Memo

Subject	Reply to submissions
Distribution	James Flockton (Byron Shire Council)
Date	September 2019
Project	Belongil Creek entrance opening strategy

Overview

Byron Shire Council (Council) has engaged Alluvium Consulting and Salients to develop the Belongil Creek Entrance Opening Strategy (referred to herein as the Opening Strategy) and the associated Environmental Management Plan (EMP) in collaboration with Council, other government agencies and key stakeholders.

A key component in developing the Opening Strategy and EMP is community and stakeholder engagement. It is critical to the long-term effectiveness of the Opening Strategy that key stakeholders have the opportunity to be part of the process and have a say in the future management of the estuary. The engagement process has involved workshops and community drop in sessions that were key to the development of the draft Opening Strategy. The draft Opening Strategy and EMP was released for public comment on in June 2019 and submissions were provided to Council.

The following document presents an overview of the submissions received and how certain feedback has been incorporated into the Opening Strategy and EMP. Where feedback has not been incorporated, the reason why has also been outlined. It should be noted that not all stakeholder submissions are necessarily aligned. The replies aim to take all stakeholder views under consideration alongside the key environmental impacts and/or constraints.

Submissions

A list of the submissions received, and an overview of each submission is provided below.

1. **Jan Olley (Byron Bird Buddies), received 29/06/2019**: *Byron Bird Buddies generally supports the opening Option 1B - 1m trigger level but has concerns about the opening location migrating east in certain conditions. They believe the opening location needs to be adaptive as the bird use area changes and the spit changes.* The key items to the submission and the responses are presented in Table 1.
2. **Mary Gardner (WaterPlaces), received 01/07/2019**: *Generally supports Option 1D - 1m watch and 1.2 m trigger with the incorporation of beach scraping before full mechanical opening. Wants the opening to be more focussed on ecological management rather than flood mitigation and believes more rigorous data collection and monitoring is required and made publicly available*. The key items to the submission and the responses are presented in Table 2.
3. **David Maguire (Cape Byron Marine Park), received 05/07/2019**: *Suggests moving the opening location to the north and placing the sand on the southern side to protect the spit and bird use area. Suggests further investigation into the current status of aquatic life (fauna and fish surveys). Concludes that a Coastal Management Program (CMP) should be developed and the Opening Strategy be reviewed to ensure consistency with objectives for management of the catchment.* The key items to the submission and the responses are presented in Table 3.
4. **Tom Vidal (Belongil Catchment Drainage Board), received 19/06/2019**: *Supports the Opening Strategy at a level of 1.0 m AHD. BCDB to be made aware of any changes to the Opening Strategy and include some additional information regarding impacts of the West Byron STP.* The key items to the submission and the responses are presented in Table 4.

5. **Jeremy Holmes (Elements Resort), received 05/07/2019:** *Generally supportive of the Opening Strategy and believes some form of shoreline protection of the northern bank to protect the littoral rainforest is required.* The key items to the submission and the responses are presented in Table 5.

6. **Duncan Dey, received 28/06/2019**: *Duncan's response primarily focuses on editing and referencing issues and suggests some formatting changes. Duncan has concerns around the proposed opening location and believes it should be excavated further to the north to protect the spit and the bird nesting area.* The key items to the submission and the responses are presented in Table 6.

7. **Dailan Pugh, received 30/06/2019**: *Believes the opening level needs to be immediately returned to 1.2 m AHD pending a full EIS. Requests further investigations into flooding, impacts of STP on water quantity and quality, updated fauna surveys, detailed water quality investigation including filling existing knowledge gaps, decoupling of estuary from back swamps and include in strategy management and planning responses at various heights under different sea level rise scenarios*. The key items to the submission and the responses are presented in Table 7.

