North Central CMA Regional Catchment Strategy:

Draft Waterway and Floodplains Discussion Paper

1. Preamble

The North Central Regional Catchment Strategy (RCS) is the principle framework for land, water and biodiversity management in North Central Victoria. This discussion paper has been written to assist in the development of the North Central RCS. The discussion paper attempts to articulate our current understanding of particular issues or assets including setting priorities and will used to seek feedback and guide future direction setting in the RCS.

The Department of Sustainability and Environment (DSE) is currently finalising the Victorian Strategy for Healthy Rivers, Estuaries and Wetlands (VSHREW). It is anticipated that this discussion paper (in particular the direction and recommendations) will align with the policy developments outlined in the VSHREW.

Policy context

2. Vision for waterways and floodplains

Waterways and floodplains will be managed sustainably to protect and enhance their diversity and ecological function while supporting the uses of the regional community.

(This vision has been adapted from the vision for waterways and wetlands in the North Central River Health Strategy - NCCMA 2005).

The VSHREW is currently in development and will provide guidance and inform the development of both the North Central RCS and the North Central Strategy for Healthy Rivers and Wetlands.

Do you agree with the Vision for the Asset Theme? Can you suggest how it could be improved, modified and strengthened?

3. Asset description

<u>Waterways and floodplains as an asset</u>

Rivers and their associated floodplains are diverse and complex ecosystems. They support a large array of native flora and fauna (many of which are threatened), are highly important in the movement and cycling of sediment and nutrients through the landscape, and are a significant interface between aquatic and terrestrial systems. In an economic sense, our community is dependent on rivers as a key component of our natural infrastructure. Rivers provide safe drinking water for thousands of people, and water to support our rural production (DNRE 2002). The location of many of our regional towns are on or near a waterway to provide a source of water has meant that waterways have become entwined in the lives and histories of people.

Water as a consumptive resource (from both surface and groundwater) is also highly valued in the region. Uses include mineral spring waters, stock and domestic supplies, town water supplies, fire fighting and irrigation. Irrigation accounts for more than 95% of water consumed in the region (NCCMA 2003).

An intrinsic relationship between Indigenous culture and land has endured for over 40,000 years. The land continues to inform Indigenous identity and community today. Traditionally, Indigenous people have a strong affinity with waterways and water bodies, as a vital source of food, water and camping sites.

The broader community places a high value on water and waterways, from which it derives many benefits. These include irrigation, stock, domestic and industrial supply, tourism, habitat for native flora and fauna, recreational and visual amenity values, regional identity and nature conservation (NCCMA 2005).

Waterways

The North Central region contains four river basins or catchments (within the Murray Darling drainage division as defined by the Australian Water Resources Council (ANRA 2011)):

- Campaspe - Basin 6
- Loddon - Basin 7
- Avoca - Basin 8
- Wimmera - Basin 15 (partial)

Campaspe Basin

The Campaspe River catchment lies in the east of the North Central region. It extends from the Great Dividing Range in the south, to the River Murray in the north, and covers a total area of approximately 400,000 hectares (NCCMA 2005).

The major waterway is the Campaspe River which flows 245 km north to its confluence with the River Murray at Echuca. The Campaspe's major tributary is the Coliban River. Other significant tributaries include the Axe, McIvor, Mount Pleasant, Wild Duck and Pipers creeks (NCCMA 2005).

Loddon Basin

The Loddon River catchment, home to two-thirds of the North Central population, covers approximately 1,500,000 hectares and extends approximately 310km from the Great Dividing Range in the south to the River Murray (NCCMA 2005).

The Loddon River is the principal waterway which flows north from near Daylesford on the Great Divide to the River Murray near Swan Hill. Major tributaries of the Loddon River are Tullaroop and Bet Bet creeks in the southwest of the catchment, and Bullock and Bendigo creeks in the east. River Murray anabranches Gunbower and Pyramid creeks flow across the northern floodplain. Barr Creek is considered one of the saltiest inland waterways in Victoria and plays an important role in salt mitigation in the Loddon-Murray region. There are several high value wetlands associated with the Loddon including the internationally recognised Ramsar listed Kerang Lakes, Boort district wetlands and Gunbower Forest (NCCMA 2005).

Avoca Basin

The Avoca basin is the fifth largest catchment in Victoria and covers 1,200,000 hectares, though only 690,000 of these lie within the North Central CMA region.

The Avoca River is an anabranching river system which conveys the most variable flow of all the Victorian rivers in the Murray-Darling Basin. The river rises at the foot of Mt Lonarch, near Amphitheatre and initially flows within a relatively confined valley. Approximately halfway along its length (near Glenloth), the river splits into a series of anabranching channels across the alluvial plain to eventually terminate in Lake Bael Bael. Upper catchment streams of Glenlogie, Sugarloaf, Cherry Tree and Strathfillan creeks all enter the Avoca from the west. In the lower catchment two ephemeral effluent streams, namely Lalbert and Tyrell creeks flow west to terminate in Lake Timboran and Lake Tyrell respectively. These lakes and the majority of their creek lengths lie within the Mallee CMA region (NCCMA 2005).

