Kimberley regional water plan
Supporting detail

Draft for public comment

Looking after all our water needs

Department of Water
December 2010
Contents

Contents ..................................................................................................................... iii

1 Introduction .............................................................................................................. 1
  1.1 Background information ..................................................................................... 2

2 Water planning in the Kimberley ......................................................................... 3
  2.1 Context ................................................................................................................... 3
  2.2 Planning framework ............................................................................................... 3
  2.3 Government responsibilities and priorities related to water ......................... 3
  2.4 Water reform ......................................................................................................... 4
    2.4.1 Water resource management legislation .................................................... 5
    2.4.2 Statutory water allocation planning .............................................................. 6
    2.4.3 Consumptive pools and water access entitlements ...................................... 6
    2.4.4 Addressing over-allocation .......................................................................... 7
    2.4.5 Water resource accounting ............................................................................ 7
    2.4.6 Trading of water entitlements ........................................................................ 7
    2.4.7 The physical transfer of water ....................................................................... 8
    2.4.8 Indigenous perspectives in water reforms ..................................................... 8
  2.5 Addressing Indigenous disadvantage ................................................................ 8
  2.6 Native Title and Aboriginal heritage legislation ............................................... 9

3 The process and community involvement ......................................................... 10
  3.1 The principles ....................................................................................................... 10
  3.2 The stakeholders .................................................................................................. 10
  3.3 The approach ....................................................................................................... 10
  3.4 The process .......................................................................................................... 11
    3.4.1 The water forum ............................................................................................. 11
    3.4.2 Engagement with regional groups and people ............................................. 12
    3.4.3 Subregional discussion papers ...................................................................... 12
    3.4.4 Draft Kimberley regional water plan ............................................................. 13
    3.4.5 Supporting detail ............................................................................................ 13

4 Subregional approach and overviews ............................................................... 14
  4.1 Ord subregion: overview and future directions ........................................... 14
    4.1.1 Background ................................................................................................... 16
    4.1.2 Water resources and ecology ...................................................................... 18
    4.1.3 Current water use and management ............................................................ 19
    4.1.4 Stakeholder overview and planning activities ........................................... 20
    4.1.5 Regional hotspots ........................................................................................ 21
    4.1.6 Issues of significance .................................................................................... 22
  4.2 North Kimberley subregion: overview and future directions ..................... 25
    4.2.1 Regional setting ............................................................................................. 25
    4.2.2 Natural values ................................................................................................ 27
    4.2.3 The water resources ....................................................................................... 29
    4.2.4 Current water use and management ............................................................. 30
    4.2.5 Stakeholder overview .................................................................................... 31
    4.2.6 Planning processes and current initiatives ................................................. 31
    4.2.7 Regional hotspots ........................................................................................ 32
    4.2.8 Issues of significance .................................................................................... 33
  4.3 La Grange subregion: overview and future directions ............................... 35
    4.3.1 Background ................................................................................................... 35
Appendices........................................................................................................................................77
Glossary ........................................................................................................................................94
References ....................................................................................................................................96

Appendices

Appendix A — Community and stakeholders ..............................................................................77
Appendix B — Community consultation and information forums .............................................82
Appendix C — Water-dependent ecological assets .................................................................90

Figures

Figure 1 Kimberley region showing six subregions .................................................................1
Figure 2 The Ord subregion ........................................................................................................15
Figure 3 Native Title and Aboriginal communities .................................................................17
Figure 4 The North Kimberley subregion ................................................................................25
Figure 5  Pastoral stations and Aboriginal communities located within the North Kimberley subregion ................................................................. 26
Figure 6  Wild Rivers and Department of Environment and Conservation estates within the North Kimberley subregion .............................................. 28
Figure 7  Aboriginal reserves and Native Title determinations within the North Kimberley subregion ......................................................................... 29
Figure 8  The La Grange subregion ........................................................................................................................................................................... 35
Figure 9  The Fitzroy subregion ................................................................................................................................................................................ 40
Figure 10  The Fitzroy catchment showing land tenure .............................................................................................................................................. 41
Figure 11  Native Title and Aboriginal communities in the Fitzroy subregion ........................................................................................................ 43
Figure 12  The Fitzroy subregion showing river and waterway features, with Department of Water gauging stations ........................................................................ 49
Figure 13  The Desert subregion ................................................................................................................................................................................. 57
Figure 14  Pastoral stations and Indigenous communities within the Desert subregion ........................................................................................................... 58
Figure 15  Wild Rivers and Dec estates within the Desert subregion .................................................................................................................................. 61
Figure 16  Groundwater licence locations within the Desert subregion .................................................................................................................................. 62
Figure 17  The Dampier subregion ................................................................................................................................................................................. 66
Figure 18  Land use and tenure within the Dampier subregion ..................................................................................................................................... 67
Figure 19  Native Title determinations and Aboriginal communities within the Dampier subregion ............................................................................................................ 68
Figure 20  Key surface water and groundwater resources within the Dampier subregion ................................................................................................. 71

Tables

Table 1  Water resource management issues in the Ord subregion .................. 22
1 Introduction

Water is a defining feature of the Kimberley landscape, is vital to the region’s socio-cultural character and a critical natural resource supporting agriculture and a range of industries.

Planning for the future sustainable use of water in the region and the protection of water-dependent values is a priority for the Department of Water. The *Kimberley regional water plan 2010–2030: Draft for public comment* (the Plan) has been developed to guide the management of water resources for the next 20 years.

The Plan applies to the Kimberley region, as shown in Figure 1. To better scope and define the issues across the region, and to communicate with regional stakeholders, the Kimberley was split into six subregions for analysis.

![Kimberley region showing six subregions](image)

The Plan consists of two documents:

1. *Strategic directions and actions* – outlining the Kimberley’s major challenges in water resource management
2. *Supporting detail* (this report) – looks at the region in detail and provides background information on how the report was put together, including the community and stakeholder engagement process.
1.1 Background information

The Department of Water prepared and published discussion papers for the Kimberley’s six subregions to ensure broad consultation during the Plan’s preparation. These are now incorporated in Section 3 of this document.

Description of the region’s groundwater resources is based largely on work by Allen et al. (1992) and the Geological Survey of Western Australia (1992). Work by Barber and Rumley (2003) has added considerable knowledge to Indigenous issues in the Kimberley.
2 Water planning in the Kimberley

2.1 Context

Western Australia’s Kimberley region has some of the world’s most recognised and intact natural and cultural landscapes. The region’s water resources support healthy ecosystems as well as social and cultural values.

There is a growing national perception that water resources are plentiful and available for development in northern Western Australia. In reality, the Kimberley is a water-limited environment characterised by northern Australia’s wet/dry cycle of water abundance and scarcity, with significant constraints to water resource development. The sustainable management of the Kimberley’s water resources is therefore essential to the region’s future social, cultural and economic prosperity and development must build on the region’s special characteristics.

The challenge we often face in the Kimberley is assessing and managing large-scale development proposals in the absence of integrated regional development strategies.

2.2 Planning framework

Regional water plans are being developed throughout Western Australia, the boundaries for which generally align with the Regional Development Commission boundaries set out by the Department of Regional Development and Lands. Given the growing demand for a highly variable water resource, and the perception of year-round water abundance in the Kimberley, a longer-term strategic approach to water planning is essential.

The Kimberley regional water plan covers all water users within the Plan area, although different aspects of the Plan will be relevant to different water users.

2.3 Government responsibilities and priorities related to water

The sustainable management of the state’s water resources is the responsibility of the Minister for Water with the support of the Department of Water. Established in 2005, the department is responsible for water policy and planning and the overall management and regulation of water resources in Western Australia. The department is also accountable for investigating and assessing water resources, providing security of water use for the environment and communities, licensing water extraction, managing catchments and aquifers, setting limits on volumes of water able to be allocated for consumptive use, protecting drinking water sources, drainage planning, floodplain mapping and planning, setting standards for water service provision and implementing water reform.
The department is not the only government agency or organisation with water-related priorities in the Kimberley. Appendix A lists the organisations and their roles and responsibilities for water in the region.

2.4 Water reform

Water reforms, at both the state and national level, are introducing significant changes to how Western Australia manages and plans for its water resources, which in turn will influence long-term water resource planning and management in the Kimberley.

In 2006, Western Australia signed the *Intergovernmental Agreement on a National Water Initiative* (NWI) (Council of Australian Governments 2004; Ray & Kalaitzis 2007), thus embarking on a statewide program of water reform. The NWI is an agreement between the Commonwealth and state and territory governments that recognises the imperative to increase the productivity and efficiency of Australia’s water use and improve water management across the country.

As a signatory to the NWI, Western Australia is committed to implementing a number of reforms including:

- improved water allocation planning that includes provisions for environmental and other public benefit outcomes and improved environmental management practices
- protecting the health of surface water and groundwater systems
- progressive removal of barriers to trade in water entitlements and setting up an open trading market
- undertaking better monitoring, reporting and water accounting for water extraction, and improving public access to this information
- clarifying the assignment of risk for future changes to water availability
- policy setting that facilitates water use efficiency and innovation in both urban and rural areas.

In particular, the NWI seeks to provide more confidence and security for those investing in the water industry by amending state water legislation. This will enable full implementation of the water reform measures and provide secure, legal and perpetual water access entitlements and the establishment of statutory-based water allocation plans.

For further details on the NWI, refer to the *Intergovernmental agreement on a National Water Initiative* at <www.nwc.gov.au>.

It is proposed that new state water resources management legislation and water services legislation be drafted to encompass these water reforms.
2.4.1 Water resource management legislation

Western Australia’s water legislation will be amended so that the water reform measures may be implemented fully. A new Water Resources Management Bill will replace the outdated Rights in Water and Irrigation Act 1914 (WA) as well as the water resource management provisions in other related legislation, and provide a contemporary approach to water management.

Through its new legislation, the state government will establish a new system of allocating water through:

- water licenses (including existing licences established under the Rights in Water and Irrigation Act), which provide a defined volume over a defined period for a specified purpose, issued to the licence holder subject to defined conditions
- water access entitlements (WAEs) – new forms of entitlements – which will be a share of the consumptive pool issued in perpetuity to the entitlement holder on completion of a statutory water allocation plan
- basic rights to take limited water for livestock and domestic purposes.

An important part of the new water legislation is the establishment of statutory water allocation plans which will be legally enforceable. Water allocation plans define limits on the extraction of water from any water resource being managed under the plan. They will specify how and where WAEs will coexist within the plan area. They will also establish the impact management arrangements required to manage water extraction, which will apply irrespective of the type of water entitlement issued.

The passage of the new legislation, currently scheduled for 2011–12, will support the water management requirements of the Department of Water. Until the new legislation is enacted, all water licences (whether or not they are in an area subject to a water allocation plan) will continue to be managed in accordance with the Rights in Water and Irrigation Act.

The Act allows licences to be granted for fixed terms after consideration of all matters including whether the taking and use of water is ecologically sustainable, environmentally acceptable, prejudicial to other current or future needs for water or likely to have a detrimental effect on another person (Schedule 1, section 7(2) of the Act).

Another significant piece of legislation for the water service industry is the Water Service Licensing Act 1995 (WA). This Act stipulates that a person cannot provide a water service (potable water supply, sewerage, irrigation or drainage) in a controlled area unless they have an operating licence, or are exempt by the Governor. The Economic Regulation Authority (ERA) administers the water services operating licence scheme.

The Department of Water is also integrating water services legislation into a new Water Services Bill to consolidate regulatory arrangements for the construction and operation of works associated with water services. Under this new Bill, it is
envisioned that the whole state will be a controlled area and any water service provider will require a water service operating licence or be exempt from this requirement.

2.4.2 Statutory water allocation planning

Statutory water allocation planning is an important mechanism to help the government and community make water allocation decisions to meet economic, environmental and social objectives.

Statutory water allocation planning will provide for:

- secure ecological outcomes and define appropriate management arrangements to achieve those outcomes
- resource security outcomes by determining the rules to allocate water on a fair, equitable and sustainable basis.

In the Kimberley, statutory water allocation plans will be determined for all areas where multiple interests are likely to want to extract water from the same resource. The statutory water allocation plans developed for the region’s priority areas will be informed by best-available science, socio-economic analysis and community input. There are currently no statutory water allocation plans in the Kimberley.

2.4.3 Consumptive pools and water access entitlements

In addition to the continuation of the existing water licensing process, the new forms of entitlements discussed in Section 2.4.1 – to be known as water access entitlements (WAEs) – will be established under the new legislation. The consumptive use of water for non-domestic purposes will require a WAE, to be issued as a perpetual share of a specified water resource (known as a consumptive pool), as determined by a relevant statutory water allocation plan.

A WAE will enable the department to allocate water to consumptive use on the basis of water availability. A WAE will not be tied to any parcel of land, but will entitle the holder to a volume of water depending on how much is available from the consumptive pool. Annually or periodically, the department will determine the water available from the consumptive pool and allocate this water to WAE holders, on the basis of their share of the consumptive pool. However, a WAE holder will not be able to extract and use water from a water resource without a ‘water allocation’, a ‘water take’ licence and a ‘water use’ licence. These components are sometimes referred to as the ‘unbundling’ of a licence currently issued under the Rights in Water and Irrigation Act, which incorporates all these components in the one licence.

Under a drying climate, the water available in a consumptive pool may reduce. The department may then need to reduce the water allocations of WAE holders to protect the integrity of environmental values and/or basic rights. The opposite may also occur after a particularly wet year. To put it in simple terms: while the share in the consumptive pool will not change, the volume that this share represents may change.
Consumptive pools and WAEs may not operate everywhere in the Kimberley, but are likely in defined water systems where demand for water is high and significant competition for water exists. Water licences will continue to operate in parts of the region where consumptive pools have not been, or may not be, established.

### 2.4.4 Addressing over-allocation

Failure to adhere to the sustainable yields and allocation limits of a water resource may result in over-allocation. Over-allocation of water resources can lead to over-use that may produce short-term economic gains but will eventually lead to detrimental environmental impacts. Social and economic impacts can also occur when over-allocated and over-used water systems are subject to allocation reductions to return them to sustainable levels. The department will firstly work towards avoiding over-allocation and secondly, where it does occur, set appropriate pathways to return water resources to sustainable levels of allocation.

The department is also developing a risk-assignment framework that will apply post-2014 to any future reductions in the availability of water for consumptive use. It will apply to water resources subject to statutory water allocation plans incorporating consumptive pools and WAEs. Briefly, WAE holders will bear the risks of any entitlement reduction arising from reductions to the consumptive pool as a result of changes in climate and natural events such as bushfires and drought. Any risks associated with new knowledge or policy changes will be shared between water users and government according to an agreed formula. The risk-assignment policy is being developed in line with the national water reform agenda.

### 2.4.5 Water resource accounting

Water resource accounting in the region will be enhanced. This will ensure that adequate measurement, monitoring and reporting systems are in place to support public and investor confidence in the amount of water being extracted for consumptive use, traded, and allocated to the environment. Mandatory metering of water extraction will be phased-in across the state.

Water reforms will see that policy, planning, management and/or regulatory measures are applied where necessary to protect the integrity of licences and WAE systems in the future and, importantly, the achievement of environmental objectives.

### 2.4.6 Trading of water entitlements

The trading of water entitlements is, and will remain, voluntary. An efficient water market will be enabled by the new water legislation. One of the associated reforms involves the development of a publicly accessible water register of all WAEs and trades. The department will set the local rules for trading which will include the assessment of impacts on the environment and other users. Trading in WAEs may not be appropriate in all areas, and will be facilitated only in water resources subject to statutory water allocation plans.
2.4.7 The physical transfer of water

The physical transfer of water (through pipes) between management areas already occurs in Western Australia (e.g. the pipeline from Perth to Kalgoorlie). In the Kimberley, where water surpluses and shortages occur in different areas, it may be of overall environmental, social and economic benefit to transfer the water from a surplus to a deficit area under a clear set of rules and conditions.

2.4.8 Indigenous perspectives in water reforms

The NWI explicitly recognises the special character of Indigenous interests in water. All jurisdictions are committed to achieving better outcomes for Aboriginal people, improving the delivery of services, building greater opportunities and helping families and individuals become self-sufficient. It is a requirement that WAEs and planning frameworks explicitly recognise Indigenous needs in relation to access and management of water resources. Indigenous access is to be achieved through planning processes that:

- include Indigenous representation in water planning, wherever possible
- incorporate social, spiritual and customary objectives and strategies for achieving these objectives, wherever they can be developed
- take account of the possible existence of Native Title rights to water
- potentially allocate water to Native Title holders
- account for any water allocated to Native Title holders for traditional cultural purposes.

2.5 Addressing Indigenous disadvantage

In December 2007, the Council of Australian Governments (COAG), which comprises the Commonwealth and all state and territory governments, agreed to a partnership to work with Indigenous communities to ‘close the gap’ on Indigenous disadvantage. Included in this partnership approach is optimal service delivery for small remote communities – including water service delivery.

The Department of Water highlighted issues in water service delivery to Indigenous communities in Western Australia in the Report for the Minister of Water Resources on water services in discrete Indigenous communities (DoW 2006). The report called for a whole-of-government action plan to improve the delivery of essential services, particularly water, to Indigenous communities. The report also requested that the department take a lead role in developing this action plan. The department has accepted this role and is working with the Western Australian Taskforce on Essential Services to Indigenous Communities and with COAG to improve the delivery of essential services.

The department recognises that the significance of water to Aboriginal people goes beyond water service provision. The department’s water allocation planning process
will provide for Indigenous access to water resources and, as such, engagement with Traditional Owners is vital to the planning process.

2.6 Native Title and Aboriginal heritage legislation

Native Title describes the rights that Aboriginal and Torres Strait Islander people hold in the land and water by virtue of their occupation of Australia before European settlement. The Commonwealth *Native Title Act 1993* sets out the processes and obligations that relate to dealing with land and water that is, or in the future may be subject to a Native Title claim. Native Title rights may range from complete ownership of land (Native Title) to a limited number of specific rights of access or carrying out certain activities. These rights can vary considerably between different areas and claims. Where Native Title has been established, the holders may have certain additional rights over and above those of ordinary land holders, such as hunting and fishing rights, or rights to protect sites of significance.

Native Title provides an important framework for water management. Proposals for water extraction may need to be analysed with regard to potential impacts on the exercise of Native Title rights and interests.

Native Title rights relating to waters are generally restricted to the purpose of satisfying personal, domestic or non-commercial communal needs, including those of observing traditional, cultural, ritual and spiritual laws and customs.

A significant proportion of the Kimberley is subject to Native Title or Native Title claims and the department is committed to working with Native Title holders and claimants in its water planning and management activities.

The *Aboriginal Heritage Act 1972* (WA) protects all known and unknown/unrecorded sites of cultural or historic significance to Aboriginal people, regardless of the land tenure where those sites are located. A wide range of places can be identified as significant sites. The Act makes it an offence to conceal, knowingly damage or alter a significant site unless authorisation is received from the Registrar of Aboriginal Sites or consent is obtained from the Minister for Indigenous Affairs.
3 The process and community involvement

3.1 The principles

- Be as inclusive and wide reaching as possible.
- Build on existing and previous projects and processes.
- Integrate planning with other initiatives to provide context and respect for people’s time.

3.2 The stakeholders

The Kimberley has a unique social and cultural character. It has a small population that is widely dispersed throughout a large and remote area. This makes bringing people together difficult, although the networks are strong.

There is a significant permanent Indigenous population of residents and Traditional Owners, many of whom still have strong connections with their Country and maintain cultural practices. They live in all the major towns as well as in numerous remote communities of varying sizes. Many Indigenous people speak English as a second language and have a limited formal education.