Table 1. Jan Olley (Byron Bird Buddies) key submission items and responses

	Key submission item	Reply to submission
1.	The creek entrance is an important roosting, feeding and nesting site for shorebirds, waterbirds and seabirds. These different groups of birds utilise the entrance in different ways and are vulnerable to pollution of their food source, and the manipulation of water levels for roosting and breeding. These needs require consideration when mechanical opening of the entrance occurs. (Documents attached)	No documents attached to email submission.
2.	Move the opening location to the north to reduce impact on spit and bird use area: "Opening Locations & Arrangements- BBB has concerns, under the current and agreed summer and winter opening positions. Basically, we are losing the eastern spit and the breeding site for the Pied Oystercatcher and the Redcapped plover. We have to keep moving the temporary fencing in an easterly direction. For example, we believe the last (June 11th) excavation was carried out in the usual prescribed location but the catchment rain has overwhelmed the channel and moved the entrance further east."	Non breeding season location removed from recommendation. Breeding season location (to the north) has been recommended for opening year round unless prevailing wind and swell conditions are coming from the north. In which case the entrance location is to be north of the breeding season line. Additional monitoring of the bird nesting area has been recommended to allow for adaptive management of opening location.
3.	We understand that BSC monitors water quality prior to, and six days after, an artificial opening but does not monitor the impacts on the creek entrance. A more robust monitoring strategy is required. Council appears to be unaware that sometimes, after opening, the creek outlet tracks towards the south/east and not always north as stated in the strategy.	Additional monitoring of entrance, channel and spit morphology have been recommended. Prevailing wind and swell direction is also to be considered when determining opening location and placement of excavation spoil.
4.	In 2012 we became concerned about the loss of sand to the eastern spit and called a meeting regarding the loss of the spit, the opening methods used and the future way forward. We agreed to three GPS points for where the channel was to be dug to open the entrance with the expectation that the GPS points would be monitored AFTER each opening and that by using the adaptive management approach these points would be assessed and adjusted.	Non breeding season location removed from recommendation. Breeding season location (to the north) has been recommended for opening year round unless prevailing wind and swell conditions are coming from the north. In which case the entrance location is to be north of the breeding season line. Additional monitoring of the bird nesting area has been recommended to allow for adaptive management of opening location.

5.	Again, in 2014 we approached Byron Shire Council and Marine Parks requesting that only position “B” (or the middle GPS position) be used to prevent further erosion, and then the outcomes of the change be monitored. We also requested that to protect the eastern spit that the dredge material be placed on the eastern side of the channel. This request appears to have been ignored.	Additional swell and wind monitoring recommended along with alternate opening location and sand disposal arrangements.
6.	We believe the monitoring assessments need to record the swell direction, the height and other necessary aspects of the ocean condition pre and post opening so we better understand the dynamics involved.	Additional swell and wind monitoring recommended along with alternate opening location and sand disposal arrangements.
7.	The Belongil Estuary is a very dynamic system and conditions can change very quickly. Therefore, in general, we support both (2A & 2B) to protect both the shorebird and littoral rainforest. However, we believe the current winter opening position is damaging the spit and therefore needs to be eliminated and be redefined north in line with the breeding season position. A more robust monitoring regime also needs to be in place that requires an approach that will adapt to the conditions and protect the values that we hold in high regard.	Non breeding season location removed from recommendation. Breeding season location (to the north) has been recommended for opening year round unless prevailing wind and swell conditions are coming from the north. In which case the entrance location is to be north of the breeding season line. Additional monitoring of the bird nesting area has been recommended to allow for adaptive management of opening location.

