they to ~~expand~~ export as projected, their employment might be of the order of 1,300-1,500 men.

Were their projected expansion to occur, the existing Balmain loader might be expected to accommodate as much as 4 million tonnes without significant adaptation. It is relevant to note that the Joint Coal Board reports that the Balmain loader has not been pressed to capacity by available coal supplies. Were the ~~collieries to continue to truck the present volume of the order of 2 million tonnes~~ through Port Kembla *the projected expansion of Port Botany would need to accommodate some 4 million tonnes by 1985. This is not suggested as a desirable proposal but merely to reflect on the wisdom of proposals to generate a coal loading facility at Port Botany at the level of 25 million capacity*. Even if the entire projected output were to pass through Port Botany, after final evaluation the loader capacity appears to be far in excess of

Impact of Port Botany

Of the total of N.S.W., the share of the value of coal exported through Sydney and originating in the western and south-western fields was at most only 15 per cent valued at pit-head prices. The remainder flowed, in 1974/75, to Newcastle and Port Kembla. The volume share passing through Sydney was approximately 18 per cent. The comparatively limited difference in volume and value shares is due to the very high priced Clutha coals, a large proportion of which, in any event, flows to Port Kembla. The projected rise in western coal exports would be expected to reduce this value share significantly, assuming the same absolute volume of Clutha coal to go to Port Kembla. More importantly the gap between the volume and value share would be expected to ~~rise~~ increase on the basis of projected western expansion. The reason lies in the character of western coal.

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It is important to stress that a high proportion of the western coal, in particular, is low-grade and costly to mine. There are vast deposits elsewhere in N.S.W. — let alone Queensland — that are of higher quality, more accessible and more capable of larger volume flows. The companies concerned in the west and southwest fields are established companies in these areas. One is wholly foreign-owned; one has very substantial foreign equity. It would be difficult for them to develop coal projects elsewhere because of the ownership of coal-bearing land. They employ directly some 750 men. In 1985, were they to expand as projected, their employment might be of the order of 1,300-1,500 men.

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plausible projections. *Equally, 4 million tonnes is the approximate Balmain capacity.*

In the light of the magnitude of the Australian coal trade alone, the rationality of permitting such a ~~tiny and~~ (so far as the western fields are concerned) largely low-grade coal flow to monopolise valuable and expensively gained Port Botany wharf and berth space is very much in doubt — to say the least. The large-scale expansion of the future lies in the Hunter Valley and it appears to be here, rather than in Sydney, that the major development should most appropriately occur.

But the proposed coal loading facility needs to be considered in the light of Sydney's needs as a metropolitan centre on the one hand and the position of Port Kembla on the other. We accept the importance of developing *some* substantial port facility in Botany Bay. The coal loader proposal places demands on rail facilities that are costly to provide, maintain and operate and compete with alternative uses. These other uses are much more significant to the economy of Sydney and in terms of their impact on Sydney land use. The case for the overriding use of rail facilities by these other freights appears far to outweigh the claims of the western collieries. The case for using valuable wharf and berth facilities for other purposes is far stronger for other uses. Most obviously, if the proposed Botany coal loader does not absorb this space, the need for the expensive construction of Stages III and IV of Port Botany is to that extent reduced. The opportunity cost of the coal loader, at the Port alone, can be cast in terms of the consequential accelerated need for Stages III and IV. The opportunity cost of the coal traffic is the use of rail facilities and the constraint on the carriage of containers on the railways: hence, in part, the need for the Port-side road and the widening of General Holmes Drive; and so on.

Sydney is not necessarily the 'natural' outlet for western and southwestern coal flows. On the other hand, Port Kembla is the natural outlet for the output of the south coast coal. Port Kembla's coal transport and coal loading facilities are deplorable in terms of efficiency and environmental disturbances. The case for upgrading these facilities on both counts is very strong, though this does not imply any support for the generation of large excess capacity at Port Kembla. It must be borne in mind that Port Kembla appears to have a secure, long-run, but not necessarily very rapidly expansive, future in the coal trade, as a result of its possession of a very high grade coking coal. The case for large and immediate expansion to service southwestern and western coal appears to be very thin.

If *southwestern* (Burragorang) coal were to flow to *Port Kembla* in increasing quantities, provisions for better transport procedures overland are essential. The proposal made by B.H.P. recently to acquire Clutha Collieries and to construct a rail line to the coast had some merit. This proposal faced some opposition, partly environmental, partly on the grounds of geological problems with the escarpment. There appears to be a case for closer investigation of other modes of transport to Port Kembla. One possibility suggested the slurry piping of coal to Port Kembla from the southwestern fields. The conclusion of a recent study of consulting engineers was that 'the hydraulic transportation of 10 million tonnes of -50mm coking coal, 50km from the Bargo area west of the escarpment to an offshore ship loader at Port Kembla is feasible'.[1] This judgment is claimed specifically for coking coal which, as distinct fron non-coking coal, had been

regarded as difficult to pass through a slurry pipe. The reputed cost (1976) of such a pipeline was represented at $10 m, far below the cost of the Port Botany developments that would follow loader construction there. The pipeline is claimed to be environmentally and economically superior and could, it is said, traverse any area without serious environmental damage, as a buried pipe. It is professed that it would allow deep-water loading of large ships at anchor and enhance rather than exacerbate the port conditions of Port Kembla.

If these claims are substantiated, the valuable deposits in the south west could be dealt with, at a general advantage to collieries and to Sydney and Port Kembla environments. They need to be closely investigated. We make no judgment. There would be an obvious need to protect Port Kembla waters from coal slurry. There is also the important issue of improving the existing coal export facilities at Port Kembla. But, given the prospective volumes and quality of coal flows from the western ~~and south-western fields~~, these matters are not particularly relevant to Port Botany. *Even if the claims for slurry piping to Port Kembla do not sustain their promise, the case for substantial development of coal export facilities at Port Botany is, in any event, extremely slim.* It is remarkable that a decision in principle could have been made by a responsible State Government to proceed with this proposal.

