



Office of  
Environment  
& Heritage

Your reference: SSD-5119  
Our reference: DOC13/2981; FIL12/10927  
Contact: David Paull, 49086837

Mr Chris Ritchie  
Manager Industry  
Major Development Assessment  
Department of Planning and Infrastructure  
GPO Box 39  
SYDNEY NSW 2001

Attention: Andrew Hartcher

Dear Mr Ritchie

**RE: REVIEW OF ENVIRONMENTAL IMPACT STATEMENT FOR CRAWFORDS AMMONIUM NITRATE STORAGE AND DISTRIBUTION FACILITY, SANDGATE (SSD - 5119).**

I refer to your letter dated 30 January 2013 requesting comments and advise on recommended conditions of consent for the 'Ammonium Nitrate Storage Facility - Environmental Impact Statement' (the EIS). It is noted that the EIS is currently on public exhibition until 11 March 2013.

The Office of Environment and Heritage (OEH) has undertaken a review of the EIS (including appendices) and has provided detailed comments in **Attachment A**. OEH acknowledges that with respect to Aboriginal cultural heritage, the EIS generally addresses OEH's matters of interest, however, with respect to the potential of ammonium nitrate contamination on adjacent wetlands, threatened ecological communities and threatened species dependent upon them, OEH has major concerns. These concerns are detailed below:

- The current condition of the '2HD swamp' and groundwater needs to be improved so that their ecological function continues into the future. Water sampling contained in the EIS is deficient and a detailed water monitoring programme should be included a condition of approval;
- Preventative measures outlined in the EIS do not provide certainty that current contamination issues to groundwater and surface water systems will be resolved. Any ongoing issues for water quality in the surrounding wetlands and groundwater should trigger improvements to the proposed stormwater management system;
- The proponent must detail procedures for managing the Aboriginal cultural heritage values associated with the project area in relevant sections of the Construction Environmental Management Plan and the Operational Environmental Management Plan prepared for the project. These measures must be developed in consultation with representatives of the local Aboriginal community;
- Site-based Flooding Emergency Response Plan should be modified to include evacuation and updated so that it places no extra requirement upon the State Emergency Services;
- Structural certification for all the storage sheds on the site should be undertaken so that they can withstand floodwaters up to and including a 1% AEP design flood event.

In summary, OEH still has concerns that the EIS can deliver positive environmental outcomes. Consent needs to be conditional on improvements to water quality, flood and Aboriginal cultural heritage management.

If you require any further information regarding this matter please contact David Paull, Regional Biodiversity Conservation Officer, on 4908 6837.

Yours sincerely

A handwritten signature in dark ink, appearing to read 'R Bath', with a stylized, flowing script.

8 MAR 2013

**RICHARD BATH**  
**Head – Hunter Planning Unit**  
**Regional Operations**

Enclosures: Attachment A



## **ATTACHMENT A: OEH REVIEW – OUTSTANDING ISSUES**

### **THREATENED SPECIES**

OEH's preliminary assessment of the EIS states its main concerns regard the proposal is indirect impacts on:

- (i) Swamp Oak floodplain forests
- (ii) Freshwater wetlands on coastal floodplains EEC and the habitat they provide, particularly for the Black-necked Stork, Magpie Goose and the Green and Golden Bell frog, namely stormwater runoff, potential changes to hydrological regimes, and light and noise pollution. It stated that a review of on-site impact mitigation measures proposed in the EIS appear to be adequate, though OEH requests that the final EIS ensures that any potential indirect impacts on adjacent EEC's and threatened species habitat are adequately addressed.

### **Adequacy of assessment of the potentially affected natural systems**

#### **1. Presence and condition of locally occurring surface water and groundwater systems**

##### **(a) Hydrological Environment**

The EIS correctly describes the hydrogeology of the region as part of the Hexham Swamp Soil Landscape comprised of alluvial sediments, with groundwater levels encountered between 0.5-2.2 metres below the surface. The surface drainage flows in two directions across the site, in a west to east direction across the site in the southern end into '2HD Swamp', from which it flows in a north-west direction into Hexham Swamp.