Wimmera Basin

Basin 15 is divided between the regions of the North Central CMA (Avon and Richardson rivers) and Wimmera CMA (Wimmera River and tributaries). The Avon-Richardson catchment is a land-locked river system that extends northwards from the Pyrenees foothills southwest of St Arnaud, to Lake

Buloke on the margins of the mallee, and covers a total area of approximately 330,000ha. The catchment has relatively little river regulation to modify flows (NCCMA 2005).

The two main waterways in the catchment are the Avon River and the Richardson River. The Avon River originates in the sedimentary hills south of Beazleys Bridge, and the Richardson River flows through the flat clay plains near Callawadda and Marnoo. The two rivers meet at Banyena, where the Richardson River continues flowing northward to the nationally significant Lake Buloke. The major tributaries flowing into the Avon River are Sandy, Paradise and Reedy creeks. Those flowing into the Richardson River include Wallaloo and Swedes creeks. There are over 100 lakes and wetlands within the Avon-Richardson catchment, including Lake Batyo Catyo, Lake Cope Cope and the lakes at Avon Plains (NCCMA 2005).

Murray River

Although not part of the North Central region, the River Murray between Echuca and Swan Hill lies on the border of the region, and the interaction between the region and the River Murray is very significant – the River Murray is the single largest source of water in the region for irrigation, while the Loddon, Campaspe and Avoca rivers all contribute water, salt and nutrients to the Murray as well as the exchange of aquatic species (i.e. migratory fish). The River Murray is a waterway of national importance and is integral to the health of the internationally significant Gunbower Forest and Kerang Lakes wetlands (NCCMA 2005).

Whilst not a direct asset, environmental water is a key tool in maintaining the health of waterways in the region. The North Central CMA is the appointed Environmental Water Reserve Manager within the North Central region and works with the Victorian Environmental Water Holder (VEWH) and the Commonwealth Environmental Water Holder (CEWH) and a range of other parties to maximise environmental benefits from the EWR and integrate it with other waterway management activities (see Appendix 1).

Floodplains

The catchments of the various rivers and streams within the North Central region include areas of flood-prone land, where flooding has historically caused substantial damage to both the natural and built environment. Floods are naturally occurring events. The inherent functions of the floodplains to convey and store floodwater should be recognised and preserved to minimise the deterioration of environmental values and the long-term flood-risk to floodplain production, assets and communities (NCCMA 2005).

More than 5,000 square kilometres of rural and urban land across the region under public and private ownership is subject to inundation by a 1 in 100 year flood. *Ad-hoc* works and inappropriate development in the past have significantly impacted on the natural floodplains by changing the flood frequency and flooding patterns, and has caused deterioration in the natural riverine, floodplain and wetland environments. Best practice floodplain management will reduce flood damage, improve the wellbeing of landowners and reduce adverse impacts on the natural environment (NCCMA 2005).

The flood event of January 2011 was the largest flood on record for the majority of river systems in the North Central region. It is estimated that in the order of 7,800 square kilometres of rural and urban across the region was affected by flood inundation, this equates to 25% of the North Central region. The flood events of 2010-11 caused devastating impacts on urban and rural communities within the region. The Comrie Review (as at 12 October 2011) estimated gross total cost of these floods is nearly $1.3 billion (this amount may further increase as damage to assets is assessed). For example, VicRoads has found that new damage to some roads has been identified following an initial repair. This figure includes direct costs to local government authorities, CMAs, government departments, agricultural losses, repair and restoration costs and other recovery measures.

There has been significant economic and environmental benefits from the January 2011 flood event, all water storages within the region are at capacity, wetlands that are otherwise disconnected from the floodplain have been filled and farmers are realising a bumper crop season.