Table 2. Mary Gardner (WaterPlaces) key submission items and responses

	Key submission item	Reply to submission
1.	With reservations, I agree with recommendation D of the strategy: 1.0 m AHD watch and 1.2 m trigger incorporating first berm scraping, the most reluctantly digging and all in the current digging guidelines.	A 1 m AHD watch and 1.1m AHD trigger level has been recommended. In the last 20 years a consistent opening regime has been maintained by Council. According to monitoring reports, there have been minimal fish kill events following an artificial opening during this period. Many of the values identified by the stakeholders and the community would be threatened if the opening level was raised significantly. The recommendation is given based on the environmental impacts and consideration of all other submissions.
2.	At the heart of my concerns is that Byron Shire Council initiate ecological management of its ICOLLS (Belongil and Tallow) not simply flooding management, that ecological management aim for advancing better conditions for aquatic and coastal wildlife and their habitats and that resilience infrastructure for both drought and flood become part of private, public and protected waterplaces (floodplains, riparian zones, waterways, drain/channels/storm-water infrastructure, retention ponds, recycled waters, etc.). With special design of programmes, community-based publicly available monitoring data can contribute to relevant ecological knowledge and decision making. This would guard against undue influence of biased or false alarms or twisting of the decision trees and action criteria. The programmes and plans must be robust enough to withstand changes of personnel in council, staff or in community and the review/update/adaptive management elements must be flexible enough to update knowledge and change actions to support the future of wildlife as much as infrastructure private or public. What has become a default practice is that private reports of nuisance waters on private properties can put pressure on the decision trees which focus on the conditions at the bridge or the mouth of Belongil.	Additional water quality parameters added into recommended monitoring. Recommendations made to make all water level and water quality data publicly available.
3.	In general, I do not support permanent decoupling of the various parts of the catchment. Storm-water treatment in situ is long overdue.	Stormwater quality issues to be addressed in future catchment management plan or Coastal Management Program (CMP).

4.	I would prefer that the opening strategy include the spit as an ecological component. The Belongil may well break through in its former location (the community changed the outfall of the Belongil back in the 1890s). The spit as a whole is impacted by the opening strategy and there are some advantages to the old opening site (one of which, paradoxically, might be protection of resort land, the littoral forest and continued capacity to intervene with the opening).	Review of entrance opening arrangements recommended if there is a 'break through' at the spit
5.	a timed transition to the plan D (a deadline of say six months) and associated monitoring and investigations about water heights, length and depth of standing waters, changes in vegetation conditions, storm-water quality. This will keep the issue from getting lost or slowed down in the machinery of council.	The recommendations from the opening strategy will take effect immediately after its adoption by Council including an expanded monitoring programme.
6.	urgent funding and design for a novel monitoring programme of actual conditions at the mouth and throughout the waterway, recorded against the projections of weather and tides and the water levels and the actual openings, if any. The monitoring should extend to include assessment of fish, shellfish and crustaceans. The water quality monitoring should include sediment analysis designed to understand the levels of change in black muds, iron bacteria and floc, microbial mats floating on the water surface and site specific oxygen readings. Both of these should be produced as public data sets. They can be designed as a combination of efforts by citizen science volunteers and specialist data collection to build on visual observations, measurements and photography plus extra sampling for lab work.	Additional entrance, channel and spit morphology monitoring recommended as a part of the Opening Strategy. A fauna survey should be carried out as a part of a Catchment Management Plan or Coastal Management Program (CMP), additional water and sediment quality monitoring should also be considered under these frameworks.
7.	The report on the Belongil is a desktop analysis and the changes ahead require additional knowledge produced in real time. But the new knowledge also must be well known so that the wider community is conversant with the changes in the local ecology	Recommended that all water level and water quality monitoring data be made publicly available.

8.	Water quality issues: acid sulphate reactions, untreated storm-water and paddock run-offs, new effluent flow-paths, drains both rural and in town, pollutants ranging for petrochemical and fertilisers to pharmaceuticals, estrogen-mimics and recreational drugs are all issues and only the simplest of monitoring for water quality is taking place. Some detailed exploratory testing about these issues can become baselines and with a well designed community -based monitoring programme, robust and ongoing testing can track some of the key highlights and provide real-time alerts.	Should be investigated as a part of the future Catchment Management Plan or CMP
9.	During the 8-10 months before this set of changes in the Belongil, there were some very unusual additions to the Belongil. A major de-watering in the centre of town (Mercato works), another on Milton St off Shirley, still another at the roundabout at the Ozi-Go – all were ground waters discharged into the systems that ultimately led to the Belongil. In addition there was a considerable additional discharge of surface water (treated effluent from the West Byron STP) that had sat for an extended period over council wetlands adjacent to the STP. I do not find any records of quantities of qualities of the ground or surface waters. But I know from first hand observation by myself or neighbours, landowners or contractors that there were many days of apparently continuous pumping and discharge, suggesting large volumes. I wonder about the biophysical and biochemical impacts of particularly ground waters to an acid sulphate lands and waters during the long dry.	Dewatering is closely monitored by the Council's development team
10.	The socio-ecologic goals set out in tables in this document are a snapshot of the enduring concerns relevant up to the present time. The goals themselves require adaptation and support for not only short term emergency resilience but longer term deep resilience	Any significant environmental or community concerns should be considered as a part of the 24 month review of the Opening Strategy, this includes significant shifts in goals or values.
11.	I hope that this EPA license requirement can become part of an integrated catchment/WSUD/climate emergency actions and protocols.	Not an EPA license requirement