It is important to face the fact that the *western* collieries cannot be expected to be major competitive producers for the foreseeable future. In the worst conditions for Sydney and these companies, the continued exportation of their coal through Balmain may serve appropriately to place a lid on their pretensions and to avoid inappropriate expansion. Such an outcome poses no threat to existing employment in the western collieries; it merely limits growth. The future of N.S.W. coal trade does not lie with these collieries. The future of N.S.W. prosperity is very much wrapped up with the efficient operation of Sydney as a metropolis.

8 Ameliorating the effects of container transport

The key to the attraction of storage, transport and distribution activity to the Port Botany hinterland is the central location of the container terminals at the Port itself. The key to the potential expansion of chemical and refining operations near the Port is not only the development of the Port as an oil port but the location of bulk storage of liquids and space for their storage in the Port area. The key to the development of road congestion and the pressure for a good deal of the road improvement and new road construction is the transport of containers by road from the container terminals at the Port and the grouping of transport, storage and distribution establishments in the Port hinterland. The key to the need for Stages III and IV of the Port is the acceptance of large coal export flows from the Port loader combined with the placement of container terminals at the Port itself.

These are the strategic issues that need to be dealt with in order not only to ameliorate the impacts of the Port but also — and perhaps more importantly — to make the operations of the Port and its metropolitan distribution process efficient. In the preceding chapter, the validity of the claims for the coal loader was questioned. It is not the intention of this volume to adopt the view that barriers to development and change should be erected without good reason. The assumption is accepted that significant Port functions should be transferred from Port Jackson to Botany Bay or that substantial capacity for trade expansion should be provided at Port Botany. The circumstances of the harbours and their hinterlands appear to point strongly in the direction of a transfer of container traffic to Port Botany. But the manner of this transfer and the provisions made for container operations need to be examined with care. It would appear that similar careful consideration should be given to the provision of large-scale storage of liquids and dry bulk goods at the Port-side.

The proposal for container terminals on the large areas of reclaimed (or to be reclaimed) land at Port Botany serves the inportant need that has escaped the Maritime Services Board in Port Jackson, to avoid the stacking of containers. Another advantage arising from the size of the reclaimed area is the opportunity for separate container firms to have their own terminals, without possible confusion arising from shared facilities. With direct unloading from ship to terminal, container firms are free to distribute containers, as desired, predominantly by road either direct to customers (full container loads) or to sub-locations for breaking up other container contents that need to be distributed to several clients. Container firms using their own road transport fleets are free to determine the times and rate of movement of containers from the Port-side terminals.

These are considerable advantages to the container firms. The costs of terminal locations at Port-side are, however, land-use changes in the hinterland,

pressure on residential locations, congestion, new road development and road widening. These costs derive from the basic weakness in the Port planning, the concentration of container terminals at the Port-side and the need for long road hauls particularly north and west. Amelioration of the major impacts depends on altering this design of terminal location and of avoiding long road haulage. *Basically it needs to be altered to use a high capacity transport mode — railways — to shift containers to terminals located more closely to the major areas of distribution.*

This alternative suggested requires some compromise between the immediate advantage of container firms and the needs of the society on which their activities impinge. This alternative is a package deal and depends on:

(a) The abandonment of container terminals at the Port-side
(b) Possibly the development of limited stacking facilities at the Port-side to handle the export of empty containers (though there appears to be an alternative to this)
(c) The transport of *all* containers to and from the Port by rail and the provision of appropriate rail facilities at the Port-side
(d) The establishment of a number of container terminal locations serviced by rail and distributed in appropriate places in the metropolitan area to conform to the distribution patterns of the containers and their contents
(e) The reservation of some areas for additional terminal locations in the western limits of the metropolitan area to permit the effective servicing of container traffic in a growing city.

Such a design would avoid the problems that we have attempted to identify arising from concentrating terminals at the one point of the Port; it would overcome many of the physical difficulties due to the Port location; it would greatly reduce the attraction of transport, storage and distribution enterprises into the Port hinterland and disperse them to a limited number of different areas; it would remove the need for highly expensive road construction; it would reduce the case for the Cooks River Valley road and remove the congestion and noise problems of westward moving container trucks on that route; it would reduce the need for road widening in the hinterland and limit the congestion of local roads and the alienation and disturbance of local communities. Above all, it would make maximum use of high capacity rail carriage and transfer the terminals and the containers into their major distribution areas.

In selecting a number of appropriately located container terminals elsewhere in the metropolitan area, it would avoid container distribution by road from one location, reduce the local Port-side congestion and wider disturbance problems in these areas and significantly lower transport costs. Containers could be moved in bulk by rail in contrast with the highly labour- and capital-intensive methods of road haulage. The inefficiently used city land contained in the Botany-Marrickville railway could be turned to advantage while, at the same time, avoiding the costs of new road construction and widening and the consequential absorption of other city land into these purposes.

The immediate question is: do such appropriate locations exist in the metropolitan area? The answer, subject to some adjustments of relevant locations, appears to be a firm 'yes'.

