Council Reference: GT1/52 Pt12
Your Reference: MP08_0200

4 March 2010

Department of Planning
Major Project Assessments
GPO Box 39
SYDNEY NSW 2001

Attention: Alan Bright

Dear Sir

Comments on the Project Application - Cobaki Lakes Central Open Space, Lane and Riparian Corridor (Major Project 08_0200) - Council Submission

Reference is made to the abovementioned Major Project (MP08_0200 – Project Application for Cobaki Lakes which has recently been on public exhibition.

Council has reviewed the Project Application (PA) and the associated Environmental Assessment and provide the following submission.

Summary

From a town planning and urban design point of view, provision of a Lake for amenity purposes is not opposed, provided environmental engineering matters can be adequately addressed ensuring impacts are mitigated.

Upon review of the PA, Council officers consider that there are significant environmental and engineering concerns with the proposal. Based on the information provided in the PA Council's position is as follows.

- Council will not accept dedication of the lake as it cannot be feasibly maintained to an appropriate standard without adverse impact on the environment and is contrary to ecologically sustainable development principles.
- Council will not accept dedication of the central stormwater drainage corridor as it does not provide adequate, continuous and maintainable drainage conveyance to Cobaki Creek, and fails to take account of boundary conditions imposed by adjoining land;
- Until matters relating to the lake and stormwater management can be resolved to Council's satisfaction, all current and future applications that rely on stormwater discharge to the drainage corridor should be deferred as they impact directly on the provision of viable public infrastructure.
- Council will not accept dedication of proposed casual and structured open space areas until issues relating to flooding, maintenance and compliant design are resolved satisfactorily.
- Council will not accept dedication or maintenance of the saltmarsh and freshwater rehabilitation areas until: there is no conflict between the PA and proposed rehabilitation plan objectives; rehabilitation plans are amended satisfactorily; on-going management and maintenance issues are rectified and costs for maintenance in perpetuity are identified and deemed appropriate.

- The saltwater flushing system proposed for the lake is deemed inappropriate due to potential impacts on downstream environments and rehabilitation areas (including potential issues associated with acid sulphate soils and acid ground water as well as potential for the system to increase algae bloom occurrence).
- Council opposes the PA in its current form given the fundamental conflict between the saltmarsh and freshwater rehabilitation area objectives and the proposed stormwater management systems.
- That Council opposes the PA as it contradicts justification provided in the Concept Plan and PPR for removal of Ecologically Endangered Communities and Threatened Species Impact through introducing infrastructure, roads (etc) into compensatory habitat areas proposed as offsets.

In terms of stormwater infrastructure and the proposed lake, the above position will only be reconsidered, if the following changes be made to the PA:

a) Deletion of the lake, or reconfiguration of the lake to locate it off-line to all public drainage infrastructure and the lake privately maintained in perpetuity;

b) Extension of drainage design and local flood modelling to incorporate the land downstream of the Sandy Lane culverts, to provide a continuous and maintainable drainage service, that takes into account the long term boundary conditions imposed by adjoining land, including environmental management areas, public open space and filled land for urban development;

c) Modification of the central drainage design and/or the proposed fill design for adjoining land to provide flood immunity for residential allotments up to the 100 year ARI flood event, plus allowance for climate change;

d) Provide consideration of existing filling and drainage approvals for precincts within the drainage catchment, to ensure that tailwater levels in the lake and central open channel permit efficient design of infrastructure within these urban areas.

Further justification for this position is summarised below, including identification of areas which (should the PA be approved) require amendment as well as additional issues of concern.

Infrastructure Engineer

Stormwater Management

In terms of infrastructure provision, the main objective of the application is to provide the north-south trunk drainage system for the Estate. In order to manage stormwater quality, quantity and flood liability, the trunk drainage system is made up of the following components:

Lake

As per the (unapproved) Concept Plan, a 7.86Ha lake is proposed at the northern end of the project application area, at the base of the "Northern Hillside" precinct and immediately west of the Town Centre. The lake will be embellished with open space, landscaping, revetments, boardwalks, promenades etc around its foreshore, and provides a significant amenity and marketing feature for the applicant. As such, the applicant aims to minimise plant growth in and around the lake, which could promote odour (due to rotting vegetation) and "nuisance wildlife", including but not limited to vermin and mosquitoes.

The lake will generally be 5m deep, which will be achieved by excavating to -2.5m AHD, and constructing a weir at the lake outlet with a crest level of +2.5m AHD. Spoil from the excavation will be used to fill flood liable land within the Estate for future urban development (in accordance with separate approvals). For a lake of this depth vegetation growth will be limited, but stratification is likely to occur. To counter this, the applicant proposes a vertical mixer (such as a fountain) to provide oxygenation.

The lake is located “on line” with runoff catchments to the north, east and west, and as it accepts all water from these areas (some 60Ha), performs an important stormwater drainage function. While these flows will be passed through various treatment measures including constructed wetlands, relatively high levels of nutrients (nitrogen and phosphorus) are predicted in the lake, which are likely to lead to algal blooms in the warmer months. To counter this, the applicant proposes to pump salt water from Cobaki Creek and inject it into the upstream end of the lake, to achieve salinity levels that will inhibit vegetation and algal growth. The system will consist of a 250mm UPVC gravity line from Cobaki Creek, across the salt marsh rehabilitation area, to a storage reservoir located south of Sandy Lane. A pump station will be provided, capable of delivering 100L/s of salt water from the reservoir to the lake via a 250mm UPVC rising main. This system will mean that the lake will be brackish for six months of the year, and that this brackish water will travel down the central corridor of the Estate.

The applicant fails to properly investigate the potential impacts of this brackish water on the downstream environment. The PA describes the central corridor as a "natural riparian and freshwater wetland environment", which would be susceptible to salt water intrusion. Indeed the other elements of the plan include rehabilitation of these freshwater wetland areas, and Sandy Lane was to provide a permanent bund to separate the freshwater and salt water environments. The lake's salt water system is not addressed in the Freshwater Wetland Rehabilitation Plan (James Warren, Appendix C).

The Stormwater Assessment and Management Plan (Gilbert and Sutherland, Appendix E) states that *"plant communities in wetlands will be most sensitive to increases in salinity. Problems will occur when salinity increases to around 1000mgL^{-1}"*. The optimum level of salinity required to prevent algal blooms in the lake will be determined by trial, due to lack of data in this field. As a first estimate, lake salinity would be increased to 10,000mgL^{-1} to control algal and macrophyte growth in the lake. Unfortunately, the salinity will have similar adverse impacts on the downstream freshwater environment. While salinity levels diminish downstream, they have been modelled at 5,800mgL^{-1} at the future playing fields, located over half way along the central corridor. The applicant may be able to demonstrate that this level of salinity is acceptable for periodic inundation of well drained, non-indigenous salt

tolerant grass species on these playing fields, however the more sensitive wetland environments located in this same corridor are more susceptible to permanent damage.

The Stormwater Assessment estimates the operating and maintenance costs for the lake in this arrangement (referred to as Option 3) to be between $1,249,000 and $1,437,000, depending on the level of salinity required in the lake. This compares to $932,000 for Option 1, which is a shallower freshwater lake that relies on manual management of vegetation, odour and vermin but suffers from poor water quality and amenity, and $1,620,000 for Option 2, which is a deep lake without salt water dosing that relies on some mechanical vegetation management and chemical dosing to counter algal blooms. No mechanism for dealing with this cost imposition on Council has been proposed in the PA. Further, this assessment is based on the lake in isolation to the rest of the central drainage system and only considers real costs. It does not consider impacts of the various options on downstream land, including more subjective ecological values. Option 3 would not compare as favourably when considering all of these factors.

The outlet of the lake is controlled by a concrete weir, with a crest level (and resultant standing water level) of 2.5m AHD. The Flooding and Flood Management Report (Appendix F) looks at a local flood event from the contributing catchment and predicts a peak 20 year ARI flood level of 3.0m AHD in the lake, and a peak 100 year ARI flood level of 3.2m AHD. These levels are significantly higher than regional flood levels from Cobaki Creek (refer to Section 2 for further discussion on flooding).

As the lake is on line, the weir level controls the tailwater conditions for all of the stormwater drainage systems discharging to it from the Northern Hillside Precincts and the Town Centre. The application does not address compatibility of the standing water level with these future development areas, some of which already have approvals in place. A review of the bulk earthworks approval for the Town Centre Precinct confirms portions of the site will be filled to around 3.5m AHD. The ability to effectively drain these areas by underground piped systems becomes marginal when depths of pits, pipe diameters, cover requirements, and headloss through treatment devices is considered. As such, either fill levels should be increased, or the standing water level of the lake needs to be reconsidered. The topography of the Northern Hillside Precinct is somewhat higher, and the lake should prove less critical to drainage design in these areas.

The lake has been opposed by Council in submissions to DoP for the Concept Plan, and is still opposed for the Project Application. The lake, its foreshore open space and associated infrastructure, are proposed to be dedicated to Council, with Council responsible for all maintenance in perpetuity, including the mixer and salt water collection and distribution systems. On the basis of above issues with the PA, Council will not accept this dedication. Should a lake be approved by DoP, it must be taken offline from all stormwater drainage systems that are accepted as public infrastructure. The lake and its associated infrastructure will have to be maintained by the developer or an alternate body determined by the developer and/or DoP in perpetuity, or should be deleted altogether.

Open Channel

Downstream of the lake weir, a large open channel will be provided through the site. The channel will be some 1900m long, from the lake to Sandy Lane. The drain will be 10m-30m wide, generally 0.6m-0.7m deep, with a trapezoidal cross section. Longitudinal gradient is

virtually flat, at 0.05%. A salt water "trickle feed" from the lake is proposed to provide some flushing at this low grade.

Design confirmation of the channel capacity has not been provided, however based on the Local Flooding Assessment (Gilbert and Sutherland, Appendix F) it appears that the open space in this central corridor has been assumed as available conveyance and storage area for major events in the trunk drainage system, once the main channel surcharges. This is generally acceptable, provided the open space areas achieve the minimum fill level of 100 year ARI flood level – 1.0m required by DCP Section A5 Subdivision Manual. This should consider peak levels for both local and regional flood events. Major storm design for the central drainage corridor must provide for a minimum freeboard of 0.5m to adjoining urban land, with a safety factor of 1.5 applied to rainfall intensities (to account for blockage, sedimentation of swale drains, the potential impacts of climate change etc).

The trunk drain will have a number of branch connections to urban stormwater catchments to the west and east. These branch drains should also be sized to accommodate the 100 year ARI event, with adequate freeboard and safety factors.

Saltmarsh Polishing Zone

The open channel terminates at a set of culverts at Sandy Lane towards to southern end of the site (refer to Section (d) for further discussion on this critical element of the drainage system). From this point, the applicant intends to allow flows to dissipate across the salt marsh rehabilitation / compensatory planting zone, relying on existing agricultural drains across this land to convey this stormwater to floodgated outlets through the Cobaki Creek levee. This is intended to provide final "polishing" of the stormwater runoff before it enters Cobaki Creek. While in principle this may be an acceptable approach to managing nutrients in urban stormwater, it does not provide a continuous and maintainable drainage path through the site between Sandy Lane and Cobaki Creek, nor does it address the potential impacts of these pulses of concentrated stormwater on the salt marsh environment.

Council requires the central drainage system to be continuous and contained within an appropriate reserve (or at least an easement in the short term), with ongoing maintenance rights for Council, without the need for repeated environmental approvals each time drain maintenance is required. In this regard, it is recommended that such a drainage path be established from the Sandy Lane culverts along Sandy Lane to the south east within a widened road reserve, through the future culverts under Cobaki Parkway, and then to the creek via a Cobaki Parkway widened road reserve. This widened road reserve could serve a dual purpose by providing a corridor for sewerage infrastructure from the pump station on the other side of Cobaki Creek. The stormwater drainage paths needs to be adequately separated from the salt marsh communities to the satisfaction of ecological experts, considering water quality and fresh water / salt water mixing.

Sandy Lane

The future alignment of Sandy Lane crosses the central drainage system at a number of points. This includes:

- A bridge over the lake;
- External drain culvert crossings 1, 2 and 3;
- Floodgated culvert crossing at the outlet of the open channel.

