Hawkesbury Nepean River System Community Values and Uses Report

April 2023

Developed as a part of:

Hawkesbury-Nepean River System (HNRS) Coastal Management Program (CMP) – Stage 2

Document history

This report has been prepared by Mosaic Insights in partnership with Alluvium Consulting Australia Pty Ltd for Hornsby Shire Council on behalf of the Partner Councils for the Hawkesbury Nepean River System Coastal Management Program.

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Alluvium recognises and acknowledges the unique relationship and deep connection to Country shared by Aboriginal and Torres Strait Islander people, as First Peoples and Traditional Owner/Custodians of Australia. We pay our respects to their Cultures, Country and Elders past and present.

Artwork by Melissa Barton. This piece was commissioned by Alluvium and tells our story of caring for Country, through different forms of waterbodies, from creeklines to coastlines. The artwork depicts people linked by journey lines, sharing stories, understanding and learning to care for country and the waterways within.

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1. Introduction and context

This Hawkesbury Nepean River System Community Values and Uses Report has been prepared as a supporting document to the Hawkesbury Nepean River System Coastal Management Program (HNRS CMP). The HNRS CMP will be the guiding framework for managing the Hawkesbury-Nepean River system (HNRS) for the next 5 – 10 years and set the long-term strategy for the coordinated management of the system and its catchment. A system-wide approach to the CMP has been adopted in recognition of the fact that important physical and ecological processes extend across the waterways, catchment and foreshores of the HNRS, and that these processes underpin the diverse and significant value of the system.

The Hawkesbury-Nepean River system is an ancient, iconic waterway skirting the edge of the Sydney Basin. It supports the lives, livelihoods, and lifestyles of approximately 2.9 million people living within the catchment area– a population that is forecast to increase over the next 30 years (HNRS CMP Scoping Study). The catchment and waterways are part of the traditional lands and waters of several First Nations who have an ongoing physical and cultural connection to the area extending more than 40,000 years. The estuary system is a fundamental and defining aspect of life in the region, and is valued for a broad range of social, cultural, environmental, and economic benefits. At the same time, and as the recent flood events of 2021 and 2022 accentuated, the community is deeply concerned about future threats associated with the impacts of natural hazards, climate change, urbanisation, and pollution of the catchment and waterways.

The communities in the region are not homogenous, and have a broad range of interests, opinions and perspectives. Future planning of the Hawkesbury-Nepean River system must take the diversity of values, aspirations, and concerns into account in order to establish a transparent evidence base for decision-making that is supported by the community.

The geographical area of the HNRS CMP, includes the Hawkesbury River Estuary, the Brisbane Water Estuary, the Pittwater Estuary and Broken Bay – and also considers the wider contributing catchment of these waterways. However, the legislation limits management actions within the CMP to the coastal zone as defined in the *NSW Coastal Management Act 2016*. The HNRS can be split in five geographical zones: the Upper Hawkesbury, Lower Hawkesbury, Brisbane Water, Pittwater and Broken Bay (Figure 1).

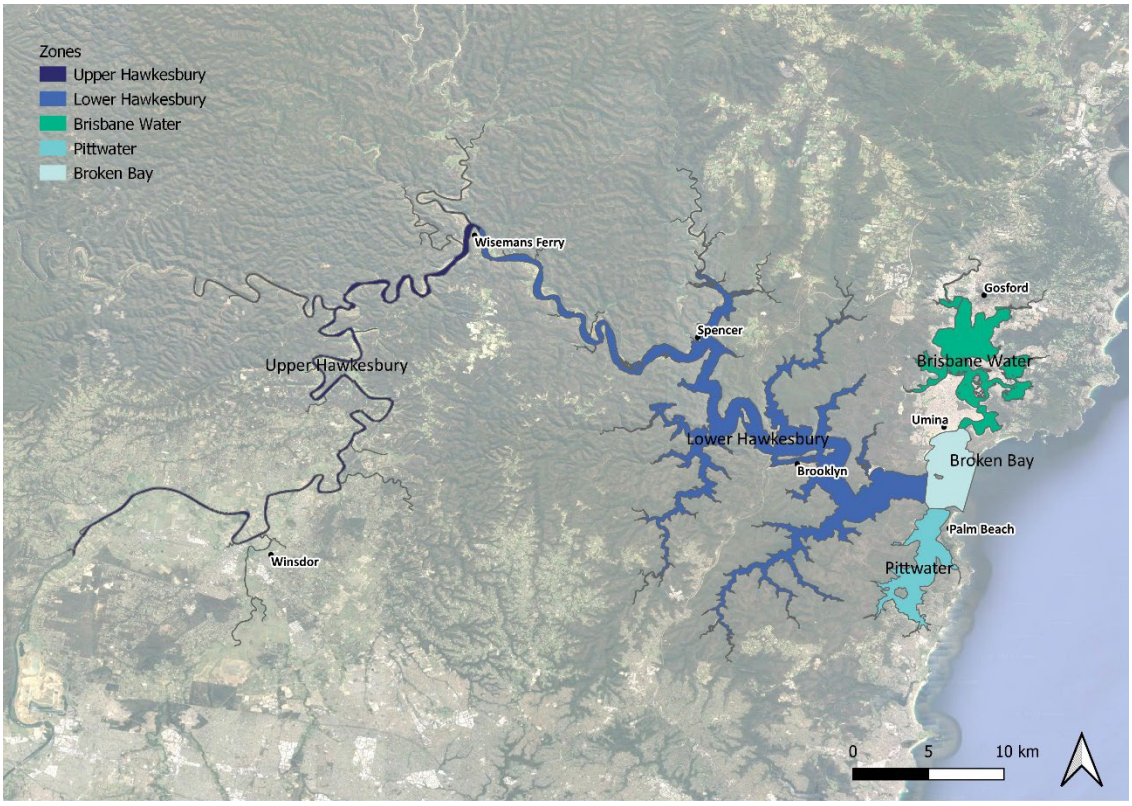

Figure 1. *Zones of the HNRS*

1.1 Intended use of the Community Values and Uses Report

This Community Values and Uses Report will be an essential tool for developing a CMP that broadly aligns with community values and addresses threats, both perceived and actual. This report will support a smooth transition into Stage 3, informing the identification and evaluation of management actions by providing context of which values, uses and threats are most prominent throughout the HNRS. This report will support the development of a CMP which is inclusive, meaningful and endorsed by the community and stakeholders. Furthermore, this will also help to streamline the review, adoption and certification processes for the CMP and help the Partner Councils to access funding to prioritise and implement management actions.

This report is based on a desktop review and analysis of existing and available data. There is a wealth of information that councils and other organisations have invested significant time, money and effort in to gain a better understanding of community values and uses associated with the HNRS catchment, coastal zone and marine estate. These efforts have also generated feedback from the community about attitudes towards and understanding of threats and stressors that jeopardise these values and uses. This report serves as a review and collation of this information, synthesising it into an easily understandable format that is fit for the purpose of CMP development.

1.2 Overview of information used to determine values and uses

A full list of reports reviewed are provided in Appendix A along with the citation number that is used to reference the report in the results section. Data were extracted from these reports across the areas of community values, community uses and community perceived threats. The synthesised findings of this data extraction are presented in the following sections.

There were a number of data limitations across the reports reviewed. For example, some reports relied on small sample sizes or samples that were not representative of all community groups or of the whole geographical zone. As such the findings presented in this report, while representing the current knowledge base, do not claim to be definitive and instead serve more as insights and directions on community value and uses in the study area.

1.3 Understanding community values, uses and perceived threats

There are many existing frameworks for informing how we understand the diverse ways people use and value natural environments such as waterways. For example, the Millennium Ecosystem Assessment's Ecosystem Services Framework (2003) outlines 'cultural services' to capture the recreation and aesthetic values as well as the spiritual and sense of place values of environments. Similarly, Kellert's nature values typology (Kellert et. al., 1993) outlines nine distinct values ranging from aesthetic to utilitarian. However, Kellert's typology has been developed from a western perspective and can be considered as limited in its consideration of the unique values that First Nation people hold for the environment. The Ecosystem Services Framework uses the broad banner of 'cultural services' to capture all kinds of social values and uses of environments which can make it difficult to tease apart the differences in how a community value a waterway and how they use a waterway.

To address the limitations of previous nature values frameworks, a bespoke values and uses framework has been developed for the Hawkesbury-Nepean River system CMP. The values and uses framework presented in this report, as described below/next section, has the following strengths:

- Values and uses are considered as conceptually distinct in recognition that people can use the same waterway in the same way but the value associated with that use can be different for different people. For example, while one person might walk along a waterway for the physical health values it provides, other people may undertake the same activity for the sense of connection with nature and belonging. Similarly, people may still place high value on a waterway, even if they don't have the opportunity to visit or use the waterway. While there is still much debate in the literature about the relationships between community values and uses, considering the two as separate was considered appropriate for the purposes of this report.
- In this value framework Traditional Owner/Custodian Values are considered as its own standalone category, distinct from other Cultural Values, in recognition of the unique ways in which Aboriginal and Torres Strait Islander people connect with and value Country.

2. Community Values

The community values and uses framework presented in this report has seven community value categories:

- Environmental values
- Cultural values
- Traditional Owner/Custodian values
- Connection to place values
- Social health and wellbeing values
- Physical health and wellbeing values
- Mental health and wellbeing values

Community values are considered to be those values that can be accessible to all community and have the potential to be experienced by all community. A definition of each of these values categories are presented in Table 1. These value categories are not mutually exclusive, and overlap can exist between different categories.

The following sections review what is currently known about how each of these value categories are perceived by community across the five zones of the Hawkesbury-Nepean River system. Note, while the findings have been structured based on the zones mapped in Figure 1, some of the findings are reported at an aggregate level where survey results might represent responses from multiple zones.

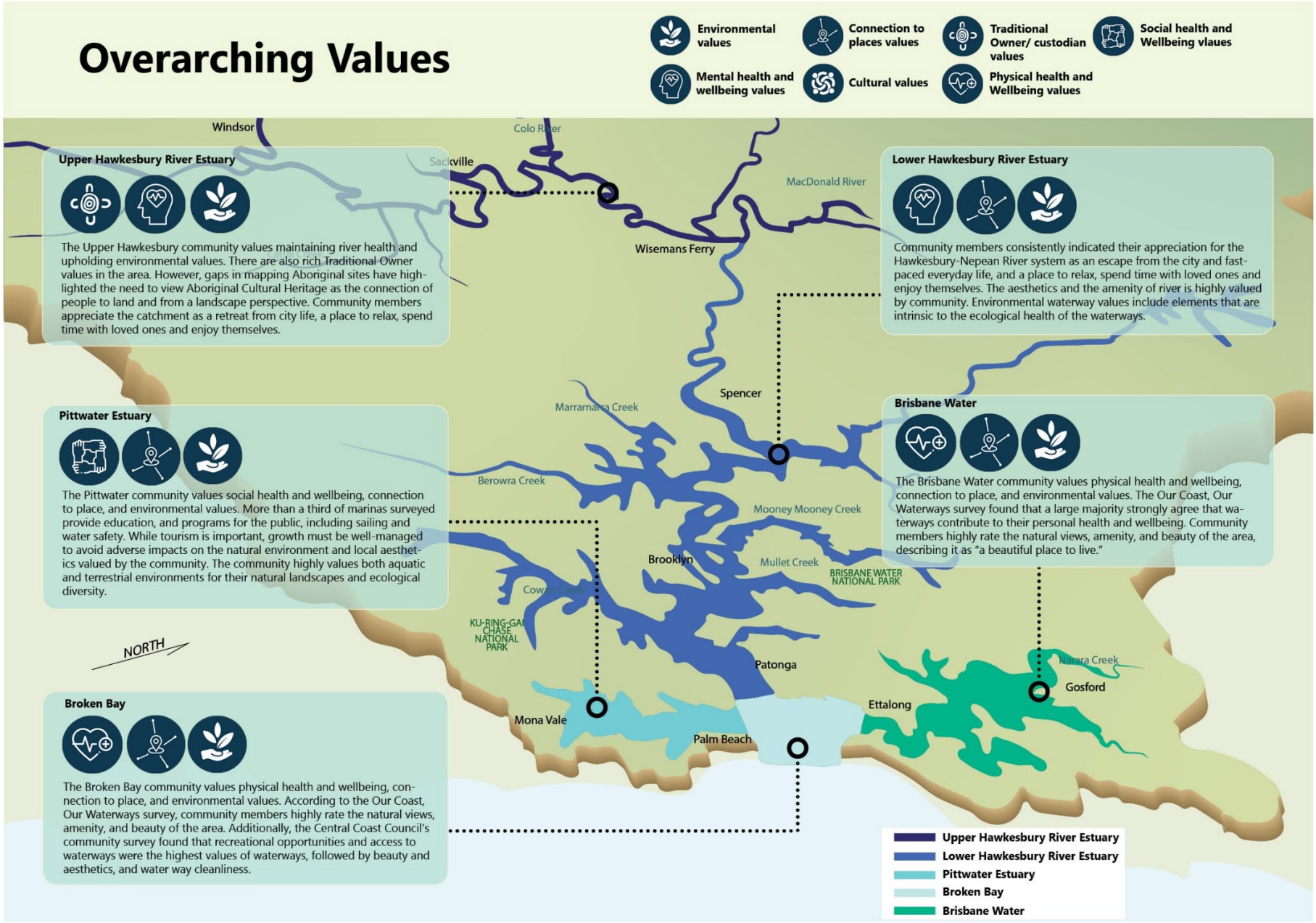

Figure 2 provides an overview of the value categories that are most highly valued by the community in each region based on the literature review.

Table 1. Definition of community value categories for the Hawkesbury-Nepean River system

Community value category	Definition
 Environmental values	Environmental values refer to people valuing environments for their natural ecological characteristics such as presence of wildlife, flora, fauna and biodiversity and absence of water pollution, litter and weeds.
 Cultural values	Cultural values refer to the historical and heritage value people place on the natural and built environment and whether a place is perceived as culturally significant, even on a local scale.
 Traditional owner/custodian values	Traditional Owner/Custodian values refer to Aboriginal and Torres Strait Islander's people reciprocal relationship and connection with Country and the sense of belonging, language, culture, family, law and identity that natural environments provide.
 Connection to place values	Connection to place values refer to valuing natural environments for the sense of place attachment and belonging they can provide. For example, valuing the natural environment for the natural aesthetics and amenity and the sense of connection and identity a person feels with that place and nature.
 Social health and wellbeing	Social health and wellbeing values refer to valuing natural environments for opportunities they can provide for social interactions. For example, valuing natural environments as gathering places for friends, family and community and for opportunities to engage and interact with other people.
 Physical health and wellbeing values	Physical health and wellbeing values refer to valuing natural environments for the physical health benefits they can provide. For example, valuing the opportunities for physical exercise and activities in the outdoors and access to perceived health promoting characteristics of the environment such as 'fresh air'.
 Mental health and wellbeing values	Mental health and wellbeing values refer to valuing natural environments for the mental health benefits they can provide. For example, valuing the opportunities for rest, relaxation and escape from stressful environments. This can include valuing natural environments for their characteristics of being calm, tranquil and providing a sense of 'being away'.

