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Mr Scott Jeffries  
Manager Critical Infrastructure and Special Projects  
Office of Sustainable Development Assessments and Approvals  
Department of Planning  
Via email: [scott.jeffries@planning.nsw.gov.au](mailto:scott.jeffries@planning.nsw.gov.au)



HEALTHY CATCHMENTS  
HEALTHY OCEANS

Dear Mr Jeffries

**Submission : Sydney Water Corporation's Proposed Western Sydney Recycled Initiative: Replacement Flows Project Environmental Assessment**

This letter sets out the comments of OceanWatch Australia Ltd (OWA) in relation to Sydney Water Corporation's (SWC) proposed Western Sydney Recycled Initiative: Replacement Flows Project (the Project). OceanWatch Australia is a national environmental, not-for-profit company that works to achieve sustainability in the Australian seafood industry through protecting and enhancing fish habitats, improving water quality and advancing the sustainability of fisheries through action based partnerships with the Australian seafood industry, government, natural resource managers, private enterprise and the community.

OWA supports the release of "environmental flows" to the Hawkesbury-Nepean River system, environmental flows, being the amount (and the timing) of freshwater that is required to maintain the health of aquatic ecosystems (Pierson et al., 2002). SWC proposes to replace natural environmental flows releases from Warragamba Dam with advanced treated tertiary effluent released just below Penrith Weir in order to obtain greater security of potable water from Warragamba Dam. The Environmental Assessment (EA) predicts that there will be a net neutral effect on flows in the Hawkesbury Nepean, however this is dependent on additional flow releases from the Nepean Dams (riding on the outcomes of the Metropolitan Water Sharing Plan which is yet to be finalised). OWA does not support this proposal in its current form as we do not believe our concerns, as summarised below and discussed in the following sections have been adequately addressed in relation to:

- the resultant "health" of the replacement flow;
- the need for a detailed assessment of the quality of the discharged "brine";
- certain external proposals/initiatives that will considerably impact on the environmental outcomes of this proposal;
- the need for a detailed assessment of the impacts of the Project on South Creek;
- the impacts of the proposal on the aquatic environment and on the commercial/recreational fishing industry;
- poor consultation with industry; and
- the need for more detailed monitoring of the Project.

Many of these concerns are required to be addressed as part of the Environmental Assessment Requirements of the Director General for Planning. OWA believes that SWC has failed to adequately address these requirements.

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### **1. Healthy river = Healthy and viable fishing industry.**

The health of the study area i.e. Hawkesbury-Nepean River Catchment and the aquatic ecosystem it supports is crucial for the survival of the many commercially and recreationally important species of fish and crustaceans. These include bass, mulloway, mullet, flathead, bream, squid (lower estuary) and most significantly the school prawn *Metapenaeus macleayi*, targeted by the commercial prawn trawl fishery and utilised by recreational fishers as bait across NSW. The school prawn is also an important food source for fish and other communities which inhabit the Hawkesbury-Nepean River. Thus, the river supports viable commercial and recreation fishing industries (note there are between 75 and 100 commercial fishing licenses held for the Hawkesbury-Nepean River system) that are dependent on the health of the river.

The recreational and commercial fishing industries can therefore be regarded as integral stakeholders in any proposed activity, such as this Project, which impacts on the aquatic environment.

### **2. Current health of the Hawkesbury-Nepean River.**

Numerous reports such as the Healthy Rivers Commission Inquiry into the Hawkesbury-Nepean River, (1998) and the Hawkesbury-Nepean River Management Forum Report (2004) state that the Hawkesbury-Nepean River System is under stress. Agricultural and urban runoff, extraction for irrigation and urban needs (supplies 80% of Sydney's drinking water), and the discharge of effluent from 18 sewage treatment plants (STPs) have placed considerable strain on the river. This is illustrated by the elevated river temperatures, excessive nutrients, low flows and the proliferation of aquatic weeds. Growth of Sydney in the western and north western sectors will place continued strain in terms of water extraction and sewage discharge.

A long-term approach to improving river health needs to be embraced. An integral component of this is the maintenance of environmental flows and advanced treatment of tertiary effluent for all STPs discharging into the river. However, SWC indicated at a meeting held on 1 December 2006 with a range of stakeholders (HNCMA office in Windsor) that further upgrades of treatment plants will be driven by the end use rather than the long-term protection of the aquatic environment.

OWA believes that SWC needs to take responsibility for the river system, instead of treating it like a sewer drain, compromising the health of the river and imposing on the community and future generations the economic legacies of continual clean-ups.

