

PEEL INLET MANAGEMENT AUTHORITY

Reserve 40109 Draft management plan



Waterways Commission
Report No 41
1993



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RESERVE 40109 DRAFT MANAGEMENT PLAN

Report to the Peel Inlet Management
Authority

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Perth WA 6000

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PUBLIC SUBMISSIONS

This management plan was prepared by Waterways Commission for the Peel Inlet Management Authority.

Copies of the management plan will be available at local government public libraries and:

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Public submissions on the draft management plan are invited. All public submissions received will be considered before the preparation of the final management plan.

A summary of public submissions will be contained in the Appendices in the final draft.

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1. INTRODUCTION

In 1961, Lot 2, Cockburn Sound Location 16 was subdivided to form residential lots, plus a foreshore reserve - Lot 66. Lot 66 was subsequently indentured to the original owners of Lot 2 for a period of twenty one years. On expiry (1982) it was to be surrendered to the Crown "free of all encumbrances" for the purpose of Public Open Space.

Prior to the expiry date, some adjacent land owners entered into lease agreements with the covenantors for the sublease of that part of the reserve which abutted their property boundary. Under the terms of the lease, the subject land was to be surrendered to the Crown under the terms of the original indenture.

During this twenty one year period, the adjacent owners developed some of the reserve. The developments included jetties (licensed by the Department of Marine and Harbours and approved by the Peel Inlet Management Authority (PIMA)), construction of retaining walls (usually to PIMA's satisfaction and at the applicants' cost), outbuildings - sheds and barbecue areas - (sometimes with Shire of Murray approval) and extensive landscaping. No formal approvals have however been issued for many of the above developments.

Prior to expiry of the indenture, the Shire of Murray undertook to accept vesting of the reserve (now Reserve 40109). One of the conditions set by the then Department of Lands and Survey was that prior to vesting, the Shire would have to prepare a management plan for the reserve.

Subsequently, various management plans were proposed, but none officially adopted. During this period the Shire of Murray reversed its decision to accept vesting.

In 1987 the Waterways Commission accepted vesting of reserve 40901 for the purpose of "foreshore management and recreation" and subsequently delegated management responsibility to PIMA. While PIMA accepted that many of the developments do not have formal approval, it has tolerated their existence. It is important that a workable management plan be prepared and adopted by all interested parties. This draft management plan is presented for comment and modification if necessary.

Section 34(A) of the Land Act (1933) requires, in part, "any person in whom land has been ... vested under Section 33(2) ... to submit a management plan to the satisfaction of the Minister...". This document is designed to meet that requirement.

1.2 Aim

It is the aim of the management plan to conserve and enhance the waterways, banks and foreshores of Reserve 40109 whilst maintaining the historical association of adjoining residents' and ensuring provision for public access.

2. THE NEED FOR FORESHORE RESERVES

Foreshores play an important part in maintaining the health of waterways. It is vital that they are managed in a way that ensures they function as an integral part of the waterway environment. Foreshore areas are important because:

- . they include plant and animal communities and physical features which form an integral part of the estuarine/riverine ecosystem.
- . fringing vegetation within the reserve provides a buffer between the waterway and possible sources of water pollution and reduces the severity of erosion processes.
- . they contain features which are part of the waterway landscape.
- . they enable public access in a manner consistent with the multiple use of the waterway.

3. ISSUES AND RECOMMENDATIONS

3.1 Management of the reserve

Long term management and ultimate decision-making rests with the Waterways Commission, in which the reserve is vested, through the Peel Inlet Management Authority (PIMA). Various committees have been formed to consider management of the reserve. Committees enhance communications between interest groups and the vesting body and it is desirable that a management committee for this reserve continue to operate.

Recommendations

1. Ongoing management of the reserve be undertaken by the Peel Inlet Management Authority.
2. PIMA establish a liaison committee which comprises delegates from :
 - (i) PIMA
 - (ii) Shire of Murray (1)
 - (iii) Ravenswood Society (1)
 - (iv) Res. 40109 Preservation Soc. (1).

It would be the responsibility of this committee to liaise with residents and other members of the community to assist PIMA in implementing the management plan.

3.2 Foreshore erosion

There is concern amongst residents that the foreshore of Reserve 40109 is eroding and that remedial work would be costly.

In 1989 PIMA commissioned the Department of Marine and Harbours to conduct a study into the erosion stress on the foreshore. A copy of the report is attached although it is recognised the report is somewhat dated (Appendix 2). The main findings of the report were:

- (i) erosion was minor and that extensive foreshore protection works are not required.
- (ii) it was due primarily to river scour which varied in intensity throughout the river bend.
- (iii) Two methods of foreshore protection were recommended depending on location:
 - a) on steep slopes where scour is more evident a form of hard walling may be necessary (PIMA also encourages the use of loose stone over matting walls).
 - b) on shallow slopes the preferred method is re-vegetation.
- (iv) It was not possible to quantify the rate of erosion due to inadequate historical survey data but inherent in the recommendations is a subjective engineering assessment that the rate is relatively low. This was manifested by an absence of any large or prevalent escarpments and by the ability of vegetation to adjust gradually to any underlying erosion.
- (v) It was observed that human activity such as destruction of vegetation increases the rate of erosion. Erosion due to boat wash was not investigated specifically.
- (vi) It was observed that isolated foreshore protection works may have caused increased erosion at their end points by swirling back eddies.
- (vii) The report also recommended with respect to existing works that all man-made obstacles in the floodway (or flood plain) be removed. This does not include licensed jetties and other essential marine structures.

Structures within the floodway can impede the flow of floodwaters causing water to bank up upstream. This can result in flooding to areas not normally flood prone. Structures built without the proper approvals (hence not to an approved standard) may not be able to withstand floodflows. The resultant debris is a threat to people and other structures as it is swept downstream.

Recommendations

3. The form of erosion protection works to be approved by PIMA in consultation with the liaison committee prior to any works commencing. Any other engineering works would require special approval.
4. All obstacles to flood flows be assessed for impact on erosion during flood and either be removed or designed to minimise impact to an acceptable level.
5. A baseline survey of embankment profiles be carried out to serve as a basis to monitor erosion processes.

3.2.1 Funding of erosion protection works

The cost of river bank erosion protection works can be quite substantial. Rental derived from the proposed lease arrangement (See Section 3.5) should be used for this and other necessary foreshore works, including nature conservation and landscape protection.

Recommendations

6. Income derived from the agreed lease should be used to help maintain and enhance the banks and foreshore reserve.

3.3 Private jetties

Until recent years, owners of property abutting this reserve have been allowed to construct jetties. Upon vesting of the reserve in the Waterways Commission in 1987, applications for private jetties were refused by DMH in accordance with agreed PIMA/DMH policy which states, with regard to jetties abutting foreshore reserves, "no new structures be allowed". However there may be grounds for an exception to this policy because of the special circumstances of this reserve. PIMA's requirements for new jetties includes consideration of design, location, erosion, environmental and visual impacts. It should be clear that if this policy is wavered for Reserve 40109 it should not be considered a precedent for other reserves.

PIMA will continue to encourage applicants for jetties to consider sharing structures with adjacent owners to minimise the number of structures protruding into a public waterway.

Recommendations

7. Holders of jetty licences should continue to enjoy the use of their jetty provided it is kept in good repair. (Alterations to or removal of existing structures will still require the approval of DMH and PIMA).
8. PIMA policy for new jetties abutting foreshore reserves be waived for this reserve (in cases where abutting owners are party to a lease - see section 3.5).. Applications will be subject to approval by PIMA and DMH.
9. PIMA support the siting of jetties on common property boundaries to encourage sharing of jetties between adjacent land owners (It is PIMA's intention to minimise the number of structures intruding into the river along a public reserve).

3.4 Vandalism and theft

There is some concern that vandalism and theft may increase as a result of any increased public access to the reserve. However, advice from local police indicates that illegal activities are no worse where similar foreshore reserves exist (eg. Banksia Terrace and River Road, South Yunderup). The Police have advised that the Neighbourhood Watch program operates in

Rodoreda Crescent. Also the erection of fencing on lot boundaries abutting the reserve would hinder access of unauthorised persons on to private property. If at a later stage it becomes apparent that access along the reserve is contributing to security problems, PIMA, the liaison committee and local police should consider other options.

Recommendations

- 10 PIMA and the liaison committee encourage residents to construct fencing along their common boundary with the reserve. Guidelines on the type of fencing preferable to be developed by the liaison committee.

3.5 Maintenance of the reserve

Historically, the reserve has been maintained and developed by the adjacent land owners at their own cost. It is recognised that interest in the reserve by local residents has been a positive influence. Unfortunately, some development has been contrary to the purpose for which the reserve was vested in PIMA, ie. foreshore management and recreation. Development should be restricted to jetties, foreshore protection, provision for public access and the enhancement of native vegetation. Guidelines for maintenance/development must include consideration of:

- (i) Importance of foreshore vegetation to the integrity of river banks and native fauna.
- (ii) Visual amenity of the reserve from and to the river.
- (iii) Native versus exotic vegetation.
- (iv) Fire, litter and other debris.
- (v) The long term integrity and purpose of the reserve.
- (vi) Access by residents and visitors.
- (vii) Erosion processes.
- (viii) The prevention of pollution such as fertilisers and other chemicals, air conditioning discharge and hardstand (pavement) hydrocarbon runoff entering the river.

Given the historical development of the reserve, PIMA acknowledges that an appropriate mechanism for management could be to:

Option 1. Lease sections of the reserve to adjacent owners or to a corporate body or,

Option 2. Lease the whole reserve to a body corporate consisting of PIMA and Shire of Murray representatives, adjacent owners and other interested parties by agreement.

The main benefits of a leaseback arrangement and rental fee include local vested interest in maintaining the reserve to a high standard, the generation of funds for reserve maintenance and the possibility for privileges such as jetties and structures which would normally not be allowed on or abutting a public reserve. To ensure the long term legality of a leaseback arrangement, potential owners should be aware of the lease arrangement.