Table 3. David Maguire (Cape Byron Marine Park) key submission items and responses

	Key submission item	Reply to submission
1.	Consideration should be given to moving the location of future artificial creek openings further to the west. Placing sand on the eastern side of the channel when artificially opening the creek could reduce the scour of the Belongil Spit and shorebird habitat which was seen to be eroding at increasing rates following recent artificial openings. The protection of shorebirds and their habitat is an important issue and minimising disturbance and habitat loss is a key component of this.	Non breeding season location removed from recommendation. Breeding season location (to the north) has been recommended for opening year round unless prevailing wind and swell conditions are coming from the north. In which case the entrance location is to be north of the breeding season line. Sand placement will also be determined by prevailing conditions. Additional monitoring of the bird nesting area has been recommended to allow for adaptive management of opening location
2.	The development of a broader coastal management program for the Belongil catchment is encouraged. Key objectives would include the improvement of water quality and the protection or enhancement of ecological communities. is supported. The objectives of any final Opening Strategy should be inclusive of multiple factors beyond flood mitigation and include contribution to the health of the waterway and its catchment, protection of shorebird habitat, and recognition of the traditional owners and associated cultural considerations. Upon finalisation of a coastal management program the Opening Strategy should be reviewed to ensure consistency with objectives for the management of the catchment.	Recommendation for CMP and review of Opening Strategy following added into text (Section 5.7)
3.	The context and associated risks of the effects of inundation on the use of agricultural land in the catchment is unclear.	Recommended in the Catchment issues study as requiring further investigation i.e. economic assessment of productivity losses etc.
4.	It should be noted that fauna and fish surveys quoted in the draft Strategy are dated (e.g. Parker 1996, 1998; Schneirer 1988) and no indication is provided of any effects that the current management regime has had on these populations since these surveys were undertaken. Consequently, no information is provided on the current status of populations of these suites of organisms to inform any ongoing assessment of the current opening regime strategy and any influence caused since discharges from the Sewage Treatment Plant commenced.	Fauna and fish surveys in the estuary have been recommended as a part of the future Catchment Management Plan or CMP. The Opening Strategy may be adapted following findings.
5.	Recent artificial openings of both Tallow and Belongil creeks which have resulted in fish kills have demonstrated that our levels of understanding of what happens when these ICOLLs are artificially opened is still incomplete. Consequently, it is considered that this opening strategy would benefit from detailed modelling of what happens to the creek and levels of dissolved oxygen in the waters of the creek under different opening regimes including different opening trigger levels, rainfall and runoff input, and different configurations of channel excavation. Methods such as the depths to which opening channels are excavated. This could assist with understanding the	It is recommended that this modelling be undertaken either as a stand alone project or as a part of a CMP. Results could help inform future amendments of the Opening Strategy. The cost of such modelling is likely to be considerable (>$50,000) but could assist in managing public expectations.

effects of openings and the mechanisms of subsequent fish kills. The management of fish kills, should they occur, will need to meet public expectations and some degree of preparedness is necessary. The long term effects of increasing levels of discharge from the Sewage Treatment Plant and other catchment inputs require consideration and wise management.

