North Coast Option		Individual ratings	Comments
Option 1	Expand the Clarence-Coffs Harbour Regional Water Supply Scheme	Minor impact	Difficult to assess as it depends on the additional demand and pressure placed on water supplies. In droughts, this option could place additional stress on the Nymboida river which is the source of water from Shannon Creek Reservoir which feeds the scheme. Option is probably preferable to damming tributaries of the Nambucca River which would degrade that system
Option 2	Portable desalination	Minor improvement	If this eases pressure on the region's water supplies and is an alternative to damming rivers and streams to provide town water then this will have a positive environmental effect (perhaps rate as moderate improvement)
Option 3	Emergency water supply provided by new pumped hydro storage projects	Minor impact	This scheme is an off-river project that will take ittle water from the river. It would appear to have only a minor environmental impact on the Macleay River. An EIS is underway for this project (State significant project)
Option 4	Augment Shannon Creek Dam	Minor impact	Augmentation should have a neglible impact on the natural flow regime of the Nymboida River as this is an off-river storage. However, rules for harvesting flows from the nymboida will be critical to minimising the impact of the enlarged storage on the Nymboida River flows.
Option 5	Upgrade major town water treatment facilities	no/little change	
Option 6	Repurpose existing assets to provide emergency storage for local industries	Insufficient detail	Not enough information to assess impact on the aquatic environment.
Option 7	Vulnerability of surface water supplies to sea level rise	Insufficient detail	Provide more detail.
Option 8	New industry and rural licence category within major council storages	Moderate impact	More detail needs to be provided about the sizes of town water supplies, the current rules for managing inflows to these storages (e.g. are there translucency rules and minimum releases to maintain base flows?) and hydrological modelling of the impact of the proposed rules changes on river flows. However, these new licences would take more water from existing town water storages, reducing spill frequency and the magnitudes of small to moderate freshes downstream of these storages. This would degrade the downstream ecology.
Option 9	Protecting coastal groundwater resources for town water supplies and rural water users	Minor improvement	This should also protect GDEs but GDEs ned to be identified and mapped so that they can be monitored and assessed for impact.
Option 10	Remove impediments to water reuse projects	Minor improvement	Positive outcome of managing recharge under stress. Need to manage nutrient loads and other contaminents for recharge into groundwater and surface water streams/bodies. This option could also incorporate storm water harvesting and use in urban situations. Removing regulatory impedements to water reuse was highlighed in the recent Productivity Commission's review of integrated urban water management.
Option 11	Increase use of recycled wastewater for intensive horticulture	Minor improvement	On its own this is probably represents a minor improvement for the environment because recycled water is a small proportion of extracted water. Combined with other re-use measures and desalinisation, cumulative benefits could be significant. Need to manage nutrient loads and other contaminents for recharge into groundwater and surface water streams/bodies, this option could also incorporate storm water harvesting and use in urban situations.
Option 12	Indirect potable reuse of purified recycled water	Minor improvement	This would redirect watewater from waterbodies, leading to improved water quality. Addition of this to potable water supplies should significantly reduce demand for natural water sources. Option needs to be carefully planned and monitored in order to manage any potential impacts on natural ecosystems.
Option 13	Direct potable reuse of purified recycled water	Minor improvement	Positive outcome of managing recharge under stress. Need to manage nutrient loads and other contaminents for recharge into groundwater and surface water streams/bodies. This option could also incorporate storm water harvesting and use in urban situations.
Option 14	Increased harvestable rights	Moderate impact	Less water in streams means less water for aquatic ecosystems. If the climate is getting hotter and significantly reduced stream flows occur, increasing harvestable rights will only add to the pressure on aquatic ecosystems. Building dams on 3rd order streams should be avoided to reduce impact on these streams and to minimise adverse impacts on contributing flows to higher order streams. The uptake of the 10% harvestable rights is well below the allowable limit in many catchments so justifaction to increase the threshold should be well supported . The limit ought to be reviewed on a catchment by catchment basis because modelling indicates different levels of impacts among catchments. Nevertheless, modelling of various harvesting scenarios may show that it is possible to increase extraction during periods of high flow with minimal impact on stream hydrology. Refer to the response to the Coastal Harvestable Rights Discussion Paper.