The Groundwater Dependent Ecosystems near the site are described as the Freshwater Wetlands and the Hunter Estuary wetlands in the Hunter are highly groundwater dependent (Kuginis *et al.* 2012). The EIS notes that soil in the vicinity of current operations and the groundwater have elevated levels of ammonia/um and nitrate. The EIS claims there are no historical water sampling data available from the site or from adjacent lands.

##### **(b) Water quality in '2HD Swamp'**

This water sampling study provides only a snap-shot of conditions and cannot be compared to any historical data, making establishment of baseline levels difficult. Another fault in the design of the sampling is the establishment of Site 1 as the reference site, despite obvious algal blooms from eutrophication and high nitrate levels. It is not appropriate to use such a contaminated site in order to draw conclusions about the health of the other sampling areas.

The water quality Table 5.10 used in the EIS to compares water quality samples to ANZECC thresholds uses values in Chapter 8, though for assessing impacts on ecological systems it is more appropriate to use values in Chapter 3 which gives a threshold value for Ammonia-N as 20 µg /L and Total N at 500 µg/L. Ammonium or ammonia is very toxic to biological species and systems as are nitrites (Mann *et al.* 2009). While there has been limited work done to test the susceptibility of invertebrates, fish and amphibians to these compounds in Australia, work done overseas has shown that fatal doses range between 130 and 800 µg NH<sub>3</sub>/L for fish and invertebrates (Camargo and Alonso, 2006) while Diamond *et al.* (1993) found that the embryos/larvae of the frog species *Rana pipiens* and *Hyla crucifer* were generally more sensitive than other test-species (with mortality associated with 420 and 460 µg NH<sub>3</sub>/L, for *R. pipiens* and *H. crucifer*, respectively) in water at 12 degrees centigrade. Increasing the temperature increased the threshold level.

Nitrite has a high affinity for Chlorine and induces the conversion of haemoglobin to methaemoglobin which is incapable of binding oxygen. Methaemoglobinemia following exposure to NO<sub>2</sub> has been demonstrated in amphibians (Punzo and Law, 2006) and is likely the root cause of mortality, sluggish growth and



development, and behavioural traits observed among embryonic/larval amphibians exposed to up to 20,000 µgNO<sub>2</sub> /L (Griffis-Kyle, 2005, 2007).

Ammonia or Ammonium does not persist in water for very long as its presence and persistence is dictated by: (1) losses of NH<sub>3</sub> gas to the atmosphere; (2) a pH (and temperature) dependent equilibrium between un-ionized NH<sub>3</sub> and the relatively non-toxic ionized NH<sub>4</sub><sup>+</sup>; and (3) the sequential conversion of NH<sub>4</sub><sup>+</sup> to nitrite and nitrate by Nitrosomonas and Nitrobacter bacteria, respectively. Because ammonia and nitrite are transient within the environment, high environmental concentrations are usually only found at point source discharges or after heavy rainfall events. The water monitoring Site 2 in the 2HD Swamp is 3 to 4 higher than other parts of the swamp suggesting a higher than background level and possible point source of contamination.

Due to its higher persistence in the environment, focus is often given to Nitrates, however, Nitrate is not considered to be particularly toxic, or more accurately, a mechanism of toxicity has not been described. However, eutrophic conditions can lead to the detrimental proliferation of toxic algal blooms (Camargo and Alonso, 2006). However, under less than extreme conditions, the proliferation of algae and macrophytes that occurs in nitrate enriched systems appears to either benefit (by providing a source of food and habitat) or have no effect on amphibian communities (Massal *et al.*, 2007). Baker and Waights (1994) showed that sodium nitrate causes sub-lethal- growth and behaviour in the Australian frog species *Litoria caerulea*.

The salt levels in the '2HD Swamp' are described as high and the dissolved oxygen levels are given as low though aerobic conditions are still thought to exist despite high levels of oxidation. The high levels of nitrates and phosphorous have no doubt given rise to algal blooms in the water body, which in turn has resulted in the depletion of the dissolved oxygen further reducing its ecological function.