It is not clear whether the PA seeks approval for any or all of these structures, and if so, whether these structures will be constructed with the rest of the drainage works, or in conjunction with separate stage(s) that incorporate Sandy Lane. Clarification of this matter is sought from the applicant and/or DoP.

The PA includes engineering details of the bridge and outlet culverts. The bridge appears necessary under the PA to maintain road access to the west of the lake, but has been designed in isolation to the rest of Sandy Lane. The bridge is a 4x18m span, piered concrete structure. The bridge deck is 14m wide, with a 9m wide traffic lane. Council's Traffic Engineer has made a preliminary review of the design and has no major objections, provided the bridge is conditioned to comply with Australian Standard AS5100.1-2004 Bridge Design Code. Detailed design can be addressed with the Construction Certificate, however as it has been designed in isolation, the bridge could present compatibility difficulties with future approvals (refer to additional comments below in relation widths).

The outlet culvert under Sandy Lane is a 10 cell 1800x1800 RCBC, with floodgates fitted on the downstream (Cobaki Creek) side. Construction of this structure would help prevent tidal intrusion into the freshwater rehabilitation area included as part of the PA, but will be of limited use without the rest of the Sandy Lane formation to act as a tidal bund. The main concern with these culverts is the proposed invert levels of -0.3m AHD (for the two central culverts) and 0.5m AHD (for the remainder). As discussed in (c) above, discharge across the salt marsh area requires determination of a formal, maintainable drainage path to Cobaki Creek. It is not acceptable to rely on existing drainage channels for conveyance, as they are unlikely to be maintained in the long term. Determination of an adequate invert level for the culverts that addresses downstream ground and tailwater levels is essential for achieving a working central drainage system, and has implications for the design of all elements upstream to the lake. This must be determined in conjunction with the rehabilitation and management plans for the salt marsh areas. To date, these plans appear to have been prepared in isolation to engineering plans for the drainage systems. These issues are integral while ever this land is to be used for stormwater conveyance.

A complete long section of the drainage system from Cobaki Creek, through its levee, to the Sandy Lane culverts, along the central open drain, to the constructed wetlands and the outlets of all contributing urban drainage systems needs to be provided. Only with that information can aspects such as road and fill levels for upstream development be confirmed.

Constructed Wetlands

A constructed wetland, in accordance with Development Design Specification D7 - Stormwater Quality, is required for each future urban catchment discharging to the central drainage system. The Stormwater Assessment (Gilbert and Sutherland, Appendix E) provides a breakdown of possible future development in each of these catchments, as well as typical soil types and slope, to propose a treatment train approach of water sensitive urban design (WSUD) measures, and ultimate wetland sizing at the downstream outlet of these catchments.

These breakdowns do not appear to be consistent with the kind of higher density and small lot development proposed in the Cobaki Lakes Concept Plan, which would be incompatible with proposals such as provision of rainwater tanks, and on site bio-retention. Swales and

bio-retention are also generally unsuitable on sloping sites, which will be encountered across much of the northern and western precincts.

D7 requires, as a starting point, subdivision areas to be set aside for constructed wetlands amounting to 5% of the contributing urban catchment. Discounts to these wetland areas can be applied depending on the application of WSUD in the catchment. According to the Stormwater Assessment, the total 275Ha urban catchment requires 6.9Ha of constructed wetlands (approximately 2.5%), once all discounts are applied. The preliminary plans provide 5.9Ha of constructed wetland surface area, and assume that the lake provides the remaining "deep water zone".

While in concept the provision of constructed wetlands discharging to the central drainage system is supported, proper assessment of these measures is not possible until subdivision plans for the upstream precincts are approved. Required area for the constructed wetlands should be set aside in the subject PA, and details should be provided as part of subsequent PAs/DAs for each precinct. Use of the lake as a stormwater treatment facility is not supported by Council, as deep water zones should only provide primary treatment for course sediments and the like, and are unable to significantly address nutrient loads, hence the issues predicted with algal blooms in the lake. As Council will not accept dedication of the lake, the wetland systems and connecting drainage systems must remain off-line from the lake.

It should also be noted that a review of Council's Development Design Specification D7 – Stormwater Quality is being undertaken, to incorporate contemporary, best practice WSUD measures developed in South East Queensland, known as "Water By Design". A review of D7 is a recommendation of the recently completed Cobaki and Terranora Broadwater Catchment and Estuary Management Plan, which identifies the Cobaki development area as potentially impacting on the viability of the Broadwater environments. It is expected that the configuration of constructed wetlands (including ratios of deep water to macrophyte zones, depth and bathymetry, and planting requirements) will change as a result of the review. The discounts that currently apply to wetland sizing in D7 will also be reviewed.

The constructed wetlands are also proposed to be connected to the salt water pumping system via side connections to the rising main, so that they can be periodically flushed with salt water to control vegetation. This is totally contrary to best practice management of constructed wetlands, which rely on healthy, dense macrophyte plantings to provide stormwater treatment, and is opposed by Council.

Flooding

The central corridor land subject to this PA is flood liable, and as such the PA includes flooding assessments that consider both regional and local catchment flood events. Assessment of the regional flood event utilises Council's recently updated Tweed Valley Flood Model (RORB/TUFLOW by BMT WBM). The local flood assessment required a new model be created by the applicant's consultants, utilising WBNM/SOBEK modelling.

The land has various historic filling approvals already in place. The PA indicates that around 70% of this filling has already been undertaken. As such, the modelling demonstrates that the completion of these earthworks will have little additional affect on local flood behaviour

and afflux. Note - The modelling indicated the development would result in an afflux increase of only 12mm.

Of more interest are the various drainage structures, notably the Sandy Lane culverts and the lake weir, which influence design flood behaviour within the Estate. Sandy Lane will be constructed to approximately 3.0m AHD, and will act as a levee to exclude the river flood event from the Estate. The design flood levels for internal land adjacent to the central drainage corridor will be influenced by the interaction of regional flood tailwater levels, and flood flows from the local catchment through these various structures, while considering the different times of concentration for these events.

In addition to the design flood scenarios (such as the 100 year ARI event), climate change impacts have also been modelled. In accordance with the 2007 DECC Guideline "Practical Consideration of Climate Change", a sea level rise of 0.91m, and an increase in rainfall intensity of 30% has been modelled as a "high level" impact scenario, which generally has a timeframe of 2100.

The modelling provides the following results for the 100 year ARI event, which is used as the design flood for future development:

Regional Flood
Existing flood level (70% earthworks completed) = 2.3m AHD
Post-development flood level (downstream of Sandy Lane) = 2.3m AHD
Post-development flood level plus climate change = 3.2m AHD

Note that the pre-development design flood coincides with Council's flood model results. Council's modelled climate change results indicate a flood level of 2.9m AHD. This is most likely due to different assumptions as to ocean boundary conditions: as detailed in the Climate Change Discussion Paper appended to the updated Flood Study Report, Council added sea level rise to a base of 2.2m AHD, not the more conservative 2.6m AHD ocean level boundary condition used in the model.

Local Flood
Post-development, upstream of Sandy Lane culverts = 2.1m AHD
Post-development, at sports fields = 2.2m AHD
Post-development, downstream of lake weir = 2.3m AHD
Post-development, lake level = 3.2m AHD
Post-development plus climate change, upstream of Sandy Lane culverts = 3.1m AHD
Post-development plus climate change, at sports fields = 3.1m AHD
Post-development plus climate change, downstream of lake weir = 3.1m AHD
Post-development plus climate change, lake level = 3.3m AHD

In response to these flood predictions, the applicant has adopted 3.0m AHD as the minimum fill level for urban land and Sandy Lane, and 3.3m AHD as the minimum habitable floor level for development.

At its meeting of 16 February 2010, Council resolved to exhibit draft Version 1.3 of DCP Section A3 - Development of Flood Liable Land, to incorporate (amongst other things) the new flood information from Council's Tweed Valley Flood Study Update, including climate

change data. Draft DCP A3 requires filling of residential allotments in greenfield estates (which will include Cobaki Lakes), to a minimum of the climate change design flood level.

Under this draft DCP, the fill level proposed in Cobaki Lakes will need to be raised to 3.1m AHD for all residential land downstream of the lake weir, and to 3.3m AHD for land around the lake. As per existing DCP A3 requirements, a freeboard of 0.5m will need to added to these design flood levels to determine a more suitable minimum habitable floor level than has been proposed.

It is recommended that Sandy Lane be raised to 3.1m AHD minimum, being the design flood level under climate change scenarios. This would prevent overtopping from either regional or local flood events, ensuring a viable evacuation route to high land.

Other Matters

- The applicant provides a Statement of Commitments in Section 8.0 of the PA. The Department should confirm that the PA approval will be subject to conditions of approval, including the need for subsequent applications to Council (including Section 138 Roads Act and Section 68 Local Government Act applications as applicable).

- Cut and fill diagrams provided in Appendix M do not have legible contour information.

- Sandy Lane is integral to the access network for the central corridor, but is not included in the PA. The application should provide commentary about the staged construction of accesses to the project area.

- Staging of construction, discussed in Section 4.8 of the PA, does not specify when the drainage works will be carried out. It is assumed this will occur as part of Stage 2 earthworks (cut and fill). As discussed above, the staging plan is silent on the construction of Sandy Lane and the associated structures, including the bridge and outlet culverts.

Development Assessment Engineer

Subdivision

The proposal includes subdivision for the open space, lake and riparian corridor into 9 lots (Lots 801 to 809) leaving 2 master lots (Lots 810 and 811) for the future urban development of the Cobaki Lakes Estate. This contradicts previous approval (i.e. Consent 1262/2001DA) which is for "subdivision involving the creation of eight (8) master lots and bulk earthworks", of which the applicant has recently (February 2010) received from Council amended Construction Certificate plans. The Applicant needs to clarify their intention of overlapping consents and approvals.

Staging, Construction and Management of Works

The application advises that works are intended to be staged as follows:

1. Implementation of Saltmarsh Rehabilitation Plan (SRP), and Biting Midge and Mosquito Control Plan.

    a. Intended to commence immediate after approval.

    Note, the SRP states that:

    - an adjustable weir structure will be constructed within the existing drain on Cobaki Creek to control of the number of tides which flood the Saltmarsh area and to account for rising sea levels. Tidal monitoring will be completed to determine the appropriate level and period of inundation. Continued monitoring will then be carried out to ascertain whether tidal flooding frequencies are being achieved. Further explanation required, as none have been provided.
    - it is also suggested that the current levee system along the banks of Cobaki Creek may require additional levelling, filling and limited excavation so as to ensure the complete and efficient flooding and draining of the saltmarsh habitats.
    - tides will be prevented from entering drainage lines north of Sandy Lane by the installation of a barrage (flood gates).
    - details the proposed drainage lines and other stormwater infrastructure within the SRA are shown (Figure 9) and also detailed within the accompanying Stormwater Management Plan. No such details have been provided and will be requested.

2. All earthworks (cut and fill) - Construction of the lake and landscaping its edges.

    a. Intended to commence within 6 months after approval.

3. Landscaping of open space and roads - Implementation of relevant flora and fauna management plans.

    a. Intended to commence in conjunction with civil works for the subdivision of adjacent precincts.

    Note, this application does not cover any road construction apart from the proposed bridging structure over the lake. Refer Section 5.0 Roads.

4. Landscaping of structured open space/ playing fields.
    a. Intended to commence on a pro - rata basis with subdivision of adjacent precincts in accordance with Tweed DCP rates.

<u>Operational Management</u>

The PA includes a commitment for the proponent to manage and maintain the central open space, lake and riparian corridor for 2 years after works are complete in each stage and then dedicate the land to Tweed Shire Council for public use. If the Department approves the lake, a longer maintenance period is required as the proposal is non-standard (i.e. injecting salty water into the lake and wetlands) and adequate time needs to be given to ascertain any maintenance issues.

