Lower Gordon River Recreation Zone Plan

November 1998

A subsidiary document to the Tasmanian Wilderness World Heritage Area Management Plan

Approved for publication on 11 November by the honourable David Llewellyn MHA,
Minister administering the National Parks and Wildlife Act 1970

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Executive summary

The plan supplements the findings of the Gordon River Tourist Operations Inquiry conducted by the Honourable Sir Max Bingham QC in 1994.

The object of this plan is to prescribe management policy to conserve the environment of the lower Gordon River and provide the environmental framework within which the river can be presented to visitors.

The geomorphology of the area, including the already degraded river banks, is of outstanding significance at a global level. The plan acknowledges the importance of the river to the Tasmanian tourism industry and the economy of Strahan, and the sensitivity of the environment, particularly the banks of the river, to disturbance. The aim of the plan is to facilitate environmental sustainability and ecotourism world best practices in accordance with the significance of the Gordon River environment.

The plan provides scope for the existing tourist vessel operations to continue and be improved and for new ventures to be established, once there is no doubt that their impact on the river environment will be within the limits of acceptable change. The limit of acceptable change does not include wash induced erosion of the river banks as erosion is a reversal of the natural depositional processes that formerly operated in the area.

The one set of environmental standards will apply to all users, recreational and commercial. The techniques for applying these standards will vary to suit the requirements of different classes of users.

Wake wave height has been scientifically determined by an independent study to be the critical factor influencing bank erosion and will be the main parameter by which the potential environmental impact of vessels proposed to be used on the river will be assessed. Further research will be carried out to determine acceptable wash height limits and refine the measurement of bank disturbance.

The cumulative effects of the potential number of vessels operating on the river and the frequency of trips will also need to be considered in any decision to vary existing services or establish new ones. Once the carrying capacity of the river is established with confidence expansion of commercial use will be considered, provided that the environmental impact of such use is within the limits of acceptable change.

The banks of the river within the plan area are not uniform, the extent to which they have been damaged by past erosion varies as does their potential for further damage. For these reasons, the plan divides the river into four sections or zones.

Zone 1, the section from the river mouth to the upstream end of Horseshoe Bend is still being eroded, but at a lower rate than during the 1980s. It will remain the major section of the river available for commercial operations. Existing operators will be encouraged to upgrade the environmental standards of their services, in particular by reducing wash heights.

Prescribed wash heights will allow for all vessels licensed to operate at 30 November 1995 to continue to operate at 6 knots, subject to monitoring of effects. When the speed of the two largest cruise vessels was reduced from 9 to 6 knots in 1994 a three year trial was considered necessary in order to assess the effect of reduced speeds on bank erosion. The trial period finished in November 1997 and analysis of results indicate that commercial vessel operation at 6 knots continues to cause erosion and that further restrictions will be required.

New operators who can meet environmental standards will be catered for. Prospective operators will be required to demonstrate that their craft can meet the environmental requirements and that the total effect of all operations will not exceed the total environmental carrying capacity of the river.

Zone 2, from the upstream end of Horseshoe Bend to the upstream end of Limekiln Reach. This zone will be opened to suitable commercial operations using craft without motors and other craft with a proven lack of impact on bank stability.

Zone 3, from the upstream end of Limekiln Reach to Warners Landing, is the most sensitive section of the river. The previously disturbed banks in this zone remain unstable. With the exception of a limited number of trips to transport Franklin River rafters off river from Sir John Falls motorised commercial use of this zone will only be authorised when it can be demonstrated that such use is

within the sustainable carrying capacity of the zone. The zone will be open to suitable commercial operations using craft without motors.

Zone 4, from Warners Landing to the Franklin River confluence, is likely to have similar standards set as for Zone 1.

The Parks and Wildlife Service will continue to monitor erosion rates on the river and provide regular reports to commercial operators and other users. Specialists engaged by commercial operators will be encouraged to observe erosion monitoring.

Commercial licences will include environmental protection standards and provision for them to be measured and enforced. If as a result of further research or monitoring, it becomes necessary to vary the operating regime on the river, adequate notice of any proposed changes will be given to affected parties. In the long term, commercial operators will be encouraged or may even be required to change to vessels with low wake characteristics.

The voluntary users code will be updated and publicised as the main means of regulating recreational users. As required, the movement of large privately owned vessels will be regulated.

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1 Introduction

The Gordon river has long been one of the State's major tourism drawcards. Cruises on the river are the most popular visitor destination within the Tasmanian Wilderness World Heritage Area (WHA) after Cradle Mountain. However the wash from cruise boats has contributed significantly to bank erosion on the river.

This Recreation Zone Plan, (hereinafter referred to as the 'plan') aims to balance the conservation requirements of the river, given its World Heritage status, with the important role it plays in the Tasmanian tourism industry.

This plan is a subsidiary document to the World Heritage Area management plan. It expands on the recommendations contained in the Management Plan which relate to the Gordon River and incorporates the recommendations of various other reports, including the Gordon River Tourist Operations Inquiry.

1.1 Background

The natural values of the lower Gordon River were first acknowledged when part of the area was proclaimed a public reserve in 1908. The Gordon River Scenic Reserve extended this in 1939. This reserve was then incorporated in the Franklin - Gordon Wild Rivers National Park, proclaimed on 13 May 1981. The park became part of the Western Tasmania Wilderness World Heritage Area on 14 December 1982. The World Heritage Area, and subsequently the national park, were expanded as the Tasmanian Wilderness World Heritage Area on 12 December 1989. This area included most of the remaining, then-unreserved lower Gordon catchment.

The 13 884 km^2 Tasmanian Wilderness World Heritage Area is managed by the Parks and Wildlife Service, with significant management funds being provided by the Federal Government. As the management agent the Parks and Wildlife Service is required to protect, conserve, present and where necessary rehabilitate the natural and cultural heritage of the World Heritage Area. Management strategies to achieve this are outlined in the *Tasmanian Wilderness World Heritage Area Management Plan* 1992 and *Draft Tasmanian Wilderness World Heritage Area Management Plan* 1997. This plan has been prepared in accordance with those documents.

Within the past fifteen years or so, significant erosion of the river banks has occurred. The wash waves (wake) from river traffic have been identified as the major cause of this. Bank erosion has a seriously deleterious impact on the World Heritage values of the area. The maximum extent of wash induced bank retreat has been estimated to be up to 10 m in places. This is now recognised as being contrary to the natural depositional processes that formerly operated in the area and is clearly incompatible with all management objectives, including long term sustainable use of the river by visitors.

An extensive program of erosion monitoring and geomorphological investigation has been undertaken by the Parks and Wildlife Service (and its predecessors) since 1987 in an attempt to understand the erosion problem so that the area may be managed in a sustainable manner. To a lesser extent, the vegetation of the area has also been examined, while for the most part only relatively brief zoological and cultural heritage investigations have yet been undertaken.

Tourist visitation to the lower Gordon River has taken place for most of this century. The remains of early facilities were noted near Sir John Falls by a visitor in 1959. Up until the 1970s tourist cruises were conducted at a leisurely pace. Early cruises were less frequent than in recent times, and were mostly full day trips. Investigations of the hydro-electric development potential of the area led to the Gordon - below - Franklin dam proposal in 1979. The ensuing debate and 1983 High Court decision preventing construction of the dam considerably raised the public profile of the area. High speed cruise vessels, which made half day trips possible, were introduced around that time. Tasmanian visitor survey data indicates that during the period 1993 - 1996 approximately 110 000 tourists visited the lower Gordon River annually. At present, tourist access to the area is predominantly by daily commercial cruises or short sea plane excursions operating out of Strahan.

The Gordon River is a tourist destination of importance to the economy of Tasmania and of great significance to the township of Strahan in particular. Use of the lower Gordon River has been demonstrably unsustainable since at least 1983. Failure to act could lead to criticisms of the Tasmanian and Australian governments for not protecting World Heritage values. Unilateral Federal government intervention to close the river remains a possibility if use continues to be unsustainable.

As a statutory requirement, all commercial vessels operating on the lower Gordon River are licensed by the Parks and Wildlife Service. The licence agreements contain operating restrictions in order to reduce bank erosion. To date these have been partially effective, considerably slowing, but not halting erosion.

A major aim of the Gordon River Tourist Operations Inquiry was to examine the problems presented by the licensing regime and develop a more appropriate licence system. Where relevant, the recommendations of the Gordon River Tourist Operations Inquiry have been incorporated into this plan.

1.2 Aim

The Gordon River Tourist Operations Inquiry focussed upon obligations imposed by the UNESCO Convention concerning the Protection of the World Cultural and Natural Heritage, in particular those regarding conservation and presentation of World Heritage properties. In accordance with those obligations this plan seeks to ensure preservation of the unique and globally significant environmental and World Heritage values of the lower Gordon River whilst facilitating presentation in the form of long term sustainable recreational and tourism use. The aim of the plan is to provide a management framework that ensures environmental sustainability and ecotourism world best practices in accordance with the nature and significance of the Gordon River environment.

2 Planning context

The major World Heritage Area management philosophy and objectives are outlined in the UNESCO *Convention Concerning the Protection of the World Cultural and Natural Heritage* 1972. This was adopted by the Commonwealth of Australia in 1974. Of particular significance is Article 5 of the convention which states each party shall "*ensure that effective and active measures are taken for the protection, conservation and presentation of the cultural and natural heritage situated on its territory ...*"

2.1 Tasmanian Wilderness World Heritage Area Management Plan

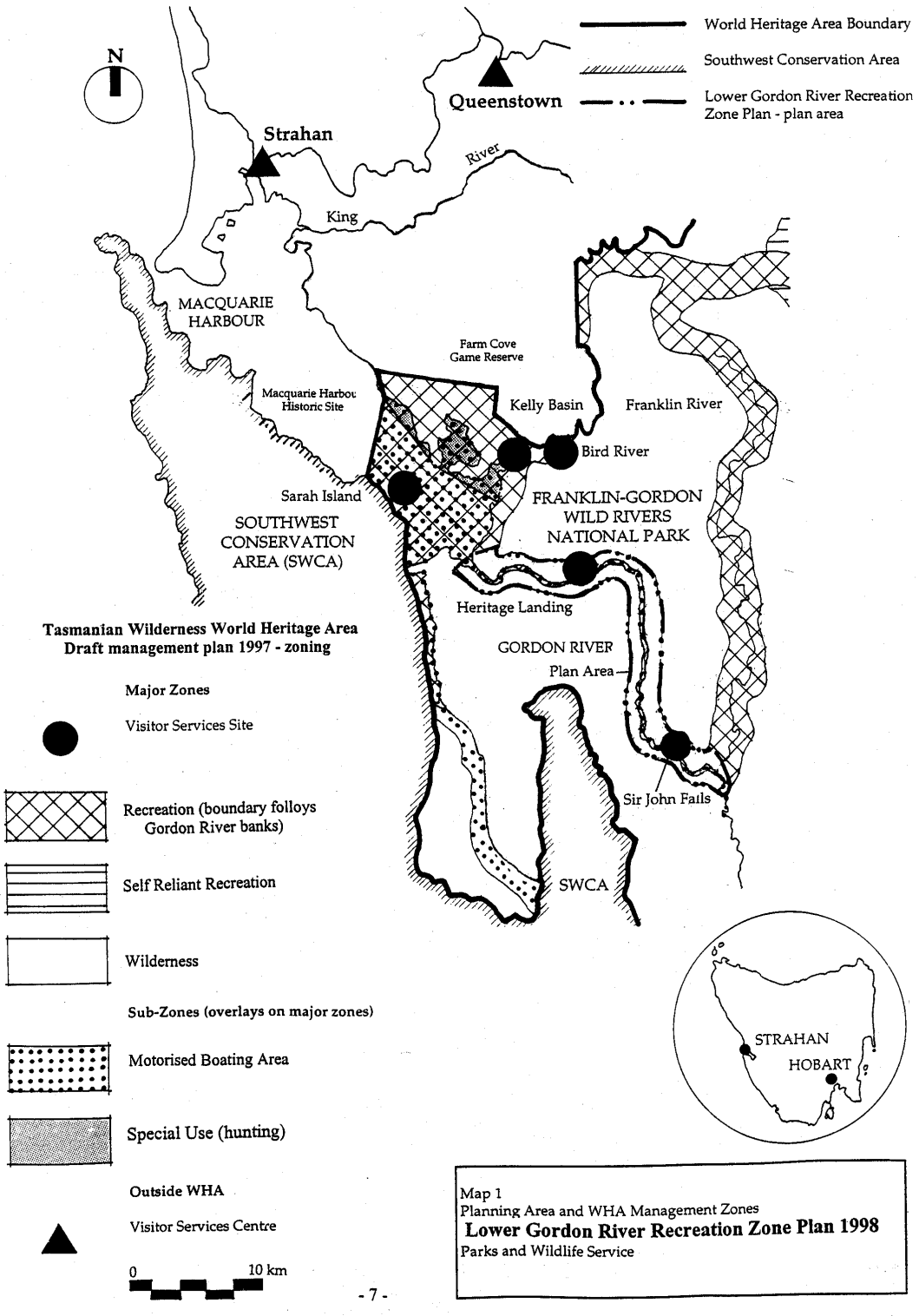
The *Tasmanian Wilderness World Heritage Area Management Plan* 1992 is binding on the Parks and Wildlife Service under the *National Parks and Wildlife Act* 1970. An updated version of this plan is presently in draft form. The primary objectives for World Heritage Area management are listed in appendix one. Major aspects of the plan that relate to the Gordon River are summarised below.

