Department of Primary Industries

OUT15/30169

Mr Brent Devine
Infrastructure Projects
NSW Department of Planning and Environment
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SYDNEY NSW 2001

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Dear Mr Devine,

WestConnex M4 East Project (SSI_6307)
Response to exhibition of Environmental Impact Statement

I refer to your email dated 8 September 2015 requesting advice from the Department of Primary Industries (DPI) in respect to the above matter.

DPI considers that while there are a number of matters that require addressing and further work, the matters of interest to DPI are relatively low risk and should not be an impediment to determination of this project.

Comment by DPI Water
DPI Water has reviewed the Environmental Impact Statement and provides the following key comments and recommendations and detailed comments in Attachment A.

- DPI Water considers that further work is required in assessing impacts along the length of the tunnels, impacts on groundwater flow; extent of drawdown and the volume of take. The immediate risks to the groundwater system are considered low, however the long term impacts of dewatering in terms of drawdown and saline water movement are of interest. It is requested this is revised prior to final design and construction to ensure adequate consideration of impacts and mitigating measures.
- DPI Water considers that the groundwater modelling used to assess likely tunnel impacts on the environment and other groundwater users should be improved. This is due to the use of insufficient baseline data, poor model conceptualisation and the use of 5 different groundwater models which is considered inappropriate in this case.
- The considerations and discussions with respect to GDEs seem reasonable, however, the level of groundwater dependency of those flora assemblages identified has not been addressed. Although it is more likely that tidal-

influence saline inundation is more important to the habitats located in the harbour foreshore areas than groundwater inputs, the analysis of impacts could be enhanced.

- The groundwater assessment indicates that private bores are likely to be subject to level 2 impacts under the NSW Aquifer Interference Policy which requires the implementation of make good provisions.

Recommendations

The following recommendations are made:

1) Prior to final design and construction of the tunnel the groundwater modelling for tunnel inflows and saline water migration requires revision in consultation with DPI Water. The modelling should be resubmitted once additional baseline data has been collected and is to address the following:
   i. One model is required to take into account the steady state and transient matters in respect of the tunnels' groundwater inflows, sub-regional drawdown effects, and salt water migration, for the projected life of the project.
   ii. Proper description of conceptualisation for one model including justification for layer choice.
   iii. Specification of matrix hydraulic and storage parameters for each layer of one model.
   iv. A comprehensive statistical evaluation of the model's calibration in accordance with the *Australian Groundwater Modelling Guidelines* by Barnett *et al*., Australian National Water Commission, 2012.
2) The analysis of impacts due to groundwater drawdown into the tunnels should be reassessed with the aid of improved groundwater modelling. Flows and volumes during the construction phase need to be quantified. Likely long-term potential flows – i.e. those that will be limited to a maximum 1 L/sec/km – are to be specified.
3) All potential impacts of groundwater drawdown should be reassessed in terms of the NSW Aquifer Interference Policy. In particular, any potential impact on the Mason Park and Homebush Bay saltmarsh/wetlands needs to be clarified and specifically discussed in terms of potential drawdown following updated groundwater modelling.
4) The reporting of monitoring bore data and measured water levels in Table 5.2 is unclear and should be re-presented. Insufficient information is provided to enable the determination of SWL in mAHD, and different water level measurements from different dates need to be separated.
5) The Groundwater Monitoring Plan be adjusted to include the following provisions related to construction and operation of the project in consultation with DPI Water:
   i. Replacement bores for any loss of monitoring bores due to construction. A clearer listing of present and proposed monitoring bores is required, including their specification in 3 dimensions and details of their construction and borelogs.

ii. Provision for groundwater level and reporting for at least 3 years after the opening of the tunnels to regular traffic. This should preferably be by continuous data loggers but otherwise quarterly.

iii Reporting of groundwater volumes extracted from the tunnels for the life of the project. This information should be reported annually to DPI Water.

6) The groundwater management plan should include “make good” provisions to be implemented in the event of adverse impacts to groundwater users.

7) In relation to waterways and riparian corridor it is recommended that the project is undertaken in accordance with the *Guidelines for controlled activities on waterfront land* (DPI, 2012)

For further information please contact Janne Grose, Water Regulation Officer, on 8838 7505 or at janne.grose@dpi.nsw.gov.au.

Yours sincerely

Mitchell Isaacs
Director, Planning Policy & Assessment Advice
28/10/15

Attachment A

WestConnex M4 East Project (SSI_6307)
Response to exhibition of EIS
Detailed comments - DPI Water

DPI Water has reviewed the Environmental Impact Statement (EIS) and provides the following comments:

Groundwater

DPI Water provided submissions on the draft EIS – Soil and Water Quality and Groundwater Assessment. In relation to the issues previously raised:

- Loss of monitoring bores: the Proponent has not fully identified which monitoring bores will be lost to roadway construction and which may need to be replaced (Section 6.1 of Groundwater Monitoring Plan). This matter requires further consideration.
- Details of future monitoring bores and their equipping with data loggers are not provided (they are generally discussed in Section 7.4.2). Figure 7.1 indicates the general spatial relationship of the bores.
- Groundwater inflow management – the EIS and supporting documents maintain a position that the tunnels will be unlined in general. Groundwater inflow will be controlled to a target of 1 L/s/km by treating areas of excessive inflow as necessary.
- The groundwater and tunnel water will be treated in a central facility at Cintra Park; this facility will treat for a number of potential dissolved and suspended chemicals to a standard suitable for discharge. The one central facility, rather than multiple disposal options, is presented in the EIS as the only approach. (see Figure 5.21 in the EIS Volume 1A).