### **3. Environmental flows for the health of the aquatic environment.**

OWA supports increased natural environmental flows to the Hawkesbury-Nepean River. These flows provide many environmental benefits, most notably in the case of the Hawkesbury Nepean, is the dilution of existing discharged sewage effluent that is entering the study area and flowing downstream (with elevated nutrients, environmentally relevant concentrations of EDCs and PPCPs). OWA recommends that the following key points need to be addressed in the EA if the proposed "replacement flows" (consisting of advanced tertiary treated effluent) are to adequately "replace" the environmental benefits provided by natural environmental flows.

- Flows consisting of treated effluent are not equivalent to natural environmental flows, in terms of chemical composition and nature and timing of dispersal.
- "replacement flows" should be of a superior quality, mimicking natural flows in terms of salinity, timing and nature of release, temperature (accounting for seasonal variation), oxygen, pH Chlorophyll-a and complex chemical loads (removal of endocrine disrupting chemicals – EDCs and Pharmaceuticals and Personal Care Products (PPCPs)).

- If levels within Warragamba Dam increase such that there is sufficient water in the dam to return to previous arrangements/or if there are significant health issues within the Hawkesbury Nepean, environmental flows from Warragamba should be released. This is consistent with what is proposed in the EA (p 3.2.4) states:

*“long-term shutdown of the AWTP (Advanced Water Treatment Plant) will occur if “there is ample water available to provide releases from the dam than from the AWTP.”*

#### **4. Flows – uncertainties**

The success of this Project is dependent upon the removal of weirs and the environmental flows released from the Nepean dam. However, there are a number of unknowns in this equation hinging of the outcomes of the Metropolitan Water Sharing Plan, which is still yet to be finalised. This is reflected in section 2.2.5 p 2.12:

*“the Water Sharing Plan for the Sydney region is likely to include requirements with the potential to affect the Replacement Flows Project....”* This includes: *“Define releases of environmental water from dams and weirs..”*; and *“Define an overall long-term extraction limit for each river (including the Hawkesbury-Nepean).”*

The amount of water that is to be extracted by irrigators (the greatest users of water) is still to be resolved with stakeholders by the Department of Natural Resources. If the outcome is greater extractions than estimated (in the EA), then the success of the Project will be jeopardised and the health of the Hawkesbury-Nepean will be further degraded.

#### **5. Treatment of effluent for environmental flows**

It is critical that the proposed advanced treatment effectively removes nutrients such as nitrogen, phosphorous (and associated compounds), together with chemicals such as EDCs and PPCPs, and is discharged at the appropriate temperature, salinity, oxygen content of “natural” flows at the discharge point if it is to adequately replace natural environmental flow releases from Warragamba Dam.

This is crucial for the maintenance of the health of the aquatic ecosystem, with nitrogen and phosphorous fuelling prolific exotic weed growth that chokes the river system, and chemicals such as EDCs causing adverse effects to aquatic life, even at very low concentrations (the EA makes no mention the impacts of such chemicals to aquatic life). The following factors must be considered and adequately addressed in the EA.

##### **5.1. Impact of EDCs and PPCPs on the aquatic environment**

The impact of chemicals such as EDCS and PPCPs on the aquatic environment is illustrated in the *“National Framework for Chemicals Management in Australia Discussion Paper July 2006”*, which states:

*“Nonyl phenol ethoxylates, a commonly used group of industrial detergents, have been found in sewage effluent in Australia and a range of countries at concentrations that would be likely to cause adverse environmental effects... At the concentrations found these chemicals can kill fish and other aquatic organisms as well as impact reproduction (they are endocrine disrupting chemicals) and development.... The UK banned the use of this group of chemicals for a wide range of uses from January 2005. In Australia, they are listed for a chemical review assessment by NICNAS but as yet no review has commenced.”*

Recent research has shown that some EDCs can interfere with the reproduction and development of humans and other animals, particularly fish, even at extremely low concentrations (i.e. on the order of nanograms per litre and lower) (Reinhard et al., 2003). Batty and Lim (1999) found that male mosquito

fish in a waterway downstream to a sewage treatment plant in Western Sydney had significantly shorter anal fins (growth triggered by testosterone) than those that dwell in the upstream.

Additionally, common pharmaceuticals have exhibited adverse effects on zooplankton, which is integral to the health of freshwater ecosystems (eg zooplankton Daphnia, are eaten by fish and eat and thus control algae. For example studies have shown that when Daphnia were exposed to a pharmaceutical cocktail of cholesterol lowering drugs such as, clofibril and the anti depressant, fluoxetine (at environmentally relevant concentrations of just 10 parts per million) the offspring were more likely to be female, had more deformities, and up to 90% died immediately after exposure (Graham, 2002).

### **5.2. Effectiveness of the proposed treatment**

Studies have shown that conventional wastewater treatment is ineffective at the elimination of most EDCs and PPCPs (Westerhoff, 2003). All existing major STPs discharge conventionally treated tertiary effluent into the Hawkesbury Nepean River System, so chemical pollutants such as EDCs and PPCPs are a reality in the system.