Construction Management Plan

The PA also includes a commitment for a Construction Management Plan to be prepared prior to commencement of works that addresses:

- Management responsibility and reporting;
- Environmental management including construction traffic, noise and vibration, air quality, heritage conservation, erosion and sediment control plan, vegetation management plan, fauna management plan, acid sulphate soils management plan;
- Workplace health and safety policy and on-site safety requirements including risks and control methods, safe work method statements, dangerous goods and hazardous substances, traffic management, electrical power supply and safety, signs, protective equipment and clothing, fire prevention, communication, public safety, inspections and safety audits, site inductions and visitors, plant and equipment;
- Site emergencies including procedures for evacuation, fire, spills, injury, robbery, flood, storm, dust, first aid and incident reporting.

The Department of Planning should assess these matters to determine adequacy.

Geotechnical Constraints

A commitment is included in the PA for detailed geotechnical studies to be carried out to support earthworks and construction of the lake and riparian corridor prior to works commencing to ensure geotechnical stability. This will suffice, given that no supporting Geotechnical Reports were submitted with the PA, with reference only made to those documents submitted with the Concept Plan.

The geotechnical advice provided advises that clays on site would be of sufficient quality to be used as a lining for the lake.

Earthworks / Landforming (including the Lake)

A large portion of the site requires filling for flood management. The PA advises that more than 70% of this work has already been undertaken, in accordance with previous approvals. Further qualification of this statement is required, demonstrating which approvals cover which area including clear indication of areas of overlap with the PA and other approvals.

Water Quality Management

A storage reservoir (gravity fed from Cobaki Creek) is proposed to service the pump station for saltwater flushing. It is questionable as how this system will operate without sucking in small fish and debris, which would be detrimental to the pumps. This should also be commented on by Industry & Investment NSW in regards to impact on the creek and aquatic life.

Roads

The underside of the deck is proposed to be approximately 1.0m above the lake water surface level. This appears adequate for stormwater conveyance.

Open Channel

There are concerns that the proposed open channel will become difficult to maintain and boggy, especially under low flow conditions. The Applicant needs to confirm that the proposal complies with the provisions of Council's Development Design Specification D5 – Stormwater Drainage, especially Section D5.13 – Open Channels. It needs to be shown that:

- The product of average Velocity and average flow Depth for the design flow rate is not greater than $0.4m^2/s$, under a Q100 storm event,
- Appropriate provisions for low flow conveyance are provided, including flows for ARI of 1 year to be contained within a pipe system or concrete lined channel section.
- Concrete inverts that extend 300mm above the hydraulic grade line for ARI 2 year flows are required where the channel slope is less than or equal to 0.5%.

The Applicant needs to also confirm whether the proposed low flow drainage channel will be permanently wet, as a result of groundwater influence and/or being trickle fed by the upstream lake or connecting catchments. The open channel needs to be maintainable by Council machinery. Additionally refer Section 9.3 – Dewatering / Groundwater.

Wetlands

The proposed constructed wetland sites should be set aside in the subject PA, but the area allocated for them needs to amount to 5% of the contributing urban catchment, (i.e. zero discounts are applied). As requested by the Proponent, the wetland areas can then be adjusted, subject to provision of appropriate justification, during the detailed design phases.

Construction Phase (Erosion & Sediment Control)

The application includes an Erosion and Sediment Control Plan (prepared by Gilbert + Sutherland). This plan includes responsibilities, performance criteria for water quality, implementation strategies, monitoring and auditing of water quality during and after construction, and site rehabilitation after construction.

Monitoring of surface water quality in Cobaki Creek has been carried out by WBM (1989-1991) and Gilbert & Sutherland (commenced November 2007 and is ongoing). The report states that site-specific water quality criteria will be determined from the results of this monitoring, however this criteria is set by Council and other state agencies.

Prior to commencement of earthworks in any stage, temporary sedimentation ponds will be installed, with the exact number, location and size determined at the detailed design stage concurrently with the development of the staging plan.

Proposed wetlands are intended to be used as temporary sedimentation basins during the construction phase.

The lake is intended to be utilised as a sediment trap during the filling of the surrounding area. Trapped water in the lake is intended to be used to control dust during construction and will only be released if the water quality criteria are met.

Erosion and Sediment Control shall be enforced via appropriate consent conditions in accordance with TSC requirements.

It is noted that the XP-AQUALM modelling utilised Brisbane City Council parameters and has not been calibrated for the tweed shire. This is sufficient for PA assessment however calibrated modelling will be during the detailed design phases of the development.

Operational Phase (Stormwater Management)

The Stormwater Assessment and Management Plan submitted with this application provides the stormwater management plan for the main central riparian corridor through Cobaki Lakes Estate and includes a treatment train of stormwater management measures, under a range of development densities, consistent with the Concept Plan. In particular, it includes the lake; open channels, swales and bio-retention swales; constructed wetlands that include gross pollutant traps on entry, open water sedimentation zone, shallow and deep marsh zones, and perforated riser/ litter screen outlet; and diffuse discharge point into final saltmarsh polishing zone.

The performance of each 'deemed to comply' treatment train (in accordance with Tweed Shire Council's *Development Design Specification D7, Stormwater Quality*), was then compared using the MUSIC computer model.

The following MUSIC models were investigated.

- Base Case.
- Developed Case WITHOUT treatment measures.
- Developed Case WITH treatment measures.

Note, the Base Case represents the site in its present state, not the site undisturbed, as the site has been significantly disturbed by previous clearing and earthworks.

Post-development water quality estimates have been assessed against Council requirements (for suspended sediment, nitrogen and phosphorous) and the objectives of OISAS, with the report concluding that provided the recommended water quality management measures are properly installed and maintained, the water quality of runoff from the proposed development would achieve desired objectives for pH levels, salinity, nutrients, suspended solids and metals and is unlikely to have any impact on Priority Oyster Aquaculture Areas. Given the significance of runoff and potential impacts on the oyster industry, the Department of Planning should seek comments from the Department of Industry & Investment NSW.

Note – the use of infiltration systems is questionable as the existing soil appears to have very little permeability.

Self draining “stilling basins” are proposed immediately downstream of the lake weir to control overflow velocities. This will be assessed further under detailed design.

It is also the applicant’s intention that runoff from catchments C1 to C6 (inclusive) are treated by a GPT prior to release via a diffuse discharge over a low level flow spreader bund to the rehabilitation area. This will be subject to Council requirements and can be assessed further under detailed design.

Miscellaneous

The catchment plans (as shown on Drawing No. HJ0090.1.3) is not consistent with the catchment plans submitted under the Stormwater Management Concept (i.e. Drawing No. GJ0872.2.4)

Dewatering / Groundwater

A Groundwater Assessment and Management Plan was submitted with this application. The report states that the groundwater levels vary over the site and that there are no groundwater dependent users or ecosystems present in or near the Cobaki Lakes site (before the Cobaki Broadwater).

The assessment identifies three construction activities that have the potential to impact upon the pre-developed groundwater regime:

- construction of the proposed lake
- construction of the wetlands for stormwater quality treatment
- construction of roads and associated infrastructure.

Such works are intended to be controlled by appropriate management plans to minimise potential impacts. Constructed wetlands are also intended to be elevated above the level of acid sulphate soils, to minimise such risks.

Table 3.4.1.1 however indicates that groundwater could be found as high as RL2.5m AHD around the location of GW3. This will impact on the proposed Central Open Space Area open channel, potentially making it permanently wet in this location. This would obviously have impacts of water levels and maintenance accessibility. This needs to be investigation further by the Applicant.

A comprehensive assessment of the submitted Groundwater Assessment and Management Plan is recommended. Refer to additional comments on Acid Sulfate Soils below.

Issues to be Resolved

- This application seeks approval for the subdivision of the Cobaki Lakes Estate into 11 lots which contradicts previous approvals (namely Consent 1262/2001DA) which is for “subdivision involving the creation of eight (8) master lots and bulk earthworks”. The Applicants needs to clarify their intention of overlapping consents and approvals.
- The proposed bridge on Sandy Lane crossing the lake needs to be a minimum 18m wide (i.e providing 3.5m wide verges), with an 11m roadway (kerb to kerb).

- Sandy Lane should be at minimum design flood level of 3.1m AHD
- The Saltmarsh Rehabilitation Plan (SRP) makes mention that an adjustable weir structure will be constructed within the existing drain on Cobaki Creek to control of the number of tides which flood the Saltmarsh area and to account for rising sea levels. Additional explanation is required to clarify what is proposed, including supporting detailed plans.
- The SRP refers to proposed drainage lines and other stormwater infrastructure on Figure 9, within the SRA, however no such details are shown on the referenced plan. Applicant is required to provide the appropriate documentation.
- The weir length of the lake has determined to ensure that the proposed northern lake water surface level remains below RL 3.0m during a Q20 event. The weir needs to consider flows up to the Q100 storm event. (To be read in conjunction with Flooding comments on revised fill levels)
- It need to be confirmed how the proposed gravity fed storage reservoir servicing the salt water pump station will operate without potentially sucking in small fish and debris from Cobaki Creek, which would be detrimental to the pumps over time as well as increasing maintenance requirements. It is also requested that commented is obtained from Industry & Investment NSW on such a proposal.
- The Proponent needs to provide appropriate documentation to show that the proposed open drainage channel complies with the provisions of Council's Development Design Specification D5 – *Stormwater Drainage*, especially in regards to Section D5.13 – Open Channels. It needs to be shown that:

    i. The product of average Velocity and average flow Depth under a Q100 storm event is not greater than $0.4m^2/s$,
    ii. Appropriate provisions for low flow conveyance are provided, including flows for ARI of 1 year to be contained within a pipe system or concrete lined channel section.
    iii. Concrete inverts that extend 300mm above the hydraulic grade line for ARI 2 year flows are required where the channel slope is less than or equal to 0.5%.

- The Applicant also needs to confirm whether the proposed low flow drainage channel will be permanently wet, as a result of groundwater influence and/or being trickle fed by the upstream lake or connecting catchments. The open channel needs to be maintainable by Council machinery.
- The proposed layout needs to be amended to accommodate constructed wetlands sized to 5% of their contributing urban catchment, (i.e. with zero discounts applied) in accordance with Council's Development Design Specification D7 – *Stormwater Quality*. Wetland areas can then be adjusted, subject to provision of appropriate justification, during the detailed design phases of the development.
- Comment should be obtained from Industry & Investment NSW, confirming that the proposal complies with the requirements of the New South Wales Oyster Industry Sustainable Aquaculture Strategy (OISAS)) and that the development will not impact on identified Priority Oyster Aquaculture Areas.
- The XP-AQUALM modelling undertaken for stormwater quality, utilised Brisbane City Council parameters and was not calibrated for the tweed shire. This is sufficient for PA assessment however calibrated modelling will be required during the detailed design assessment of the development.

- Should the proposal be approved, Council does not accept the proposed developer management and maintenance period of 2 years for the central open space, lake and riparian corridor and this period should be considerably extended. Certain maintenance issues may not become evident for several years (i.e. some may not become evident until the development is exposed to a flood or prolonged dry conditions). To be considered and check with other Council divisions.

Open Space Planner

Council has previously provided extensive comments and concerns with the open space areas proposed in the Cobaki Lakes Concept Plan and PPR. The recently submitted Central Open Space, Lake and Riparian Corridor Project Application has not addressed these comments.

Sportsfields area and shape:

This application proposes 19.04ha of structured open space (sportsfield), while the required amount is 20.4ha based on a population of 12,000. This discrepancy must be resolved.

Additionally, earthworks and drainage diagrams (Appendix M) indicate wetlands, drains and batters that reduce the available area for the sportsfields significantly, and increase the boundary issues previously raised in comments on the Preferred Project Report.

Council has previously advised that the proposed sportsfields are unacceptable and do not comply with Councils Subdivision Manual (Tweed Development Control Plan: Section A5). Crucial issues previously raised include the land's dimensions, layout, boundary concerns and separation of the fields by a road. The current application has not addressed any of these.

Sportsfields required flood immunity:

Council's Development Control Plan Section A5 - Subdivision Manual, requires sportsfields to be at a level described as Q100 minus 1 metre. The application proposes sports fields at RL 1.6m.

Council's Flooding Engineer has determined the design flood level to be RL 3.1m AHD, therefore, the sportsfields should be at RL 2.1 metres AHD.

Sportsfields below the Q1 level (-1m) are not acceptable.

