NSW EPA

Our reference: EF15/2643, DOC16/250604-02
Contact: John Goodwin

Ms Rebecca Sommer
Department of Planning and Environment
GPO BOX 39
SYDNEY 2001

Dear Ms Sommer

SSD 7228 – SYDNEY ZOO – RESPONSE TO SUBMISSIONS REPORT

I am writing to you in reply to your invitation to the EPA to comment on the Response to Submissions (RtS) report for the Sydney Zoo project.

The EPA requests that these comments be read in conjunction with its letters and attachments dated 8 September 2015 and 2 February 2016.

The EPA emphasises that it does not review or endorse environmental management plans or the like for reasons of maintaining regulatory 'arms length'. And, has not reviewed the environmental management plans forming part of or referred to in the EIS.

Regulated material (Radiation Control Act)

The EPA remains concerned that the comments (3rd para) on page 31 of the RtS report indicate that the proponent has not understood that 'regulated material' includes by definition certain types of imaging equipment, including non-ionising radiation apparatus of a kind prescribed by the Regulation.

Nevertheless the EPA accepts the proponent's commitment to consult with the EPA to ensure that:

(a) the 'person responsible' within the meaning of section 6 of the Radiation Control Act 1990 will be obliged to hold an appropriate 'radiation management licence' in respect of regulated material at the zoo; and

(b) a natural person who uses regulated material at the zoo must hold a 'radiation user licence' and must comply with any conditions to which the licence is subject.

Proposed night works

The EPA notes that Table 24 (p.82) indicates opposite the nominated impact of 'construction noise impacts' that night works would be limited to no more than 2 night during any single week.

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The EPA emphasises that any proposal to undertake site preparation, construction or construction-related works outside the recommended standards hours (and especially at night) should only be approved if the proponent has fully justified that such works are unavoidable for reasons of safety or maintaining public utility network integrity. The EPA does not consider productivity or project deadlines to be adequate justification for working outside the recommended standard hours.

Water pollution

The EPA remains concerned that the development may have may have adverse water quality impacts on Eastern Creek, especially during the operational phase of the Zoo.

The EPA notes that clay soils on the site may give rise to colloidal sediments in stormwater run-off. And, notes the proposal in table 24 (p.83) of the RtS report to ensure no sediment leaves the site and to undertake monitoring and flocculation as part of a de-watering plan. The EPA is aware that exposure to long chain polymer flocculants has been implicated in native fish mortality.

The EPA understands that :

(a) all wastewater from wash-down of animal enclosures and the dropping of wet moats and aquaria will be directed to sewer;

(b) manure/sludge from back-of-house areas of animal enclosures will be composted and re-used on site;

(c) stormwater run-off from roofs, pedestrian areas, and carparks as well as run-off from animal enclosures will be directed to and treated by water sensitive urban design measures and stored for re-use on site, including for irrigation; and

(d) stormwater run-off that exceeds the available on site storage capacity will be discharged from various points around the site, including to Eastern Creek in the west and to a wetland in the east.

The EPA considers that the development could potentially impact on the environmental values of receiving waters, being Eastern Creek. And, recommends that the proponent be required to provide additional information:

(a) to determine the potential impacts on those receiving waters; and

(b) demonstrate that appropriate mitigation measures will be implemented.

The EPA expands on its concerns in Attachment A.

Should you require clarification of any of the above please contact John Goodwin on 9995 6838.

Yours sincerely,

9.6.16

MIKE SHARPIN
Acting Manager Metropolitan Infrastructure
Environment Protection Authority
Encl. Attachment A

ATTACHMENT A

The proponent has not addressed the EPA's concerns about water pollution risks associated with the project.

The EPA submitted comments regarding the EIS including a request for additional information to inform consideration of the potential water pollution impacts. The *Response to Submissions report* for the most part did not provide the additional information requested by the EPA. Thus the EPA remains unclear whether the proposed on-site manure composting and re-use of manure and animal enclosure effluent will be appropriately managed to prevent pollution to groundwater and/or surface water. And, considers that the project in its current format could potentially pollute waters and impact on the community's uses and values of receiving waterways. In particular run-off from animal enclosures could potentially cause water pollution as:

- the suitability of the proposed treatment measures has not been demonstrated;
- the concentrations and quantities of pollutants expected to be discharged has not been determined; and
- no assessment of potential impacts on receiving waters has been provided.