The proposed advanced treatment process of microfiltration/reverse osmosis will be effective at removing pathogens, reducing nutrients, and most positively and negatively charged EDCs and PPCPs. However, the EA states (section 7.6.6) that this combination *“is less effective at reducing chemicals than pathogens...small neutral molecules and ions may be less effectively reduced.”*

The EA needs to assess the potential risk that this may pose to the aquatic environment.

If this is determined a significant risk, the combination of microfiltration/reverse osmosis/granular activated carbon should be investigated. Experts have advised that granular activated carbon would greatly improve the effectiveness of the removal of these neutrally charged molecules (Snyder et al., 2006; Dr Long pers comm, 2006)).

### **5.3. Temperature**

The temperature of the discharged effluent needs to be controlled such that it is the same temperature as the receiving waters (accounting for seasonal changes). This will be an issue as effluent will be discharged 8-9km from the AWTP to the outlet at Penrith Weir. We acknowledge that SWC stated that they would investigate this issue at the recent meeting held at Windsor (1 December 2006).

### **5.4. Brine discharge**

The environmental assessment requirements (outlined in table 5.1) state that the EA is to provide: *“details of brine management”* and *“details of the expected composition of the brine.”*

In response, the EA states that the brine will be discharged via the North Side Sewage Storage Tunnel to the North Head Treatment facility where it will be treated. The EA estimates that nitrogen and phosphorous load would increase by 2% and 0.5% respectively (8ML discharged per day, with 50ML/day of advanced treated tertiary effluent to be discharged just below Penrith Weir).

The EA does not adequately state the details of the expected chemical composition of the brine in reference to chemicals such as EDCs and PPCPs (it only states it in reference to ammonia, oxides of nitrogen, total nitrogen, total phosphorous and total dissolved solids and concentration of general “pollutants”). This is of concern considering research states that the brine from a reverse osmosis process would be expected to have much greater toxicity than the influent water, and that therefore disposal to natural waters would not achieve a net increase in safety (Snyder et al, 2006). Thus OWA recommends that a detailed chemical composition of the brine be provided, particularly in relation to EDCs and PPCPs such that the impact of discharge into receiving waters can be adequately assessed.

## **5.5. Contamination of sediments**

The risk assessment identified sediment (river mud) as a potential exposure pathway, via the dermal route for some chemicals. OWA strongly recommends that a sediment survey be undertaken following commissioning of the plant to refine the risk assessment outcomes as proposed in section 7.6.8 of the EA.

## **6. South Creek**

South Creek is a highly degraded environment (in low flows, treated effluent comprises up to 99% of the flow). As a consequence of the Project, South Creek will experience considerable reductions in flows (currently 36ML/day at St Marys, and predicted to be reduced to 5ML/day). This will result in increased nutrients, facilitate growth of aquatic weeds such as salvinia and *Egeria densa* and increased siltation. Despite such predicted flow reductions and associated negative impacts to the aquatic environment, the EA states that *“detailed modeling of the hydrological impact of the Project on Ropes, Breakfast, South and Eastern Creeks has not been undertaken, as the impacts are relatively straight forward and can be assessed without a more detailed analysis”* (section 7.3.4). OWA strongly disagrees with this statement and insists that a detailed risk assessment be conducted (acknowledged by SWC at the recent meeting held in Windsor, 1 December 2006).

This is in line with the Environmental Assessment Requirements of the Director General for Planning outlined in Table 5.1 which state that the EA must:

*“include an environmental risk analysis to identify any potential impacts (construction and operation), proposed mitigation measures and potentially significant residual environmental impacts after the application of proposed measures. Any additional key environmental impacts identified through the risk analysis as significant to undergo appropriately detailed impact assessment.”*

## **7. Impacts of the proposal on the fishing industry**

The EA claims that:

*“The major commercial fisheries in the Hawkesbury-Nepean river system are located in the saline estuarine and marine areas downstream of the study area. These downstream areas would not be affected by the Project and so the commercial fishing industry would not be directly impacted.”*

OWA strongly disagrees with this statement. The EA has not adequately assessed the impacts of the Project on industry, particularly in reference to migration of fish and crustaceans, impact of EDCs and PPCPs on fish and zooplankton, impact of weed growth on industry, and the timing of the commencement of the Project. This reflects a poor understanding of industry's issues and a poor level of consultation with industry. These issues need to be addressed within the EA.

### **7.1. Migration of prawns**

Table 6.4 outlines the NSW legislative requirements relevant to the Project. The EA however, has omitted the legislative requirements of the *Fisheries Management Act 1994* in relation to fish passage/migration (includes crustaceans). This needs to be addressed. The EA needs to identify the effects of flows, temperature or salinity and chemicals on migratory crustaceans.