A draft lease agreement is attached (Appendix 1). This lease is designed for option 1, however it would be easily modified if option 2 is preferred.

Recommendations

11. That area of Reserve 40109 abutting individual lots be offered for lease to:
 - i) the owners of those lots. If some owners do not wish to lease, then those sections of the reserve be held by PIMA or,
 - ii) a body corporate as described above.

Any lease agreement must have a sunset clause and be renegotiated on sale of the lessee's property. (Details of the responsibilities of the lessee are defined in the terms of agreement).

12. The fee for the lease's shall be decided by PIMA in consultation with the liaison committee. Income generated from leases will be placed in a trust account. Trust Account funds will only be drawn for the maintenance and management of the reserve.
13. Details and priorities for reserve maintenance shall be discussed and resolved through the liaison committee and PIMA.
14. All development on and abutting the reserve will be subject to conditions of the lease agreement.
15. A caveat shall be placed on all land titles abutting Reserve 40109 stating that adjacent land is subject to a management plan and leaseback arrangement.

3.6 Public nature of the reserve

Since the creation of the Reserve and subsequent signing of the original indenture (1961), it has always been stipulated that the reserve should have provision for public access. This is inferred in the original indenture by the words "for the purposes of Public Open Space" and in the subsequent Vesting Order (1987) "foreshore management and recreation". The WA Land Act and the Department of Land Administration's (DOLA) policy does not allow exclusive private use of public foreshore reserves. DOLA conducted a survey of the reserve on behalf of PIMA to determine the level of encroachment onto the reserve. This is attached as Appendix 3.

With regard to recreation reserves, Waterways Commission Policy states, in part, "reserves along the state's waterways are of regional significance and cannot be considered exclusively as local open space". However the public nature of the reserve should be balanced against its historical use and regional setting.

Currently there is little pressure for public access to, and facilities on, the reserve. This is due in part to the small local population and the availability of alternative recreational sites. Although this situation may change in the future, developments (eg. constructed pedestrian access) to pre-empt public use are not considered appropriate at this stage, provided that the ultimate "public nature" of the reserve is appreciated and understood by the residents.

To provide public access to the reserve in the long term, it is proposed that a two metre wide pedestrian access way be pegged along the reserve and that no development be allowed to interfere with this survey path. This may necessitate the removal or alteration of obstacles along the agreed route. Any proposed developments must take into account proximity to the intended pathway. Structures that give the appearance that the reserve is private property must be removed (eg trespassers prosecuted signs, fences).

Apart from the path, it is considered that no other public development is required at this time.

Recommendations

16. A two metre wide public pedestrian access way be pegged along the reserve, and no development be permitted which would interfere with the route of this path. Fencing or other developments impeding the path's route be removed. The path would be constructed as funding becomes available.
17. No signs should be permitted on the reserve other than those permitted by PIMA. All unacceptable signs to be removed (eg. 'trespassers prosecuted', 'private property').
18. In the event of subdivisions of land abutting the reserve, foreshore reserves, of widths not less than that of Reserve 40109, to be acquired by the Crown.

Appendix 1

Proposed lease agreement

THIS LEASE made the _____ of _____ 19____

BETWEEN:

WATERWAYS COMMISSION a body corporate of 184 Saint George's Terrace
Perth in the State of Western Australia (hereinafter "the Lessor") of the
one part and _____ of _____ in the said State
(hereinafter "the Lessee") of the other part.

WHEREAS:

- (A) All that piece of land being Cockburn Sound Location 2904 and being the whole of the land in Reserve 40109 is vested in the Lessor with power to lease.
- (B) The Lessee has requested the Lessor to grant to the Lessee a lease of that portion of the Reserve comprising an are of approximately shown more particularly delineated and coloured green on the plan annexe hereto (hereinafter called "the leased land") and the Lessor has agreed to grant to the Lessee a lease for the term at the rental and upon and subject to the covenants conditions and agreements hereinafter contained.

WITNESS:

1.____The Lessor HEREBY LEASES UNTO the lessee the leased land TO HOLD the same unto the Lessee for the term of five (5) years (hereinafter " the term") which term shall be deemed to have commenced on the _____ day of 19____ and upon and subject to the covenants and agreements herein contained and also to the covenants and powers implied in leases under any Act for the time being in force (unless hereby negatived or modified) the Lessee YIELDING AND PAYING therefor an annual rental of ONE HUNDRED DOLLARS (\$100) to be paid yearly in advance the first of such payments to be due and payable on the _____ day of 19____ .

2.____The Lessee HEREBY COVENANTS with the lessor that during the term he will:

- (a) pay to the Lessor the rent hereby reserved at the times and in the manner aforesaid without any abatement or deduction whatsoever:

- (b) pay and discharge on the due date for payment thereof all present and future rates taxes charges assessments duties impositions penalties and other outgoings whatsoever which now are or during the term shall be assessed and charged upon or in respect of the leased land;
- (c) pay in accordance with the meter readings all gas electricity excess water and telephone charges used or consumed on the leased land during the term or any extension thereof;
- (d) not without the approval in writing of the Lessor first had and obtained develop or erect or build or permit or cause to be developed or erected or built on the leased land any buildings erections or other improvements nor without the like approval make any additions or alterations to the improvements now erected on the leased land and then only in strict accordance with plans and specifications to be first approved in writing by the Lessor and the Local Authority having jurisdiction over the leased land;
- (e) at all times duly and punctually comply with observe and carry out and conform with the provisions of all statutes now or hereafter in force and all ordinances regulations and by-laws thereunder and all requirements and orders of any authority statutory or otherwise which affect the leased land or the use thereof or which impose any duty or obligation upon the owner occupier thereof;
- (f) permit the Lessor by its agents or servants with or without workmen and others at all reasonable times to enter upon and inspect the condition of the leased land and forthwith (so far as the Lessee is liable) execute all repairs and works required to be done by written notice given by the Lessor provided always that if the Lessee shall not within a space of thirty (30) days after service of such notice commence and proceed diligently with the execution of the repairs and works mentioned in such notice it shall be lawful for the Lessor to enter upon the leased land and execute such repairs and works and the cost thereof shall be a debt due from the Lessee to the Lessor and be forthwith recoverable by action;
- (g) use the leased land for the purposes of _____ and for no other purpose whatsoever without the consent of the Lessor in writing first had and obtained and not carry on or permit or suffer to be carried on in or upon the leased land or any part thereof any noxious noisome or offensive trade or business occupation or calling or do or omit to be done or permit or suffer to be done or omitted any act matter or thing whatsoever which shall at any times during the term be or grow to the nuisance or disturbance of the occupiers or adjoining lands and properties;
- (h) use and adopt all reasonable and proper means and precautions to prevent the outbreak or spread of bush fires on the leased land and if applicable in due season to construct effective firebreaks and to comply with the provisions set out in the management plan for the said reserve 40109 fire control;

(i) at all times and at his own cost and expense in all things keep and maintain-

- (i) the leased land in a reasonably clean and good condition; and
- (ii) all buildings fences gates and other improvements now or hereafter standing or being on the leased land in good tenable repair order and condition;

AND YIELD AND DELIVER UP the leased land in good and substantial repair order and condition at the expiration of the term or sooner determination thereof;

- (j) not do or cause to do anything that is likely to bring about the collapse or movement of any part of the banks or waters within or adjoining the said Reserve 40109 including the removal of any tree, shrub or other plant or cause or permitting grassing by livestock;
- (k) pay the Lessor on demand all sums of money which the Lessor may at any time and from time hereafter pay or expend or be called upon to pay in or about or in connection with performing discharging or executing any requisitions or works or abating any nuisance or alleged nuisance referred to in the preceding sub-clauses hereof and which contrary to the agreement therein contained the Lessee neglects or fails to perform discharge or execute and to pay the same to the Lessor notwithstanding that by any statute by-law or regulation the Lessor is liable alone or jointly with the Lessee and/or others to perform discharge execute or pay for the same or any part thereof;
- (l) not without the written consent of the Lessor first had and obtained assign transfer mortgage sub-let or part with possession of the leased land or any part thereof and the provisions of Section 80 of the Property Law Act 1969 are expressly excluded from this lease;
- (m) at all times indemnify and keep indemnified the Crown in right of the State of Western Australia its servants and agents and all instrumentalities of the Crown and the servants and agents of such instrumentalities. -
 - (i) against all damage to any property of the Crown or any instrumentality of the Crown caused by or arising out of or in relation to the use by the Lessee or any of his servants workmen agents licensees or invitees of the leased land;
 - (ii) against all actions suits demands claims and cost which may be made at any time or times by any person or corporation arising out of or in relation to or incidental to the use by the Lessee or any of his servants workmen agents licensees or invitees of the leased land;
- (n) on behalf of himself and the Lessor and at his own cost and expense effect and keep in full force and effect a Public Liability policy of insurance with an insurer approved by the Lessor (such approval not to be unreasonable withheld) and provide indemnity in respect of both injury to persons and damage to property in the usual terms with respect to the leased land of

which the limit of indemnity shall be not less than (\$). The policy or a copy thereof or a certificate of insurance shall be produced by the Lessee to the Lessor on request in writing by the Lessor;

- (o) not do permit or suffer to be done anything whereby the policy of insurance on the leased land taken out as aforesaid may become void or voidable or whereby the rate of premium thereon may be increased and any expenses incurred by the Lessor as a result of a breach of this covenant shall be a debt due from the Lessee to the Lessor and be forthwith recoverable by action;
- (p) not to pull up cut back or injure any tree shrub or other perennial plant on the leased land and not make any excavations on the leased land nor excavate remove and take away or allow to be excavated removed or taken away therefrom any clay soil or other material without the consent in writing of the Lessor first had and obtained;
- (q) not affix or cause or permit to be affixed or exhibited or exhibited on any part of the leased land any poster signboard neon sign or other advertisement except as shall be first approved in writing by the Lessor;
- (r) yield up the leased land at the expiration or sooner determination of the term or any extension thereof in good and tenantable repair and condition as shall be in accordance with the Lessee's covenants herein contained;
- (s) pay to the Lessor all costs of the Lessor incurred in respect of the instructions for and the preparation of this lease and the stamp duty hereon and all costs charges and expenses for which the Lessor shall become liable in consequence of or in connection with any default by the Lessee in performing or observing any covenants conditions or stipulation's herein contained or implied and on the part of the Lessee to be performed or observed including (but without limiting the generality of the foregoing) all costs charges and expenses incurred by the Lessor for the purposes of and incidental to the preparation and service of any notice requiring the Lessee to remedy a breach of the covenants conditions or stipulation's herein contained or implied notwithstanding forfeiture for such breach shall be avoided otherwise than by relief granted by the Court.