The lower Gordon River is currently zoned as a Recreation Zone, which is overlain with a Mechanised Access Zone. These zones and the area covered by this plan are shown in map one (over page). The objectives of the Recreation Zone are to allow for relatively high levels of recreation, provide a range of recreational experiences for visitors and improve access for less experienced people. The objective of the Mechanised Access Zone overlay is to enable mechanised access consistent with environmental protection and recreational values. In the 1997 *draft World Heritage Area Management Plan* the mechanised access overlay has been renamed Motorised Boating Area but is otherwise identical.

The 1992 Management Plan notes under the Mechanised Access Zone section that “The operation of large commercial vessels on the lower Gordon River will be strictly controlled and may be permitted as far as Horseshoe Bend. Private vessels over eight metres [in length] will also be subject to controls in consultation with the West Coast Community Advisory Committee.”

The relevant prescription from the 1997 Draft Management Plan is: “Continue use of the Lower Gordon River under conditions specified in licence agreements for commercial craft, the code of practice for private craft (Voluntary Users Code for Motorised Craft on the Gordon River) and the provisions of the Lower Gordon River Recreation Zone Plan. Revise these as required in the light of the results of monitoring of the rate of riverbank erosion and revegetation. If monitoring shows erosion to be continuing, further restrictions may be imposed including closure of the river.”

Visitor Services Sites are located in Macquarie Harbour at Sarah Island and Kelly Basin and on the Gordon River at Heritage Landing. To retain wilderness quality the Parks and Wildlife Service generally locates Visitor Services Sites on the periphery of wild areas, this limits environmental impact within natural areas and locates the services closer to users.



Map 1
Planning Area and WHA Management Zones
Lower Gordon River Recreation Zone Plan 1998
Parks and Wildlife Service

No visitor Services Sites were located upstream from Heritage Landing due to the bank erosion problems that increased river traffic would cause. Floatplane landings were allowed near Sir John Falls to pick-up rafting parties when the upper sections of the river were closed to commercial traffic in 1989 as a result of the bank erosion problems. The floatplane operation has expanded considerably (beyond that anticipated when the 1992 Management Plan was drafted) and in addition to transporting rafting parties now also runs numerous tourist trips. Sir John Falls has been reclassified as a Visitor Services Site in the 1997 Draft Management Plan.

The 1992 Management Plan (page 125) also notes that the Parks and Wildlife Service will "regularly consult and liaise with relevant government agencies and other organisations regarding any developments or activities that may adversely impact on world heritage values and on all matters of mutual interest." The 1997 Draft Management Plan (pages 48 - 49) maintains this commitment to consultation. Two draft versions of the lower Gordon River Recreation Zone Plan previously published (November 1994 and April 1996) formed part of an intensive consultation process. The present version of the plan takes into account submissions received during consultation from a wide variety of sources including commercial operators, the public, conservation groups and government agencies.

2.2 Area covered by this plan

The area covered by this plan comprises the lower Gordon River downstream from the Franklin River confluence to the outermost part of the marked navigation channel in Macquarie Harbour. It extends approximately one kilometre inland from each river bank. It encompasses both the Recreation Zone and the Mechanised Access Zone / Motorised Boating Area depicted in map three of the 1992 *Tasmanian Wilderness World Heritage Area Management Plan* and 1997 *Draft Tasmanian Wilderness World Heritage Area Management Plan*.

The Mechanised Access Zones / Motorised Boating Area and associated Recreation Zones in Macquarie Harbour, Birchs Inlet and along the Low Rocky Point track, as well as the Franklin River Recreation Zone are not considered in this plan. Nor is the Eagle Creek track, which is presently zoned as a Wilderness area. However, these areas may be incorporated in a future version of the plan. This document does not examine issues in Strahan or other areas outside the plan area.

2.3 Other government agencies

Other Government agencies that operate or have an interest in the plan area and associated commercial activities include the following:

Commonwealth

- Environment Australia
- Department of Transport

State

- Department of Primary Industries, Water and Environment
- Department of State Development
- Department of Infrastructure, Energy and Resources
- Hydro Electric Corporation
- Marine and Safety Authority Tasmania
- West Coast Council
- Tasmanian Police

This Recreation Zone Plan is a policy document to guide the actions of the Parks and Wildlife Service. It does not interfere with other agencies carrying out their statutory duties as prescribed in the World Heritage Area Management Plan. Where this plan calls for action in collaboration with other agencies, these actions will be fully discussed and examined with the agencies concerned prior to implementation.

Natural and cultural values of the lower Gordon River

3.1 Overview

The lower Gordon River, in particular the approximately 40 km of navigable, tidally influenced reaches downstream from Big Eddy, is the only Australian river with levee bank and floodbasin deposits in a cool temperate rainforest environment. This area contains exceptional examples of meromictic lakes, a very rare phenomenon. The levee bank - flood basin - meromictic lake landform assemblage is of international geoconservation significance. Several rare or threatened plant species and rare, threatened or undescribed invertebrate species also occur in the lower Gordon River area. A number of historic sites have been identified and recent studies in adjacent areas suggest Pleistocene, Holocene and recent Aboriginal sites may also exist in the lower Gordon River area.

3.2 Geology

The oldest rocks exposed in the plan area are the Ordovician sandstones of the Butler Island Formation, part of the Denison Group which elsewhere forms rugged mountains such as the West Coast Range. On the lower Gordon River these rocks crop out in the core of a major anticline between the Franklin confluence and Butler Island. The Butler Island Formation is conformably overlain by the Gordon Limestone. The Gordon Limestone also occurs extensively in other areas of Tasmania, hosting abundant and highly significant palaeontological (fossil) and karst (caves, etc.) resources. Considering that the type area of the Gordon Limestone is on the lower Gordon River, its palaeontological and karst potential in the plan area is surprisingly poorly known.

The nature of the boundary between the Gordon Limestone and the overlying Devonian strata, correlated with the Eldon Group, is poorly understood. Sandstones, greywackes and shales of the Eldon Group correlates crop out sporadically from Eagle Creek to First Gorge. Although the detailed structure is complex, these rocks tend to become younger downstream towards the core of a major syncline. The entire sequence of lower Palaeozoic rocks was folded along approximately meridional axes during the mid Devonian Tabberabberan Orogeny, a major mountain building event.

A major, but unnamed, fault occurs immediately downstream of First Gorge. Although probably originally a mid Devonian structure this fault is believed to have been reactivated during the late Mesozoic - Cenozoic rifting of Australia and Antarctica. It now forms the eastern margin of the Macquarie Harbour Graben, a downfaulted rift structure containing a thick sequence of poorly consolidated Tertiary sands and gravels. These crop out poorly in the slopes above the river downstream from First Gorge.

3.3 Geomorphology

The geomorphology of the area has developed by uplift of and downcutting from a major erosion surface since mid Tertiary times. Remnants of that surface are suggested by the form of flat crested hills, concordant ridge heights and obvious terraces cut into nearby mountains. Differential erosion of the variety of rock types that occur in the area has resulted in a strongly dissected topography.

During low sea levels associated with the Quaternary glaciations downcutting would have continued, at least partially removing glacial outwash deposits. Steep colluvial banks consisting largely of poorly sorted, coarse grained slope deposits occur in the gorge reaches and are considered to be largely fossil features associated with river downcutting. The oldest dated valley fill deposits date from approximately 14 000 years before present although some glacial outwash deposits may be considerably older. Rising post-glacial sea levels drowned the lower Gordon River valley and stabilised around 6 000 years ago. Deposition of Holocene sediments commenced with inundation of the river valley. A buried river channel at a depths of 60 m below sea level at the abandoned dam site and at least 75 m in Expectation Reach indicates the considerable extent of sedimentary infilling that may have occurred since then.

Three sequential evolutionary stages are recognised in the development of the Holocene sedimentary river banks overlying remnant glacial outwash deposits. Examples of each stage occur in discrete sections of the river. Muddy estuarine banks are characteristic of the area below First Gorge which is yet to infill sufficiently to allow fluvial processes to dominate geomorphic development. The alluvial banks along the infilled areas of low energy floodplain occurring downstream from Eagle Creek to First Gorge display somewhat more fluvial characteristics. Alluvial banks are composed of relatively cohesive organic-rich mud and fine grained, organic rich silty sands.

Levee banks occur along the 10 kilometre section of meandering river from below Cataract Creek downstream to Lake Fidler. These are the most evolved of late Holocene bank types. They represent the most complete infilling of the drowned river valley and show the greatest development of fluvial depositional characteristics. Levees consist almost exclusively of moderately sorted, massive, unconsolidated sand several metres in thickness, and are backed by silty flood basins.

Geomorphic and radiocarbon age evidence indicates that most of the river banks in the plan area constituted depositional or at least stable environments prior to the onset of the bank erosion *circa* 1983.

Levee formation allowed the development of salinity related water stratification and meromixis in Lake Fidler and Sulphide Pool. The abrupt physico-chemical changes across the shallow chemocline and accompanying finely structured micro-stratification of micro-organisms displayed by the meromictic lakes is a rare limnological phenomenon. These small lakes provide an unusual habitat that supports in excess of 200 plant and animal taxa and contain an extremely high resolution palynological record of the Holocene.

3.4 Karst and caves

The majority of karst (caves, etc.) features in the plan area are associated with the Ordovician Gordon Limestone. Three main areas underlain by this rock type occur between Macquarie Harbour and Angel Cliffs. Although poorly explored as yet, each area is known to exhibit significant karst development. This includes surface solution features, underground drainage and cave systems. Speleothems (cave decorations), bone deposits and cave fauna have also been reported.

Caves in Gordon Limestone on the nearby Franklin River have proven to be of great cultural significance with some of the most significant archaeological deposits in Australia being located in Kuti Kina and Deena Reena Caves. The archaeological potential of caves along the lower Gordon River is presently unknown. By analogy to areas on the Franklin River underlain by very similar limestones it should be assumed that significant archaeological sites may exist in the plan area.

To date, no caves in the plan area have been sampled for cave fauna. The range of cave species is likely to be considerable, as indicated by the numerous species identified from the more extensively surveyed Franklin River karst. Cave faunas typically display a high degree of endemism and therefore may be significant for biological reasons.

An additional outcrop of Siluro-Devonian Limestone has been reported near Guy Fawkes Rivulet and contains some small surface karst features. No caves have as yet been discovered in that area.

The caves in the area appear to have developed over a wide vertical range, from river level to high abandoned passages up to 60 m above base level. Cave sediments in these vertically stacked systems have often proven to be of great value in reconstructing the environmental history of the surrounding area.

3.5 Soils

Soil development in the immediate vicinity of the river has been dominated by the rapid accumulation of alluvial material. This prevented the formation of conspicuous topsoil horizons in most areas although palaeosols (fossil soils) in the river banks and associated deposits suggest that there have been periods in the past where deposition rates were relatively low and organic accumulation occurred. The surface layer of the levee banks consists of a thin (10 - 25 cm) fibrous organic horizon strongly bound by an interlaced living root network. Prior to disturbance this layer effectively armoured the banks against erosion. Fine organic matter may darken the upper sections of the levees, and minor contorted ferruginous horizons occur in places, but the young soils generally show only shallow development.

In general soil development on the alluvial banks is restricted to thin organic horizons which have formed on top of relatively well drained sedimentary deposits. These soils are not continuous, particularly in back swamps where silty material accumulates.

More estuarine flood plains which have not been regularly subjected to high rates of sediment accumulation have surface profiles dominated by reasonably thick organic horizons. Swamp forest areas in particular can have red to brown fibrous peats up to 60 cm deep and although no detailed surveys of soils in the area have been undertaken these soil types appear to be unique to this part of south west Tasmania, possibly due to extensive periodic flooding, high rainfall and low evaporation experienced in the lower Gordon valley.

Due to the history of the area the development of deep soils on bedrock is rare but in the Limekiln Reach area mineral soils have developed on limestone, perhaps as a result of the susceptibility to chemical weathering exhibited by this rock type.

Colluvial deposits in steep valley locations have developed soils with some organic accumulation at the surface overlying poorly sorted 'mobile' deposits at depth. These occur in the gorge region upstream from Cataract Creek and in the First Gorge area. The mobile nature of the substrate is due to the steep slopes, and the rapid weathering of the bedrock and the high rate of river downcutting in geologically recent times. In broader valleys the soils developed on slopes underlain by Palaeozoic bedrock contain local concentrations of rounded exotic gravels.