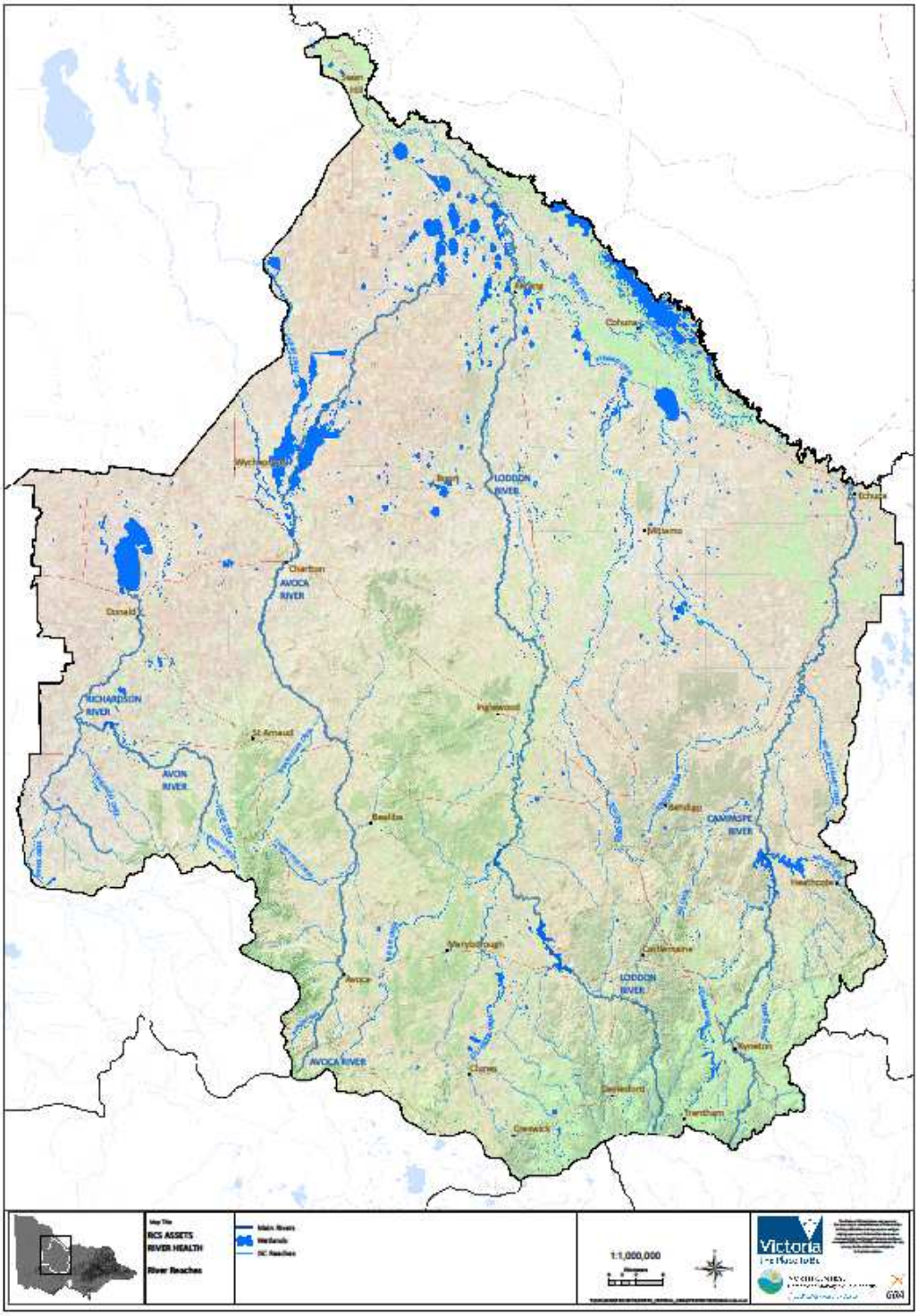

Figure 1 - Waterways of the North Central region

4. Condition of asset

Index of Stream Condition
The more than 3,500 km of waterways in the North Central CMA region have been assessed five-yearly since 1999 using the Index of Stream Condition (ISC) assessment method.

In 2004, there were no North Central region waterway reaches assessed to be in excellent condition. One reach was in good condition, 43 in moderate condition, 38 in poor and 15 reaches were found to be in very poor condition. The above information may be updated with 2010 ISC when it becomes available. (DSE 2005)

Sustainable Rivers Audit
The Sustainable Rivers Audit (SRA) carried out by the Murray Darling Basin Authority provides a long-term assessment of the condition and health of the 23 river valleys in the Murray—Darling Basin. The first SRA report is based on data collected in 2004—07 on three environmental themes: fish, macro-invertebrates and hydrology. Nine out of 10 Victorian valleys in the Murray Darling Basin were in very poor ecological health, and one valley – the Ovens - was in poor ecological health.

This audit shows:

- the Campaspe valley to be in very poor overall health (Lowland zone – very poor, Slopes Zone – extremely poor, Upland Zone – extremely poor)
- the Loddon valley to be in very poor overall health (Lowland zone – very poor, Slopes Zone – very poor)
- the Avoca valley to be in very poor overall health (Lowland zone – very poor, Slopes Zone – poor), and
- the entire Wimmera valley to be in very poor overall health (Lowland zone – very poor, Slopes Zone –poor),

The next SRA report is due in 2011, with assessments based on indicators from five environmental themes — fish, macro-invertebrates, hydrology, vegetation and physical form (MBDC 2008).