3. _____ AND THE LESSOR COVENANTS with the Lessee that the Lessee paying the rent hereby reserved and observing and performing the several covenants and stipulation's on his part herein contained shall peaceably hold and enjoy the leased land during the term without any interruption by the Lessor or any person rightfully claiming under or in trust for the Lessor.

4. _____ AND IT IS MUTUALLY AGREED AND DECLARED by and between the parties hereto as follows:

- (a) If the rent hereby reserved or any part thereof is not paid on the due date for payment thereof or within (7) days thereof (whether formally demanded or not) or if the Lessee shall sell its property adjoining the leased land or if any covenant on the part of the Lessee hereunder contained or implied shall not be punctually and effectually performed or observed and such default continues for a period of fourteen (14) days after service on the Lessee of a notice calling on him to pay such rental or to

perform and observe such covenant or if the Lessee shall become bankrupt or makes any assignment for the benefit of or enters into any arrangement for composition with his creditors or suffers any execution to be levied on his goods then in any of the said cases it shall be lawful for the Lessor at any time thereafter to re-enter upon the leased land or any part thereof in the name of the whole and thereupon this Lease shall absolutely determine but without prejudice to the right of action of the Lessor for arrears of rent or damages for breach of hereby granted or any extension thereof may be determined at any time by the Lessor giving to the Lessee one (1) month's notice in writing of its intention so to determine the same and upon the expiration of such notice this lease shall cease and determine and the Lessee shall quietly deliver up the leased land to the Lessor in such state of repair and condition as shall be consistent with the proper performance by the Lessee of the covenants herein contained and the Lessor will not be liable for compensation in respect of such sooner determination;

- (e) the Lessor shall, with due reason and due notice, be empowered to cause the removal of any improvement on that portion of land that the Lessor or its representative considers necessary which improvements the Lessee or any previous Lessee may have been permitted by the Lessor to erect on the Leased land:
 - (f) any notice to be served by the Lessor on the Lessee under this lease shall be deemed to have duly served if sent in a prepaid registered letter addressed to the Lessee at his address hereinbefore given or left upon the leased land and any notice served by the Lessee on the Lessor under this lease shall be deemed to have been duly served if sent in a prepaid registered letter addressed to the Lessor at the address of the Lessor hereinbefore given. A notice sent by post shall be deemed to have given at the time when in due course of post it would be delivered at the address to which it is sent
5. (1) IF at any time any dispute of difference shall arise between the parties hereto in respect of any of the matters hereinbefore referred to or the meaning or construction of any of the provision herein contained such dispute or difference shall be referred to a single arbitrator to be appointed in accordance with the provisions of the Commercial Arbitration Act 1985 and its amendments.
- (2) NOT WITHSTANDING the provisions of Section 20 of the Commercial Arbitration Act 1985 on any reference to arbitration pursuant to subclause (1) of this clause any party may be represented by a duly qualified legal practitioner or other representative.

AS WITNESS the execution of this lease the day and year first hereinbefore written.

THE COMMON SEAL of the)
WATERWAYS COMMISSION)
was hereunto affixed by)

SIGNED by the said ()
in the presence of: (-----)

WITNESS

ADDRESS

OCCUPATION

DATED

LEASE

CONVEYANCER
CROWN LAW DEPARTMENT
109 ST GEORGE'S TERRACE
PERTH W.A. 6000

TELEPHONE: (09) 327 1711

CLD REF: 1714/90

WC: 166.3.4

(JAMO55DO4)

Appendix 2

Rodoreda Crescent Foreshore Erosion Investigation

**An Engineering Report Prepared for the Waterways
Commission**

November 1989

**Department of Marine and Harbours
Marine House, 1 Essex Street
Fremantle WA 6160**

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1. INTRODUCTION

Rodoreda Crescent is a residential street located on the northern bank of the Murray River at Ravenswood. Riverside properties are separated from the river by a narrow foreshore reserve (#40109) which has been vested in the Waterways Commission since early 1988. The Waterways Commission is developing a management plan for Reserve 40109 and has requested the Department of Marine and Harbours (DMH) to prepare a short engineering report on the need for bank erosion mechanisms, control measures and available options.

1.1 Programme

This investigation was essentially a desk top study which included several site visits. A file and plan search was conducted together with a review of previous reports. Site inspections were conducted on the shore and on the water. The existing environment was videotaped to provide a visual record, and river depth cross sections were measured at various points along the reserve to gain an understanding of the erosion processes.

2. LITERATURE REVIEW

The following review is a summary of existing information which exists in files, drawings and reports held by the Department of Marine and Harbours, the Waterways Commission and the Peel Inlet Management Authority (PIMA).

2.1 Files

A search of DMH and PIMA files revealed that most of the file documents refer to foreshore lease agreements between the local residents and management authorities. Only a few documents were found which referred to foreshore erosion protection measures.

A description of the reserve river bank and associated structures relative to each property fronting the reserve is included in a 1985 PIMA inspector's report. This information was useful for identifying those sections of Reserve 40109 on which rock retaining walls, jetties and other structures have been built by the local residents. A second PIMA file document included rock walling specifications recommended by PIMA to applicants who were granted permission to build such structures. Some of these specifications have been incorporated in the foreshore protection measures recommended herein.

2.2 Drawings

Drawings of the Murray River at Rodoreda Crescent were drawn up as part of the 1984 Murray River Flood Study and are held in Public Works Department plan books 51796 and 54586. These drawings identify flood prone areas, stage discharge relationships and suggested development limits.

The Rodoreda Crescent section of the Murray River experiences a 1 in 100 year flood level of about + 5.1m AHD and the associated flood prone areas are shown in Figure 2.1. The backwater curve for this section of the Murray River is such that the 1 in 100 year flood level at the Ravenswood Bridge is + 4.3m AHD as shown in Figure 2.2. Flood levels for other recurrence intervals are shown in Figure 2.3, but they are only valid at the Ravenswood Bridge. The flood levels for other recurrence intervals at Rodoreda Crescent were determined using the difference in the 1 in 100 year flood level between the bridge and Rodoreda Crescent.

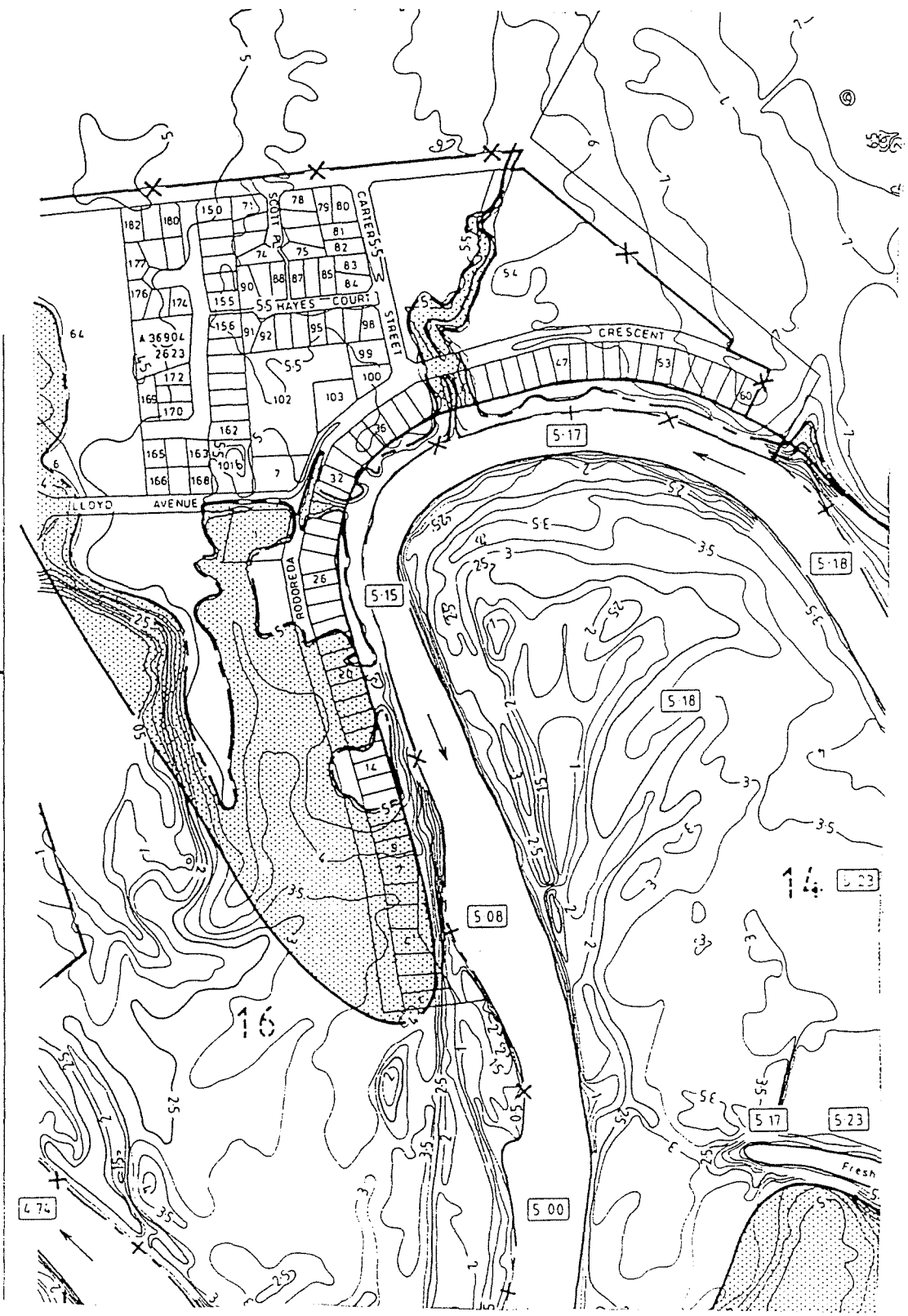
The existing development and physical features of Reserve 40109 are shown on a PIMA drawing which is included herein as Figure 2.4. This drawing identifies the erosion areas along the reserve and illustrates the river flow characteristics along with locations where river bed profiles were measured.

