

## POSITION PAPER

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### **Twin Swamps Nature Reserve**

NLWA-04-WM-0001

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### **1 INTRODUCTION**

The Twin Swamps Nature Reserve is approximately 2.6km east of the PDNH alignment and to the south of Warbrook Road (refer to Figure 1). It is home to the critically endangered Western Swamp Tortoise (the most endangered reptile in the World) and is managed by the Department of Parks and Wildlife.

Whilst the project is outside the Western Swamp Tortoise Policy area (refer to Appendix A), possible impacts on the Twin Swamps Nature Reserve, particularly from road runoff from the proposed Perth-Darwin National Highway (PDNH), was a key concern raised during stakeholder consultation. This paper has been prepared to address these concerns.

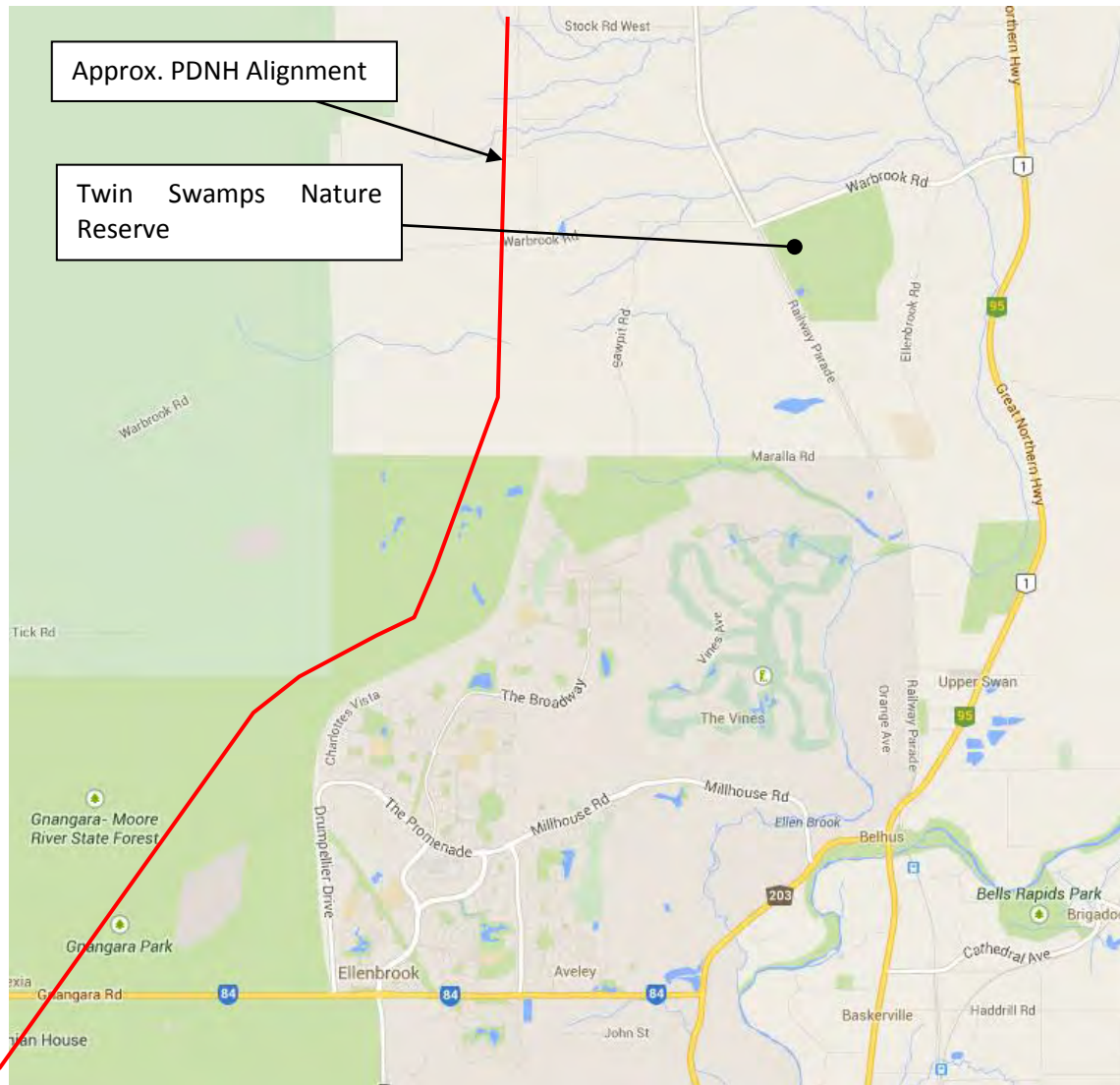


Figure 1: Locality Plan

## 2 SURFACE HYDROLOGY

A key concern raised by members of the Environment Reference Group is the control of road runoff entering Twin Swamps via a tributary draining into the reserve from the west. A review of the surface drainage patterns between the PDNH alignment and Twin Swamps using the available LIDAR data (1m contours) shows that the tributary draining into Twin Swamps is from a localised catchment to the east of the PDNH alignment. Surface flows from the PDNH alignment to the east split to the south and north of the Twin Swamps reserve and therefore do not actually flow into Twin Swamps (refer Figure 2 below).