Tertiary deposits towards the mouth of the river are often overlain by silt and/or organic soils. There is generally very little contribution from these substrates to soil development.

3.6 Flora

The vegetation along the lower Gordon River varies in response to changes in the substrate, drainage, aspect and history of disturbance. Although there has been no systematic survey of the higher plant vegetation of the lower Gordon River, a number of smaller surveys indicate a rich and significant flora. Very little is known of the lower plants with the exception of the phytoplankton flora of the meromictic lakes.

The levee bank areas alone support at least 11 different forest and scrub communities, including sclerophyll forest, thamnic rainforest, swamp forest and scrub. Some of the plant assemblages are not known from other river systems. These include, for example, the disturbed thamnic rainforest with *Anopterus glandulosus* and /or *Cenarrhenes nitida* understorey and the thamnic rainforest with *Acradenia frankliniae* understorey (levee bank rainforest).

The limestone cliff faces provide a niche for a specialised flora such as the rare plants *Milligania longifolia* and *Oreomyrrhis gunnii* as well as other herbaceous species. Other rare species known from the Gordon River include *Acradenia frankliniae*, *Epacris mucronulata*, *Pseudopanax gunnii* and *Spyridium gunnii*. Two species occurring on the river outside their normal geographic range are *Poa poiformis* var. *ramifer* and *Leucopogon australis*. Other species of significance include those mentioned in the World Heritage Area nomination document (see section 3.9 below). Included on this list were species such as *Lagarostrobos franklinii* (Huon pine), significant because of its endemicity, evolutionary antiquity, longevity and rarity.

The meromictic lakes along the lower Gordon River are a unique habitat that is important to the existence of a number of significant species including photosynthetic anaerobic bacteria. The chemical and biological processes taking place in the meromictic lakes are of great scientific interest and significance on a world scale. These were seriously threatened by potential breaching of the levee banks when that section of the river was recording very high erosion rates prior to 1989. The lakes are surrounded by herbfield vegetation which is also unusual and therefore of regional significance.

3.7 Fauna

The lower Gordon River and its banks support a high diversity of Tasmanian fauna which includes a significant proportion of Tasmania's endemic species and subspecies. At least 10 of Tasmania's 25 native freshwater fish species occur in the plan area, including the vulnerable Australian grayling. There are a number of bird species which are dependent on the river for their survival in the area. These include the beautiful azure kingfisher, the bizarre looking musk duck, and Australia's largest cormorant, the great cormorant. There are two native mammal species which depend on the river, the platypus and the beautifully coloured water rat; both construct tunnels in the river bank and feed in the river. Many of Tasmania's vertebrate species occur in the terrestrial habitat along the banks of the river.

There are 36 species of terrestrial and freshwater vertebrates which have been listed as Rare or Threatened in Tasmania. Of these, five are known to occur in the lower Gordon River region. They are the endangered orange-bellied parrot (*Neophema chrysogaster*), the vulnerable swift parrot (*Lathamus discolor*), wedge-tailed eagle *(Aquila audax fleayi*) and Australian grayling (*Prototroctes maraena*) and the rare grey goshawk *(Accipter novaehollandiae*).

Five of Tasmania's 11 frog species have been recorded in the area, including both endemic species; the Tasmanian tree frog (*Litoria burrowsae*) and the Tasmanian froglet (*Ranidella tasmaniensis*).

Only four of Tasmania's 21 reptile species have been recorded in the area. The Tasmanian tree skink (*Niveoscincus pretiosus*) is an endemic. It is likely that more species occur in the area.

Fifty eight of Tasmania's 181 regularly occurring bird species have been recorded from the area and many others are likely to occur there. This includes six of Tasmania's 11 endemic bird species. They are the green rosella (*Platycercus caledonicus*), the Tasmanian thornbill (*Acanthiza ewingii*) the scrubtit (*Sericornis magnus*) the yellow throated honeyeater (*Lichenostomos flavicollis*), the strong-billed honeyeater (*Melithreptus validirostris*) and the black currawong (*Strepera fuliginosa*).

Twenty two of Tasmania's 34 native terrestrial mammal species occur in the area (this number assumes that the sugar glider is native and the Thylacine is extinct). These include four of Tasmania's five endemic mammals; the Tasmanian pademelon (*Thylogale billardierii*), the Tasmanian devil (*Sarcophilus harrisii*), the long-tailed mouse (*Pseudomys higginsi*) and the eastern quoll (*Dasyurus viverrinus*). Its likely that another eight species may also occur in the area.

Several brief but systematic surveys of invertebrates have been conducted in and along the lower Gordon River. All have found a high diversity of invertebrate species, significantly different in composition to any other river in Australia. Indeed, some components of the invertebrate fauna have not been found elsewhere in Tasmania. The faunal assemblage of crayfish burrows is more diverse than other areas around Tasmania (and probably Victoria). Similarly, the interstitial freshwater fauna of a quaking section of the shores of Sulphide Pool appears to be more diverse than in previously recorded interstitial samples in Tasmania. The meromictic lakes of the area are already recognised as being of considerable scientific and cultural importance, supporting more than 200 taxa.

The knowledge of Tasmanian invertebrates is limited and the conservation status of many species is not known. Nevertheless an interim list of rare and threatened invertebrates has been developed for species where information is available. A total of 175 species of invertebrates has been listed as rare or threatened in Tasmania. Of these only one rare species has been recorded in the area. This is an undescribed species of stonefly belonging to the genus *Neboissoperla* which has also been recorded in the tributaries of the Arthur river. However, due to the limited nature of investigations that have been undertaken to date it should be assumed that potentially significant invertebrates occur in the plan area.

3.8 Cultural heritage

There is a long history of human activity in the lower Gordon River area. Aboriginal people are known to have inhabited the area, at least intermittently, since the Pleistocene. No Aboriginal sites have yet been identified along the lower Gordon River, where poor ground visibility is a severe hindrance to archaeological surveys. However, for management purposes it should be assumed that Aboriginal sites are likely to be present and that prevention of river bank degradation is consistent with site protection.

Macquarie Harbour and the mouth of the Gordon River were discovered by Europeans in late 1815; probably by Captain James Kelly, although Dennis McCarty may have discovered it earlier the same year. Sarah Island convict station was established in 1821 and occupied until 1834. Convicts extracted Huon pine and limestone from the lower Gordon River, amongst other activities. Sarah Island was briefly reoccupied as a timber getting station for probation pass holders during 1846-47. Pining in the area was revived during the 1850s, and increased somewhat during the 1880s after the decline of the industry at Port Davey. By 1896 areas being worked by the piners extended up the Gordon River to almost nine kilometres above the Franklin confluence. The 1890s to 1920s represent a boom period of the Huon pine market, however pining continued on a much reduced scale until the 1960s.

Approximately 26 historic sites have been identified to date along the lower Gordon River, although surveys have been fairly cursory and it is likely that additional sites exist. Known sites are predominantly associated with Huon pine extraction although sites representing all major phases of historic activities occur. An important industrial site associated with the Sarah Island convict settlement occurs in Limekiln Reach. Other sites noted as having particular significance occur at Duncs Camp, Goulds Landing, Blockade Camp and Ghost Creek. The majority of historic sites are located directly adjacent to the river bank and may be threatened by bank erosion. The contemporary recreational pursuits of local communities has been identified as a developing cultural heritage management issue.

The area also has a significant association with the conflicts between twentieth century hydro-electric development and environmentalism. A history of the Franklin - Gordon Wild Rivers National Park has recently been written.

3.9 World Heritage values

The Tasmanian Wilderness World Heritage Area satisfies all four of the natural criteria and three of the six cultural criteria for the listing of a World Heritage property. The lower Gordon River contributes significantly to the World Heritage values of the Tasmanian Wilderness World Heritage Area. The 1981 nomination of the Western Tasmania Wilderness National Parks for inclusion in the World Heritage List specifically refers to the following as justification for inclusion:

1 The meromictic lakes on the lower Gordon River, two of which are thought to be the shallowest meromictic lakes in the world.

2 An impressive tract of *Nothofagus cunninghamii* lowland rainforest along the lower Franklin and Gordon Rivers.

3 Endemic trees such as *Acradenia frankliniae* and *Lagarostrobos* (formerly *Dacrydium*) *franklinii* which are mainly confined to riverine habitats within the Franklin - Gordon Wild Rivers National Park and are relatively abundant on the lower Gordon River.

4 The Tasmanian endemic species *Leptospermum riparium, Lindsaea trichamanoides, Oreomyrrhis sp., Oschatzia saxifraga, Nothopanax gunnii, Anodopetalum biglandulosum, Archeria eriocarpa, A. hirtella, Epacris mucronulata, Prionotes cerinthoides, Blandfordia punicea, Milligania longifolia, Trochocarpa cunninghamii* and *T. gunnii* listed in the nomination document have all been found in the lower Gordon River riparian environment.

5 The azure kingfisher and Tasmanian pademelon are discussed in the nomination document, both of these may be sighted on the lower Gordon River.

In addition, the number of previously undescribed invertebrate species collected during a short survey in a relatively small portion of the area suggests that it may contribute further to biodiversity. Close environmental similarities suggest archaeological deposits similar to those near the Franklin River may occur in the relatively unexplored plan area. Ruins in Limekiln Reach are associated with the Sarah Island convict settlement.

The 1989 *Nomination of the Tasmanian Wilderness for inclusion in the World Heritage List* specifically refers to the 'imminent or potential danger' to the lower Gordon River banks that is posed by the wash from large tourist cruise vessels. It also mentions that hydro-electricity generation and the associated regulation of river discharge may exacerbate the problem. The need for careful long term management of the lower Gordon River is explicitly noted in the nomination.

4 Visitor use, services and facilities

The Gordon River has become the key attraction of the West Coast tourism industry. It is the second most popular Tasmanian Wilderness World Heritage Area gateway after Cradle Mountain. The nature of the river experience, often including mist covered rainforest reflected in perfectly still waters, the wildlife and the quiet of the river make a visit to the Gordon River an ideal platform for introducing people to the World Heritage Area.

4.1 Visitor profile

The main source of visitor statistics for the Gordon River has been the Tourism Tasmania annual Tasmanian Visitor Survey. The main limitation of this data, in terms of visitation rates, is that it doesn't give an indication of the amount of local tourism by Tasmanian residents. It is difficult to accurately estimate total visitation without this information. The Tasmanian Visitor Survey data indicates that approximately 20% of all visitors to Tasmania go to the Gordon River and that since 1993 this number has stabilised around 100 000

per annum. The total number of visitors to the Gordon River (including Tasmanian residents) is estimated to be approximately 110 000 per annum.

The following profile of visitors is derived from estimates from local operators, Tasmanian Visitor Surveys and from a Parks and Wildlife Service survey conducted in February 1994 and is consistent with the 'first time holiday-maker' profile.

- International tourists comprise between 10 - 15% of visitors.

- Interstate visitors make up the majority of visitors and almost 60% of those come from Victoria and New South Wales. Approximately half of all Australian visitors live in a capital city.

- Gordon River visitors are slightly older than the average tourist to Tasmania, 32% being over 55 (22% is the average for the State).

- A large percentage of tourists who visit the Gordon River are also interested in cultural activities, which suggests that the tourist drawn to the natural attractions of the Gordon River is also very interested in historic sites, museums, crafts, antiques and quality Tasmanian foods, etc.

- Most visitors (88%) travel to Strahan by car with a small proportion travelling by bus/coach, bicycle, motorbike, campervan, caravan or aircraft.

4.2 Visitor expectations

A Parks and Wildlife Service visitor survey for Gordon River/Sarah Island (February 1994) found the following:

- Visitors predominantly rated both the displays, information and directional signs at Heritage Landing as being 'good' (on a scale of excellent, good, satisfactory, poor and don't know). The board walk was consistently rated as 'excellent'.

- The most frequent comments/requests at Heritage Landing (in order of popularity) were for:
  - more labelling of tree and other flora species
  - a longer walk
  - more time at Heritage Landing
  - more information about bird and animal life
  - that the area be left as is.

- When asked what additional information they would like to see provided about the Gordon River and Sarah Island visitors requested more information on the following:
  - no additional information (31% of respondents)
  - wildlife, plants and geology (38%)
  - Aboriginal heritage (48%)
  - historic heritage (21%).

- The preferred form of this information was through brochures and/or handbooks and signs and/or information boards. A few visitors thought videos, audio tapes and guided walks would be useful.

- Of the 417 respondents to the survey there were only a few visitors who felt there was anything that spoilt or detracted from their visit. Negative comments were mostly about the weather. Five respondents complained about litter, especially cigarette butts at Heritage Landing and there were five requests to be able to explore further up the Gordon River.

Visitors to Sir John Falls were not included in the survey.

4.3 Jetties, huts and walking tracks

Huts are available for public use at Boom Camp and the former HEC Lower Gordon Camp opposite Warners Landing. The latter is informally known as Sir John Falls Camp.