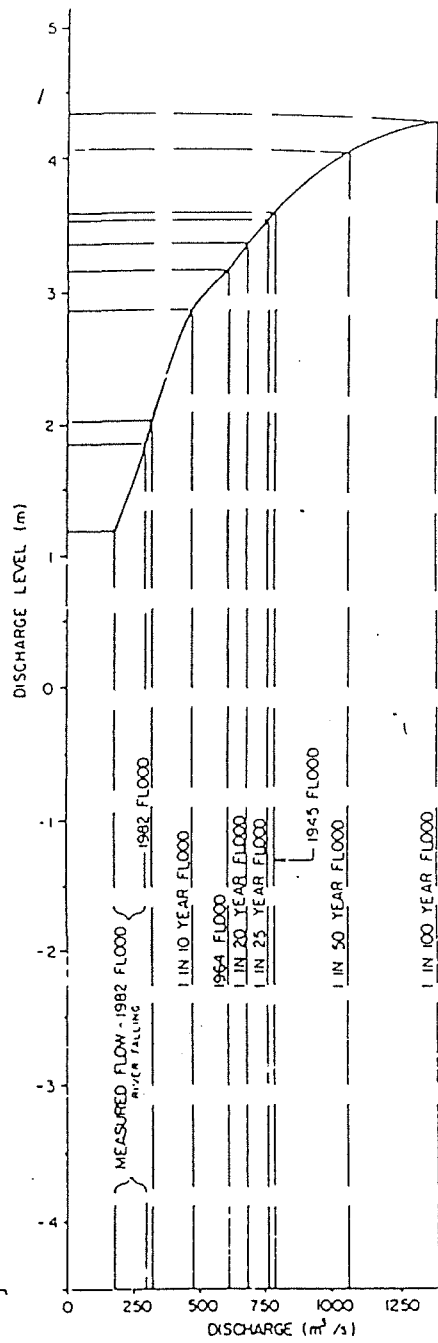
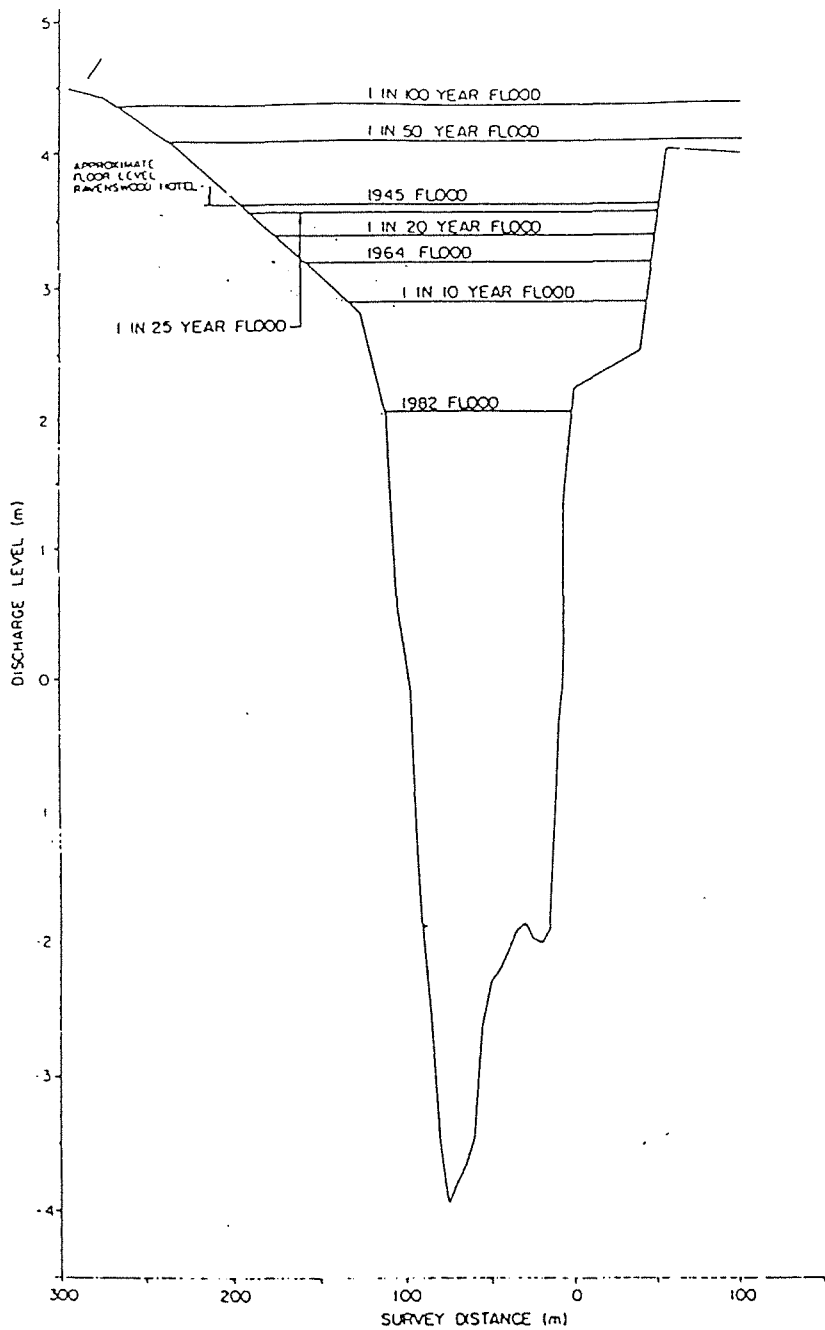
2.3 Reports

The purpose of the Murray River Flood Study (PWD, 1984) was to provide detailed information on flood flow behaviours to facilitate the formulation of management strategies in flood prone areas along the Murray River. The study recommended that floodways be kept clear of excess scrub growth and structural developments so as to minimise the obstructions in the flood flow path.

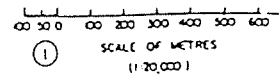
The various flow regimes of the Murray River are discussed in the Water Quality of the Murray River Estuary Study (D'Adamo and Lukatelich, 1985). The report describes the water level variation in the Murray River as predominantly diurnal with a range of order 0.1m.

Foreshore erosion problems caused by natural processes and boating activities are presented in a report by the Waterways Commission entitled Effects of Increased Boat Populations on Foreshore Erosion and Congestion, Particularly in the Murray and Serpentine Rivers (Dick, 1978).



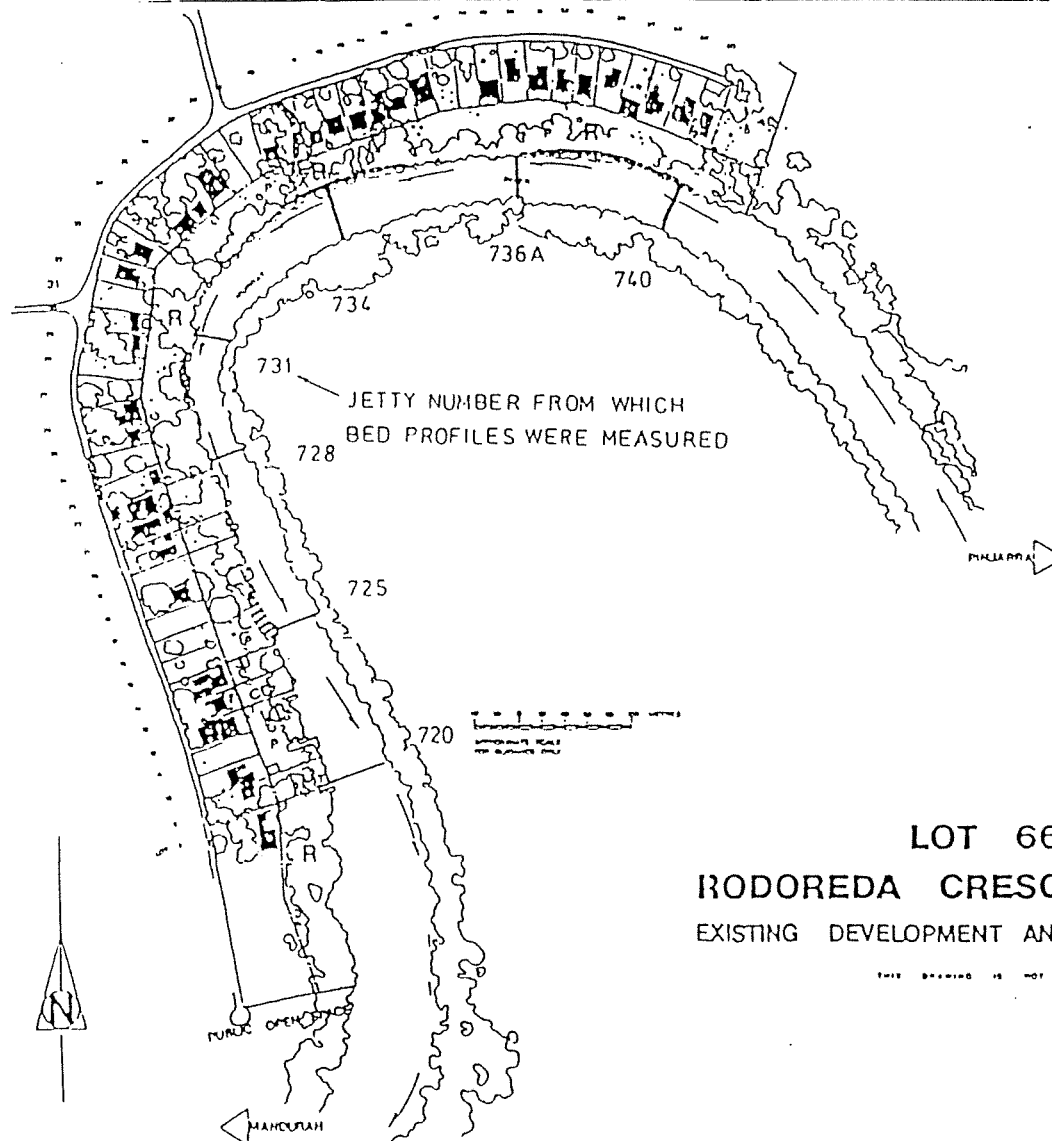


CROSS SECTION UPSTREAM OF RAVENSWOOD BRIDGE (WATERWAY DISTANCE 7690 m)










