1.0 Background

The EPA response also included a range of assessment requirements for any proposed discharge to local waters. Based on those assessment requirements, detailed investigations of the local hydrology, aquatic ecology and beach dynamics have been carried out. The EPA also required that worst case assumptions be the basis of the assessment. In addition, a detailed assessment of the benefits of a wetland on the treatment plant site also has been undertaken.

Worst case assumption hasn't been modelled or investigated, particularly the dry weather low flow period release of treated effluent into the local waterway. The analysis of impacts is an 'average' impact over a year, the risk assessment should look at a dry period event and the associated ecological and human health risks (swimming exposure in creek and lagoon). The low flow 7 day;10-year (7Q10) impact is generally used as the reference event this type of STP discharge impact assessment[1]. Mixing zone assessment should also be undertaken, particularly for ammonia, using the low flow event.

The addition of a subsurface flow wetland treatment system for the SDRW has been identified as providing significant nutrient and pathogen reduction prior to SDRW discharge.

Wetland treatment is considered an effluent polishing technology. As it is replacing a leading practice treatment technology (RO plant), this is a significant reduction in the level of treatment of treated effluent proposed to now discharge into a local creek. The change from zero discharge to around 50% discharge + the reduction in the level of treatment increases ecological and human health risks significantly. The risk assessment needs to be reviewed by a panel of ecological and human health experts.

Dry release will be to the beach lagoon at a rate at which inflow of the SDRW matches the beach lagoon outflow.

If a discharge occurs during a dry period with limited catchment inflows into the lagoon, the beach lagoon water will be close to 100% treated sewage effluent – this is not acceptable..

2.0 The Proposal

The standard is that up to 20 ML of this quality water can be ingested up to 50 times per year without human health effects.

This should be 20 millilitres, not megalitres. Note that this is a workplace risk, not a public health risk.

The overall process will produce wetland-treated recycled water, which will be temporarily stored prior to offsite discharge.

This is not true. The process will produce wetland polished sewage effluent for disposal to the environment. The recycled water doesn't get wetland polishing, only treatment via the STP – see Drawing Number 56-RW-PFD-ST3-1A in Appendix 4.

The amended treatment process removes reverse osmosis (RO), and includes a wetland treatment step and additional dechlorinated SDRW storage.

---

[1] *The 10-year (7Q10) annual low-flow statistic is based on an annual series of the smallest values of mean discharge computed over any 7-consecutive days during the annual period. A probability distribution is fitted to the annual series of 7-day minimums, and the 7Q10 statistic is the annual 7-day minimum flow with a 10-year recurrence interval (non-exceedance probability of 10 percent).*

Any discharge to the environment should have RO treatment for this location - subject to ecological and human health risk assessments.

The current proposal will involve changes to the STP site layout and additions to the sewage reticulation system to include SDRW release points.

SDRW is treated sewage effluent.

Proposed Changes from WICA Licence Approval

One release point will be below the Stage 6 and 7 stormwater basin (for wet release) and the other adjacent to the existing stormwater flow path in Lindsley Street in the CHB village (for dry release). Both these release points and their construction will be done as part of stormwater work required under the Beaches subdivision MP10_204 approval. The Lindsley Street works are associated with stormwater for the intersection upgrade of the Lindsley Street / Hale Street / Flowers Drive intersection.

Subject to the EPL being issued by NSWEPA. It is not good industry practice to allow STP treated effluent outfalls to connect to stormwater infrastructure within the urban footprint adjacent to houses. Even more concerning is that the STP effluent flows to a lagoon near a popular surf beach.

Recycled water storage will be increased to include an additional 3 ML for wetland treated SDRW (2 ML of storage is already approved for recycled water produced by the advanced water treatment plant, and the additional 3 ML of SDRW storage will increase total storage of recycled water to 5 ML

This is not true:

1. *The 3ML storage is for wetland polished treated effluent for disposal to the environment – not for recycling*
2. *The advanced water treatment plant is not advanced without the RO treatment process. The 2 ML of storage is for tertiary treated sewage that could be used for recycling – no additional 'advanced' treatment processes, such as RO or advanced oxidation disinfection, are proposed.*
3. *Recycled water storage could be described as 2ML and waste treated effluent storage is 3ML.*

A key change to the treatment process is the removal of RO capacity. RO extracts salts but produces a high salinity wastewater.

This is a high-risk option.

Removal of the RO enhances the sustainability of the plant by removing a high energy demand process and the need to transport high salinity waste from the site for disposal elsewhere. The risks are therefore removed regarding the storage of highly saline water in an area adjoining, and draining to conservation lands.