5. Threats to assets

At the regional scale, a number of management activities can impact on the health of waterways and floodplains (DNRE 2002). These include:
Urban

- Urbanisation
- Inappropriate recreation practices
- Growth and spread of exotic flora and fauna (both aquatic and terrestrial)
- Poor management of urban runoff and stormwater

Rural

- Catchment clearing
- Poor land management
- Grazing and clearing of stream banks
- Growth and spread of exotic flora and fauna (both aquatic and terrestrial)
- Levees and floodplain development
- Structural woody habitat (snag) removal
- Instream barriers for fish passage
- Water regulation

Some of the key impacts of these activities include:

- Increased catchment erosion, hence sedimentation of the streambed and smothering of biota

- Increased input of contaminants such as sediment, salt or nutrient causing deterioration in instream habitat
- Increased salinity levels
- Changed vegetation structure and species composition
- Reduced regeneration of native vegetation
- Reduced input of organic matter and structural woody habitat to rivers
- Reduction or loss of floodplain linkages
- Disrupted longitudinal and lateral linkages to waterways
- Changed streambed and channel shape
- Changes in flow patterns leading to loss of biological cues for aquatic species, reduced linkages, changes to habitat availability and changed geomorphic processes.

Do you feel the asset, its condition and risks have been described appropriately in the context of RCS development?

6. Community context

All river health projects and activities in the North Central CMA region have community input and consultation from the development of project concepts to project completion. The Natural Resource Management Committee (NRMC) is a community based committee that provides North Central CMA with a local community perspective on planning and works, and advises the North Central CMA Board on regional strategy, investment priorities and community engagement. Projects are supported by portfolio representatives from the NRMC and, in many cases, steering committees including community and agency members. Projects also deliver a range of community engagement activities such as events, field days, forums, fact sheets and media activities. There are also strong links between projects and the North Central CMA auspiced through Landcare and Waterwatch programs.

Two recent social surveys have provided insight into community perceptions of river health and community involvement in river health projects, both of which provide insight into the value of the community engagement activities delivered in the North Central region.

Case Study One: Landholder participation in Loddon river health projects

The North Central CMA currently delivers two projects on the Loddon River, the Enhancing upper catchment waterways and Loddon Stressed River projects, which seek to protect and improve the health of Victoria's second longest waterway through activities such as addressing vegetation removal, habitat loss and weeds; improving fish habitat; and community engagement.

A 2010 research project by Charles Sturt University (Curtis et al 2010) was conducted via a mail out to 223 landholders with licensed or freehold frontage along the Loddon River and interviews with 30 people including agency staff, landholders both involved and not involved in the project.

The survey aimed to determine:

- The effectiveness of the Loddon river health projects in working with landholders.
- Constraints to implementation of recommended river health practices by landholders who have not been involved in the projects.
- Factors influencing the extent of long-term commitment by landholders to river health project outcomes.

Key findings included:

- The Loddon river health projects have engaged a much higher proportion of landholders than most natural resource management programs.

- People who have been involved in the projects are more focused on environmental values than non-participants and are less concerned about government taking a stronger role in natural resource management.
- Project participants have higher awareness and more knowledge of river health issues, are more confident in recommended practices and are implementing these at much higher levels than non-participants.
- Project participants are very satisfied with the support provided by the North Central CMA and Department of Primary Industries staff.
- A small percentage of non participants were reluctant to be involved in projects. The main reasons for landholders not participating in projects are that they haven't been approached or are not aware that the projects exist.

Case Study Two: Community connections to local waterways

In 2009 the Department of Sustainability and Environment (DSE) undertook research to investigate the social importance of waterways in Victoria (DSE 2011a). This survey set out to investigate:

- how Victorians use their waterways
- their values and aspirations for rivers, wetlands and estuaries
- their knowledge of what makes a waterway healthy
- what Victorians do / are prepared to do to help manage for healthy waterways.

The survey was available on-line and paper copies were mailed to riparian landholders across the state with a total of 7140 surveys being completed. The My Victorian Waterway report shows Victorians feel a strong connection to their local waterway and most have good knowledge of river health issues.

The report is based on the results of a survey completed by more than 7000 Victorians who answered questions about how they use and care for their local waterways as well as their knowledge of river health issues and aspirations for the future of our waterways.

The information from the survey is being used to improve the Victorian Government's understanding of what Victorian communities would like to see from waterway management.

Some key findings of the survey include:

- Victorians visit waterways to engage in a wide variety of recreational and commercial activities. Results found that 92% visit waterways to enjoy scenery; 76% to walk, hike or cycle; 37% to plant native trees and clear weeds; 36% to fish and 21% for stock and irrigation purposes
- 99% of Victorians have high aspirations for our waterways and 98% agree that it is important for our waterways to be as healthy as possible so they continue to provide for our needs
- 83% feel most personally connected to a waterway local to them and 96% agree that they have a personal responsibility to our waterways
- 67% of Victorians have good to excellent knowledge of waterway health.

7. Priority setting

Broad objectives for overall asset

The Draft Victorian Strategy for Healthy Rivers, Estuaries and Wetlands (DSE 2011b) defines five key elements in an approach for managing rivers, estuaries and wetlands:

- recognising the importance of waterways with formal international, national and state significance
- fostering strong community partnerships

- implementing on-ground works and managing environmental water to protect, maintain or improve key community values
- using existing controls to prevent damage from current and future activities
- managing serious risks to public infrastructure from waterway processes.