SHEET NO. 1 MURRAY RIVER DATUM	SCALES AS SHOWN	DESIGN CALC CHECKED	BOOK & FILE BOOK	PUBLIC WORKS DEPARTMENT — WESTERN AUSTRA MURRAY RIVER FLOOD STUDY WEST MURRAY AREA STAGE DISCHARGE RELATIONSHIPS
	DRAWN TO/D TRACED	CHECKED / N/S	CHECKED	
A.H.D.	SUBMITTED DATE 1-1-83	APPROVED DATE 17-6-83	P.W.D. W.A. 51796-5-2	
	<i>David L. Sney</i> DESIGN ENGINEER LTD	<i>Bob Williams</i> CHIEF DESIGN ENGINEER		

FIGURE 2.3



GENERAL PROBLEMS

-  EXISTING FENCES PREVENTING FREE PUBLIC ACCESS.
-  STRUCTURES AND BUILDINGS ON CROWN LAND.
-  LANDINGS.
-  ERODED AREAS AND RELATED PROBLEMS.
-  UNDEVELOPED LOTS.
-  AREAS REQUIRING PHYSICAL REPAIR OR ALTERATIONS.
-  SITES SUITABLE FOR REST AREAS.

LOT 66
 RODOREDA CRESCENT RAVENSWOOD
 EXISTING DEVELOPMENT AND PHYSICAL FEATURES

THIS DRAWING IS NOT TRUE TO SCALE

FIELD FILE MANAGEMENT AUTHORITY	DATE: MAY 1
PROJECT NO.	
DRAWN BY	
CHECKED BY	
DATE	

3.0 EROSION PROBLEM

3.1 General description

Soil erosion in a river system is caused by several natural processes. The turbulence of a river flow can be strong enough to dislodge individual sediment particles from the river bed and banks. This is referred to as stream channel erosion. Another manner in which erosion takes place is the mass movement of soil by creep, slumps and landslides. The effects of these natural erosion processes are often exaggerated by man-made forces such as the trampling of banks by man and domestic livestock together with wash from boating activities.

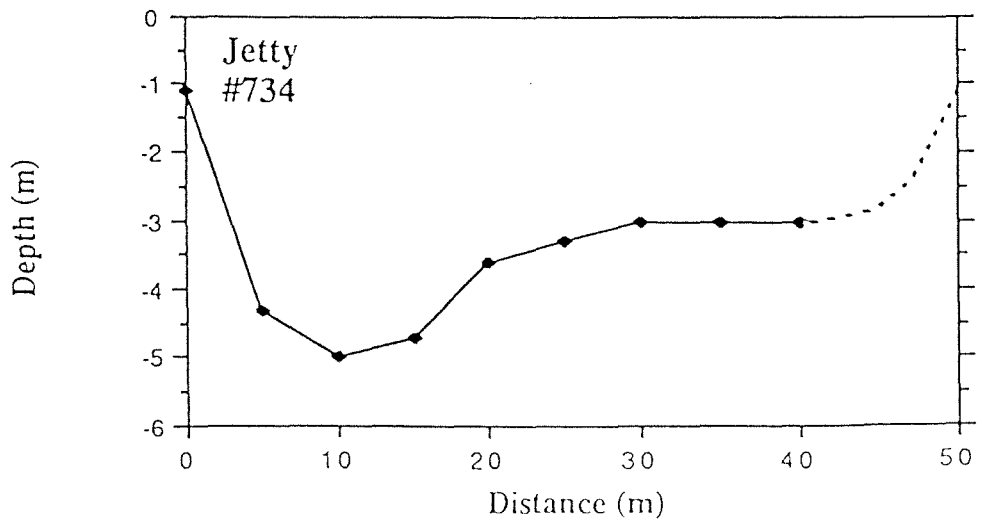
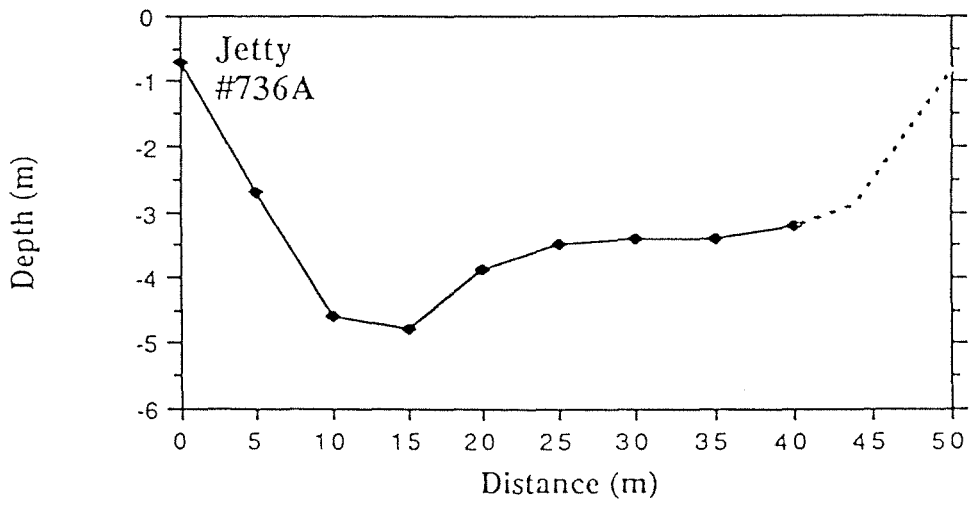
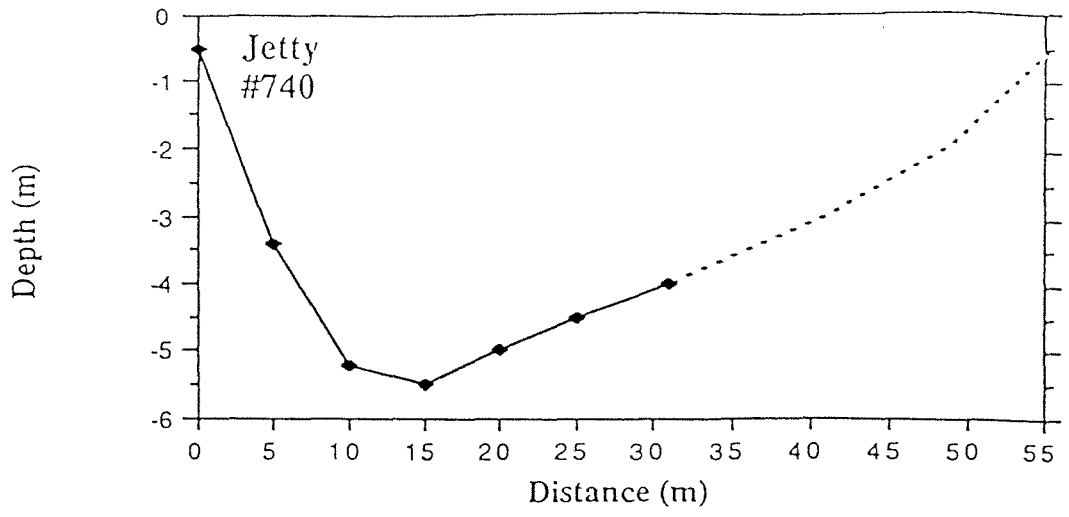
The factors which affect the rate of erosion are vegetation cover, soil type and land slope. The erosion process is initiated by the removal of vegetation along the river foreshores, and the extent of erosion is determined by the soil type and bank slope. A coarse sandy river bank is more susceptible to erosion than a silt or clay river bank. Furthermore, a steep bank will erode faster than a gently sloping bank of similar soil type.

The outer bank of a river bend usually has more pronounced erosion problems. This is because the outer bank is exposed to a scour circulation which exists due to centripetal acceleration effects on the river flow through a bend. The centripetal acceleration required to keep a column of water in a circular path is greater at the surface than at the bottom due to a difference in velocities caused by bottom friction. Therefore, the near surface water particles tend to move toward the outer bank and a return flow is created near the bottom towards the inner bank. This three dimensional flow structure is referred to as helical flow pattern which causes scouring of the outer bank in a river bend with deposition of eroded material occurring further downstream and closer to the inner bank.