The Lower Gordon Camp, which previously provided single quarters for approximately 20 HEC employees, had become structurally unstable in part and generally run down in recent years. Major works are currently being undertaken and most of the superfluous single quarters accommodation has been demolished.

Boom Camp, at Pine Landing is maintained by a local community group. It is a single roomed structure equipped to sleep seven people with additional accommodation on a semi-permanent tent site. A toilet, wood stove, wood shed, new jetty and walkways have recently been installed. The site occupied by the camp is of some historic significance.

The hut at Duncs Camp is a very dilapidated structure which in its present condition is unlikely to be of interest to most visitors. It is, however, of considerable historic value. Its location should therefore not be publicised until recently recommended stabilisation works are completed.

A small garden shed type structure dating from the period of HEC investigations is located at Goulds Landing.

Jetties or other boat landing infrastructure exist, in varying states of maintenance, at Boom Camp, Heritage Landing, Warners Landing, Lower Gordon Camp and Cataract Creek (Sir John Falls). The jetty at Eagle Creek was recently destroyed by treefall during a flood.

Of the walking tracks associated with the above jetties only two, at Heritage Landing and Sir John Falls, are subject to high use. Both are short (less than 500 metres in length) and are comprised entirely of elevated boardwalk. They were constructed for and are primarily used by passengers from river cruises and float plane operations.

The tracks to Perched Lake (500 metres) and from Sir John Falls to Angel Cliffs (seven kilometres) are old piner's tracks. Both receive little use and are heavily overgrown in places. The nine kilometre long Eagle Creek Track is currently rarely used. Several other tracks and cut lines extend from Warners Landing. These are also rarely used and are being allowed to rehabilitate naturally.

4.4 Existing commercial operations

At present eleven ventures are licensed by the Parks and Wildlife Service to conduct commercial operations within the plan area. The largest operation is Gordon River Cruises, which predominantly conducts as half day trips, with a brief walk at Heritage Landing. Gordon River Cruises presently operate three vessels, the largest of which displaces approximately 65 tonnes and can carry 250 passengers. Sarah Island or Hells Gates are additional features of the cruise, depending upon which vessel is used and the length of the cruise undertaken (half or 'full' day).

World Heritage Cruises also operate a large capacity cruise vessel. Cruises are conducted as day trips and also include a walk at Heritage Landing and on Sarah Island.

West Coast Yacht Charters offer a more versatile service. Trips may be tailored to suit the requirements of individual client groups and may be of several days duration, also visiting other areas of interest in Macquarie Harbour. West Coast Yacht Charters are also licensed to make a limited number of trips to Sir John Falls to transport Franklin River rafters downriver.

Wilderness Air conducts floatplane excursions to the lower Gordon River, landing near Sir John Falls. These short trips offer a popular mixture of an exhilarating flight and rainforest tranquillity. The number of landings on the lower Gordon River has been rapidly increasing for almost a decade, and a new, larger aircraft has been recently introduced. Carolge Pty. Ltd. have also been licensed to conduct floatplane landings on the lower Gordon River although have not as yet commenced operations.

Roaring 40s Ocean Kayaking conduct occasional guided sea kayak tours of several days duration through the plan area to the lower Franklin River. World Expeditions, Peregrine Adventures, Rafting Tasmania, Headwaters and Tasmanian Wild River Adventures end their Franklin River rafting expeditions on the Gordon River. Rafting parties are transported off the river from Sir John Falls by Wilderness Air or downriver by West Coast Yacht Charters.

4.5 Other proposals

It has previously been proposed that the Wilderness Air float plane excursions to Sir John Falls be combined with a steamboat cruise operation in the gorge upstream from the jetty. This proposal was granted approval by the Tasmanian Wilderness World Heritage Area Ministerial Council, subject to certain conditions. However, the operation never went ahead and the steamboat has subsequently been removed from the Gordon River area. Wilderness Air has also informally proposed to run tours in the Limekiln Reach area, combined with interpretive development of the convict built limekilns. Another operator, Carolge, proposes and has Parks and Wildlife Service approval for floatplane landings at Heritage Landing and Limekiln Reach, as well as other areas outside the area of this plan, although operations have not yet commenced.

The possibility of helicopter access to the plan area has been raised. Factors to be considered in assessing such proposals include:

- disturbance to wildlife and other visitors
- airspace crowding
- shore facilities (none currently available)
- Helicopters cause minimal physical impact

Use of helicopters must also be in accord with the World Heritage Area management plan which states that "Helicopter landings will only be permitted for management purposes or activities in keeping with the management objectives for the area or if otherwise approved by the Director and consistent with this plan." (*Tasmanian Wilderness World Heritage Area Management Plan* 1992, page 66). The 1997 Draft Management Plan additionally specifically allows helicopter landings for search and rescue purposes. Whilst consistent with some of the presentation objectives of the World Heritage Area, helicopter access has the potential to be inconsistent with the conservation objectives for the plan.

4.6 Private (non-commercial) visitors

Private visitors are also drawn to the lower Gordon River by its natural values and the attractive angling opportunities. Many visitors stay at either Boom Camp or the Sir John Falls camp, although some may overnight on suitably equipped vessels. It is estimated that less than 1 000 people per year visit the lower Gordon River on a non-commercial basis, although there are some indications that private visitation is increasing. Most private visitors arrive in small recreational boats, although ocean going fishing boats may also occasionally enter the river on a recreational basis.

All of the above mentioned jetties, huts and walking tracks (see section 4.3) are available for use by private visitors, who are predominantly Tasmanian residents.

Based on bookings received by the Boom Camp coordinators, approximately 20 groups use the camp during the fishing season (September to May). The average group size is six people, with about three vessels per group and a stay of four days being typical. Unbooked usage is expected to be similar, if not lower, while usage over the winter months is also expected to be lower.

Anglers tend not to stay at the Sir John Falls camp, the use of which is dominated by rafting parties and Parks and Wildlife staff conducting river management activities. A log book has recently been installed to provide a more accurate indication of use. During the peak summer period an estimated average of one private boat trip per day may be made this far up the river, although use of the logbook by Wilderness Air clients complicates this estimate.

Whilst licences control commercial operators and a voluntary code of conduct is being promoted to cover recreational use of the river, the river banks are potentially vulnerable to large non-commercial vessels and inappropriate activities by smaller private vessels.

4.7 Information, interpretation and education

Presentation and interpretation are an essential part of the requirements under the World Heritage convention, however the interpretive materials presently provided to and by most operations are perhaps somewhat rudimentary. Interpretive sites within the plan area exist at Heritage Landing and Sir John Falls. The Parks and Wildlife Service has recently reviewed the current interpretation relating to the Gordon River area. The need for interpretation to complement the themes of the Strahan Wharf Centre and also meet the needs of the tour operators and their clients will be fundamental to any redevelopment.

To assist tour operators in presenting the World Heritage Area the Parks and Wildlife Service has developed an ongoing training program in liaison with licensed river based tourism operators. The program aims to integrate the training needs of operators and the messages the Service feels should be delivered about the World Heritage Area to visitors. The program will provide operators with the most accurate, up-to-date information possible on the area, as well as general information on the World Heritage Area. Anecdotal stories and local colour will not be discouraged.

4.8 Expected visitor trends and potential developments

Predictions for growth in the Tasmanian tourism industry are confident. The 1990s have seen a change in the attitude of West Coast communities towards tourism. Significant investment in tourism infrastructure has been made, particularly in Strahan. Much of this relies upon the Gordon River as the primary tourist drawcard. However, as Strahan attractions and new activities in the West Coast region are developed the cruises on the Gordon River are threatened with a decreased market share, particularly if the level of service offered lags behind visitor expectations.

The tourism market is also fragmenting, with the growth of a 'discerning, socially aware' client base. These tourists seek an intimate, educational experience of 'wilderness' for which they are prepared to pay, but are keen to avoid crowds and 'mass tourism' facilities. These are seen to degrade the experience, as they are not consistent with the definition of 'wilderness' as an area ecologically undisturbed by humans. Surveys indicate discerning, socially aware tourists are concerned for the environment and the negative impact of tourism, as well as tolerating and expecting strict controls on their activities in fragile environments. This plan seeks to allow for the predicted growth of that sector of the tourism industry, subject to strict environmental controls. Niche marketed tours offering detailed examination of particular natural and/or cultural heritage aspects or resources within the plan area will be encouraged, subject to rigorous assessment of the impact of such ventures.

To be competitive in this emerging market, tourism operators will need to recognise that the product they are selling is not simply a cruise, but a World Heritage Area experience of 'wilderness'. That experience will be enhanced if the need for environmental protection measures is interpreted to the visitor. However, that World Heritage Area experience could be degraded if there are too many vessels or other operations on the river.

Additional tourism opportunities exist in the Macquarie Harbour region and should be promoted. These include Sarah Island and the Kelly Basin – Bird River areas. The Kelly Basin – Bird River area has a site plan which can guide the installation of improved facilities and conservation works while interpretation on Sarah island is being upgraded. The planned promotion of the cultural heritage of the region, combined with careful use of the lower Gordon River would allow a more varied and interesting tourism experience. There is also potential for a greater number of visitors to take the cruise on the Arthur and Pieman Rivers, particularly now the "Western Explorer" road and ferry link are open.

5 Management issues

As indicated in section two and detailed in appendix one of this plan, the primary objectives of the Parks and Wildlife Service relate to the protection, conservation, presentation and rehabilitation of the World Heritage Area. Management issues specific to the lower Gordon River include the environmental concerns regarding streambank erosion, the effect of river regulation and other natural and cultural heritage matters discussed in section 5.1. Other management issues are detailed in section 5.2.

5.1 Environmental issues

A number of environmental concerns arise from past and present human use of the lower Gordon River. These are indicated in the following pages.

5.1.1 Streambank erosion

No definitive date for the commencement of bank erosion can be given, however by 1983 there was apparently significant active bank erosion in some areas, and the wash from boats had been suggested as the cause. By 1986, continuous stretches of river bank up to several hundred metres in length had collapsed into the river, taking with them Huon pine and Myrtle trees up to 20 metres in height. Based on estimates of root

exposure, undercutting and treefall it has been determined that some 80% of the total bank length of the lower Gordon River is affected by erosion and cruise vessels are considered to be the major erosive agents.

Causes
In natural fluvial systems erosion is expected to be concentrated on the outside bank at bends in the river channel, while inside bends are often depositional areas. However, the erosion on the lower Gordon River is generally more severe on the inside bank of bends where wash waves are concentrated by compression of the wave train generated by the turning vessel and by boats tending to cut corners and travel closer to the inside banks. In 1987 University of Wollongong consultants concluded that the bank erosion was almost entirely due to boat-generated waves and that the (then) recently introduced high speed tourist launches had accelerated and spread the problem. This hypothesis has been strongly supported by subsequent investigations and regular erosion monitoring.

The effect of waves generated by river traffic is significantly different to that of naturally occurring wind driven waves. The size of wind waves is proportional to wind speed and fetch, with wind driven waves tending to travel along the relatively straight reaches with greatest fetch. Whilst large waves may commonly occur towards the centre of the channel they do not travel into the more sheltered nearshore waters except at the ends of reaches. Relatively few stretches of bank are therefore subject to direct attack from large wind driven waves. Wash waves are generated in mid channel and approach most areas of bank, including those not normally affected by wind waves, at a greater angle than naturally occurring waves (see Appendix four, figure one).

Monitoring
The present erosion monitoring program conducted by the Parks and Wildlife Service comprises a six-monthly inspection and measurement of erosion pins inserted into estuarine, alluvial and levee banks at approximately 50 sites; a six-monthly inspection of evidence for recent landslip activity on colluvial banks which are not amenable to erosion pin monitoring (because of their considerably coarser average grainsize); and a periodic natural revegetation survey of approximately 40 permanent $1m^2$ quadrats. In addition, permanent bank profile survey transects and/or planiform grids have been established at 36 sites. These provide a reference for re-survey following catastrophic erosion events which may remove the erosion pins. The effect of aircraft activity in the gorge upstream from Sir John Falls is also periodically assessed using a small profiling device similar to that used to measure walking track erosion. A recent international review of streambank erosion monitoring methods indicates that the monitoring techniques being used are suitable and does not suggest additional methods which would be appropriate to the lower Gordon River.

Restrictions to reduce erosion
Since the erosion problem was first identified a range of restrictions have been successively placed on commercial operations. These have each been trialed for varying periods, and although generally successful in reducing erosion rates, no restrictions other than closing sections of the river, have yet completely solved the problem. After a trial period it has always been found necessary to introduce further restrictions. The history of bank erosion and management response, including progressive restrictions, is summarised in appendix two.