Water quality and sportsfield inundation

The Stormwater Assessment and Management Plan states water quality in the lake and drainage system will be managed by introduced salt water. Assumptions have been made suggesting salinity will be at 10,000 mg/L as it exits the lake, and be reduced by dilution to around 5,800 mg/L in the channel as it flows past the sportsfield.

The plan further assumes the field will be inundated in a 5 year rainfall event, and that in such flood events salinity will be further diluted to around 3,700 mg/L. The plan also states

that Green Couch Grass can tolerate salinity of 6,000 mg/L as long as the fields are built on "….. 500mm of sandy soil with adequate subsoil drainage…".

The application appears to be inconsistent in the anticipated frequency of flooding of sportsfields. The Stormwater Assessment and Management Plan (Appendix E) suggests the fields will flood in a 5 year rainfall event, while the Flooding and Flood Management Report (Appendix F) indicates the fields will flood either:

- between 10 and 20 year flood events (Q10 to Q20) under existing climate conditions; or
- annually under climate change conditions.

Council's Recreation Services Unit considers there are too many assumptions in the statements and seeks:

- an independent review of relevant available information as it applies to turf management of these sportsfields and the impact of saline water; and
- confirmation of the accuracy of the assumptions made regarding salinity levels and frequency of inundation.

Confirmation is also required that there will be no impact on the sportsfield from the saline water flowing through the adjoining channel outside of flood times. Council requires technical assurance that the saline water will not move by capillary action or any other means from the channel to affect the root zone of the sports field grass.

Additionally, the application gives no detail on the construction method for the sportsfield, including the requirement for "….. 500mm of sandy soil with adequate subsoil drainage…" to avoid the salinity problems. This description exceeds Councils standard sportsfield specifications and the applicant must commit to constructing the sportsfields to specifications specific to the above matters.

<u>Area, shape and accessibility of Casual Open Space</u>

The Project Application states that 10.9ha of 'Open Space Parkland' is to be provided.

The applicant must confirm this area is part of the overall 13.6ha of Casual Open Space required to be contributed by the Cobaki Lakes Subdivision, and that a minimum additional area of 2.7 ha of casual open space will be contributed in future stage applications, and that all such Casual Open Space meet the Councils Subdivision Manual requirements.

More detailed information needs to be provided to demonstrate how the casual open space complies with Councils Subdivision Manual. The 'Central Open Space – Landscape Plan' is the only part of the application to demonstrate the location and size of the various portions of Casual Open Space. The stylised drawings at 1:4000 (A3) do not provide sufficient detail to determine the functional dimensions of each park. It appears that many of these parks do not meet Councils Subdivision Manual requirements, including minimum size, configuration, shape, access and road frontage. The applicant must specifically address the requirements of tables A5-8.2.1, A5-8.2.2 and A5-8.2.3 (Development Standards for Local, Neighbourhood and District Parks) before these areas can be considered.

The application states the majority of residents will be within 800m or 10 minute walking distance of the central open space area. The applicant must note the above A5 tables referenced above, require 95% of residents must be within 400m walking distance of a local park, hence there will need to be additional local parks provided in the residential areas of the development to satisfy the requirement.

Boundaries to casual open space

The Landscape Plan includes a drawing (Open Space Interfaces plan SK01-07) that shows the interface between open space and future stages of the development. However most of it is described as 'appropriate esplanade road or alternate fencing/boundary interfaces'. This is not acceptable as Council has clear guidelines for public access and road frontage. In most of the areas shown, unless the 'interface' is a road, the casual open space will not meet Councils DCP Section A5 - Subdivision Manual.

Required flood immunity for casual open space

The PA provides no clear information on the frequency of flooding anticipated for the parks. Some drawings in the Landscape Plan (Open Space interface Profiles) suggest a minimum RL of 3.0m however they do not state which parks they refer to, and it appears this level applies only to parks above the lake weir.

The Flooding and Flood Management Plan (Appendix F) makes no comment on the anticipated frequency for flooding of the parks. Frequency of flooding is an important factor in selecting appropriate park infrastructure, potential damage to such infrastructure and reduced park useability. It is also important in plant selection and management due to the increased salinity levels proposed. A number of plants seem inappropriate to this location.

As above, Council's DCP Section A5 - Subdivision Manual specifies Casual Open Space to be at a level described as Q100 minus 1 metre, and all parks should as a minimum, comply with this requirement. As with the sportsfields, this should be at the levels indicated under climate change conditions.

Impact of water quality on park grass, garden beds and other vegetation

The PA does not address the impact of high salinity water, either through inundation or other means, on the proposed vegetation (grass, garden beds and other vegetation). The stylised drawings in the landscape plan show open areas of grass, but the application is silent on how often the high salinity water will flood these areas, or how this will affect the vegetation.

The applicant must address this matter specifically, and the same analysis as proposed for the sportsfields should be undertaken. That is:

- an independent review of relevant available information as it applies to turf management of the open space and the impact of saline water; and
- confirmation of the accuracy of the assumptions made regarding salinity levels and frequency of inundation.

Wetland and riparian areas below the weir

As above, much of the area below the lake weir is described as Wetland Areas and Freshwater Riparian Corridor. Note that the Stormwater Assessment and Management Plan (Appendix E) describes salinity in these areas as ranging from 10,000mg/L to 5,800mg/L for around 6 months of the year. The same report states that in relation to wetland plant communities, problems will occur when salinity increases to 1,000mg/L. The description Freshwater Riparian Corridor seems inconsistent with the Stormwater Assessment and Management Plan.

The regeneration and future management of these areas is not covered by the Site Regeneration and Revegetation Plan (Appendix B). The PA however includes a Landscape Plan including vegetation management and planting lists. However this species list does not state that the plants have been selected as suitable for the salinity levels described above, but rather says they are for a freshwater riparian area.

Frequency of flooding is also an issue in plant selection as the impact of increased salinity is likely to be significant.

The area of riparian corridor and wetlands, excluding the grass parklands indicated on the Landscape Plan, should be subject to similar rigour in plant selection and future management as other natural areas within the development.

Interface between lake and public land

The Landscape Plan indicates fenced boardwalks and concrete promenade areas around the lake, as well as stone wall edging in managed parks and some 'natural' wetland edging. The application (section 4.2, p13) states this will be a 'high quality finish'.

The lake itself and high quality embellishment around the edge is a significant future maintenance cost to Council. Council has previously stated it does not support the lake concept and this additional high level of embellishment is an unnecessary additional cost.

Should the lake eventually proceed, alternative means of meeting the cost of maintaining this additional infrastructure must be identified.

It is noted that, while a boardwalk or similar surrounds the lake, certain areas beyond the lake edge are not part of this application and are nominated in the concept plan as residential. Should the lake eventually proceed, it will be an essential requirement that public access will be provided, and that the design of the future residential development will encourage public access to the lake edge.

Embellishment of Casual Open Space

The project application gives no details of proposed embellishment of the Casual Open Space other than stylised drawings and photographs from other unspecified lakeside parks. The application (section 4.2, page 13) refers to embellishments such as shelters BBQs and play equipment, however little information is provided. Should this application be approved Council will require additional information in order to consider the appropriate embellishments for casual open space.

Acid sulphate soils

Almost the entire area covered by the PA is nominated as potential Acid Sulphate Soil (ASS). That is, all ASS in the Cobaki development is nominated to become public land.

An assessment of Acid Sulfate Soil management issues has not been undertaken by Council officers due to limited available resources. Given that the PA is a Part 3A project, Council will not accept public land unless the Department of Planning commissions an independent assessment of the proposed ASS management and deems it adequate. The ASS management plan (appendix H) appears to deal with issues during the construction phase only. The ASS Management Plan should also address issues that may arise in the future as a result of parkland, sportsfields, wetlands and the central drainage channel being constructed on this ASS.

It is likely that in the future Council may wish to construct some buildings, other park infrastructure, do works on the wetland areas, and also undertake earthworks and other landscape works. Water quality in the drainage channel and wetlands is also an important consideration. The possible effects of ASS on future management these areas must be known before further Council will accept ASS constrained land as park.

Site Contamination

The site contamination assessment (Appendix G) indicates areas of contaminated lands. These areas must not be dedicated as part of the proposed open space or environmental protection areas and must be subject to further investigation.

It is noted that a potential contaminated land site is situated is in the south west corner of the development and immediately adjacent to a long narrow area nominated for public open space. The project application does not address the potential impacts of this site as it is 'outside the boundary' of the current Project Application

Notwithstanding, Recreation Services requires the following matters to be addressed:

- What is the function of the long narrow piece of land extending towards this contaminated site that has been nominated as public open space.
- An analysis of the potential impacts of this contaminated site is required before any approval of this project application will be given it is within metres of the public open space proposed in this application, it is not acceptable to simply state this is not relevant as it is outside the boundary of the Project Application.

Future Community Facility

The Project Application nominates a 'future Community Centre'. Some maps indicate this area is part of the Project Application, while the Landscape Plan (Appendix J, Landscape Plan) excludes it. The applicant is requested to confirm if this is part of the Project Application.

Restaurant Site

The application proposes a restaurant in the public open space immediately north of the sportsfield. No information has been provided on ownership, operational details and the feasibility of the proposal. Such facilities have historically not been located on Council Administered Community Land in Tweed Shire.

Recreation Services expresses concern regarding suitability of this proposal, and seeks more information before the proposal can be considered.

Environmental Scientist – Natural Resources

Council's Environmental Scientist (Natural Resources) has reviewed the submitted Site Regeneration & Revegetation Plan (JWA 2009), Saltmarsh Rehabilitation Plan (JWA 2009) and Freshwater Wetland Rehabilitation Plan (JWA 2009) as submitted with the Part 3A Project Application for the Cobaki Lakes Central Open Space, Lake and Riparian Corridor. There have been no changes to these documents since their submission with the Cobaki Lakes Estate Preferred Project Report (PPR) and comments regarding these documents are similar.

These documents have subsequently been reviewed with regard to detailed open space, landscape and stormwater drainage plans submitted as part of the Project Application, and any conflict between the proposed PA and environmental rehabilitation areas.

Flora and Fauna Assessment

The following comments are made on the Flora and Fauna Assessment (Section 7.5 of the Environmental Assessment Report):

- The applicant acknowledges that within the project application site there are four threatened flora species, two threatened fauna species and three Endangered Ecological Communities (EEC). However the applicant fails to acknowledge that the PA would have any impact on these threatened species, ecological communities and their habitats through clearing, altered hydrology, disturbance, etc. No assessments as required under Section 5A of the EP&A Act have been undertaken for this stage of the project and it is assumed the applicant is relying on Section 5A assessments undertaken for and included within the Preferred Project Report for the Concept Plan. Section 5A assessments should be undertaken for each threatened species or ecological community impacted by each project stage as it is only when detailed designs are available that an accurate assessment of impacts to threatened species and ecological communities are known and can be properly considered.
- In particular the applicant fails to acknowledge that large areas of Freshwater Wetland EEC and to a lesser degree Saltmarsh EEC would be cleared as part of the PA (although not stated it is understood 26.45ha of Freshwater Wetland EEC would be cleared with the majority occurring within the central open space area).
- The applicant has failed to acknowledge that the threatened Wallum Froglet (*Crinia tinnula*) and its habitat occurs within the PA site and that this species would be impacted by this stage of the development as large areas of Freshwater Wetland would be cleared which provides habitat for this species. This is acknowledged in the

Flora and Fauna Assessment included with the PPR but the Flora and Fauna Assessment in the Environmental Assessment Report fails to acknowledge this.

- The Freshwater Wetland Rehabilitation Plan states "*A detailed Wallum Froglet Compensatory Habitat Plan will be prepared to accompany the Development Application for the central open space area. Furthermore an offset for the removal of Wallum Froglet forage habitat will be completed in agreement with DECC*." A Wallum Froglet Compensatory Habitat Plan has not been included with the PA which covers the central open space area. No detail is provided of an offset plan for the removal of Wallum Froglet forage habitat. The applicant states in the Freshwater Wetland Rehabilitation Plan that the Freshwater Wetland Rehabilitation Area "*provides an opportunity to create a more suitable 'core' habitat area*" for this species. However there are major failings with this plan and proposed site stormwater management is in direct conflict with the objectives of this plan as detailed below.