The EPA notes that the SEARs issued in respect of the project required the proponent to:

a) assess existing surface water and groundwater quality against relevant criteria for the environmental values of Eastern Creek identified in ANZECC Guidelines for Fresh and Marine Water Quality 2000;

b) identify pollutants likely to be generated by project activities, including stormwater runoff, and estimate the concentration and quantity of those pollutants reported against the environmental values and criteria referred to in paragraph (a) above;

c) assess the impact of any pollutants referred to in paragraph (b) on surface and groundwater, including Eastern Creek and its tributaries;

d) include details of any proposed discharge (nature, volume and location) to receiving waters, including Eastern Creek and its tributaries."

However the RtS report states (2nd para, p.32) that "The current quality of surface water has not been assessed since Eastern Creek is not part of the site and therefore not included as part of the assessment (no other surface water features were identified during the environmental site assessment)." The EPA understands from the EIS that run-off from animal enclosures will be discharged to surface waters that drain to Eastern Creek after treatment with water sensitive urban design measures.

The EPA is particularly concerned considers that the run-off from animal enclosures -

(a) is likely to contain manure and associated contaminants including Total Nitrogen, oxides of nitrogen, ammonium, Total Phosphorus, phosphate, pathogens, and organic matter, and

(b) could potentially cause water pollution, if not adequately managed.

<u>Proposed discharge of treated stormwater and run-off from animal enclosures</u>

The EPA understands that the proponent proposes to discharge treated stormwater and treated run-off from animal enclosures to Eastern Creek. However, the proponent has not:

(a) provided evidence to demonstrate the performance of the proposed treatment measures;

(b) adequately characterised the quality of the proposed discharges (i.e. concentrations of contaminants); or

(c) considered the potential impacts of the proposed discharges on the environmental values of receiving waters (ie Eastern Creek).

The EPA recommended that *"The proponent should be required to:*

a) provide a detailed description of and justification for the nodes and settings used in the modelling; and

b) discuss the underlying assumptions and limitations of the modelling when reporting the results of that modelling."

The RtS report does not address the above recommendation. Instead, the proponent states that it "... adopted the principles for MUSIC design specified by Blacktown Council who are widely known to have one of, if not the most, stringent controls for MUSIC modelling and make their pre-approved MUSIC nodes (which differ to the default settings and as a general rule are conservative compared to default settings) available to consultants."

Blacktown City Council (BCC) may have developed pre-approved MUSIC nodes that may be conservative compared to that model's default nodes. However, the EPA is concerned that neither the BCC 'pre-approved' nodes nor the default nodes are designed to represent the nutrient and sediment generation rates for run-off from animal enclosures. And, the proponent has not presented evidence to support the applicability of its assumptions concerning the MUSIC model.

The EPA suggests that a literature review may provide a preliminary indication of expected effluent quality from animal enclosures. The EPA notes for instance that one such study (Zhou *et al.*, 2006) characterised runoff from animal enclosures where the enclosures comprised part impervious and part pervious areas that were cleaned daily. The EPA compared (see Table 1 below) the Event Mean Concentrations (EMCs) reported by the Zhou study with those recommended for urban pervious areas in Blacktown City Council's (BCC's) *Developer Handbook for Water Sensitive Urban Design* (BCC, 2013). And, that comparison reveals:

a) BCC's recommended EMC values are much less (~90% less) than those observed by Zhou for animal enclosures, which suggests that BCC's 'pre-approved' node may significantly underestimate the sediment and nutrient generation rates for the proposed animal enclosures;

b) a substantial proportion of the nutrients observed in run-off from the animal enclosures was in dissolved form indicating that treatment measures would need to be designed and managed to specifically treat dissolved forms; and

c) elevated Chemical Oxygen Demand (COD) was observed in run-off from animal enclosures, indicative of entrained organic matter that can cause oxygen depletion in aquatic environments, which suggests proposed treatment measures would need to be designed and managed to specifically treat organic matter.