There is a high transient population employed in various service, government and industry sectors, as well as a vibrant pastoral and agricultural sector that is widely dispersed and remotely located. The wet season isolates many of the pastoral and Indigenous communities and along with large distances, makes travel and access challenging. Only rudimentary telecommunications are available to many of these communities, making internet communication unreliable at best.

Appendix B lists the organisations and stakeholder groups who attended the information forums and were consulted in the planning process. The list is comprehensive and contains the names of individuals within the organisations and stakeholder groups.

3.3 The approach

Given the challenges that exist in the region, certain approaches for informing and engaging people in planning are more successful than others. The community and stakeholders have repeatedly said they wanted to know how things connect (the context) and how new initiatives build on the work and input they have been providing for many years (the integration).

There have been many planning processes related to natural resource management (NRM), planning and land and water development over the years in the Kimberley. A variety of forums, workshops, meetings and consultation processes have asked local people about their values for water and their aspirations for regional development. These have been documented in a range of papers, plans, proceedings and studies. For this Plan, a thorough review of previous work was important to capture the values
and aspirations that stakeholders had already shared (to bring these through to current water planning).

Supporting and using existing networks, groups, projects and committees was another important principle given the difficulty in getting people together; the importance of ‘context’ to people when contributing to planning; and the time commitments of regional people already involved in a range of planning and NRM initiatives.

Community and regional stakeholders also indicated they needed training, education and capacity to engage in water planning and management. In recognition that water planning is not a standalone process or a means to an end, the department has provided a framework to strategically link and progress broader integrated water management outcomes across the community, industry and government sectors.

3.4 The process

1) Inform people of the process (launched by the Kimberley Water Forum in 2008)

2) Literature and consultation review

3) Regular updates to many groups and stakeholders, with regular information (such as e-Bulletins or briefings at their local meetings)

4) Six subregional discussion papers prepared and published

5) Discussion papers sent out to groups for comment and subregional workshops held

6) All information (literature review, discussion papers, workshops, written comments) bought together to prepare a draft Kimberley regional water plan: Strategic directions and actions 2010–2030 and Supporting detail

7) Both reports making up the Kimberley regional water plan to be released for a two-month public comment period

8) Public submissions will be analysed and incorporated into a final Kimberley regional water plan: Strategic directions and actions 2010–2030 and Supporting detail with an accompanying Statement of Response referring to all submissions received.

3.4.1 The water forum

The Department of Water initiated the regional planning process in 2008 with a joint Kimberley Water Forum run in partnership with four other regionally based organisations: the Kimberley Land Council, Environments Kimberley, the Department of Agriculture and Food, and the Tropical Rivers and Coastal Knowledge research program. This forum brought together about 100 people from the Kimberley community and other water-related sectors such as the National Water Commission, research organisations, the Indigenous Water Policy Group and local people.
undertaking river projects – to put together the ‘water picture’ in the Kimberley, as it related to the state and national picture. The forum shared information and knowledge and provided an opportunity to illustrate the complex interrelated nature of water management in the region.

The forum was planned with the needs of all stakeholders and partners in mind, including special structures and communication styles to encourage Indigenous participation (such as language interpreters). There were many break-out sessions between presentations to allow for processing of the information and explanation by interpreters and presenters. Constructive discussion occurred across sectors and interest groups and clearly demonstrated the sharing of information, which was an objective of the forum. The key messages to emerge from the forum have been used to underpin the regional planning process undertaken by the department in the Kimberley.

3.4.2 Engagement with regional groups and people

The Department of Water (and its predecessors the Department of Environment and the Water and Rivers Commission) has been involved in a wide range of NRM activities over many years in the Kimberley. We have supported various NRM groups, Land Conservation District Committees (LCDCs) and catchment groups (such as FitzCAM and Ord Land and Water).

For the regional planning process, we built on our existing networks and relationships and established some new ones to enable us to talk about water management with people and stakeholders across the Kimberley. We provided regular briefings about the process and collated all the water issues raised by the various groups including government agencies. We gave presentations to a wide range of other stakeholders to inform them about the planning process and to seek their input on the main issues. Much of this communication was in response to messages from people who said they needed to better understand water management and planning to contribute effectively.

3.4.3 Subregional discussion papers

The community and stakeholders helped to define the six subregions (shown in Figure 1), which made sense from a broad geographical and water issues perspective.

After reviewing much of the literature for the region, including previous NRM forums, workshops and proceedings, the six subregional discussion papers were prepared. These identified the key issues unique to the subregion and possible actions to address them. The discussion papers were then distributed widely to stakeholders for review, with an invitation for submissions.

The department then held some specific workshops and meetings to present the individual discussion papers to various groups and stakeholders in the subregions. We worked through existing structures and groups wherever possible, such as LCDCs; Indigenous Protected Area (IPAs) and catchment groups (e.g. FitzCAM); the
East Kimberley Reference Group and the Kimberley Aboriginal Reference Group. We also presented specific briefings and workshops to shires, government departments and organisations on the subregional issues and gathered feedback through these forums.

The discussion papers formed part of the department’s regional water planning process and contributed to a framework for water management that clearly recognises and builds on the significant progress already made by the community, local stakeholders, government and other organisations. The information in the six subregional discussion papers has been captured in Section 4 of this report.

3.4.4 Draft Kimberley regional water plan

From the forums, workshops and written submissions, we refined the regional water issues within each subregion and prepared the draft *Kimberley regional water plan*. The draft Plan was released for a two-month period of formal public comment. All written submissions have contributed to the preparation of the final plan.

The *Kimberley regional water plan* will help guide the Government of Western Australia in developing key policy positions for the region and will identify areas needing more detailed water planning, particularly areas that have significant emerging development pressures.

3.4.5 Supporting detail

This *Kimberley regional water plan: Supporting detail* report provides technical and non-technical information to support the Plan.
4 Subregional approach and overviews

The following subregional overviews:

1) identify the current status of water use and management in the subregion
2) identify the key people and groups
3) identify the key issues facing water management in the catchment in the future
4) suggest future directions and ways forward to manage and resolve identified issues.

4.1 Ord subregion: overview and future directions

The Ord subregion covers the catchment area of the Ord River and its tributaries in the Kimberley region’s east (Figure 2). The catchment covers an area of 55 100 km² and with a length of 650 km, the Ord River is one of the state’s major river systems. The Ord River basin and its water resources have an almost 40-year history of modification and use for irrigated agriculture and hydro power, through damming of the main Ord River channel by the Kununurra Diversion Dam and later by the main dam at Lake Argyle and establishment of irrigation infrastructure. Significant research, investigation and consultation has been undertaken by a number of key organisations and departments throughout the Ord River basin’s development, with recognition of the area’s rich cultural, social, environmental and economic values.
Figure 2  The Ord subregion
4.1.1 Background

The Ord subregion encompasses the towns of Kununurra, Wyndham and Halls Creek, as well as 26 pastoral stations. A number of pastoral stations and crown reserves are vested in the Aboriginal Lands Trust throughout the catchment.

The population of the Ord subregion is largely based in the three towns, with a combined population of 6500 averaged across the two Australian Bureau of Statistics census periods from 2001 and 2006 (ABS 2006). A significant additional population resides outside the towns on pastoral stations and in communities. Up to 73 Aboriginal communities are found in the subregion, with transient populations moving into and out of the main towns throughout the year (Figure 3).

Ord River surface water management plans

The Ord River Irrigation Area (ORIA) has been developed in stages since the Kununurra Diversion Dam and the Ord River Dam were first constructed in 1963 and 1972 respectively, allowing for the preliminary development of small parcels of farmland within the Ivanhoe and Packsaddle plains. For the first two decades of farming and irrigation, limited development of the area occurred and the ORIA slowly recovered from the failed use of commercial cotton as a crop.

The 1990s saw partial expansion of the Stage 1 ORIA in line with construction of the Ord River Dam hydro-electric power station (which supplies power to the Argyle Diamond Mine and the towns of Kununurra and Wyndham). The Western Australian and Northern Territory governments also proceeded with planning to account for current and future expansion.

The Department of Water (then the Water and Rivers Commission) began preparing a water allocation plan in 1997 to establish a framework for sharing water between competing needs: the environment; current and future needs for water; and hydro-electricity generation. A draft interim water allocation plan for the Ord River was released for public review in 1999, with a consultation period undertaken on the advice of the Environmental Protection Authority (EPA).
Figure 3  Native Title and Aboriginal communities
The Department of Water released the final *Ord River water management plan* in 2007. We are currently updating this plan to include:

- revised environmental water provisions (EWPs) for the lower Ord River incorporating the catchment’s updated hydrological characteristics, as detailed in *Ecological water requirements for the lower Ord River* (DoW 2007)
- revised release rules for the hydro-electric power station
- management rules for the current Ord expansion project.

The updated *Ord River surface water allocation plan* will be released for public comment in 2011, in line with stakeholder input on the current 8000 ha expansion project. While the allocation volumes have not changed from the 2007 plan, public comment is being sought before a final updated plan is released. Once the EWP is confirmed, it will be possible to issue a water licence to a water service provider to deliver bulk water for the expansion project.

Any further modification to the existing Ord River irrigation system resulting in changes to flow regimes, or potential increases to allocations beyond the current limits specified in the 2007 *Ord River water management plan*, will require revisions to the plan, the EPA assessment, power supply agreements and the *Ord final agreement* (2005), as well as development of interstate agreements and extensive community consultation – all of which is beyond the scope of the current planning update.

### 4.1.2 Water resources and ecology

**Surface water**

Before the dams were built, flow in the Ord River was seasonally variable. Large flood events occurred during the wet season with flooding of Carlton Plain and Mantinea Flats, while dry season flows were negligible.

Construction of the Kununurra Diversion Dam and the Ord River Dam significantly changed the Ord River system, altering seasonal flow regimes and flood events. Peak flood events and wet season flows have decreased and dry season flows are maintained by controlled releases. Commissioning of the hydro-electric power station in 1996 resulted in further requirements for flow maintenance; that is, regulated releases from Lake Argyle (O’Boy et al. 2001).

The Ord River has been used for irrigated agriculture for more than 30 years and has enabled the development of a significant horticultural industry within the ORIA. The ORIA presently covers an area of 12 500 ha on the Ivanhoe Plain and 2500 ha on the Packsaddle Plain.

**Groundwater**

The Ord basin is underlain by a series of groundwater resources primarily comprised of the Bonaparte, Ord-Victoria and Combined Fractured Rock aquifers.
The Bonaparte Aquifer lies to the west of the subregion and extends from beneath the ORIA, north to the coast and then crosses into the Northern Territory. The shallow alluvial aquifers have an associated current low level of water use both within the ORIA (where they are underlain by bedrock) and pastoral leases extending to the north. Groundwater in the ORIA is a key focus for water management (through irrigation licences) due to rising groundwater and salinity potential and has been the subject of extensive research during the past eight years.

The Ord-Victoria and Combined Fractured Rock aquifers extend over a vast area of the Kimberley region and into the eastern and southern Ord subregion. Water availability is mostly limited to fractures in the bedrock and localised sedimentary aquifers located in and around the town of Halls Creek. Groundwater usage is limited to key mining operations, Aboriginal communities and non-intensive pastoral use.

**Ecology**

Three Ramsar wetlands are listed for the Ord River: the Ord River Estuary and False Mouths of the Ord in the tidal range, the Parry Floodplains, and lakes Kununurra and Argyle (listed for their post-dam values). These areas are recognised for their uniqueness as some of the best examples of tropical floodplain, mudflat and wetland areas supporting biologically diverse populations of vegetation, high populations of waterbirds and saltwater crocodiles (Australian Wetlands Database 2008).

### 4.1.3 Current water use and management

**The Ord Irrigation Cooperative**

The Ord Irrigation Cooperative (OIC) is licensed to divert an average of 335 GL per year from Lake Kununurra. This annual water entitlement is authorised to be diverted at the M1 supply area off-take and the Packsaddle pump station, and distributed to OIC’s shareholders. The licence is issued for the purposes of distribution and supply to irrigators for irrigation use, and for non-potable commercial uses in areas serviced by the Stage 1 channel systems of the district (DoW 2006).

Small land holders adjacent to the first 12.8 km of the M1 supply area remain customers of the Water Corporation. The Water Corporation holds a licence to divert water into the M1 supply area for these customers as well as to flush the channel. The licence has an annual allocation of 3.9 GL per year.

**Licensing irrigators that pump direct from the Ord River**

Approximately 80 landowners adjacent to the Ord River (mainly small land holdings <10 ha) have established their own pumps and pipes to divert water directly from Lake Kununurra or the downstream river. (Irrigators that divert water from the lower Ord River are located within 15 km of the Kununurra Diversion Dam.) These self-supplied users are predominantly small-scale irrigators, although some diversions are for public and commercial purposes. To divert water lawfully from the Ord River watercourse, each land owner is required to hold a licence under the *Rights in Water and Irrigation Act 1914*. 
A number of town water supplies are established in the Ord River catchment including Kununurra, Wyndham and Halls Creek. Wyndham town water supply is sourced from Moochalabra Dam, which has water quality issues related to sedimentation and thus bio-filtration of the water supply is required (WRC 2002a; DoE 2003). Halls Creek is facing a steady increase in population pressure (WRC 2002b); however, the Water Corporation’s recent addition of a new borefield about 2 km from the existing water supply network will ease housing pressures.

Other key water use in the subregion comprises non-intensive stock usage from pastoral bores that intersect groundwater, as well as mining and mineral exploration activities. Two key mining operations in the Ord subregion, Argyle Diamond Mine (Rio Tinto) and the Savannah Project (Savannah Nickel Mines Pty Ltd), are licensed to use water for dewatering, camp purposes, potable water supply and processing purposes.

**Reserve management and the Ord final agreement**

Reserve 31165 is 125 000 ha in size and borders the eastern and southern shores of Lake Argyle. As part of the *Ord final agreement* (OFA) (2005), Reserve 31165 was jointly vested in a management body consisting of the Department of Water (then known as the Water and Rivers Commission) and the Miriuwung-Gajerrong (MG) Corporation for the purposes of protecting water resources and wetland values, and maintaining and enhancing traditional culture. As required by the OFA, a Joint Management Committee was established in 2006 to manage the land and is comprised of representatives from four Indigenous groups and the Department of Water. The reserve is vested for the following purposes:

1) protection of the water resource values of Lake Argyle and the Ord River Dam
2) the protection of Lake Argyle’s wetland values
3) the maintenance and enhancement of the traditional culture of the MG people (for Reserve 31165, the Miriuwung and Gija language groups)

The OFA committed state funding for the committee to develop a management plan for the reserve. An interim management plan was completed in March 2008 after consultation with a wide range of stakeholders, including Indigenous groups, pastoralists and various state agencies. It was developed to guide investment and land management to 2011 and to build the MG’s capacity to sustainably manage the area in the longer term. Strong partnerships with stakeholders have been developed and the committee has, with the support of Commonwealth and state government funding grants, begun implementation of the management plan.

**4.1.4 Stakeholder overview and planning activities**

The Ord River has been the focus of a significant body of research and planning activities undertaken by a wide range of stakeholders over the years. Research and planning has been a response to emergent natural resource management (NRM) issues primarily associated with modification of the Ord River system and subsequent agricultural development of the Ord River valley. Stakeholders in the
region have been involved in collaboratively setting NRM priorities and driving research into best management practices.

Activities of particular relevance to water management and planning have included studies of hydrological modelling, groundwater accession, environmental water requirements for the lower Ord River, water quality monitoring and assessment, erosion and sedimentation, pesticide residues, and various environmental and cultural studies related to water and the Ord River.

The Ord River valley was identified as a priority catchment for research investment through the National Action Plan for Water Quality and Salinity and the Natural Heritage Trust. A large body of research has been carried out, led by a multi-agency and community-based stakeholder reference group (the East Kimberley Reference Group). Another integrated research program focused on the Ord River catchment was the Ord Bonaparte Program that ran from 2001–03 and contributed to a range of social, environmental and economic studies.

In 2000 the Ord land and water management plan was produced, which was driven by a strong community process. This resulted in formation of Ord Land and Water (OLW), a community-based NRM group focused on the wise use of land and water and reducing the impact of land uses in the catchment.

A strong community and cross-agency stakeholder network (Appendix A) that collectively drives the research agenda has resulted in a solid foundation of research in the catchment. With the Ord irrigation scheme’s expansion, further knowledge needs to be generated around aspects of water quality, delivery, efficiency and use.

4.1.5 Regional hotspots

In 2008, the Western Australian Planning Commission and Department of Planning, in conjunction with Landcorp, jointly prepared a regional hotspot land supply report for centres in the Kimberley, Pilbara, Gascoyne and Goldfields-Esperance regions. Together with Broome, Derby and Fitzroy Crossing, Halls Creek and Kununurra were identified as regional hotspots.

The report focuses on land and housing supply issues as a result of growth in the resource and/or other industry sectors. The main challenges for land release and housing supply related to water include:

- resolution of Native Title and Indigenous heritage issues (Fitzroy Crossing)
- limited availability of land constrained by the 100-year flood level (Fitzroy Crossing)
- capacity constraints in the building and construction industry (Kununurra)
- wet season conditions limiting civil works (Kununurra).

A key regional initiative has been the development of the Kimberley regional water plan, which consolidates the available water information, identifies water management issues and reports on actions to be implemented in the region. This report was developed to support the Kimberley regional water plan.
4.1.6 Issues of significance

Some of the key water resource management issues to have arisen through discussion with stakeholders, previous planning processes and a range of projects and forums relevant to the Ord subregion are discussed in Table 1.

<table>
<thead>
<tr>
<th>Issue</th>
<th>Department of Water comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Water planning and management</strong></td>
<td>Sections of the lower and upper Ord River are classified as wetlands of international significance under the Ramsar convention. As manager of the state’s water resources, we need to integrate our work with the Department of Environment and Conservation – the agency responsible for Ramsar classification management and protection – to incorporate values and criteria associated with Ramsar and other environmental listings.</td>
</tr>
<tr>
<td>Maintaining environmental flow in the Ord River</td>
<td>We will continue to ensure the Ord River system’s environmental requirements are being met. We are doing further work to confirm the ecological water requirements (EWRs) and develop a monitoring strategy. EWRs were set by the EPA in 1999 and incorporated into the 2007 Ord River water management plan.</td>
</tr>
<tr>
<td>Facilitating the release of further land and water allocations with</td>
<td>A technical update of the 2007 Ord River water management plan is being undertaken to allow for the release of further land and water allocations for the ORIA expansion. This will include revision and update of EWPs and release rules following negotiation and revision of the licence with the Water Corporation and Pacific Hydro for storage and management of the Ord River dams.</td>
</tr>
<tr>
<td>the review and update of the 2007 Ord River water management plan</td>
<td></td>
</tr>
<tr>
<td>Lack of an integrated water quality management framework for the Ord</td>
<td>This water quality framework should address the following key target areas:</td>
</tr>
<tr>
<td>River catchment</td>
<td>- setting water quality targets for the ORIA stage 1 &amp; 2</td>
</tr>
<tr>
<td></td>
<td>- on-farm practice in the ORIA – fertilisers/pesticides, drainage and waste ways</td>
</tr>
<tr>
<td></td>
<td>- groundwater levels and salinity in the ORIA</td>
</tr>
<tr>
<td></td>
<td>- drainage and erosion (upper catchment) including</td>
</tr>
</tbody>
</table>
pastoral management, infrastructure development, erosion control and sedimentation into Lake Argyle
• build on work undertaken through previous projects (i.e. National Action Plan for Water Quality and Salinity).