Effects of erosion
The average erosion rates of approximately 10 mm per year measured during the past five years in the area downstream of Horseshoe Bend may appear to be very low and therefore acceptable. However, this erosion is quite clearly significant if one considers that these banks were stable or depositional for about 6 000 years prior to the onset of the erosion problem. Estimates suggest that at the above erosion rate (ie. 10 mm per annum) each year of operation removes 10 years accumulation of bank sediment. It must also be emphasised that erosion rates are being underestimated by current monitoring because undercuts or notches in embayments are inaccessible below a dense root mat. As a result measurements are made on more resistant headland areas and it appears these measurements are probably an order of magnitude underestimation of the true extent of erosion occurring.

Since the onset of erosion it is estimated that between 250 000 and 500 000 tonnes of sediment have been eroded from this previously stable to depositional environment. If the bank retreat estimated from the most recently recorded erosion rates (including correction for the above mentioned underestimation presented by recorded erosion rates) were to be maintained over the relatively short timescale of another 50 years, between 10 000 and 100 000 tonnes of bank material will be removed, with estuarine and alluvial bank retreat averaging up to 5 m. It appears likely that recovery from such degradation would take at least 500 years. Recovery will not even begin until the banks are stabilised. This is clearly an undesirable outcome.

Management target
Wash energy is approximately proportional to vessel displacement and the square of vessel speed, although other factors also apply. It is believed the reduced speeds may lead to a substantial reduction in the overall energy of the wash and hence erosion rate. The speed limit for the larger commercial cruise vessels was reduced from 9 to 6 knots on 1 July 1994. Due to the complexities of the erosion process the only accurate method of determining the effect of the new speed limit was considered to be an empirical three year trial period with continued river bank erosion monitoring. As of December 1997, at the end of that trial period, erosion monitoring data indicated that wash induced erosion continues to occur and that despite speed reductions 60 - 80% of the overall proportion of alluvial bank erosion remains attributable to cruise vessels.

Despite the relatively small magnitude of present erosion rates the problem remains significant because erosion is a reversal of the natural depositional processes that formerly operated in the area. Any artificially induced erosion in areas that would not otherwise be erosional cannot be considered to be sustainable. The sustainable management target for the lower Gordon River should therefore be considered to be zero wash induced erosion in the previously stable to depositional fluvial and estuarine environments. To achieve this the exclusion of conventional vessels may eventually have to be considered. Results from the Australian Maritime College hydrodynamic study suggest it is unlikely that these vessels could ever be modified to cause zero erosion.

However, this does not mean that the river should necessarily ever be closed entirely to mass market tourist operations. Twin hull designs suitable for large vessels have demonstrated both desirable low wash characteristics and sea-keeping abilities appropriate for Macquarie Harbour. Problems with low speed manoeuvrability may be overcome with designs that customise final drive ratios while recent developments in engine control and variable pitch propeller systems also show promise. The use of purpose built low wash vessels should be encouraged and may be required if monitoring indicates unacceptable erosion continues.

Aircraft
The wash from float plane operations, especially during certain stages of take off, is quite sizeable, although accurate wave height figures are unavailable because measurement is considerably more complex than for boats. Aircraft wakes also have the potential to cause bank erosion and to hinder the rehabilitation of previously eroded banks. However monitoring indicates that aircraft operations in the relatively erosion resistant gorge upstream from Sir John Falls wharf during the period January 1995 to May 1997 had no detectable net influence on rehabilitation of the previously disturbed banks.

The precautionary principle dictates that potential stress not be increased until the likely effects can be understood and predicted. To this end, a limit on the number of landings (see 7.1.4) on sections of the lower Gordon River will be required until it can be demonstrated that an increased level of activity would not cause adverse environmental effects.

Stabilisation and revegetation
The Parks & Wildlife Service has been monitoring natural revegetation on disturbed parts of the lower Gordon River since 1989. The eroded levee banks and stabilised landslips now have good cover, which is not surprising considering the capacity of riparian vegetation to colonise disturbed areas. However the levees are extremely prone to disturbance and still have oversteepened banks which, it is predicted, will take many decades to reach a more stable state.

Estuarine and alluvial banks have very serious undercuts or notches where vegetation will not grow, or low vertical faces where it is extremely difficult for seedlings to become established naturally or artificially. Before revegetation has a chance of success erosion needs to be halted.

Artificial stabilisation has been avoided on all banks because of environmental impacts, economic constraints or because it is impossible in practice. Monitoring indicates that natural revegetation is occurring, on levee and colluvial banks, at a rate which it would be very difficult to recreate artificially. Trees that have fallen into the river because of erosion provide a degree of bank protection and since removal would be likely to cause additional disturbance shall be left to decay in place.

5.1.2 Other environmental issues

River regulation
The Hydro Electric Corporation regulates some 30% the Gordon River discharge (at Warners Landing). The regulation regime increases summer flows and decreases winter/spring floods. This may have predisposed the

banks to failure by increasing the saturation of bank sediments during summer (when boat wash stress was at a maximum) and by focussing the wash slightly higher and within a narrower zone of the bank than would otherwise be the case. However, the wash from river traffic remains the demonstrable major cause of erosion.

The potential impact of river regulation on the meromictic lakes has already been noted. Recent scientific studies indicate that HEC operations have affected these lakes. However, under the present power station operating regime (introduced in the early 1990s) the meromictic condition appears to have stabilised, albeit at a lower level. The meromictic condition of these lakes still requires regular monitoring, which is now conducted by the Parks and Wildlife Service.

Other investigations raise further concerns regarding the significant reduction in the frequency of bankfull discharge (flood) events that results from river regulation. The natural rate of geomorphic development of fluvial landforms, including the long-term downstream migration of levees and the aggradation of alluvial banks, is therefore likely to be also considerably reduced. The associated reduction in backswamp deposition rates may lead to enhanced organic soil development as burial by silts becomes less common. The resultant ecological shift is has the potential to be unfavourable to the present backswamp biotic communities that have developed on extremely thin, silty soils.

Although problems associated with regulation of river levels were mentioned in the 1989 World Heritage nomination, potential abatement measures have yet to be addressed. This will require extensive co-operation with the Hydro Electric Corporation.

Natural and Cultural Heritage Issues
Bank erosion along parts of the river is still caused by the wash from boats. The impact of this erosion on some cultural sites has been noted as a problem. The impacts of this erosion on faunal communities is not known but is unlikely to threaten most faunal populations. Vertebrate species which may be affected include the platypus and the native water rat, both of which burrow into river banks. Determining whether there is an impact would be very difficult. If there was an impact it would be a reduction in numbers along that part of the river that is disturbed. Their conservation status would not be affected.

The river margins of the Gordon River represent a significant component of the total population of Huon pine which is estimated to be a mere 2 400 ha. Furthermore, river bank integrity is important for the conservation of this significant species.

Feeding of wildlife by tourists or tour operators is not permitted for several reasons: (1) it can cause sickness such as lumpy jaw. (2) animal numbers will build up to unnaturally high levels. This causes a problem during the off-tourist season as there is not enough food available, resulting in impacts on the vegetation and starvation of animals. (3) some species of animals become pests as a result of feeding and become more aggressive in their demands for food. This has led to people being injured. (4) the Parks and Wildlife Service has a policy of 'keeping wildlife wild' in national parks.

There are some indications that a number of bird species may have already been affected by constant motorised traffic on the river. Birds such as the black swan, Pacific black duck, great cormorants and in particular the azure kingfisher are sensitive to disturbance. A decline in these bird species as a result of motorised traffic has been observed at Birch's inlet and other areas. Similarly, birds such as the white-bellied sea eagles and wedge-tailed eagles will not usually nest along river edges where there are regular disturbances.

As more and more visitors access the area the potential for the introduction of exotic species such as weeds, pathogens, etc. should not be overlooked. Such introductions are often detrimental to existing resident species.

Fire will also impact on biotic communities by favouring some species over others. Frequent fires are not part of the natural order of the lower Gordon River rainforests and are likely to result in ecological shift. Recreational activities that increase the chance of wildfire should therefore be strictly controlled.

Caves and karst
Although at present recreational interest in caves within the plan area is very low, the potential for future recreational use of karst should not be overlooked. This use must however be balanced with the conservation of scientific and cultural resources outlined above. The true significance of the Gordon River karsts will not

be identified until a systematic multidisciplinary survey has been undertaken. Until then any potential disturbance to caves and karst features should be minimised.

5.2 Other management issues

River Management
The Parks and Wildlife Service has identified problems with collection of visitor statistics for both commercial and private visitors to the Gordon River. Accurate visitor statistics are an essential element in park planning and management. They are also required for ensuring licensed concessionaires provide a fair return for the opportunity to operate in a prime tourist attraction requiring considerable management input to maintain.

The licence regime has been of concern for both the Parks and Wildlife Service and licensed concessionaires. Most aspects of those various issues have no bearing on the major concerns of the Parks and Wildlife Service, which relate to the conservation and presentation of the World Heritage Area. The licence provisions will be in accord with the findings of the *Gordon River Tourist Operations Inquiry.*

Visitor experience and safety
Tourism on the Gordon River should not be considered in isolation and ideally needs to be discussed in the wider context of the total visitor experience of Strahan and the West Coast. A regional tourism development plan may be required, however broader regional matters are beyond the scope of this document.

In their submission to the *Gordon River Tourist Operations Inquiry*, the then Department of Tourism, Sport and Recreation put the case that the current cruise operations are not fully meeting potential tourism demand by not targeting their product to meet the expectations of the specific market segments of 'holiday makers', 'conservatives', 'socially aware' and 'adventure seekers'.

The 1993 Tasmanian Visitor Survey noted that one in five passengers considered the cruise "too long and tedious". Visitors have expressed a desire for more land based experiences to break up the monotony of the cruises. Opportunities for these experiences may be explored at Sarah Island, Kelly Basin and possibly other locations around Macquarie Harbour. The profile of tourists to the area suggests that the experience for the high proportion of visitors interested in cultural matters could be expanded, particularly focusing on the rich Aboriginal and historic heritage of the wider Macquarie Harbour area.

There is a real danger that the presence of too many vessels on the river will result in the loss of 'wilderness' aspect of the World Heritage Area experience. The overcrowding of Heritage Landing has been raised as a visitor experience and safety issue. Hand-rails have recently been installed to ameliorate the safety aspects of these concerns. Visitor observation at Heritage Landing indicates that at times of peak boat passenger discharge there are some problems experienced with visitor flow and congestion around the landing. Congestion around the signs makes them difficult for all visitors to read, which may detract from their experience. The tranquil ambience of Heritage Landing is also reduced by the sound of vessel motors idling whilst passengers are ashore.

The high number of aircraft movements on the lower Gordon River may effect the tranquillity of the area and the safety of other river users. To prevent degradation of the World Heritage Area experience there may also be a need to have aircraft exclusion zones. Consideration will be given to consultation with the Civil Aviation Authority, aircraft operators and other interested parties with respect to the formal declaration of a 'Fly Neighbourly Advice', as declared for Kakadu National Park. Consideration must also be given to employing best available technological solutions to the problem of aircraft noise.

Interpretation and presentation by the Parks & Wildlife Service and licensed commercial operators should be of a standard commensurate with the World Heritage status of the area and its significance to the Tasmanian economy as a visitor destination. The present provision of interpretation, especially on-board interpretation, is relatively rudimentary, although interpretation redevelopment projects have been proposed. These may include the replacement of signs at Heritage Landing to adopt a more appropriate theme, and replacement of interpretation at Sir John Falls.

Some of the findings of geoscientific, ecological and cultural heritage investigations that have recently been conducted by officers of the Parks and Wildlife Service and other institutions would be of interest to members of the visiting public. The information is available to prepare a range of thematic interpretation presentations (eg. notesheets, brochures, etc.) for visitors. The unpleasant facts regarding bank erosion should not be avoided, since visitors to any World Heritage Area should always be aware of the impact of their visitation. Heritage Landing may be an appropriate site to provide information on the erosion problem as the landing was developed as a result of erosion control measures being introduced.

Despite the excellent safety record of the present operator, the high level of aircraft traffic upstream from the Sir John Falls area raises the spectre of an aircraft accident within the very tightly constrained flight-path available. The area is uncontrolled airspace, for which the Civil Aviation Safety Authority has little responsibility, apart from ensuring that the aircraft carry emergency locater beacons and adequate safety gear, and operate at an altitude of more than 500 feet. There is also the possibility of a collision between aircraft and rafts or other river users. All river users need to be made aware of the potential hazard presented by aircraft operations and warning signs have recently been posted at Sir John Falls and may need to be posted in other areas if the volume of floatplane traffic warrants.

Collisions between boats are a possibility under low visibility conditions often encountered, particularly if there is a substantial increase in river traffic.

6 Gordon River management philosophy and objectives

The lower Gordon River is part of a World Heritage Area reserved on account of its outstanding natural and cultural heritage values. It is implicit that World Heritage Areas are to be conserved, if not preserved, in perpetuity. Assuming continual human population increase, with concomitant pressure on remaining areas of natural land, World Heritage Areas listed for their natural values will become increasingly more valuable. In this sense they are an investment in the future, both for the planet as a whole and for the Tasmanian and Strahan economy in particular, but only if managed in a sustainable manner.