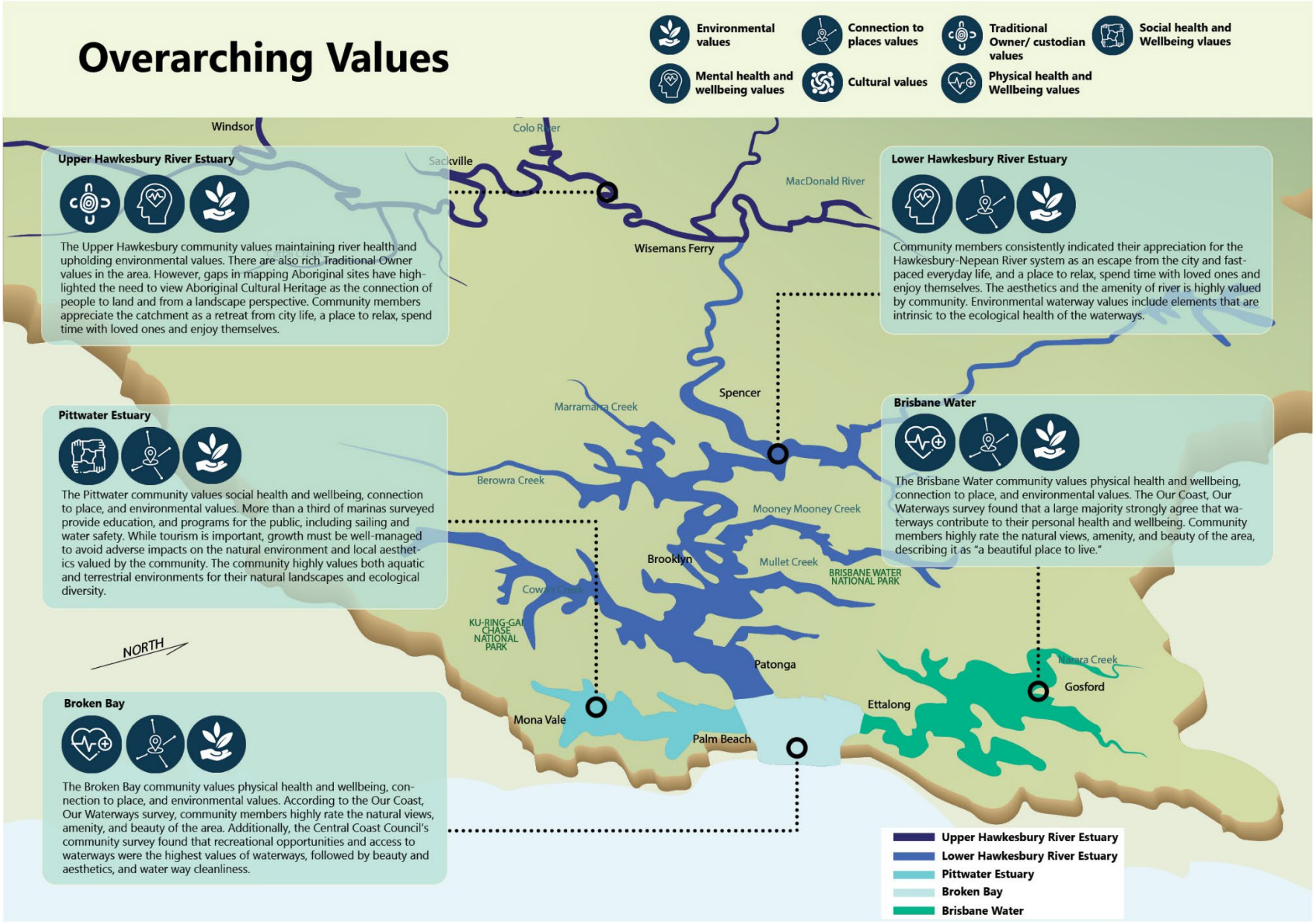

Figure 2. *Key value categories identified in each zone of the HNRS*

Upper Hawkesbury

Environmental, Traditional Owner/Custodian/Custodian and Mental Health and Wellbeing values were identified as the community values for which there was most supporting evidence in this zone of the Hawkesbury-Nepean River system. Each of these top value categories are described in detail below.

Environmental values: The Upper Hawkesbury community recognise the importance of protecting the river and holds the expectation that river health will be maintained, and the intrinsic environmental values of the waterways upheld[13]. This is evidenced by 98% of 603 respondents to a CATI (computer assisted telephone interview) survey with residents of the Hawkesbury-Nepean community indicating that the riverbank areas should be kept in a healthy condition[14]. Within the Hills Shire, community express environmental values through active participation in environmental volunteering such as at the Community Environment Centre or through Bushcare groups.

Traditional Owner/Custodian values: Long Neck Lagoon has high Aboriginal Heritage value[5]. Based on a meeting with local representatives of the Aboriginal Community conducted in 2013 it was clear that the upper Hawkesbury is rich in Traditional Owner/Custodian/Custodian values. However, gaps were identified in the mapping of Aboriginal sites and highlighted the need to look at Aboriginal Cultural Heritage beyond individual sites and more as the connection of people to land and of taking a landscape perspective[5]. Discussions with members of Deerubbin Local Aboriginal Land Council reiterated the strong relationship between Aboriginal people and country. It was noted that the river is a live, living landscape and greater attention needs to be paid to its protection. Attention was drawn to the fact that water is critical to all human beings, not just Traditional Owner/Custodian/Custodians of the land because they have a longstanding relationship with the resource. Members expressed their frustration that decades have been spent talking about water quality and management with nothing being done[13]. Deerubbin Local Aboriginal Land Council noted that there is an expectation from environmental groups and agencies that natural landscapes on native title lands would be protected, however, this perception does not necessarily align with the views of Deerubbin LALC [13]. While Deerubbin LALC inherently recognise the importance of country, they also hold the view that land is for the betterment of life[13]. The economic value of land is a key consideration for Deerubbin LALC, and they noted that not all Aboriginal native title land should necessarily become a de facto national park. A key focus area for Deerubbin LALC is to provide affordable housing for Aboriginal people on Deerubbin land[13].

Mental Health and Wellbeing values: Community members consistently indicated their appreciation for the catchment as an escape from the city and fast-paced everyday life, and a place to relax, spend time with loved ones and enjoy themselves[13]. This is evidenced by the results of a CATI (computer assisted telephone interview) survey with residents of the Hawkesbury-Nepean community (n=300) and 300 residents from the rest of the Greater Sydney area, where the most commonly cited reason to visit waterways was to enjoy nature, relax, and have a peaceful and pleasant time (31% total sample n=261)[14]. The CATI survey was conducted as part of the Sydney Water Hawkesbury-Nepean Nutrient Management Project - Engagement research report in 2018. While this was the top motivation amongst with residents of the Hawkesbury-Nepean, residents from the rest of Greater Sydney were most likely to use the river system due to its beauty and scenery (41%)[14].

Other values were also identified for the Upper Hawkesbury. For example, the heritage and historical value of the catchment[13] and connection to place values, such as amenity, were also identified[5]. Although community perspectives on amenity values can be mixed particularly on the issue of tree plantings where some community perceive tree plantings as adding to the area's amenity where as other community members perceive trees as blocking views and reducing an areas amenity.

Lower Hawkesbury

Mental Health and Wellbeing, Connection to Place and Environmental values were identified as the community values for which there was most supporting evidence in this zone of the Hawkesbury-Nepean River system. Each of these top value categories are described in detail below.

Mental Health and Wellbeing values: Similar to the Upper Hawkesbury, community members consistently indicated their appreciation for the Hawkesbury-Nepean River system as an escape from the city and fast-paced everyday life, and a place to relax, spend time with loved ones and enjoy themselves[13]. This is evidenced by the results of a CATI (computer assisted telephone interview) survey with residents of the Hawkesbury-Nepean community (n=300) and 300 residents from the rest of the Greater Sydney area, where the most commonly cited reason to visit waterways was to enjoy nature, relax, and have a peaceful and pleasant time (31% total sample n=261)[14]. The CATI survey was conducted as part of the Sydney Water Hawkesbury-Nepean Nutrient Management Project - Engagement research report in 2018.While this was the top motivation amongst with residents of the Hawkesbury-Nepean, residents from the rest of Greater Sydney were most likely to use the river system due to its beauty and scenery (41%)[14].

Connection to Place values: The aesthetics and amenity of river is highly valued by community. Based on the results of Central Coast Council's community survey (n=1168) 14.8% of respondents rated beauty and aesthetics as the highest value of waterways, which was second only to recreational opportunities and access to waterways[3]. Participants described the value of aesthetics and amenity as having the 'luxury of being able to enjoy the beauty of natural environment but still having amenities nearby'.

Environmental values: Environmental waterway values include elements that are intrinsic to the ecological health of the waterways[19]. Environmental value of waterway scores was high in Hornsby LGA with most of the suburbs having a score of 4 and above out of 5[19]. Elements of the natural environment is one of the top three liveability strengths of the area[7]. When ranking each environmental feature from 'not at all important' to 'very important', healthy bushland and wildlife, and healthy waterways and foreshores were most frequently ranked as 'very important' (90% respectively)[20]. Based on the results of Central Coast Council's community survey (n=1168), 13.8% of respondents rated cleanliness of waterways as the highest value of waterways, which was third after recreational opportunities and access to waterways and beauty and aesthetics[3]. A study of the Ku-ring-gai Environmental Levy found that 97% of respondents indicated that environment levy was important for Council to continue to improve the natural environment[9]. Similar levies are in use by other HNRS CMP partner councils such as Hornsby Shire.

Brisbane Water

Physical Health, Connection to Place and Wellbeing and Environmental values were identified as the community values for which there was most supporting evidence in this zone of the Hawkesbury-Nepean River system. Each of these top value categories are described in detail below. However, only one report that was included in this review specifically covered the Brisbane Water area and hence the below insights draw mainly from that one report[4].

Physical Health and Wellbeing values: According to the Our Coast, Our Waterways survey results, 91.2% strongly agree and 1.2% somewhat agree that waterways contribute to their personal health and wellbeing[4]. When asked 'other than recreational use, how else do you use waterways?' 29.7% of respondents said for wellbeing[4].

Connection to Place values: Natural views, amenity and beauty were highly rated by community[4]. When asked what they valued most about Central Coast Waterways, beauty and aesthetics ranked third (15.8%) and environmental and natural amenity (11.2%) ranked fourth with respondents describing the area as 'a beautiful place to live'[4].

Environmental values: Based on the results of Central Coast Council's community survey, 13.2% of respondents rated cleanliness of waterways as the highest value of waterways, which was third after recreational opportunities and access to waterways and beauty and aesthetics[4]. However, this doesn't necessarily translate into environmental action with 41.7% of respondents reporting that they do not volunteer to protect waterways[4].

Pittwater

Social Health and Wellbeing, Connection to Place and Environmental values were identified as the community values for which there was most supporting evidence in this zone of the Hawkesbury-Nepean River system. Each of these top value categories are described in detail below.

Social Health and Wellbeing values: Consultation was undertaken with face to face interviews and via an online survey with representatives from nine marinas as part of the 2016 Pittwater Marine Industry Survey, as reported in the Pittwater Waterway Review - Stage 1 discussion paper[11] Over a third of the marinas surveyed identified that they currently undertake education, social or event programs that are currently available to the general public[11]. This can include, sailing and water safety with local schools, learn to sail programs, exhibitions and events[11].

Connection to Place values: While tourism is important in this zone, any growth in this sector needs to be well-managed and balanced to ensure the natural environment and local visual aesthetics and amenity that are valued by community are not adversely impacted upon[12].

Environmental values: The aquatic and terrestrial environments are equally important and highly valued by the community from a natural landscapes and ecological diversity perspective[12].

Broken Bay

Physical Health and Wellbeing, Connection to Place and Environmental values were identified as the community values for which there was most supporting evidence in this zone of the Hawkesbury-Nepean River system. Each of these top value categories are described in detail below. However, only one report that was included in this review specifically covered the Broken Bay area and hence the below insights draw mainly from that one report[4]. Owing to both Brisbane Water and Broken Bay drawing from the same report, the findings reported here are the same as those reported for Brisbane Water.

Physical Health and Wellbeing values: According to the Our Coast, Our Waterways survey results, 91.2% strongly agree and 1.2% somewhat agree that waterways contribute to their personal health and wellbeing[4]. When asked 'other than recreational use, how else do you use waterways?' 29.7% of respondents said for wellbeing[4].

Connection to Place values: Natural views, amenity and beauty were highly rated by community[4]. When asked what they valued most about Central Coast Waterways, beauty and aesthetics ranked third (15.8%) and environmental and natural amenity (11.2%) ranked fourth with respondents describing the area as 'a beautiful place to live'[4].

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3. Community Uses

The community values and uses framework presented in this report has five community use categories:

- Primary recreation use
- Secondary recreation use
- Adjacent recreation use
- Non-recreational use
- Accessibility

A definition of each of these use categories are presented in Table 2. These use categories are not mutually exclusive and overlap can exist between different categories.

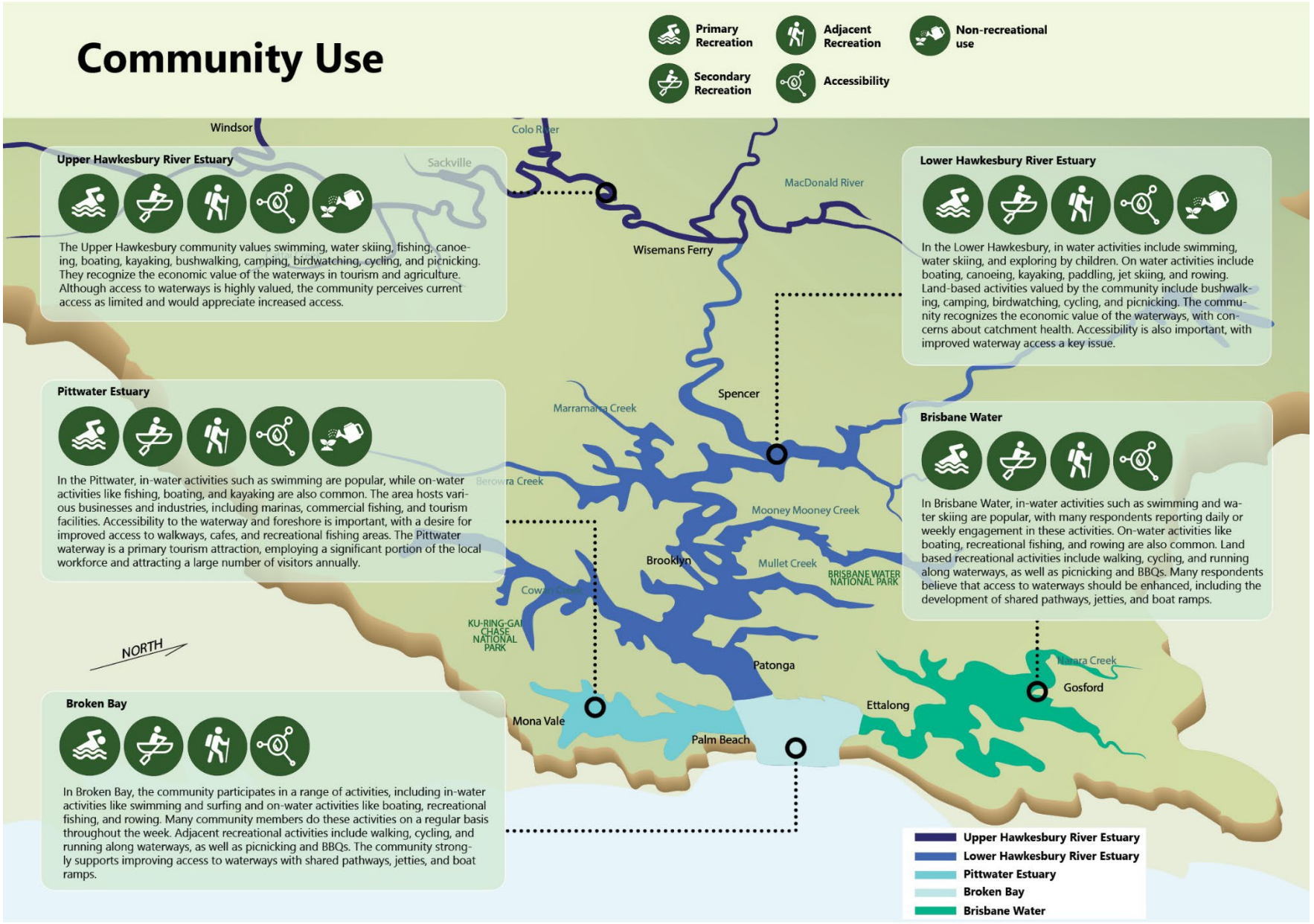

Figure 3 provides an overview of the use categories that are most commonly identified by community in each zone based on the literature review.