**Water supply and demand**

| Management of mining and irrigation developments | Careful management is required around a number of industries using water in the Ord Catchment – to ensure sustainability of supply and protection of the water resource and its dependent ecologies. These include mining operations, mineral exploration, horticulture and agroforestry. |
| Provision of advice on town water supply schemes | We have responsibility for licensing water service providers and ensuring thorough assessment and provision of advice on groundwater and surface water resources used for town water supplies. |
| Lack of water supply quality testing and treatment facilities for small remote Aboriginal communities | Testing of remote community drinking water and maintenance of infrastructure is an important issue to Indigenous communities across the Kimberley. Communities with a population above 50 receive monthly water quality testing and planned and unplanned maintenance through the Department of Housing’s Remote Area Essential Service Program (RAESP). The state government’s policy is that services to small remote Aboriginal communities and outstations (generally those of less than 50 people) are the responsibility of the Australian Government. At present communities with a population of less than 50 do not receive water quality testing and most small communities do not have water treatment facilities. An emergency breakdown service is currently provided for power, water and wastewater infrastructure in those communities not receiving regular maintenance (those not covered by RAESP, with populations generally less than 50). |
| Lack of Aboriginal access to water markets | We are responding to discussions in relation to providing Aboriginal people with equitable access to the water market, particularly in the context of water market reforms. Development of policy on Indigenous access to water for economic futures is required and we are working with the Indigenous Water Policy Group and the National Water Commission on a project discussing this. |
The OFA sets the framework for land and water supply questions in the Ord and will guide discussion through the Ord expansion process.

**Water licences**

The community requires simple information about licensing, including:

- What is a licence? Why are there licences?
- Is there a requirement to license stock and domestic use and will this be required in the future?
- Does community water supply require licensing?

**Expansion of the Ord River Irrigation Area**

<table>
<thead>
<tr>
<th>Ensuring water use in the expanded irrigation area is properly monitored and efficiently used</th>
<th>Water allocation, availability and efficient use are key issues for the development of further land and water resources in the Ord subregion. We need to ensure water use in the Ord expansion has appropriate levels of monitoring and targets for achieving most efficient use of water.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ensuring appropriate siting of infrastructure development</td>
<td>Ensuring appropriate siting and assessment for infrastructure development to protect water quality and ensure adequate erosion and drainage control measures are considered and incorporated. This includes advice on infrastructure design and metering requirements.</td>
</tr>
<tr>
<td>Ensuring the <em>Ord final agreement</em> is adhered to</td>
<td>There is an ongoing need to ensure the key commitments in and requirements of the OFA relating to water management principles are carried out. We are in a joint management arrangement with the MG people through the OFA for management of Reserve 31165.</td>
</tr>
<tr>
<td>Updating the 2007 <em>Ord River water management plan</em> to facilitate any future Ord expansion</td>
<td>The 2007 <em>Ord River water management plan</em> currently specifies sufficient water for a total of 53,000 ha of irrigation development. This plan demonstrates that enough water, with an associated reliability of supply, is available for the currently approved expansion phase within Western Australia. Any further expansion would require revisions to the 2007 plan (currently being done), the EPA assessment, power supply agreements and the OFA, as well as development of interstate agreements.</td>
</tr>
</tbody>
</table>
4.2 North Kimberley subregion: overview and future directions

The North Kimberley subregion is situated between Derby and Wyndham, extending along the Gibb River Road and north to the coast, as shown in Figure 4. This area has seen a change in land management practices during the past 10 years, with the growth in tourism ventures, expansion of environmental and cultural conservation areas and prospective expansion of mineral resource development. Increases in tourism, as well as the spread of weeds and feral animals, has resulted in increased pressure on the region’s waterways, many of which have high conservation values.

![Figure 4 The North Kimberley subregion](image)

4.2.1 Regional setting

The North Kimberley subregion covers about 17,185 km² within the Timor Sea Drainage Division. The area has a tropical monsoonal climate, with rain falling predominantly in the wet season between October and April, during which the region receives 90 per cent of its annual rainfall.

The Gibb River Road is the main access route through the North Kimberley, with the subregion spanning the shires of Derby–West Kimberley and Wyndham–East Kimberley. In 2001, 1345 people lived in the subregion – less than five per cent of the
total Kimberley population of 32 700 (ABS 2001), of which 74 per cent are Aboriginal. The subregion has 32 Indigenous communities and outstations (Figure 5) which incorporates 19 key language groups with many more localised overlapping dialects. In addition, there are four Native Title claimant groups in the subregion. The Wanjina Wunggurr Wilinggin claim was determined in 2005 and the Dambimangari, Uunguu and Balanggarra claims are in progress.

Thirty-one pastoral stations are located within the North Kimberley subregion, some of which are only partly included in the study area (as they straddle the subregional boundary, see Figure 5). Cattle production is the predominant land use with approximately half the pastoral leases operating various tourism ventures as a secondary form of income. Aboriginal corporations own seven of these stations and have plans to develop cattle and tourism enterprises.

Pastoral long-term leases in the Kimberley are due for renewal in 2015. The state government has recently undertaken a process to identify key parcels of land for excision during the lease renewal process, mostly for expanding the region’s conservation estate.

The regional economy is supported primarily by pastoralism and tourism, with a significant local customary economy (e.g. fishing, hunting, knowledge exchange, language and cultural maintenance) that is critical for many Aboriginal communities.

Figure 5  Pastoral stations and Aboriginal communities located within the North Kimberley subregion
A number of reports have documented land use and management pressures facing the North Kimberley. Most of these reports have focused on the impact of increased tourism activity associated with the Gibb River Road and growing coastal tourism. Examples of these reports include:

- *Tourism and the Kimberley coastal waterways: environmental and cultural aspects of expedition cruising* (Scherre, Smith & Dowling 2008)
- *The relationship between landholders and tour operators – an investigation of the areas adjoining the Gibb River Road in the North Kimberley* (Greiner & Larson 2004)
- *The impacts of recreation and tourism in the remote North Kimberley regions of Western Australia* (Hercock 1999).

The following reports and strategies have been used to scope the issues in the North Kimberley subregion:

- *Kimberley region economic development strategy* (Kimberley Development Commission 1997)
- *Kimberley regional transport strategy* (Department of Transport & Kimberley Development Commission 1997)
- *Roads 2020 regional development strategy, Kimberley* (MRWA 1997)
- *Kimberley aquaculture development plan* (Department of Fisheries Western Australia & Kimberley Development Commission 1996)
- *Aboriginal people in the economy of the Kimberley region* (Crough & Christophersen 1993)
- *Biodiversity assessment of Western Australia* (DEC 2005)
- *How traditional owners of the North Kimberley want to look after their country* (Kimberley Land Council 2004)
- *Bungarun workshop* (Kimberley Land Council 2004)

*Land use and infrastructure investigations in the North Kimberley* (Department for Planning and Infrastructure 2006, unpublished report)

### 4.2.2 Natural values

The North Kimberley is recognised for its significant cultural and ecological values. The Australian Government has identified the subregion as one of 15 national...
biodiversity hotspots, defined as areas of land that are rich in biodiversity but are also under immediate threat (Australian Heritage Database 2008).

Twenty-two of Western Australia’s 49 Wild Rivers are located in the North Kimberley (Figure 6). Wild Rivers are defined as:

… ‘those rivers which are undisturbed by the impacts of modern technological society. They remain undammed, and exist in catchments where biological and hydrological processes continue without significant disturbance. They occur in a variety of landscapes, and may be permanent, seasonal or dry watercourses that flow or only flow occasionally’ (Williams et al. 1999).

These waterways and their catchments remain generally undisturbed due to their isolation, rugged topography and/or land tenure.

![Figure 6](image-url) **Figure 6** Wild Rivers and Department of Environment and Conservation estates within the North Kimberley subregion

The Department of Environment and Conservation (DEC) manages the Prince Regent Nature Reserve; Mitchell River, Lawley River and Drysdale River national parks; and King Leopold Ranges Conservation Park. An additional nine sites have also been proposed for the ‘conservation of flora and fauna’ as part of the 2015 lease excision. These areas are currently included in pastoral leases associated with: Beverley Springs, Drysdale River, El Questro, Gibb River, Mt Elizabeth and Theda stations. The Kimberley Land Council is discussing the establishment of Indigenous
Protected Areas (IPAs) within the North Kimberley. There are also a number of Aboriginal reserves located in the subregion (Figure 7).

![Map of the North Kimberley subregion with labels for Protected Areas, Aboriginal reserves, and Native Title determinations.]

Figure 7    Aboriginal reserves and Native Title determinations within the North Kimberley subregion

The North Kimberley subregion has significant known mineral deposits including diamonds, iron ore, bauxite and uranium. Limited exploration data exists because isolation makes the deposits difficult to access, and exploration costs are very high (Kimberley Development Commission 2001).

While historic pastoral activity in much of the region has degraded some of the riverine habitats through weed invasion, feral animal damage and livestock access, the waterways across the North Kimberley are generally considered to be in good condition, especially those located in more inaccessible areas.

4.2.3 The water resources

Indigenous culture is deeply rooted in the water cycle, with wet season flushing and dry season pools being critical. From a water resource perspective, the North Kimberley has not received the same level of development interest as other areas of the Kimberley such as the Ord and Fitzroy river catchments. This is partly due to the
seasonal flow regimes of the river systems, isolation, access, the rugged topography of the catchments and potentially high development costs.

More recent development interests in the North Kimberley have come as a result of proposals for an eco-tourism venture on the Berkley River, an oil and gas processing hub on the North Kimberley coast, industrial development at Point Torment and the mining of bauxite deposits at Mitchell Plateau. These interests would require water resources for their development and ongoing operation.

There have also been a number of proposals for diversification of pastoral lands within the North Kimberley subregion. These have been predominantly for establishment of tourism ventures (associated with increased tourist visitation along the Gibb River Road and Kimberley coast).

The North Kimberley is generally considered unsuitable for broadscale intensive agricultural development. This is primarily based on the lack of productive soil types and inaccessibility of the rugged topography, leading to a very high cost of development.

However, the isolation and ruggedness of the North Kimberley supports a number of high-conservation-value waterways that attract many domestic and international tourists. It is within this context that planning for water use in the North Kimberley subregion is considered as part of the draft Kimberley regional water plan: Strategic directions and action 2010–2030.

4.2.4 Current water use and management

There are approximately 14 current groundwater licences in the North Kimberley subregion. Most of the groundwater licences are for Aboriginal community bores and some pastoral bores (for diversified activities other than stock and domestic use). The largest groundwater licence is for the Kimberley Diamond Company located within the Canning-Grant Aquifer. There are no surface water licences although unlicensed water use includes livestock and domestic bores associated with the pastoral industry. No maximum water allocation limits have been assessed because the required water information is not yet available. Water demand is low and thus water allocation plans do not need to be initiated.

Surface water measurement began in the mid-1950s with gauging stations at Crystal Creek and Lennard River. A number of surface water gauging and rainfall monitoring stations were built in the 1960s and 1970s to monitor water resources. Since the 1980s, however, a number of these monitoring sites have been decommissioned due to resourcing constraints and more significant development pressures elsewhere in the region.

Currently there is no monitoring of streamflow, continuous rainfall or water quality north of the Isdell River. The water monitoring network is generally considered to be inadequate due to the North Kimberley subregion’s large area and high climatic variation both temporally and spatially. Although no broad groundwater monitoring programs are being undertaken in the North Kimberley, limited monitoring associated
with individual licences occurs to determine the localised abstraction impacts of larger licences. Re-establishment of water information monitoring in the North Kimberley would enable a better understanding of the impacts of climate change on the region.

4.2.5 Stakeholder overview

A number of stakeholders in the North Kimberley are engaged in water planning and management (Appendix B) including 31 pastoral properties, of which seven are Aboriginal pastoral leases. Several key stakeholder groups, namely the Pastoral and Graziers Association (PGA), the North Kimberley Land Conservation District Committee (LCDC) and the Kimberley Aboriginal Pastoral Association (KAPA) represent pastoral land managers. The North Kimberley LCDC is active within the region and has been engaged in water planning and management through the regional natural resource management (NRM) process and the Department of Water.

Thirty-two Indigenous communities and outstations are located within the North Kimberley. Indigenous people in the region have been engaged in NRM and research through various avenues. These include the Kimberley Land Council’s Land and Sea Management Unit (KLC-LSMU), Kimberley Aboriginal Law and Culture Centre (KALACC), Kimberley Aboriginal Reference Group (KARG), projects through the Northern Australian Indigenous Land and Sea Alliance (NAILSMA), the NRM planning process (RCG 2005), and various joint research projects (partnered by government departments and universities).

In addition, environmental organisations such as Environ Kimberley, World Wide Fund for Nature (WWF) and Australian Wildlife Conservancy (AWC) are actively involved in NRM and water management in the North Kimberley subregion.

4.2.6 Planning processes and current initiatives

Stakeholders in the North Kimberley subregion have been actively engaged in a number of NRM and regional planning processes and research initiatives related to water planning during the past 10 years.

The *Kimberley natural resource management strategy* was developed as part of the Rangelands NRM plan to provide direction to the allocation of Commonwealth Natural Heritage Trust funds. The strategy was developed in 2005–06 to source Commonwealth funds for implementation during 2007–08. This strategy was designed to ‘….create a more healthy sustainable relationship between use of the land and water resources and the natural environment’ (RCG 2005). The Department of Planning (DoP) has also undertaken an extensive planning process for the North Kimberley subregion to determine a strategy for long-term land use and regional development.

The engagement of Traditional Owners has been essential to the above-mentioned planning processes and other applied programs. For example, the KLC undertook community consultation across the region as part of DoP’s ‘land use and infrastructure investigations in the North Kimberley’ assessment. The issues raised
are contained in the report, *How Traditional Owners of the North Kimberley want to look after their Country* (KLC 2004). The KLC also undertook a Saltwater Country planning project to record cultural knowledge of the North Kimberley’s coastal areas, which was aimed at helping Traditional Owners with planning and decision-making. From these planning processes, it became clear that the Traditional Owners in the North Kimberley were seeking:

- increased control over activities occurring on Country, their future and the operations and functionality of their communities
- recognition of cultural values related to water
- active participation in water planning processes, on-ground management and economic activities
- access to Country.

A number of planning initiatives are underway across the North Kimberley subregion. The Australian Heritage Council (AHC) through the Department of the Environment, Water, Heritage and the Arts (DEWHA) is undertaking a national heritage listing assessment of the cultural and environmental values of the North and West Kimberley. This process will formally identify areas of national and potentially international heritage value.

The Kimberley is a focal point in the delivery of the Australian Government's $2.25 billion NRM initiative, Caring for our Country. This program replaces previous NRM funding initiatives and provides a number of opportunities for waterway management projects. The Department of Water is working with a small group of key regional stakeholders to discuss the way forward in addressing the management of the large number of Wild Rivers and other high-conservation-value waterways across the North Kimberley. The Eco Fire initiative is working to reduce the impact of mid- to late-dry-season wildfire through the development of a *Regional burn plan*. This plan emphasises a strategic early dry-season controlled burning regime.

KARG is developing a *Kimberley Aboriginal Caring for Country plan* to provide a regionally coordinated approach to NRM across the region. This plan will include a coordinated and strategic regional approach for Aboriginal land, sea and water management.

The KLC-LSMU through the Kimberley Ranger Initiative is the lead organisation coordinating on-ground Aboriginal land, sea and water management across the North Kimberley. It is a key partner to enable the Department of Water to undertake on-ground waterways management.

**4.2.7 Regional hotspots**

In 2008, the Western Australian Planning Commission and DoP, in conjunction with Landcorp, jointly prepared regional hotspot land supply reports for centres in the Kimberley, Pilbara, Gascoyne and Goldfields-Esperance regions. Together with Broome, Kununurra, Fitzroy Crossing and Halls Creek, Derby has been identified as a regional hotspot.
The report focuses on land and housing supply issues as a result of growth in the resource and/or other industry sectors. The main challenges for land release and housing supply related to water include:

- Native Title and Indigenous heritage issues
- capacity constraints in the building and construction industry
- water and sewer service capacity constraints on meeting anticipated demand
- water and wastewater upgrades may be required to service the prison site at Derby
- protection and management of Indigenous heritage, environment and tourism values while facilitating industrial development associated with the Browse Basin gas reserves and other oil and gas supply based facilities.

A key regional initiative has been the development of the *Kimberley regional water plan*, which consolidates the available water information, identifies water management issues and reports on actions to be implemented in the region. This report was developed to support the *Kimberley regional water plan*.

### 4.2.8 Issues of significance

Initial stakeholder and departmental discussions have highlighted a number of issues related to water planning and management across the North Kimberley subregion. Many of the issues are related to waterway impact management rather than high levels of water use. Issues of significance are grouped under the following broad headings:

<table>
<thead>
<tr>
<th>Issue</th>
<th>Department of Water comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water planning and management</td>
<td>The North Kimberley subregion is rich in mineral deposits. There have been several proposals to develop these resources including bauxite and iron ore extraction. Water resources would be required for processing and the development of infrastructure.</td>
</tr>
<tr>
<td>Mining and petroleum exploration</td>
<td>The number of tourists visiting the North Kimberley subregion on self-drive and coastal cruising tours has increased significantly. The Gibb River Road gives visitors access to a range of waterways and National Parks. As part of a 10-year state and local road program (Department of Transport &amp; Kimberley Development Council 1999), there are plans for improvements along the Gibb River Road. This would lead to more people accessing waterways in the area, and therefore an increased likelihood of human impact on waterway condition as well as increased water demand for drinking, ablutions and gardens</td>
</tr>
</tbody>
</table>
Pastoral leases, other special leases and modified or degraded environments have, in some places, restricted public and Traditional Owner access to the subregion's rivers. Access to and the condition of waterways is a significant issue for people in the North Kimberley.

### High-conservation-value waterways

| Aspirations of Traditional Owners to care for their land and water | The KLC is involved in discussions to establish Indigenous Protected Areas (IPAs) in the North Kimberley. There are also a number of Aboriginal communities close to high-conservation-value aquatic ecosystems (HCVAEs). The Kimberley Ranger Initiative is actively involved in waterway management and hopes to become more involved in water monitoring. |
| Planning and management | No adequate strategies are currently in place to recognise and protect high-conservation-value waterways in the North Kimberley. Discussions about Wild Rivers and the National Heritage assessment of the North Kimberley will potentially help resolve this issue. |
| Weeds, feral animals and fire management | Invasive weeds along waterways in the North Kimberley degrade high-conservation-value riparian habitats, limit access to rivers and are an issue for livestock management. Feral animals are considered to have a significant impact on waterway condition. The Department of Agriculture and Food has been actively managing feral animals and has successfully controlled feral donkey populations in the region. DEC, the Fire and Emergency Services Authority and the Eco Fire project have been working to reduce the impact of wildfire across the region. The management of weeds, fire and feral animals is critical to the long-term management of waterways in the North Kimberley, as well as to the maintenance of their significant regional value. |
| Erosion of riverbanks | Local people have observed erosion around waterways in the North Kimberley for a number of years, particularly near nodes of activity involving road maintenance, intensive grazing and increased fire activity. These activities have the potential to affect waterways through increased erosion, sedimentation and nutrient concentrations. |
4.3 La Grange subregion: overview and future directions

The La Grange subregion is located south of Broome. It is bounded to the west by the Indian Ocean, to the north by Roebuck Plains, and to the south by Mandora Marsh. The area is situated within the Canning-Kimberley groundwater area (Figure 8).