## 2. Fauna and flora surveys

OEH has reviewed the effort and sampling design for the 'Ecology Assessment' (Volume III) acknowledges that the general baseline flora and fauna survey components have some deficiencies, though is an acceptable level.

## **Adequacy of risk and impact assessment to threatened species potentially affected natural systems**

### 1. Risk assessments

The EIS (Volume II: Phase 1 Environmental Site Assessment – Final) provides an "issue identification" which includes various sources of off and on site contamination. It identifies a number of sources on-site, sources, particularly historical in-fill with unknown substances, the ammonium nitrate storage areas, disused diesel tanks, a workshop area where hydrocarbons are used, use of chemicals within the wash bay and a rail siding along one boundary of the site.

With respect to the ammonium nitrate storage, the EIS states that the sheds and the outdoor storage area "...represent a potential source of contamination...as a result of probable historical leaks and spills, potentially contributing to excessive levels of Ammoniacal Nitrogen and Nitrate-Nitrogen within soil and groundwater" and "Historical leaks and spills are considered likely to have occurred as a result of storage of general fertiliser ... according to site personnel, a fertiliser release occurred from the southwest corner of Shed B however site staff were unable to provide information on the date and quantity of the release."

Offsite sources of contamination include contaminated lands, railway facilities, petrol storage and infill of surrounding lands which further exacerbate the overall background levels of site contamination.

The main body of the EIS provides a risk assessment which gives potential impacts in the following way:

- flooding as an "extreme risk", a catastrophic impact with very serious impairment of ecosystem function, even after establishment of a flood risk management and response plan
- spillage of dangerous goods as "moderate risk" though impacts to the environment is not stated



- impacts on Aboriginal cultural heritage as a "*low risk*"
- water pollution as a result of construction activities associated with stormwater control devices which is given a misleading assessment as the categories used should have yielded a "*high risk*".

Based on the evidence, OEH considers the risk of contamination of "*dangerous goods*", however, as being "*high*" and likely to be ongoing.

## 2. Threatened species assessment

OEH has completed a review of the biodiversity and threatened species assessment sections (including the 'assessment of significance' components) of the Ecology Assessment Report (Volume III).

While most of the focus of the EIS is on the direct impact upon an impoverished site, OEH would like to remind the applicant that as much due consideration should be given to offsite or 'indirect' impacts as per the assessment of significance guidelines (DEC 2004). Pursuant to this approach, assessments of the significance should have been provided in the '7 Part test' format for both direct and indirect impacts.

OEH is of the opinion that in general the risk posed by Ammonium nitrate contamination has been overlooked in the EIS. This is particularly true of the impacts upon the species which may utilise the '2HD Swamp', groundwater systems, the surrounding SEPP 14 lands and endangered ecological communities.

For example the analysis relating to the Green and Golden Bell Frog (GGBF) seems to discount any possible impact from Ammonium nitrate, attributing "*...drought conditions, disease (chytrid fungus), salinity and Mosquito fish are potential causal factors for the decline of the population.*"

and

*"The introduced Mosquitofish was observed in all aquatic habitats within the Study Area. Studies have shown Mosquitofish predate on Green and Golden Bell Frog tadpoles (Morgan and Buttemer 1996) and have also suggested that presence of the Mosquitofish in permanent water bodies reduces their suitability as breeding sites (Hamer et al. 2002). The presence of Mosquitofish in very high abundance within water bodies of the Study Area is considered to significantly reduce its suitability for the Green and Golden Bell Frog."*

While it is true that the Mosquitofish are considered a threat to the GGBF, this fish is present in all known sites where the GGBF is still found (except the Broughton Island population, Robert Quirk, NPWS, pers. comm.).