Table 4. Tom Vidal (Belongil Catchment Drainage Board) key submission items and responses

	Key submission item	Reply to submission
1.	The document needs to mention the Byron Bay STP as major contributor to the water quantity and quality in the system.	Comment added that further information regarding the potential impacts of the West Byron STP in the broader catchment are outlined in the Capacity Assessment of the Belongil Creek Drainage System report (AWC, 2016). Impacts on the broader catchment should be considered as a part of the future Catchment Management Plan or CMP not as a part of the Opening Strategy.
2.	The additional flow path must be mentioned as means to mitigate the impact of treated effluent discharge from the Byron Bay STP. Water will then be released closer to the tidal prism of the estuary rather than in the upper catchment where it creates unnatural volumes of water, interacting with ground water.	Additional flow path should be investigated as a part of the future Catchment Management Plan or CMP.
3.	The BCDB needs to be acknowledged as a major stake holder and needs to be involved in the opening protocol.	Belongil Drainage Board added to the list of key stakeholders that should be notified when the trigger for scraping or opening has been reached.
4.	The BCDB needs to be informed of any changes to the strategy.	All key stakeholders, including BCDB, should be informed/involved in any adaptation of the Opening Strategy added into text.
5.	To mitigate flooding effectively the Belongil creek level should be 1m AHD.	A 1 m AHD watch and 1.1m AHD trigger level has been recommended. In the last 20 years a consistent opening regime has been maintained by Council. According to monitoring reports, there have been minimal fish kill events following an artificial opening during this period. Many of the values identified by the stakeholders and the community would be threatened if the opening level was raised significantly. The recommendation is given based on the environmental impacts and consideration of all other submissions.

Table 5. Jeremy Holmes (Elements Resort) key submission items and responses

	Key submission item	Reply to submission
1.	The erosion of the Littoral Rainforest is a significant issue, which is unlikely to be fully resolved by the construction of a tripper wall or shore normal groynes alone (in the form depicted in the report sketches) since such structures, while key to future entrance management, do not address the specific mechanism for erosion of the Littoral Rainforest (considered to be the ongoing growth of the 'bulbous' recurved spit immediately south of the entrance and the associated redirection of creek breakout flows. Specific protection of the Littoral Rainforest is likely to be required to combat ongoing erosion.	Should be investigated as a part of the future Catchment Management Plan or CMP
2.	A tripper wall concept rather than shore normal groynes is likely to be a preferred entrance management option due to the tripper wall limiting the northward migration of the entrance channel along the foreshore of the Elements of Byron and the Crown Land to the north, however it is appreciated further investigation is required.	Should be investigated as a part of the future Catchment Management Plan or CMP

Table 6. Duncan Dey key submission items and responses

	Key submission item	Reply to submission
1.	"I challenge the use of the word "small" in the first line of Section 1.1 (PDF page 5/231)."	"Small" removed from text.
2.	"Please remove the word "would" from the third sentence "Under natural littoral and runoff processes the beach berm would form a barrier to create a closed lake system"."	"Would" removed from text.
3.	"Paragraph 2 of Section 1.1 needs to acknowledge that the level was not always set at 1.0m AHD. It was set at 1.2m AHD prior to the current interim arrangement. That must be mentioned here as well as on Page 9/231."	Text amended.
4.	"Figure 1 on Page 28/231 is missing its title and an arrow from the words "Jonson St seawall". And please write Street, not St."	Figure adjusted.
5.	Add sentence in Section 2 "system understanding" in flooding and flow dynamics to highlight the difference between catchment flood behaviour and ocean flood behaviour: "In the 5th bullet on Page 9/231 the sentence should be expanded for educational reasons to say "The entrance barrier height is a critical control on catchment flood behaviour". Catchment flood behaviour must be distinguished from ocean flood behaviour. We must educate the reader that, while enlarging the entrance may relieve flooding by catchment water, it will increase flooding by ocean water"	Text amended.
6.	"the second bullet on Page 10/231 says "A stakeholder workshop held at Byron Shire Council on the 13th of November". Council is an organisation, not a location. The location may have been Council's Chambers or its Conference Room."	Text amended.
7.	Separate drainage and water quality as values in the in Section 3 - Management objectives and include limiting deoxygenation as an objective: "Table 1 on Page 11/231, the second value heading "Drainage" should be titled "Flood Mitigation". In addition, that should be separated from Water Quality, which is a value quite separate from it. In addition, why is deoxygenation not listed under Water Quality?"	Headings changed and separated and limiting deoxygenation added under "water quality".