Five locations may be examined (see Fig. VIII(i)) as possible candidates, as

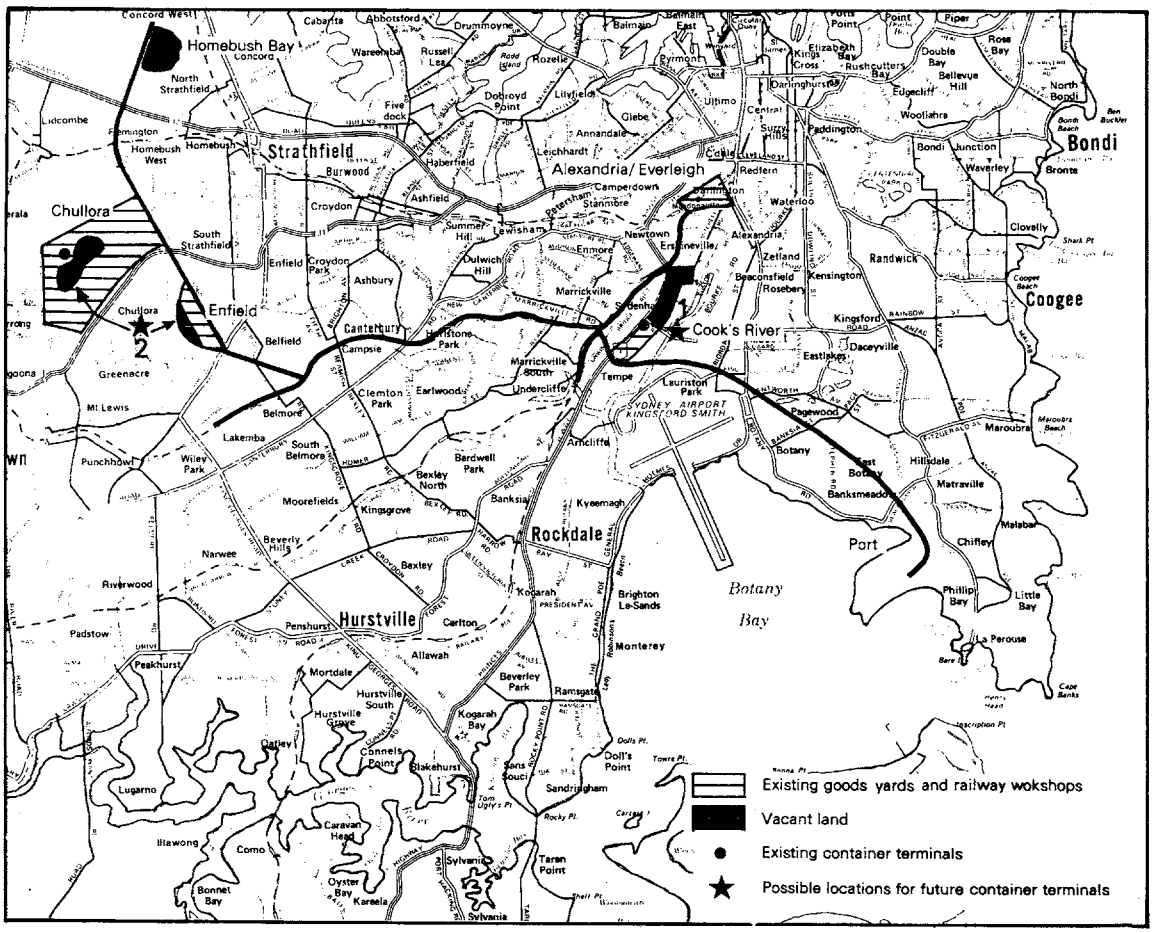

Fig. VIII (i) Potential suburban freight terminals

areas presently served by rail but with available vacant land and, in principle, placed reasonably well in main distribution areas. Not all of these appear to offer satisfactory possibilities as they stand and one conceivable candidate may need to be ruled out in any circumstances. Some appear better than others. In addition to these five locations, other possibilities may be suggested for long-term purposes in meeting the needs of further city expansion westward.

The five possibilities for immediate consideration can be grouped, for purposes of comment, in terms of their proximity to inner city needs and their ability to service westward flows. They are:

I. *Inner city possibilities*
   (a) Eveleigh/Alexandria railway yards
   (b) Cooks River yards

II. *Western possibilities*
   (a) Enfield yards
   (b) Chullora yards
   (c) Homebush Bay

These locations are all linked by rail to Port Botany; the line already skirts the major transport obstacle of the Airport; the container use of available railway lines would have comparatively restricted impact on main suburban railways. The use of any of these locations would require the up-grading of the Botany-Marrickville line as already proposed for the coal traffic but at a cost to the State Budget perhaps less than one-tenth of the road developments currently proposed for container road transport.

It would appear, however, that the Eveleigh/Alexandria yards might not offer a viable possibility, though the obstacles to their use may be less on closer inspection of possible adaptations and there may be scope for some limited development here. The rail access is not particularly good, though capable of improvement. Th yards are virtually fully occupied at present though some relocation of some facilities may be possible and has been suggested by the Sydney Area Transportation Study.[1] It is possible that the major obstacle may, in fact, be the very proximity to the Central Business District and existing road transport constraints on subsequent road movements from any (even small) container terminal in this location.

For servicing the containers moving northwards from Botany Bay, the Cooks River yards, *with adjacent vacant land*, appear to offer an appropriate location for major terminal facilities. The yards themselves are not large enough for a major terminal *but they provide access to fifty hectares of potentially vacant land in the brickpits to the north of the yards.* These brickpits are currently being redeveloped by landfill and appear to offer, in conjunction with the Cooks River yards, adequate opportunity for a major terminal. In particular, this location might be most closely investigated in order to serve, perhaps, three functions:

(a) to receive full container loads destined for inner-city customers
(b) possibly to receive all 'less than container loads' — i.e. containers whose contents are to be distributed to or received from several clients
(c) possibly a storage location for empty containers.

It is possible, in the circumstances, that the Cooks River location would need to be occupied by a consortium of container firms. This could be a defect and we will return to this point. In the circumstances, it may be appropriate to consider either construction by a consortium or building and ownership by the State Government. In either case space or access to facilities could be available for lease or hire.

