NORTH EAST LINK PROJECT

EPBC Referral Attachment C - Hydrogeology Report

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1. Introduction

1.1 Purpose of this report

North East Link ('the project') is a proposed new freeway standard road connection that would complete the missing link in Melbourne's metropolitan ring road, giving the city a fully completed orbital connection for the first time. North East Link would connect the M80 Ring Road (M80) to the Eastern Freeway, and include upgrade works along the Eastern Freeway.

The project is being referred to the Australian Government Environment Minister in accordance with the requirements of the *Environment Protection and Biodiversity Conservation Act 1999* (the EPBC Act).

This report was prepared in order to support the EPBC referral being prepared for the project. It includes a summary of the existing hydrogeological conditions within the referred project area, and a discussion of the mitigation that is planned to prevent impacts to groundwater that could affect matters of national environmental significance.

1.2 Description of proposed action

The following describes the North East Link alignment and the key elements, noting that development of the concept design is ongoing:

- **Western Ring Road to Lower Plenty Road** – from the M80 and Greensborough Bypass to the northern tunnel portal, this section would include a mixture of above, below and at surface road sections, with new road interchanges at M80, Grimshaw Street and Lower Plenty Road.
- **Tunnels** – from the northern tunnel portal located just north of Lower Plenty Road to south of Manningham Road, twin tunnels would travel under residential areas, Banyule Flats and the Yarra River. Near each tunnel portal, supporting tunnel infrastructure would be required, including ventilation structures, substations and associated infrastructure. This section would include a new interchange at Manningham Road.
- **Bridge Street to Eastern Freeway** –this section would include open cut and bored or mined tunnel with the southern tunnel portal located south of the Veneto Club. Further south, surface road and viaduct structures would connect to the Eastern Freeway via a new interchange.
- **Eastern Freeway upgrades** – from around Hoddle Street in the west through to Springvale Road in the east, modifications to the Eastern Freeway would include widening to accommodate future traffic volumes, provision of new dedicated bus lanes for rapid bus services (Doncaster Busway) and associated works.

A more detailed description of the project is provided in the covering referral submission.

1.3 Relevance to EPBC Act

The groundwater environment has the potential to be altered by the project. Water qualities can be altered by contamination, and water levels can change through dewatering activities. These changes in groundwater (quality and level) can influence the health of ecosystems that may rely upon groundwater to support some, or all of their water needs. For example, groundwater may be an important contributor to flow in waterways, or in other areas, its shallow occurrence may render it accessible to terrestrial vegetation.

2. Existing hydrogeology

From a hydrogeological perspective and based on the regional geology, the referred project area can be simplified into two main aquifer systems, referred to as either fractured rock aquifers, or porous media aquifers. The bulk of the project area is situated upon Palaeozoic rocks, comprising mudstones, sandstones and shales. These form fractured rock aquifers rocks that are regionally extensive.

These older rocks have been eroded, and in part, covered by younger sediments and volcanics. The sediments, typically Quaternary age, comprise variable mixtures of sands, clays and silts, and are porous media aquifers. As the sediments typically form the floodplains of the present day waterways within the project area, and can have high permeabilities, there can be a high degree of connectivity between surface water and groundwater.

Groundwater levels are a subtle reflection of topography, with flow occurring from the higher topographies towards the valleys and floodplains, where it can discharge as seeps and spring flow, e.g. baseflow to the creeks and rivers. Given the size of the project area and its topography, the depth to groundwater is quite variable. The shallowest groundwater levels are expected to be associated with floodplain sediments, and lie within a few metres below the ground surface, e.g. the Yarra River floodplain. Groundwater levels in the higher topographies can be considerably deeper than 20 metres below the surface.

Groundwater quality has been assessed based on regional mapping and tends to be relatively fresh amongst the various aquifers, with salinities ranging between <1,000 mg/L Total Dissolved Solids (TDS) to <3,500 mg/L TDS.