This is not true using a balanced scorecard approach. Yes, GHG emissions may reduce, subject to accounting for the fugitive GHG emissions from the proposed wetland system, however, pathogen and chemical hazards discharged into the environment increase significantly with removal of irrigation and RO treatment. Overall, the whole proposal is not sustainable.

The wetland treatment of SDRW will provide additional treatment for nutrients, pathogens and free chlorine removal.

This is not true as it should be compared to the zero environmental discharge with leading practice treatment (RO plant) option approved under the stage 1-5 approvals.

3.7 HYDROLOGY AND WETLAND TREATMENT OF SDRW

The hydrology work also provided opportunities to review utility operations with a view to improving the sustainability of the utility and SDRW releases. This led to increased storage for SDRW on the site and the addition of wetland treatment of effluent to improve water quality. The potential for use of a wetland on the CHB utility site to improve SDRW water quality has been investigated by Whiteheads and Associates (refer to Appendix 8).

Sustainability should be compared to the zero environmental discharge with leading practice treatment (RO plant) option approved under the stage 1-5 approvals.

Sustainability hasn't been assessed using the worst case assumption, particularly the dry weather low flow period release of treated effluent into the local waterway. The analysis of impacts is an 'average' impact over a year, the risk assessment should look at a dry period event and the associated ecological and human health risks (swimming exposure in creek and lagoon). The low flow 7 day;10-year (7Q10) impact is generally used as the reference event this type of STP discharge impact assessment. Mixing zone assessment should also be undertaken, particularly for ammonia, using the low flow event.

The wetland treatment significantly reduces the pollutant load in the SDRW but complicates the hydrology of release.

Pathogen and chemical hazards discharged into the environment increase significantly compared to the zero discharge to waterways arrangement in the current approval. Removal of irrigation and RO treatment is a backward step. Overall, the whole proposal is not sustainable.

The maximum modelled annual dry release is 4.0 ML and occurred for 2004. In 2004 catchment flow was 303 ML from 1,115 mm of rainfall. In 2004 the dry release followed 73 days and 57 mm of rain without wet release. For the year of maximum dry release, the volumes represent 1% of annual flow through the lagoon. No dry release was required for 23 of the 35 year modelling period.

Worst case assumption hasn't been modelled or investigated, particularly the dry weather low flow period release of treated effluent into the local waterway. The analysis of impacts is an 'average' impact over a year, the risk assessment should look at a dry period event and the associated ecological and human health risks (swimming exposure in creek and lagoon). The low flow 7 day;10-year (7Q10) impact is generally used as the reference event this type of STP discharge impact assessment. Mixing zone assessment should also be undertaken, particularly for ammonia, using the low flow event.

Suggested Options for way forward

Option 1 – Advanced water treatment for all flows using RO, 90% recycling, land irrigation and 10% discharge during wet weather events with zero-net nutrient emissions via offsets.

1. RO treatment plant must remain as an integral part of the scheme as it is a key risk reduction process. Remove the wetland treatment system to polish the treated effluent.
2. Eliminate dry weather release through additional storage and land irrigation.
3. As indicated by the NSWEPA, land irrigation must remain as an integral part of the scheme as it is a key risk reduction process. The proponent should investigate options to achieve 90% reuse in at least a Q10 year. Options for additional land irrigation:
    a. Development footpaths, road verges, parklands (to be maintained by Solo Water if the Council won't maintain
    b. 200Ha of conservation land donated as part of the development

    c. Outdoor use to existing CHB residents.
4. RO concentrate should be stored in a covered tank for offsite disposal
5. A nutrient offset project in the affected creek catchment should be conditioned so the development can achieve zero-net nutrient emissions to the creek. This could be streambank restoration, riparian improvement or improved stormwater treatment.

Option 2: no advanced water treatment or effluent polishing. Pump waste treated effluent to Hunter Water sewerage system.

1. Remove the wetland treatment system to polish the treated effluent.
2. Remove the RO plant and irrigation area.
3. Install an waste effluent pump station and rising main back to Hunter Water sewerage system (subject to HW acceptance and other approvals).
4. As it is tertiary treated effluent to be pumped, previously identified sewage pumping risks aren't relevant.
5. A smaller volume to be pumped compared to original investigation (50%) means costs will be significantly lower and this option now may be feasible with investment needed for the RO plant.
6. Opens up opportunities for the waste sewage effluent to be recycled by new customers adjacent to the new pipeline alignment - could generate some shared value for the wider community.

Additional comment –

Based on the commentator's experience reviewing 3rd pipe recycled water schemes, demand is always lower than predicted. Calculationss are for ultimate 550 lots:
223kl/day sewage influent
89kl/day recycled back to 550 lots
134kl/day surplus treated effluent requiring disposal.
add 10% they use for conservative = ~150kl./day to dispose.