It appears that the westward flow of container traffic may be served jointly by the Enfield, Chullora and Homebush Bay yards as locations reasonably appropriate for the (dominant) western distribution and collection of containers. The Enfield location has vacant land of some thirty hectares and there is currently a proposal for a Railways of Australia Container Express terminal at this point. Indeed it appears that there might be a good deal of spare capacity in the RACE terminal for a considerable time. In any event, provision might be made to reserve a larger part of the thirty vacant hectares for additional terminal development.

However, a further build-up of container facilities at the Enfield yards would undoubtedly lead to further increases of traffic in the area, and this could adversely affect the residential areas to the northwest and southeast of the

yards. The yards are largely surrounded by industrial areas, but the residential areas referred to could be subjected to increased traffic interference from trucks attempting to reach Hume Highway to the north (Fig. VIII(i)) and Punchbowl Road to the south — these roads are the main outlet arteries from the area. We need to recall the discussion of Chapter 3 and the tendency for related distribution and transport establishments to group around major despatch and arrival points.

Current Department of Main Roads plans call for a widening of Roberts Road, which connects these two arteries to the west of the yards. If this widening were carried through, it could obviate the filtering of traffic through residential areas in the vicinity. However, it would also serve to increase traffic noise and interference to residential properties bordering the road. Extension of Wentworth Street, which runs adjacent to the southwest flank of the yards, to Hume Highway and Punchbowl Road through railway reservations, could be a more satisfactory solution. In either event, any development at Enfield could deal with only portion of the container traffic.

However, the Chullora location is nearby and offers possibly a better site for a container facility: it has some forty hectares of vacant land, even allowing for the present Seatainers (OCL) Terminal already located there. The allocation of a major part of the vacant land would provide the essential needs for some time in the future for container flows to and from the western areas of Sydney.

Some interference to surrounding uses is also possible here, however. Rookwood Road to the west of the yards — which connects to the Hume Highway — would be likely to bear the brunt of traffic increases generated by expanded terminal facilities. The road is currently being upgraded to six lanes and this will obviously improve its carrying capacity. Its southern connection to the Hume Highway is likely to be realigned through an industrial area, but some disturbance is likely to be felt in residential areas on the road's western flank. Furthermore, Rookwood Road has no clear connection to Parramatta Road, and the residential areas north of Lidcombe station could be adversely affected by traffic filtering through to Parramatta Road. Nevertheless, the road and traffic problems appear much less than those arising from the present proposal for Port-side terminals.

Homebush Bay offers a third possibility. It is somewhat closer to the city's western industrial areas, particularly to Parramatta. The fifty hectares of vacant land at this site have a strong claim for reservation for transport and distribution purposes. *It may be doubtful whether both Chullora/Enfield and Homebush Bay are needed as major container terminal sites for the next decade in servicing west Sydney container traffic. For this reason it could be preferable to develop the Homebush Bay site initially for containers from Port Botany moving to and from the western metropolitan area.* Surrounding uses are compatible with such a development, and the planned Western Freeway extension parallel to Parramatta Road (some of which is currently under construction) will improve access to the west. Traffic to the southwest would need to gain quick access to Hume Highway, and this would require the construction of the Flemington-Enfield portion of the proposed Kyeemagh-Chullora Road if interference to residential areas in Chullora is to be avoided. However, the railing of containers from Port Botany would largely remove the

need for extension of the County Road to Kyeemagh, and thus the capital costs of road construction would be considerably less than if containers were shipped from Botany largely by road as is currently suggested. In addition, disruption of the Cooks River Valley residential and recreational areas would be avoided, and traffic congestion and potential disruption to residential areas of Botany avoided.

In all cases, it would appear appropriate that the lands made available for container terminals should be leased from the State and not sold. The future of transport technology is uncertain and it is important that the State Government retain some direct element of control over the land use through ownership.

It may be noted that future facilities may be needed as the city spreads westward. These appear to be available most conveniently at St Marys/ Blacktown and at Campbelltown. It would be appropriate to protect the future by making some reservations in these areas.

If this design were found to be reasonable after closer inspection, it would have the major merits of avoiding terminal concentration at Port-side and long cross-city road haulage. Essentially, to repeat, it would move containers off the roads until they arrive within the main distribution areas of the city and would use a high capacity transport' system in doing so. This is an elementary condition in limiting stress on the environment, on traffic flows and on business efficiency. It would also disperse transport, distribution and storage establishments from the Port-side and tend to group them around a few, more appropriate, locations.

This proposal would require the development of adequate rail facilities not only from Marrickville to Botany but also and most importantly at the Port-side. Rail services could provide an important source of complaint by container firms. There would be double-handling. There would also be the problem of some loss of control over the timing and rate of container movements to and from Port. There may need to be some co-operative arrangement in terminal use by some of the firms and hence some loss of direct control. There are several contrary considerations as counter-balances to these potential problems for the container firms.

(i) Container movement by rail offers the opportunity of large economies of scale in transport to offset double handling costs. The costs of road transport are very high, even in terms of private cost, in the light of the numbers of drivers and heavy vehicles needed. Moreover, the concentrated Port location would tend relatively quickly to develop congestion with a slowing-down of road movement and increased road transport costs. There are therefore likely to be substantial offsets to the costs of double-handling. In any event, some extra handling in mass movements to and from ships and to and from major terminals with appropriate crane and rail facilities does not appear to be a critical problem; it may be irritating.

(ii) A great deal of container traffic would, in any event, require double-handling. This applies most obviously to 'Less than Container Loads' where containers would normally be deposited first on the wharf terminal and subsequently moved and deposited in depots for unpacking and distribution. It is possible that rail transport to a rail-serviced terminal would not affect handling operations in these cases.