![La Grange subregion map](image)

Figure 8 The La Grange subregion

4.3.1 Background

In 1999, in response to increasing demand for water, the Department of Water began the planning process to develop a La Grange groundwater allocation plan. Extensive consultations with local community stakeholders were undertaken and as a result, a community reference group – the La Grange Groundwater Committee – was established to work with the department. A number of studies were carried out to support the process (DoW & Miriuwung Gajerrong Corporation 2008). A large proposal for irrigated cotton did not proceed beyond the proposal stage but the water planning process was significantly advanced through that proposal’s assessment, although a water allocation plan was not finalised at the time.
In 2006 the department revisited this work and re-engaged with key stakeholders to progress and finalise the *La Grange groundwater allocation plan* (DoW 2010).

### 4.3.2 The water resource

The allocation limit for the Broome Sandstone Aquifer is based on the best information available. However, this information provides only a preliminary understanding of the hydrogeology and water-dependent values in the area. For this reason, the allocation limit is precautionary to ensure the dependent values are protected.

An initial estimate of recharge for the Broome Sandstone Aquifer was determined by the Geological Survey of Western Australia in 1992 as part of *A review of the major groundwater resources in Western Australia* (GSWA 1992). It was calculated for a much larger area outside of the regional plan’s boundary and projected a recharge estimate of 380 GL per year, with half the water (190 GL per year) potentially available for use.

Based on improved data collected in 1999 by Water Management Consultants, the department reviewed the estimate to include a throughflow component. The review was based on 20 m per day hydraulic conductivity, which indicated a throughflow of 140 GL per year. This gave a yield estimate of 105 GL per year by subtracting 25 per cent (from the throughflow) to maintain the saltwater interface.

The ecological and cultural values of water were then accounted for by providing a further 50 per cent of yield to support these values, in addition to the 25 per cent for maintaining the saltwater interface. This resulted in an estimated sustainable yield for the Broome Sandstone Aquifer of 50 GL per year for the La Grange North and South subareas combined.

### 4.3.3 Current water use and management

Applications for pastoral diversification are increasing, with associated applications to take water expected to rise. Pastoralists across the Kimberley are seeking to develop
other enterprises to support their primary pastoral operations including horticulture, tree plantations, aquaculture and tourism ventures. The Australian Government has also shown interest in the potential of northern Australia to support extensive agricultural development. This may have implications for the long-term development of the La Grange groundwater subareas. However, this concept has been at a formative stage for some years and there is no definite drive for development in the short term.

Mining developments are few in the La Grange groundwater subareas. However, the potential exists for mining activity to increase in the La Grange South subarea. Best management practice for the entire life of a project is required by proponents taking water for operations at port facilities, rail and mine operations. The department will provide guidance for future proponents to achieve optimal water management practice in mine site operations.

4.3.4 Stakeholder overview and planning activities

The Department of Water has worked with many La Grange stakeholders for the past decade on water planning and management in the subregion.

Through the earlier engagement process, community members were able to express their views on the use and management of water resources in the area. The consultation process raised key community interests – see the La Grange water allocation plan (DoW 2010) for more details. These interests helped to inform development of the water allocation rules and policies in the groundwater allocation plan and, more broadly, to inform the water management planning process in the Kimberley.

One of the key issues identified through the recent La Grange consultations was Aboriginal aspirations for water management and access to water for community activities, including water supply and possible future economic activities.

The department is developing a project (in partnership with the Northern Australia Indigenous Land and Sea Management Alliance – Indigenous Water Policy Group, Land and Water Australia and the National Water Commission) that aims to build on the La Grange water allocation consultation process to establish policy options for Indigenous access to water, including water use for commercial purposes.

4.3.4 Issues of significance

Some of the key water management issues to have emerged through discussions with stakeholders and a range of projects, consultations and forums in the La Grange subregion include:

<table>
<thead>
<tr>
<th>Issue</th>
<th>Department of Water comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water planning and management</td>
<td>We have developed a draft La Grange water management plan and, subject to incorporating public submissions, it</td>
</tr>
</tbody>
</table>
will provide the foundation for water management in La Grange. A peer review of the allocation limit is currently being undertaken.

<table>
<thead>
<tr>
<th>Protection of aquifers</th>
<th>Impact management of the unconfined aquifer from over-abstraction, contamination and water quality deterioration, particularly saline intrusion.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protection of groundwater-dependent values (e.g. springs and wetlands)</td>
<td>There are recognised groundwater-dependent values; for example, a series of culturally and ecologically significant coastal springs and wetlands. The community has expressed interest in helping to manage these values.</td>
</tr>
</tbody>
</table>

**Supply and demand**

| Water licences | The community requires simple information about licensing, including:  
|----------------|-----------------------------------------------------------------------------------------------------------------------------------|
|                | • What is a licence? Why are there licences?  
|                | • Is there a requirement to license stock and domestic use and will this be required in the future?  
|                | • Does community water supply require licensing? |
| Groundwater investigation and monitoring | Knowledge of the resource needs to be improved and the impacts of abstraction monitored. Drilling and investigation is scheduled for 2015. |
| Increasing demand for water | There has been growing interest in horticultural and pastoral development and associated water resource development in the La Grange area. |
| Irrigation management | Several horticultural enterprises are operating in the La Grange subregion. There is growing interest in developing irrigation enterprises for augmenting pastoral production through fodder crops, or for horticultural production. |

**Remote community water supply and Indigenous access to water**

| Remote community water supply | Testing of remote community drinking water and maintenance of infrastructure is an important issue to Indigenous communities across the Kimberley. Communities with a population above 50 receive monthly water quality testing and planned and unplanned maintenance through the Department of Housing’s Remote Area Essential Service Program (RAESP). The |
State government’s policy is that services to small remote Aboriginal communities and outstations (generally those of less than 50 people) are the responsibility of the Australian Government. At present communities with a population of less than 50 do not receive water quality testing and most small communities do not have water treatment facilities. An emergency breakdown service is currently provided for power, water and wastewater infrastructure in those communities not receiving regular maintenance (those not covered by RAESP, with populations generally less than 50).

Future water allocation

How will water be allocated for future use and in particular how will Indigenous people be included in water resource development? We are responding to emergent discussion about ensuring that Indigenous people have equitable access to the water market, particularly in the context of water market reforms. Development of policy on Indigenous access to water for economic futures is required.
4.4 Fitzroy subregion: overview and future directions

The Fitzroy River basin covers about 95 000 km² within the Timor Sea Drainage Division: it extends from Halls Creek in the east through to Derby and King Sound in the west and is partly bordered by the King Leopold Ranges (Figure 9). The Fitzroy River and its associated catchment have received increasing attention during the past decade as various proposals to develop the water resource and floodplain have come and gone. Local communities, organisations and government agencies have invested significant effort in defining and articulating the catchment’s cultural, social, environmental and economic values (RCG 2005). A number of scientific studies describe the catchment’s environment and hydrological character and some limited documentation describes the rich extant cultural heritage that continues to sustain much of the Fitzroy basin’s population.

Figure 9 The Fitzroy subregion
Figure 10   The Fitzroy catchment showing land tenure

The Fitzroy River is more than 700 km long, with very high annual flow discharge at the wet season’s peak. The catchment covers an area of about 95 000 km² and lies within the Canning Basin.

Photo 2: Fitzroy River looking north from the bridge at Fitzroy Crossing

The catchment has a semi-arid/arid-monsoonal climate with rain falling in the wet season between November and April (Beckwith & Associates 1999). Rainfall in the
Fitzroy catchment has exceeded the mean annual value in seven out of the last nine years (1999–2007).

The Fitzroy catchment takes in parts of three Kimberley shires: the shires of Wyndham–East Kimberley, Halls Creek and Derby–West Kimberley. The catchment supports a population of about 7000 people, comprising those who live in the two major town centres of Fitzroy Crossing and Derby and those who live in small communities (ABS 2007). The region has experienced a period of rapid growth over the past 10 years. Approximately 80 per cent of the population is Indigenous, with the catchment supporting over 57 Indigenous communities and their customary economies. There are four key language groups with many more localised overlapping dialects in the region, each with different connections and responsibilities to the Fitzroy River and catchment.

The regional economy is primarily supported by mining, tourism, pastoralism and some horticulture and aquaculture, with a significant local customary economy (e.g. fishing, hunting, knowledge exchange, language and cultural maintenance) that is critical for many Aboriginal communities. Most land is under pastoral leaseholding, with 44 stations being fully or partly within the Fitzroy catchment (Figure 10). Small parcels of Aboriginal Lands Trust land are also found in the catchment, mostly reservations around communities.

Two major Native Title determinations come within the Fitzroy catchment, with several others overlapping the catchment boundary and around five registered claims (Figure 11). Five conservation reserves fall within the subregion boundary.
4.4.1 Natural values associated with the water resource

The Fitzroy River and its associated floodplain are considered to have high ecological value, which underpins significant cultural, social and economic value (Mann & Vernes 2005). A number of research projects have focused on the river’s fish biota (Morgan et al. 2004; 2005), blending western and Indigenous knowledge. The river contains 35 of the 43 species of fish known in the Kimberley, 18 of which are endemic to the region – making it a significant watercourse in terms of biodiversity (Storey et al. 2001; Sutton 1998). The freshwater sawfish (*Pristis microdon*) and the freshwater whipray (*Himantura chaophraya*) are endangered and listed on the International Union for Conservation of Nature threatened species list (Red List May 1996) (Morgan et al. 2004; Thorburn et al. 2004). The Camballin floodplain is recognised as supporting internationally significant waterbird populations (Halse & Jaensch 1998). The link between the river and its floodplain is highly significant to the maintenance of ecological values, while the riparian vegetation zone represents a rich source of resources such as food and medicine (Storey 2005). Historic pastoral activity in much of the catchment is associated with some degradation of riverine habitats, through weed invasion and livestock access. However, the river is generally considered to be in good condition, especially in the more inaccessible areas.

There are clear and specific links between the ecological and cultural values of the river, floodplain and permanent pools (Toussaint et al. 2001; Storey 2001). The
permanent pools sustained by groundwater recharge are the only enduring water sources during the dry season for terrestrial, aquatic and avian fauna and represent significant resources for local people (Lindsay & Commander 2005).

4.4.2 The water resource

The Fitzroy River is one of Australia’s largest virtually unregulated rivers; it is characterised by braiding channels within a wide floodplain and significant lower floodplain storage. Annual river discharge measured at Fitzroy Crossing varies between 300 GL (1992) to 25 000 GL (2000) with most of the flow occurring in the wet season between December and March. The river usually dries up around July or August, leaving a series of disconnected permanent pools that are recharged by alluvial groundwater during the dry season (Lindsay & Commander 2005).

The Fitzroy has many tributaries including the Margaret River, Christmas Creek, Hann River, Sandy Creek, Geegully Creek, Little Fitzroy River, Collis Creek, Adcock River, Cunningham River, Yeeda River, Mudjalla Gully and Minnie River.

Strong interaction between the surface water and groundwater hydrology exists at the catchment scale, but little is known at a more local scale. A project funded by the National Water Commission will further investigate the groundwater and surface water interactions in the lower Fitzroy River catchment, downstream of Fitzroy Crossing.

The Fitzroy River’s water resources have long been used by people in the catchment. Aboriginal people have reiterated their dependence on the river as central to their lives, culture and sustenance (Toussaint et al. 2001). The local people’s dependence is rooted deeply in the water cycle, with wet season flushing, dry season pools, and surface water/groundwater interactions being critical in supporting the pools and billabongs during the dry season. Pastoral and tourism enterprises have relied on water in the river for many years.

At Camballin, the river’s water resources have been diverted by a barrage for irrigation, while a number of other dam sites have been investigated (in association with proposals to send water to the state’s south west). Previous studies concluded the costs of such an exercise could not compete with alternatives, and severe environmental constraints on damming the river existed (see Section 4.4.4). Assessments of the groundwater resources associated with the river suggested a significant resource, but little work has been done to confirm this.

Previous exploratory and geotechnical drilling across the floodplain at Willare, Fitzroy barrage and Gogo have confirmed the presence of an alluvial aquifer with a 20–30 m thick layer of gravels and sands, overlain by approximately 10 m of silts and clays. (The alluvial aquifer is represented on the 1989 Hydrogeological map of Western Australia and in part on the 1992 Derby 1:250 000 hydrogeological map.) This aquifer could contain significant volumes of groundwater; however, the extent to which the ecosystems along the river rely on this resource, particularly in the dry season, has yet to be fully investigated. During the wet season, surface water flow in the river and across the floodplain recharges the alluvium through the riverbed. During the dry
season, river flow is initially maintained by groundwater discharge, until declining levels drop below the riverbed. Permanent pools in the riverbed are maintained by groundwater from the alluvium.

The salinity of dry season river flows indicates the groundwater salinity is generally less than 500 mg per litre; however, salinity of 500–800 mg per litre in a stretch centred on Noonkanbah (corresponding to an outcrop of the shaley Noonkanbah Formation) indicates that a considerable portion of the alluvial aquifer is brackish. The alluvium receives groundwater discharge from the regional Canning Basin aquifers, which vary in salinity.

Although the ecological water requirements have yet to be determined, it is expected that the consumptive use of the alluvial aquifer will be constrained by the need to maintain dry season river flows and permanent pools, which will limit allowable drawdown at the riverbed.

**4.4.3 Historical development of water resources**

The first dam infrastructure was constructed at Camballin in the 1950s. The scheme was implemented to support a large-scale rice growing venture, and enable trials of fodder crops, sorghum, oats and cotton. The scheme was plagued by problems associated with wet season flooding that damaged infrastructure and crops, as well as limited water in the dry season due to high evaporation rates. The scheme was abandoned in 1983.

The Camballin barrage (Photo 3) is now used by Liveringa Station, which has a current licence to impound and extract surface water for irrigated fodder. The barrage impounds water on the Fitzroy River, with Uralla Creek (a tributary) acting as a feeder channel to divert water through a series of modified pools to the Inkarta irrigation channel, where water is supplied to several centre-pivots. The off-take from the mainstream Fitzroy River at Uralla Creek has a sill that is permanently set at a level that regulates the amount of water diverted and maintains the river’s environmental water requirements.
Further major interest in developing the river was expressed by Western Agricultural Industries Pty Ltd (WAI) in the late 1990s. WAI proposed to dam the Fitzroy River at Diamond Gorge as well as build dams on the Margaret and Leopold rivers. The WAI plan was to irrigate about 225 000 ha of land south and east of Broome to grow cotton. The West Kimberley community strongly opposed the further impoundment of the Fitzroy River or its tributaries and the broadscale cultivation of irrigated, genetically modified cotton. WAI abandoned its dams’ proposal and began investigating options for off-river storage and use of groundwater. However this did not progress past pre-feasibility stage, due primarily to strong opposition from the community (specifically the Traditional Owners who did not grant access for drilling). Such a large-scale development proposal caused strong community concern (see www.environskimberley.org.au/cotton.htm) and continues to be a contentious issue in the Fitzroy subregion.

A growing number of proposals for diversification of pastoral lands have emerged recently, such as development of small- and medium-scale irrigated cattle fodder, timber plantations, horticultural crops, aquaculture, and tourism enterprises. The Pastoral Lands Board, responsible for administering diversification under the Land Administration Act 1997 (WA) requires that diversification activities be strongly linked with pastoral activity and provide only secondary income to the primary pastoral enterprise. In the case of some pastoral leases, diversification permits have been used as a mechanism to effect more significant land-use changes, which have sometimes fallen outside of the broader regional planning context.
4.4.4 The ‘pipeline from the north’

There is a perception that water resources are plentiful and available for development in the north of the state. However, the Kimberley’s wet and dry cycle of water abundance and scarcity, typical of much of northern Australia, characterises the region as a water-limited environment.

For many years, a pipeline from the Kimberley region to Perth has been promoted as a simple and obvious solution to improve Perth’s water supply situation. The proposal has been the subject of much concern, debate and numerous feasibility studies and technical investigations, using the Ord and Fitzroy rivers as the potential sources of water.

In 2004 a panel of experts re-investigated the viability of transporting water from the Kimberley to Perth (Appleyard et al. 2006; Department of Premier and Cabinet 2006), evaluating the technical and financial viability of transporting water by canal, pipeline and ocean (in supertankers and large synthetic bags towed by tugs). The main findings were:

- The highest cost was $20.5 per kL via canal. Current household water use costs between $0.8–$1.2 per kL.
- The average household water bill would increase by 100–400 per cent.
- Kimberley water would be 100–200 times more expensive than irrigation water currently used in the state, which would make other irrigation projects or ‘greening of the desert’ unviable.

Many issues are associated with transporting water from the north of the state to the south. To pipe water from the Kimberley to Perth would not only involve huge capital and operating costs, but also require numerous pumping stations with substantial energy demands to pump the water through the pipeline. Other issues to consider are the adverse impacts on environmental and cultural values and lack of storage capacity in the hills dams for the additional water.

The cost of Kimberley water would need to be reduced by 80 per cent to be competitive with other potential sources. This is unlikely even with new technologies. Based purely on economic feasibility, the expert panel categorically rejected all options for transporting water from the Kimberley to Perth. This is in addition to the environmental and social concerns which were not considered in the investigation.

4.4.5 On-going challenges

Interest in the Fitzroy’s water resources as well as the region’s irrigation potential has been increasing. The Kimberley’s water resources are the subject of ongoing public discussion around the shifting of agricultural development to northern Australia. An Australian Government taskforce was assembled in January 2007, coinciding with the release of *A national plan for water security*, to investigate this concept (Howard 2007). Previous analyses of agricultural development in the West Kimberley were based solely on efficiency arguments employing cost-benefit economic analyses. This past thinking has been limited when considering sustainable regional
development that appropriately considers the environment as well as human and social welfare (Greiner & Johnson 2000).

It is within this context that planning for water use in the Fitzroy catchment is now considered a high priority for the Department of Water. The on-going challenges relate to balancing demands for the water resource in terms of economic development versus environmental, cultural and social requirements. Impounding in-channel flow can result in water quality impacts, restrictions to fish migration and changes to the flow regime. How groundwater abstraction affects the alluvial aquifer is not well known but it could influence the river flow and the characteristics of any river pools and billabongs, and associated ecology.

Knowledge is limited in relation to climate change and its impact on the Fitzroy River, associated aquifers, and environmental, social and cultural interests. Hence groundwater and surface water monitoring is vital to understanding the resource. There could be more, or less, water in the river and alluvial aquifer at any given time of year, with possible changes to water quality (e.g. saltwater intrusion). CSIRO has undertaken the Northern Australia Sustainable Yields project across northern jurisdictions and has broadly determined the sustainable yields of certain catchments, including that of the Fitzroy River <www.csiro.au/partnerships/NASY.html>.

The water resources of the Fitzroy cannot be managed in isolation from other NRM issues, such as restricting the spread of weeds, protection of riparian vegetation, access to the river, and erosion prevention.

4.4.6 Current water use and management

There are approximately 25 current groundwater licences in the Fitzroy catchment, with an approximate allocation of less than 2 GL per year. Most of the groundwater licences are for Aboriginal community bores, some pastoral bores (for diversified activities other than livestock and domestic use), and limited horticultural activities. Unlicensed water use includes livestock and domestic bores (pastoral industry) and possibly some tourism operations and Aboriginal community bores. There is no assessed maximum allocation limit in the catchment as the required water information is not yet available (demand for water resources is low and thus has not triggered initiation of more detailed water allocation planning at this stage).