8.	Add references that indicate there has been fewer fish kills since the lowering of the trigger level: "the last bullet on Page 9/231 states that the reduction in 2001 of the trigger level from 1.2m AHD to 1.0m AHD "was primarily aimed at reducing fish kills. Lowering the opening level from 1.2 m AHD to 1.0 m AHD results in 10 times less water being drained from the drains and wetlands within the catchment into the estuary each opening. Since lowering the opening level there have been fewer fish kills and acidic runoff events within the estuary". If this is based on a study or studies, they must be referred to here. If the statements are not based on studies, they should be removed. Perhaps the studies referred to in option 4.1B on Page 13/231 are relevant? If so, they are dated and should be reviewed before being relied on here."	References included and text adjusted.
9.	Include a description of flood frequency and duration and how the importance of them differ for rural and urban settings: "in Table 1 on Page 11/231, the approach of not increasing or of minimising flood levels ignores the fact that "flood levels" are a regime of levels. For urban folk, it is only the top level that needs limiting. For rural, there is a tolerance of the top level but not for the more frequent levels (ones that occur more often, or last longer). While not a product of the workshop, this should be explained soon after Table 1."	Text adjusted to include frequency.
10.	Limiting the erosion of the coastal area adjacent to Elements Resort should be considered an objective of Category 2 - Broader objectives for the catchment management plan	The EOS will potentially influence this and therefore needs considering in Category 1. Has also been added to Category 2 also.
11.	Change description of Option 4.1A as it implies that a no opening arrangement will return behaviour to pre-European.	"pre European condition" removed from text.
12.	"in option 4.1B on Page 13/231, the last sentence is clunky "The lowering was primarily to reduce fish kills by reducing turbidity and increased organic matter entering the estuary". Does this mean to reduce increased organic matter?"	Text adjusted.
13.	"on Page 15/231, the document claims "Prolonged inundation may increase interaction with ASS and release potentially acidic groundwater when water levels go down". No logic supports this. ASS remain inert if saturated. Inundation cannot increase acidity. Only exposure to air does that."	Text adjusted.
14.	"on Page 15/231, a bullet starts with "Water in the catchment will have a greater residence time and increased opportunity for chemical reactions before being drawn into the estuary, potentially leading to increase fish kills". If this is referring to increase in Biological Oxygen Demand, just say so. That isn't what I'd call a chemical reaction. Maybe 'bio-chemical' or similar."	Text adjusted.

15.	Believes that that the Option 1B suggesting that lower discharge velocities may result in a more shoaled entrance and exacerbate upstream flooding should result in lower scores against the flooding assessment criteria: "secreted in the third bullet of Table 4 on Page 16/231 (option 1B) is a critical description of the failure of this option to achieve the stated Objectives. This should be highlighted rather than glossed over by the table's ticks and crosses. The points made in bullet three mean that many of the greens ticks allocated to this option are wrong. Please reconsider those graphics."	One 'tick' removed for 'do not increased flood levels' management objective text adjusted. While the accumulation of sand is a likely consequence of low discharge velocities it is likely that some of the accumulated sand will be 'flushed out' during significant flow events.
16.	Wording change required to make clear that it is the rapid draining of waters that causes blackwater events: "I question the saga described in the fourth bullet of Table 4 on Page 16/231 (option 1B). What is its source? The saga makes poor assumptions and is hydraulically incorrect. We know from studies of large waterways that it is the rapid drainage of floodplains that draws high BoD water into the estuary. Why is this estuary be any different? Rapid drainage causes blackwater events in the estuary. In nature, the biological digestion with the water on the floodplain is completed on the floodplain and high BoD water never enters the estuary."	Text adjusted to highlight the primary issue is the rapid drainage of floodplain waters.
17.	Remove physical outcome in Option 1B that refers to increased tidal exchange leading to greater flushing of nutrients and increased watery clarity: "the sixth bullet of Table 4 on Page 16/231 (option 1B) claims that high tidal exchange leads to greater flushing of nutrients and constituents and greater water clarity. It is not clear whether this is deemed a positive or negative trait of option 1B. As in the 'sewer to river' debate, flushing is claimed positive but is in fact a negative. This point should be removed from the document, along with its perception as positive."	The point is highlighting a potential outcome and has been left in document.
18.	Suggests that the physical outcomes determined for Option 1C-increasing the opening level to 1.2m are biased and require references: "on Page 17/231, Table 5 for option 1C reads like the outcome was determined first and the bullet points second. They include biased and prejudiced claims that lack reference to any studies."	The potential physical outcomes have been listed, it is a complex system with many interactions and we can therefore not 'determine' exact outcomes for an options analysis.
19.	Opening records including description of earthworks performed and a continuous record of water level should be kept and made public.	Continuous water level record now being kept by Council. Additional monitoring recommended to include entrance opening description and a recommendation made to make all water level and water quality data publicly available.
20.	Entrance opening location should be moved to the north to protect the bird nesting area, and this should take precedence over protecting littoral rainforest and elements resort. "on Page 21/231, the author says the Option 2A (maintaining the existing opening location) seems to get the balance right between protecting the littoral rainforest and Elements Resort to the north and the bird nesting area to the south. In my view, there is no comparison between those two ideas. The birds include threatened and/or endangered species whose habitat must be preserved and must	Non breeding season location removed from recommendation. Breeding season location (to the north) has been recommended for opening year round unless prevailing wind and swell conditions are coming from the north. In which case the entrance location is to be north of the breeding season line.