It is now widely considered that the Key Threatening Processes 'Alteration to the natural flow regimes' and 'Amphibian chytridiomycosis' are much more significant factors that have lead to the decline of this species. Tidal inundation is also known to have potentially catastrophic impacts for GGBF (Prof. Mike Mahony, University of Newcastle, pers. comm.). The impact of pollutants on natural systems has often been overlooked as a significant factor due to a lack of investigation into this area, particularly in Australia, and also has implications for the conservation of the GGBF (Mann and Bidwell 1999). A wide usage of fertilisers may have deleterious effects on frog populations particularly via impacts on tadpole development. In overseas studies, high nutrient loads of nitrate, ammonia and phosphate have been implicated in frog declines (Berger, 1989). It also may be that reduced tadpole health will lead to increased risk of predation.

It is worth noting that the Australian frog fauna has evolved in an environment that is comparatively depauperate in nitrate and phosphate (Lamont 1994) which may accord Australian frogs a greater sensitivity to these chemicals. An assessment on the IUCN Red List of Endangered Species website for 2008 indicate that after habitat loss, pollution is the next major threatening process to amphibian populations.



The population of at least 100 adult GGBF in the '2HD Swamp' was last recorded in 2004 and (assuming that its continued presence was not overlooked by recent studies); it is not known precisely when this population disappeared or the reasons for its disappearance, however, given the circumstantial evidence of ammonium nitrate contamination of the local water systems and the known toxicity of these chemicals, a direct link cannot be discounted.

The results of the macro-invertebrate survey also show a depauperate fauna, (notwithstanding the survey constraints) indicating in general, a fauna typical of sub-optimal water conditions.

In conclusion, there is ample evidence that the wetland areas found offsite have suffered extensive and possibly ongoing contamination both from the proponent and from other surrounding sources. Continuation of this impact is likely to pose serious risks for aquatic life, threatened species and groundwater dependent ecosystems.

### **Provision of mitigating actions**

The EIS proposes a series of mitigating actions to control stormwater runoff across the site, including "Treatment Zones", "Surface Protection", "Minor site regrading", "Drainage headwalls" and additional "Stormwater Pits". Inherent in the modelling proposed is that there will be 45 per cent reduction in levels of Total P entering the wetland areas to the east of the facility. No target has been set for Total N or ammonia N.

However, OEH believes that a positive outcome for this State Significant Development would be to improve the water conditions of the '2HD Swamp', groundwater and surrounding surface water systems by eliminating any further contamination from ammonium nitrate and reducing overall nitrate and phosphate loads. This needs to be achieved via an ongoing water quality monitoring programme. The aim of this programme would be to feedback situations where improvements to the stormwater control regime are improved where necessary, using an adaptive approach.

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- Kuginis L., Byrne G., Serov P, Williams J.P., (2012). *Risk assessment guidelines for groundwater dependent ecosystems, Volume 3 – Identification of high probability groundwater dependent ecosystems on the coastal plains of NSW and their ecological value*, NSW Department of Primary Industries, Office of Water, Sydney
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Punzo, F., Law, S. (2006). Effect of nitrate-related compounds on growth, survival and hematological responses in tadpoles of the Cuban tree frog, *Osteopilus septentrionalis* (Boulenger). *Journal of Environmental Biology* 27, 187–190.

## **FLOODING ISSUES**

The site is located wholly within the floodplain of the Hunter River. Annex E of the EIS includes a Stormwater, Flooding and Receiving Water Quality assessment by BMT-WBM. The report notes that the threshold for Hunter River flooding to impact the site is the 2% AEP design flood event, where flood depths of approximately 0.4 metre are anticipated to inundate part of the site. In a design 1% AEP flood, flood depths of between 1 to 1.8 metres are anticipated across the whole site.

The proposed development does not involve the construction of any additional buildings or structures on the site.

The proponent has stated that local flooding issues can be managed and mitigated primarily by good practice stormwater management measures as outlined in the Stormwater Management Concept Plan – Figure 2.7 – of the BMT-WBM report. This is concurred with.