There are three surface water licences issued in the Fitzroy catchment, the most significant allocation being approximately 6 GL per year at Liveringa Station for irrigation of fodder crops.

Groundwater and surface water resources in the Fitzroy catchment depend on river flows. Surface water measurement in the Fitzroy began in the mid-1960s with gauging stations at Fitzroy Crossing, Diamond Gorge, Phillips Range and Me No Savvy and other stations temporarily set up at Mt Winifred and Mt Krauss (Figure 12). More recently other stations were established such as Fitzroy barrage, Christmas Creek, Margaret Gorge, Noonkanbah, Looma and Willare primarily to support flood monitoring of the Fitzroy.
The Department of Water currently maintains 13 surface water gauging stations in the Fitzroy catchment, eight of which are located on the Fitzroy River itself, while the other five are on tributaries. Long-term streamflow records are limited and little water quality monitoring has been carried out. The department is working to enhance knowledge of the Fitzroy River’s low-flow characteristics.

Groundwater monitoring is not extensive across the Fitzroy catchment. It is limited mainly to developed areas around Derby and large-scale mining operations active in the subregion such as those at Lennard Shelf and Panoramic Resources. Groundwater availability studies are limited, the latest being a desktop study assessing the Fitzroy alluvium as a groundwater resource, and the interaction with surface water flows (Lindsay & Commander 2005). Further work is required to better assess the potential for abstracting groundwater in this region and recommendations were made by Lindsay and Commander (2005) for further field investigations.

In addition to surface water and groundwater monitoring, the department is undertaking a study (funded by the National Water Commission and Raising National Water Standards) into the hydrological interactions between surface water and groundwater. Current hydrological and hydrogeological knowledge of the Fitzroy River is limited and insufficient to support management decisions. This project is considered integral to future understanding of the catchment, and therefore planning and risk assessment for the lower Fitzroy River.

Figure 12  The Fitzroy subregion showing river and waterway features, with Department of Water gauging stations
4.4.7 Stakeholder overview

A diverse range of stakeholders in the Fitzroy catchment are engaged in water use and management. There are 44 pastoral properties including 16 Aboriginal pastoral lease holdings. Pastoral land managers are represented by several groups, namely the Pastoral and Graziers Association (PGA), the more localised West Kimberley Land Conservation District Committee (LCDC) and the Kimberley Aboriginal Pastoral Industry (KAPI). More recently the West Kimberley Agricultural Association has been formed to represent some key West Kimberley water users with interests in pastoral diversification and development of agricultural enterprises. Pastoralists have been engaged in a range of NRM processes and projects over the years, such as the Kimberley Regional Fire Management Project and more recently, the Fitzroy Catchment Action Management group (FitzCAM).

Aboriginal people in the region have been engaged in NRM and research through various avenues, such as the Kimberley Land Council’s Land and Sea Management Unit (KLC-LSMU), Kimberley Language and Resource Centre (KLRC), Kimberley Aboriginal Law and Culture Centre (KALACC), projects through the Northern Australian Indigenous Land and Sea Alliance (NAILSMA), the NRM planning process (RCG 2005), National Heritage Trust (NHT) Rivercare program, and various research projects (partnered by government departments and research organisations).

The original Caring for Country program, supported by the Australian Government, helped Aboriginal people to engage in land and water planning and management. Proposals are currently being prepared for the latest NRM initiative from the Australian Government – Caring for our Country. NAILSMA has established the Indigenous Water Policy Group via funding from the National Water Commission, providing a voice for Indigenous people through the national water reform and water planning process.

4.4.8 Planning activities

The history of development in the Fitzroy has driven reactive stakeholder engagement in water planning and management. A range of stakeholders have been contributing to planning and research in the Fitzroy catchment for a long time. For example, Environs Kimberley, a local non-profit organisation, was established in 1999 to campaign against the WAI proposal to dam the Fitzroy River: it has now become a key driver in regional planning with a particular focus on protecting the Fitzroy River catchment from inappropriate development.

More recently a core group of stakeholders convened the Kimberley Appropriate Economies Roundtable in Fitzroy Crossing in October 2005 (Hill et al. 2006), which was a significant contribution to community-driven planning in this region. The roundtable resulted in development of 11 principles for appropriate regional development put forward to all stakeholders and government to adopt. Numerous recommended actions and outcomes were agreed to, some of which were specific to water resource management in Western Australia (Jackson 2005a; Seidel 2005).
Building on the roundtable work, in March 2008 the Kimberley Water Forum was jointly convened by the Department of Water, Environ Kimberley, Kimberley Land Council, Department of Agriculture and Food (DAFWA), and Tropical Rivers and Coastal Knowledge (TRaCK). This aimed to bring together key Kimberley stakeholders to share information about water planning and management and to set the scene for Kimberley-wide water planning.

A recent project saw the establishment of FitzCAM. This catchment management group comprises representatives from all Indigenous language groups across the catchment, pastoralists, environmental groups, horticulturalists and key organisational and government stakeholders. It aims to build the Fitzroy community’s capacity to represent the catchment in planning and management, share views and issues, and develop catchment management projects.

4.4.9 Research and current initiatives

It is important to recognise that key organisations have been working together for 10 years to build the local capacity for community engagement in land and water planning and management (Table 2). A growing interest in the value of water in the Fitzroy region has emerged, along with recognition of its ecological, cultural and possible economic value. This is evidenced by the growing body of literature focused on the Fitzroy as well as the broader interest in research involvement in the region.

Several examples of this include the New Opportunities for Tropical and Pastoral Agriculture (NOTPA), Northern Agricultural Irrigation Futures and the TRaCK research consortium. NOTPA was established by DAFWA to support the investigation and development of agricultural enterprises in pastoral areas and Indigenous communities (Table 2). This was particularly relevant to pastoral diversification opportunities and was focused on the West Kimberley. Ongoing funding for NOTPA has not been confirmed.

TRaCK is an integrated research program, primarily funded by Land and Water Australia. The Fitzroy has been identified as one of three focus catchments within northern Australia to be studied as part of the four-year $16 million research investment. In Western Australia, the Department of Water is the lead state government agency for involvement in TRaCK.

Table 2  Projects or initiatives of relevance to water planning in the Fitzroy.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Camballin barrage fishway</td>
<td>A group of stakeholders has been discussing the idea of a fishway to be constructed on the Camballin barrage. Environ Kimberley is leading a feasibility study and a stakeholder consultation process.</td>
</tr>
<tr>
<td>FitzCAM (Fitzroy Catchment Action Management group)</td>
<td>FitzCAM is a reference group for the Fitzroy catchment, currently funded by the Australian Government through NHT.</td>
</tr>
<tr>
<td>Initiative</td>
<td>Description</td>
</tr>
<tr>
<td>---------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Fitzroy Futures</td>
<td>Planning process jointly run by Bunuba and Department of Planning.</td>
</tr>
<tr>
<td>Indigenous Water Policy Group (IWPG)</td>
<td>Supported by NAILSMA to bring together Indigenous people to contribute to water policy and planning and keep abreast of water reform.</td>
</tr>
<tr>
<td>Irrigation review (2005)</td>
<td>Independent review of irrigation potential in Western Australia prepared for the state government.</td>
</tr>
<tr>
<td>Kimberley Appropriate Economies Roundtable</td>
<td>A community-driven planning event. The meeting looked at options, principles and actions that promoted appropriate and sustainable development with a focus on the Fitzroy valley, but also more broadly across the Kimberley.</td>
</tr>
<tr>
<td>National Heritage listing assessment</td>
<td>The Australian Government is undertaking a heritage assessment that encompasses part of the Fitzroy catchment. This process aims to identify key areas of high environmental and cultural heritage for possible inclusion on the National Heritage listing. The process might overlap with some of this planning work.</td>
</tr>
<tr>
<td>National Water Initiative</td>
<td>Australia’s blueprint for national water reform – to which the Government of Western Australia is a signatory.</td>
</tr>
<tr>
<td>New Opportunities for Tropical and Pastoral Agriculture (NOTPA)</td>
<td>Objectives: 1) to identify opportunities in pastoral and tropical agriculture that have a high chance of success and economic impact on the two regions; 2) to support the identification and capture of economic opportunities for Indigenous communities; 3) to develop new opportunities that meet community values and expectations; and 4) to develop opportunities that aim for sustainability beyond the life of the project.</td>
</tr>
<tr>
<td>Northern Agricultural Irrigation Futures (NAIF)</td>
<td>Providing new knowledge, tools and processes to support debate and decision making on irrigation in northern Australia. The NAIF project seeks to add value to government and community processes addressing NRM to ensure existing irrigation in northern Australia, and any new irrigation, is done sustainably within a catchment context.</td>
</tr>
</tbody>
</table>
Kimberley regional water plan: supporting detail

| Northern Australia Water Futures Assessment (NAWFA) | Australian Government |
| State water plan 2007 | A strategy for ensuring a sustainable water future for Western Australia. |
| Tropical Rivers and Coastal Knowledge (TRaCK) | A research hub that brings together Australia’s leading tropical river and coastal scientists and managers to provide knowledge and processes for managing the region. |
| Tropical Rivers Inventory and Assessment Project (TRIAP) | A risk assessment process was trialled in the Fitzroy catchment with key stakeholders – via a workshop held in Derby in 2006. Assets and threats were identified, then a risk model was used to explain the interactions between them. |
| Water Planning | The Department of Water’s strategic and operational water planning program. |
| Waterways Awareness Program (and previously Ribbons of Blue) | The Department of Water is developing a community education/awareness program aimed at increasing community understanding about local water quality, and embedding skills for water monitoring. |
| Yiriman Project | ‘Back to country’ project that supports leadership, land management and community development. Has many joint projects and partnerships (Shire of Derby–West Kimberley, departments of Justice and Community Development, KLC-LSMU, KLRC, NAILSMA). |

4.4.10 Regional hotspots

In 2008, the Western Australia Planning Commission and DoP, in conjunction with Landcorp, jointly prepared a regional hotspot land supply report for centres in the Kimberley, Pilbara, Gascoyne and Goldfields-Esperance regions. Together with Broome, Kununurra, Fitzroy Crossing and Derby, Halls Creek was identified as a regional hotspot.

The report focuses on land and housing supply issues as a result of growth in the resource and/or other industry sectors. The main challenges for land release and housing supply related to water include:
- water supply capacity constraints (note the Water Corporation’s recent commissioning of additional groundwater bores to supplement the existing water supply)
- resolution of Native Title issues
- capacity constraints in the building and construction industry.

A key regional initiative has been the development of the *Kimberley regional water plan*, which consolidates the available water information, identifies water management issues and reports on actions to be implemented in the region. This report was developed to support the *Kimberley regional water plan*.

### 4.4.11 Issues of significance

Some of the key water management issues to have emerged through discussions with stakeholders and a range of projects, consultations and forums in the Fitzroy subregion include:

<table>
<thead>
<tr>
<th>Issue</th>
<th>Department of Water comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Water regimes in the Fitzroy River</strong></td>
<td></td>
</tr>
<tr>
<td>Dams on the Fitzroy River</td>
<td>There has been significant public opposition to any further impoundment (damming) of the Fitzroy River, as highlighted when the WAI proposal was being investigated and more recently when talking to stakeholders through the ‘Kimberley water for Perth’ process (Beckwith Environmental Planning 2006). Natural flow regimes have been identified by most stakeholders as important.</td>
</tr>
<tr>
<td>Inter-basin transfer of water from the Fitzroy River to Perth or other states</td>
<td>An analysis of stakeholder input on the recent proposal to transfer water from the Fitzroy River to Perth found that Kimberley people were not receptive to the concept. There was particular opposition to any significant impoundment of the Fitzroy River.</td>
</tr>
<tr>
<td>Camballin barrage (at Liveringa)</td>
<td>There are mixed opinions about the Camballin barrage, with some community members wanting the structure removed to restore fish passage and others wanting it retained for commercial purposes and because it is a good fishing spot. A project is underway to investigate the feasibility of a fishway on the barrage, and will include stakeholder views.</td>
</tr>
<tr>
<td>Maintenance of flow regime</td>
<td>In the wet season, the Fitzroy River has very high peak flows; in the dry season, the surface water ceases to flow and the river dries up into a series of pools. This</td>
</tr>
</tbody>
</table>
seasonal fluctuation is considered critical for the maintenance of ecological, social and cultural values associated with that flow regime.

**Groundwater**
The groundwater associated with the Fitzroy River alluvium has significant connectivity to the surface water and influences the patterns of pool formation expressed at the surface. It is important to understand the way this works so any impacts of abstraction on groundwater can be managed.

### Development and land-use impacts

<table>
<thead>
<tr>
<th>Water use for agricultural development within the catchment (scale and type)</th>
<th>Development of agricultural enterprises in the region is generally accepted by the community but the scale and type needs to be appropriate to the environment and region (Kimberley Appropriate Economies Roundtable Forum Proceedings 2005; DAFWA 2007; Northern Australia Land and Water Taskforce 2009).</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Weeds and waterway management</strong></td>
<td>Invasive weeds along the Fitzroy River (such as Noogoora burr) limit people’s access to the river and is an issue for livestock management in the catchment.</td>
</tr>
<tr>
<td><strong>Erosion of riverbanks (through road maintenance activity, grazing and clearing)</strong></td>
<td>Over the years, local people have identified erosion problems within the Fitzroy floodplains as an issue, particularly at nodes of development such as clearing for infrastructure and at the Camballin barrage.</td>
</tr>
<tr>
<td><strong>Access to the river (tenure and weedy riverine environment)</strong></td>
<td>Pastoral leases, other special leases and modified or degraded environments have, in some places, restricted public and Traditional Owner access to the river. This is a significant issue for Fitzroy people.</td>
</tr>
<tr>
<td><strong>Water quality</strong></td>
<td>Maintenance of good water quality is raised as a key issue for people on the Fitzroy River.</td>
</tr>
</tbody>
</table>

### Water management and planning

<table>
<thead>
<tr>
<th>Water licences</th>
<th>The community requires simple information about licensing, including:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• What is a licence? Why are there licences?</td>
</tr>
<tr>
<td></td>
<td>• Is there a requirement to license stock and domestic use and will this be required in the future?</td>
</tr>
<tr>
<td></td>
<td>• Does community water supply require licensing?</td>
</tr>
</tbody>
</table>
Future water allocation
How will water be allocated for future use and in particular how will Indigenous people be included in water resource development? We are responding to emergent discussion about ensuring that Indigenous people have equitable access to the water market, particularly in the context of water market reforms. Development of policy on Indigenous access to water for economic futures is required.

Engagement in policy, planning and legislative reform
There is a growing expectation for good water planning, and new policy and legislation to incorporate community values and aspirations. Therefore engagement in these processes is important. People also need information about water and its management.

4.5 Desert subregion: overview and future directions
The Kimberley’s Desert subregion extends from Halls Creek eastward to the border with the Northern Territory, southward to the Great Sandy Desert – encompassing the desert communities of Mulan, Balgo and Billiluna – and westward below the Fitzroy River catchment over to the La Grange basin (Figure 13). This area has seen a change in land management practices during the past 10 years, with the establishment of Indigenous Protected Areas (IPAs), mining development and mineral resource exploration activities. Increased tourism, as well as the spread of weeds and feral animals, has resulted in heightened pressure on the region’s waterways, a number of which have high conservation values.
Figure 13   The Desert subregion
4.5.1 Regional setting

The Desert subregion covers 417 496 km² within the Western Plateau Drainage Division. It has a semi-arid climate, with most of the rain falling in January and February as a result of tropical monsoonal activity (BoM 2009).

The Tanami Road is the main access route through the Desert subregion’s northern section, and spans the shires of Derby–West Kimberley and Halls Creek. The subregion has 17 Indigenous communities and outstations (Figure 14) which incorporates nine language groups with many more localised overlapping dialects.

The Desert subregion encompasses three Native Title claimant groups (Figure 15). The Tjurabalan, Nugurrara and Karajarri claims were determined in 2001, 2002 and 2004 respectively. In addition, the Desert subregion incorporates the Paruku and Warlu Jilajaa Jumu IPAs.

Thirteen pastoral stations are located within the Desert subregion, some of which are only partly included in the study area (as they straddle the subregional boundary). Pastoral leases in the Kimberley will come up for renewal in 2015, at which time key parcels of land will be excised during the lease renewal process, mostly for expanding the region’s conservation estate.
The regional economy is primarily supported by pastoralism and tourism, with a significant local customary economy (e.g. fishing, hunting, knowledge exchange, language and cultural maintenance) that is critical for many Aboriginal communities.

![Image: Kimberley regional water plan: supporting detail](image)

**Figure 15**  Native title determinations and Indigenous protected area boundaries within the Desert sub-region

### 4.5.2 Natural values

The Desert subregion is recognised for its significant cultural and ecological values. Paruku (Lake Gregory) is one of the most important arid wetlands in Australia (Timms 2001).

Paruku is a large floodplain wetland system located at the terminus of Sturt Creek. It is a significant site for many waterbird species, both domestic and migratory, and provides habitat for some species that are recognised nationally and internationally as being of conservation significance. This internationally significant wetland supports 100 000 regularly visiting birds in addition to numerous permanent bird inhabitants (Halse et al.1998).

Sturt Creek is classified as a Wild River, as defined by Williams et al. (1999):

…‘those rivers which are undisturbed by the impacts of modern technological society. They remain undammed, and exist in catchments where biological and hydrological processes continue without significant disturbance. They occur in a variety of landscapes, and may be permanent, seasonal or dry watercourses that flow or only flow occasionally’..
These waterways and their catchments remain generally undisturbed due to their isolation, rugged topography and/or land tenure (Figure 16).

No river courses nor permanent surface waters are found in the Desert subregion’s south western section. Water sources consist of permanent subsurface springs charged by extensive and more localised aquifers, and non-permanent surface deposits such as clay pans, rock holes and soaks (Warlu Jilajaa Jumu IPA 2007).

The Department of Environment and Conservation (DEC) manages Dragon Tree Soak, Ord River Regeneration Reserve and the Wolf Creek meteorite crater as conservation estates within the Desert subregion. In addition, the Paruku and Warlu Jilajaa Jumu IPAs are classified as part of the National Reserve System. An IPA is an ‘area of Indigenous-owned land or sea where traditional Indigenous owners have entered into an agreement with the Australian Government to promote biodiversity and cultural resource conservation’ (DEWHA 2008).

The Tjurabalan Traditional Owners have put forward the possible listing of Paruku as a Ramsar wetland. It is recognised that all the important bird breeding sites are located within the Paruku IPA boundary and the IPA management plan is generally consistent with the management guidelines established under the Ramsar convention (Paruku IPA 2001).

Feral animals and wildfire are considered the main threats to the region’s biodiversity and natural values. The Kimberley Land Council (KLC) and the IPAs have been actively managing some feral animals (predominantly horses and cattle) in the region. The KLC, IPAs and pastoralists have been working to reduce the impact of wildfire across the desert through an active early dry-season burning regime.
The Desert subregion has significant known mineral deposits, such as gold and uranium. Limited exploration data exists because isolation makes the deposits difficult to access, and exploration costs are very high (Kimberley Development Commission 2001).

Even though weeds, feral animals and livestock access have degraded some of the riverine habitat, the waterways across the desert are generally considered to be in good condition, especially those located in the more inaccessible areas.

4.5.3 The water resources

The Desert subregion does not have large known surface water resources, although there is much traditional Indigenous knowledge about subsurface water systems and their cultural connectivity through to the Fitzroy River basin and beyond (Toussaint et al. 2001; Toussaint et al. 2005). The geographic isolation, inaccessibility and low population base of the subregion has also constrained water resource development.