	not be risked. Where is the investigation to improve on a "this seems ok" approach? Proper investigation and consideration will show Option 2B as the right choice."	
21.	The opening location should be moved to the north as the land used by shore birds has migrated to the north since the 7j Scientific Zone was mapped: "the aerial image in Table 8 on Page 22/231 indicates several issues. The 7j Scientific Zone does not encompass all land used by shore birds. That zone may have moved north since being mapped. The beach area north of the 7j zone is occupied by birds and is very close to both the black and red lines. It is my view that, if a channel is to be excavated, its location should be set around a pivot point both further north."	Non breeding season location removed from recommendation. Breeding season location (to the north) has been recommended for opening year round unless prevailing wind and swell conditions are coming from the north. In which case the entrance location is to be north of the breeding season line. Additional monitoring of the bird nesting area has been recommended to allow for adaptive management of opening location.
22.	Move the opening location to the north: "the aerial image in Table 9 on Page 23/231 indicates only one option, the black dotted line. It is my view that, if a channel is to be excavated, its location should be set around (i) a pivot on the boundary intersection next south of that marked pink in the image, and (ii) with a maximum angle of 45 degrees east of north (map not compass)."	Non breeding season location removed from recommendation. Breeding season location (to the north) has been recommended for opening year round unless prevailing wind and swell conditions are coming from the north. In which case the entrance location is to be north of the breeding season line. Additional monitoring of the bird nesting area has been recommended to allow for adaptive management of opening location.
23.	Provide fish kill events data from this century and last: "I disagree with the claim on Page 31/231 that there have been minimal fish kill events in the last two decades of low opening levels. Please list the fish kills of last century versus this century, or remove the claim. This data must be included in the document, or at least made available by referencing in this document."	There have only been 3 reported fish kill events following an artificial opening reported in the monitoring reports post 2001, one of which involved 6 fish. Text adjusted to include where information for this claim originated.
24.	Trigger level should be raised automatically every five years in line with SLR. "I support the fourth paragraph of Section 4.4, on Page 31/231 in recommending that the trigger level be raised incrementally over time in response to sea level rise (SLR). Adopting 2020 as a start point, the trigger level should rise automatically by review every five years to match SLR. This would be in addition to changes due to rising frequency in opening (the monthly thing). Both criteria need consideration."	Automatic raising of trigger level in line with actual SLR included in addition to rising frequency of opening.
25.	Concerned that disposing of excavated sand along the northern bank will increase costs significantly and is biased toward protection of Elements Resort: "the document raises for the first time in the Environmental Management Plan on Page 41/231 a "disposal" arrangement for sand to the benefit of Elements Resort. This will greatly increase cost over that of current arrangements, which leave spoil beside the excavated channel. How did this bias enter the process of drafting this document?"	Excavated sand to be placed adjacent to the channel on the northern or southern side depending on prevailing wind and swell direction.