The interaction between groundwater and surface water in the study area can be complex, owing to hydraulic gradients, e.g. losing and gaining stream reaches, and aquifer material permeabilities. In the floodplain areas, alluvial sediments may be strongly linked with adjacent waterways. The deeper bedrock aquifers underlying these sediments may be hydraulically disconnected from an overlying waterway by fine grained (clayey) beds within the sedimentary sequence. However, surface and groundwater interaction can also be high where such confining beds are absent.

In some parts of the project area, the waterways flow directly over the Palaeozoic fractured rock aquifers. Interaction in these areas depends upon material permeabiliites, e.g. weathering can create zones of reduced permeability and hydraulic connection, as well as the prevailing hydraulic grade, i.e. differences between water levels in the stream relative to groundwater levels.

The National Groundwater Dependent Ecosystem Atlas (BOM, 2012) was reviewed to identify potential groundwater dependent ecosystems (GDEs) in the vicinity of the project. The mapping identified potential for GDEs associated with the main waterways throughout the study area, i.e. terrestrial and riparian vegetation may be dependent upon groundwater, e.g. areas within the floodplain of the Yarra River (Banyule Wetlands, Bolin Bolin Billabong), Banyule Creek, and Koonung Creek. Further information on the EPBC Act-listed ecological communities identified in the vicinity of the project is provided in the Ecology report (Attachment D to this referral). In summary, no EPBC Act-listed groundwater dependent communities or species were identified within the referred project area.

3. Hydrogeological considerations in design

The project includes a tunnel passing under the Yarra River and the Banyule Wetlands. Parts of the tunnel will be below the watertable, and therefore disturbance to the groundwater environment could occur as part of tunnel and associated portal construction, i.e. dewatering to maintain safe and dry excavation conditions, and on-going operation. Depending upon the extent and magnitude of dewatering, the dewatering can reduce water availability to dependent ecosystems, and depending on the level of reliance and the availability of alternative water sources, this could result in stress and degradation of ecosystem health, e.g. water levels could be lowered making groundwater less accessible to ecosystems. As well as potentially altering the accessibility of groundwater, over the long term, groundwater quality changes may also result. To manage potential impacts, dewatering would be minimised through adoption of specific tunnel design measures and implementation of a groundwater management plan.

Connection between the Yarra River and groundwater within the project area is expected to be variable along its reaches, and aquifer of interest. This will be confirmed through geotechnical investigations. Flow in the regulated Yarra River is influenced by releases from the Upper Yarra Reservoir, but is expected to be orders of magnitude greater compared to the quantity of groundwater seepage contributing to its flow over the reach within the project area. Under these conditions, groundwater dewatering activities are unlikely to have a measurable impact upon flows within the Yarra River. However, dewatering activities may have a measurable effect on smaller tributaries, and billabongs connected with the groundwater.

Specific design measures such as the tanking or water proofing of the tunnel and other buried structures would be adopted as appropriate to achieve a desired outcome with the permanent works or operation condition. Tanked, sealed or undrained structures minimise entry of groundwater and therefore the resultant disturbance to the groundwater environment is minimised. Also, by minimising changes to groundwater levels, changes in the movement of groundwater are also reduced. This reduces the risk of disturbance of contaminated groundwater plumes, or mixing of groundwaters of differing quality. Drained structures allow groundwater entry and therefore there is significantly greater disturbance to the groundwater environment and would be therefore avoided by the project where this is a possibility.

A groundwater management plan includes measures that minimise disturbance to, and protect, the groundwater environment. A plan would be implemented during construction, as the construction method itself may result in impact to groundwater, and in some cases greater impacts compared to those arising from the completed, permanent structure. The management plan would set out the processes, objectives, and actions to be applied to minimise, mitigate or rectify disturbance during construction, before the permanent structure is completed. The management plan would document monitoring requirements, as well as addressing issues that may have arisen during construction and which could influence the ongoing operation.