Several mineral exploration projects are underway, with potential for further development of these resources in the future. The extraction of these mineral deposits would require development of water resources for long-term operation.

The Desert subregion is generally considered unsuitable for intensive agricultural development. This is primarily based on a lack of surface water resources, unproductive soil types, extreme weather conditions and inaccessibility (leading to a very high cost of development).
The Desert subregion’s isolation and high-conservation-value waterways (Sturt Creek and Paruku) attract many domestic tourists on self-drive holidays and tours. It is within this context that planning for water use and management in the Desert subregion is considered as part of the Kimberley regional water plan.

4.5.4 Current water use and management

There are approximately six current groundwater licences in the Desert subregion (Figure 16). These licences are for Aboriginal community bores and mineral exploration. The largest groundwater licence is for the Tanami mine, which is located within the Canning Aquifer. There are no surface water licences in the Desert subregion, although unlicensed (exempt) water use includes livestock and domestic bores (pastoral industry). There are no assessed maximum allocation limits in the Desert subregion as the required water information is not yet available (demand for water resources is low and thus has not triggered initiation of more detailed water allocation planning at this stage).

Figure 17  Groundwater licence locations within the Desert subregion

No monitoring of streamflow, continuous rainfall or water quality is being undertaken in the Desert subregion. Water monitoring would be difficult due to high climatic variation both temporally and spatially. While no broad groundwater monitoring is occurring, limited monitoring associated with individual licences is being done to determine localised abstraction impacts. Water information monitoring would help
establish a broader understanding of the impacts of climate change on the region, in particular the region’s high-conservation-value aquatic ecosystems.

### 4.5.5 Stakeholder overview

A number of stakeholder groups in the Desert subregion are engaged in water planning and management (Appendix 2). The Pastoral and Graziers Association (PGA), the East Kimberley Land Conservation District Committee (EKLCDC) and the Kimberley Aboriginal Pastoral Association (KAPA) represent pastoralists and land managers across the region.

Aboriginal people in the region are actively engaged in natural resource management (NRM) and research through various avenues, such as the Kimberley Land Council’s Land and Sea Management unit (KLC-LSMU), Indigenous Protected Area (IPA) planning and management processes, Kimberley Aboriginal Law and Culture Centre (KALACC), Kimberley Aboriginal Reference Group (KARG), projects run through the Northern Australian Indigenous Land and Sea Management Alliance (NAILSMA), the NRM planning process (RCG 2005), and various joint research projects partnered by government departments and universities.

In addition, environmental organisations such as the World Wide Fund for Nature (WWF) and Environs Kimberley (EK) are actively involved in NRM and water management within the Desert subregion.

### 4.5.6 Planning processes and current initiatives

Stakeholders of the Desert subregion have been actively engaged in a number of NRM and regional planning processes and research initiatives related to water planning over many years.

The *Kimberley natural resource management strategy* was developed as part of the Rangelands NRM plan to provide direction on the allocation of Commonwealth Natural Heritage Trust funds. The strategy was developed in 2005–06 to source Commonwealth funds for implementation during 2007–08. This strategy was designed to ‘…create a more healthy sustainable relationship between use of the land and water resources and the natural environment’ (RCG 2005).

The Kimberley is a focal point in the delivery of the Australian Government's $2.25 billion NRM initiative, Caring for our Country. This program replaces previous NRM funding initiatives and provides a number of opportunities for waterway management projects. The Department of Water is working with a small group of key regional stakeholders to discuss the way forward in addressing the management of the large number of Wild Rivers and other high-conservation-value waterways such as Sturt Creek and Lake Gregory, as well as getting some new waterways management projects underway.

The Kimberley Land Council (KLC) has undertaken an extensive planning process across the Desert subregion to establish the Paruku and Warlu Jilajaa Jumu IPAs. The Paruku and Warlu Jilajaa Jumu IPA management plans outline some of the Traditional Owners’ aspirations for Country. The management plans outline
strategies for land and water management and maintenance of the IPA values, addressing the issues of pastoral management, weeds and feral animals, tourism, conservation and culturally significant sites.

KARG is currently developing a *Kimberley Aboriginal Caring for Country plan* to provide a regionally coordinated approach to NRM across the region. The KLC-LSMU through the Kimberley Ranger Initiative is the lead organisation coordinating on-ground Aboriginal land, sea and water management across the Desert subregion in partnership with the IPAs and others. It is a key partner to enable the department to undertake on-ground waterways management in the Kimberley.

As a result these planning processes, it has become evident that the Traditional Owners in the Desert subregion are seeking:

- increased control over activities occurring on Country, their future and the operations and functionality of their land and water
- recognition of cultural values related to water
- active participation in planning processes, on-ground management and economic activities
- access to Country.

### 4.5.7 Issues of significance

Initial stakeholder and departmental discussions have highlighted a number of key water planning and management related issues across the Desert subregion. Many of the issues are related to waterway impact management rather than high levels of water use. Issues of significance are grouped under the following broad headings:

<table>
<thead>
<tr>
<th>Issue</th>
<th>Department of Water comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Water management and planning</strong></td>
<td></td>
</tr>
<tr>
<td>Mining and exploration</td>
<td>The Desert subregion is rich in mineral deposits. Several exploration projects are underway with potential for further development of these resources. Water resources are required for processing and the development of infrastructure.</td>
</tr>
<tr>
<td>Tourism</td>
<td>Numbers of tourists visiting the Desert subregion on self-drive tours are increasing, particularly along the Canning Stock Route. Unmanaged visitor access to waterways has the potential to impact on their condition.</td>
</tr>
<tr>
<td>Access to waterways</td>
<td>Pastoral leases, other special leases and modified or degraded environments have, in some places, restricted public and Traditional Owner access to the subregion’s waterways. Access to and the condition of waterways is</td>
</tr>
</tbody>
</table>
### Waterways management

| Aspirations of Traditional Owners to care for their land and water | The KLC manages two IPAs within the Desert subregion: Paruku and Warlu Jilajaa Jumu. Several Aboriginal communities are near high-conservation-value aquatic ecosystems (HCVAEs). The Kimberley Ranger Initiative is actively involved in waterway management and hopes to become more involved in water monitoring. |
| Planning and management | Limited strategies are currently in place to recognise and protect high-conservation-value waterways in the Desert subregion. The Paruku IPA management plan acknowledges the ecological and cultural values of water in Lake Gregory and Sturt Creek. We have had discussions about Wild Rivers and other high-conservation-value waterways. We held a small workshop with some key stakeholders (including a pastoral representative, the KLC, EK, DEC and others) last year to discuss possible strategic directions for management of Wild Rivers. |
| Catchment use | Local people have observed erosion and weed infestation around waterways in the desert for a number of years, particularly near nodes of activity involving road maintenance, intensive grazing and increased fire activity. Invasive weeds along waterways in the desert degrade high-conservation-value riparian habitats, limit access to rivers and are an issue for livestock management. The impact of feral animals is considered the most significant issue for waterway condition in the subregion. |
4.6 Dampier subregion: overview and future directions

The Dampier subregion extends from the town of Broome up the Dampier Peninsula and includes the Fraser River catchment on the peninsula’s eastern side (Figure 17). It covers a total area of approximately 15 700 km² and measures approximately 150 km from east to west and 175 km from north to south. The Indian Ocean lies to the west of the peninsula and King Sound to the east.

Figure 18 The Dampier subregion

The Dampier Peninsula (including the Broome area) and its water resources are the subject of various proposals to develop areas for tourism, horticulture, forestry and infrastructure projects including the large oil and gas hub. In recent years a range of projects were initiated that are yet to be completed, particularly under the water planning framework. These projects seek to establish and define the area’s cultural, social, environmental and economic values.

4.6.1 Regional setting

The Dampier subregion encompasses Broome and six pastoral stations extending along the southern boundary of the subregion through to the centre of the Dampier Peninsula. These stations include Kilto, Country Downs, Water Bank, Mt Jowlaenga, Roebuck Plains and Yeeda Station. Land tenure on the northern end of the peninsula
is dominated by crown leases and reserves vested with the Aboriginal Lands Trust (Figure 18).

The Dampier subregion’s population is approximately 15 500, with most people living in Broome and the remainder in more than 70 Indigenous communities across the Dampier Peninsula (ABS 2006). Broome has a high seasonal fluctuation in residential population and a huge transient movement of tourist visitors. The population across the greater peninsula north and east of Broome is much less transient and variable, but quite mobile – with people moving between communities or into Broome on a seasonal basis.

The four largest Indigenous communities are Ardyaloon (One Arm Point), Lombadina, Djarandjin and Beagle Bay. There are three Native Title determination areas over the Dampier subregion: the Bardi Jawi 1 Determination on the northern point of the peninsula and the Rubibi 1 and 2 determinations in the south west of the subregion over the Broome area (Figure 20).

Figure 19  Land use and tenure within the Dampier subregion

The Dampier Peninsula and Broome area offer a wide range of tourism opportunities such as fishing, oceanic cruises, four wheel driving, and eco and cultural tours. The main access route to Broome is via the Broome Highway, while access to the peninsula is via the Broome-Cape Leveque Road, an unsealed road that is inaccessible at certain times during and immediately following peak wet season.
events. The shires of Broome and Derby–West Kimberley are the local government authorities responsible for service delivery in the subregion.

The Dampier Peninsula’s key industries are pastoralism, tourism, fishing, aquaculture, pearling, small-scale horticulture and agroforestry. There are a number of development proposals related to oil and gas, mining and infrastructure.

![Map of the Dampier Subregion](image)

**Figure 20** Native Title determinations and Aboriginal communities within the Dampier subregion

### 4.6.2 Natural values

The Dampier subregion is located in the Canning Basin and the area’s geology is of sedimentary origin. There are two groundwater resources present: the unconfined Canning-Broome Aquifer and the extensive Canning-Wallal Aquifer, which is unconfined in the east outside the Dampier subregion and confined and artesian on the peninsula’s west coast. The groundwater systems are strongly connected to surface water expressions in the form of mound springs, wetlands and small drainage lines in coastal areas where groundwater discharge occurs from perched unconfined aquifers (Figure 20).

The Dampier subregion has many recognised environmental, cultural and heritage values. A number of sites are listed for their ecological significance, particularly on the Dampier Peninsula’s west coast, with the subregion as a whole supporting a diverse range of nature reserves, waterways and threatened ecological communities (Graham 2002b). The vegetation of the Dampierland biozone, as classified by the
Department of Environment and Conservation (DEC), is supported by the water resources of the subregion and characterised by communities of mangroves, rainforest assemblages, samphire, grasslands, coastal dune communities and open woodlands (Graham 2002b).

Mound springs and perennial wetlands are a feature of the Dampier Peninsula; they support unique assemblages of flora and fauna species, are of cultural significance to Indigenous communities and are recognised food gathering sites. A number of these springs have been classified as threatened ecological communities or 'ecosystems at risk' by DEC, including springs located at Bunda Bunda, Disaster Bay, Lolly Well and the Willie Creek wetlands (Graham 2002b). Two wetlands on the Dampier Peninsula are listed as wetlands of national significance including the Willie Creek wetlands north of Broome and the Bunda Bunda mound springs, located in the Coulomb Point Nature Reserve (Environment Australia 2001).

The Dampier Peninsula’s coastal dunes support a significant number of dispersed communities of monsoonal vine thickets listed as threatened ecological communities (Graham 2002b). The vine thickets occur on the leeward slopes of coastal dunes, with discontinuous communities along the coast totalling an area of approximately 1000 ha (McGilvray 2008).

Roebuck Bay, located on the coast south of Broome and on the southern boundary of the Dampier subregion, is listed as a Ramsar wetland. It is classified as a wetland of national and international significance due to the presence of large populations of migratory and shore birds and its high biological diversity supported by tidal mudflats and mangrove communities (Australian Wetlands Database 2009). Roebuck Bay has been the focus of an intensive integrated community management effort through the Roebuck Bay Working Group.

4.6.3 The water resource

Most of the Dampier subregion’s detailed hydrogeological investigations have focused on the Broome groundwater area and are compiled in the 1994 Broome groundwater management plan prepared by the then Water Authority of Western Australia (WAWA), and hydrogeology reports prepared in support of the management plan. Significant investigations into the Broome area’s aquifers were conducted in the late 1980s and early 1990s by WAWA after the Broome groundwater area was declared for groundwater management in 1986 (Laws 1991). Large-scale development occurred in the area in the 1970s, with the Shire of Broome growing steadily in the years following. This prompted a management response to protect the unconfined aquifer from saltwater intrusion (Laws 1991). The Department of Water is reviewing the 1994 Broome groundwater management plan as Broome continues to expand and develop regionally.

Tourism is a key industry in the Dampier subarea. Broome experiences high visitor numbers each year, mainly from June to August when many tourists venture out into surrounding areas including the Dampier Peninsula and other popular remote destinations. The peninsula provides visitors with the opportunity to experience the
Kimberley coastline’s remote beauty and eco and cultural tourism activities both on land and offshore. While tourism helps to support the region’s economic development, the subregion’s water-related values are under threat from uncontrolled access to groundwater and surface water resources as well as coastal areas.

Horticultural development in the subregion is limited to a number of trial plantations of native bush plants including gubinge, with the Department of Agriculture and Food (DAFWA) undertaking feasibility studies in partnership with TAFE WA and some Aboriginal communities (DAFWA 2007). An agroforestry trial on the peninsula was initiated by Tropical Timbers a number of years ago with a proposal to develop a large-scale sandalwood plantation near the Beagle Bay community. The project has not progressed beyond the 100 ha approved trial plantation to date.

4.6.4 Current water use and management

There are 10 groundwater licences issued in the larger Dampier Peninsula region outside the Broome groundwater area. These licences have a total allocation of 0.35 GL per year and are issued for a variety of purposes including agroforestry, community water supply, petroleum exploration and road infrastructure maintenance by Main Roads. Two additional large applications are pending final assessment and approval: one for pastoral diversification and the other for the Tropical Timbers development.

Hydrogeological information for the Dampier Peninsula outside the Broome groundwater area is largely sourced from community water supply bores, hydrogeological investigations in support of the Tropical Timbers development, and mineral and petroleum exploratory drilling operations. There is scant water resource information beyond this at present, although the Department of Water is currently scoping the need for more intensive investigations pending a decision on siting of the oil and gas hub.

The unconfined Canning-Broome Aquifer is the key potable water source for Broome. The Water Corporation has a current licence to abstract 4.4 GL per year, with a proposed increase to 5.4 GL per year pending assessment. Broome’s town water supply is sourced from a borefield located east of Broome and extending north of the Broome Highway. The Department of Water is currently reviewing the drinking water source protection plan for the Broome town water supply.
The remaining water used in the Broome groundwater area amounts to approximately 1.8 GL per year for small-scale horticulture, domestic self-supply, watering of parks and gardens and small-scale industry. Only one licensee (with two equipped bores in the coastal Cable Beach subarea) is abstracting water from the confined Canning-Wallal Aquifer for desalination and use of the water resource.

### 4.6.5 Stakeholder overview

Stakeholder interests in the Dampier subregion include Broome residents, Aboriginal communities, pastoralists, the tourism industry and environmental organisations (which are particularly interested in the oil and gas proposal and growing coastal tourism). Key representative groups include the Pastoral and Graziers Association (PGA), Kimberley Land Council (KLC), Environ Kimberley, and government agencies. See Appendix A for further details.

There has been much community interest in tourism growth and the impact this is having on the environment, natural resources and the subregion’s character. The increasing number of visitors to the area has placed more pressure on resources. Stakeholder interests have focused both on tourism development opportunities and managing the impacts on natural resources.
The Traditional Owners have been heavily involved in protracted Native Title negotiations and planning processes over the subregion, as well as many land and water management programs through the KLC’s Land and Sea Management Unit (LSMU), and various natural resource management (NRM) projects. This has included an active ranger program with the Bardi Jawi Rangers involving development of the Saltwater Country Project, on-ground training and work programs as well as work programs in the Minyirr Coastal Park. Aboriginal people in the subregion have clearly demonstrated their desire to be involved in land and water management and planning, and to maintain cultural responsibilities.

Slowly expanding horticultural interests in the areas just outside Broome, and more active engagement across the horticultural and pastoral sector, have seen the formation of the West Kimberley Agricultural Association. This group encompasses representatives from across the West Kimberley with interests in irrigated horticulture development and pastoral enterprise expansion and diversification.

The Northern Development Taskforce has undertaken feasibility studies into four possible locations, with a decision on the most feasible location nominated by the state government as James Price Point on the Dampier Peninsula. The Kimberley Land Council has led consultation with Native Title claimants and Indigenous communities about the proposed location. The Department of State Development is currently, and will continue to lead and oversee the impact assessment process. This is being undertaken by way of a Strategic Assessment Report which will be assessed concurrently by the state (EPA) and the Commonwealth (DEWHA – or its equivalent) under the state’s Environmental Protection Act 1986 and Commonwealth’s Environmental Protection and Biodiversity Conservation Act 1999 respectively. The Strategic Assessment Report is due to be released for public comment in late 2010.

4.6.6 Planning and research initiatives

The Department of Planning (DoP) has undertaken significant work, including extensive stakeholder consultation, in support of a draft Dampier Peninsula plan, which seeks to set a framework for long-term land use and development on the peninsula. The process has been placed on hold while outcomes of the oil and gas consultation and siting discussion are resolved. Additional planning activities on the peninsula have been limited to a number of key community layout plans, road infrastructure and airstrip development reports, as well as planning documents such as the Waterbank structure plan and Lurujarri walking trail structure plan.

New Opportunities for Tropical and Pastoral Agriculture (NOTPA) was a program established by DAFWA to support the investigation and development of agricultural enterprises in pastoral areas and Indigenous communities. This program has been particularly relevant to pastoral diversification opportunities, currently focused on the West Kimberley, and has sought to engage communities in development of small-scale and regionally appropriate agricultural enterprises. Ongoing funding for this program is not secure but outcomes from the work undertaken so far will be used in future water use development planning.
Further initiatives in the Dampier subregion have included projects coordinated by the KLC’s Land and Sea Ranger program with Bardi Jawi and Minyirr Park Rangers, as well as the WEED (Weed Education Eradication Delivery) project undertaken by Environs Kimberley that developed educational tools and on-ground works to eradicate invasive weeds across areas of the subregion, including affected vine thickets on the greater Dampier Peninsula and within the Minyirr Park area.

4.6.7 Regional hotspots

In 2008, the Western Australia Planning Commission and DoP, in conjunction with Landcorp, jointly prepared a regional hotspot land supply report for centres in the Kimberley, Pilbara, Gascoyne and Goldfields-Esperance regions. Together with Derby, Kununurra, Fitzroy Crossing and Halls Creek, Broome has been identified as a regional hotspot.

The report focuses on land and housing supply issues as a result of growth in the resource and/or other industry sectors. The main challenges for land release and housing supply related to water include:

- Native Title and Indigenous heritage issues
- capacity constraints in the building and construction industry
- water and sewer service capacity constraints on meeting anticipated demand.

A key regional initiative has been the development of the Kimberley regional water plan, which consolidates the available water information, identifies water management issues and reports on actions to be implemented in the region. This report was developed to support the Kimberley regional water plan.