It is noted that in the amendments and additions to the draft Statement of Commitments in Council's letter to the Department of Planning dated 12th January 2010 is a statement of commitment referring to the Wallum Froglet - "*An offset will be provided for impacts on the Wallum Froglet Crinia tinnula to offset direct and indirect impacts of the proposal*." The timing for completion states that "*The offset area shall be secured in a manner to the satisfaction of DECCW, or alternatively the agreed offset sum shall be paid by the developer to DECCW, prior to the commencement of work within the central open space area*." As detailed above, no offset plan has been submitted with the Project Application.

Freshwater Wetland Rehabilitation Plan (JWA 2009)

Conflict between design drawings submitted with the Project Application and the Freshwater Wetland Rehabilitation Plan

The applicant states that the Freshwater Wetland Rehabilitation Area (FWRA) provides for the creation of Freshwater Wetland EEC and Wallum Froglet habitat that will be cleared as a result of the proposal.

However a review of open space and stormwater plans reveals that the FWRA will not be used solely for wetland habitat creation. A 30m wide high flow stormwater drain and two constructed wetlands to treat stormwater are proposed within the FWRA. A neighbourhood connector road, four lane Cobaki Parkway and numerous bike and pedestrian pathways are also proposed within the FWRA. Finally a saltwater rising main to transfer saltwater to the northern lake is proposed within the FWRA. The proposed siting of infrastructure within the FWRA is in conflict with the objectives of the Freshwater Wetland Rehabilitation Plan (FWRP).

It appears from the Stormwater Management Plan that the created freshwater wetland offset area would be used to treat and transfer stormwater flows, prior to discharge into SEPP Coastal Wetlands and Cobaki Creek. Any created freshwater wetland offset area should not have as a dual function the treatment and management of stormwater flows from the development.

Siting a connector road, four lane Cobaki Parkway and pedestrian walkways/cycleways within the FWRA would also reduce the suitability of this site as a created freshwater wetland offset area. The FWRP states that "*the Freshwater Wetland Rehabilitation Area*

provides an opportunity to create a more suitable 'core' habitat area (for the Wallum Froglet)*, linked to adjacent SEPP wetland areas via a vegetated corridor, which will provide some benefit for the local population*." The vegetated corridor is narrow and would be bisected from the adjacent SEPP wetland areas by three pedestrian walkways/cycleways, a 30m wide high flow drain, a neighbourhood connector road and the four lane Cobaki Parkway. It is highly unlikely this would provide safe and easy movement for the Wallum Froglet between the FWRA and existing habitat areas to the east. Habitat creation and underpass options for the Wallum Froglet at the Tugun Bypass have been very difficult and this large Government project has been backed by considerable financial and scientific resources.

The project application includes a saltwater reticulation system that would transfer saltwater flows from Cobaki Creek to the northern lake in order to manage water quality. It is proposed the system would pump saltwater to the top end of the central open drain and allow saltwater to trickle feed through the drain. Saltwater outlets are proposed at the top end of the lake (upstream of the FWRA) and into the high flow stormwater drain within the FWRA. Saline intrusion into the FWRA would cause die off of created freshwater wetland vegetation and would create conditions unsuitable for the Wallum Froglet. Proposed inputs of saline water into the created freshwater wetland offset area are in direct conflict with the objectives of the FWRP and further demonstrate that this area would be unsuitable as a freshwater wetland offset area.

The Acid Sulfate Soil Assessment acknowledges that ASS with high acid generating potential are present at shallow depths within the proposed central open space area, and also within part of the proposed lake south of Sandy Lane. The central open space is to be utilised in stormwater treatment and drainage and hence construction of drains and wetlands would require excavation of ASS. The ASSMP identifies management actions for the construction phase (liming of soils, monitoring and treating if required of surface and ground water) but does not consider impacts and management actions once drains, constructed wetlands and the southern portion of the lake are operational. Whilst it is understood that a saltwater reticulation system is proposed to maintain water levels so as not to expose ASS, it is possible drains and constructed wetlands would intercept shallow groundwaters. The ASS assessment acknowledges that groundwater is of poor quality, being acidic with high chloride and sulfate concentrations and variable levels of Iron and Aluminium. It is likely these factors would contribute to reduced water quality within the stormwater drainage and treatment areas which in turn would contribute to reduced water quality within the FWRA.

<u>Review of the Freshwater Wetland Rehabilitation Plan</u>

There are numerous deficiencies in the Freshwater Wetland Rehabilitation Plan (FWRP) as detailed below (and previously identified as part of the submission on the PPR):

- The proposal would entail the removal of 26.45ha of Coastal Wetland on Floodplain EEC with rehabilitation works creating a proposed minimum of 8.89ha of freshwater wetland (ratio of 0.33:1). This would equate to a reduction of freshwater wetland area by approximately one third. This offset is considered inadequate as it will result in a significant net loss of this community.

- Decline in water quality is cited as a potential impact on the created wetland area. However, the FWRP states that the created wetland area would provide a more 'suitable' core habitat area for the threatened Wallum Froglet. It is considered highly unlikely that the created wetland area would provide suitable core habitat for this species as the Wallum Froglet is highly susceptible to changes in water quality and requires acidic 'wallum' type conditions. As the created wetland area has been incorporated into the stormwater drainage and treatment area and would receive stormwater from the surrounding urban environment and at times inputs of saline water, it is highly likely water quality in the created wetland would be unsuitable and this area would not provide habitat for this species.
- Introduction of diseases and non-native fauna is cited as a potential impact on the created wetland area. Several recommended mitigation measures provide no detail on the responsibility or funding of measures including the removal of cats and dogs in wetland areas and cane toad 'round-ups'. If these are considered potential impacts of the development, these measures should be the responsibility of the proponent to fund and enact. Additionally, mitigation measures include maintaining acidic conditions within wetland areas to minimise potential breeding by cane toads and prevention of ponding water and retaining natural hydrology to control potential invasions of Gambusia. The proponent needs to specify how these mitigation measures would be achieved (particularly in light of proposed stormwater and saline inputs into the wetland area), and these measures should be the responsibility of the proponent to fund and enact.
- The FWRP states that at the completion of the rehabilitation of the FWRA, it would be rezoned to Environmental Protection and dedicated to Council or the relevant State Government Department (subject to their agreement). Any offset area should be zoned Environmental Protection at the outset of the project to ensure security from further development. Should Council become the land manager, the proponent must estimate costs of maintenance along with strategies for sourcing funding to allow Council management of the FWRA in perpetuity.
- The FWRP states that maintenance of the FWRA would continue until plants have become well-established which is expected to take two to three years. As the FWRP proposes to create a freshwater wetland to offset clearing of Freshwater Wetland EEC, maintenance of two to three years is considered inadequate.
- Monitoring of vegetation and water quality is proposed by the proponent. However, the FWRA is also considered to provide compensatory habitat for the Wallum Froglet. No monitoring is proposed of Wallum Froglet usage of the FWRA. The proponent must also monitor whether the Wallum Froglet is utilising the FWRA. Should the Wallum Froglet fail to utilise the FWRA (which is likely, as predicted conditions are likely to be unsuitable for this species due to proposed stormwater and saline water being discharged into the system), alternative offset areas must be provided.
- As with other management plans, the proponent needs to be tied into agreed performance criteria to ensure the FWRP achieves successful creation of Coastal Freshwater Wetlands EEC and Wallum Froglet habitat. Completion criteria proposed are not adequate.

<u>Saltmarsh Rehabilitation Plan (JWA 2009)</u>

<u>Conflict between design drawings submitted with the Project Application and the Saltmarsh Rehabilitation Plan</u>

The ‘Stormwater Drain Overall Catchment Plan’ reveals that stormwater from a drainage catchment of approximately 470ha would discharge into the Saltmarsh Rehabilitation Area (to the west of the proposed Cobaki Parkway and Sandy Lane) through a series of ten 1800mm by 1800mm box culverts under Sandy Lane.

The proposed design for stormwater drainage at the Cobaki site would mean very large concentrated flows of stormwater would be discharged within the Saltmarsh Rehabilitation Area. The proponent has stated in response to Council’s previous concerns of stormwater discharges into the Saltmarsh Rehabilitation Area that “*the delivery of stormwater will be intermittent and ephemeral and provided saline groundwater is present and existing tidal regime is maintained, saltmarsh will maintain its competitive advantage*”. However it is clear due to the size of the catchment and size of the culvert structure at Sandy Lane that stormwater flows into the western portion of the Saltmarsh Rehabilitation Area would be at times substantial, and would potentially result in scouring, sedimentation, increased nutrient input and altered salinity. Alteration of salinity and increasing nutrient levels resulting from the discharge of stormwater into saltmarsh is recognised by DECCW as a threatening process to Saltmarsh EEC. The proponent has not adequately addressed how this threat will be managed, particularly as it is likely that at times, fresh stormwater discharge would dominate part of the saltmarsh rehabilitation area, and would significantly alter salinity levels.

The stormwater management plan reveals that the Saltmarsh Rehabilitation Area would act as a ‘final polishing zone’ for stormwater. This is contradictory to the SRP which states that the Saltmarsh Rehabilitation Area provides for the creation and rehabilitation of Saltmarsh EEC and Swamp Oak Forest EEC to compensate for the loss of both of these threatened communities as a result of the proposal. This offset area should not have a dual function the treatment and management of stormwater flows from the development. Its sole purpose must be the rehabilitation and conservation of the target communities, particularly as increased nutrient levels from stormwater discharge is recognised as a threat to Saltmarsh EEC.

The stormwater management plan states that stormwater will discharge diffusely through the Saltmarsh Rehabilitation Area, utilising existing drainage channels within this area. It is likely that these remnant agricultural drainage channels will be subject to sedimentation over time and yet no consideration has been given to how these will be maintained to ensure there stormwater drainage function. Maintenance of this stormwater system over time to prevent sedimentation within an environmental protection and rehabilitation area with no established maintenance tracks, etc will be difficult and in conflict with the objectives of the Saltmarsh Rehabilitation Plan (SRP).

It is therefore recommended that stormwater from the central drainage system not be discharged into the Saltmarsh Rehabilitation Area as proposed in the stormwater management plan.

Whilst smaller residential catchments to the west of the Cobaki Parkway are not included within this Project Application Stage, it is noted in the Stormwater Management Concept that stormwater would be discharged from these residential areas via pipe culverts under Cobaki Parkway into the remainder of the Saltmarsh Rehabilitation Area. According to the Stormwater Management Concept it does not appear that there would be any treatment of

stormwater prior to discharge, and stormwater runoff from the four lane Cobaki Parkway would contribute to increased stormwater pollutant loads discharged into the Saltmarsh Rehabilitation Area. The Saltmarsh Rehabilitation Area must be first and foremost an area set aside for the rehabilitation and conservation of target communities and not an area for urban stormwater discharge and final treatment.

As with the FWRA, it is considered probable that construction of stormwater drains and wetlands within ASS areas in the central open space area, and interception of poor quality acidic groundwater would result in discharge of poor quality stormwater downstream into the Saltmarsh Rehabilitation Area.

Review of the Saltmarsh Rehabilitation Plan

There are numerous deficiencies in the SRP as detailed below (and as previously detailed in the submission on the PPR):

- Environmental processes within saltwater wetland systems are dominated by the dynamic nature of tides and tidal processes. Consequently, the elevation and slope characteristics of the wetland topography relative to tidal range and period are important factors in determining the chemical and biological characteristics of different regions within a saltwater wetland. The SRP is very broad without specifics or scientific analysis provided to justify or detail the mechanics of the proposal. No information is provided on the existing topographic and tidal characteristics or modelled changes to wetland hydrodynamics as a consequence of increased stormwater input or construction of tidal barrages and tidal gates. Site investigations need to be undertaken to determine the existing topography and bathymetry of the wetland and the tidal characteristics at the site. Modelling also needs to be undertaken to determine changes to wetland hydrodynamics as a consequence of the development and infrastructure proposed as part of the SRP to control tidal movement. The Saltwater Wetlands Rehabilitation Manual (DECC 2008) provides guidance on this and should be used as a guide to assist in the refinement of the SRP.