1. Groundwater Models

The Proponent has submitted 5 different groundwater models in order to explain the various impacts of the construction with respect to groundwater and salt migration. This is a very unusual practice and is considered quite unsatisfactory for such a limited interference with a relatively uniform hydrogeological setting. The interference is essentially linear – 2 tunnels side by side 5.5 km long; relatively shallow – invert less than 35 mbsl; mostly constructed in uniform strata – Hawkesbury Sandstone; in a geological environment – Sydney Basin – which is well understood and for which historic and related geotechnical information is used as a supporting situation for their analyses.

The models have different structures – in terms of layering and hydraulic parameters. They are calibrated to different criteria – mainly the groundwater monitoring results in a particular geological stratum. Table 1 compares these features; the run numbers are the final calibrated model being presented in each case. The models are not components of each other because of their different design e.g. layers and hydraulic parameters, and they are individually calibrated.

No overarching conceptualisation of the model domain is presented except in Section 6.1.2 and 6.1.3 where it is stated that there is a great degree of uncertainty in model parameters primarily hydraulic conductivity, that the modelling platform is Modflow-based, and that 4-6 layers were developed comprising broad stratigraphic horizons.

There is no further justification for the choice of layering, or its subsequent division or multiplication – up to 14 layers (run 209). In short, the presentation and design is unsatisfactory and relevant information is lacking. Discretisation is discussed, however, an unusual aspect reported in Figure 6.1 is that "*the model did not converge when running the drained tunnel simulations, hence a conventional refined grid was used*". This information suggests

considerable difficulty with the model design and/or conceptualisation and/or data inputs. Primarily, it is considered that there are insufficient baseline data to enable a satisfactory modelling effort.

A discussion of calibration efficacy and uncertainty analysis is not presented for the models. Some indication of calibration statistics is presented but since there are no hydrographs for comparative analysis, or other data for matching it is not possible to assess the veracity of claims made. The Proponent states that only steady state calibration was possible (Section 5.4.5), which is further discussed under "Monitoring Data".

There is an attempt in Figures 6.11 and 6.12 to present an assessment of computed versus observed heads. However, these diagrams have no 'key' so that their meaning is unclear, and further with such a limited data set – maximum 2 values – a very close alignment of outcomes to inputs would be expected.

One model – run 1113 used the MT3D platform to perform predictive analysis on salt transport. Very few details are provided of this model design and its veracity cannot be assessed.

2. Monitoring Data

There were sampling events in Nov 2014 and June 2015. At these times groundwater levels could be determined and as a consequence there are 15 bores that were sampled on two (2) occasions and a further 12 bores that were sampled on one (1) occasion. The approximate timeframe is seven months. This amount of sampling is insufficient to provide baseline data for modelling of groundwater to be consistent with the NSW Aquifer Interference Policy.

The Proponent lists monitoring well details in Table 5.2 but does not provide sufficient information to enable the calculation of SWLs relative to the Australian Height Datum here. This important information can only be determined by additional reference to Table 2 in Appendix C. Further, the listing does not separate out measured water levels on each sampling occasion.

In Section 5.4.5 "Water Level Response to Rainfall" the Proponent has sought to explain potential groundwater fluctuations on the basis of similar information from areas to the east of the project. Whilst this may give some overarching guidance, it does not substitute for baseline monitoring which is project specific. In the end, the Proponent concluded that the data was not considered suitable for providing details of seasonal groundwater level fluctuations and enables a steady state calibration only of the groundwater model.

3. Impacts and Tunnel Inflows

The significant uncertainty in the models has made it difficult to evaluate tunnel groundwater inflows. The Proponent's design calls for ultimate tunnel inflows during operation to be limited to 1 L/sec/km. However, there will be significant groundwater take during construction and potentially on-going, and impacts on registered bores have also been predicted.

From model Run 106 the steady state predicted tunnel inflow was 392m^3/day. However, from model run 108 the predicted inflow was 1277m^3/day; a large difference.

To assist in formulating better predictions, the Proponent attempted a stochastic analysis of the conductivity and recharge data. However, this exercise produced tunnel inflow predictions in the range 239 to 5530m^3/day with a 95% upper confidence level of 1325m^3/day.

The transient model (run 209) produced predicted tunnel inflows of up to 1600m^3/day during construction; but tapering off at about 50 years to 500 m^3/day (comparable to the steady state model).

Overall: the predicted model inflow rates to the tunnels are very variable and are of limited guidance for planning and predictive purposes, and accordingly are accompanied by little confidence in their quality.

There are a number of registered bores within 5km of the proposed project. These three bores GW110899, GW024096, GW109699 are likely to be substantially impacted (see pp 6-19, and 6-23); and these impacts are likely to be level 2 impacts under the Aquifer Interference policy, and accordingly it will be necessary for the Proponent to instigate necessary make-good or other arrangements. The Proponent discusses this in Section 7.5 but needs to undertake an extensive assessment of this aspect prior to construction.

The matter of potential impacts on GDEs is discussed previously: the considerations of this matter need greater clarity following updated groundwater modelling.

Watercourses and Riparian Land

It is recommended all final design options and works be undertaken to minimise impacts on watercourses and waterfront land. Where relevant, the project should be undertaken in accordance with the *Guidelines for Controlled Activities on Waterfront Land* (DPI, 2012).

DPI Water recommends that permanent operational areas and areas of disturbance be located outside riparian corridors wherever feasible, and that existing and remaining areas of riparian corridors be protected and restored following construction.

Areas of riparian land permanently lost as a result of the construction should be offset elsewhere along the riparian corridor.

End Attachment A