Mitigation for mainstream Hunter River flooding will primarily involve emergency site and response planning. On-site management of flood mitigation specifically for the management of the hazardous chemicals has been detailed in section 4.4.3 of the EIS. The flood emergency response equipment should be able to withstand floodwaters up to and including the 1% AEP plus 500mm freeboard depth.

Due to the nature of flooding expected across the site during a major flood, refuge should never be taken on-site during a flood. The BMT-WBM report recommends updating the Site-based Emergency Response Plan be modified to include evacuation due to flooding. This is concurred with.

The EIS also states that structural certification will be undertaken for all the storage sheds on the site so that they can withstand floodwaters up to and including a 1% AEP design flood event. This structural certification should be up to the 1% AEP plus 500mm freeboard depth.

The proponent is responsible for the maintenance of this on-site flood emergency response plan, and any updates that may be required to it in the future. The occupation and use of this site should place no extra requirements on the State Emergency Services for assistance during flood times.

## **ABORIGINAL CULTURAL HERITAGE**

A review of the draft EIS, including Sections 5.12.1, 6.1.2 and Annex L (the AHIMS Search Tool) was undertaken by OEH to assess the potential impacts of the project on Aboriginal cultural heritage, in accordance with OEH's Aboriginal cultural heritage assessment guidelines and the requirements of Part 6 of the *National Parks and Wildlife Act 1974* (NPW Act).

### **Aboriginal cultural heritage assessment**

OEH acknowledges that the Aboriginal cultural heritage assessment has been undertaken in accordance with OEH assessment requirements. OEH also acknowledges the results of this assessment and notes the project area is located within a highly disturbed environment and no known Aboriginal cultural heritage values are likely to be impacted by the project.

However, OEH acknowledges that there is a possibility that currently undetected cultural material may be present within the project area in those areas where Aboriginal objects have not been previously identified.



OEH acknowledges that the proponent has detailed mitigation measures in the event that Aboriginal cultural heritage values are identified during construction activities associated with the development proposal. OEH has prepared recommended conditions of approval below to target these matters.

## **Conclusion**

OEH has no additional concerns with the Aboriginal cultural heritage assessment for the project application. It is recommended that the following conditions of approval for Aboriginal cultural heritage are reflected in any approval conditions for the project.

## **RECOMMENDED CONDITIONS OF APPROVAL FOR ABORIGINAL CULTURAL HERITAGE**

1. The proponent must detail procedures for managing the Aboriginal cultural heritage values associated with the project area in relevant sections of the Construction Environmental Management Plan and the Operational Environmental Management Plan prepared for the project. These measures must be developed in consultation with representatives of the local Aboriginal community.
2. In the event that surface disturbance identifies a new Aboriginal object, all works must halt in the immediate area to prevent any further impacts to the object(s). A suitably qualified archaeological specialist and representatives of the local Aboriginal community must be contacted to determine the nature, extent and significance of the object(s). The site is to be registered in the Aboriginal Heritage Information Management System (AHIMS) (managed by OEH) and the management outcome for the site included in the information provided to the AHIMS. The proponent will consult with representatives of the local Aboriginal community, and the archaeological specialist to develop and implement management strategies for all objects/sites. If impacts are unavoidable, mitigation measures are to be undertaken in accordance with the heritage component of the Construction Environmental Management Plan. All sites impacted must have an Aboriginal Site Impact Recording form completed and be submitted to the AHIMS Registrar within three months of completion of these works.
3. If human remains are located in the event that surface disturbance occurs, all works must halt in the immediate area to prevent any further impacts to the remains. The NSW Police are to be contacted immediately. No action is to be undertaken until the NSW Police provide written notification to the proponent. If the skeletal remains are identified as Aboriginal, the proponent must contact the OEH's Environment Line on 131 555 and representatives of the local Aboriginal community. No works are to continue until OEH provides written notification to the proponent.
4. An Aboriginal Cultural Heritage Awareness Program must be developed for the induction of all personnel and contractors involved in the construction activities on site. Records are to be kept of which staff/contractors were inducted and when for the duration of the project. The program should be developed and implemented in collaboration with the registered Aboriginal parties.