- The SRP provides a very simplistic review of the past disturbances, hydrological integrity and current impacts to vegetation communities within the saltmarsh restoration area. It appears this assessment has been used to define whether an area will be created through revegetation or restored via assisted regeneration. Species selection within revegetation areas appears to be based entirely on mapping of soil salinity. This approach fails to consider site elevation and topography, groundwater and surface water conditions and tidal processes. It also fails to consider changes to surface and groundwater hydrology as a result of the proposal and the natural processes of regeneration, particularly following removal of cattle from the site. Table 1 of the SRP states that saltmarsh and freshwater wetland EEC communities have ‘developed as a result of clearing of the original Swamp Forest, construction of drains and installation of tidal flaps’. The SRP proposes that the majority of these areas would be subject to assisted regeneration to restore saltmarsh and freshwater wetland EEC’s and provide the basis to justify clearing of these EEC’s elsewhere on site within the proposed development footprint. However, it is considered possible that Swamp Forest would regenerate across much of these grazed areas (which have developed as a

result of Swamp Forest clearing) and consequently proposed offsets for saltmarsh and freshwater wetland EEC's would not be reached.

- The applicant states that the SRP would cover a five year maintenance period. It would be beneficial for the Saltmarsh Rehabilitation Area to be in Council ownership for mosquito management and conservation beyond the five year period, but a funding source for the long-term management of this area must be identified.

- Sections of the Cobaki Creek bank adjacent the proposed Saltmarsh Restoration Area is steep, fragile and actively eroding. Creek bank erosion should be incorporated into the SRP.

- Figure 5 of the Site Regeneration and Revegetation Plan defines EEC and other vegetation offset areas. Within the saltmarsh rehabilitation area, this includes creation through revegetation of Swamp Sclerophyll Floodplain Forest EEC, Freshwater Wetland EEC, Swamp Sheoak Floodplain Forest EEC and wet sclerophyll forest. However the SRP provides a very limited species list for the creation (through planting) of these four vegetation communities with the species selected being, Swamp Oak, Tuckeroo, Guioa, Flooded Gum, Swamp Mahogany, Northern grey Iron-bark, Forest Red Gum and Broad-leaved Paperbark. The SRP must provide detailed planting species lists which provide information on planting composition and densities for each vegetation community and EEC to be created. Planting species lists, composition and density should be based on a reference community located (where possible) in close proximity to the site, having similar abiotic features and in good condition with low levels of disturbance. Planting species lists for EEC and other vegetation offset area must include ground, mid and canopy species and species composition must be benchmarked against a reference EEC community.

- Climate Change issues are inadequately addressed in the SRP. Sea level rise is recognised as a threat to Saltmarsh EEC as in many situations there is no capacity for landward expansion to keep pace with losses as the sea level rises. Figure 8 of the SRP defines the location of the saltmarsh community within the saltmarsh rehabilitation area. For the portion of the saltmarsh rehabilitation area located between Cobaki Creek and Cobaki Parkway, the Cobaki Parkway would prevent the landward expansion of saltmarsh with sea level rise. For the portion of the saltmarsh rehabilitation area located to the west of the Cobaki Parkway, landward expansion of saltmarsh would be prevented due to the location of Sandy Lane and creation of a wet sclerophyll forest offset area.

- There is no detail in the SRP regarding impacts of particular aspects of the development and siting of infrastructure within the saltmarsh rehabilitation area. Figure 9 of the SRP – stormwater/tidal infrastructure shows proposed channels, dispersion channels, and tidal gates and barrages within and adjacent the saltmarsh restoration area. A saltwater reticulation pumping station is also proposed with the Saltmarsh Rehabilitation Area. No detail is provided on the impacts of these structures. Furthermore, it is assumed some access would need to be maintained into and within the saltmarsh rehabilitation area to undertake works and maintain areas. No detail is provided here.

Additional comment is provided by Council's Entomologist on proposed revegetation of Swamp Oak and mixed species (as per Figure 12 of the SRP – revegetation plantings) in the saltmarsh rehabilitation area, opposite Cobaki Broadwater Village and Cobaki Creek. The southwest corner of the Cobaki Broadwater Village is a chronic and prolific breeding area for the mosquito species *Verrallina funerea*. This mosquito bites aggressively by day and moves from its breeding areas along narrow waterways and heavily vegetated corridors. Consultation between Council's Entomologist and the project's revegetation manager is recommended to avoid facilitating movement of this mosquito into the proposed Cobaki Lakes developed areas. However, should offset revegetation areas be changed as a consequence of this consultation, other suitable offset areas must be located and rehabilitated accordingly.

Site Regeneration and Revegetation Plan (JWA 2009)

Conflict between design drawings submitted with the Project Application and the Site Regeneration and Revegetation Plan

The Site Regeneration and Revegetation Plan (SRRP) denote 13 Management Precincts, five of which are included within the project application site (3, 6, 8, 9 and 13). These management precincts include retained vegetation and areas where revegetation is proposed to offset vegetation clearing, including clearing of threatened ecological communities across the site. Within two of these management precincts, small remnants of Lowland Rainforest on Floodplain EEC occur. Additionally, four threatened plant species are located within proposed management precincts 3, 8 and 13. The regeneration and revegetation of these five areas contribute to providing offsets for the proposed clearing of Lowland Rainforest on Floodplain EEC, Swamp Sclerophyll Forest on Floodplain, Lowland Rainforest EEC and Freshwater Wetland EEC.

The SRRP states that detailed regeneration and revegetation plans would be completed for each management precinct at the Operational Works stage. This is a Queensland term, referring to detailed civil / earthworks application stage. The only equivalent stage in New South Wales would be the construction certificate stage. However, it is considered that detailed regeneration and revegetation plans for these five management precincts should be submitted with the Environmental Assessment Report for the Project Application.

Four of these five proposed management precincts are included within layout, earthworks, stormwater and landscape plans and with various infrastructure and works proposed here including, stormwater treatment ponds, stormwater drains, bicycle/pedestrian pathways, open space parkland, community facilities (temporary sales and project office) (including a carpark), lake boardwalks and earthworks. Again, as with Freshwater Wetland and Saltmarsh Rehabilitation Areas, there is a conflict with the proposal and goals of the SRRP which is to "*ensure restoration of degraded areas and offsets for any vegetation removal*" including contributing to providing offsets for the proposed clearing of Lowland Rainforest on Floodplain EEC, Swamp Sclerophyll Forest on Floodplain, Lowland Rainforest EEC and Freshwater Wetland EEC elsewhere on site.

It should be noted that offsets proposed in the Freshwater Wetland Rehabilitation Plan, Saltmarsh Rehabilitation Plan and Site Regeneration and Revegetation Plan provide justification (as stated by the applicant) for the removal of EECs and loss of threatened species habitat. The applicant has stated in Section 5A assessments prepared under the

EP&A Act and submitted with the PPR that the proposal will not have a significant impact on threatened species and ecological communities occurring on site as certain offsets will be achieved through restoring and creating threatened species habitat and EECs[1]. However, a review of the design plans submitted with the Project Application for the central open space area reveal that these offset areas will be subject to other land uses and are in conflict with rehabilitation and conservation of these environmental areas in perpetuity. In light of this, the applicant needs to reassess offset targets as proposed in the PPR, as it is considered highly unlikely these can be met. If offsets can not be met, Section 5A assessments for threatened species and ecological communities must be amended and an assessment made by the applicant as to whether the proposal will have a significant impact on these species and communities.

Review of the Site Regeneration and Revegetation Plan

There are numerous deficiencies in the Site Regeneration and Revegetation Plan (SRRP) as originally detailed in the submission on the PPR and as outlined below.

The SRRP identifies offset areas for the clearing of EECs and other vegetation, and denotes broad site restoration strategies (i.e. regeneration or revegetation) for offset areas and retained vegetation.

However, it only provides an overview of the intent of site restoration strategies and lacks any detail in the on-ground methods that will be employed to achieve the site restoration strategies. The SRRP states that detailed regeneration and revegetation plans will be completed for each management precinct. However this Plan (in addition to other specific vegetation management plans), provide the basis to justify the clearing of EEC and other vegetation, as it identifies areas that will be used to offset their loss through either revegetation or assisted regeneration. According to comments provided by DECCW, an offset strategy should be provided for loss of all threatened flora and fauna habitat and EECs. The proponent's response was that the SRRP provides for a combination of regeneration and revegetation techniques to ensure restoration of degraded areas and offsets for any vegetation removal. Therefore, as presented by the proponent, the SRRP is in essence a combined offset and restoration management plan. With regard to the offset strategy provided in this plan, it is lacking the following elements:

- Background information to support the consideration of the offset proposal;
- Description and quantification of the development impacts for which offsetting is proposed as a compensation mechanism;
- Description and quantification of the offset site and management actions proposed to effect the compensation, accounting for timelag and risk factors,
- Explain how the site will be secured;
- Provide details on monitoring and reporting requirements; and
- Provide contingency planning options in the case of system failure or natural events which hinder progression.

[1] Whilst the applicant has stated in the PPR that the proposal will not have a significant impact on threatened species and ecological communities due to offsetting proposed, DECCW has argued that the applicants approach and adequacy of offsetting threatened species habitat and EECs is inadequate.

Figure 5 in the SRRP provides a simplistic depiction of EEC and other vegetation offset areas to be created via revegetation or restored via assisted regeneration. However this approach does not consider the natural processes of regeneration, particularly following removal of cattle from the site or cessation of slashing. The occurrence of these floodplain communities is highly dependant on small changes in topography, soils and hydrology. Site hydrology has been highly altered and there only appears to be a simplified analysis undertaken to determine if offset areas offer the suitable suite of conditions for the goal community to regenerate. Alternatively, revegetation of a community may be proposed in an area at the detriment of another floodplain EEC community, which may readily regenerate following removal of cattle and control of weeds.

Whist it is understood several more detailed management plans have been prepared for specific vegetation communities at the Cobaki Lakes site, a detailed site restoration plan must be prepared for the whole of site to enable a proper assessment as to whether offset targets are feasible and to tie the proponent in to restoration commitments.

Accordingly, Council requests the proponent amend the SRRP (or alternatively prepare detailed restoration plans for each management precinct) to include the following information:

1. Aims and objectives which form the basis for monitoring and evaluating the effectiveness of the restoration plan(s). Aims should be overall statements of what is to be achieved with the restoration plan(s). Objectives should be specific statements indicating how individual actions achieve the aims of the restoration plan(s). Aims and objectives should provide for ecological restoration of goal communities.
2. Measurable and time based performance indicators in order to establish if the objectives of the restoration plan(s) are being met. Performance indicators must be agreed to by Council.
3. Identification of any relevant planning, legal, physical or other constraints that may affect management of restoration areas.
4. The location and degree of infestation of noxious weeds and the class of each noxious weed according to the *Noxious Weeds Act 1993*, the location and degree of infestation of highly invasive environmental weeds, and the location and abundance of environmental weeds commonly encountered at the site (i.e. major weeds).
5. Identification of any issues and threats to biodiversity on or adjacent to the site that is likely to influence ongoing management both during construction and operation phases of the development. Examples include, fire protection and maintenance of bushfire asset protection zones; potential impacts from adjacent development – e.g. stormwater, sedimentation, incursions into restoration areas; environmental and noxious weeds; pest animals and domestic pets; livestock grazing; climatic hazards – e.g. drought, flood, fire; unauthorised human access – e.g. construction traffic, motorbike use, walking tracks; illegal clearing; rubbish dumping – e.g. garden waste, household and building waste; pollution incidents; site fragmentation and isolation; altered hydrology; and erosion.
6. Recommend action(s) to address each management issue/site threat.
7. Identify appropriate restoration strategies to be applied across the site. The restoration strategy should determine the goal community or communities across the site. Reference communities should be located (where possible) in close proximity to the site, have similar abiotic features and be in good condition with low levels of disturbance. The use of management zones will be necessary where there are spatial

or temporal variations in restoration strategies and required management actions across the site. Specific implementation strategies should be listed for each management zone, detailing the step by step approach, methods and techniques to be used for each restoration strategy. The SRRP prepared by JWA has indicated a restoration strategy (assisted regeneration or revegetation) for areas to be restored based on an assessment of the restoration potential of these areas, but provides very limited additional detail on the methods and techniques to achieve these restoration strategies. Additionally, some proposed regeneration areas are located adjacent areas of retained vegetation in very good condition. It would appear that in these areas, expansion of existing vegetation through control of threatening processes to facilitate natural regeneration would be a better restoration strategy.