Table 1. Comparison of EMC's reported by Zhou et al. (2006) with those recommended for urban pervious areas in Blacktown City Council's *Developer Handbook for Water Sensitive Urban Design* (BCC, 2013).

	Parameter	Pervious areas – storm flow (BCC Developers Handbook)	Animal yards (Zhou et al, 2006; Mean)	BCC:Zhou et al. (%)
Log10 EMC (mg/L)	TN	0.3	1.26	-
	TP	-0.6	0.57	-
	TSS	2.15	3.05	-
EMC (mg/L)	TN	2.00	18.17	11%
	TP	0.25	3.70	7%
	TSS	141	1,119	13%
	DN	-	6.67	-
	DP	-	0.57	-
	COD	-	413	-
	TN:TP	7.9	4.9	162%

EMC = event mean concentration; TN = total nitrogen; TP = total phosphorus; TSS = total suspended solids; DN = dissolved nitrogen; DP= dissolved phosphorus; COD = chemical oxygen demand

The EPA considers that where modelling is used to demonstrate treatment system performance, the proponent should:

- identify all assumptions underpinning that modelling;
- provide adequate justification for the adopting the assumptions underpinning that modelling, and
- provide a detailed analysis that properly addresses key model limitations.

Similarly, the EPA considers that relevant empirical data such as that available from the scientific literature should have been used to inform estimates of pollutant concentrations (i.e. node EMCs) associated with animal enclosure effluent.

Recommendation

The EPA recommends that the proponent address the above mentioned SEARs and when -

- identifying the pollutants likely to be generated, consider those pollutants typically associated with animal manure and urine (examples: nitrogen and phosphorus compounds [including oxides of nitrogen, ammonium, phosphate], organic matter, and pathogens),
- estimating the concentrations and quantities of those pollutants, provide separate estimates for both untreated and treated stormwater run-off and run-off from animal enclosures.

  [Note: relevant empirical data, such as from the scientific literature, should be used to inform estimates of pollutant concentrations and quantities associated with run-off from animal enclosures.]

Water Quality Objectives

The EPA recommended that *"The proponent should be required to clarify the following in the context of ambient water quality targets consistent with maintaining or restoring the NSW Government's Water Quality Objectives for the receiving waters:*

a) suitability of proposed water treatment measures, including those proposed for the treatment of –
   i. run-off from animal enclosures, and
   ii. discharges from the hippopotamus pool, aquaria and wet moats;
b) expected water quality from different sources on the site; and
c) design storm sizing for each storage proposed to discharge to waters."

The RtS report has not:

(a) identified the NSW Water Quality Objectives (WQOs) for the receiving waters;

(b) demonstrated the suitability of the proposed water treatment measures (particularly for animal enclosures effluent) for maintaining or restoring the WQOs;

(c) characterised the expected water quality from different sources (as discussed in relation to the SEARs); and

(d) specified the design storm sizing for each storage proposed to discharge to waters.

Water balance modelling

The EPA notes that the water balance modelling results indicate that, the project will:

- increase the frequency of discharges from the site;
- increase discharges during small rainfall events, when potential dilution is low; and
- decrease discharges during large rainfall events, when potential dilution is high.

Thus the EPA considers that:

(i) the project represents a risk of causing water pollution, given the above water balance modelling results understood in the context of –

   (a) the uncertainty regarding the suitability of proposed treatment measures (as outlined above), and

   (b) the potential for discharges to contain high concentrations of nutrients and sediment.

(ii) there is a risk that contaminated discharges may pollute receiving waters especially during small to medium rainfall events.

Recommendation

The EPA recommends that, to address the above risks the proponent should be required:

- demonstrate the suitability of proposed water treatment measures, including those proposed for the treatment of run-off from animal enclosures; and
- specify the design storm for each storage proposed to discharge to waters.

Separation of stormwater run-off and run-off from animal enclosures

The EPA recommended in response to the EIS that *"The proponent should be required to consider measures to separately collect and store water from different sources such as runoff from carparks, exhibit enclosures, water buffalo wallow (nee hippopotamus pool), aquaria and wet moats to facilitate effective water treatment and prevent pollution of waters."*

However, the EPA notes that the RtS report does not evaluate options for separately collecting, treating, storing and handling general stormwater run-off and run-off from animal enclosures to optimise treatment and minimise pollution risk.