(iii) The third consideration is that the current design proposed by the container firms imposes heavy external costs on a substantial number of Sydney residents. Attitudes by container firms that a rail transport system is unacceptable should be countered by the simple proposition: the polluter pays. If it is inescapable that containers must be carried by road, these firms should bear the costs of amelioration. Were this impost to be placed on them, a more rational decision making would be likely. These external costs are large: changed land use, degraded Botany environment, degraded Cooks River Valley, dwelling displacement, residential congestion, expensive road construction. The choice needs to be made.

Nevertheless, the mode of operation of container rail services and the relocation of terminals need to be examined with care. It could be that the Botany-Marrickville line might be actually operated by a consortium or subsidiary of a group of private firms, to provide the assurance of delivery arrangements. It may be that it would be the responsibility of the Maritime Services Board to deliver containers to inland terminals. There are obviously several possibilities that could be investigated. The institutional arrangements should not operate as a major barrier to a means of avoiding the extensive disturbance and heavy costs that the existing proposals yield.

The matter has not been explored in this volume but it would be strongly urged that relocation of dry-bulk storages away from the Port and their transport to other locations by rail may be an appropriate deterrent to hinterland change and a significant amelioration of the disturbances due to the Port.

The relocation of terminals, serviced by rail, would not dissolve the environmental problems. There would still be some persons who would lose and some who would gain. Nevertheless, a concentrated rail flow out to reasonably appropriately located terminals, avoiding major residential locations, and the limited dispersal of terminals with their associated traffic to a small number of locations would greatly reduce the environmental stress. The objective is to achieve a compromise between land-use planning favouring concentration of activities and environmental needs that require the avoidance of concentrated stress.

It is important to emphasise the point that the suggestions in this chapter do not rest merely on the need for amelioration of *local* disturbances. The basic fact is that Port Botany is extremely badly placed to serve Sydney from its southeasterly location. Most of the issues raised here could as easily be raised in terms of efficient transport design of the growing city as of environmental criteria, given the Port's location and the westward city expansion. Indeed, it appears to be a case in which planning for growth and planning for environmental considerations lead to the same essential conclusions.

9 Conclusions and suggestions

A general evaluation

Port Botany development has lurched through obscurity into confusion. Fortunately, for a brief period, its course has taken it into limbo. The history of the Port is a history of planning failure. The current plans for development of Port Botany to four stages, the approval in principle of some of the major proposed uses of Stages I and II and the interface between Port Botany and its hinterland are open to fundamental questions.

Questions arise on three grounds, all of which reflect on the planning procedures, at various levels, of the N.S.W. Government. These doubts and the criticisms can first be cast wholly in economic terms. They are summed up in the questions: What is expected to be the rate of return to the public as well as the private capital to be committed to the Port and its uses? What is the expected rate of return relative to other port development in Port Jackson and elsewhere in New South Wales? These questions have never been asked, let alone answered.

Second, the questions arise on environmental grounds. The environmental impact inquiries of the N.S.W. Coalition Government carried out under the direction of the State Pollution Control Commission have been totally inadequate. The proposals for port use have been presented in such a way as to allow no comparisons with alternatives to Port Botany. The inquiries have been held as last-ditch confrontations with affected city populations. Each environmental evaluation has been confined to one proposed use in isolation from others. The environmental criteria have been limited to physical and technical issues, incompletely specified, and without effective concern for the basic problems of amenity for city dwellers. The effects that were considered were confined narrowly to the immediate Port location. Until the effects of the various uses are added together, the environmental impact cannot be comprehended. Until the environmental problems are considered basically as questions of valuable amenity, no sensible conclusion can be reached. Until the *total* resulting environment and not only the incremental effects of Port Botany are considered, the risk of a major planning mistake must be high. Until environmental amenity and the 'internal' costs and benefits are merged, no adequate consideration of alternative costs and benefits — the *sine qua non* of project evaluation — can be made.

Third, basic questions arise over how far the extent of Port planning has been related to planning the future development of the Sydney region. The powers of the Maritime Services Board, as harbour owners, port builders and port operators are, at one and the same time, extraordinarily wide and inappropriately narrow. It is possible that, having become severely constricted by sur-

rounding land use in Port Jackson and exposed to mounting criticisms by port users and surrounding residents, the Board, like a beleaguered army, sought to break out into open country. The Board proceeded with lavish reclamation schemes in the one location where extensive deep-water dredging and large-scale land reclamation, that still left adequate water areas available, was feasible. The attempt by the Board, in the four planned stages of Port Botany, to set up an integrated port lay-out accommodating many users in large Port areas, took little if any regard for the social, land-use and environmental impact of the Port and these users' facilities on the hinterland and indeed on the metropolis as a whole. The Board displayed — and the ambitions of the Coalition Government to maintain Sydney as a premier port city of Australia supported — a remarkable willingness to commit public funds to a grandiose but ill-conceived port design.

It is symptomatic of the narrowness of the Board's perspective and its generosity with public funds that it proposed to commit up to $1 million into profitless investigation into the base-line water quality of Botany Bay. The most minute and esoteric scientific inquiry was proposed, the end result of which was predictable: that Botany Bay was full of sea-water. This attitude of the Board reflected the preoccupations of a proprietor, not a public servant.

It was predominantly the land-use impact on the hinterland, the effects on city design, the social disturbances to city residents, the efficiency and economic rationality of the investment project and the social implications for the land environment that should have been given priority in planning. It is this latter approach that is represented in this volume. This study has been hampered in very many directions by refusal of the Coalition Government to provide the most elementary information and by the confusion of Ministerial statements and official announcements about proposals for Port Botany and for other port planning in N.S.W. We do not pretend that we have been able to take the investigation to a satisfying conclusion. Relatively simple assumptions have had to be made. The Board is not subject to oversight and control by land-use planning authorities or by more general agencies of resource allocation planning in N.S.W. As the Port neared completion, with only vague declarations on its intended use, a variety of private users appeared as claimants for use of valuable Port-side space. These pressures were intensified because the Board has moved progressively to encourage private interests to construct facilities at ports and to relieve the Board of the financial tasks and of the criticisms arising from any defects in operation.