3.2 Cross sections

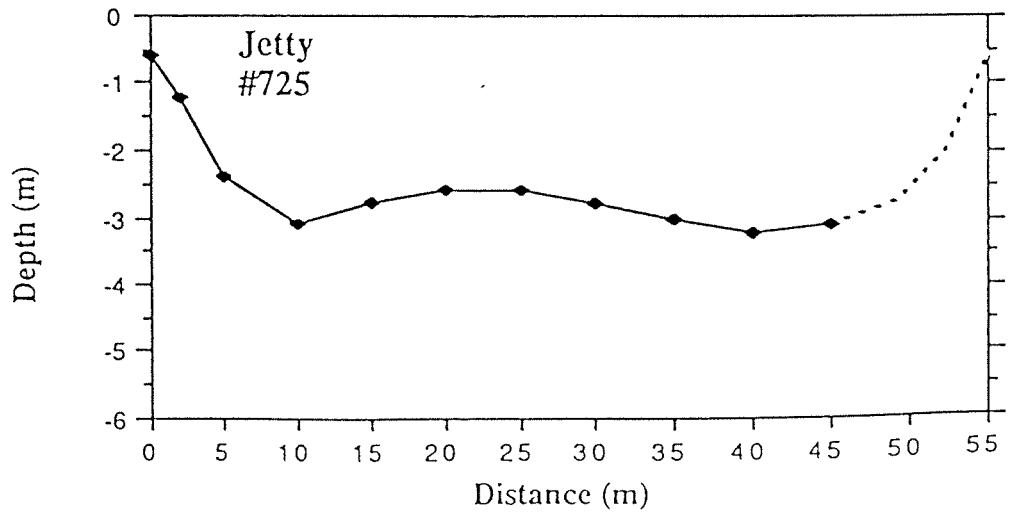
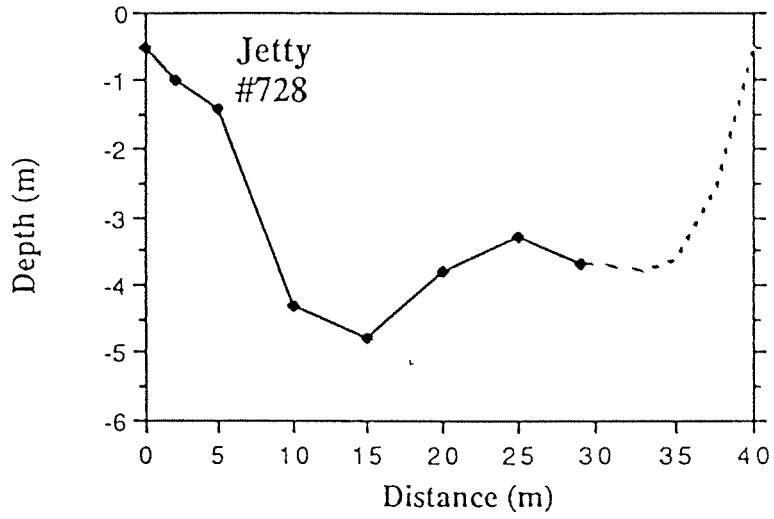
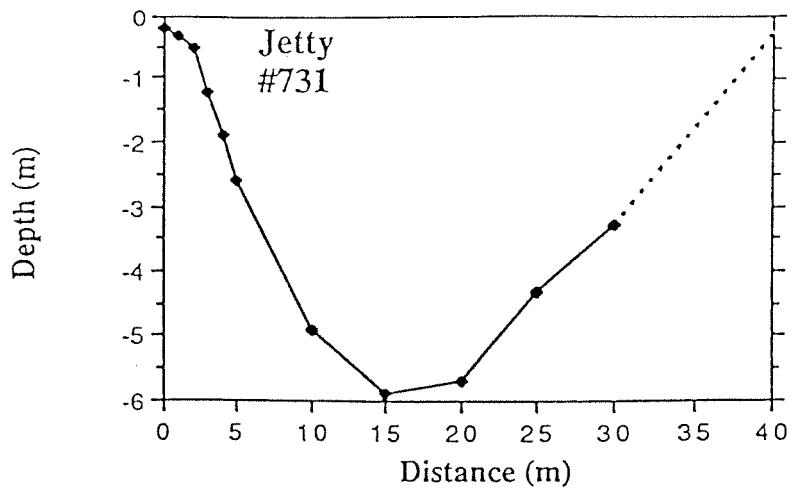
The signature of a helical flow structure through the Rodoreda Crescent bend of the Murray River can be identified from a series of river bed cross sections which were measured from the face of several jetties as shown in Figure 2.4. The measured profiles are presented in Figures 3.1 - 3.4 wherein it can be seen that a deep flow channel has been scoured out near the outer bank in the bend, and the outer bank slope is steeper. Further downstream, the bed profile is more uniform and consequently the bank slope is flatter.

Sediment transport rates are impossible to quantify from the existing data because the existing records are inadequate. An estimate of the erosion rate requires data collection on a long term basis which is beyond the scope of this investigation.



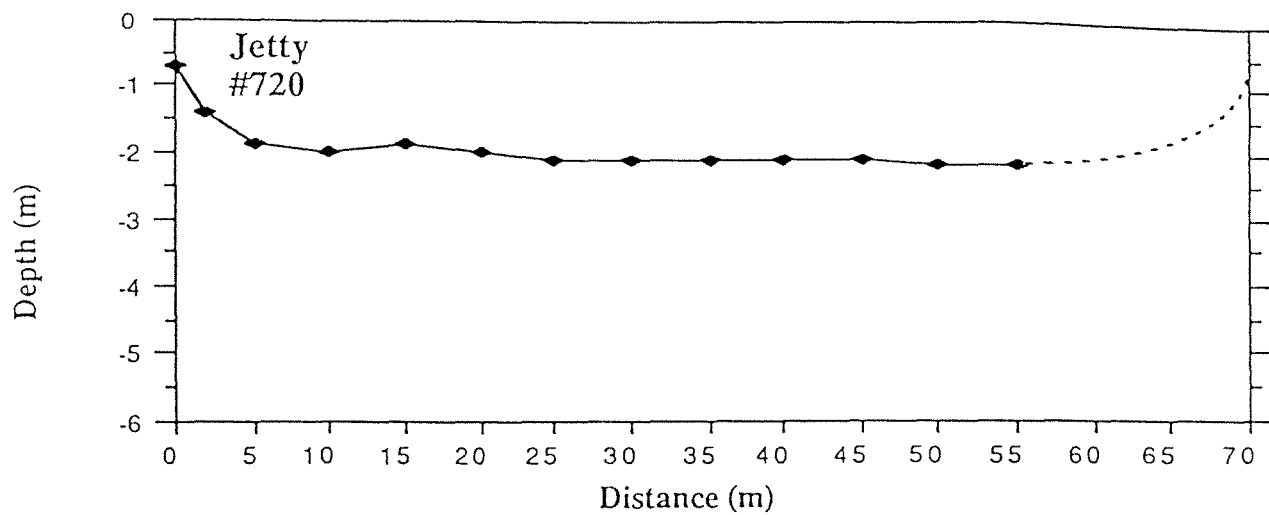
"RIVER BED PROFILES"

FIGURE 3.1



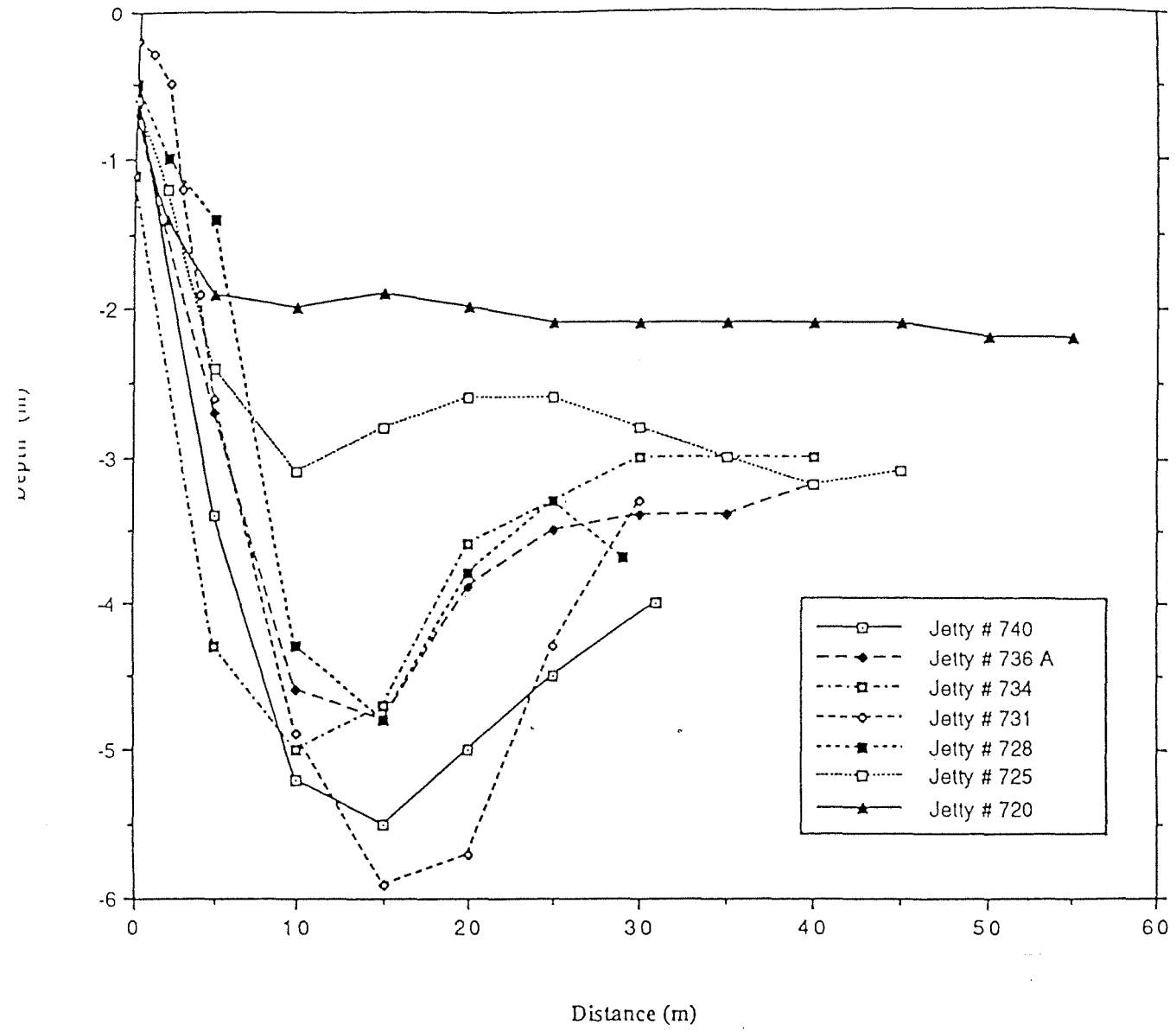
"RIVER BED PROFILES"

FIGURE 3.2



"RIVER BED PROFILES"

FIGURE 3-3



Depth Profiles taken from Jetty Face at Rodoreda Crescent.