Table 7. Dailan Pugh key submission items and responses

	Key submission item	Reply to submission
1.	Immediately restore the opening height to 1.2.m while a full impact assessment is undertaken.	A 1 m AHD watch and 1.1m AHD trigger level has been recommended. In the last 20 years a consistent opening regime has been maintained by Council. According to monitoring reports, there have been minimal fish kill events following an artificial opening during this period. Many of the values identified by the stakeholders and the community would be threatened if the opening level was raised significantly. The recommendation is given based on the environmental impacts and consideration of all other submissions.
2.	Develop and fully monitor a strategy for estuary lowering's that minimises the likelihood of fish kills.	This is what this Opening Strategy aims to do. Additional monitoring has been recommended to develop a greater understanding of impacts of estuary opening under different conditions.
3.	Only open the estuary during significant rainfall events, and investigate other means of lowering water heights (if required) at other times. This should include consideration of siphoning to minimally reduce estuary heights until a rainfall event.	The idea of siphoning to minimally reduce or maintain estuary heights until favourable conditions enable opening has some merit, although outside of the scope of this study. The idea warrants further investigation and Opening Strategy could be amended following the investigation.
4.	Redo the Belongil Creek Flood Study to rectify flaws and account for sea-level rises of 1-2m.	Outside of the scope of this project.
5.	Undertake a reassessment of fish and invertebrate populations in the estuary for comparisons to previous studies	Fauna and fish surveys in the estuary have been recommended as a part of the future Catchment Management Plan or CMP. The Opening Strategy may be adapted following findings.
6.	Take into account sea-level rise in investigating preferred locations for estuary openings, including considering effects on estuary morphology, erosion and coastal recession, shorebird habitat, and littoral rainforest erosion. This must take into account the impacts of the current location upon the shore bird area and littoral rainforest, the pre-1970 opening location and the imminent breakthrough to the Belongil estuary to the west of the Belongil seawalls.	Should be investigated under the NSW Coastal Management Framework. The Opening Strategy may be adapted following findings.
7.	Investigate the feasibility and desirability of decoupling back swamps at 1.4m, and initiate a trial if appropriate. This must account for future sea-level rises.	This was investigated and had no stakeholder support. Could be investigated further as a part of a Catchment Management Plan or CMP process.

8.	Undertake a comprehensive assessment of all records and monitoring of water quality parameters from throughout the Belongil catchment (including within the estuary, drains, and groundwater), to identify and quantify pollution sources and trends over time. Include data collection to fill gaps.	This was investigated and there were large gaps in the data, datasets without units and significant variation in parameters measured. Recommend increased monitoring including reinstating TN, TP and faecal coliforms (point below) we will aim to fill these gaps into the future.
9.	Immediately reinstate monitoring of Total Nitrogen, Total Phosphorus, and Faecal Coliforms in the Belongil Estuary.	Additional water quality parameters added into recommended monitoring.
10.	Assess the current and proposed volumes of water from the West Byron STP and the impact this has on estuary openings, and any impacts on nutrients and faecal coliforms in the estuary, particularly during low rainfall periods.	Comment added that further information regarding the potential impacts of the West Byron STP in the broader catchment are outlined in the Capacity Assessment of the Belongil Creek Drainage System report (AWC, 2016). Implications from these impacts should be investigated further as a part of a Catchment Management Plan or CMP process.
11.	Take into account accelerating sea-level rises over the next 100 years in developing a long-term management strategy addressing the rising waters in the estuary, the need to increase opening heights, increasing flooding of developments (most particularly the town centre), and ecosystem responses, to identify management and planning responses required to be implemented at various heights. This should consider sea-level rises of 0.5m, 1m, 1.5m and 2m.	We have accounted for SLR in the strategy opening height will be adjusted in line with SLR. Issues of flooding of developments etc. is outside the scope of this project and should be investigated under a Catchment Management Plan or CMP.