4.6.8 Issues of significance

Some of the key water management issues to have arisen through discussion with stakeholders, previous planning processes and a range of projects and forums relevant to the Dampier Peninsula include:

<table>
<thead>
<tr>
<th>Issue</th>
<th>Department of Water comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water management and planning</td>
<td>The department needs to continue to interact with proponents and the Northern Development Taskforce to ensure water quality protection values are upheld, water use is sustainable and that siting of any future gas hub occurs with appropriate assessment and criteria applied.</td>
</tr>
<tr>
<td>Oil and gas development</td>
<td>The burgeoning tourism industry and increased numbers of visitors to the Kimberley in recent years, together with established and emergent pastoral activities on the peninsula, has resulted in a number of impacts from</td>
</tr>
</tbody>
</table>
uncontrolled access to waterways, including:
- weed infestation
- dune destabilisation
- unmanaged groundwater and surface water abstraction
- disturbance from uncontrolled stock access.

<table>
<thead>
<tr>
<th>Protection of groundwater</th>
<th>This involves impact management and protection of community water supplies and the unconfined aquifer from over-abstraction, contamination and water quality deterioration (particularly saline intrusion).</th>
</tr>
</thead>
</table>

### Water supply and demand

<table>
<thead>
<tr>
<th>Increasing demand for water</th>
<th>Development in and around the Broome groundwater area and the Dampier Peninsula has resulted in an increase in the requirement for water use and supply in the subregion.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge of the groundwater resource</td>
<td>There is limited information available for the groundwater resources of the greater Dampier Peninsula including water availability and current levels of use.</td>
</tr>
</tbody>
</table>
| Water licences | The community requires simple information about licensing, including:
- What is a licence? Why are there licences?
- Is there a requirement to license stock and domestic use and will this be required in the future?
- Does community water supply require licensing? |

### Remote community water supply and Indigenous access to water

<table>
<thead>
<tr>
<th>Remote community water supply</th>
<th>Testing of remote community drinking water and maintenance of infrastructure is an important issue to Indigenous communities across the Kimberley. Communities with a population above 50 receive monthly water quality testing and planned and unplanned maintenance through the Department of Housing’s Remote Area Essential Service Program (RAESP). The state government’s policy is that services to small remote Aboriginal communities and outstations (generally those of less than 50 people) are the responsibility of the Australian Government. At present communities with a population of less than 50 do not receive water quality</th>
</tr>
</thead>
</table>
testing and most small communities do not have water treatment facilities. An emergency breakdown service is currently provided for power, water and wastewater infrastructure in those communities not receiving regular maintenance (those not covered by RAESP, with populations generally less than 50).

| Future water allocation | How will water be allocated for future use and in particular how will Indigenous people be included in water resource development? We are responding to emergent discussion about ensuring that Indigenous people have equitable access to the water market, particularly in the context of water market reforms. Development of policy on Indigenous access to water for economic futures is required. |
Appendices

Appendix A – Community and stakeholders

The Department of Water is committed to working in partnership with stakeholders, the community and regional organisations and recognises the important role of Aboriginal people in the Kimberley in enhancing our ability to manage water resources.

<table>
<thead>
<tr>
<th>Organisation and initiative</th>
<th>Responsibilities/roles in relation to water in the region</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australian Wildlife Conservancy AWC</td>
<td>Actively involved in natural resource management (NRM) and water management.</td>
</tr>
<tr>
<td>Commonwealth Scientific and Industrial Research Organisation CSIRO</td>
<td>Conducting research into land, water and environmental issues</td>
</tr>
<tr>
<td>Department of Agriculture and Food WA DAFWA</td>
<td>Helps Western Australia’s agriculture, food and fibre sectors to be sustainable and profitable, with a focus on export-led growth. Managed the New Opportunities for Tropical and Pastoral Agriculture (NOTPA) project, which facilitated pastoral diversification and development opportunities and, with its Indigenous pastoral support program, provided help for people to develop and run pastoral enterprises.</td>
</tr>
<tr>
<td>Department of Environment and Conservation DEC</td>
<td>Administers the Environmental Protection Act 1986 (vegetation clearing and pollution licensing), the Conservation and Land Management Act 1984, the Wildlife Conservation Act 1950; manages conservation reserves and Ramsar classifications; protects and manages biodiversity including wetlands; and manages wastewater discharges.</td>
</tr>
<tr>
<td>Department of Environment, Water Heritage and the Arts DEWHA</td>
<td>Australian Government department that undertakes national heritage listing assessments of Australia’s cultural and environmental values. Administers the Caring for Our Country program and environmental impact assessments under</td>
</tr>
<tr>
<td>Department</td>
<td>Acronym</td>
</tr>
<tr>
<td>-----------------------------------</td>
<td>---------</td>
</tr>
<tr>
<td>Department of Fisheries</td>
<td>DoF</td>
</tr>
<tr>
<td>Department of Housing</td>
<td>DH</td>
</tr>
<tr>
<td>Department of Indigenous Affairs</td>
<td>DIA</td>
</tr>
<tr>
<td>Department of Planning</td>
<td>DoP</td>
</tr>
<tr>
<td>Department of Premier &amp; Cabinet</td>
<td>DPC</td>
</tr>
<tr>
<td>Department of State Development</td>
<td>DSD</td>
</tr>
<tr>
<td>Department of Water</td>
<td>DoW</td>
</tr>
<tr>
<td>East Kimberley Land Conservation District Committee</td>
<td>EKLCDC</td>
</tr>
<tr>
<td>East Kimberley Reference Group</td>
<td>EKRG</td>
</tr>
<tr>
<td>Environ Kimberley</td>
<td>EK</td>
</tr>
<tr>
<td>Environment Protection Authority</td>
<td>EPA</td>
</tr>
<tr>
<td>Organisation</td>
<td>Code</td>
</tr>
<tr>
<td>--------------</td>
<td>------</td>
</tr>
<tr>
<td>Fitzroy Catchment Action Management Group</td>
<td>FitzCAM</td>
</tr>
<tr>
<td>Indigenous Implementation Board</td>
<td>IIB</td>
</tr>
<tr>
<td>Indigenous Land Corporation</td>
<td>ILC</td>
</tr>
<tr>
<td>Indigenous Water Policy Group</td>
<td>IWPG</td>
</tr>
<tr>
<td>Kimberley Aboriginal Law and Culture Centre</td>
<td>KALACC</td>
</tr>
<tr>
<td>Kimberley Aboriginal Pastoral Association</td>
<td>KAPA</td>
</tr>
<tr>
<td>Kimberley Aboriginal Reference Group</td>
<td>KARG</td>
</tr>
<tr>
<td>Kimberley Development Commission</td>
<td>KDC</td>
</tr>
<tr>
<td>Kimberley Land Council</td>
<td>KLC</td>
</tr>
</tbody>
</table>
| Kimberley Language Resource Centre | KLRC | Supporting the transmission of language and culture for maintenance of cultural
<table>
<thead>
<tr>
<th>Organization</th>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land Conservation District Committee</td>
<td>LCDC</td>
<td>Represents pastoral land managers.</td>
</tr>
<tr>
<td>Main Roads Western Australia</td>
<td>MRWA</td>
<td>Responsible for regulations and safety guidelines, and gives road works information.</td>
</tr>
<tr>
<td>Miriuwung Gajerrong Corporation</td>
<td>MG Corp</td>
<td>MG Corp was established to improve the social, cultural and economic wellbeing of the Miriuwung Gajerrong people.</td>
</tr>
<tr>
<td>National Water Commission</td>
<td>NWC</td>
<td>Responsible for driving progress towards the sustainable management and use of Australia's water resources.</td>
</tr>
<tr>
<td>New Opportunities for Tropical and Pastoral Agriculture</td>
<td>NOTPA</td>
<td>Builds on existing feasibility studies for large-scale irrigated agriculture in the state's north.</td>
</tr>
<tr>
<td>North Australian Indigenous Land and Sea Management Alliance</td>
<td>NAILSMA</td>
<td>Supports Indigenous land and sea management using strategic approaches to care for Country with an emphasis on practical management by Traditional Owners across north Australia.</td>
</tr>
<tr>
<td>Northern Australia Land and Water Taskforce</td>
<td>NALWT</td>
<td>Examines the longer-term strategic potential for further land and water development in northern Australia, with particular emphasis on the identification of the capacity of the north to play a role in future agricultural development.</td>
</tr>
<tr>
<td>North Kimberley Land Conservation District Committee</td>
<td>NKLCDC</td>
<td>A pastoral based landcare group for the North Kimberley.</td>
</tr>
<tr>
<td>NRM Rangelands Coordinating Group</td>
<td>RCG</td>
<td>Administers Natural Heritage Trust funds and the implementation of the Kimberley NRM strategy.</td>
</tr>
<tr>
<td>Office of Energy</td>
<td>OOE</td>
<td>Provides a range of services on energy matters to the Minister for Energy, government, the energy sector and the Western Australian community.</td>
</tr>
<tr>
<td>Office of Northern Australia</td>
<td>ONA</td>
<td>Provides policy advice to the Australian Government on sustainable development issues in, or affecting, northern Australia.</td>
</tr>
</tbody>
</table>
| Ord Catchment Reference Group                      | OCRG         | A subregional group of the Rangelands NRM Coordinating Group in WA and is a partnership of community, industry and
<table>
<thead>
<tr>
<th>Organisation</th>
<th>Acronym</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ord Irrigation Cooperative</td>
<td>OIC</td>
<td>The OIC was formed to operate and manage the business of providing water and drainage services to farms within Stage 1 of the Ord River Irrigation Area (ORIA). It is owned by the irrigators and is a cooperative water-delivery organisation.</td>
</tr>
<tr>
<td>Ord Land and Water</td>
<td>OLW</td>
<td>OLW was formed in March of 1998 by the local community as a means to ensure (especially through community participation) sustainable natural resource management in the ORIA and the environs of Kununurra.</td>
</tr>
<tr>
<td>Pastoral and Graziers Association</td>
<td>PGA</td>
<td>A non-profit industry organisation in Western Australia that represents primary producers of wool, grain and meat and livestock. Key consultative group for pastoralists across the region.</td>
</tr>
<tr>
<td>Pastoral Lands Board</td>
<td>PLB</td>
<td>Administers the <em>Land Administration Act 1997</em> for pastoral leases and pastoral diversification.</td>
</tr>
<tr>
<td>Shire of Broome</td>
<td></td>
<td>Local government authority</td>
</tr>
<tr>
<td>Shire of Derby–West Kimberley</td>
<td>SDWK</td>
<td>Local government authority</td>
</tr>
<tr>
<td>Shire of Halls Creek</td>
<td></td>
<td>Local government authority</td>
</tr>
<tr>
<td>Shire of Wyndham–East Kimberley</td>
<td>SWEK</td>
<td>Local government authority</td>
</tr>
<tr>
<td>Tourism Western Australia</td>
<td>TWA</td>
<td>Responsible for promoting Western Australia as an attractive holiday, event, convention and incentive travel destination (nationally and overseas) and enhances the tourism industry, infrastructure and product base.</td>
</tr>
<tr>
<td>Tropical Rivers and Coastal Knowledge</td>
<td>TRaCK</td>
<td>Provides the science and knowledge that governments, communities and industries need for the sustainable use and management of Australia’s tropical rivers and estuaries.</td>
</tr>
<tr>
<td>Western Australian Planning Commission</td>
<td>WAPC</td>
<td>Sets the overarching policy for land use planning in Western Australia.</td>
</tr>
<tr>
<td>Organisation/ stakeholders</td>
<td>Individuals</td>
<td></td>
</tr>
<tr>
<td>-----------------------------</td>
<td>-------------</td>
<td></td>
</tr>
<tr>
<td>IWPG and other government jurisdictions</td>
<td>Joe Ross, Peter Yu, Murrandoo Yanner, Richard Jenkins, Richie Ah Mat, Richard Aiken, Nolan Hunter, Frank Davey, Toby Accoom, William Busch, Des Hill, Catherine Monagle, Sue Jackson, Jon Altman, Joe Morrison, Michael O'Donnell, Lorrae McArthur, Murray Radcliffe, Nigel Kelly, Ian Lancaster, Peter Whitehead, Paul Rosair, Susie Williams</td>
<td></td>
</tr>
<tr>
<td>Multiple stakeholders</td>
<td>Lorrae McArthur (NAILSMA), Craig Phillips (Chamber of Commerce), Gary Scott (Environs Kimberley), Michael Douglas (TRaCK), Joe Morrison (NAILSMA), Chris Mitchell (Broome Shire), David Collard (DoW), Ian Perdrisat (Madjulla Incorporated), Pam Baskind (DoP), Nolan Hunter (KLC, IWPG), Jerome Goh (Main Roads), Justin McCaul (Australian Conservation Foundation), Eugene Carew (Department of Premier and Cabinet), Mary Tarren (Yawuru Traditional Owner), Frank Sebastian (Yawuru Traditional Owner), Elsia Archer (Shire of Derby–West Kimberley), Sharon Ferguson (DEC), Jane Blackwood (KLC), Dillon Andrews (Bunuba), Mervyn Street (Gooniyandi), Helen Malo, David Street, Dave Munday (DoW), Michael Wright (WaterCorp), Jack Burton (Yeeda Pastoral Corporation), Hugh Wallace-Smith (FitCAM), AJ Aiken (DEC), Nadelle Brooks (DoW), Phillips Hams (GoGo Station), Elaine Gardiner (Ord Irrigation Cooperative and Rangelands Coordinating Group), Paul Rosair (DoW), Dean Mathews (DoW), Patrick Annesley (Water Dynamics), Lawford Benning</td>
<td></td>
</tr>
<tr>
<td>Date</td>
<td>Event Description</td>
<td>Participants</td>
</tr>
<tr>
<td>----------</td>
<td>------------------------------------</td>
<td>------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>1 Apr 08</td>
<td>TRaCK workshop (Darwin)</td>
<td>Kimberley Aboriginal Reference Group, Dee Lightfoot, Ronnie Jimbidie, Annette Kogolo, Harry Watson, Poh-Ling Tan, Alan Lawford, Keith Bristow, Murray Radcliffe, Ed Hauck, Peter Bagley, Anthony Watson, William Watson, Daryl Coombs, Anna Straton, Fred Mills, Pieter Swart, Sue Jackson, Peter Davies, Simon Keenan, Andrew Dickson, Hmalan Hunter-Xenie, Craig Pasch, Louise Williams, Ben Wilson, Damian and Kirsty Foreshaw, Sarah Yu, Jeff Cooper, Joe Cooper, Meghan Barnes, Chris Ham, Roy Stone, Susie Williams, Kate Sonan, Lorrae McArthur, Samara Erlandson, Murray Radcliffe, Sue Jackson, Jon Altman, Michael O'Donnell, Nigel Kelly, Peter Whitehead, John Loney, Susie Williams</td>
</tr>
<tr>
<td>1 Jun 08</td>
<td>IWPG (Kununurra)</td>
<td>Joe Ross, Toby Accoom, William Busch, Des Hill, Richie Ah Mat, Richard Aken, Mona Lidy, Joe Morrison, Lorrae McArthur, Hugh Wallace-Smith, Samara Erlandson, Murray Radcliffe, Sue Jackson, Jon Altman, Michael O’Donnell, Nigel Kelly, Peter Whitehead, John Loney, Susie Williams</td>
</tr>
<tr>
<td>3 &amp; 4 Jun 08</td>
<td>FitzCAM meeting (Fitzroy)</td>
<td>Hugh Wallace-Smith, Kate Andrew, David Banjo, Joe Duncan, Mervyn Street, Annette Kogolo, Rosita Shaw, Mary Aiken, Jim Motter, Philip Hams, Jimmy Shandley, Matt Brann, Alain (Doodi) Lawford, John Silver, Sharon Ferguson, Kevin May, Neil Collier, Hmalan Hunter, David Morgan, Nicole Dwan Ismaih Croft, Susie</td>
</tr>
<tr>
<td>Date</td>
<td>Event</td>
<td>Participants</td>
</tr>
<tr>
<td>----------</td>
<td>------------------------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>28 &amp; 29 Aug 08</td>
<td>FitzCAM meeting (Fitzroy)</td>
<td>Bunuba: George Brooking, Dylan Andrews; Gooniyandi: Mervyn Street, Thomas Dick; Walmajarri: Annette Kogolo; Wangkajunga: Doodie Alan Lawford; Pastoralists/PGA: Jim Motter; DEC: Sharon Ferguson; DAFWA: Kevin May; DoW: Susie Williams, Rob Cossart; Environs Kimberley: Gary Scott; Australian Wildlife Conservancy: Richard Kingswood; NRM Rangelands: Liz Brown; Irrigators: Philip Hams.</td>
</tr>
<tr>
<td>1 Sep 08</td>
<td>Regional planning process update (Drysdale Station)</td>
<td>North Kimberley pastoralists</td>
</tr>
<tr>
<td>1 Sep 08</td>
<td>Paruku IPA meeting (Mulan)</td>
<td>Gillian Kennedy &amp; Wade Freeman</td>
</tr>
<tr>
<td>23 Sep 08</td>
<td>KALAAC (Mt Barnett)</td>
<td>Wide range of stakeholders</td>
</tr>
<tr>
<td>1 Oct 08</td>
<td>EK LCDC meeting (Kununurra)</td>
<td>East Kimberley LCDC</td>
</tr>
<tr>
<td>1 Oct 08</td>
<td>North Kimberley LCDC meeting (Broome)</td>
<td>Cecilia Myers (Theda), Chris Wilkinson (Derby), Gary Scott (Environs Kimberley), Peter Camp (Charnley River), Matt Bullard (DAFWA), Michael Jeffery (DAFWA), Joanna Koeyers (Drysdale Station), Rob Cossart &amp; Meghan Barnes (DoW), Pam Baskind (DPI), Phillip Cox (KWA), Daryl Moncrieff (DEC), Peter Kneebone (SDWK), Robert Cox (FESA), Nicholas Atkins (Drysdale Station), Karen Dayman (FitzCAM/KLC), Sarah Legge (Mornington Station; AWC), Robin Maher (Derby), Anne Koeyers (Drysdale Station)</td>
</tr>
<tr>
<td>16 Oct 08</td>
<td>Wild Rivers Workshop (Kununurra)</td>
<td>DoW Staff, Gary Scott (Environs Kimberley), Joanne Koeyers (Pastoralist Drysdale Station), Martin Thoms (University of Canberra), Liz Brown (Rangelands NRM), Joe Ross (Chair Indigenous Water Policy Group and Chair Northern Task Force), Jane Blackwood (Kimberley Land Council), Scott Goodson</td>
</tr>
<tr>
<td>Date</td>
<td>Event Description</td>
<td>Participants</td>
</tr>
<tr>
<td>------------</td>
<td>-----------------------------------------------------------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>1 Dec 08</td>
<td>DEWHA meeting (Canberra)</td>
<td>DEWHA Jennifer Carter</td>
</tr>
<tr>
<td>29 Jan 09</td>
<td>Notre Dame Centre for Indigenous Studies (Broome)</td>
<td>Notre Dame University staff Steve Kinane, Erica Spry and Joe Edgar</td>
</tr>
<tr>
<td>01 Feb 09</td>
<td>IWPG (Darwin)</td>
<td>IWPG and other government jurisdictions</td>
</tr>
<tr>
<td>10 &amp; 11 Mar 2009</td>
<td>Fitzcam meeting/ workshop (Halls Creek)</td>
<td>Multiple stakeholders Gooniyandi: Thomas Dick, Sam Cox; Walmajarri: Annette Kogolo; KIJA: Wallace Midmee, Jock Jowalji; Wangkajunga: Alan Lawford; Nykina: Anne Poelina; Mangala: Banjo; DAFWA: Kevin May; DoW: Susie Williams, Dave Munday; Pastoralists/PGA: Jim Motter; Enviroms Kimberley: Gary Scott; Irrigators: Philip Ham; NRM Rangelands: Liz Brown, Fiona Tingle; WJJ Rangers: Joseph Nuggett; Interpreters: Patsy Bedford, Josie Farrer, Henry AhChoo; KLC: Gary Kairn; Stan Brumby; community member, Louise Stelfox; DoW: Kate Golson, TRaCK: Joe Ross; Northern Australia Land and Water Taskforce: Hugh Wallace-Smith; NAILSMA: Sonia: Indigenous Community Water Facilitator for the East Kimberley, Lillian Chestnut and Karen Dayman.</td>
</tr>
<tr>
<td>11 Mar 09</td>
<td>Meeting with KLC (Kununurra)</td>
<td>KLC Nolan Hunter</td>
</tr>
<tr>
<td>12 Mar 09</td>
<td>Indigenous Policy meeting (Broome)</td>
<td>Yawuru, Lingiari Foundation, NAILSMA, IWPG, Karajarri Traditional Lands Association, Land and Water Australia, DoW. Pat Dodson (Yawuru/Lingiari Foundation), Joe Morrison (NAILSMA), Paul Lane (Lingiari), Joe Ross (IWPG), Lorrae McArthur (IWPG), Mervyn Mulardy, Shirley Spratt (KTLA), Sarah Yu, Lynne Sealie; Noni Przybylski, Ken Moore (LWA); Susie Williams, Ed Hauck (DoW)</td>
</tr>
<tr>
<td>19 Mar 09</td>
<td>Meeting with Yawuru and representative</td>
<td>Pat Dodson, Peter Yu, Jackie Turfrey</td>
</tr>
<tr>
<td>Date</td>
<td>Event</td>
<td>Location</td>
</tr>
<tr>
<td>--------</td>
<td>----------------------------------------------------------------------</td>
<td>-----------------------------------</td>
</tr>
<tr>
<td>19 Mar 09</td>
<td>Nyangumarta Native Title Meeting (Bidyadanga)</td>
<td>Nyangumarta Foundation (Broome)</td>
</tr>
<tr>
<td>20 Mar 09</td>
<td>Meeting with DPI (Broome)</td>
<td>DPI</td>
</tr>
<tr>
<td>02 Apr 09</td>
<td>Meeting with DEC (Kununurra)</td>
<td>DEC</td>
</tr>
<tr>
<td>02 Apr 09</td>
<td>Meeting with MG Corp (Kununurra)</td>
<td>MG Corp</td>
</tr>
<tr>
<td>23 Apr 09</td>
<td>Update to DEWHA</td>
<td>DEWHA</td>
</tr>
<tr>
<td>24 Apr 09</td>
<td>PGA bi-annual meeting (Derby)</td>
<td></td>
</tr>
<tr>
<td>28 Apr 09</td>
<td>IWPG (Broome)</td>
<td>IWPG</td>
</tr>
<tr>
<td>29 Apr 09</td>
<td>West Kimberley Stakeholder Meeting (Broome)</td>
<td></td>
</tr>
<tr>
<td>30 Apr 09</td>
<td>Scheduled regional planning process update</td>
<td>Kimberley Land Council</td>
</tr>
<tr>
<td>8 May 09</td>
<td>East Kimberley Reference Group meeting (Kununurra)</td>
<td></td>
</tr>
<tr>
<td>21 May 09</td>
<td>ABARE conference</td>
<td></td>
</tr>
<tr>
<td>Date</td>
<td>Event Description</td>
<td>Stakeholders</td>
</tr>
<tr>
<td>----------</td>
<td>-----------------------------------------------------------------------------------</td>
<td>-----------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>1 May 09</td>
<td>Regional planning process update (Canberra)</td>
<td>DEWHA, Jennifer Carter</td>
</tr>
<tr>
<td>9 Jun 09</td>
<td>Paruku IPA planning meeting (Mulan)</td>
<td>IPA steering committee; Commonwealth IPA manager, Jennifer Ramoi, WWF, KLRC, DEC</td>
</tr>
<tr>
<td></td>
<td>Phone update with DPI</td>
<td>DoP, Kathy Macklin</td>
</tr>
<tr>
<td>18 Jun 09</td>
<td>Meeting with pastoralists (Drysdale Station)</td>
<td>Drysdale Station, Joanne and Anne Koyers</td>
</tr>
<tr>
<td>24 Jun 09</td>
<td>KLC meeting (Kununurra)</td>
<td>Kimberley Land Council, Nolan Hunter (Kununurra)</td>
</tr>
<tr>
<td>1 Jul 09</td>
<td>NW Planners Forum (Broome)</td>
<td>Multiple stakeholders, Shire Broome, SWEK, Shire Derby, DPI, UDLA, Environ Kimberley, WAPC (Gary Pratley)</td>
</tr>
<tr>
<td>2 Jul 09</td>
<td>Northern Australia Land and Water Taskforce meeting (Kilto Station)</td>
<td>Multiple stakeholders, Taskforce members (Elaine Gardiner, Joe Ross, David Crombie, Ro Hill, Stuart Blanche, Andrew Johnson, Shirley McPherson, David Roche), Michael Douglas (TRaCK), Chris Ham, Kevin May, and Sandra van Vreeswyk (DAFWA), Murray Radcliffe (NWC), Phillip Hams (Gogo Station), Anne Poelina (Nikina-Mangala), Karen Dayman and Lilian Chestnut (FitzCAM), Mervyn and June Street (Gooniyandi), Annette Kogolo, Jack Burton, Peter Kneebone (SDWK), Redbeard (Rec fishing), Gary Scott (EK), Jim Motter (PGA), Martin Pritchard (EK) Barbara Wheeler (CSIRO)</td>
</tr>
<tr>
<td>6 Jul 09</td>
<td>DoW staff (Kununurra)</td>
<td>DOW – region, DoW staff</td>
</tr>
<tr>
<td>28 Jul 09</td>
<td>DoW staff (Kununurra)</td>
<td>DOW – region, DoW staff</td>
</tr>
<tr>
<td>31 Jul 09</td>
<td>Kimberley Development Commission (Derby)</td>
<td>Kimberley Development Commission, KDC Board</td>
</tr>
<tr>
<td>4 Aug 09</td>
<td>Ballangerra</td>
<td>Traditional, Ballangerra Traditional Owners and KLC staff</td>
</tr>
<tr>
<td>Date</td>
<td>Event</td>
<td>Location</td>
</tr>
<tr>
<td>------------</td>
<td>-------</td>
<td>----------</td>
</tr>
<tr>
<td>5 Aug 09</td>
<td>IPA meeting (Home Valley)</td>
<td>Owners and Kimberley Land Council</td>
</tr>
<tr>
<td>11 Aug 09</td>
<td>TRaCK E-flows workshop (Perth)</td>
<td>TRaCK and DoW</td>
</tr>
<tr>
<td>12 Aug 09</td>
<td>KARG meeting (Broome)</td>
<td>Kimberley Language Resource Centre, Kimberley Land Council, Kimberley Aboriginal Law and Culture Centre</td>
</tr>
<tr>
<td>15 Sep 09</td>
<td>DoW staff (Kununurra)</td>
<td>DOW – region</td>
</tr>
<tr>
<td>18 Sep 09</td>
<td>Lingiari Foundation (Broome)</td>
<td>KLC, Lingiari Foundation, IWPG, LWA</td>
</tr>
<tr>
<td>1 Oct 09</td>
<td>Australian Society of Limnology Conference (Alice Springs)</td>
<td>Researchers and water resource managers</td>
</tr>
<tr>
<td>5 Oct 09</td>
<td>MG Directors meeting (Kununurra)</td>
<td>Miriuvung Gajerrong Corporation</td>
</tr>
<tr>
<td>7 Oct 09</td>
<td>Shire of Broome</td>
<td>Shire of Broome and</td>
</tr>
<tr>
<td>Date</td>
<td>Event Description</td>
<td>Participants</td>
</tr>
<tr>
<td>-----------</td>
<td>--------------------------------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>4–5 Nov 09</td>
<td>NAWFA meeting (Darwin) Other government agencies and</td>
<td>Chris Schweizer (Chair, DEWHA), Murray Radcliffe (NWC), Chris Wicks (NRETAS, NT), Susie Williams (DoW, WA), Marcus Lane (CSIRO), Michael Storrs (NAILSMA), Natalie Stoeckl (JCU), Sandy Toussaint (UWA).</td>
</tr>
<tr>
<td></td>
<td>northern water resource stakeholders</td>
<td></td>
</tr>
<tr>
<td>23 Nov 09</td>
<td>Dambimangari IPA meeting (Derby) Traditional Owners</td>
<td>Traditional owners</td>
</tr>
<tr>
<td></td>
<td>and Kimberley Land Council</td>
<td></td>
</tr>
</tbody>
</table>
# Appendix C – Water-dependent ecological assets