Option 15	Increased on-farm water storage	Minor improvement	The effect of this option depends on the size of the dams, the density (surface area) of dams in the catchment, and placement so that they do not interfere with natural run-off (overlaps with harvestable rights). The option does have the potential to remove pressure on low stream flows which is a positive.
Option 16	Establish sustainable extraction limits for Far North Coast surface water and groundwater sources	Major improvement	This is very important so that LTAAs protect the base flow levels of streams and rivers. Prolonged rainfall deficiencies of several years may eventually cause baseflow levels of streams to fall, perhaps drying out long sections of stream. This is because groundwater aquifers gradually runout of water, hence, conservative extraction limits are important. Modelling the low-flow behaviour of streams and using indicators like Q50/Q90 or Q50/Q95 is useful for assessing low flow constancy of streams. This option would be important for guiding limits to the numbers of farm dams and their specifications (Option 15).
Option 17	Convert low-flow water access licences to high-flow water access licences	Major improvement	Support intent would depend on the review and management of risks identified for each water source. This would significantly reduce the impact of extractions on flow regimes but would need to remain within sustainable extraction limits. Take would need to be controlled by cease to pump heights or be limited by time/volume to protect small to moderate freshes in streams so that they are not destroyed or significantly diminished. Consideration needs to be given to cancelling pumping of high flows when the region is in drought.
Option 18	Long-term water plans to support healthy coastal waterways	Major improvement	Currently, the environmental water requirements of aquatic biota has not been assessed. As there is increasing pressure to extract more water from rivers and streams LTWPs are essential. Identifying EWRs is also a prerequisite for Option 14 and Option 16.

Option 19	**Characterising coastal groundwater resources**	**Moderate improvement**	There is a need to address groundwater knowledge gaps to inform resource management and protection. This is a prerequisite for developing groundwater resources and for managing them. It would also assist in protecting Groundwater Dependent Ecosystems supported. the area supports diverse and important groundwater dependent ecosystems which will come under increasing pressure (development, intrusion of saline water, water quanity and quality issues Should be combined with option 29.
Option 20	**Protecting ecosystems that depend on coastal groundwater resources**	**Moderate improvement**	Offsetting - vegetation is currently offset but their dependence on groundwater is not considered. If offsetting is to be considered it would have to be approached cautiously as many types such as springs and wetlands are unique and cannot be substituted. Considerations; "groundwater salinity monitoring and management" – agreed but add water quality as well particularly in areas of salt water intrusion.
Option 21	**Improve stormwater management**	**Minor improvement**	Urban runoff is recognised by the NSW Marine Estate Threat and Risk Assessment Report (2017) as one of the prioirty threats to the NSW marine estate. Intercepting and harvesting stormwater could attenuate flows running off impervious surfaces which would reduce the geomorphic impacts (channel and streambank erosion) of flashy flows. In addition, stormwater harvesting could intercept pollutants that would otherwise end up in streams. However, this option would have only localised benefits around urban and peri-urban areas.
Option 22	**Bringing back riverine and estuarine habitats and threatened species**	**Major / Extreme improvement**	This program has the potential to make a major improvement to aquatic systems but only if it is done on a large scale and brings the community (riparian landholders) on board. Steps for prioritisation include surveys and an audit of aquatic biodiversity (including spiny crayfish and freshwater mussels) in the region to help prioritise streams and wetlands. The River Styles framework, especially the GIS maps of geomorphic condition, would be a useful framework for planning surveys and restoration work. Geomorphic assessment of channel stability and stream banks is an essential aspect. Restoration of riparian and in-stream habitat is essential for resilience to changing climate. EES would like to be involved in the further development and implementation of this option. Lessons can be learned from a number of privately run stream restoration initiatives that go under names such as 'natural sequence farming'. The NSF practitioners are largely self taught and have largely filled a need left when the Soil Conservation Service (now reformed) was disbanded, and they have marketed stream restoration very successfully as a means of improving farm productivity and health - this strikes a chord with many landholders. Ensure communication with DPIE Biodiversity Conservation - Water, Floodplain and Coast in relation to meeting this option so doubling up of programs does not occur. This should be noted in the considerations.