Table 2. Definition of community use categories for the Hawkesbury-Nepean River system

Community use category	Definition
 Primary recreation	Primary recreational use refers to in-water activities where immersion in the water occurs and ingestion of water is likely. This includes activities such as swimming, surfing, stand-up paddle boarding and water-skiing.
 Secondary recreation	Secondary recreational use refers to on-water activities where immersion in the water does not occur and ingestion of water is unlikely. This includes both powered (e.g., fishing, jet skiing) and non-powered (e.g. paddle boats, canoes, kayaks) boating activities.
 Adjacent recreation	Adjacent recreational activities refer to off-water activities where there is little to no physical contact with the water, for example, using trails and parks alongside waterways for any type of recreational activity (e.g., walking, cycling, picnicking).
 Non-recreational use	Non-recreational use refers direct use of waterways to support livelihoods, for example, waterway dependent businesses (e.g. water-based tourism, aquaculture, agriculture), as well as other provisioning services such as for water extraction and irrigation water supply including livestock, irrigated and drinking water supply and aquatic foods.
 Accessibility	While accessibility is not a direct community use it does underpin each of the other use types and hence is considered as its own category. Accessibility refers to community's physical access to waterways.

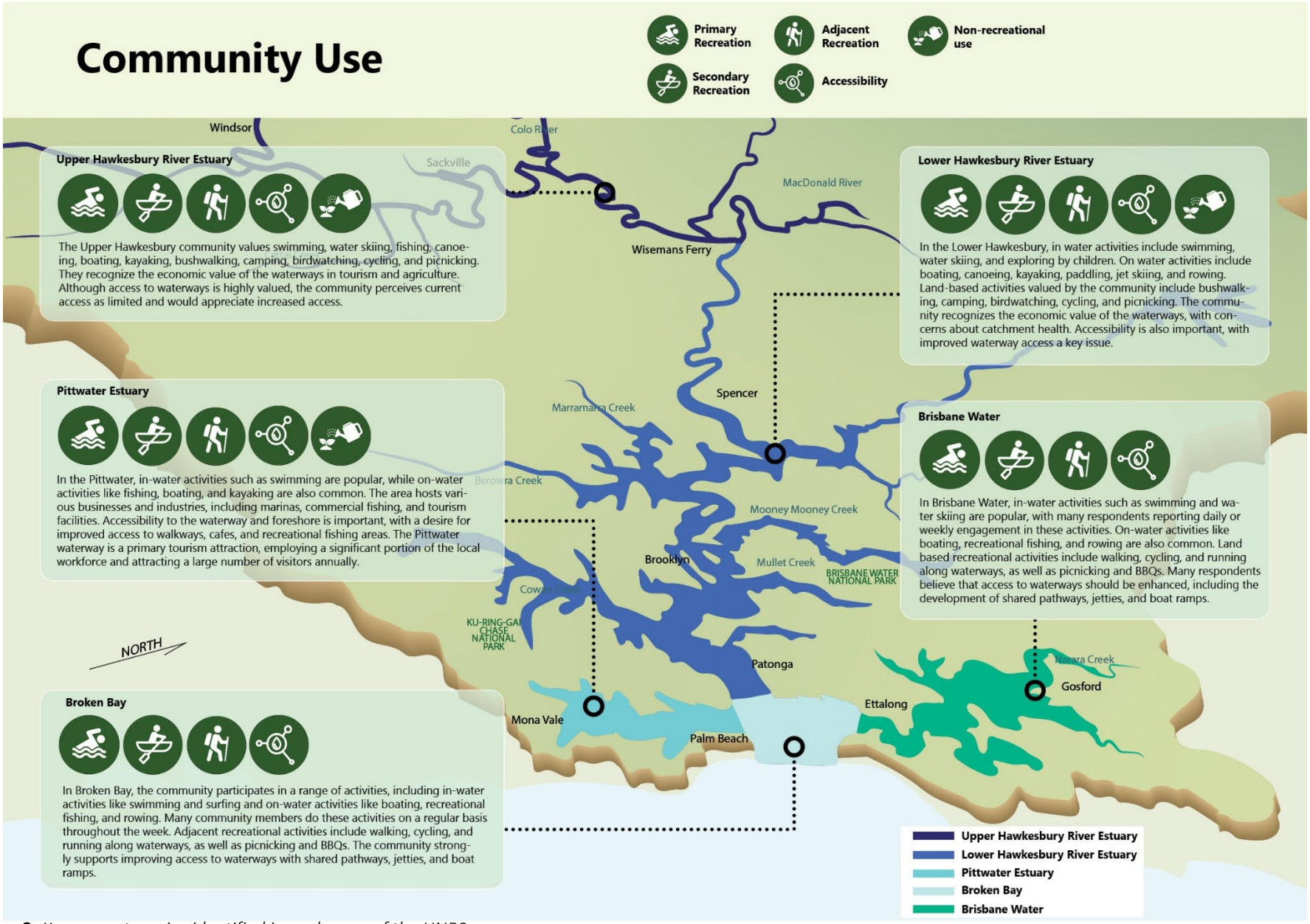

Figure 3. *Key use categories identified in each zone of the HNRS*

The NSW Department of Environment and Planning (DPE) has developed an online Risk-based Framework Toolkit which is informed by a range of data layers including a Community Values and Uses layer. The DPE Community Values and Uses data aligns closely with the Community Use categories used in this framework and hence an overview of these data is provided in Figure 4. As can be seen in Figure 4, primary and secondary recreational use are highly reported across all zones, particularly the more coastal zones such as Brisbane Water and Broken Bay. A map of the survey responses for each zone are provided in each section below, respectively.

Table 3. The DPE Community Values and Uses categories and descriptions

Category (aligned with NSW water quality objectives)	Description
Aquatic ecosystems	As a place where fish, plants and animals live
Visual amenity	A natural place to look, walk, relax, picnic or camp
Primary contact recreation	As a place to swim and immerse yourself in water
Secondary contact recreation	As a place to canoe, paddle or sail
Livestock water supply	As a source of water for farm animal/stock use
Irrigated water supply	As a source of water for irrigation of crops/fields
Drinking water supply	As a source of safe drinking water
Aquatic foods (& secondary contact recreation	To fish and/or catch seafood (fishing, aquaculture, other)

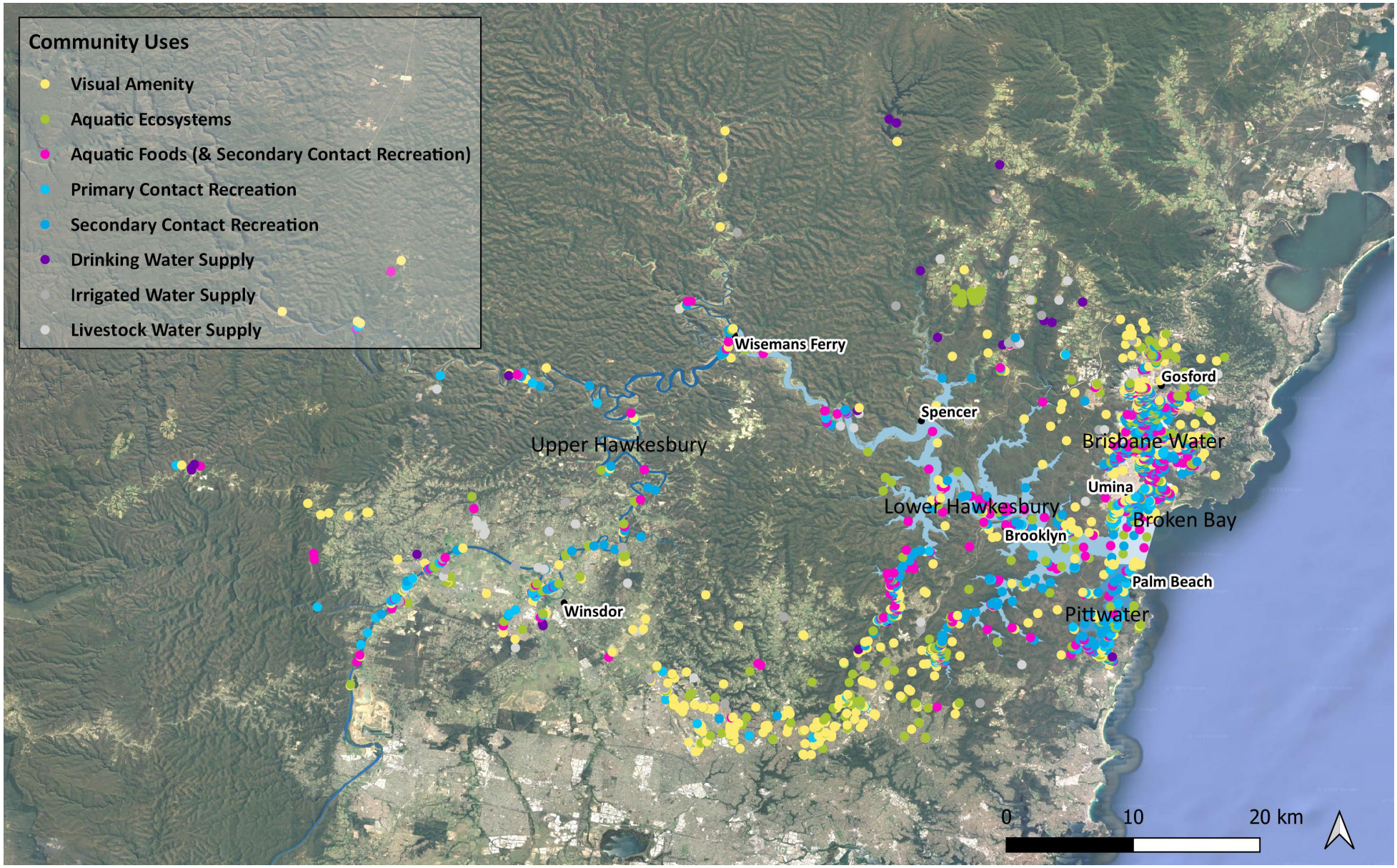

Figure 4. *Overview of DPE data on community use (as of 16 January 2023)*

Upper Hawkesbury

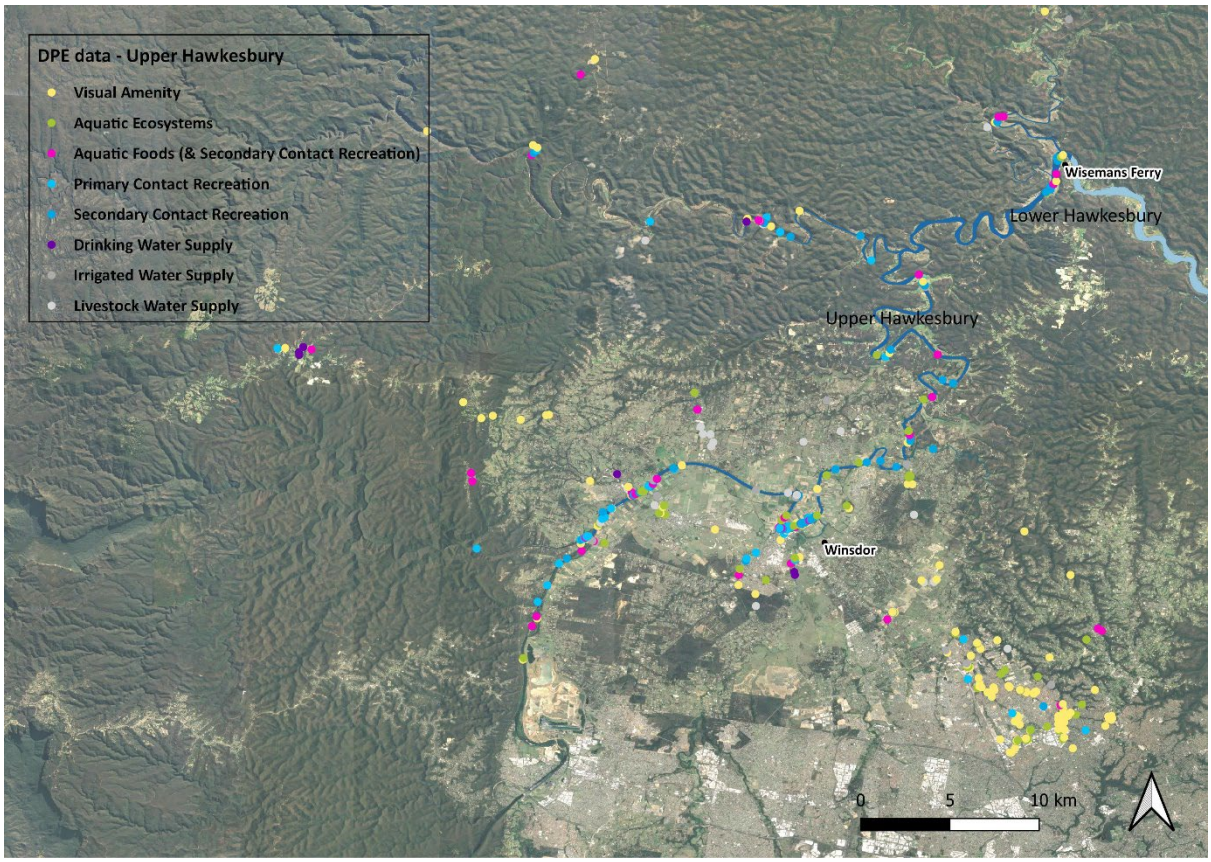

Figure 5. *Overview of DPE Community Uses data for the Upper Hawkesbury (as of 16 January 2023)*

Primary recreation: Swimming was the most valued water-based recreational activity by the community[13]. The intercept survey revealed that 82% of those community members who use the waterway had been swimming at least sometimes, while half reported swimming on most of their visits[13]. In addition to swimming, water skiing is a long-established recreational activity in the study area and is likely to be a feature of the waterway into the future[5].

Secondary recreation: Secondary recreation is popular in this region 11% of respondents who were residents of the Hawkesbury Nepean catchment area rating fishing as a one of the reasons for using the Hawkesbury-Nepean river systems and 14 % of respondents rating canoeing, boating, kayaking[14].

Adjacent recreation: Adjacent land-based recreational activities that were valued by community included bushwalking, camping, birdwatching, cycling and picnicking[13]. 19% of 216 respondents rated bushwalks, hiking and jogging as one of the main reasons for using the Hawkesbury-Nepean river systems[14].

Non-recreational use: The community recognise the economic value of the waterways in contributing to tourism and agricultural industries[14]. Tourism, in particular, was cited as a significant aspect of economic value, due to the large size of the catchment and diversity within. Community members recognised the need to protect this industry to ensure a thriving local economy. Grazing land and turf farming were identified as key aspects of economic value, with turf farms and vegetable farms cited as being important contributors to the local economy and food security[13].

Accessibility: Access to waterways is highly valued by community, however community perceive the current access as limited and increases in access would be highly appreciated by community[5].