The result has been that other Sydney authorities have been faced with the need to devise emergency solutions to pressing problems arising from the effects of port operations on the metropolitan hinterland. Though the Port use proposals have been subjected to nominal environmental impact review, no suggestion has been made that these land planning 'solutions' — involving heavy public outlays and massive disturbance — should be similarly subjected to environmental study. The old problem of Sydney's planning approaches has emerged in full — to deal with one problem at a time, to find that one 'solution' leads to another problem and in this way to generate a series of costly mistakes each of which has to be remedied at considerable public expense.

We have attempted to give some indicative projection of the likely impacts

and, where possible, the order of magnitude of the impacts of Port Botany on:

(a) land-use changes
(b) employment changes and relocation
(c) traffic congestion and road adaptations
(d) water amenity and biological processes
(e) air-borne waste generation
(f) noise problems
(g) the social costs and the social benefits to different groups
(h) some indication of the total environmental characteristics that appear to be implied for the Botany Bay area.

As a result, we have raised, as matters that appear to be essential to be explored, some possibilities of:

(a) altering the proposed uses of Port Botany
(b) varying its interface with the land environment
(c) adapting the mode of land cargo carriage and the composition of cargoes carried
(d) altering the ultimate scale of the Port Botany complex.

Some specific suggestions

There are other suggestions contained in the text of preceding chapters; and those given here are limited to strategic issues. Our suggestions are subject to the weaknesses of the information available to us for purposes of projecting over the next decade. With this important reservation, the following proposals are made.

A. General procedural issues

1. Contrary to the views expressed in environmental impact statements on Port uses and in opposition to findings of inquiries that have been held, it is our view that a considerable worsening of the physical, as well as the social, environment will occur with the establishment and operation of Port Botany. The effects will be most noticeable in the areas surrounding the Bay but some major ones will be widespread, over large parts of Sydney.

The chief defect with environmental impact statements and inquiries as adopted with respect to Port Botany are:

(a) the isolated consideration of each proposed Port use
(b) the limitation to specific physical disturbances
(c) the narrow area over which possible disturbances were considered.

This study has attempted to study the aggregated effects on the environment and to project some of the characteristics of the *total* environment arising from Port development that will induce major manufacturing, distribution, transport and storage expansion, together with increases in shipping, rail and road transport movements. These changes will add significantly to *existing* problems of noise most importantly through night operations of the Port. They will alter detrimentally the biological capacity of the Bay, disturb its wave patterns and energy and alter its floor and marine fauna and flora. They will considerably increase the risks of major oil spills. They will generate very serious air pollution problems and these appear to be the most important and widespread

consequences in areas in which concentrations of photochemical oxidants already are very high compared to World Health Organization goals. The Port operations will add significantly to road congestion and to noise in the area of traffic flows.

These problems will require amelioration either by preventive action or by limiting their incidence.

2. The N.S.W. Coalition Government procedure of environmental impact statements and inquiry has been wholly unsatisfactory and is unacceptable. *The specific case-by-case approach to assessment should be abandoned.* The procedure has allowed private and public decisions to approach finality and only then has permitted environmental considerations to be taken into account at the last stage. If inquiries are to be held, *they should be carried out into the social, economic and environmental implications of major projects, activities and expansion proposals* and in a manner that permits consideration of alternatives. In the planning process, attention should be given to local and community implications of plans, above all to identify the gainers and the losers.

B. Proposed construction

3. We accept the necessity for some substantial port development in Botany Bay. *Subject to major changes in proposed uses*, construction of Stages I and II of Port Botany appears appropriate for future port operations in Sydney though it is essential to recognise that Port Botany represents a 'second best' and partially committed solution to Sydney's port problems.

4. There is no purpose in delaying the completion of these two stages in terms of berth and wharf construction and those additional reclamations necessary for Stages I and II, provided the consequential uses of the Port are not thereby determined.

5. The development of Stages III and IV should be suspended and should be subject to detailed investigation into the long-term needs for and implications of this development; this investigation should include a thorough consideration of alternative redevelopment possibilities in Port Jackson.

6. The study of the last two proposed Stages (III and IV) should not be made by the Maritime Services Board but could appropriately be a task for the Planning and Environment Commission. Its economic expertise must be strengthened.

7. The up-grading, double-tracking and electrification of the Botany-Marrickville railway line, together with other signalling improvements and elimination of level crossings, appear to be not only appropriate but an essential precondition if the impact of the Port on the hinterland is to be kept within acceptable limits. The line should be built to minimise noise of heavy freight carriage.

8. This railway line appears to be needed predominantly as a high-capacity carrier for substantially all heavy bulk cargoes to minimise long roads hauls across large parts of the metropolitan area. It is possible that some consequential adaptations beyond Marrickville are necessary. This is a matter for expert investigation.

9. Following from point (8), the construction of the proposed Port-side road,

the widening of General Holmes Drive and the construction of the proposed Cooks River Valley road appear to be inappropriate for economic, land use and environmental reasons.

C. The coal loader

10. The loading of coal at Port Botany appears to be undesirable for both economic and environmental reasons. The main case for expanded coal facilities is at Newcastle. The main case for improving the environmental impact of coal loading appears to be in Port Kembla where there is also a case for some expansion of capacity.

11. The proposal for export of coal from Port Botany should, we believe, be abandoned in its entirety and the port area currently reserved for this use reallocated. It is possible, though we have not been able to explore this issue, that the Balmain coal loader should remain operational to handle coal from the western collieries.