Flows play a significant part in the lifecycle and movements of school prawns and many other aquatic species within the study area. Studies on the impacts of river discharge on the distribution and production of the school prawn *Metapenaeus macleayi* show that there is an importance of river discharge to production of *M.macleayi* and suggests that modification of discharges by restriction of freshwater flow could have an adverse effect on production – up and downstream (Glaister, 1978).

Furthermore, Mwalyosi (2005) has shown that prawn production (up and downstream) is dependent upon the inflow of freshwater to the river system and the natural organic carbon and other nutrients that are discharged.

The EA does however, acknowledge the impact of the Project on fish migration in its potential to attract migrating fish away from the fishway at Penrith Weir. The EA states that:

*“The discharge of replacement flows via Boundary Creek has the potential to attract migrating fish away from the fishway at Penrith Weir.” (p S.11). Although fish may be able to reproduce and survive in Boundary Creek, the attraction of the replacement flows could result in a reduction in fish migrating further up the Nepean.”* Specific requirements of the EA were to:

*“Focus on Warragamba Dam to Penrith Weir and downstream of the three STPs addressing:*

- *fish movement (past Boundary Creek and Penrith Weir);*
- *migratory fish species;*
- *aquatic weed growth; and*
- *flow regime changes in South, Eastern, Breakfast and Ropes Creeks and ecological impacts....”.*

OWA agrees that a “study” (as proposed) in consultation with DPI (Fisheries) to determine whether the discharge of the Project would result in changes to the natural fish migration over Penrith Weir, needs to be conducted, however recommends that industry be consulted in relation to this as well.

### **7.2. *Egeria densa – impacts on the viability of industry***

Predicted flow reduction in South Creek will encourage the growth of *Egeria densa*. Additionally, increased flows upstream, can transport *Egeria densa* downstream. This has serious implications for the operation of the fishing industry, with fishers unable to operate in trawl grounds infested with the weed. This has not and needs to be addressed in the EA.

### **7.3. *Chemicals not removed in the microfiltration/reverse osmosis process, potential affect on zooplankton***

There is insufficient information on the impact of chemicals (EDCs/PPCPS) on zooplankton communities and fish, crustaceans and other aquatic fauna in the EA. In particular the small neutrally charged molecules and ions (potential EDCS and PPCPs) which are not effectively removed by the treatment process (and are likely to be present at concentrations that have been shown to create hormonal changes in aquatic species (see comments under 5.1 and 5.2). The EA needs to outline the impacts of these chemicals on the aquatic environment, assess the impact of the chemicals that are not effectively removed by the proposed treatment processes and provide effective mitigation measures such as further treatment if these chemicals are found to pose a threat to the health of the aquatic environment (at concentrations present following the proposed treatment).

### **7.4. *Timing***

The timing of the construction is critical to the commercial fishing industry. OWA strongly supports the industry’s recommendation that a winter commencement would be most beneficial to industry when conditions do not favour growth of *Egeria densa*, prawns have moved out to sea and there are fewer commercial fishers operating.

### **7.5. *Consultation***

The environmental requirements of the EA state that *“issues raised by stakeholders in consultation and how they have been addressed in the EA”*. This has not been achieved as it is clear that issues

impacting on aquatic habitat and the commercial fishing industry are still not understood, nor addressed.

## **8. Monitoring**

The monitoring program outlined in section 7.9.3 states that the Program will focus on River ecological health (amongst other things). This needs to include monitoring of chemicals such as EDCs and PPCPs, at concentrations known to exhibit detrimental effects on organisms described above in section 5.1.

## **Conclusion**

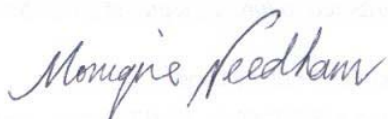
OWA cannot support the Project proposal/ EA in its current form, primarily as the success of most of the modelling provided in the assessment is subject to other projects such as the Metropolitan Water Sharing Plan, which have not as yet been completed. OWA believes therefore that SWC has failed to adequately address the Environmental Assessment requirements of the Direction General for Planning.

In summary, the EA needs to:

- provide a more adequate assessment of the true impacts of the Project on the commercial fishing industry and aquatic environment e.g impacts of EDCs and PPCPs and other complex chemicals on aquatic life, migration of fish, timing of the proposal, proliferation of weed;
- model and assess the risk posed to South Creek with a 75% reduction in flows to South Creek;
- recognise that changes to flow regimes and aquatic habitats in the study area have a significant impact on the lower estuarine marine aquatic species and commercial fishing and undertake an assessment of these impacts;
- effectively consult and address the commercial fishing industry's concerns; and
- provide adequate details of monitoring.

Please do not hesitate to contact me on (02) 9660 2262 should you require further information.

Yours sincerely



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