Lower Hawkesbury

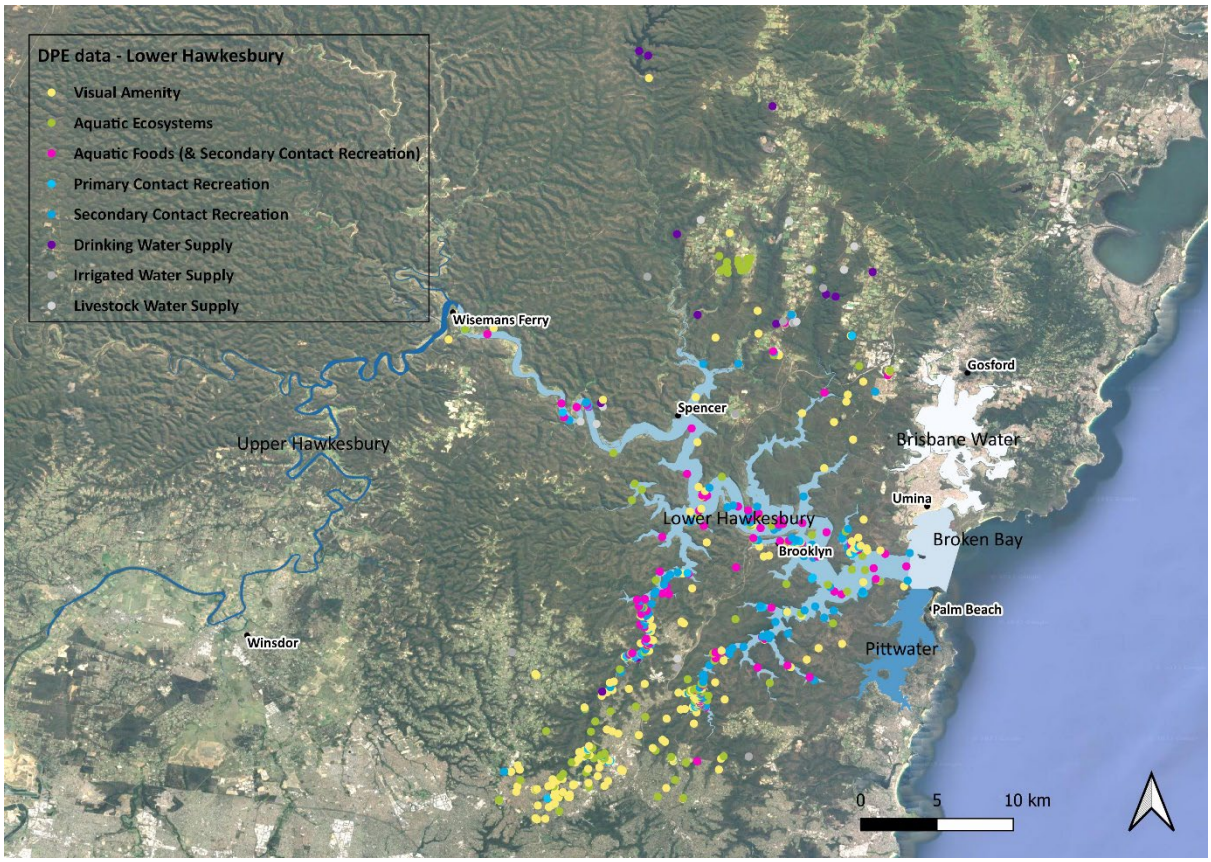

Figure 6. *Overview of DPE Community Uses data for the Lower Hawkesbury (as of 16 January 2023)*

Primary recreation: Community reported frequent use of waterways for swimming. According to the Our Coast Our Waterways report (which provides a summary of the survey results from users of the Hawkesbury-Nepean River system including Brisbane Water)- survey results show that 10.9% of respondents reported daily use of waterways for swimming and 31.4% report weekly use for swimming[3,4]. Similar to the Upper Hawkesbury, results from intercept surveys revealed that 82% of those community members who use the waterway had been swimming at least sometimes, while half reported swimming on most of their visits[13]. Identified primary contact uses across the Hornsby LGA included swimming, water skiing, and exploring by children[19].

Secondary recreation: Secondary contact recreation uses include boating, canoeing, kayaking, rowing, sailing, adult wading (e.g. an adult walking waist deep through water but not immersing their head under water), paddling and jet skiing[19]. Respondents reported weekly use of waterways for boating (31%), recreational fishing (13.7%) and rowing (16.8%)[3].

Adjacent recreation: Adjacent land-based recreational activities that were valued by community included bushwalking, camping, birdwatching, cycling and picnicking as found in the Hawkesbury-Nepean Nutrient Management Project - Engagement research report commission by Sydney Water[13]. 19% of 216 respondents rated bushwalks, hiking and jogging as one of the main reasons for using the Hawkesbury-Nepean river systems[14]. According to Ku-ring-gai Council's Open Space and Recreation Needs Study, residents want parks, natural and bush areas and walking tracks and trails to be the main priority for future recreation planning but 23% of respondents felt that waterway spaces were in less need of investment in comparison to other spaces[18].

Non-recreational use: The community recognise the economic value of the waterways in contributing to tourism, aquaculture and agricultural industries[13]. Tourism, in particular, was cited as a significant aspect of economic value, due to the large size of the catchment and diversity within. Community members recognised the need to protect this industry to ensure a thriving local economy. The Central Coast Council Tourism Impact Assessment considered ways to support tourism while mitigating the potential adverse impacts of tourism on

the natural environment and scenery. One option was to engage local tourism businesses and guides in sustainability certification (e.g. like the Good Travel Seal) where businesses are expected to contribute to the conservation and experience of nature and landscape by providing good information to travellers and by following sustainability principles. The community identified key drivers of the catchment's economic value as being aquaculture industries and agricultural land uses[13]. Concerns were raised by community members regarding impacts to catchment health and the resulting effect this would have on the economic value of the area. Water quality was recognised as having a critical impact on aquaculture industries such as oyster harvesting and prawning[13].

Accessibility: Accessibility was explored as an important consideration that allows for the social value of the catchment to be realised. 12% of intercept survey respondents stated that improving access to the waterway, by making it easier or safer, is a key issue for the area[13]. Members of the community who indicated an interest in participating in water sports in the area acknowledged that access improvements would be required, with 1 in 5 respondents noting that improving access to the waterway should be a focus[13]. According to the Our Coast, Our Waterways in the Lower Hawkesbury 49.4% of respondents strongly agree and 26% agree that more should be done to enhance access to waterways (e.g. shared pathways, jetties, boat ramps etc)[3].

Brisbane Water

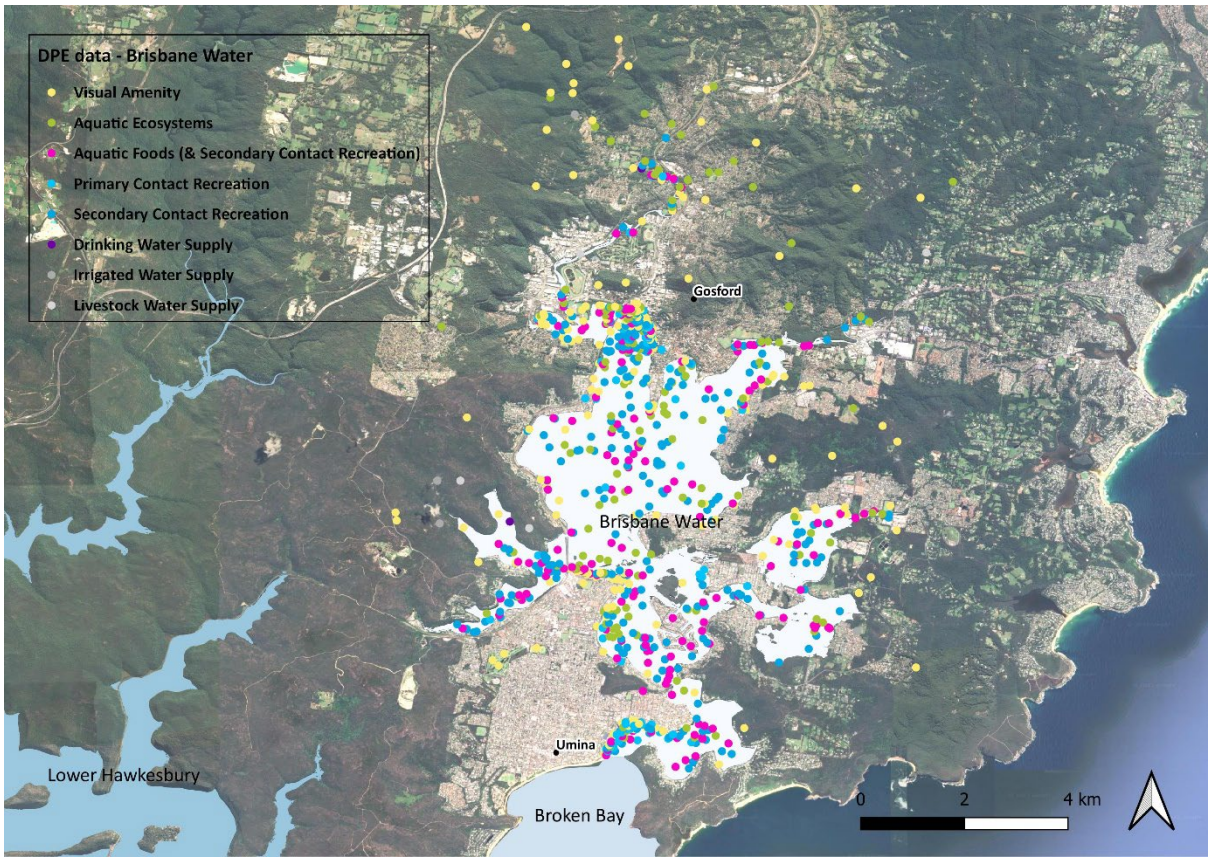

Figure 7. *Overview of DPE Community Uses data for Brisbane Water (as of 16 January 2023)*

Only one report that was included in this review specifically covered the Brisbane Water area and hence the below insights draw mainly from that one report[4].

Primary recreation: According to the Our Coast, Our Waterways survey results 15.9% of respondents report swimming daily and 33.2% report swimming weekly.

Secondary recreation: Respondents reported weekly use of waterways for boating (19.9%), recreational fishing (10.5%) and rowing (13.6%)[4].

Adjacent recreation: Respondents reported walking cycling or running next to waterways everyday (41.4%) or weekly (34.6%)[4]. 18.7% reported weekly use for picnics and BBQs.

Accessibility: 43% strongly agree and 24.8% agree that more should be done to enhance access to waterways (e.g. shared pathways, jetties, boat ramps etc)[4].

Pittwater

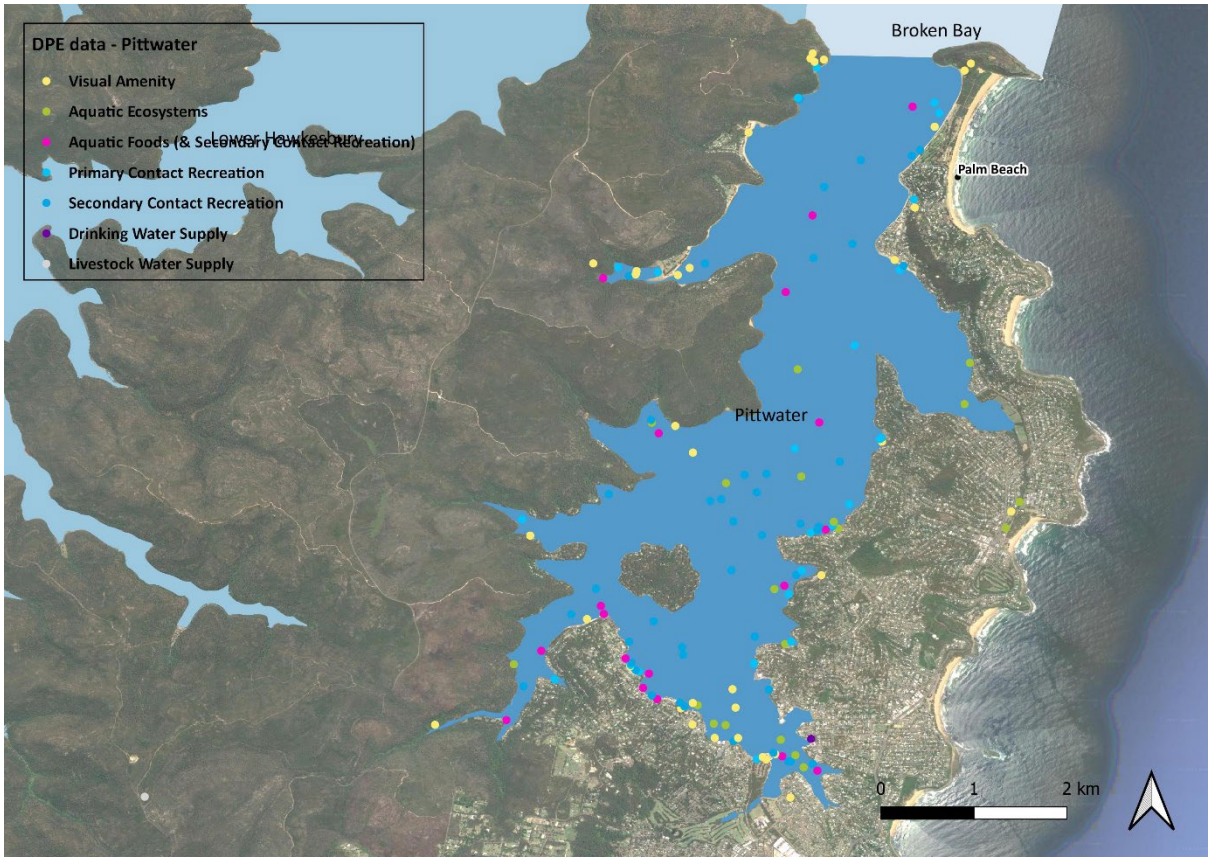

Figure 8. *Overview of DPE Community Uses data for Pittwater (as of 16 January 2023)*

Primary recreation: The community survey identified swimming as a primary use of the waterway and one which must be considered in future planning[11].

Secondary recreation: Secondary recreation is popular in this region 11% of respondents who were residents of the HNC area rating fishing as a one of the reasons for using the Hawkesbury-Nepean river systems and 14 % of respondents rating canoeing, boating, kayaking[14]. As reported in the Pittwater Waterway Review - Stage 1 discussion paper, predicted growth in boating and boat size from 2008 - 2031 is estimated to increase boat storage space requirements in the region by 2068 spaces or a 13% increase. This will have direct impact on boat and associated infrastructure, wait lists for marina berths, moorings, demand for larger berthing spaces, on land implication arising from trailer boat parking and increased use of boat ramps[11].

Adjacent recreation: Adjacent land-based recreational activities that were valued by community included bushwalking, camping, birdwatching, cycling and picnicking[13]. 19% of 216 respondents rated bushwalks, hiking and jogging as one of the main reasons for using the Hawkesbury-Nepean river systems[14].

Non-recreational use: The Pittwater waterway is a working waterway and an economic hub, home to a diverse range of businesses and industries including marinas, commercial fishing, sailing clubs, restaurants, cafes and tourism facilities[11]. The Pittwater waterway is a primary tourism attraction and potentially more so in the future. Tourism employs 10% of the former Pittwater LGA workforce and approximately 670,000 visitors a year visit the area[11].

Accessibility: 91% of the respondents felt that public access to the foreshore and waterway was an important or very important social issue[11]. Comments relating to this issue include the need for more accessibility to foreshore walkways, cafes and retail, recreational foreshore fishing. Some respondents and workshop participants recognised the difficulty providing and linking foreshore access given private ownership implications but options to provide and improve foreshore access was desirable and reflected in response to the survey question, "What are you top three aspirations for the waterway in the future?" Additionally, 65% of the respondents said that access to the waterway for recreational fishing was an important or very important issue[11, 12].