12. Immediate attention should be given to the transit of Burragorang coal to Port Kembla by means alternative to road transport.

D. Container terminals

13. The construction of the major container terminals at the Port-side together with the road carriage of containers would be expected to generate major environmental degradation over large areas; could lead to major land-use disturbances; would generate heavy social costs; and would require large-scale capital outlays from the public purse. The problems arise, in considerable degree, from the physical obstacle posed by Sydney Airport but some are independent of this obstacle. Limiting these problems should be a primary planning objective.

14. The movement of large-scale container traffic through Port Botany would be acceptable providing it could be arranged through

(a) the use of a high capacity rail line from Botany to move containers direct between ship and major container terminals located in the regions of main distribution and pick-up centres

(b) the establishment of these large container terminals at suburban locations appropriate to these centres.

15. We believe that the presently conceived terminal construction at the Port-side should be abandoned. Instead, ample rail facilities with appropriate crane equipment on reclaimed land should be provided to permit efficient rail servicing of suburban terminals by rail delivery. Road truck collection and delivery of containers from and to the Port should be *prohibited.*

16. Suburban terminals, located reasonably appropriately to distribution and pick-up areas, should be selected to be served by rail. There seem to be several appropriate sites. Two that appear most appropriate in the light of existing rail links, location and size of available unused land are

(i) Cooks River yards *together with the adjacent brickpits currently being redeveloped with land-fill*

(ii) Homebush Bay yards.

These could serve respectively the northern and western flow of containers. Both appear to have ample space; preference for these areas is based, in our

judgment, on the grounds that they offer the best opportunities to limit (not eliminate) disturbance to surrounding areas by the operation of terminals and subsequent road flows of containers to and from them.

17. It appears likely that the Cooks River and Homebush Bay sites could supply the necessary space required for Sydney's container trade for some time to come. Other possible sites might be investigated — at Eveleigh yards (for Central Business District dispersal); at Enfield yards; and at Chullora yards (the two latter to service the western metropolitan area).

18. For the long-term purposes it is possible that additional terminals might be sought in the future, more appropriately to the west, conceivably at St Marys/Blacktown or at Campbelltown.

19. Attention should be given to possibilities of railing all containers from some port areas in Port Jackson so that some of the container trade may remain and expand in Port Jackson, using the same principle of direct transport by high-capacity rail links from ship to suburban container terminals.

20. Some double handling of containers is implied by these suggestions. Some loss of control by container firms may also follow. These are small costs compared to the external costs that the operation of these firms impose by road transport of containers and by land-use disturbances at the nearby Port hinterland. Where it is practicable, it is an appropriate principle that 'the polluter pays'. This is a case where appropriate charges on Port use could induce container firms to operate by use of a high capacity rail link to dispersal areas.

It is possible however that container firms might be given the operating charge of, at least, the Botany-Marrickville line to ensure their greater control of container rail movements. This is an arrangement that may be worth consideration.

E. The need for amelioration and compensation

21. It is impossible to eliminate losses to communities in the case of major disturbances on the scale of Port Botany. It is important that the losing groups and the scale and nature of their losses should be identified. On present proposals for the Port, the main losers are low-income, blue collar workers, with a high proportion of non-British immigrants and a large fraction of low-rent tenancies north of Botany Bay. These groups are least able to meet the costs of disturbance. It would be important that serious attempts be made to ameliorate any impacts by clear and definite land-use controls, to limit physical environment disturbances and to avoid reduction in amenity. In present proposals, serious risks of disturbance arise covering a relatively wide area and not only in the immediate Port limits. In the last resort, it would be appropriate for compensation to be paid for disturbances arising from events over which affected groups have no control. For these purposes, and for purposes of ameliorating Port-induced change, extra charges could be placed most appropriately on Port users.

F. The problem of the total environment

22. Other major proposed uses of Port Botany need careful investigation. This applies partly because of the heavy industry in the area and the

implications for the total environment arising from new Port-related developments. The two most obvious are the projected expansion of Caltex and Total refineries respectively on the south and north edges of Botany Bay. Refineries are massive sources of hydrocarbon and nitrogen oxides emissions. Combined with other factories in the area, they threaten to add very large quantities of these wastes to the atmosphere. The air quality of the area immediately north of Botany Bay is already very degraded. It will become worse and these refineries and all major industry are likely to be subjected to very expensive controls, the effectiveness of which on air quality may not be commensurate. Our projections suggest a flow of refinery and other factory wastes equivalent to some 500,000 motor vehicles subject only to present very limited vehicle controls. The siting and the expansion of these activities in these areas seem likely to affect extensive areas of Sydney in spreading large quantities of the primary wastes that are the precursors of photochemical smog. The refinery expansion proposals should, we believe, be subjected to close environmental scrutiny; so too should the very location of these refineries in this area. Botany Bay is probably the worst area in Sydney in which these activities should be conducted. Their relocation, even, if necessary, some distance outside the metropolis, does not necessarily make Port Botany inappropriate as a substantial oil port. Already major pipe lines from Botany to Silverwater, with small feeders as far afield as Newcastle, are proposed.

23. A firm decision needs to be made, recognising environmental and other problems, on the locating of oil refineries. If they are to be located in or near Sydney, Botany Bay is the more appropriate place as Sydney's oil port than is Port Jackson. However, the use of Botany Bay as a bulk oil port, with very large ships, enhances the prospect of major oil spillages in the Bay, adding to the not infrequent small spills. It would be essential that a specialised organisation to control these spills should be set up. The relatively informal system currently operated by the M.S.B. is inadequate.

G. Administrative proposals

24. We believe that the statutory authority of the Maritime Services Board should be reduced. Its proprietorial rights in Botany Bay should be withdrawn. The Board should most appropriately operate, under Ministerial control, as a port-operating authority only. It should not have the very large powers to determine large-scale investment outlays and to be so unrestrained either in terms of metropolitan land-use considerations or objectives of N.S.W. resource development.