It is therefore imperative that all users of the river accept and respect the obligations of the Australian and Tasmanian governments outlined under the 1972 UNESCO *Convention Concerning the Protection of the World Cultural and Natural Heritage* and the *Tasmanian Wilderness World Heritage Area Management Plan*.

6.1 Lower Gordon River recreation zone plan objectives

The primary objective of the plan is to conserve the environment of the lower Gordon River and provide scope for the facilities and services required to present the river to visitors in a sustainable way.

More specifically the objectives of this plan are to:

- Maintain the uniqueness of the area and its aesthetic and environmental values.
- Encourage recreation consistent with resource protection and maintenance of scenic quality.
- Uphold the uniqueness of the plan area as a visitor destination.
- Rehabilitate sites, where appropriate.
- Manage the river as an integrated, accessible World Heritage Area destination for visitors, having highly significant, but fragile landforms, diverse natural ecosystems, rare species, high natural scenic quality, high wilderness values and remoteness which set it apart from other World Heritage Area visitor destinations.
- Assist visitor appreciation and enjoyment.
- Manage the existing recreation opportunities to cater for visitor use by:
  - half day, full day and longer stay commercial cruise visitors
  - rafting visitors
  - private boat based visitors
  - visitors arriving in aircraft
  - other environmentally acceptable pursuits, private or commercial.
- Maximise the quality or recreation experience of visitors to the area through the management of suitable facilities and services.

The management philosophy and objectives guiding this plan are outlined in section two and appendix one of this document. Detailed World Heritage Area management philosophies and objectives relating to the lower Gordon River may be divided into issues of environment and visitor experience and safety, as follows.

6.2 Environment

The primary concerns of the Parks and Wildlife Service are the potentially conflicting aims of conservation and presentation. In order to reconcile these aims the presentation of the plan area to visitors must be conducted on a demonstrably sustainable basis. Sustainable use cannot be considered to have been achieved until the natural propensity of the river banks towards stability or deposition (as appropriate to particular sites) is restored. This will be a lengthy process.

Environmental objectives:

- To conserve the environment of the lower Gordon River, in particular those significant features described in chapter three of this plan.

- To restore the natural propensity of the river banks towards stability or deposition (as appropriate to particular sites).

- To conduct environmental research as required in order to effectively manage the area and achieve the above objectives.

6.3 Visitor experience and safety

The lower Gordon River is to be managed as a destination where visitors can gain an experience of wild, natural country. To maximise the visitor satisfaction the whole trip should be considered as part of that experience rather than as simply a ride through a scenically attractive area. The following objectives relate to visitor experience:

- Factors that detract from the special characteristics of the plan area will be controlled. This will affect the numbers, frequency and size of vessels and aircraft using the river.

- A range of activities should be available to cater to individual taste. Whilst many visitors may desire a comfortable experience others might seek something more adventurous.

- Opportunities for small scale as well as mass market tourism will be provided.

- In order to maximise the visitor experience the natural attributes of the river and surrounds are to be maintained. These include the relatively unaltered landscape, the tranquillity and sense of isolation from modern, city based life.

- The amount, location, type and quality of interpretation should be improved to maximise the visitor experience.

- To upgrade interpretation on the river at Heritage Landing and Sir John Falls and liaise with commercial operators to increase visitor understanding and enjoyment of natural and cultural values during their visit to the river.

- To jointly create a distinctive Gordon River experience linked with the Strahan Wharf Centre.

- Additional on-board interpretive facilities should be provided. There is significant unrealised potential for cruise boats to be fitted out as floating visitor centres, complimenting (but not duplicating) the interpretation available at the Strahan Wharf Centre.

- To ensure, as far as possible, the safety of visitors to the area.

7 Management prescriptions

7.1 General management prescriptions

The Parks and Wildlife Service will continue to follow the management prescriptions arising from the 1992 World Heritage Area management plan and subsequent revisions. In addition the following general environmental management prescriptions will be implemented.

7.1.1 Commercial river craft

Wash heights instead of speed limits
The Low Wake Hull Project results indicate that the wave height of vessel wash is the critical factor influencing bank erosion attributed to river traffic. This parameter is not a simple correlate of vessel speed, as hull design considerations are also significant variables. Wave height, rather than vessel speed, is probably a better measure of the erosive potential of vessels.

However further research is required before a maximum wave height that will ensure long term sustainability can be specified with confidence. The speed limits for existing vessels will remain in force until research to enable wave height - erosion correlations for the various bank types has been conducted or erosion monitoring indicates that decreased speeds or other changes are necessary. See Appendix four for results of recent monitoring and wave impact research.

Speed limits will then be set according to the erosive capacity of the individual vessels, and in accord with the sensitivity of the zone of operation. Licences will contain provisions to allow speed limits determined in this manner to be incorporated.

- The Service will continue to conduct, commission and encourage scientific investigation of the river banks and the processes of erosion. Further work will be carried out to refine the measurement of bank disturbance. Sustainable wave height limits determined as a result of this research will be incorporated into operational conditions as appropriate.

- The effect of the 1 July 1994 reduction in permissible speed to six knots was only a minor reduction in the rate of erosion of trafficked reaches and erosion demonstrably attributable to cruise vessels continues to occur. Further changes to the wake wave climate are therefore required to achieve the objectives of this plan (see Appendix four for details).

- Permitted wash heights for vessels licensed as of 1 July 1994 will initially be based upon present practice. In the event that erosion monitoring indicate vessel wash continues to cause unsustainable erosion further limitations will be required.

- New or replacement vessels will be required to meet wave height limits determined on the basis of available scientific data. Where this is insufficient to allow a sustainable maximum wave height to be determined with confidence a precautionary approach will apply.

Other matters
- If as a result of further research or monitoring, it becomes necessary to vary the operating regime on the river, adequate notice of any proposed changes will be given to affected parties. In the long term, commercial operators will be encouraged or may even be required to change to vessels with low wake characteristics.

- Only vessels with proven low wash characteristics will be permitted to be used for any new commercial venture.

- The potential for broadening the area of tours in order to take the pressure off the Gordon River will be examined in consultation with the tourism industry and the local community. Sarah Island and Kelly Basin may be appropriate alternative destinations.

7.1.2 Private river craft

- Users will be encouraged to abide by the voluntary users code for motorised craft on the Gordon River (and subsequent revisions) and self register at the ranger station in Strahan. Further restrictions on private use may be required if monitoring indicates a problem has arisen.
- The existence of the voluntary users code will be widely publicised.

7.1.3 Rafters

- In accordance with the *Gordon River Tourist Operations* report, West Coast Yacht Charters have been licensed to conduct a limited number of trips to transport Franklin River rafters by boat from Sir John Falls to Strahan.
- Priority is to be given to transporting of rafters - a regular service for other visitors is not to be offered.

7.1.4 Aircraft

Floatplane operations will only be permitted in strictly defined areas. These are: 1/ the gorge upstream from Cataract Creek (Sir John Falls area), 2/ Limekiln Reach between Australian Map Grid northings 529 4900 and 529 5900 and 3/ Horseshoe Bend area.

- The Sir John Falls site will be monitored. Aircraft landings at the site will be held to 2,200 per annum pending results of environmental and visitor experience monitoring .
- The permitted annual number of landings in Limekiln Reach will be 1500 and 500 in the Horseshoe Bend area for environmental reasons and also to limit disturbance to other visitors. If warranted by the level of other river traffic, aircraft may in future not be permitted in the Horseshoe Bend area for either safety or visitor experience reasons.
- The Parks And Wildlife Service will liaise with aircraft operators to minimise noise by use of new equipment.
- In liaison with commercial operators and aviation clubs appropriate voluntary flight guidelines will be developed and promoted.
- Flight paths, minimum flying heights and landing zones will be stipulated in licences
- Any proposal to visit the area by helicopter will be assessed according to the criteria noted in section 4.5

7.1.5 Erosion monitoring

- The regular monitoring program and reporting of results to operators will be continued.
- Specialists employed by operators will be given the opportunity to observe erosion monitoring.
- The results of monitoring will be publicised amongst recreational users of the river and the tourist industry.

7.1.6 Consultation

District Community Committee

- It is intended to establish District Community Committees to provide the Parks and Wildlife Service and the community with an opportunity to co-operatively address land management and conservation issues. The West Coast District Community Committee will be the forum for discussion of lower Gordon River management.

7.2 Specific zone prescriptions

The plan area is unique and diverse in both the nature and distribution of natural and cultural values and in the patterns and types of visitor use. Zoning is a way of recognising this diversity and at the same time creating an overall framework for management designed to ensure that management objectives are fulfilled.

The World Heritage Area zoning scheme has a concern for the appropriate levels and forms of recreation, associated facilities and management requirements for different parts of the planning area, that are in keeping with maintaining environmental values. The following four zones are proposed as additional overlays to the World Heritage Area zones to further define the appropriate level and forms of environmental management, recreational use and associated facilities:

1 From the mouth to the upstream end of Horseshoe Bend
2 From the upstream end of Horseshoe Bend to the upstream end of Limekiln Reach
3 From the upstream end of Limekiln Reach to Warners Landing
4 From Warners Landing to the Franklin River confluence

The zones are shown on map two. This zoning scheme is based upon the susceptibility of the river bank environment to human induced degradation. It takes into account existing use of the river and allows for potential future uses, subject to strict environmental impact evaluation. Where appropriate smaller subzones may be identified for specific reasons - for example approved floatplane landing sites. The specific management prescriptions outlined below relate to zones and features on map two.

7.2.1 Prescriptions applicable to all zones

Wash wave height limits
Permitted wash wave heights for commercial vessels in each zone will be in accord with the sensitivity of the banks in the zone. Once determined, all licensed commercial vessels will be required to meet the permitted wash wave height limits.

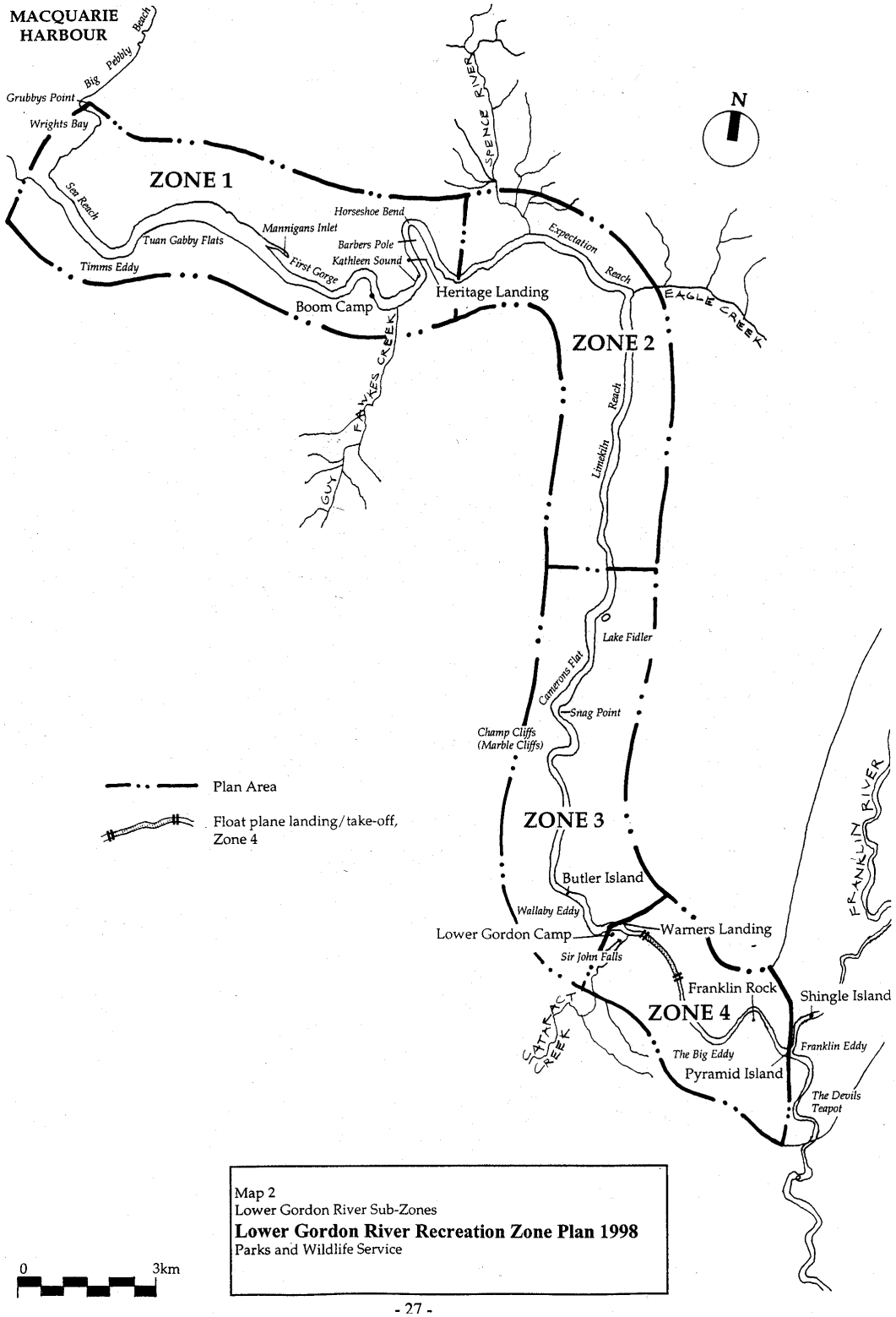
Private vessels
Private vessels are permitted in all zones, subject to the users code and future revisions thereof. See also section 7.5.