The draft strategy further defines that Government investment in on-ground works and the provision of environmental water will be targeted at waterways with:

- Formal international, national or state significance
- Regional significance for their high community values
- Threats to upstream or downstream waterways of high value
- Critical importance for connectivity between other high value waterways
- Strong community commitment and support for improving environmental condition

Regional priority setting

The 2005 North Central River Health Strategy is due for renewal in 2013 and priorities will be subject to change based on that renewal.

The asset identification and priority setting process is a key component to the RCS development. The process used for asset identification and priority setting is explained below.

1. **Community Asset Identification** – 10 community meetings were held across the region seeking community nominations on environmental assets that were most valued by the community. These assets were mapped (where possible) and information regarding values and threats were captured in a database. These assets have been described at various scales such as a specific small patch of vegetation or a small section of river up to an entire forest or river system.

2. **Expert Stakeholder Workshops** – Experts, including agency staff with knowledge of environmental assets, attended workshops and added to the list of assets that were most valued within the region.

3. **Assets Review –** Many assets were nominated several times with slightly different areas of extent, asset name, values and threats identified. The Asset Review process aggregated assets together, where appropriate. All asset nominations have been recorded and can be found on the North Central CMA website.

   Many waterways assets were identified as part of the asset identification process run with the community and regional stakeholders. These assets were mapped at various scales from small stretches of river through to entire river systems. Some of these assets have been amalgamated to represent a waterway at a reach scale (approximately 20 to 30km in length) to match the existing reaches identified in the North Central River Health Strategy.

4. **Asset Filtering –** All assets identified were rated for their environmental significance and threat. This rating was used as an initial filter to help understand the importance of the asset. Highly significant assets were then also rated for feasibility of implementation from a technical and socio-economic perspective. This process was consistent with the recommended approach by the DSE Asset-based Approach (Refer to Table 1).

These assets may also include priority tributaries as identified Table 1.

Table 1: Waterway assets

Asset	Significance	Threat	Feasibility	Priority for detailed assessment
Avoca River Reach 2	high	moderate	medium-high	High
Avoca River Reach 3	high	moderate	medium-high	High
Avoca River Reach 4	high	moderate	medium-high	High
Avoca River Reach 5	high	moderate	medium-high	High
Avoca River Reach 6	high	moderate	medium-high	High
Avoca River Reach 7	high	moderate	medium-high	High
Avoca River Reach 8	high	moderate	medium-high	High
Avoca River Reach 1	high	moderate	medium-high	High
Birch Creek Reach 21	high	high	medium-medium	Medium
Campaspe River Reach 6	very high	high	medium-high	High
Campaspe River Reach 1	high	high	medium-high	High
Campaspe River Reach 2	high	high	medium-high	High
Campaspe River Reach 3	high	high	medium-high	High
Campaspe River Reach 4	high	high	medium-high	High
Campaspe River Reach 5	high	high	medium-high	High
Coliban River Reach 18	high	high	medium-high	High
Coliban River Reach 19	high	high	medium-high	High
Five Mile Creek	high	high	medium-high	High
Gunbower Creek Reach 38	high	very high	medium-high	High
Gunbower Creek Reach 39	high	very high	medium-high	High
Kangaroo Creek Reach 21	very high	moderate	medium-high	High
Loddon River Reach 2	high	very high	medium-high	High
Loddon River Reach 10	very high	high	medium-high	High
Loddon River Reach 9	high	high	medium-high	High
Loddon River Reach 7	high	high	medium-high	High
Loddon River Reach 6	high	high	medium-high	High
Loddon River Reach 5	high	high	medium-high	High
Loddon River Reach 3	high	very high	medium-high	High
Loddon River Reach 1	high	very high	medium-high	High
Loddon River Reach 4	high	very high	medium-high	High
Serpentine Creek Reach 11	high	high	medium-high	High
Tullaroop Creek	high	moderate	medium-high	High
Loddon River reach 48	very high	moderate	medium-high	High
Kangaroo Creek (Reach 49 Loddon Basin)	very high	moderate	medium-high	High
Headwaters of the Coliban River	very high	high	medium-high	High
Axe Creek and tributaries	high	very high	medium-medium	Medium
Murray River and associated Riparian zone and adjoining floodplain (public and private land)	very high	high	medium-medium	Medium

Representing Priority Waterways Assets in the RCS

The assets represented in the RCS have been further amalgamated to reflect a scale appropriate for the RCS. The priority waterway assets for the North Central RCS are listed below.

Please note: Although this process does provide direction regarding the highest priority assets for protection, this does not diminish the value of all assets identified through the community driven asset identification process. Assets not deemed to be a priority are rated as "notable assets" and are acknowledged in the RCS and can be viewed on the North Central CMA website. All notable assets can also be found on the CMA website along with information obtained from the community and some State Government databases.