Broken Bay

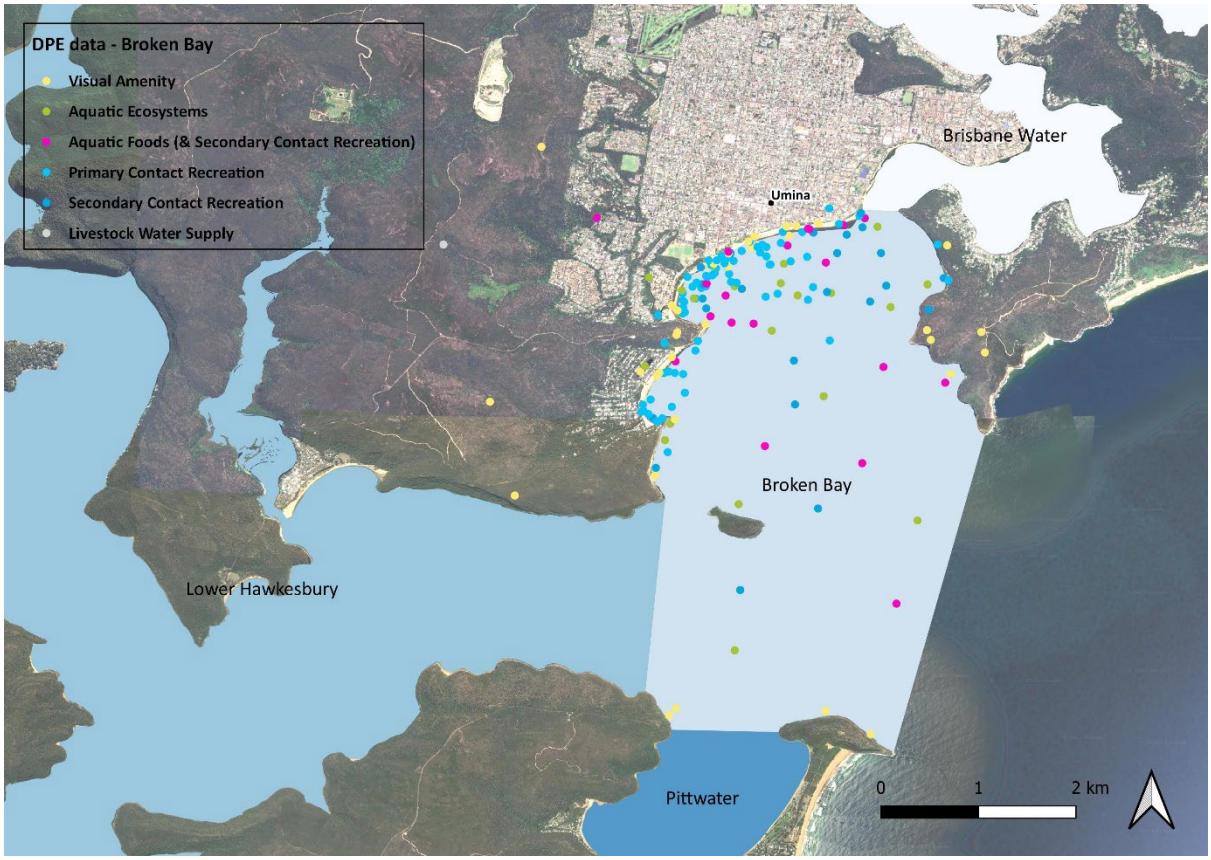

Figure 9. *Overview of DPE Community Uses data for Broken Bay (as of 16 January 2023)*

Only one report that was included in this review specifically covered the Broken Bay area and hence the below insights draw mainly from that one report[4]. Owing to both Brisbane Water and Broken Bay drawing from the same report, the findings reported here are the same as those reported for Brisbane Water.

Primary recreation: According to the Our Coast, Our Waterways survey results 15.9% of respondents report swimming daily and 33.2% report swimming weekly, 15% report daily surfing and 14% report weekly surfing[4].

Secondary recreation: Respondents reported weekly use of waterways for boating (19.9%), recreational fishing (10.5%) and rowing (13.6%)[4].

Adjacent recreation: Respondents reported walking cycling or running next to waterways everyday (41.4%) or weekly (34.6%)[4]. 18.7% reported weekly use for picnics and BBQs.

Accessibility: 43% strongly agree and 24.8% agree that more should be done to enhance access to waterways (e.g. shared pathways, jetties, boat ramps etc)[4].

4. Threats to community values and uses

The Hawkesbury Nepean River System represents an intersection between values and pressures where an abundance of environmental, social and cultural values coincide with high levels of social, commercial and recreation use, population growth and, coastal and estuarine hazards. The waterways and surrounding catchment support important biodiversity and provide ecosystem services to the community and local businesses. They are also utilised by visitors and the local community for a wide variety of recreational and commercial activities, supporting a thriving regional economy underpinned by the health and effective management of the HNRS.

Major threats to these values and uses include urban, industrial and agricultural development within the catchment and foreshores of the system. Urbanisation includes the alteration of land uses from more natural to more developed, with these changes driving declines in water quality due to increased nutrient and pollutant loads, and changes to the timing, velocity, and volume of stormwater runoff. Urbanisation is tied to population growth which is accompanied by increased industrial activity, resource consumption and waste production. There are several high growth regions projected for the wider HNRS Catchment – particularly the proposed Western Parkland City and the Central Coast City, outlined in The Six Cities Region Discussion Paper (Greater Cities Commission 2022) indicating that the trend for many of these stressors is increasing into the future. Stormwater management has been identified as a major focus area to reduce the downstream impacts of development.

Climate change poses an additional long-term and emerging threat that will lead to cascading impacts throughout the system. Changes in environmental patterns such as rainfall, temperature, bushfires and sea level will disrupt the existing ecological equilibrium with uncertain outcomes. However, some emerging trends are clear although the rate and magnitude of change is dependent on future global greenhouse gas emissions. Sea level is projected to rise with a high certainty, similarly, mean sea and land surface temperatures are projected to increase. Regional scale projections suggest with relative uncertainty that there will be a decrease in mean annual rainfall in the HNRS area, but that this will be accompanied by more intense floods and droughts. This will have impacts on flood and bushfire regimes (Earth Systems and Climate Change Hub 2020).

The HNRS CMP process including the Stage 1 Scoping Study and multiple Stage 2 technical reports has identified and described a comprehensive list of threats that the HNRS faces. The Stage 1 Scoping Study identifies a total of 67 threats and stressors, across five (5) threat categories and twelve (12) subcategories which are listed in Appendix B. The threat categories considered are provided in Figure 10 provides an overview of the threat categories that were most identified by the community in each region.

Figure 10. *Threat categories as determined in the Stage 1 Scoping Study*

In the following section, the community perceived threats for each of the 5 threat categories are discussed for each of the zones. Subsequently, the threat level for each sub-category on the previously identified community uses and values is assessed using a risk-based approach based on the NSW Marine Estate Statewide Threats and Risk Assessment (TARA) (MEMA 2017).

4.1 Community perceived threats

The following sections review what is currently known about how each of these threat categories are perceived by community across the five zones of the Hawkesbury-Nepean River system. Note, while the findings have been structured based on the zones mapped in Figure 1, some of the findings are reported at an aggregate level where survey results might represent responses from multiple zones.

Lower and Upper Hawkesbury

Coastal and estuarine hazards: According to the Your say Hornsby survey, coastal and estuarine hazards were voted as the second highest threat category with 16% vote. Foreshore/bank erosion is voted as the most important reason for the threat at 66%, along with catchment flooding (48%) and shoreline recession (42%)[25].

Urbanisation and land use impacts: Land use intensification (urban stormwater discharge, foreshore development, inappropriate zoning/planning and clearing catchment/dune vegetation) were consistently the highest perceived threats by community across all areas[3]. Community identified the impacts of development and growth in the catchment were a primary driving factor for most environmental issues and risks[13]. Several CATI survey respondents noted their concerns on the increase of hard surfaces, particularly roads, roofs and driveways because of urban growth; leading to a decrease in the health of the rivers as a result of run-off[13]. Results from the intercept surveys show that 65% of respondents indicated that maintaining water quality in the Hawkesbury-Nepean river system is critical and deserving of attention from Sydney Water. Additionally, one out of five (21%) of intercept survey respondents mentioned issues relating to water quality as barriers to their enjoyment of the waterways. This included dirty water, poor water quality, weed and algae[13]. Approximately two thirds of respondents indicated that the areas of the environment that they were 'very concerned' about were the effects of climate change, over-development species extinction and pollution of waterways[20]. In the Your say Hornsby – Survey , 27 out of 58 respondents ranked stormwater pollution as the highest perceived urbanisation and land use impact[25].

Public health and safety: Comments from a social pinpoint survey highlighted the need to improve boating facilities (e.g. boat ramp access) and apply stricter controls on motorised boats to improve amenity and safety for passive boaters (kayakers, canoers)[20]. Several CATI survey respondents expressed their concern regarding overflows during wet weather events, resulting in them not wishing to swim in the rivers and ocean directly after an event due to health and safety concerns[13]. 56.9% strongly agree and 32.5% somewhat agree that if waterway access, safety or condition declined significantly I would reduce the frequency I visit and use waterways[3]. In the Your say Hornsby – Survey , 37 out of 57 respondents ranked water pollution impacting recreational activities as the highest perceived public health and safety impact[25].

Waterway use and resources conflict: Community expressed dissatisfaction with loud activities such as jet skis and loud music being undertaken on the water and the effect this has on the environment[13]. Comments from a social pinpoint survey highlighted the need to improve boating facilities (e.g. boat ramp access) and apply stricter controls on motorised boats to improve amenity and safety for passive boaters (kayakers, canoers)[20]. In the Your say Hornsby – Survey , 23 out of 53 respondents ranked anti-social behaviour and unsafe boating practices as the highest perceived waterway use and resources conflict issue[25].

Planning and governance: In the Your say Hornsby – Survey, 27 out of 57 respondents identified lack of coordination between government agencies when managing the estuary as the most important planning and governance issue[25].

Brisbane Water

Only one report that was included in this review specifically covered the Brisbane Water area and hence the below insights draw mainly from that one report[4].

Coastal and estuarine hazards: According to the Our Coast, Our Waterways survey results 33.7% of respondents rate erosion as a top five greatest threats to Central Coast beaches. 9.9% of survey respondents rate climate change and sea level rise as a threat to Central Coast beaches[4]. These threats were scored similarly in the context of Central Coast lakes and estuaries[4].

Urbanisation and land use impacts: Land use intensification (urban stormwater discharge, foreshore development, inappropriate zoning/planning and clearing catchment/dune vegetation) were consistently the highest perceived threats by community across all areas[4].

Public health and safety: 11% of respondents rate they are concerned for their health and safety as a reason for not using Central Coast Waterways[4].

Waterway use and resources conflict: According to the Our Coast, Our Waterways survey results 10% rate waterways are too crowded by recreational users as a reason for not using Central Coast waterways[4].

Pittwater

Coastal and estuarine hazards: According to the Pittwater Waterway Review, sea level rise was found to be an important environmental issue to the community as demonstrated in the survey, due to the potential to affect foreshore habitats, ecological diversity and properties on the waterway[11].

Urbanisation and land use impacts: Overall 63% of the community indicated, during the online survey, that they were satisfied or very satisfied with the water quality of Pittwater and the natural environment, in comparison to 27% who were dissatisfied or very dissatisfied[11]. Access was identified as the second highest challenge facing the waterway now and into future[11]. 84% of survey respondents considered littering and illegal dumping to be a very important environmental issue for the Pittwater waterway[11].

Public health and safety: Community are concerned about the age and deterioration of boating facilities, such as jetties, wharfs, boat ramps and tie-up facilities[12].

Waterway use and resources conflict: Pittwater Waterway Strategy survey identified several conflicts between waterways uses and values. It highlighted the need for Managers to consider trade-offs when addressing concerns of one user group as management actions can impact on the values or uses of another group.

Issues identified related to boat use, including trailer and boat parking, traffic, fishing and access to off-leash dog areas[12]. Growth in boat ownership was considered to be an important issue to 47% of survey respondents, with 39% highlighting the growth in marina size and 35% the increasing demand for moorings as a very important issue[11]. As reported in the Pittwater Waterway Review - Stage 1 discussion paper, predicted growth in boating and boat size from 2008 - 2031 is estimated to increase boat storage space requirements in the region by 2068 spaces or a 13% increase. This will have direct impact on boat and associated infrastructure, waitlists for marina berths, moorings, demand for larger berthing spaces, on land implication arising from trailer boat parking and increased use of boat ramps[11]. Increased boat traffic can also result in loss of habitat to moorings and/or public spaces to private marinas, increased erosion from boat wake, greater pressure from recreational fishing and increased potential for fuel spills. As such, an increase in boating and associated infrastructure can impact on various waterway values and forms of recreational use.

Survey respondents perceived that there was a need to reduce conflict between commercial and recreational fishing[12]. Some respondents and workshop participants stated that commercial fishing was impacting local fish resources and perceived it as being in direct conflict with recreational fishing pursuits. Some respondents perceived that commercial fishing practices, such as offloading of animal matter directly into the waterway and oil slick run-off, are directly impacting water quality[11].

Planning and governance: Two online community surveys (363 total respondents) were conducted as part of the Pittwater Waterway Review - Stage 1 discussion paper[11]. When survey respondents were asked 'What is the

single biggest challenge facing the waterway now and into the future?' 15.9% of respondents identified governance and regulation, which was the third highest ranking behind natural environment (23.8%) and access and parking (21.3%)[11].

Broken Bay

Only one report that was included in this review specifically covered the Broken Bay area and hence the below insights draw mainly from that one report[4]. Owing to both Brisbane Water and Broken Bay drawing from the same report, the findings reported here are the same as those reported for Brisbane Water.

Coastal and estuarine hazards: According to the Our Coast, Our Waterways survey results, 9.9% rated climate change and sea level rise and 4% rated existing and future coastal hazards as the greatest threats to Broken Bay beaches[4].

Urbanisation and land use impacts: Land use intensification (urban stormwater discharge, foreshore development, inappropriate zoning/planning and clearing catchment/dune vegetation) were consistently the highest perceived threats by community across all areas[4].

Public health and safety: 11% rate they are concerned for their health and safety as a reason for not using Central Coast Waterways.

Waterway use and resources conflict: According to the Our Coast, Our Waterways survey results 10% rate waterways are too crowded by recreational users as a reason for not using Central Coast waterways[4].

4.2 Threat assessment and alignment with perceived threats

The threats identified in Stage 1 of the CMP have been assessed to gain a better understanding of their impact on community uses and values throughout the different zones of the HNRS. This exercise is based on the approach used for the NSW Marine Estate Statewide Threats and Risk Assessment (TARA) (MEMA 2017), which in turn uses a risk assessment process in accordance with AS/NZS ISO 31000:2009. The Statewide TARA is informed by a series of matrices that identify the threats to the marine estate and then determine the risk (e.g. consequence and likelihood) of the threat impacting upon the environmental assets and/or social and economic benefits derived from the marine estate. The risk matrix used in the MEMA TARA is provided in Figure 11. A description of each risk level is provided in Table 4.

LIKELIHOOD	LEVEL OF RISK				
ALMOST CERTAIN	MINIMAL	LOW	MODERATE	HIGH	HIGH
LIKELY	MINIMAL	LOW	MODERATE	HIGH	HIGH
POSSIBLE	MINIMAL	MINIMAL	LOW	MODERATE	HIGH
UNLIKELY	MINIMAL	MINIMAL	MINIMAL	LOW	MODERATE
RARE	MINIMAL	MINIMAL	MINIMAL	MINIMAL	LOW
CONSEQUENCE LEVEL	INSIGNIFICANT	MINOR	MODERATE	MAJOR	CATASTROPHIC

Figure 11. *Risk matrix used in the MEMA TARA and adopted for the HNRS CMP values and uses threat assessment*

Table 4. Description of risk levels

Risk Levels	Description	Likely Management Action
Minimal	Risk currently acceptable but trend in the risk to be tracked over time.	Existing control measures (if any) are suitable. Monitoring of risk likelihood and consequence over time to identify if risk is increasing, decreasing or staying the same.
Low	Risk likely to be acceptable but trend in the risk to be tracked over time.	Existing control measures (if any) are suitable. Monitoring of risk likelihood and consequence over time to identify if risk is increasing, decreasing or staying the same.
Moderate	Risk may be acceptable with suitable risk control measures in place.	Review of existing management controls or activities for the risk. Increased or different management controls or activities may be needed.
High	Risk less likely to be acceptable; additional risk control measures may need to be considered.	Review of existing management controls or activities for the risk. Increased or different management controls or activities are likely to be needed.

The threats assessment for the HNRS CMP is informed by the results of the Statewide TARA, with additional consideration for the variable threat levels in different zones of the HNRS. The analysis was applied to assess the level of threat for each subcategory in each zone. A threat rating was determined for both values and uses, differentiating how each threat impacts each across the types of values and uses considered in Section 2 & 3. A summary of the threat assessment results for each subcategory is provided below. Subsequently Figure 12 provides an infographic illustrating the top threats for each zone of the HNRS. Table 5 summarises the threats and provides an aggregate rating (uses and values) for each of the zones.