<table>
<thead>
<tr>
<th>Significance</th>
<th>Site description and examples</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>United Nations Education, Cultural and Scientific Organisation (UNESCO) Biosphere Reserve</strong>: Prince Regent River</td>
<td>Refer to: <a href="http://www.unesco.org">www.unesco.org</a></td>
</tr>
<tr>
<td></td>
<td><strong>World Heritage Site</strong>: Purnululu National Park</td>
<td>Refer to: <a href="http://www.whc.unesco.org">www.whc.unesco.org</a></td>
</tr>
<tr>
<td><strong>National Significance</strong></td>
<td><strong>Wetlands of national significance listed in the Directory of important wetlands in Australia</strong>: Geikie Gorge, Gladstone Lake, Le Lievre</td>
<td><em>A Directory of Important Wetlands in Australia (DIWA)</em>, Third Edition (Environment)</td>
</tr>
<tr>
<td>Wild Rivers: Thirty-three of the state’s forty-eight wild rivers are located in the Kimberley, concentrated mostly in the North Kimberley. These waterways and their catchments remain generally undisturbed due to their isolation, rugged topography or land tenure.</td>
<td>Water and Rivers Commission 1999, report to the former Australian Heritage Commission.</td>
<td></td>
</tr>
<tr>
<td>State-level significance</td>
<td>11 distinct areas in both the west and east Kimberley containing approximately 45 individual mound springs. There is likely to be many more that have not been recorded.</td>
<td></td>
</tr>
<tr>
<td>--------------------------</td>
<td>--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>Subterranean desert sites</td>
<td>Numerous significant groundwater dependent ecosystems in cave and karst aquifers and springs, such as in the limestone ranges in the East and West Kimberley. These support significant stygofauna communities, including short range endemic species. There are also significant stygofauna in sandstone springs (e.g. Zebedee Springs) and alluvial and fractured rock aquifers. E.g. Argyle mine.</td>
<td></td>
</tr>
</tbody>
</table>


**Threatened Ecological Communities (TEC)** listed under the Wildlife Conservation Act 1950 as either vulnerable or endangered: Theda Soak - Assemblages of Theda Soak rainforest swamp; Walcott Inlet - Assemblages of Walcott Inlet rainforest swamp; Roe River - Assemblages of Walcott Inlet rainforest swamp; Bunda Bunda - Assemblages of Bunda Bunda organic mound springs; Big Spring - Assemblages of Big Spring organic mound springs; Dragon Tree Soak - |

- *Shanahan & Coote, 2008*
- *Warlu Jilajaa Jumu IPA, 2007; Paruku IPA Plan, 2001*
- *pers. com. Dr Stefan Eberhardt*
Dragon Tree Soak organic mound springs; North Kimberley Mounds - organic mound spring; Sedgeland community of the North Kimberley Bioregion; Monsoon Thickets-Monsoon (Vine) thickets on the coastal sand dunes of the Dampier Peninsula; Black Spring - Black spring organic mound spring community; Mandora Mounds-Assemblages of the organic springs and mound springs of the Mandora Marsh area, West Kimberley.

Priority Ecological Communities (PEC): Priority 1 (P1): Perched spring-fed peat-based swamps on hill slopes of the Durack Range area; assemblages of Point Spring and Long Spring rainforest swamps; assemblages of the wetlands associated with the organic mound springs on the tidal mudflats of the Victoria-Bonaparte Bioregion; Monsoon vine thickets of limestone ranges; *Oryza australiensis* (wild rice) grasslands on the alluvial flats of the Ord River; inland Mangrove (*Avicennia marina*) community of Salt Creek; plant assemblages on vertical sandstone surfaces-Bungles and Molly Spring, Cathedral Gorge and Thompsons spring; invertebrate community of Napier range Cave-on Old Napier Downs, Karst No. KNI; invertebrate community of the cliff foot springs around Devonian reef system, Black soils.


**Wildlife Conservation Act 1950, and**

# Glossary

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABS</td>
<td>Australian Bureau of Statistics</td>
</tr>
<tr>
<td>aquifer</td>
<td>Rock or sediment in a formation, group of formations, or part of a formation which is saturated and sufficiently permeable to transmit economic quantities of water to wells and springs.</td>
</tr>
<tr>
<td>DEC</td>
<td>Department of Environment and Conservation</td>
</tr>
<tr>
<td>DEWHA</td>
<td>Department of the Environment, Water, Heritage and the Arts (Australian Government)</td>
</tr>
<tr>
<td>DoE</td>
<td>former Department of Environment</td>
</tr>
<tr>
<td>DoW</td>
<td>Department of Water</td>
</tr>
<tr>
<td>ecosystem resilience</td>
<td>The capacity of ecosystems to cope with disturbances without shifting into a qualitatively different state.</td>
</tr>
<tr>
<td>evapotranspiration</td>
<td>Process of moisture loss to the atmosphere from plants by transpiration and evaporation.</td>
</tr>
<tr>
<td>GSWA</td>
<td>Geological Survey of Western Australia</td>
</tr>
<tr>
<td>HCVAEs</td>
<td>high conservation value aquatic ecosystems</td>
</tr>
<tr>
<td>inter-basin transfer</td>
<td>Transfer of water between different water basins or catchments.</td>
</tr>
<tr>
<td>Kimberley Appropriate Economies Roundtable</td>
<td>A community-driven planning event. The meeting looked at options, principles and actions that promote appropriate and sustainable development with a focus on the Fitzroy valley but also more broadly across the Kimberley.</td>
</tr>
<tr>
<td>KEP report</td>
<td>Kimberley Expert Panel report: <em>Options for bringing water to Perth from the Kimberley – an independent review</em></td>
</tr>
<tr>
<td>KLC</td>
<td>Kimberley Land Council</td>
</tr>
<tr>
<td>MRWA</td>
<td>Main Roads Western Australia</td>
</tr>
<tr>
<td>national heritage</td>
<td>National heritage is all the things that make up Australia’s identity</td>
</tr>
</tbody>
</table>
Kimberley regional water plan: supporting detail

- our spirit and ingenuity, our historic buildings, and our unique, living landscapes.

**National Water Initiative**

The National Water Initiative (NWI) is Australia's enduring blueprint for water reform. Through it, governments across Australia have agreed on actions to achieve a more cohesive national approach to the way Australia manages, measures, plans for, prices, and trades water.

**ORIA**

Ord River Irrigation Area – the original 15,000 ha area in the Ord valley that has been developed for irrigated farming.

**Ramsar wetland**

The Ramsar Convention was signed in 1971 and is an intergovernmental treaty that provides a framework for national action and international cooperation for the conservation and wise use of wetlands and their resources. Ramsar is a city in Iran where the convention was held.

**RCG**

Rangelands NRM Coordinating Group

**saltwater intrusion**

The movement of saline water into freshwater aquifers. Most often it is caused by groundwater pumping from coastal bores.

**RAESP**

Remote area essential services provider

**TECs**

threatened ecological communities

**volumes**

100,000 litres (L) = 1000 kilolitres (kL) = 1.0 megalitres (ML) = 0.001 gigalitres (GL)

**water-dependent values**

Existing ecological, social, cultural or economic values that depend on a water regime for their maintenance.

**water licence**

A legal entitlement to use or interfere with water.

**Wild Rivers**

Those rivers which are undisturbed by the impacts of modern technological society. They remain undammed, and exist in catchments where biological and hydrological processes continue without significant disturbance. They occur in a variety of landscapes, and may be permanent, seasonal or dry watercourses that flow or only flow occasionally.

**WRC**

Water and Rivers Commission
References

Allen AD, Laws AT, Commander DP, 1992, A review of the major groundwater resources in Western Australia, Geological Survey of Western Australia, Perth.

Appleyard et al. 2006, Options for bringing water to Perth from the Kimberley: an independent review, for Department of Premier and Cabinet.


Australian Bureau of Statistics 2001, Census of population and households, Canberra


Barber K & Rumley H 2003, Gunanurang: (Kununurra) Big River, Aboriginal cultural values of the Ord River and wetlands: a study and report prepared for the Water and Rivers Commission.


Beckwith Environmental Planning Pty Ltd 2006, Options for transferring water from the Kimberley – an analysis of Kimberley stakeholder perspectives, unpublished report prepared for the Kimberley Water Expert Panel and Department of Premier and Cabinet.


Crough, G & Christophersen, C 1993, Aboriginal people in the economy of the Kimberley region, Australian National University, Darwin.

Department of Agriculture and Food WA 2007, Summary of stakeholder survey throughout the West Kimberley and Pilbara regions, benchmarking study by the New Opportunities in Tropical and Pastoral Agriculture program.


Department of Land Administration 2000, *Waterbank structure plan*, Broome.

Department of Planning and Infrastructure 2006, *North Kimberley land use and infrastructure investigations*, draft discussion paper, unpublished report.


Department of Water and Miriuwung Gajerrong Aboriginal Corporation 2008, *Interim management plan – Reserve 31165*

Department of Water 2006, *Environmental values, flow related issues and objectives for the lower Ord River, Western Australia*, prepared by Kerry Trayler, Ben Malseed and Mike Braimbridge, Department of Water, Environmental water report series, report no. 1.


Geological Survey of Western Australia 1992, *A review of the major groundwater resources in Western Australia*, Perth, Western Australia.


Howard, J 2007, *A national plan for water security*.


Kimberley Development Commission and Department of Transport 1999, North Kimberley road user study – final report, Department of Transport, Perth.

Kimberley Development Commission 2001, Kimberley economic perspective: an update on the economy of Western Australia’s Kimberley region, KDC.

Kimberley Land Council 2004, How traditional owners of the North Kimberley want to look after their country, Department for Planning and Infrastructure North Kimberley scoping study, Indigenous consultation.


Lindsay, RP & Commander, DP 2005, Hydrogeological assessment of the Fitzroy alluvium, Western Australia, Department of Water, Hydrogeological record series, report no. 16.

Mann, M & Vernes, T 2004, Initial submission to expert panel: an investigation into Kimberley dewatering proposals, submitted to the Kimberley Expert Panel.

Main Roads Western Australia 1997, Roa.ds 2020 regional road development strategy, Kimberley region, MRWA, Perth


Morgan, D, Allen, M, Bedford, P & Horstman, M 2004, Fish fauna of the Fitzroy River in the Kimberley region of Western Australia including the Bunuba, Gooniyandi, Ngarinjin, Nyikina and Walmajarri Aboriginal names, records of the Western Australian Museum 22: 147-161.

Morgan, D, Thorburn, D, Fenton, J, Wallace-Smith, H & Goodson, S 2005, Influence of the Camballin barrage on fish communities in the Fitzroy River, Western Australia, Murdoch University/Kimberley Land Council/ Department of Environment report to Land and Water Australia.


Rangelands NRM Coordinating Group 2005, *A strategy for managing the natural resources of Western Australia’s Rangelands*.