Figure 3.4

4.0 FORESHORE PROTECTION

The difference in the bend profiles and the downstream profiles means that foreshore protection requirements specified for the bend section are not appropriate for the downstream section. Therefore, the two sections need to be treated differently with respect to foreshore protection. A video survey of the existing foreshore protection works was conducted to determine their effectiveness; however, no conclusive assessments could be made because it was difficult to extract the necessary engineering details from the video.

4.1 Bend profile

The only alternative for stabilising the outer bank in the bend is rock walling or some form of flexible scour matting. The slumping sections of the bank should be filled with rock and shaped to a slope no greater than 2:1 to prevent continual undercutting and collapse. A filter cloth secured from -1.0m AHD up to +1.0m AHD will then prevent leaching of the fine sediments. The filter cloth needs to be covered with stone pitching to protect the bank from boat wash. Larger stones should be anchored at the toe of the rock walling so as to provide a suitable foundation and prevent future subsidence. The top of the rock walling should be cut back into the slope to prevent flood flows from scouring behind the walling. A schematic of these specifications is shown in Figure 4.1, and an example of the desired finished product is evident in Figure 4.2.

The upper bank slope should not exceed 1:2 and longitudinal regularity should be maintained so that flood flows do not encounter any abrupt changes in slope. Likewise, any man-made structures (except licensed jetties) should be removed to minimise the number of obstructions and prevent local scouring under flood flow conditions. The local scouring process caused by flows around an obstacle is illustrated in Figure 4.3.

4.1 Downstream profile

The flatter bank slope of the downstream section does not require rock walling as an erosion prevention programme. Instead, an extensive foreshore planting scheme should be initiated using local, naturally occurring plan species.

Reeds planted at water level are quite effective in binding the soil and dampening the effects of boat wash. A flatter upper bank slope can also be tolerated but should not exceed 1:4. As in the case of the bend profile, the reserve should be cleared of all man-made objects (except licensed jetties) to provide an unimpeded flood flow path. A schematic of the suggested downstream foreshore protection works is shown in Figure 4.4.

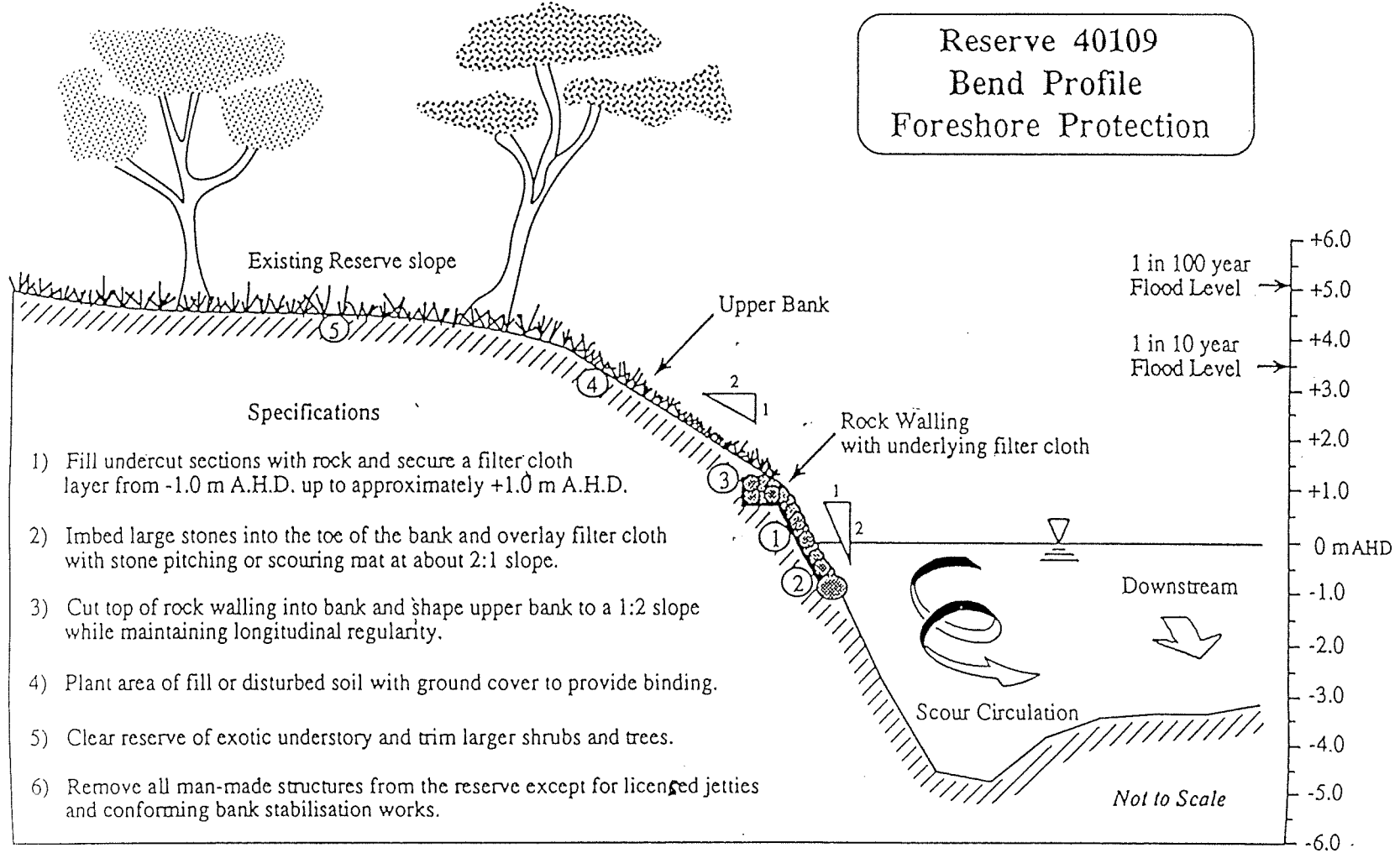


FIGURE 4.1



FIGURE 4.2 EXAMPLE OF SPECIFIED ROCK WALLING (LEFT).