The waterway assets identified in Table 1 are described at a reach scale (20km to 30km) which is best used for more detailed planning and implementation. The reach scale is too fine for region wide planning such as the RCS, therefore the priority assets have been represented at a larger scale. Many of the priority assets are contiguous and have been represented as follows and in Figure 2:

- Lower Avoca River
- Upper Avoca River
- Lower Campaspe River
- Lower Loddon River
- Upper Loddon River
- Coliban River
- Gunbower Creek

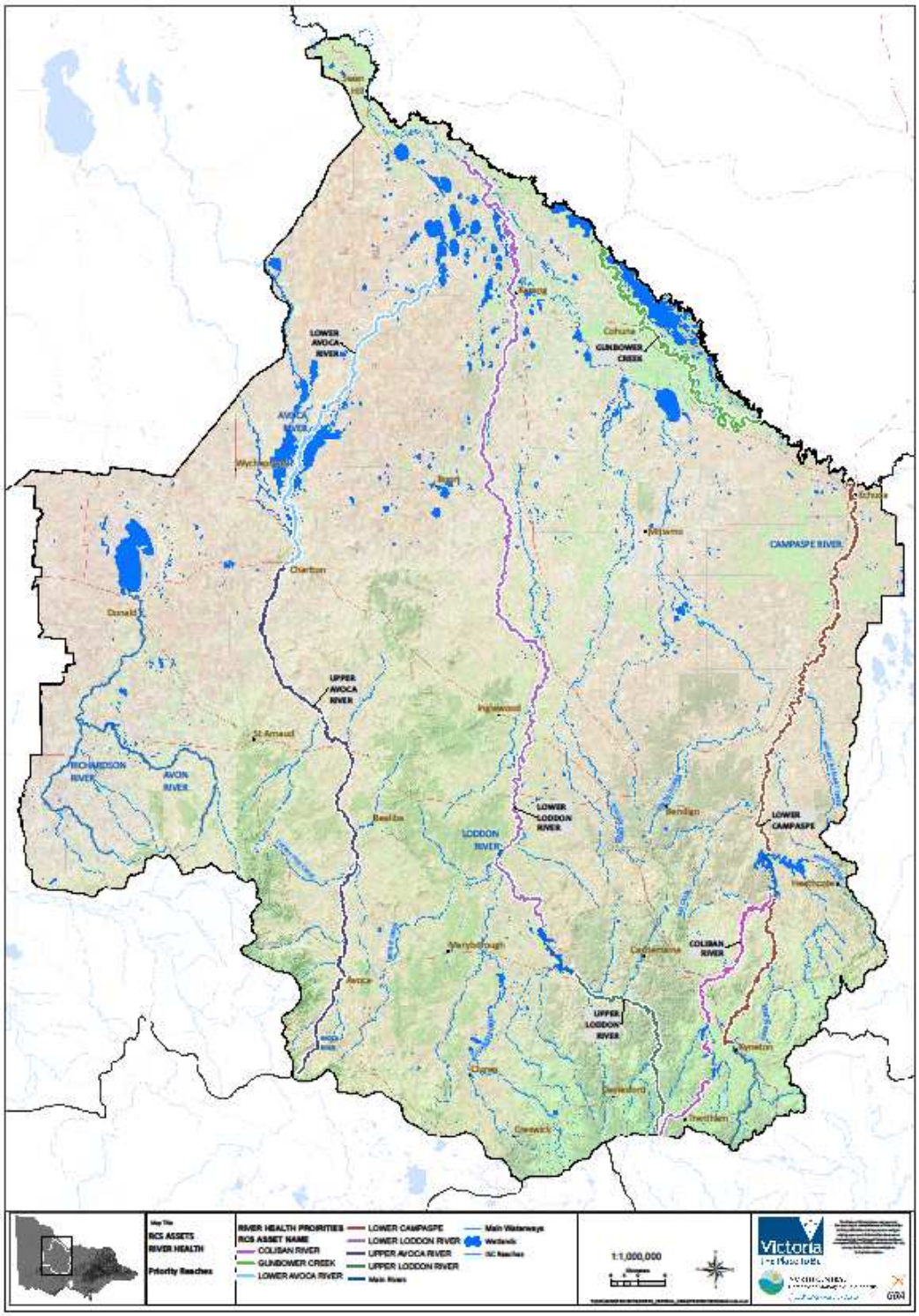

Figure 2 – North Central RCS Priority Waterway Assets

Do you agree with the priorities identified? Are there additional priorities? If so, what are they and why should they be a priority?

8. Priority asset objectives

The Investment Framework for Environmental Resources (INFFER) has been used for all priority RCS assets. The INFFER is a robust, scientific and transparent asset based approach to investment decision making for environmental assets.

Table 2 below summarises the targets that have been set for each asset (detailed INFFER assessments can be found on the North Central CMA website).