Coastal and estuary hazards

	Long Term Hazards				
	1.1 Tidal inundation of estuaries (i.e. “sunny day flooding”) 1.2 Estuary foreshore erosion and bank instability 1.3 Long term coastal shoreline recession 1.4 Estuary entrance instability 1.5 Cliff and slope instability				
	Upper Hawkesbury	**Lower Hawkesbury**	**Brisbane Water**	**Pittwater**	**Broken Bay**
Uses risk level	Low	Low	Low	Low	Low
Values risk level	Moderate	Moderate	Moderate	Moderate	Low

Long term hazards by their nature are not an immediate threat to community values and uses, and their gradual onset allows for the community to adjust to changing conditions. However they will exacerbate the impact of event based hazards like storm erosion and inundation by increasing their frequency and severity. Over various planning horizons, including immediate, 20, 50, and 100 years, these effects will be increasingly felt.

The viability of certain areas for current residential uses and recreational activities may be diminished over time. Non-recreational use such as livelihoods which rely on consistent conditions into the future may be more threatened by long-term hazards such as increased tidal inundation and cliff and slope stability.

In the same regard, these hazards threaten community values with foreshore erosion and bank instability, increased tidal inundation, and shoreline recession expected to have serious impacts on foreshore environments and private assets and is not easily or cheaply defended. Beyond the economic value of private property, these hazards will affect Connection to Place Values for impacted residents.

	Event Based Hazards				
	2.1 Coastal storm impacts - erosion 2.2 Coastal storm impacts - inundation 2.3 Combined coastal and catchment flooding 2.4 Bushfire 2.5 Drought 2.6 Tsunami 2.7 Dam breach / break				
	Upper Hawkesbury	**Lower Hawkesbury**	**Brisbane Water**	**Pittwater**	**Broken Bay**
Uses risk level	High	Moderate	Moderate	Moderate	Low
Values risk level	Moderate	Moderate	Moderate	Moderate	Low

Event based hazards pose a higher threat to community uses and values due to their abrupt impact and the potential to cause damage to assets, areas, and ecosystems. The catchment, Upper Hawkesbury and Lower Hawkesbury are more at risk from combined coastal and catchment flooding, with Brisbane Water, Pittwater and Broken Bay more at risk from coastal storms. Bushfires and drought threaten the catchment, Upper Hawkesbury and Lower Hawkesbury.

Within the catchment and in the Upper and Lower Hawkesbury, events such as bushfires and floods threaten recreational uses by physically altering the spaces where these activities take place. Brisbane Water and Pittwater are somewhat less threatened by these hazards, although in these zones, coastal storms can cause localised erosion and flooding in certain areas.

Event based hazards can also potentially impact environmental and cultural values, depending on the severity of the event, noting that bushfires, floods and storms are a natural part of the environment. These events can impact mental health and well-being values by creating angst and worry in the community that landscapes are being damaged. The temporary nature of these events means many of the community values can be restored post-recovery.

	Climate Change Impacts				
	3.1 Altered ocean currents and nutrient inputs 3.2 Ocean temperature increase 3.3 Ocean acidification 3.4 Altered storm frequency and severity 3.5 Altered hydrological regimes 3.6 Sea level rise 3.7 Long term shoreline recession due to sea level rise 3.8 Altered salinity levels / profile 3.9 Habitat migration and squeeze				
	Upper Hawkesbury	**Lower Hawkesbury**	**Brisbane Water**	**Pittwater**	**Broken Bay**
Uses risk level	Moderate	Moderate	Moderate	Moderate	Moderate
Values risk level	Moderate	Moderate	Moderate	Moderate	Moderate

Climate change impacts will be felt gradually as the earth system adjusts to increased greenhouse gases in the atmosphere. Trends and distributions of phenomena will shift, increasing the likelihood of certain events or conditions. However the HNRS is a naturally variable system, and it is important to carefully distinguish between climate change and event based hazards which are assessed as a separate sub category.

Climate change impacts threaten both community values and uses. Climate change will impact the way certain areas are able to be utilised for activities such as primary, secondary, and adjacent recreation. Non-recreational use may be increasingly threatened as climate change can impact the economic productivity of the estuary and the surrounding catchment.

Environmental values are at high risk as a changing climate will have complex and uncertain impacts on estuarine ecosystems throughout all functional zones. Traditional Owner/Custodian/Custodian values are also at high risk from climate change impacts as tangible and intangible cultural heritage such as traditions, spiritual values, knowledge, places, items, and source of food are intrinsically tied to land and sea country which will be impacted by climate change.

Alignment with perceived threats:

In the Threats and Management Priorities Survey for the HNRS CMP, coastal and estuarine hazards were voted as the second highest threat category with 16% vote. Foreshore/bank erosion is voted as the most important reason for the threat at 66%, along with catchment flooding (48%) and Shoreline recession (42%).

Urbanisation and land use impacts

	Water Pollution and Sediment Contamination				
	4.1 Urban stormwater discharge 4.2 Agricultural runoff 4.3 Industrial discharges 4.4 Sewage effluent and septic runoff 4.5 Sediment contamination / pollution 4.6 Disturbance of contaminated sediment on seabed (e.g. dredging) and in foreshore areas				
	Upper Hawkesbury	**Lower Hawkesbury**	**Brisbane Water**	**Pittwater**	**Broken Bay**
Uses risk level	Moderate	Moderate	Moderate	Low	Minimal
Values risk level	High	High	Moderate	Low	Low

Water pollution and sediment contamination from various sources pose a significant threat to community uses and values throughout the HNRS. The various functional zones are threatened by different sources of pollution based on activities the surrounding catchment. The HNRS catchment provides a range of land uses including urban, agricultural and industrial activities. The lower reaches of the estuary including most of Brisbane Water, Pittwater and Broken Bay benefit from regular tidal flushing with clean oceanic water and are therefore less threatened by water and sediment pollution, although in the heavily urbanised upper reaches of these waterways this becomes more of an issue.

Water pollution and sediment contamination impact heavily on primary recreation, with some areas unsafe to swim in after rain events. Secondary and adjacent recreation are also impacted but to a lesser degree. Non-recreational uses are impacted as poor water and sediment quality can impact on commercial fishing, oyster farming, and the appeal of commercial charters and waterfront businesses. Environmental and Traditional Owner/Custodian/Custodian values are most severely impacted by water and sediment pollution in the case where ecosystems are not adapted to nutrient and pollutant loads. These can harm not only the ecological balance of the area but also the cultural and spiritual

connections that Indigenous peoples have to the land and waters. These impacts flow on to health and well-being values as communities are unable to fully enjoy waterways that are impacted by regular pollution.

	Habitat Disturbance				
	5.1 Foreshore / urban development 5.2 Stock grazing of riparian and marine vegetation (in estuaries) 5.3 Clearing / disturbance of riparian and aquatic habitat 5.4 Clearing / disturbance of littoral rainforest habitat 5.5 Clearing / disturbance of terrestrial habitat 5.6 Introduction of invasive fauna pest species (e.g. carp) and diseases (POMS etc) 5.7 Introduction of invasive flora pest species (e.g. aquatic weeds) and diseases				
	Upper Hawkesbury	**Lower Hawkesbury**	**Brisbane Water**	**Pittwater**	**Broken Bay**
Uses risk level	Moderate	Moderate	Moderate	Low	Minimal
Values risk level	Moderate	Moderate	Moderate	Moderate	Moderate

Habitat disturbance within the HNRS is both a legacy issue and a continuing pressure. Much of the foreshore and catchment is either already developed for urban or agricultural use, or protected, for example in the National Park Estate. Expanding urban development is planned and occurring in the catchment, with effects on the water quality and therefore community uses and values.

Most recreational uses are not directly impacted by habitat disturbance, although ultimately recreational use is impacted by habitat disturbance as the quality of the waterway generally declines in response to habitat disturbance (and loss of ecosystem function) and as such the user experience is also impacted. Non-recreational uses such as oyster farming and commercial fishing are negatively impacted by both habitat clearance and introduction of invasive flora and fauna and diseases. These threats are most prominent in the Upper and Lower Hawkesbury and Brisbane Water where extractive industries operate.

Habitat disturbance does impact on community values, especially environmental values and Traditional Owner/Custodian/Custodian values which depend on thriving, resilient and protected habitats. Habitat disturbance can also impact on connection to place values.

	Hydrologic Modifications				
	6.1 Increasing use of groundwater 6.2 Modified freshwater flows, including water extraction WWTP discharges 6.3 Sedimentation and infilling channels and changing and regulating flows 6.4 Navigation and entrance management and modification (such as dredging)				
	Upper Hawkesbury	**Lower Hawkesbury**	**Brisbane Water**	**Pittwater**	**Broken Bay**
Uses risk level	Low	Low	Low	Low	Low
Values risk level	Moderate	Moderate	Moderate	Low	Low

Hydrologic modifications are also a legacy and ongoing pressure on the HNRS. Significant freshwater extraction for agricultural use in the catchment and by Warragamba Dam as the primary Metropolitan Sydney drinking water source has altered the hydrological regime of the estuary with associated ecological impacts. Urbanisation and land clearing have historically introduced increased sediment loads into the system, changing flow characteristics by infilling channels and accommodation space in stream beds.

Community uses are assessed as low risk level from hydrologic modifications. WWTP discharges can reduce water quality in some localised areas such as Berowra Creek which can impact on primary recreation. Water extraction may reduce fish abundance, impacting recreational and commercial fishing yield. Sedimentation and infilling channels can impact on navigation.

Hydrologic modifications do impact on community values, especially environmental values and Traditional Owner/Custodian/Custodian values. The HNRS ecosystem depends on a variable hydrological regime as well as both lateral (river to floodplain) and longitudinal (along the river) connectivity. Dams, weirs and extraction all reduce these desirable characteristics.

Alignment with perceived threats:

In the Threats and Management Priorities Survey for the HNRS CMP, urbanisation and land use impacts were voted the highest threat category with 48% vote. Stormwater pollution is voted as the most important reason for the threat at 46%, followed by loss of native animals and plants at 43%, and sewage/septic run off at 37%.

Waterway use and resource conflict

	Commercial Fishing and Boating				
	7.1 Commercial fishing in coastal / marine waters - ocean haul etc 7.2 Commercial fishing in estuaries - prawn trawl etc 7.3 Aquaculture – oyster farming etc 7.4 Commercial boating - small commercial vessels and charters activities etc				
	Upper Hawkesbury	**Lower Hawkesbury**	**Brisbane Water**	**Pittwater**	**Broken Bay**
Uses risk level	Low	Low	Low	Low	Low
Values risk level	Moderate	Moderate	Moderate	Moderate	Moderate

Commercial fishing practices such as estuary prawn trawling and oyster farming are historic and important contributors to the "blue economy" of the HNRS. Estuary prawn trawling targets school prawns, squid, and fish with trawlers operating from the ocean entrance upstream to the vehicular ferry at Lower Portland. Commercial oyster aquaculture in the HNRS is focused on the Lower Hawkesbury and Brisbane Water, while crabs and lobster fisheries are targeted in Broken Bay. There are also numerous small commercial boating operations throughout the HNRS including ferries and charter businesses.

These industries can pose a threat to some community uses within the HNRS, primarily adjacent recreation, specifically recreational fishing. As an extractive industry, commercial fishing can impact on the abundance of species, competing with recreational fishing when there are similar target species. Conversely, the structural habitat provided by oyster leases can improve fish abundance.

These industries can also pose a threat to community values. Environmental values are threatened by the extractive nature of commercial fishing, as well as the impacts of the vessels themselves which can cause bank erosion from large wakes, can introduce pollutants and pest species, and can disturb aquatic wildlife and habitats such as seagrass (noting these impacts are much less compared to the cumulative impacts of the recreational boating fleet). Traditional Owner/Custodian values are also highly impacted by these industries as they potentially impact the environment and are in opposition to traditional cultural economies.

More information is needed to compare the quotas taken by commercial fisheries within the river and recreational take so we can more clearly understand relative impacts of both fishing activities.

	Recreation and Tourism				
	8.1 Recreational fishing (boat and shore based) 8.2 Recreational boating and boating infrastructure 8.3 Passive Recreational Use 8.4 Coastal infrastructure, marina expansion, modifications, upgrades and associated dredging. 8.5 Anti-social behaviour and unsafe practices				
	Upper Hawkesbury	**Lower Hawkesbury**	**Brisbane Water**	**Pittwater**	**Broken Bay**
Uses risk level	Low	Low	Low	Low	Low
Values risk level	Low	Low	Moderate	Moderate	Low

Recreation and tourism activities such as recreational fishing, active and passive boating and other passive recreation such as swimming and surfing are extremely popular throughout the HNRS. There is also a need for infrastructure associated with these activities. Active boating is popular throughout the HNRS however there are large concentrations of jetties, moorings and other boating infrastructure in Lower Hawkesbury, Pittwater and Brisbane Water.

Recreation and tourism pose a generally low threat to community uses. The main threat to community uses arising from recreation and tourism is related to user conflict. For example, active boating may interfere with fishing and swimming activities, especially during peak season. Recreational use may also conflict with commercial uses, such as where recreational fishing potentially reduces fish abundance for commercial fishing. Anti-social behaviour and unsafe practices can also impact on the enjoyment of community users.

Recreation and tourism pose a generally low threat to community values as well, however boating and fishing activities in the more populated zones including Brisbane Water and Pittwater can have significant impacts on aquatic ecology and foreshore erosion. Boat wash can cause bank destabilisation and erosion, threatening foreshore assets and ecosystems. Anchors, moorings and jetties can all contribute to habitat disturbance, especially when considering the cumulative effect throughout the waterways. On the other hand, recreation and tourism pose a minimal threat to physical and mental health and well-being and a low threat to social health, with the higher rating due to the potential for anti-social and

unsafe behaviours and user conflict. The biggest threat that these activities pose to community values is on the environment and Traditional Owner/Custodian values.

	Access and Availability				
	9.1 Overcrowding / congestion of waterways and user group conflict 9.2 Overcrowding / congestion of foreshores/beaches and user group conflict 9.3 Limited or lack of foreshore and waterway access 9.4 Limited or lack of supporting infrastructure (for boating etc) 9.5 Lack of disability access				
	Upper Hawkesbury	**Lower Hawkesbury**	**Brisbane Water**	**Pittwater**	**Broken Bay**
Uses risk level	Low	Low	Moderate	Moderate	Low
Values risk level	Moderate	Moderate	Moderate	Moderate	Moderate

Access and availability challenges within the HNRS can threaten community uses and values. The HNRS is a very popular destination for many different users and activities and can be overcrowded sometimes, especially during peak seasons. Access may not be available and equitable to different user groups and sections of the population such as disabled persons and Traditional Owner/Custodians.

Primary recreation typically requires less infrastructure compared to secondary recreation, so a lack of access and supporting infrastructure poses a higher threat to the latter. Non-recreational uses are minimally impacted by access and availability as industry operators are not as in need of hyper-local access and infrastructure compared to recreational users.

Community values are generally enhanced by available waterway and foreshore access, so threats arise when access is inadequate, leading to overcrowding and congestion, or poorly designed, preventing full and safe access to all users. Traditional Owner/Custodian values can be more heavily impacted due to the unavailability of access to Country for traditional and cultural activities.

Alignment with perceived threats:

In the Threats and Management Priorities Survey for the HNRS CMP, waterway use and resource conflict were voted as the third highest threat category with 14% vote. Anti-social behaviour and unsafe boating practices are considered as the highest threat with 43% vote, followed by conflict of recreation uses with 39%, and overcrowding/congestion of waterways at 35%

Public health and safety

	Public health and safety				
	10.1 Water pollution/contamination affecting human health and safety – including algal blooms 10.2 Seafood contamination 10.3 Drinking water contamination 10.4 Coastal hazards (coastal erosion, cliff instability and inundation/wave overtopping) 10.5 Public safety risk from aging and/or degraded coastal/estuary infrastructure 10.6 Wildlife interactions (sharks, jellyfish etc)				
	Upper Hawkesbury	**Lower Hawkesbury**	**Brisbane Water**	**Pittwater**	**Broken Bay**
Uses risk level	Low	Low	Low	Low	Low
Values risk level	Moderate	Moderate	Moderate	Moderate	Moderate

Alignment with perceived threats:

In the Threats and Management Priorities Survey for the HNRS CMP, public health and safety issues were voted as the least important threat category with 4% vote. Water pollution impacting recreational activities was voted as the highest threat at 64%, followed by sewer treatment plants malfunctioning at 45%, and river settlements septic leachate at 42%.