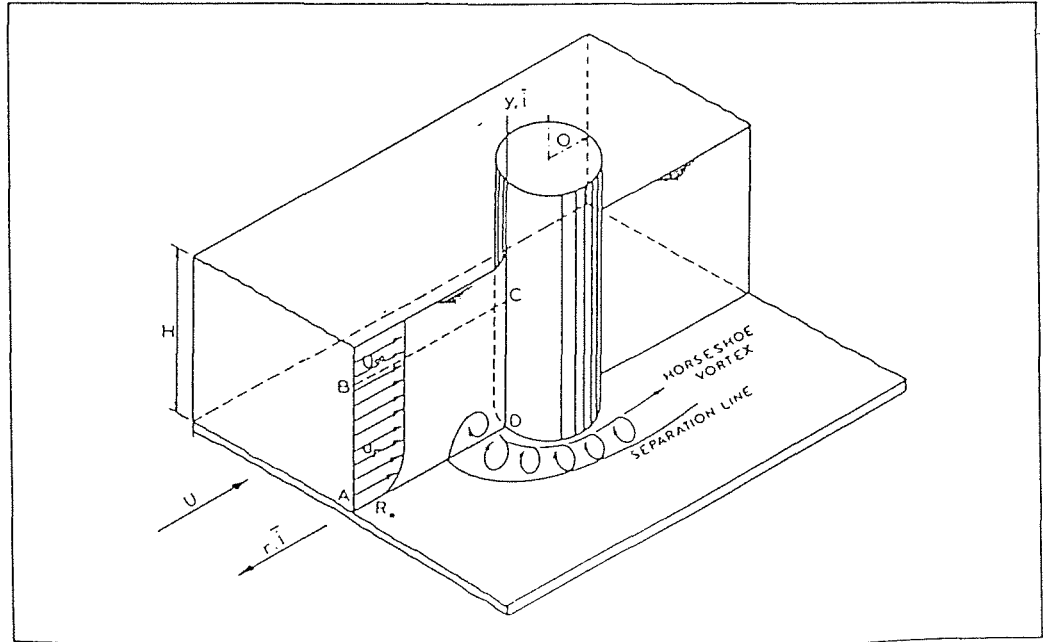


FIGURE 4.3 LOCAL SCOURING CAUSED BY AN OBSTRUCTION IN A STREAM FLOW

Reserve 40109
Downstream Profile
Foreshore Protection

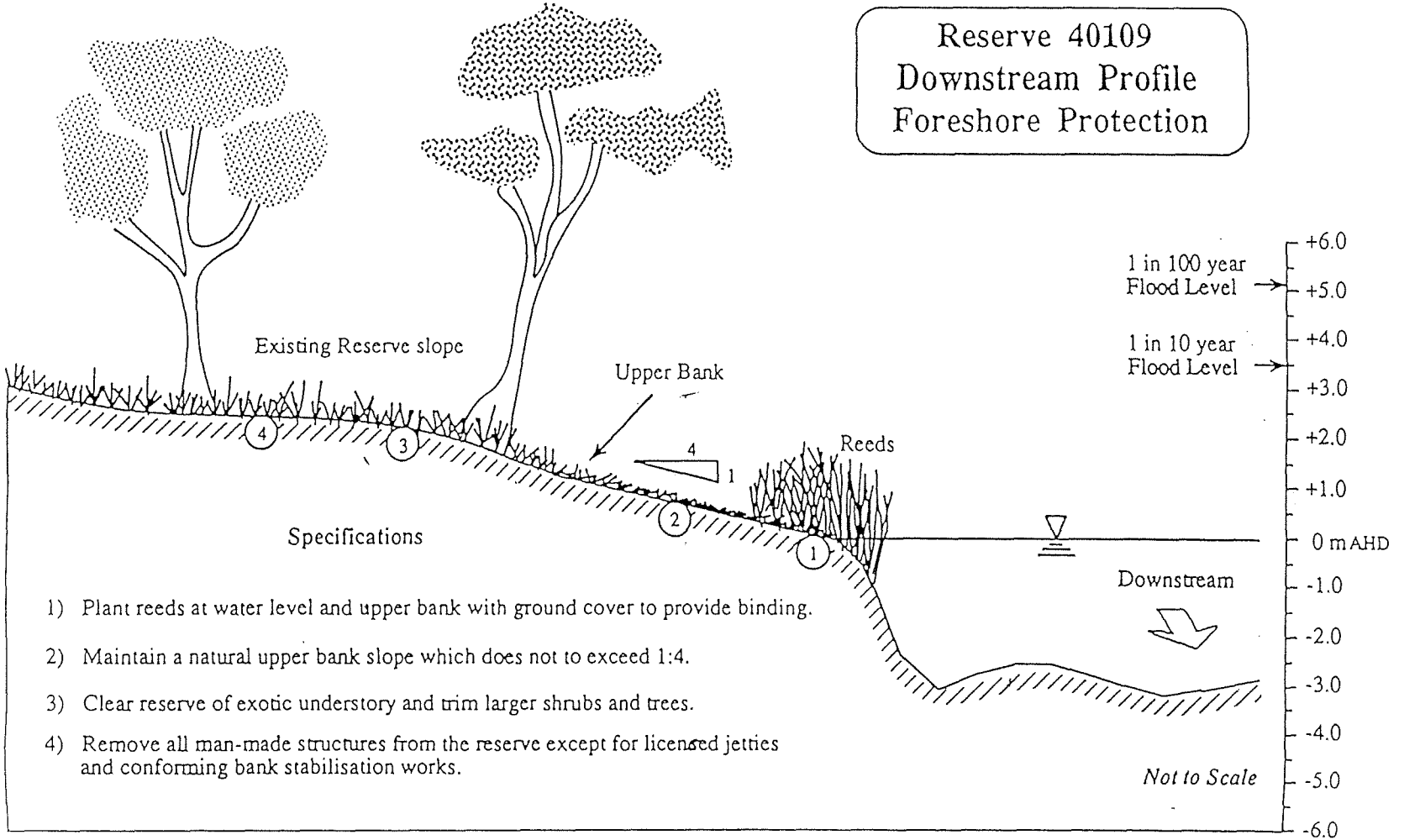


FIGURE 4.4

5.0 CONCLUSIONS AND RECOMMENDATIONS

Although evidence of foreshore erosion can be seen on the banks of the Murray River at Rodoreda Crescent, the overall extent of the erosion problem does not appear at this time to be worthy of an extensive foreshore protection works programme. It is instead recommended that isolated occurrences of severe erosion be repaired in accordance with the specifications outlined in the previous section, and a policy be implemented with regard to the removal of all man-made obstacles in the flood flow path. It is also suggested that a monitoring programme be implemented which includes annual surveys of the area. Regular surveys of the river bank profile and river bed profile will provide the necessary data needed to assess the erosion rate.

Other suggested protective measures include the establishment of controlled access ways to the water for people and animals on both sides of the river. At present, the licensed jetty system provides controlled access points and should therefore be maintained. The issue of boat wash has been reviewed in the previously mentioned reports and consideration should be given to their recommendations together with those in the Murray-Serpentine Rivers Boating Policy Review 1983.

The effectiveness of the existing foreshore protection measures was examined by a video survey which revealed very little about the engineering aspects of the bank stabilisation works. It was also difficult to determine whether some of the erosion existed prior to the construction of the intermittently spaced protection works, or whether the erosion was caused by longitudinal discontinuities arising from their construction. It can therefore only be concluded that the acceptable existing foreshore protection works are those which comply with the guidelines presented in this report.

In summary, erosion is a natural process which exists in many forms. Human influences generally act to increase the natural rate of erosion. There should therefore be minimised, and a well planned management programme is an effective way of doing so. Reserve 40109 is on a naturally eroding section of the Murray River and the natural erosion process should not be excessively exasperated by unnatural influences. This natural eroding process should be monitored and allowed to continue with minor maintenance repairs until such a time when structural property becomes threatened.

6.0 REFERENCES

D'Adamo, N and Lukatelich, R (1985) Water Quality of the Murray River Estuary. Centre for Water Research, UWA, report number ED-85-108.

Dick, R C (1978) Effects of Increased Boat Populations on Foreshore Erosion and Congestion, Particularly in the Murray and Serpentine Rivers. Waterways Commission WA, Peel Inlet Management Authority.

George, P L (1984) Murray River Flood Study. PWD Engineering Division, WA.

Mollet, S (1983) Murray-Serpentine Rivers Boating Policy Review. Waterways Commission WA, Peel Inlet Management Authority.

Appendix 3

Survey of property lines and existing structures on Reserve 40109 as of 5.5.92

The Survey Co-Ordinator
Department Of Land Administration
Cathedral Avenue
PERTH WA 6000

Dear Sir

Re: Job No. 910460
File No. 708/978

This survey was carried out as instructed in Field Book No's 653 and 655. The following comments are made:

1. The development on the reserve adjacent to some lots varies considerably from substantial buildings through reticulated landscape gardens to little or no development. There were numerous brick and stone barbecues, retaining walls and paved areas. To accurately locate all these did not seem justified.

I therefore -

- (a) Remarkd all bends in the reserve boundary.
 - (b) Located all building encroachments over the common boundary. Some of these are calculated from radiations or by approximate chaining from to the rear boundary. They are therefore not precise to the centimetre but should be sufficient to allow rationalisation of the rear boundaries if required.
 - (c) Located all substantial buildings such as sheds and gazebos which are situated well into the reserve.
 - (d) Located most minor improvements such as retaining walls, barbecues, steps in Diagram form to show which lots they adjoin. No attempt was made to locate these as it would be a major cost.
 - (e) Where possible rear intermediate pegs were located but no field check was made as to their reliability.
 - (f) All traverse points are either sunken spikes or felt pen marks on paved areas. These can be quickly located should further detail be required.
2. Two corners, particularly at the rear of Lot 7 and Lot 39, appear to be out of position. The peg on Lot 7 was referenced and its position has been perpetuated by more recent repegs. No adjustment was therefore made. Similarly, the bend peg at the rear of Lot 39 was of a recent repeg and the position has been adopted for adjoining pegs. One reference mark was found but this is not on the specified alignment and becomes worse if the obvious adjustments are made.

3. The errors mentioned in item 2 caused intermediate miscloses when closing back to Rodoreda Crescent up to 7 minutes in arc. A return trip to the site was necessary to carry out further work to substantiate our survey.
4. Photos were taken at several locations to give some indications of the type of encroachments and developments. The aim was to provide an indication of the developments only and are not a complete record.
5. A check of prints of pages 8, 9 and 10 of Field Book 653 has revealed a few omissions and errors. I have indicated these in red on the attached prints. I would be grateful if the Field Book could be amended as shown.

Should you require any further work or pick up of detail, please contact me.

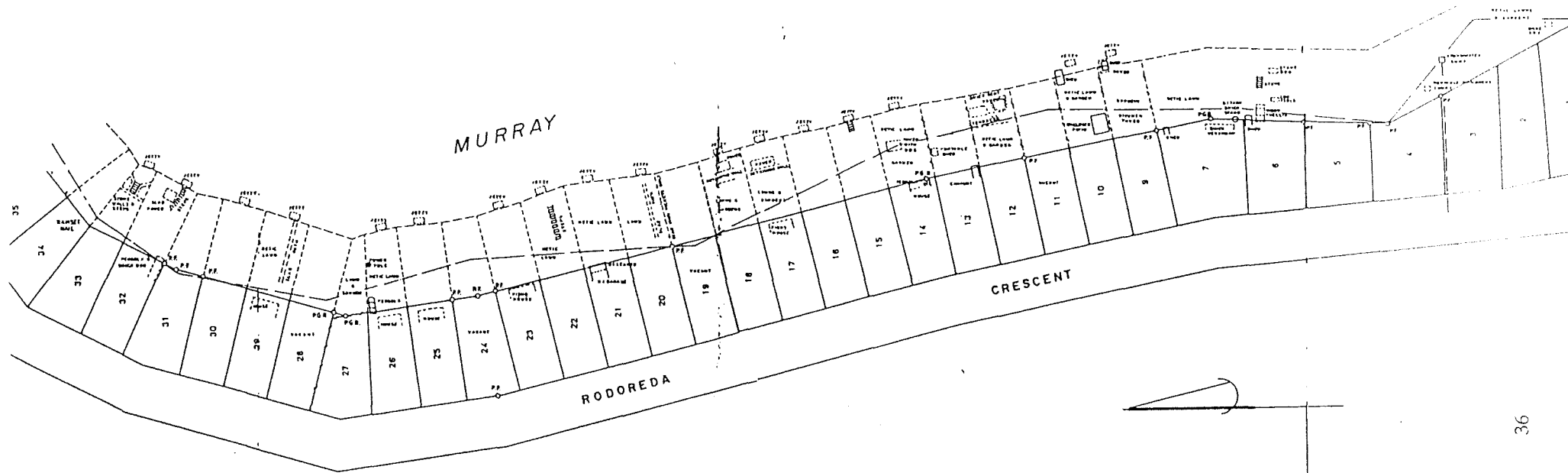
Yours faithfully

(Signature)

R J RULE

STEFFANONI, EWING & CRUICKSHANK PTY LTD

encs ...



N BROKEN ARE NOT TO SCALE
 INHATE RELATIVE POSITIONS ONLY.

36

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	CLIENT	DEPARTMENT OF LAND ADMINISTRATION		SCALE 1:1000 DATUM	S.P.C. Ref. Plan Diagram Certificate of Title Vol.	