Table 2: SMART objectives for priority assets

	Objective
Lower Avoca River	Values – Unregulated river with extremely variable flows, largely intact red gum overstory within floodplain system. Threats – overgrazing, weed invasions and levees Objectives • Aspirational goal: To improve the condition of the Lower Avoca River from poor to moderate (based on Index of Stream Condition) by 2050. • SMART goal: To improve the condition of the riparian zone of the Lower Avoca River by 2021 with a measured increase of one point in the streamside zone sub-index of the ISC. Key Actions: Fencing and grazing management
Upper Avoca River	Values – Unregulated river with extremely variable flows, endangered creek lined grassy woodland with intact overstory. Threats – sedimentation and overgrazing Objectives • Aspirational goal: To improve the condition of the Upper Avoca River from moderate to good (based on Index of Stream Condition) by 2050. • SMART goal: To improve the condition of the riparian zone of the Upper Avoca River by 2021 with a measured increase of one point in the streamside zone sub-index of the ISC. Key Actions: Erosion control, fencing and grazing management
Lower Campaspe River	Values – Key habitat within cleared landscape comprising many threatened flora and fauna. Threats – altered flow regimes, overgrazing and weeds • Aspirational goal: To improve the condition of the lower Campaspe River from moderate to good (based on Index of Stream Condition) by 2050. • SMART goal 1: To improve the condition of the riparian zone of the Lower Campaspe River by 2021 with a measured increase of one point in the streamside zone sub-index of the ISC. SMART goal 2: To open up 77km for the Lower Campaspe River for fish passage by 2015 Key Actions: Environmental flows, fencing and grazing management
Lower Loddon River	Values – Key floodplain habitat with linkages to significant wetlands systems. Threats – altered flow regimes, overgrazing and weeds • Aspirational goal: To improve the condition of the Lower Loddon River from poor/moderate to good (based on Index of Stream Condition) by 2050. • SMART goals 1: To improve the condition of the riparian zone of the Lower Loddon River by 2021 with a measured increase of one point in the streamside zone sub-index of the ISC. • SMART goal 2:The extent and quality of instream fish habitat at critical sites within the Loddon River will be increased by 50% by 2022 Key Actions: Environmental flows, fencing and grazing management
Upper Loddon River	Values – Good condition through Wombat State Forest, highly valued by community Threats – overgrazing and weeds • Aspirational goal: To improve the condition of the Upper Loddon River from moderate to good (based on Index of Stream Condition) by 2050. • SMART goals: 1. Upper: To maintain condition of riparian habitat in the Wombat Forest. • SMART goal 2: To improve the condition of the riparian zone of the Upper Loddon River by 2021 with a measured increase of one point in the streamside zone sub-index of the ISC. Key Actions: fencing and grazing management, weed control

Coliban River	Values – Largely intact overstory with many threatened flora and fauna species Threats – altered flow regimes, overgrazing and weeds • Aspirational goal: To improve the condition of the Coliban River from moderate to good (based on Index of Stream Condition) by 2050. • SMART goal: To improve the condition of the riparian zone of the Upper Coliban River by 2021 with a measured increase of two points in the streamside zone sub-index of the ISC. Key Actions: Environmental flow management, fencing and grazing management, weed control
Gunbower Creek	Values – Anabranch of River Murray and linkages to Gunbower Forest Threats – altered flow regimes, overgrazing and weeds, high nutrients • Aspirational goal: To improve the condition of the Gunbower Creek from moderate to good (based on Index of Stream Condition) by 2050. • Overall Goal: To improve the condition of the riparian zone of the Gunbower Creek by 2021 with a measured increase of two points in the streamside zone sub-index of the ISC. Key Actions: Environmental flow management, fencing and grazing management, weed control

9. **Gaps in knowledge** - What are the key gaps in knowledge in the context of the RCS (broad region wide gaps in knowledge?)

There are a number of knowledge gaps in relation to waterway and floodplain assets within the North Central region. Addressing the following information gaps could inform further understanding of waterways and their management:

- Understanding of current condition of waterways and changes in condition from ISC3 survey
- Develop further understanding of the impact of North Central waterways on the flows, water quality and ecological values of the River Murray
- Develop further understanding of the implications of the Murray Darling Basin Plan on waterway management in the North Central region
- Impact of climate change on water yield, flow regimes and flood frequency and extent
- Role of rivers and floodplains in reducing future flood impacts e.g. riparian vegetation reducing impacts and recovery costs from floods
- Long term effectiveness and resilience of current riparian restoration interventions
- Improved understanding of the risks of delivery and movement of environment water e.g. flooding of private land
- Improved understanding of ecological response of waterways and wetlands to environmental water delivery (currently partially addressed by VEFMAP)

Have the knowledge gaps been identified? If not, what additional gaps in knowledge should be described?

10. Any overall actions, planning required

Currently the Victorian Government is finalising the Victorian Strategy for Healthy Rivers, Estuaries and Wetlands. This Strategy will guide the development of the North Central Regional River and Wetlands Strategy due for completion in 2013.

The Murray-Darling Basin Plan has the potential to greatly influence the health of the Loddon and Campaspe rivers. Therefore it will be important to ensure good outcomes are achieved for the Loddon and Campaspe rivers as part of the Basin Plan.