8. Specific actions for management zones must also include measures to minimise impacts to flora and fauna during restoration works including changing weed control methods or herbicide use when controlling exotic grasses amongst native grasses and forbs, when controlling weeds adjacent a threatened plant species and when controlling weeds in aquatic habitat or habitat of frog species (particularly use of pesticides in Wallum frog habitat); timing on ground work in the vicinity of significant fauna habitat to avoid disturbance to breeding; minimising ground disturbance (i.e. trampling) in sensitive habitats; and specifying hygiene protocols were there is a risk of transmission of disease. For example spread of Chytrid fungus to threatened frog populations or spread of *Phytophthora cinnamomi* to susceptible plant communities.
9. An implementation schedule detailing actions to be undertaken across the whole of site and within each management zone to achieve the aims and objectives of the restoration plan(s). The implementation schedule should prioritise management actions and specify timing for the implementation of each management action for the duration of the restoration plan(s). The Schedule should also include resource requirements (including labour) for each management action.
10. Information on the qualifications of personnel involved in the implementation of the restoration plan(s). It is expected that on-ground restoration works are to be undertaken by persons with qualifications in the field of bush regeneration. Minimum qualifications and experience to undertake on-ground restoration works should comprise Certificate 3 in Conservation Land Management (Natural Area Restoration) or equivalent and 2 years experience working in the vegetation type(s) at the site.
11. A monitoring strategy which should set out the intended monitoring methodology and performance indicators, and must specifically address the management aims and objectives of the restoration plan(s). The monitoring strategy should set out timing of monitoring (baseline and ongoing), monitoring frequency and specify the qualifications of the personnel undertaking the monitoring.

Comment on specific sections and annexures of the SRRP is provided below.

Section 1.4.2 Performance Objectives

Several of the performance objectives which are to be reflected in plans produced for each management precinct are unsuitable/unachievable as detailed below:

- The SRRP proposes using threatened plant species in revegetation areas. No threatened plants species should be used in revegetation areas except in accordance with a site specific threatened plant species management plan. Such a management plan should be prepared in accordance with the Guidelines for the Translocation of

Threatened Plants in Australia (Australian Network for Plant Conservation 2004) and should consider promotion of natural recruitment of threatened species rather than collection of genetic material, propagation and revegetation.

- The SRRP states that at least 70% native canopy cover should be achieved within regeneration and revegetation areas. This objective is unclear and appears to suggest that it would be satisfactory for the community to have 30% weed canopy cover and 70% native canopy cover. This objective would also not apply to saltmarsh and freshwater wetland communities which do not have a canopy. A more suitable performance criterion would be that the composition, percentage foliage cover and relative abundance of each plant species is as per the reference/goal community after a stated period of time.
- The SRRP states that retained vegetation will be buffered from edge effects and other disturbance related impacts. According to Figure 4 in the SRRP, the proposed development area is located directly adjacent areas of retained vegetation. Therefore it would appear buffering retained vegetation (including threatened flora species) from edge effects and other disturbance related impacts is not achievable under the current proposal. The proposal needs to make allowance for buffers to restoration areas to minimise ongoing impacts during the construction and operation of the proposal. In response to Tweed Shire Council's comment on inadequacies of buffers to environmental protection areas, the proponent has stated that where buffers are not achievable, ecological plantings at the edge of but within the environmental protection zones will be completed to achieve the same objective. The proponent needs to define these areas and ensure environmental protection zone buffer plantings do not overlap with proposed offset areas for the clearing of EECs and other vegetation. Proposed offset areas should not have the dual function of providing a buffer. Offset areas must be maintained solely for conservation purposes.

Section 4.4 and Annexure 3 - Revegetation and Regeneration Approach

This Section details the restoration approach to be applied across the Cobaki Lakes site.

Section 4.4.1 states that at the completion of the rehabilitation works, all areas will be protected via conservation agreement in perpetuity or rezoned to Environmental Protection and dedicated to Council or the relevant State Government Department. Alternatively, the proponent states in its response to Council's submission that the saltmarsh area will be rezoned Environmental Protection and dedicated when its remediation is complete and other environmental protection areas will be dedicated at appropriate stages through the development.

As detailed in Council's submission on the Cobaki Concept Plan, the proponent needs to clarify the intent of protection and dedication of restoration areas. Should restoration areas be rezoned to Environmental Protection and dedicated to Council, the proposed terms of management needs to be agreed by Council, estimated costs of maintenance should be established along with strategies for sourcing funding to allow Council management of environmental areas in perpetuity. Additionally, offset areas need to be rezoned Environmental Protection at the outset of the project to ensure security from further development.

Section 3.2 of Annexure 3 provides very little detail regarding regeneration methods (six bullet points detailing control methods for woody weeds only). Specific detail needs to be provided by the proponent on how assisted regeneration methods will be employed to ensure successful restoration of EEC and other vegetation. Methods need to be detailed enough to guide on-ground works across the Cobaki Lakes site. It is not satisfactory to state that regeneration methods will be detailed in individual precinct plans, as an assessment can not be made as to whether restoration methods are likely to be successful in restoring EEC and other vegetation types.

Section 4.1 of Annexure 3 states that following primary weed control, sites will be left for two months to see if they need to be revegetated or if native species recruitment is sufficient. It is likely it will take longer than two months for a site to respond after a lengthy period of disturbance, particularly if the fruiting and seeding of parent material does not coincide with weed control work or environmental variables at the site are not conducive to plant germination cues. The SRRP needs to be flexible enough to allow and take advantage of the processes of natural regeneration, which will be lest costly and allow for better outcomes than a revegetation approach.

Section 4.1 of Annexure 3 also states that revegetation will continue on an as needed basis dependant upon the proponents budgetary constraints. As it is understood the revegetation program is tied in with 'creating' EECs to offset impacts from EEC clearing, the proponent must be tied into achieving specific performance criteria with regard to revegetation areas. The revegetation program should not be dependant on whether the proponent can afford the cost of revegetation. Site revegetation strategies also show a poor understanding of native regeneration processes.

Section 4.2 of Annexure 3 specifies seed collection methods for the revegetation component of the SRRP. The proponent must consider the issue of genetics in the collection and propagation of seed. The proponent must also consider the potential for over-harvesting and impacting on important food resources for wildlife or the local seed bank available for natural regeneration in the area. A section 132C licence under the National Parks and Wildlife Act should be obtained if collecting material from any protected native plant, or any plant that is a threatened species or is part of an endangered population or an endangered ecological community.

Section 4.3 of Annexure 3 states that a horticulturist would select plants for revegetation and specify methods, densities, etc for planting. As the revegetation component of restoration works is in essence creating EECs and other vegetation types lost from the development site, a horticulturist would not have the necessary experience and should not be responsible for this component of the SRRP. The suitability of sites for revegetation, species composition, densities, etc must be overseen by a suitably qualified ecologist with experience in ecological restoration in the vegetation communities addressed in the SRRP.

Annexure 4 – Propagation of threatened flora species

Annexure 4 states that revegetation works will include propagation and replanting of threatened species that occur on site, to bolster local populations of threatened species. As mentioned previously, no threatened plants species should be used in revegetation areas except in accordance with a site specific threatened plant species management plan which

provides scientifically based justification for the use of threatened species in revegetation areas.

This Annexure states that with regard to collection of seed of threatened species, populations or from EECs, a section 91 licence is required under the Threatened Species Conservation Act but that the Director General can not compel anyone to apply for a section 91 licence and it is the choice of potential applicants who must weigh up the risk of not being protected by a licence for actions which may result in harm to a threatened species, a population or an ecological community. This statement should be removed from the SRRP as it suggests that it is valid for the SRRP to be implemented by persons who have no regard for NSW threatened species legislation. Under section 118A of the National Parks and Wildlife Act, a person must not pick any plant that is of, or is part of, a threatened species, an endangered population or an endangered ecological community except if authorised under specific licences of development approvals.

Section 4.5 – Identification of significant ecological values

Existing and potential threats to significant ecological values (EECs, threatened species, significant fauna habitat) have not been addressed, neither have management actions been formulated to manage threats. This should be an essential component of the SRRP.

Section 4.6 and Annexure 5 – Weed control methods

Section 4.6 provides limited detail on weeds and weed control methods. This is the only management issue or site threat which is considered in the SRRP and it states that exotic weed invasion is a minor management issue affecting the subject site. Whilst considerable resources will be required for the control of weeds across the site, there is no detail on the location and density of weeds and no detail provided in Annexure 5 on specific methods to control weeds occurring on site.

It is likely cattle, whilst a vector for weed spread, are also keeping weeds under control. Following removal of cattle, weed growth and spread is likely. Therefore it is essential primary weed control follows soon after exclusion of cattle from restoration areas. Whilst exotic pasture grasses are not mentioned in the list of weeds occurring on site, it is likely these will be the most difficult and time consuming to control, particularly where occurring amongst native grasses and sedges and in sensitive wetland habitats where the use of certain pesticides may be limited.

Section 4.7 and Annexure 6 – Maintenance

Section 4.7 and Annexure 6 provides detail on maintenance requirements. Section 2 of Annexure 6 states that maintenance of revegetation and regeneration areas will be undertaken for a three year period. As the SRRP has been prepared by the proponent to provide justification for clearing and offsetting the removal of EEC and other vegetation, a three year maintenance period to restore and recreate EEC and other vegetation is considered inadequate. As stated by DECCW, reconstruction of ecological communities can take a considerable amount of time (50 to 100 years). Maintenance of offset areas needs to be undertaken until performance indicators have been reached. Performance indicators should be benchmarked values set against floristic and structural characteristics of the goal community. If Council are to manage restored areas once performance criteria have been

achieved, the proponent must estimate costs of maintenance of restored areas in perpetuity along with strategies for sourcing funding to allow Council management of these areas.

Section 4.8 and Annexure 7 – Monitoring

Section 4.8 and Annexure 7 provides detail on monitoring requirements. Section 4.8 states that monitoring is to be continued for a three year period after completion of regeneration works and revegetation works in each precinct. However, Section 1 in Annexure 7 states that a qualified ecologist will regularly monitor the condition of each precinct for the three year period after commencement of the regeneration and revegetation works. It is unclear whether a six year or three year monitoring program is proposed.

Annexure 7 refers to monitoring of basic indicators and Table 1 provides a list of attributes to be surveyed. The attributes to be surveyed are specific to rainforest communities only and are not applicable to the range of vegetation communities which the SRRP covers (i.e. saltmarsh, swamp forest, wet sclerophyll, etc). Additionally, no performance criteria have been developed by the proponent. In order to ensure that the implementation of the SRRP is successful in achieving offset targets, the proponent must develop performance criteria and these must be agreed to by Council. The proponent then needs to develop monitoring attributes specific to each vegetation community to enable an assessment as to whether performance criteria have been achieved.

Reporting requirements are vague. Reporting must include an evaluation of performance criteria. Proposed frequency of monitoring and reporting must be agreed to by Council.

It is noted that a water reservoir is proposed on land zoned 7(d) Environmental Protection and mapped as very tall open/closed sclerophyll forest (*E. pilularis* +/- *E. microcorys* +/- *E. propinqua* +/- *Corymbia intermedia*) within the SRRP. Based on the dominant canopy species this appears to be koala habitat. What is the justification for putting a water reservoir in this location? Additionally, the SRRP has not considered the impacts of constructing and maintaining a road to this proposed facility, which would bisect an area of retained vegetation which the SRRP proposes as an offset area. This land use is considered in conflict with the SRRP and proposed wet sclerophyll offset area.