Watersports
Motorised watersports including, water skiing, use of personal watercraft (jet skis) etc. will not be permitted in any of the zones.

Moorings
Moorings will only be permitted when required for management purposes or when approved by permit from the Minister for licensed commercial operations. Installation of moorings for private use is not permitted.

Cumulative effects
Regular impacts on the natural environment can have a greater cumulative effect than the same kind of impact undertaken on an irregular or infrequent basis. This occurs because the affected features, typically soil, unconsolidated sediments or vegetation, have no time to recover to their pre-disturbance state. For this reason activity, especially in Zone 3, needs to be very carefully managed.

Assessment of new commercial activities
Any proposals for new commercial operations will require assessment of environmental impact. As part of this assessment the effect of any new operation in combination with existing operations will be assessed. The cumulative effect of all operations should not exceed the sustainable management target of zero wash induced erosion. The proponent should meet all costs involved in the environmental impact assessment of any proposed new commercial operations.



Map 2
Lower Gordon River Sub-Zones
Lower Gordon River Recreation Zone Plan 1998
Parks and Wildlife Service

7.2.2 Zone 1 - From the river mouth to the upstream end of Horseshoe Bend

In 1989 the World Heritage Area Ministerial Council decided to close the area upstream of Horseshoe Bend to commercial river traffic. Zone 1 comprises the area west of Australian Map Grid easting 386 800, in which commercial activities were allowed to continue under that decision.

- Existing environmental protection measures will remain in place until the effectiveness of the 1994 speed reduction has been assessed (refer to section 7.1.1 and Appendix four).

- Prospective new operators or existing operators wishing to introduce new vessels will be required to demonstrate that their craft can meet environmental requirements and that the total effect of all operations will not exceed the total environmental carrying capacity of the river.

- New tourist services ashore will be considered in Zone 1, provided they are consistent with the zoning and prescriptions in the Tasmanian Wilderness World Heritage Area Management Plan and depending on the need for such developments and the impacts on natural and cultural values.

- The number of floatpane landings in the zone will be limited to 500 per annum. This limit will only be altered if environmental and visitor experience monitoring indicates such alteration is necessary, for safety reasons or if it can be demonstrated that an increase in landings will not exceed the total environmental carrying capacity or adversely impact on the environment or other users.

7.2.3 Zone 2 - From Horseshoe Bend to the upstream end of Limekiln Reach

Due to the bank erosion problem this zone was not available to commercial activities between 1989 and 1995.

- The purpose in allowing commercial activities in this zone is to enable specialist tours operating to the highest possible environmental standards to provide a high quality wilderness experience to clients.

- The erosion monitoring data from the six years during which this zone has been closed to commercial activities will form the baseline environmental data set and together with results from wave impact research will be used in formulating the limits and constraints noted below.

- Commercial operations using craft without motors will be permitted.

- The number of commercial trips by motorised craft into this zone may be subject to annual limits and/or trial periods.

- All commercial activities in this zone will be subject to stringent environmental standards and environmental impacts will be closely monitored. Continued operations will be permitted only so long as use of this zone is demonstrably sustainable.

- Part of Limekiln Reach is relatively robust and the section between Australian Map Grid northings 529 4900m and 529 900 m is considered the most suitable site on the river for commercial floatplane operations. Use of this area by aircraft operators in preference to other areas will be encouraged, however the number of landings will be limited to 1 500 per annum. This limit will only be altered if environmental and visitor experience monitoring indicates such alteration is necessary or appropriate, or for safety reasons.

- Proposed new tourist facilities or developments in zone 2 may be considered, provided they are consistent with the zoning and prescriptions in the Tasmanian Wilderness World Heritage Area Management Plan. Any development would be subject to stringent environmental assessment and conditions with regular monitoring. To preserve the wilderness experience any facilities provided must be very low key. For example, access to the shore may be by small dinghy with minimal land based facilities, ie track development for environmental purposes only. Any developments in or around culturally significant sites will be subject to the development of a conservation plan.

7.2.4 Zone 3 - From the upstream end of Limekiln Reach to Warners Landing

This zone contains the levee bank reaches, the most environmentally sensitive section of the river. These banks are extremely susceptible to the wash from river traffic and have previously been extensively degraded. The zone contains globally significant landforms, including the unique meromictic lakes, potentially significant invertebrate fauna and some cultural heritage. All of these are threatened by bank erosion. Waves as low as 20 mm have been experimentally found capable of eroding both model levee banks and the sand bars at the base of real levees. The experimental techniques did not permit waves lower than 20 mm to be generated.

- Re-opening the leveed section of the river to the present style of commercial cruises can not be considered, at least until such time as the banks are stable, the vegetation cover is fully re-established and similar erosion tests, conducted on vegetated banks, produce an acceptable result. As the major bank stabilisers are slow growing tree species and it is likely to be many decades before they contribute substantially to bank stability, the levee bank section of the river should be considered as being effectively permanently off-limits to most commercial uses.

- The zone will be opened to suitable commercial operators using craft without motors.

- Further research is required to assess the carrying capacity of the zone and enable an accurate judgement of the impact of any new operation on the river environment. Motorised commercial use of this zone will only be authorised when it can be demonstrated that such use will not impact on the natural environment, especially the sensitive levee banks.

7.2.5 Zone 4 - Warners Landing to Franklin River confluence

- Aircraft will be restricted to operating on a well defined section of the river, downstream from Australian Map Grid northing 5285 500 to the Sir John Falls jetty, subject to safety considerations. All aircraft movements west of Australian Map Grid easting 393 000 should be conducted as a ‘dead slow’ taxi.

- The number of aircraft landings in the zone will be limited to 2 200 per annum. This limit will only be altered if environmental and visitor experience monitoring indicates such alteration is necessary.

7.3 Karst and cave areas

- Disturbance of caves and associated features must be kept to a minimum until a systematic scientific survey has been conducted.

- The Parks and Wildlife Service geomorphologist (karst) should be consulted before caves in the plan area are entered.

- Archaeological finds should be reported to Parks and Wildlife Service Aboriginal Heritage Unit.

- Otherwise all activities in karst or related areas will be guided by the *Draft Tasmanian Wilderness World Heritage Area Management Plan* (1997) pp 141 - 143 and subsequent updates.

Where necessary, interpretative material should be prepared detailing the nature and vulnerability of karst in any area likely to be frequented by either private or commercial tours. If necessary, site plans should be prepared for karst areas at risk from recreational activities.

7.4 Jetties, huts and tracks

At present visitation rates no further shore facilities are required for environmental protection purposes. Detailed below are site specific recommendations for huts, jetties and tracks in the plan area. Where appropriate the West Coast District Community Committee will be consulted on these matters.

In accordance with the *Tasmanian Wilderness World Heritage Area Management Plan*, no new private huts or shacks are to be constructed within the plan area.

Lower Gordon Camp
The former single quarters has been demolished and the central structure is being progressively renovated. The camp will remain available for public use.

Boom Camp
The shack licensees in consultation with the Parks and Wildlife Service have recently developed a policy of sourcing all firewood from outside the reserve.

Duncs Camp
Duncs camp to be stabilised but will remain a 'standing ruin' as per the conservation plan. The site may then be made available as an interpretive feature for access by small parties. Overnight stays will not be allowed as the necessary structural improvements would destroy the historic fabric of the site.

Goulds Landing
The small 'garden shed' structure at Goulds Landing may be removed subject to assessment of its cultural heritage value and appropriate consultation.

Eagle Creek jetty
The jetty at Eagle Creek was destroyed by treefall during flooding. Its ruins constituted a hazard to boats and have been removed. Any decision regarding possible replacement of the jetty will be made in consultation with recreational users of the area, although it should be noted that a jetty is not necessary for small boat access to the Eagle Creek camping site.

Tracks
The walking tracks to be maintained in the plan area will be those at Heritage Landing and Sir John Falls. Stabilisation works may be required on the track between the jetty at Sir John Falls and the Lower Gordon Camp. Other tracks in the plan area will not be maintained as present usage is insufficient to warrant such action.

7.5 Private (non-commercial) visitors

To protect the river banks from erosion a voluntary users code (see appendix 3) has been prepared after extensive public consultation.

- The users code will be publicised revised according to recent scientific findings (Appendix four) and in consultation with the West Coast District Community Committee. Following revision an educational campaign aimed at achieving adherence to the guidelines will be conducted.

- Monitoring of numbers and activities of private visitors will be undertaken.

- Private users will be made aware that inappropriate activities (eg. high speed manoeuvres in close proximity to the bank) have the potential to rapidly undo the positive results achieved by regulation of commercial activities.

7.6 Hydro Electric Corporation operations

The 1989 World Heritage Area nomination noted concerns regarding the potential impact of regulation of river discharge by hydro-electricity generating operations, particularly on the globally unique meromictic lakes.

- The findings of an extensive research program on the meromictic lakes and general hydrological aspects will be examined and appropriate steps taken to implement any suggested conservation measures.

- The Parks and Wildlife Service will work with the Hydro Electric Corporation in an attempt to minimise the impact of the operation of the Gordon Power Station.

7.7 Fire management

- Fires will only be permitted in the fireplaces in the huts available for use.

- The entire area was recently declared a Fuel Stove Only Area.

8 Commercial licence prescriptions

The vast majority (estimated at greater than 99%) of visitors to the lower Gordon River are clients of commercial operators. The licensing of commercial operators within the plan area is therefore the most effective management tool available to the Parks and Wildlife Service.

8.1 Licensing of commercial operators

Licences to provide services within the plan area are granted at the discretion of the Minister administering the *National Parks and Wildlife Act* 1970.

This plan largely notes conditions that are proposed to be included in the licences that relate to environmental management of the plan area. Legal and other aspects of the licences will be documented elsewhere, as appropriate.

Sustainability

- The Director, Parks and Wildlife Service, will apply all measures necessary to ensure tourist operations are conducted on an ecologically sustainable basis.

- All waste, sewage, sullage etc. must be contained on board for disposal in an approved manner outside the World Heritage Area, preferably into a sewerage treatment system or licensed waste disposal site as appropriate.

- All licence holders and their employed vessel captains and aircraft pilots should be made aware that the most recently measured levels of human induced erosion are environmentally unsustainable.

Renegotiation/Cancellation

- Any new licence / concessionaire agreement / permit will provide for renegotiation or cancellation if it becomes apparent that streambank erosion induced by tourist operations continues to occur.

- Licences will be separate and enforceable or changeable without requiring the agreement of other licensees.

Area of Licence coverage

- Commercial operators are to be informed that any licence to operate on the lower Gordon River issued by the Parks and Wildlife Service only relates to operations within the reserves of the World Heritage Area. All other matters such as berthing and offices etc. at bases outside the World Heritage Area are managed by other authorities.

- Licences will be issued for specific zones as defined by this plan. Operators shall conduct activities only within the zone or zones for which they are licensed.

8.1.1 General licence conditions

Assessment of erosive potential of vessels

- All licences are to include a clause allowing for the introduction of limitations on permitted wash wave heights, or limitations based upon measurement of a vessel's erosive potential instead of, or in conjunction with, the current speed limit system.

Move to low wash craft

- Existing vessels may be required to be replaced with low wash hull craft. The operator shall be given a reasonable time to replace any such vessel with a vessel of similar size and carrying capacity (provided that low wash objectives can be met).

- New vessels will have proven low wash characteristics. See Appendix four for recent estimates of the appropriate maximum wake wave height for zones one and two.

Centre of the river

- In order to minimise their impact, and subject to navigational requirements, vessels must keep as close as possible to the centre of river, especially on bends. Sensitive and accurate time-tabling will be required, while radar and radio communications should be used by captains to avoid passing other vessels on bends or in erosion susceptible narrow reaches. Marine and Safety Tasmania will be consulted on possible implementation methods.

- The upstream end of Horseshoe Bend, where cruise vessels were until recently turning around and the area around Heritage Landing are amongst the more erosion affected areas on the currently trafficked reaches of the river. Ideally, the turnaround operation should take place at a dead slow speed in the centre of the channel. The point of turnaround may be required to be periodically varied to allow recovery of impacted areas.

Interpretation
- In consultation with the tourism operators, the Parks and Wildlife Service will maintain an interpretive guide for the river.