Planning and governance

	Governance				
	11.1 Lack of adequate coordination between estuary councils, catchment councils and state government agencies – and jurisdictional ambiguity. 11.2 Inadequate, inefficient regulation, or over-regulation (agencies) 11.3 Lack of compliance with regulations (by users) or lack of regulation effort (by agencies) 11.4 Lack of funding for investigation and action implementation 11.5 Lack of or ineffective community engagement or participation in governance				
	Upper Hawkesbury	**Lower Hawkesbury**	**Brisbane Water**	**Pittwater**	**Broken Bay**
Uses risk level	Low	Low	Low	Low	Low
Values risk level	Moderate	Moderate	Moderate	Moderate	Moderate

Poor governance in the form of a lack of regulation and compliance has the potential to create long-term negative impacts on community values and uses.

For example, commercial fishers may be significantly impacted where their livelihoods are under threat from overfishing and habitat destruction related to illegal activities and inappropriate development. In some instances, the roles and responsibilities of the various agencies across the estuary and catchment create inefficiencies with regard to management and approvals processes. Challenges leading to poor catchment governance can have lasting negative impacts on water quality, with primary recreation uses being the most at risk.

Poor governance leading to negative social and environmental outcomes poses a threat to community values. Good governance requires sufficient funding and resources, successful integration and collaboration across agencies, and good compliance with regulations. Shortcomings in these areas can impact on environmental management efforts and disrupt orderly social enjoyment of the HNRS.

	Information gaps				
	12.1 Incomplete coastal and estuary process information (including climate change impacts or hydrodynamics along the entire river system) 12.2 Incomplete ecological information (including climate change impacts) 12.3 Inadequate and/or incomplete European and Indigenous Heritage information 12.4 Inadequate social and economic information				
	Upper Hawkesbury	**Lower Hawkesbury**	**Brisbane Water**	**Pittwater**	**Broken Bay**
Uses risk level	Low	Low	Low	Low	Low
Values risk level	High	High	High	High	High

While there is a continuous and concerted effort to identify and address knowledge gaps, for example through the CMP development process, there will always be new and emerging areas where knowledge can be improved to facilitate better management of the HNRS.

Lack of adequate information hampers the design and implementation of effective environmental management strategies and plans. The cumulative impacts of socio-economic threats are an area that has received limited research attention to date and is recognised as a current data gap. There is also a knowledge gap around the views and aspirations of Aboriginal people in regard to the NSW marine estate, and this may affect the cultural and heritage amenity of the area.

These information gaps do not immediately threaten the ongoing enjoyment of community uses, however it does limit the effectiveness of and the ability to optimise management actions.

Information gaps threaten community values because uninformed management can be maladaptive leading to suboptimal environmental and social outcomes. The gap in knowledge of Aboriginal views and aspirations for the HNRS poses a high threat to Traditional Owner/Custodian values.

Alignment with perceived threats:

In the Threats and Management Priorities Survey for the HNRS CMP, planning and governance issues were voted as the fourth highest threat category with 11% vote. Lack of coordination between government agencies when managing estuary (47%), Inefficient council planning instruments and lack of compliance with regulations (36%), and lack of strategic planning (35%).

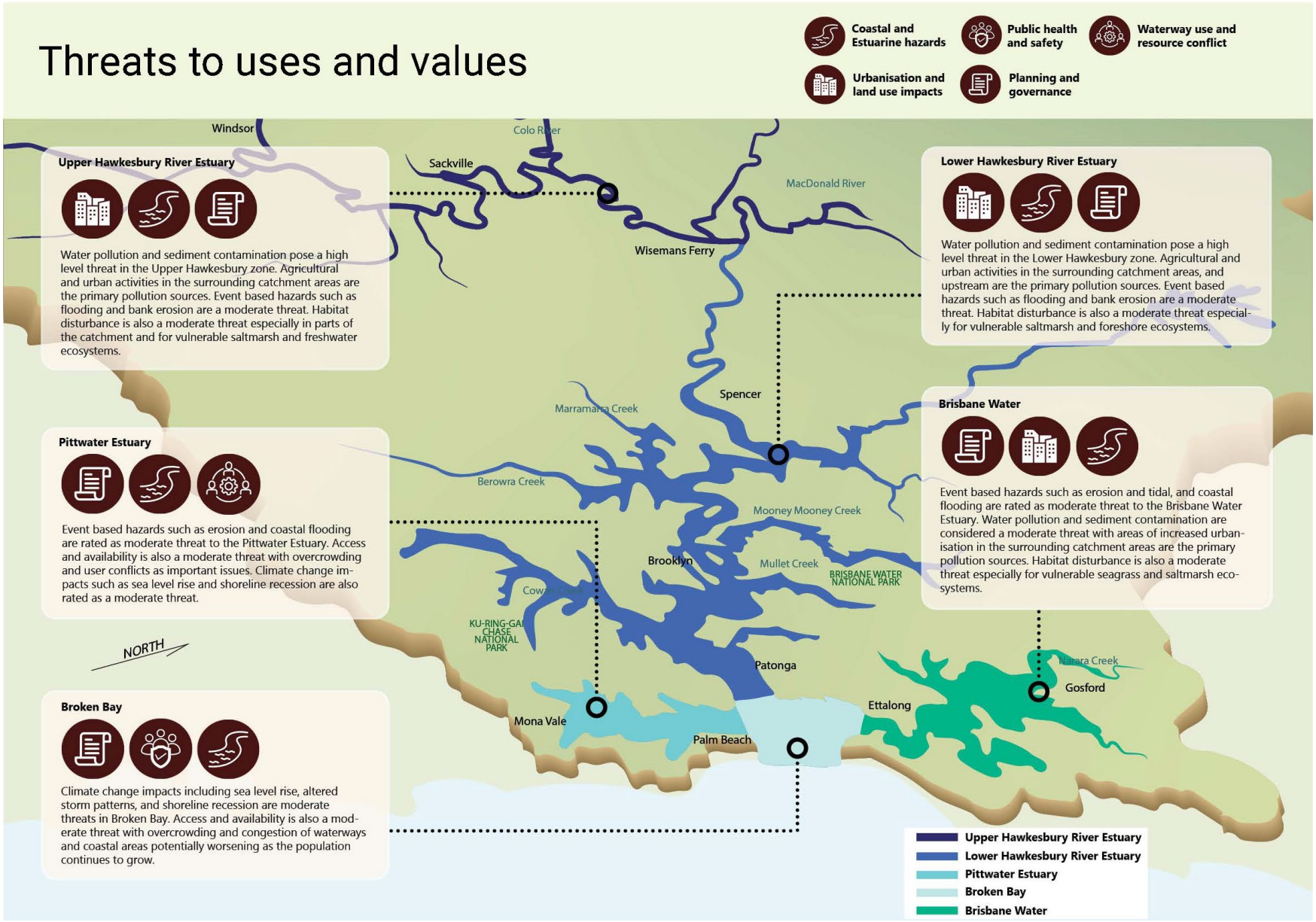

Figure 12. *Key threats identified for each zone in the HNRS.*

Table 5. Summary of threats for each zone

Upper Hawkesbury			Lower Hawkesbury			Brisbane Water			Pittwater			Broken Bay		
Category	Subcategory	Threat rating	Category	Subcategory	Threat rating	Category	Subcategory	Threat rating	Category	Subcategory	Threat rating	Category	Subcategory	Threat rating
Urbanisation and Land Use Impacts	Water Pollution and Sediment Contamination	High	Urbanisation and Land Use Impacts	Water Pollution and Sediment Contamination	High	Planning and Governance	Information Gaps Governance	Moderate	Planning and Governance	Information Gaps Governance	Moderate	Planning and Governance	Information Gaps Governance	Moderate
Coastal and Estuarine Hazards	Event Based Hazards Climate Change Impacts Long Term Hazards	Moderate	Coastal and Estuarine Hazards	Event Based Hazards Climate Change Impacts Long Term Hazards	Moderate	Urbanisation and Land Use Impacts	Water Pollution and Sediment Contamination Habitat Disturbance		Coastal and Estuarine Hazards	Event Based Hazards Climate Change Impacts Long Term Hazards		Coastal and Estuarine Hazards	Climate Change Impacts	
Planning and Governance	Information Gaps Governance		Planning and Governance	Information Gaps Governance		Coastal and Estuarine Hazards	Event Based Hazards Climate Change Impacts Long Term Hazards		Waterway Use and Resource Conflict	Access and Availability		Public Health and Safety	Public Health and Safety	
Urbanisation and Land Use Impacts	Habitat Disturbance Hydrologic Modifications		Urbanisation and Land Use Impacts	Habitat Disturbance Hydrologic Modifications		Waterway Use and Resource Conflict	Access and Availability		Public Health and Safety	Public Health and Safety		Waterway Use and Resource Conflict	Access and Availability	

Public Health and Safety 	Public Health and Safety		Public Health and Safety 	Public Health and Safety		Public Health and Safety 	Public Health and Safety		Urbanisation and Land Use Impacts 	Habitat Disturbance		Urbanisation and Land Use Impacts 	Habitat Disturbance			
Waterway Use and Resource Conflict 	Access and Availability		Waterway Use and Resource Conflict 	Access and Availability		Waterway Use and Resource Conflict 	Commercial Fishing and Boating Recreation and Tourism	Low	Urbanisation and Land Use Impacts 	Water Pollution and Sediment Contamination Hydrologic Modifications	Low	Waterway Use and Resource Conflict 	Commercial Fishing and Boating Recreation and Tourism		Low
Waterway Use and Resource Conflict 	Commercial Fishing and Boating Recreation and Tourism	Low	Waterway Use and Resource Conflict 	Commercial Fishing and Boating Recreation and Tourism	Low	Urbanisation and Land Use Impacts 	Hydrologic Modifications		Waterway Use and Resource Conflict 	Commercial Fishing and Boating Recreation and Tourism		Urbanisation and Land Use Impacts 	Water Pollution and Sediment Contamination Hydrologic Modifications		
												Coastal and Estuarine Hazards 	Long Term Hazards Event Based Hazards				

Upper Hawkesbury			Lower Hawkesbury			Brisbane Water			Pittwater			Broken Bay		
Category	Subcategory	Threat rating	Category	Subcategory	Threat rating	Category	Subcategory	Threat rating	Category	Subcategory	Threat rating	Category	Subcategory	Threat rating

Urbanisation and Land Use Impacts 	Water Pollution and Sediment Contamination	High	Urbanisation and Land Use Impacts 	Water Pollution and Sediment Contamination	High	Planning and Governance 	Information Gaps Governance	Moderate	Planning and Governance 	Information Gaps Governance	Moderate	Planning and Governance 	Information Gaps Governance	Moderate
Coastal and Estuarine Hazards 	Event Based Hazards Climate Change Impacts Long Term Hazards	Moderate	Coastal and Estuarine Hazards 	Event Based Hazards Climate Change Impacts Long Term Hazards	Moderate	Urbanisation and Land Use Impacts 	Water Pollution and Sediment Contamination Habitat Disturbance		Coastal and Estuarine Hazards 	Event Based Hazards Climate Change Impacts Long Term Hazards		Coastal and Estuarine Hazards 	Climate Change Impacts	
Planning and Governance 	Information Gaps Governance		Planning and Governance 	Information Gaps Governance		Coastal and Estuarine Hazards 	Event Based Hazards Climate Change Impacts Long Term Hazards		Waterway Use and Resource Conflict 	Access and Availability		Public Health and Safety 	Public Health and Safety	
Urbanisation and Land Use Impacts 	Habitat Disturbance Hydrologic Modifications		Urbanisation and Land Use Impacts 	Habitat Disturbance Hydrologic Modifications		Waterway Use and Resource Conflict 	Access and Availability		Public Health and Safety 	Public Health and Safety		Waterway Use and Resource Conflict 	Access and Availability	

Public Health and Safety 	Public Health and Safety		Public Health and Safety 	Public Health and Safety		Public Health and Safety 	Public Health and Safety		Urbanisation and Land Use Impacts 	Habitat Disturbance		Urbanisation and Land Use Impacts 	Habitat Disturbance	
Waterway Use and Resource Conflict 	Access and Availability		Waterway Use and Resource Conflict 	Access and Availability		Waterway Use and Resource Conflict 	Commercial Fishing and Boating Recreation and Tourism	Low	Urbanisation and Land Use Impacts 	Water Pollution and Sediment Contamination Hydrologic Modifications	Low	Waterway Use and Resource Conflict 	Commercial Fishing and Boating Recreation and Tourism	Low
Waterway Use and Resource Conflict 	Commercial Fishing and Boating Recreation and Tourism	Low	Waterway Use and Resource Conflict 	Commercial Fishing and Boating Recreation and Tourism	Low	Urbanisation and Land Use Impacts 	Hydrologic Modifications		Waterway Use and Resource Conflict 	Commercial Fishing and Boating Recreation and Tourism		Urbanisation and Land Use Impacts 	Water Pollution and Sediment Contamination Hydrologic Modifications	
												Coastal and Estuarine Hazards 	Long Term Hazards Event Based Hazards	

5. Conclusion and alignment of visions and values

The collation and synthesis of numerous sources of information has provided a coherent understanding of the community values and uses as well as threats to the HNRS. This review of information also identifies the strengths and weakness of the available information in regard to geographical coverage and consistency across the HNRS.

The process of evaluating management strategies to reduce threats to values and uses for inclusion in the HNRS CMP involves determining the feasibility, viability, and acceptability of coastal management actions. Feasibility is determined by the effectiveness, practicality, and reliability of the action, while viability is determined by the anticipated cost, availability of resources, time and commitment, and anticipated benefits. Acceptability is a measure of support by the community and stakeholders and the alignment of options with community values and the vision of the CMP.

It is important for the vision and actions in the Hawkesbury Nepean River System Coastal Management Program (HNRS CMP) to align with the community uses and values. Vision and values alignment will promote community ownership and support of the CMP. The success of the HNRS CMP depends on the engagement and support of the community. By aligning the vision and actions of the program with the values and uses of the community, it is more likely that they will take ownership of the program and support its implementation.

When the values and uses of the community are considered in the development of the HNRS CMP, it is more likely that the outcomes of the program will align with their expectations and needs. This can lead to better environmental, social, and economic outcomes for the community. And by involving the community in the development of the HNRS CMP, it increases their participation in the decision-making process. This can lead to a greater sense of empowerment and engagement and can improve the quality of the decision-making process.

By aligning the vision and actions of the HNRS CMP with the community uses and values, it increases the accountability of the program to the community. This can help to ensure that the CMP is relevant and effective, and that it is responsive to the changing needs of the community over time.

This Hawkesbury Nepean River System Community Values and Uses Report has been prepared as a supporting document to the Hawkesbury Nepean River System Coastal Management Program (HNRS CMP). It serves as an essential tool for developing a CMP that broadly aligns with community values, supports a variety of uses, and addresses threats, both perceived and actual.