The Report uses 100kl/day in all the modelling.

Reality will likely be 50% more than modelled – this makes a big difference to everything including - (storage tank sizing, amount released, loads to creek, impacts etc.)

Table 1: Summary of changes to STP and operations

Change	Justification	Response
Delete SDRW irrigation area and add Recycled Water Reticulation System	Allow completion of Stages 6 and 7 of the approved subdivision. Allow reasonable economic operation of the water utility.	SDRW should be renamed throughout the document as it is waste treated effluent, not recycled water - this is misleading Recycled water reticulation system is known in the industry as a STP outfall - this is misleading There is no supporting evidence of the economic benefits of the extra 80 lots in Stages 6 and 7 - sounds like developers trying to profit at the expense of the local environment
Dispose of SDRW to environment	Provide for sustainable alternative to irrigation area for SDRW disposal.	SDRW is waste treated STP effluent - misleading Discharge of treated effluent into a waterway in a conservation area, coastal lagoon and popular surf beach is not sustainable.
Install wetland SDRW treatment	Improve quality of SDRW including free chlorine removal.	Wetland treatment performance is significantly worse than the RO treatment it is replacing. This will result in a significant increase in pathogens and chemical hazards and exposure risks compared to RO treatment Free chlorine isn't an issue if irrigated onto pasture or plantations
Increase onsite SDRW storage to 5 ML	Optimise SDRW release for minimal environmental effect.	The storage only reduces likelihood, not consequence. Therefore environmental effect, particularly during dry weather release is not mitigated.
Delete utility RO capacity	Reduce energy use of treatment plant and avoid RO waste storage, transport and disposal issues.	Energy use decreases with the wetland, but fugitive GHG emission from the open wetland system will increase significantly. Whole project carbon footprint should be included for scope 1 and 2 GHG emissions. Road transport of waste byproducts from STP's is a standard cost for all utilities. This is not a burden with regional waste disposal options in the Hunter Water area.
Remove RO waste ponds	Provide area for SDRW wetland treatment capacity.	Waste ponds should never have been approved in the first place. Industry standard is that waste RO concentrate should be stored in tanks with camlock valves for low risk waste transfer to tankers.
Install release points for SDRW	Allow for controlled release of surplus recycled water to the environment.	This is subject to an EPL from the NSWEPA. It's not sustainable to discharge treated effluent into the proposed locations due to ecological and human health risks without the RO plant.
Revised utility water management	Improve management and sustainability of water utility and protect conservation lands.	Discharge of treated effluent to the local creek and beach lagoon is not sustainable irrespective of management interventions.

Table 2: Summary of Additional Risk and Environmental Impacts of Proposed Changes

Change	Additional Risk / Impact	
Delete SDRW irrigation area	Potential for changed impacts on downstream receiving environment.	Risks are high as the main risk mitigation treatment process, the RO plant, has been removed. Proposal increases load on local creek by 60% for TN and 40% for TP and for beach lagoon 24% for TN and 12% for TP - this is not sustainable and will lead to eutropication and local algal blooms.
Add recycled water reticulation system to stages 6 and 7	Positive impact being an essential component of the proposed water recycling service, very low additional construction risk as it can be installed as part of the subdivision works.	Only ~50% of treated effluent will be recycled, leading industry practice is >90%. 50% discharge of treated effluent to a local creek is not accptable for a location with high ecological and social values.
Dispose of SDRW to aquatic environment	Potential for increased downstream environmental impacts including flooding, physical changes to water courses, ecological effects, eutrophication, decreased recreational amenity.	Agree. This alone should be sufficient to reject the iPART approval and EPL. Note that SDRW is waste STP treated effluent
Install wetland	None identified subject to adequate wetland management.	The wetland is replacing leading practice RO treatment. RO treatment significantly removes all contaminants compared to a wetland. This increases risk, expecially now it is an environmental discharge instead of irrigation.
Install additional SDRW storage capacity	Possibility of visual impact/water, reduced potential for downstream impacts.	Additional ecologial and human health risks are significant. The proposed wetland effluent isn't disinfected and may be stored for very long periods - high risk of pathogen regrowth in storage. Note SDRW is waste treated effluent. Storing effluent without any disinfection residual for long periods is high risk, particularly via the environmental discharge route proposed.
Remove reverse osmosis capacity	Increased salinity load downstream but lower risk of onsite storage ponds over flow / breaching / groundwater impacts. Eliminates risks of RO storage transport and waste disposal.	Increases load of all contaminants, not just salt. RO concentrate storage ponds should never have been approevd in that location - should be stored in tanks to mitigate this risk. Risks associated with tankering wastewater from a STP can be easily engineered out through prudent design and basic operating procedures..