With more environmental water becoming available, the effective and targeted use of this water to meet environmental objectives is paramount. Strong planning with clear ecological objectives and an adaptive management approach will guide environmental water management within the North Central CMA region. The North Central CMA in conjunction with the DSE, the Victorian Environmental Water Holder (VEWH) and the Commonwealth Environmental Water Holder (CEWH) will work cooperatively to manage environmental water within the region.

The recent unprecedented floods within the North Central CMA region have instigated several flood studies to assist townships in preparing for and mitigating future flooding events.

Management of waterway and floodplain assets in the future will be informed by a number of projects within the North Central CMA region, as well as projects within the state and the Murray-Darling Basin.

The following projects will directly inform our understanding and management of these assets within the region:

- Finalisation of the Victorian Strategy for Healthy Rivers, Estuaries and Wetlands
- Development of the North Central Strategy for Healthy Rivers and Wetlands (to be developed by 2013) including all priority waterway and floodplain assets identified in this paper
- Murray-Darling Basin Plan
- Aquatic Value Identification and Risk Assessment (statewide tool with regional information).

In addition to these projects, the following activities are recommended to be completed as part of the RCS and the North Central Strategy for Healthy Rivers and Wetlands:

- Index of Stream Condition (ISC) assessments to be continued for all North Central CMA waterways
- Development/finalisation of INFFER assessments for all priority waterway and floodplain assets identified in this paper
- Consideration of impact of North Central waterways on the River Murray
- Consideration of implications from Murray Darling Basin Plan
- Clarification of the working relationship between the North Central CMA and the Murray Darling Basin Authority
- Clarity on the future of management and delivery of environmental water
- Develop and strengthen relationships with community, tertiary institutions and other organisations to improve research and knowledge of river health practices and understanding.
- Develop a strategy for transferring and disseminating river health knowledge to landholders, community and other agencies.
- North Central CMA, in partnership with local government, to develop Flood Mitigation Plans for high priority townships within the North Central CMA region
- Development of responses and management changes in response to recommendations from Review of the 2010–11 Flood Warnings & Response – Comrie review (State of Victoria 2011)
- Development of responses and management changes in response to recommendations from The Environment and Natural Resources Committee of Parliament inquiry into flood mitigation infrastructure in Victoria

Have regional issues/actions been identified appropriately? If not, what additional regional scale issues/actions should be identified?

11. RCS direction and recommendations

Given all information in the discussion paper what are the key components that need to be articulated in the RCS:

- Development of the North Central Strategy for Healthy Rivers and Wetlands
- Deliver Flood Mitigation Plans in conjunction with local Government
- Work with VEWH and CEWH to use environmental water efficiently and effectively
- Clear explanation of the prioritisation process for developing waterway and floodplains priority assets
- Clear explanation of planning processes in project development including the INFFER assessment
- Framework for coordination of project planning and delivery within and between agencies
- Framework for addressing identified knowledge gaps.

Do you agree with the overall RCS directions and recommendations? If not, what additional directions and recommendations should be included?

What part could your organisation play in meeting the directions and recommendations set out in this discussion paper and subsequently in the RCS?

Overall, do you have any additional comments or issues you would like to raise in regards to this discussion paper?

12. References

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Appendix 1

Environmental flows

Water is the lifeblood of our rivers and a healthy river requires a variety of flows. An "environmental flow" is any managed change in a river's flow pattern intended to maintain or improve river health. The range of flows required to maintain river health constitute a flow regime, where the volume, time of year, and duration of delivered flows vary. These individual flow components provide differing benefits to the river, and when in combination are delivered as a flow regime they contribute to maintaining or improving the health of the river.

The Environmental Water Reserve (EWR) is the legal term used to describe the amount of water set aside to meet environmental objectives. The EWR was established in 2005 as an outcome of the 'White Paper – Securing our water future together'. Changes in the legislation gave protection for the first time to the environment's share of water in rivers and wetlands.
The EWR water includes:

- Environmental water entitlements which are water held in storage that is managed to provide environmental flows in rivers
- Environmental water that must be released by water corporations from their entitlements, usually called passing flows
- Unregulated flows and spills from storages due to rainfall

Established on 1 July 2011 after amendments to the Water Act, the Victorian Environmental Water Holder (VEWH) is an independent authority that holds Victoria's environmental water entitlements. Its role is to coordinate delivery of environmental water across the state independently from the Victorian Government.

The North Central CMA is the appointed Environmental Water Reserve Manager within the North Central region. Our role is to work with the Victorian Environmental Water Holder, other environmental water holders, storage operators, water corporations, the community and land-holders to maximise environmental benefits from the EWR and integrate it with other waterway management activities. This includes:

- Environmental water planning
- Community engagement
- Bidding for environmental water
- Managing environmental water releases
- Monitoring and reporting

Rivers within the North Central CMA may also be allocated water from other sources including the Murray Darling Basin Authority the Living Murray Program, Commonwealth Environmental Water Holder, water donations and alternative delivery of consumptive water.