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4. Our Coast, Our Waterways: Survey Results. Central Coast Council. Author: Rose Brown-Mason, Warren Brown and Toan Dam (2021)
5. Upper Hawkesbury River Estuary: Community Consultation report. Hawkesbury Shire Council, Prepared by: BMT WBM Pty Ltd. Author: Michelle Fletcher (2013)
6. Results of a random 600-person telephone survey, conducted in March 2020 for Urbis and Hornsby Shire Council as input to CSP and Asset Management Plans. Author: James Parker (2020)
7. Australian Liveability Census - Hornsby Shire Council. Author: Place Score (2021)
8. Community Satisfaction Survey 2021 – Hornsby Shire Council. Author: Jetty Research (2021)
9. An Exploration of the Ku-ring-gai Environmental Levy – Ku-ring-gai Council. Author: Woolcott research and Engagement (2018)
10. Special rate variation - continuation of the Environmental Levy – Ku-ring-gai Council. (2018)
11. Pittwater Waterway Review - Stage 1 discussion paper – Northern Beaches Council (2017)
12. Pittwater Waterway Strategy 2038. Northern Beaches Council
13. Hawkesbury-Nepean Nutrient Management Project - Engagement research report. Sydney Water. Author: RPS Mandis Roberts Pty Ltd (2018)
14. Hawkesbury Nepean Catchment CATI Survey results. Sydney Water. Author: Traverner Research and RPS Mandis Roberts Pty Ltd (2018)
15. Hills Future 2036 - Local Strategic Planning Statement. Hills Shire Council (2019)
16. Environmental Strategy – The Hills Shire Council (2019)
17. Waterways direction - Planning, Protection and management of the Shires Waterways – The hills Shire Council (2008)
18. Open space and recreation needs study – Ku-ring-gai Council (2002)
19. Hornsby Shire Council Risk-based Framework Project – Stage 1. Hornsby Shire Council. Authors: Mark Wainwright, Liam Nicholson, Jan Orton (2020)
20. Environmental Sustainability Strategy Community Engagement Report – Hornsby Shire Council (2020)
21. Using existing Council data to apply the Risk-based Framework: A Risk-based Framework case study – Hornsby Shire Council (2022)
22. DPE survey data on community uses and values (2023)
23. Our Hawkesbury Photo Competition (2021)
24. Marine Estate Community Survey Final Report, NSW Marine Estate Sweeney research (2024)
25. Your Say Hornsby Survey - Threats and Management Priorities Survey - Hawkesbury Nepean River Coastal Management Program – Hornsby Shire Council (2023)
26. Tourism Impact Assessment Work Sheet - 2021 Green Destinations, Central Coast Council (2022)

Appendix A – Overview of reports reviewed

Report details					Zone					
#	Report Title	Agency	Year	Report description	Whole Catchment	Upper Hawkesbury	Lower Hawkesbury	Brisbane Water	Pittwater	Broken Bay
3	Our Coast, Our Waterways: Hawkesbury - Nepean River system including Brisbane Water mini report. Author: Rose Brown-Mason and Warren Brown	Central Coast Council	2021	Between 30 March and 15 June 2021 Central Coast Council hosted the first phase of community consultation to inform the development of the Coastal Management Programs. This report provides an overview of the engagement approach and provides a summary of the survey results (n=1168) from users of the Hawkesbury-Nepean River system including Brisbane Water.			x	x		x
4	Our Coast, Our Waterways: Survey Results. Author: Rose Brown-Mason, Warren Brown and Toan Dam	Central Coast Council	2021	Between 30 March and 15 June 2021 Central Coast Council hosted the first phase of community consultation to inform the development of the Coastal Management Programs. This report provides an overview of the engagement approach and provides a summary of the survey results (n=1168)			x	x		x
5	Upper Hawkesbury River Estuary: Community Consultation report Prepared by: BMT WBM Pty Ltd Author: Michelle Fletcher	Hawkesbury Shire Council	2013	This report documents the outcomes of community and stakeholder consultation undertaken to assist in the development of the Upper Hawkesbury River Coastal Zone Management Plan (CZMP). The consultation activities included: • A Community drop in information booth for the day on the 29th June 2013; • An open community meeting on 15th July 2013; • A website including online surveys; • A targeted stakeholder workshop		x				

Report details					Zone					
#	Report Title	Agency	Year	Report description	Whole Catchment	Upper Hawkesbury	Lower Hawkesbury	Brisbane Water	Pittwater	Broken Bay
				including participants form relevant government agencies and industry; • A meeting and telephone based discussions with representatives of the local aboriginal community.						
6	Results of a random 600-person telephone survey, conducted in March 2020 for Urbis and Hornsby Shire Council as input to CSP and Asset Management Plans Author: James Parker	Hornsby Shire Council	2020	Hornsby Shire Council commissioned Urbis and Jetty Research to conduct a random telephone survey of Hornsby Shire residents (aged 18+). This survey, the initial component of a wider community engagement strategy, was designed to: • Measure progress with a range of Quality of Life statements against a 2017 baseline study; and • Understand community aspirations for future improvements in Council's assets and infrastructure. The engagement is ultimately designed both to provide quantitative benchmarks for Council's Community Strategic Plan and provide input into the Shire's Asset Management Plan.			x			
7	Australian Liveability Census - Hornsby Shire Council author: Place Score	Hornsby Shire Council	2021	high level summary of the results from residents of Hornsby Shire Council from Australian Liveability Census conducted in March to June 2021			x			

Report details					Zone					
#	Report Title	Agency	Year	Report description	Whole Catchment	Upper Hawkesbury	Lower Hawkesbury	Brisbane Water	Pittwater	Broken Bay
8	Community Satisfaction Survey 2021 - Jetty Research	Hornsby Shire Council	2021	The Hornsby Shire Council Community Satisfaction Survey 2021 aimed to collect 400 completed responses from a random sample of residents in the Hornsby Shire Council local government area. The survey sample is a highly robust and reliable for Council's planning and reporting activities			x			
9	An Exploration of the Ku-ring-gai Environmental Levy author: Woolcott research and Engagement	Ku-ring-gai Council	2018	Ku-ring-gai Council is nearing the end of the current determination period for their current special rate variation – an Environmental Levy. Council ideally like to continue on with this Levy but requires community input into the decision making process. As part of a larger scope of work, Council engaged the services of Woolcott Research & Engagement to determine the views of their rate payers in three main areas; • The potential continuation of the Environmental Levy; • The potential permanent nature of the Levy; and • Support for the program Areas (to feed into decision relating to budget allocation)			x			
10	Special rate variation - continuation of the Environmental Levy	Ku-ring-gai Council	2018	This is a detailed survey results of the previous - data results are same as above.			x			

Report details					Zone					
#	Report Title	Agency	Year	Report description	Whole Catchment	Upper Hawkesbury	Lower Hawkesbury	Brisbane Water	Pittwater	Broken Bay
11	Pittwater Waterway Review - Stage 1 discussion paper	Northern Beaches Council	2017	The Pittwater Waterway Review (the Review) report identify and assess all issues impacting the waterway and potential opportunities to address and balance the array of competing interests. The Review is to form the basis for the development and implementation of strategies and specific actions to guide the management of the waterway over the next 10-15 years					x	
12	Pittwater Waterway Strategy 2038 This report has same data as of the previous report	Northern Beaches Council		The Pittwater Waterway Strategy 2038 is a vision for a place that balances nature with vibrant and diverse activity. It outlines key future strategy directions regarding managing the Pittwater waterway sustainably.					x	
13	Hawkesbury-Nepean Nutrient Management Project - Engagement research report Author: RPS Mandis Roberts Pty Ltd	Sydney Water	2018	The report presents the key findings of consultation including community values of catchment waterways, concerns relating to growth in Western Sydney, the current concerns and issues facing the community and priorities for management. Recommendations are made to guide the development of the Hawkesbury-Nepean Nutrient Management Framework.	x	x	x			

Report details					Zone					
#	Report Title	Agency	Year	Report description	Whole Catchment	Upper Hawkesbury	Lower Hawkesbury	Brisbane Water	Pittwater	Broken Bay
14	Hawkesbury Nepean Catchment CATI Survey results Author: Traverner Research and RPS Mandis Roberts Pty Ltd	Sydney Water	2018	RPS commissioned Taverner Research, on behalf of Sydney Water, to undertake a CATI (computer assisted telephone interview) survey with residents of the Hawkesbury-Nepean Catchment (HNC) and the Rest of the Greater Sydney area to determine resident's views on protecting the health of the Hawkesbury and Nepean Rivers Sydney Water is planning new drinking water and wastewater services, including wastewater treatment plants to cater for growth in Sydney. To manage nutrient pollution, Sydney Water proposed two options and wanted to know the views of the residents of the Greater Sydney area. These options were: Option 1: Upgrade treatment plans Option 2: Nutrient offset programs	x	x	x			
15	Hills Future 2036 - Local Strategic Planning Statement	Hills Shire Council	2019	The LSPS is to support future planning decisions as well as drive future land use planning and on managing population, housing and economic growth in The Hills. This report do not provide any information or data on the community consultation		x				
16	Environment Strategy	Hills Shire Council	2019	This Environment Strategy 2019 focuses on the Shire's biodiversity and natural resources, and on how to protect, enhance and live safely within a natural environment while reducing water and energy use, and		x				

Report details					Zone					
#	Report Title	Agency	Year	Report description	Whole Catchment	Upper Hawkesbury	Lower Hawkesbury	Brisbane Water	Pittwater	Broken Bay
				waste generation There is no mention of any community consultation in the report. No relevant data is available in the report						
17	Waterways direction - Planning, Protection and management of the Shires Waterways	Hills Shire Council	2008	The Waterways Direction provides a statement of direction for the Shire. The Waterways Direction reflects Council's desired approach to guide the planning, protection, management and maintenance of the Shire's waterways. There is no mention of any community consultation in the report. No relevant data is available in the report		x				
18	Open space and recreation needs study	Ku-ring-gai council	2002 (not adopted)	Appendix Chapter 5 - No relevant data Appendix chapter 4 - No relevant data data is very limited around water use, values and threats			x			
19	Hornsby Shire Council Risk-based Framework Project – Stage 1 Authors: Mark Wainwright, Liam Nicholson, Jan Orton	Hornsby Shire Council	2020	This report outlines a preliminary risk assessment completed to identify high priority sub-catchments within the Hornsby Local Government Area (LGA) where implementation of catchment management actions could assist with protecting higher value waterways.	x		x			

Report details					Zone					
#	Report Title	Agency	Year	Report description	Whole Catchment	Upper Hawkesbury	Lower Hawkesbury	Brisbane Water	Pittwater	Broken Bay
20	Environmental Sustainability Strategy Community Engagement Report	Hornsby Shire Council		The purpose of this document is to outline the community engagement program to inform and guide the preparation of the ESS. This Plan will assist Council in preparing an ESS that reflects the environmental values and aspirations of the community and can provide a reflective guide when developing future engagement strategies.	x		x			
21	Using existing Council data to apply the Risk-based Framework: A Risk-based Framework case study	Hornsby Shire Council	2022	Data is same as the Hornsby_Shire_RBF_Study_FinalReport			x			
22	DPE survey data on community uses and values	DPE	2023	The NSW Department of Environment and Planning (DPE) has developed an online Risk-based Framework Toolkit which is informed by a range of data layers including a Community Values and Uses layer. The DPE Community Values and Uses data layer has categories which have been developed to align with the NSW Water Quality Objectives. The data used in DPE Community Values and Uses data layer was sourced from online consultation, market research, social media platforms (e.g. Strava), social media campaign and community survey with 3,441 responses,	X	X	X	X	X	x

Report details					Zone					
#	Report Title	Agency	Year	Report description	Whole Catchment	Upper Hawkesbury	Lower Hawkesbury	Brisbane Water	Pittwater	Broken Bay
				data mining and improved mapping via Geographic Information Systems.						
24	Marine Estate Community Survey Final Report	NSW Marine Estate Sweeney research	2014	The purpose of this research was to prioritise those areas of greatest concern to the NSW community and identify key opportunities for improved management of the Marine Estate. The results of this survey will be used as one of the inputs into the program of work, either planned or being conducted, into the Marine Estate to better manage this valuable asset.						
25	Your say Hornsby - Survey results	Hornsby Council	2023	Threats and Management Priorities Survey Hawkesbury-Nepean River Coastal Management Program						
26	Tourism Impact Assessment Work Sheet - 2021 Green Destinations	Central Coast Council - Green Destinations	2022	Tourism impact assessment work sheet with information on inventory of key resources and value, impacts of tourism, policies and protection management resources. Document have attachments with specific eco criteria assessment on the following: • Nature and scenery - Tourism impacts on nature, Landscape and scenery • Environment and climate - water sourcing, water quality monitoring and response • Culture and tradition - Intangible heritage • Social wellbeing - inhabitant satisfaction						

Appendix B – Full list of threats and stressor

Threat	Stressor Category	Stressor and ID
Coastal and Estuarine Hazards	Long Term Hazards	1.1 Tidal inundation of estuaries (i.e. “sunny day flooding”) 1.2 Estuary foreshore erosion and bank instability 1.3 Long term coastal shoreline recession 1.4 Estuary entrance instability 1.5 Cliff and slope instability
	Event Based Hazards	2.1 Coastal storm impacts - erosion 2.2 Coastal storm impacts - inundation 2.3 Combined coastal and catchment flooding 2.4 Bushfire 2.5 Drought 2.6 Tsunami 2.7 Dam breach / break
	Climate Change Impacts	3.1 Altered ocean currents and nutrient inputs 3.2 Ocean temperature increase 3.3 Ocean acidification 3.4 Altered storm frequency and severity 3.5 Altered hydrological regimes 3.6 Sea level rise 3.7 Long term shoreline recession due to sea level rise 3.8 Altered salinity levels / profile 3.9 Habitat migration and squeeze
Urbanisation and Land Use Impacts	Water Pollution and Sediment Contamination	4.1 Urban stormwater discharge 4.2 Agricultural runoff 4.3 Industrial discharges 4.4 Sewage effluent and septic runoff 4.5 Sediment contamination / pollution 4.6 Disturbance of contaminated sediment on seabed (e.g. dredging) and in foreshore areas
	Habitat Disturbance	5.1 Foreshore / urban development 5.2 Stock grazing of riparian and marine vegetation (in estuaries) 5.3 Clearing / disturbance of riparian and aquatic habitat 5.4 Clearing / disturbance of littoral rainforest habitat 5.5 Clearing / disturbance of terrestrial habitat 5.6 Introduction of invasive fauna pest species (e.g. carp) and diseases (POMS etc) 5.7 Introduction of invasive flora pest species (e.g. aquatic weeds) and diseases
	Hydrologic Modifications	6.1 Increasing use of groundwater 6.2 Modified freshwater flows, including water extraction WWTP discharges 6.3 Sedimentation and infilling channels and changing and regulating flows 6.4 Navigation and entrance management and modification (such as dredging)
Waterway Use and Resource Conflict	Commercial Fishing and Boating	7.1 Commercial fishing in coastal / marine waters - ocean haul etc 7.2 Commercial fishing in estuaries - prawn trawl etc 7.3 Aquaculture – oyster farming etc 7.4 Commercial boating - small commercial vessels and charters activities etc
	Recreation and Tourism	8.1 Recreational fishing (boat and shore based) 8.2 Recreational boating and boating infrastructure 8.3 Passive Recreational Use 8.4 Coastal infrastructure, marina expansion, modifications, upgrades and

Threat	Stressor Category	Stressor and ID
		associated dredging. 8.5 Anti-social behaviour and unsafe practices
	Access and Availability	9.1 Overcrowding / congestion of waterways and user group conflict 9.2 Overcrowding / congestion of foreshores/beaches and user group conflict 9.3 Limited or lack of foreshore and waterway access 9.4 Limited or lack of supporting infrastructure (for boating etc) 9.5 Lack of disability access
Public Health and Safety	Public Health and Safety	10.1 Water pollution/contamination affecting human health and safety – including algal blooms 10.2 Seafood contamination 10.3 Drinking water contamination 10.4 Coastal hazards (coastal erosion, cliff instability and inundation/wave overtopping) 10.5 Public safety risk from aging and/or degraded coastal/estuary infrastructure 10.6 Wildlife interactions (sharks, jellyfish etc)
Planning and Governance	Governance	11.1 Lack of adequate coordination between estuary councils, catchment councils and state government agencies – and jurisdictional ambiguity. 11.2 Inadequate, inefficient regulation, or over-regulation (agencies) 11.3 Lack of compliance with regulations (by users) or lack of regulation effort (by agencies) 11.4 Lack of funding for investigation and action implementation 11.5 Lack of or ineffective community engagement or participation in governance
	Information Gaps	12.1 Incomplete coastal and estuary process information (including climate change impacts or hydrodynamics along the entire river system) 12.2 Incomplete ecological information (including climate change impacts) 12.3 Inadequate and/or incomplete European and Indigenous Heritage information 12.4 Inadequate social and economic information