Section 4.2.3 of the SRP provides descriptions of vegetation communities within the saltmarsh rehabilitation area. Within the description of community 12 – low closed grassland with scattered trees (pastoral grasses +/- mixed species), the SRP states that there is a row of old growth Forest Red Gums at the Piggabeen Road entrance in the southern portion of the Cobaki Lakes site. Throughout the area mapped as community 12, the most common scattered tree species with the saltmarsh rehabilitation area include Forest Red Gum and Swamp Oak. It is possible this community, in particularly the Forest Red Gums at the Piggabeen Road entrance, is Subtropical Floodplain Forest of the NSW North Coast Bioregion, an EEC listed under the Threatened Species Conservation Act. Forest Red Gum is one of the dominant species in this community and this EEC is known from the locality (the southern side of Cobaki Creek and Piggabeen Road). The proponent should make an assessment of whether this community (or part of) fits the description of this EEC and if so, undertake and assessment of impacts to this EEC.

Conclusion

There are significant concerns in respect of the management plans for environmental areas and impacts to threatened species and Endangered Ecological Communities for the proposal, which do not appear to have been adequately addressed. The following recommendations are made in this regard:

- The applicant should prepare Section 5a assessments under EP&A Act for threatened species and ecological communities affected by the Cobaki Lakes central open space proposal.
- In light of detailed design drawings that have been submitted with the Project Application, the Freshwater Wetland Rehabilitation Area as defined in the Freshwater Wetland Rehabilitation Plan is considered unsuitable as an offset for Freshwater Wetland EEC and Wallum Froglet habitat that will be cleared as a result of the proposal. Either an alternative offset area must be located or design plans must be amended so the Freshwater Wetland Area functions solely in the rehabilitation and conservation of freshwater wetland habitats. Furthermore, the current offset (8.89ha) is considered inadequate to compensate for the loss of 26.45ha of Freshwater Wetland EEC and Wallum Froglet habitat.
- Until a detailed Wallum Froglet Compensatory Habitat Plan and offset agreement has been prepared and approved by Council and DECCW, no habitat for this species (i.e. freshwater wetland within the proposed central open spaces area) should be cleared.
- Stormwater from the central drainage system should not be discharged into the Saltmarsh Rehabilitation Area as proposed in the stormwater management plan. This offset area should not have as a dual function the treatment and management of stormwater flows from the development. An alternative drainage pathway and discharge point needs to be determined in consultation with Council.
- The Saltmarsh Rehabilitation Plan should be amended in accordance with advice provided in this memo. This includes a much more detailed site analysis to better guide restoration targets and goal communities.
- Site specific regeneration and revegetation management plans should be prepared and approved by Council for management precinct sites 3, 6, 8, 9 and 13 which are included within the project application site as detailed in the Site Regeneration and Revegetation Plan. Site specific management precinct plans must include an assessment of whether these areas are suitable for use to offset clearing impacts as various infrastructure and works are proposed within four of these five sites and conflict with the restoration outcomes proposed.
- The Site Regeneration and Revegetation Plan should be amended in accordance with advice provided herein.
- According to the proposal, offset areas are subject to other land uses and are in conflict with rehabilitation and conservation of these areas in perpetuity. In light of this, the applicant needs to reassess proposed offset targets, as it is considered highly unlikely these can be met. If offsets can not be met, Section 5A assessments for threatened species and ecological communities must be amended and an assessment made by the applicant as to whether the proposal will have a significant impact on these species and communities.
- Any offset area should be zoned Environmental Protection at the outset of the project to ensure security from further development.

- The developer should be responsible for management under the approved management plans supervised by Council until agreed performance standards are achieved.
- Transfer of lands to Council or the relevant State Government Department (subject to their agreement) should be carried out as soon a practical after commencement of the development.
- Arrangements should be made to ensure that sufficient funds are generated from the development to allow Council or the relevant State Government Department (subject to their agreement) manage areas set aside for environmental purposes in perpetuity.

Entomologist

The same entomological concern expressed in the PPR submission also applies to the PA in relation to one of the proposed Casuarina block plantings and contiguous mixed species vegetation as described in Fig 12 of the Saltmarsh Rehabilitation Plan adjacent to Cobaki Creek opposite the Cobaki Broadwater Village.

Construction of new infrastructure to ensure the appropriate tidal inundation 6.2.6. –

Concern is raised as to whether a proposed weir structure within the existing drain on Cobaki Creek would be as effective as a tidal floodgate fitted with adjustable sluice in providing the appropriate tidal inundation and control to effectively reduce mosquito and biting midge breeding on site. There is concern that a weir may also be less effective than a tidal floodgate / sluice in reducing mangrove seed dispersal into the site, which may lead to mangrove domination of the saltmarsh. Concern is raised that a weir may restrict flood flow from the drain.

Waterways and Coast Coordinator

Background

The proposed development is directly adjacent to Cobaki Creek and ultimate construction will result in the concentration and discharge of stormwater to Cobaki Creek immediately upstream of Cobaki Broadwater. These comments relate to ASS and stormwater and its potential impact on water quality and habitat/environmental values both onsite and in downstream environments, and have been informed by significant work undertaken in this area by Councils Natural Resource Management Unit over the past two years.

Cobaki Creek is the major tributary of the Broadwater, a broad shallow embayment that is connected to the main Tweed River via Terranora creek and Inlet. Both the creek and broadwater have significant environmental, economic and recreational values.

In 2008 and 2009 Council undertook intensive water quality and stream ecosystem health monitoring in the waterways. The results of this work have been analysed and included in a report card style document (rated A to F) that has been broadly promoted to the community.

Cobaki Creek has been scored as C-, and is described as a waterway in fair condition that suffers from elevated nutrients and degraded riparian vegetation. Cobaki Broadwater is classified as C, and described as having poor water quality, particularly in wetter months due to high nutrient and sediment loads from the catchment. Nutrients act to promote

growth of phytoplankton (algae) in the water column and can lead to reduced dissolved oxygen concentrations and ultimately a less habitable environment for fish, crustaceans all the higher orders of estuarine life.

After completion and promotion of the ecosystem health monitoring program, Council has completed and will soon adopt a catchment management for the system. This document includes a detailed description of the cause and effects of poor water quality, and sets out a broad range of actions to address the significant decline in environmental quality in the catchment and estuary. It has been determined that the nutrient of greatest concern in the estuaries is nitrogen, in particular its dissolved inorganic forms, Ammonia and Nitrate. These forms of nitrogen are associated with urban runoff.

Ecosystem response modelling for Cobaki Broadwater has assessed the cumulative impact of developing both Cobaki Lakes and the Bilambil Heights estates. Results of modelling indicate that Cobaki Broadwater is particularly sensitive to any increase in dissolved inorganic nitrogen concentrations in runoff from developed areas, and that the magnitude of development proposed for this part of the catchment will in all likelihood, have a major impact on water quality in the estuarine reach of Cobaki Creek and Cobaki Broadwater.

These waterways are showing signs of ecological stress due to elevated nutrient and sediment loading, and will be extremely sensitive to increased catchment loads . This sensitivity arises from (1) the relatively large contribution of the future developed catchments to overall discharge, (2) the long residence time of receiving waters due to limited tidal flushing and (3) the shallow morphology of the Cobaki broadwater.

The above information serves to highlight the critical importance of attaining the best possible outcome for stormwater quality and quantity discharged from the proposed subdivision.

Acid Sulphate Soils and Stormwater Infrastructure

Treatment of urban stormwater to the highest possible standards, particularly in the reduction of nitrogen, is essential to avoid increasing the risk of eutrophication of Cobaki Broadwater. The development site is however highly constrained because a significant proportion of stormwater infrastructure subject to this application is proposed to be sited in areas underlain by highly reactive acid sulphate soil. It is essential that works proposed to improve water quality (by reducing nutrient and sediment concentrations) do not result in the creation of ASS impacts, including release of acid and mobilisation of high concentrations of iron and aluminium.

The Acid Sulphate Soil Assessment and Management Plan included in the central open space project application (Gilbert and Sutherland November 2009) makes reference to the potential impacts of constructing a lake, stormwater treatment infrastructure (wetlands) and augmentation and rehabilitation of an existing drain in the central open space area, which is broadly underlain by ASS soils. The concluding statement of the assessment is that, “With appropriate management exercised during the construction and operation phases of the development, no substantive impacts are anticipated.”

The ASS assessment notes that at this time investigations to identify ASS have not been undertaken in accordance with ASSMAC guidelines, and also concedes that, “the entire central open space area, south of the lake, is underlain by acid sulphate soils with high acid generating potential.”.

It is proposed in the ASS assessment that further investigation of ASS be undertaken once the detailed design of stormwater and drainage infrastructure is finalised.

From both a construction and particularly a long term operational perspective, this approach is considered to be unacceptable.

There are 9 stormwater treatment wetlands proposed to be constructed in the area south of the major lake, in areas known to be underlain by acid sulphate soils with high acid generating potential. A detailed ASS assessment should be undertaken to inform the location and depth profile of these ponds, and assess the risk that their construction poses to the environment, prior to the approval of the drainage and stormwater treatment concept. Avoiding exposure of ASS is universally accepted and documented in ASSMAC guidelines as the first and most important principle of ASS management. All precautionary steps must be undertaken to avoid creating long term acid generation potential in this central open space area which drains to Cobaki Broadwater.

This comment applies equally to the augmentation and rehabilitation of the existing drain in the open space corridor.

In addition to the lake and 9 stormwater treatment wetlands proposed, a large open channel is proposed within the site, with branch connections sized to accommodate 1:100 ARI flows to urban stormwater catchments. It has been well documented during research into the floodplain drainage network in the Tweed Valley that the area immediately adjacent to drainage channels is the zone contributing most acid and mobilised Fe and AL to waterways. Broad shallow drains (and stormwater treatment wetlands) may be able to be constructed that do not intersect the acid soil horizon, however If this is not the case, constructed drains will be a significant ongoing issue in terms of acid and metals export to Cobaki Creek and Cobaki Broadwater. The ASS assessment and management plan included within the project application does not provide any information with regard to the long term management of drains or wetlands, should it be found that they become a source of acid within the environment. A recent project undertaken by TSC’s NRM Unit to rehabilitate a cane drain that intersected acid soil layers, cost $156, 000 over 1000 metres.

The depth of excavation of the channels should therefore be accurately informed by detailed ASS investigations, to ensure that ASS is not exposed through drain augmentation and to ensure that hydraulic drawn down of adjacent groundwater does not result in oxidation of PASS material in the adjacent soil profile.

<u>Stormwater Quality and Lake Management</u>

Management of nutrient and resultant algae growth in lake waters will be difficult. Despite the expected removal of nutrients and sediments via the treatment train approach prior to the lake, if the lake has a significantly high hydraulic retention time, algae blooms will become an issue. Predicted lake water quality as described in table 3.1.4 and 3.1.5 of the Stormwater Quality Management Plan confirm the consultants concerns in this regard.

It has been proposed in the project application that recirculation of saline Cobaki Creek waters through the lake system would be possible, and this could be effective in controlling algae. This proposal appears to be based on the assumption that saline water will control the growth of phytoplankton, however this is absolutely not the case.

The primary focus of water quality recommendations included within the Cobaki and Terranora Broadwater Catchment Management Plan is the reduction of nutrients so that algae growth (phytoplankton, measured as Chlorophyll a) is reduced in the broadwaters.

These waterways are subject to high levels of algae growth due to existing nutrient loading from the catchment. Pumping water from Cobaki Creek into the lake will import the full suite of algae species from estuarine waters to the lake, and potentially increase their capacity to bloom by releasing this mix into a water body that has higher nutrient concentrations and is less efficiently flushed. The time when saline flushing is proposed (summer) is the same time when natural increases of estuarine algae growth would be expected, due to increased catchment runoff, warmer temperatures and increased light.

An additional risk in pumping saline water into the lake is that it introduces sulphate to the system, which in the presence of decaying organic matter accumulating in the lake and drain bottoms creates conditions conducive to the formation of monosulfitic black ooze (MBO's). MBO's are now recognised as one of the major contributions to fish kills following flood events, having the ability to rapidly and comprehensively strip dissolved oxygen from waters when they are mobilised during high flow events.

It does not appear that a well development process for managing algae growth in the lake has been able to be determined. There is a significant risk that inclusion of a lake as described will not meet the objectives of the proponent, and in the long term, that it will result in significant management problems for Council. As such, it would be unwise for Council to support development of a lake in the current form.

Should you require any further information regarding this letter, please contact Rowena Michel on (02) 6670 2468.

Yours faithfully

Vince Connell
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