Option 23	**Fish-friendly water extraction**	**Moderate improvement**	Fish mortality in irrigation pumps is probably much less of an issue in coastal rivers but nonetheless it is best practice and it should be mandatory that large pumps are fitted with screens
Option 24	**Improve fish passage in the North Coast region**	**Moderate improvement**	The propsed remediation of structures would significantly benefit fish movement and is fully supported
Option 25	**Addressing cold water pollution**	**no/little change**	Cold water pollution is not an issue in the NC region. There are few dams and all are relatively small. An analysis of water temperature data (collected with loggers over spring-summer) at 2-3 points dams with controls on unreg streams should be used to see if this option is worth pursuing.
Option 26	**Coastal, regional focused water reference groups**	**Moderate improvement**	This option would be an improvement IF it gets the representation of the community on the committees correct, and ensures less politically powerful or minority groups are represented.
Option 27	**Planning for climate change impacts on coastal groundwater resources**	**Minor improvement**	The big question here is just how accurately climate models can project future changes in rainfall patterns under various climate scenarios. Identifying, mapping and setting up monitoring bores for vulnerable aquifers is worthwhile so that manageement can be adapted as trends emerge. This option has potential to be a major improvement.
Option 28	**River Recovery Program for the Far North Coast: a region-wide program of in-stream works, riparian vegetation and sediment control**	**Major improvement**	How does this differ from Option 22? The two options ought to be combined. An extremely worthwhile initiative, addressing some of the major causes of degraded coastal rivers and streams along the east coast. It is also essential for building resilience to future climate change and would result in the recovery of many aquatic groups including fish, spiny crayfish and especially freshwater mussels. EES would be keen to be involved with further discussions and development of implementation plans around this option. Landholder incentive program - working close with industry bodies of benefit. Link into a BMP program Develop BMP in partnership with industry groups, community groups to ensure multiple benefits for production, community and environment. Consistency across agencies and programs critical. To ensure doubling up of projects does not occur, ensure communication with DPIE Biodiversity and Conservation Division - Water, Floodplain and Coast as Coastal Management Programs cover much of these issues and work may already have been completed in these areas which can be of use in further studies/programs. This should be noted in the considerations. In the strategy pollution from poor agricultural practices and landscape management is identified as one of the causes of poor water quality, though it is not addressed in any of the options. This option could be an opportunity to address this as one of its intentions are: 'support improved land use practices that protect catchment health'.
Option 29	**Improved data collection and information sharing**	**Moderate improvement**	Recognises significant knowledge gaps currently within multiple water management areas. EES suggests that the description also include investigating technologies to more efficiently collect rainfall, water quality and flow data. The considerations also include integration of flood warning systems, estuarine and rainfall data services.
Option 30	**Active and effective water markets**	**Minor improvement**	Critical that environmental effects of trading rule changes and related options (such as Option 14) are thoroughly investigated to neutralise negative impacts on the environment. It is difficult to ascertain what risk this option poses to the environment.
Option 31	**Apply the NSW Extreme Events Policy to the Far North Coast region**	**Minor improvement**	If this establishes trigger points and management strategies to service environmental needs during droughts then this is a good option. A risk-averse approach is needed to avoid cutting off environmental water in the event of water supply crises as happened in the Namoi River during 2019.
Option 32	**Regional Demand Management Program**	**Moderate improvement**	This would be a positive for aquatic ecosystems. As an alternative to supply-side solutions, it could delay or obviate the need for new dams like Byrrill Creek or Dunoon Ck. River regulation is one of the key threats to riverine ecosystems.
Option 33	**Regional network efficiency audit**	**Insufficient detail**	Provide more detail
Option 34	**Regional capacity building program and skills hub**	**Minor improvement**	Provide more detail on who the skills hub would target for capacity building.

Option 35	**Support for local councils to lift performance standards**	**Insufficient detail**	Insufficient knowledge to comment
Option 36	**Regional framework to manage restrictions for non-urban water users of town water**	**Moderate improvement**	This addresses a weakness in water distribution management

Consensus rating
Major / Extreme impact
Moderate impact
Minor impact
no/little change
Minor improvement
Moderate improvement
Major improvement
Major / Extreme improvement
Insufficient detail