Vessel tracking
- Movements of some vessels may now be monitored, and speed calculated, using Global Positioning System (GPS) and data logging equipment. Location, engine revolutions and other relevant parameters may be monitored on all vessels when suitable equipment becomes available

- Licences will allow for the installation of such equipment, the supply of necessary electrical power and the prompt reporting of any malfunction.

Penalties
- The licences will include provision for penalties to be incurred if licence conditions are breached and/or the Director considers that the operation is threatening the values of the area.

Data on river usage
- All operators will be legally required to provide, on at least a quarterly basis, daily data on the number of passengers and movements actually conducted. Irregular independent audits may be used to test the validity of such data. Accurate data is essential for management purposes.

User fees
- Operators will make every reasonable attempt to collect National Park entry fees on behalf of the Parks & Wildlife Service.

River Closure
In the event that river traffic induced erosion continues to occur, consideration must be given to temporary or permanent closure of the river to commercial cruises and other river traffic. This is not a matter to consider lightly, as such a move may significantly reduce the extent to which the World Heritage Area is presented to visitors (as required under the UNESCO *Convention Concerning the Protection of the World Cultural and Natural Heritage*, 1972) and would be likely to have a serious impact on the economy of Strahan in particular and the West Coast in general. The need for this option will be reviewed periodically.

8.1.2 Licence conditions for short stay boat based visitation

- Disembarkation will be permitted at the Heritage Landing Visitor Service Site.

8.1.3 Licence conditions for overnight boat based visitation

- Overnight stays will be allowed on suitably equipped vessels.

- Shore visits will be permitted at agreed sites. Such sites will be assessed for environmental sensitivity and listed in the licence agreement

- Higher standards of interpretation training will be required.

8.1.4 Licence conditions for aircraft based visitation

- Aircraft landings and take-offs will be confined to prescribed areas to be specified in the licence. If, for safety reasons, any operations occur outside of prescribed areas the operator should provide the Parks and Wildlife Service with a written report of the incident.

- Preferred flight paths and operating altitudes will also be specified in licences.

- Licences will allow for restrictions if monitoring demonstrates adverse environmental impact is occurring.

- The number of aircraft landings will be limited to 2 200 per annum in the Sir John Falls area, 1 500 in Limekiln Reach and 500 in the Horseshoe Bend area until monitoring indicates the impact of this activity.

8.2 Assessment of new proposals for commercial operations

- Applications for new proposals for commercial operations will be considered if in keeping with this plan and the World Heritage Area management plan.

- Applications must be made in writing to the Director, Parks and Wildlife Service. Applications will be assessed according to their likely impact on natural and cultural values and the existing visitor opportunities in the area. Applicants will need to meet the costs of assessment.

- The Parks and Wildlife Service will seek the advice of Australian Maritime College consultants on the need to test the wash wave heights of individual vessels on a case by case basis. Advice from consultants and wake wave height measurement conducted as necessary will be paid for by the vessel proponent.

- Commercial proposals may be required to submit a detailed business and financial plan showing a five year projection of operations which demonstrates economic viability and is in accordance with this plan.

Non-motorised tours

- Consideration will be given to granting licences to further commercial guided kayak or other non-motorised tours within the plan area if such operations are proposed.

- Licences conditions will limit shore access areas to zones 1, 2 and 4.

- Camping will be limited to areas that are already disturbed and relatively clear of undergrowth.

Helicopters

Should a proposal be made to land helicopters in the plan area careful consideration needs to be given to :

- disturbance to other visitors
- disturbance to wildlife
- airspace crowding
- shore facilities (none currently available)
- Helicopters cause minimal physical impact

Non-Commercial Special Events

- Operators of special events (organised races, commercial filming etc) are required to comply with the Special Events provisions of the Tasmanian Wilderness World Heritage Area management plan.

- Given the sensitive nature of the Lower Gordon environment it is unlikely that such events will be approved unless they are of low environmental impact.

9 Environmental research and monitoring

Understanding of both the river system and the causes of degradation is vital for ecologically sustainable long term management. Although significant advances in the scientific understanding of the lower Gordon River have been achieved in recent years, there is much that remains relatively poorly known. In order to ensure that the values upon which tourism is based are retained further scientific research is required to provide

information essential for the long-term sustainable management of the lower Gordon River system. Specific topics to be addressed are indicated below.

9.1 Monitoring of impacts of river use

- Monitoring of all aspects of river use.
- The extensive streambank erosion monitoring program will be maintained and upgraded as required.
- Further work will be done on experimental design and analysis in order to monitor the greater range of activities in more areas allowed under this plan.
- Motorised craft may cause disturbance of birds and other wildlife in the area. The potential impact of motorised craft on particularly birds using the river will be further investigated.
- Multidisciplinary scientific study should be made of all natural and cultural heritage aspects where the possibility of degradation exists through recreational or other use of the river (and surrounds) to determine the significance and vulnerability of these features.
- The bank erosion monitoring program may provide an opportunity for periodic survey of eroded areas of the river banks for Aboriginal sites.
- Additional monitoring of other aspects may be required in light of new research findings derived from these investigations or those outlined below.

9.2 Further research required for effective management

In order to sustainably manage the area a sound scientific database is required. In light of the magnitude of threats to the lower Gordon River and the limited understanding of many pertinent aspects it should be recognised that long term sustainable management will take considerable effort. This research should include, but not be limited to, the following topics.

- Sustainable management is dependant upon an understanding of the carrying capacity of the river, which is largely unknown. Substantial research needs to be directed towards establishing the limits of acceptable change and the level of impact that may be considered sustainable.
- The banks in each of the four zones vary in their susceptibility to wash wave erosion. Further research is required to establish wave height limits that will allow sustainable use of each zone.
- An ecological study of estuarine and alluvial banks, as well as karst areas is required similar to that already conducted on the levee bank sections of the river is required. This is considered a vital part of the information base necessary for long term sustainable management of the area.
- Comprehensive dating of fluvial and estuarine landforms is necessary to determine the long term erosion/deposition rates that are considered required knowledge for sustainable river management planning and the establishment of limits of acceptable change.
- Dating and analysis of ancient cave sediments should be undertaken to provide information about i) rates of river incision/uplift of the surrounding erosion surface, ii) vegetation history from pollen incorporated in sediment, iii) faunal history from vertebrate bone deposits and iv) the height and frequency of extreme floods. This data would be of value in reconstructing the geomorphic development of the entire area.
- The sub-catchment provenance of sediments deposited within the Gordon estuary is unknown. An examination of the middle Gordon impoundment to determine the volume of recent sediment trapped there needs to be undertaken as the first step in provenance analysis. If large volumes of sediment have accumulated at discharge points or elsewhere behind the dam since closure, a negative downstream sediment budget and lack of sedimentary replenishment would be implicated as a subsidiary factor in the erosion problem. This sort of data is also necessary for the calculation of rehabilitation rates.

10 Implementation

The Parks and Wildlife Service will be responsible for implementing the plan in co-operation with the Tourism Tasmania , Marine and Safety Tasmania, local tourism operators and the local community. Progress with implementation will be dependant upon available resources. It is intended that the plan will be reviewed within five years of its becoming effective, or if circumstances involving the condition of the river environment warrant earlier review. As the first step in implementing this plan it is intended to develop a business plan for the lower Gordon River and Sarah Island which examines the cost of management and research, the revenue generated and the economic benefits to the Tasmanian economy

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Appendix one: The primary objectives for World Heritage Area management

Overarching Management Objectives

The overarching management objectives of the Draft Tasmanian Wilderness World Heritage Area Management Plan 1997 are given below. They provide the basis from which is derived the more detailed planning objectives and management prescriptions of the World Heritage Area plan and subsidiary documents such as this.

OVERALL OBJECTIVE OF MANAGEMENT

1. To identify, protect, conserve, present and, where appropriate, rehabilitate the World Heritage and other natural and cultural values of the WHA, and to transmit that heritage to future generations in as good or better condition than at present.

The following objectives expand upon and augment the overall objective of management.

OTHER OBJECTIVES OF MANAGEMENT

Identify Values

2. To identify and more fully understand the World Heritage and other natural and cultural values of the WHA, their significance, and management requirements.

Protect, Conserve and Rehabilitate Values

3. To identify and take appropriate protective action to prevent, mitigate or manage within acceptable limits, adverse impacts on, or threats to, the World Heritage and other natural and cultural values of the WHA.

4. To conserve the values of the WHA in a manner consistent with their natural and cultural significance, and where appropriate, feasible and sustainable, to rehabilitate or restore degraded values. In particular to:

- 4.1 maintain or restore natural diversity and processes;
- 4.2 maintain or enhance wilderness quality;
- 4.3 maintain or enhance environmental quality;
- 4.4 maintain or enhance landscape quality and
- 4.5 protect and conserve historic heritage and Aboriginal heritage (in partnership with the Aboriginal community).

Present Values and Engage the Community

5. To present the WHA in ways that foster community understanding and appreciation of its World Heritage and other natural and cultural values, and that maximise support for the area's conservation.

6. To assist people to appreciate and enjoy the WHA in ways that are compatible with the conservation of its natural and cultural values, and that enrich visitor experience.

7. To foster the role of the WHA as an integral and valued component of community life, and to involve the community in the area's conservation.

8. To identify, protect, conserve and, where appropriate, present Aboriginal values of the WHA in partnership with the Aboriginal community.

9. To minimise, or contain within acceptable levels, hazards to human life and property.

Manage with Excellence

10. To manage the WHA with excellence, and to progressively improve the basis for, and practice of, that management in accordance with the above objectives.

Appendix two: chronology of major events relating to bank erosion

July 1979	HEC noted the "possible threat of riparian damage by vessels plying the navigable reaches of the river".
July 1981	Speed limit on the river is suggested by NPWS, however Marine Board requires details of damage before imposing such restrictions and no documented evidence exists.
14 Dec. 1982	UNESCO list the Western Tasmania Wilderness World Heritage Area.
Summer 1982/83	HEC commence Gordon below Franklin dam construction work. Conservationists mount a blockade in protest. This summer sees unprecedented levels of river traffic.
July 1983	Noticeable erosion, "substantial and active " in places, on parts of the river between Macquarie Harbour and Butler Island, according to letters to NPWS.
January 1985	First monitoring of bank erosion, by NPWS officers, and first media reporting of the problem.
23 March 1985	A six knot speed limit is imposed from Pine Landing to the southeast end of Horseshoe Bend, and upriver from one kilometre below Sir John Falls, two severely eroded areas.
6 June 1985	The speed limit is increased from six to nine knots by the Marine Board, for safety reasons.
October 1986	Consultants from the University of Wollongong are engaged for a preliminary study of bank erosion. They indicated there was a very serious problem.
16 January 1987	Announcement that, from 1 Feb. 1987, a nine knot speed limit will apply upstream of Limekiln Reach, as well as in the vicinity of Horseshoe Bend; with further restrictions foreshadowed.
1 July 1987	Further restrictions: vessels >8 metres are not to exceed 9 knots upstream of Mannigans Inlet, except for safety reasons.
March 1988	Further bank erosion studies by University of Wollongong consultants commissioned (final report produced October 1989).
April 1988	Bank erosion monitoring shows that erosion rates have reduced since speed limits were introduced. These results were not published until considerably later.
24 August 1989	World Heritage Area Ministerial Council announces that all cruise boats will be restricted to the area below the upstream end of Horseshoe Bend and that a nine knot speed limit will apply from the river mouth.
December 1989	The Department of Parks, Wildlife and Heritage expands the erosion monitoring program initiated by the University of Wollongong consultants, with subsequent six monthly (approximately) inspections.
October 1991	Gordon River Ecological Survey 1 published. This is a survey of the geomorphological, botanical, zoological and archaeological features of the lower Gordon River levee banks and floodbasins.
March 1992	Commencement of Low Wake Hull Project investigations by consultants from the University of Tasmania and the Australian Maritime College.
November 1993	Radiocarbon dating of bank sediments supports the hypothesis that banks were active depositional, or at least stable, environments prior to the onset of the river traffic induced erosion problem.
March 1994	Completion of Low Wake Hull Project final reports.

July 1994	Speed limits reduced to a uniform 6 knots for all commercial vessels. Findings of Low Wake Hull Project presented to commercial operators.
November 1994	Preliminary draft of this plan released for public comment. First low speed measurement of wake wave height by Australian Maritime College consultant. Gordon River Tourist Operations Inquiry (Bingham 1994) reports to Ministerial Council.
November 1995	Further wave height measurements by Australian Maritime College consultant. West Coast Yacht Charters permitted access beyond Horseshoe Bend to transport rafting parties off-river from Sir John Falls.
January 1996	Geophysical and sedimentological investigation of channel by James Cook University consultants.
January 1997	Further wave height measurements by Australian Maritime College consultant concurrent with experimental measurement of wave impact on banks conducted by Parks and Wildlife Service.
May 1997	Initial wave height measurement and bank impact experiments by Parks and Wildlife Service.
February 1998	Erosion monitoring indicates further improvement of the management of water craft required.