Composting and re-use of manure

The EPA in its comments on the EIS recommended that proponent clarify whether manure will be composted and re-used on the site. Whilst, the proponent indicates in the RtS report (p.31) that "Composted organic material will be recycled on site as a disposal method, in particular for gardening and landscaping purposes.", it remains unclear whether manure would be composted and recycled on site.

The EPA also recommended that *"The proponent should be required to ensure that any on-site organic waste storage and composting is undertaken using such means as may be necessary to –*

a) minimise leachate generation, and

b) prevent pollution of waters."

The EPA notes that the RtS report does not provide details of how any on-site composting (including manure composting) will be managed to prevent water pollution, and does not demonstrate how on-site composting would align with the practices and principles of the *Environmental Guidelines: Composting and Related Organics Processing Facilities* (DEC, 2004b).

Similarly, the EPA recommended that "*The proponent should be required to undertake a nutrient and salt balance assessment for the proposed utilisation areas for the re-use of composted manure on the site."* However, the EPA notes that the RtS report does not provide the requested nutrient or salt balance assessments. The EPA further notes that relevant guidance material is readily available, including-

- *Environmental Guidelines: Use of Effluent by Irrigation* (DEC, 2004a), and
- the resource manual, *Development of Indicators of Sustainability for Effluent Reuse in the Intensive Livestock Industries: Piggeries and Cattle Feedlots* (McGahan and Tucker, 2003).

Water re-use by irrigation

The EPA recommended that *"The proponent should be required to adopt and implement all such measures as may be necessary to ensure that any re-use of water by irrigation does not cause pollution of waters (including taking proper account of site, design, effluent quality and other considerations outlined in the EPA Environmental Guidelines: Use of Effluent by Irrigation and other relevant guidelines)".*

However, the EPA notes that the RtS report does not address the recommendation concerning the re-use by irrigation of stormwater run-off and run-off from animal enclosures.

Fuel, lubricant and chemical storage

The RtS report lists several chemicals likely to be used during operation of the Zoo but omits any reference to lubricants and any agrichemicals such as animal drenches, pesticides and herbicides.

The RTS report states (4th para, p.32) that "The prediction of the pollutants that may be used or leaked/spilt at the site during operation will be determined by the specific requirements of Sydney Zoo for chemicals and their management (and release to groundwater/migration in groundwater to surface water) and as such both the range of chemicals and their concentrations could vary widely (determined by management and groundwater attenuation factors). Therefore, it is not currently possible to predict the impact of any pollutant runoff on surface and groundwater". The EPA emphasises that there should be no impacts from "leaked/spilt" chemicals or fuels. And that, the project must be designed and operated to prevent discharges of chemical and fuel spills.

The EPA acknowledges the proposed 'environmental safeguard' for the storage of "All fuels, chemicals and liquids ..." briefly described at the top of page 84 of the RtS report. The EPA anticipates that all fuel, lubricants and chemicals used at the Zoo during construction and operation would be stored not only in an impervious bunded area but also that that bunded area would be-

- roofed over,
- located away from drainage paths, and
- secured against unauthorised access and tampering.

References:

BCC (2013) ***Developer Handbook for Water Sensitive Urban Design***, Blacktown City Council, Blacktown.

DEC (2004a) ***Environmental Guidelines: Use of Effluent by Irrigation***, Department of Environment and Conservation, Sydney.

DEC (2004b) ***Environmental Guidelines: Composting and Related Organics Processing Facilities***, Department of Environment and Conservation, Sydney.

McGahan, E. and Tucker, R. (2003) ***Development of Indicators of Sustainability for Effluent Reuse in the Intensive Livestock Industries: Piggeries and Cattle Feedlots***, Australian Pork Limited, Canberra.

Zhao, J.W., Shan, B.Q. and Yin, C.Q. (2006) Pollutant loads of surface runoff in Wuhan City Zoo, an urban tourist area, ***Journal of Environmental Sciences,* 19(4)**, 464-468.