25. Port planning and development are most immediately an integral part of urban planning. It is the failure to recognise this fact that is at the basis of the problems that have arisen with Port Botany. We believe, therefore, that future port development and major changes in port use should be under the control of the Planning and Environment Commission as the more appropriate body to whose planning decisions the Port authority should be subject.

26. This would require a considerable development of the powers, functions and activities of the Planning and Environment Commission. We find here the same problems that we found in the case of our first volume dealing with waste management and pollution control: the extraordinary inactivity of the Planning

and Environment Commission. The powers, the functions, the responsibilities and the staffing of this body urgently need to be built up. Port Botany is only one of the major planning problems facing Sydney.

27. It would also appear appropriate to us that the State Treasury should assume a much more influential role in major investment decisions. Sydney has not built up its set of powerful statutory authorities without good reason and we respect at least some of these reasons. But the allocation of actual ownership rights and the ability to engage in self-financing that applies in the case of the Maritime Services Board (as in other authorities) go far to defeat any attempt at rational allocation of State financial resources. It invites the generation of large-scale excess capacity that is proposed in Newcastle, Botany and Kembla for coal exports. We hesitate to suggest complete re-incorporation of the budgets of the Board in the State accounts but this may be the only way to ensure adequate information. More importantly, however, the Treasury needs to exercise a controlling influence in assessing relative rates of return to major public projects.

28. In doing so, the Treasury needs to work in close association with the Planning and Environment Commission. Environmental quality is one important consideration, but it is only one. We do not believe that confrontation with environmentalists is a sensible mode of procedure. Environmental benefits and costs are not easy to measure but should be incorporated in a full cost/benefit assessment from the beginning. Their inclusion should be made as a matter of course, based on as much knowledge and assessment of the human valuations of the quality of the city environment as can be assembled.

29. One elementary lesson should be clear: the experience of Port Botany should not be repeated. Sydney, in common with other Australian cities, is facing a heavy bill for past costly mistakes. For most environmental, planning and development needs, the same basic need applies: it is cheaper and much more effective to avoid costly mistakes than it is to clean up the consequential mess.

Notes

Notes to Ch. 2: Port Botany and its users

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8 Commission of Inquiry into the Maritime Industry, *Report,* p.224.
9 Ibid., p.208.
10 Ibid., p.220.
11 Australian National Line, *Environmental Impact Statement — Proposed Botany Bay Container Terminal.* Prepared by Maunsell and Partners, December 1975.
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2 Ibid.
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6 *Australian National Line, Environmental Impact Statement* (prepared by Maunsell and Partners 1975). This report indicates a container throughput of 180,000 CL's per annum by 1980. In this report we assume that the second Botany Container Terminal, to be operated by Seatainers Ltd (also known as O.C.L.) will have a comparable throughput. The terminal is of similar size and capacity to the A.N.L. facility.
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9 Over the 1953/4-1977/8 period, chemicals manufacturing expanded by an average 8.2 per cent per annum in value ad'ed terms, while manufacturing as a whole expanded at 5.6 per cent per annum. From 1968/9 to 1972/3 equivalent figures were 3 per cent and 2.7 per cent.
10 Total Oil announced plans for a $100 million redevelopment and extension of their Matraville refinery in April *(Australian Financial Review,* 6 April 1976). Caltex have announced a $300 million program to expand their Kurnell refinery (Ibid., 2 March 1976).
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13 Port Botany Development, M.S.B. brochure, April 1976.

Notes on Ch. 4: Potential transport congestion

1 W. J. Hickson and N. G. Butlin, 'Manufacturing in the Botany Bay Region' in D. J. Anderson (ed.), *A Handbook of the Botany Bay Region,* Botany Bay Project Committee, Sydney, 1974.
2 *Traffic Flow Maps, 1973,* Dept. of Main Roads, N.S.W., Map 11.
3 P. J. Rimmer, A.N.U., private correspondence based on the analysis of S.A.T.S. data.
4 *Sydney Area Transportation Study, I:* VI-40, Table 6.18.
5 *Guide to Traffic Engineering Practice,* published by the National Association of Road Authorities, 1974, p.14, Table 2.4. For a specification of the relationship between heavy, light and passenger vehicles, see next section.
6 *Environmental Impact Statement: Proposed Botany Bay Container Terminal.* Report prepared by Maunsell and Partners Pty. Ltd. for A.N.L., December 1975.
7 Down-River Transportation Study, Brisbane.
8 *Mascot (Kingsford-Smith) Airport: Implications for the Planning of Botany Bay Sub-Region.* Report prepared by Matt Francki and Associates for the Dept. of Urban and Regional Development, 1975, p.16.
9 The effect of additional Port-hinterland-Airport traffic movements on road congestion in the most immediately affected area of the hinterland was evaluated in the following fashion. First, 'average' vehicle operating speeds — as determined by averaging out the effects of peak and non-peak traffic movements — were used in conjunction with estimates prepared by S.A.T.S. (Vol.2: IV-12, Table 4.2) to estimate current (1973) levels of service and 'service volume capacity ratios' along major traffic arteries. The vehicle speeds used in this determination were based on field observations and those reported in S.A.T.S. Vol.1, pp.III-30-2. Second, on the basis of the service volume capacity ratios and the 'Average Annual Daily Traffic' recorded on these roads in 1973, 'capacity' of the roads in terms of average annual daily traffic was evaluated. Finally, the additional traffic movements generated by the Port-hinterland-Airport complex were assigned to the road system and the new service volumes used to estimate volume capacity ratios and levels of service in 1985.
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Notes to Ch. 5: Waste generation and pollution

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