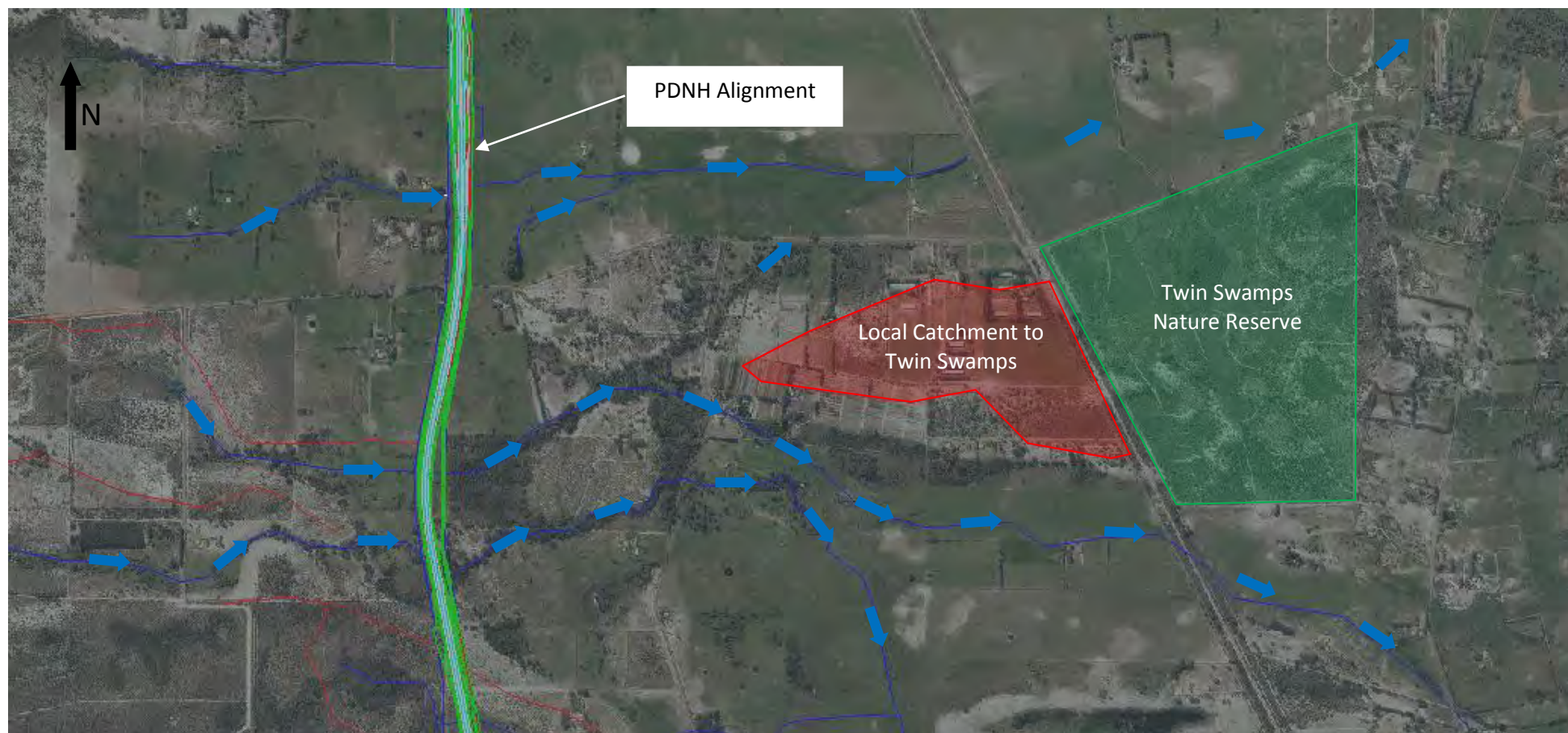


Figure 2: Surface flow patterns between PDNH and Twin Swamps





### 3 GROUNDWATER

#### ***Groundwater Flow***

The regional groundwater flow direction in the area is generally from west to east from the Gngangara Mound toward Ellen Brook. Some of the groundwater will flow into the natural surface drainages if they are deep enough to intercept the groundwater. This would mainly occur during the wet season when the groundwater level is highest. During the dry season some of the natural surface drains are likely to dry up (perennial drains) and groundwater would during this time flow beneath the drains in a west to east direction toward Twin Swamps. Therefore some of the water entering the Twin Swamps is from groundwater, which sustains the water in the swamps during the dry season. Figure 3 shows the wet season groundwater level contours derived mainly from a groundwater level investigation undertaken in October 2014 (end of wet season) as well as historical data. Based on the groundwater level contours it is estimated that groundwater that flows across less than 500 m length of the proposed road alignment could flow toward the Twin Swamps and potentially reach the swamps, if not intercepted by the surface drains first.

Based on the measured regional hydraulic groundwater gradient of 0.004 (12 m over 3000 m), an average hydraulic conductivity of 5 m/d and an effective porosity of 15%, it is estimated that it would take a water particle at the proposed road alignment more than 60 years to reach Twin Swamps (groundwater flow is approximately 50 m per year).

#### ***Groundwater Level***

A groundwater model was developed to assess the impacts the embankment construction could have on groundwater level and flow which is documented in NLWA-00-HY-PP-0001. The results indicated that the change in groundwater level would be un-noticeable if there was a sand layer with a thickness greater than 1 m at the surface. The closest Department of Water (DoW) wells (WIN ID 5402 and 5409) located at the proposed road alignment (refer to Figure 3 for locations) indicate that the soil profile consists of medium grained sand with a thickness of greater than 10 m.

On this basis, with Twin Swamps located approximately 2.6 km downstream of the road alignment, the construction of the road embankment will not result in an impact on the groundwater levels at Twin Swamps.

No other impacts on the groundwater level and flow have been identified in this area of the alignment. It is therefore concluded that the road construction will not affect the groundwater level at and groundwater flow to the Twin Swamps.

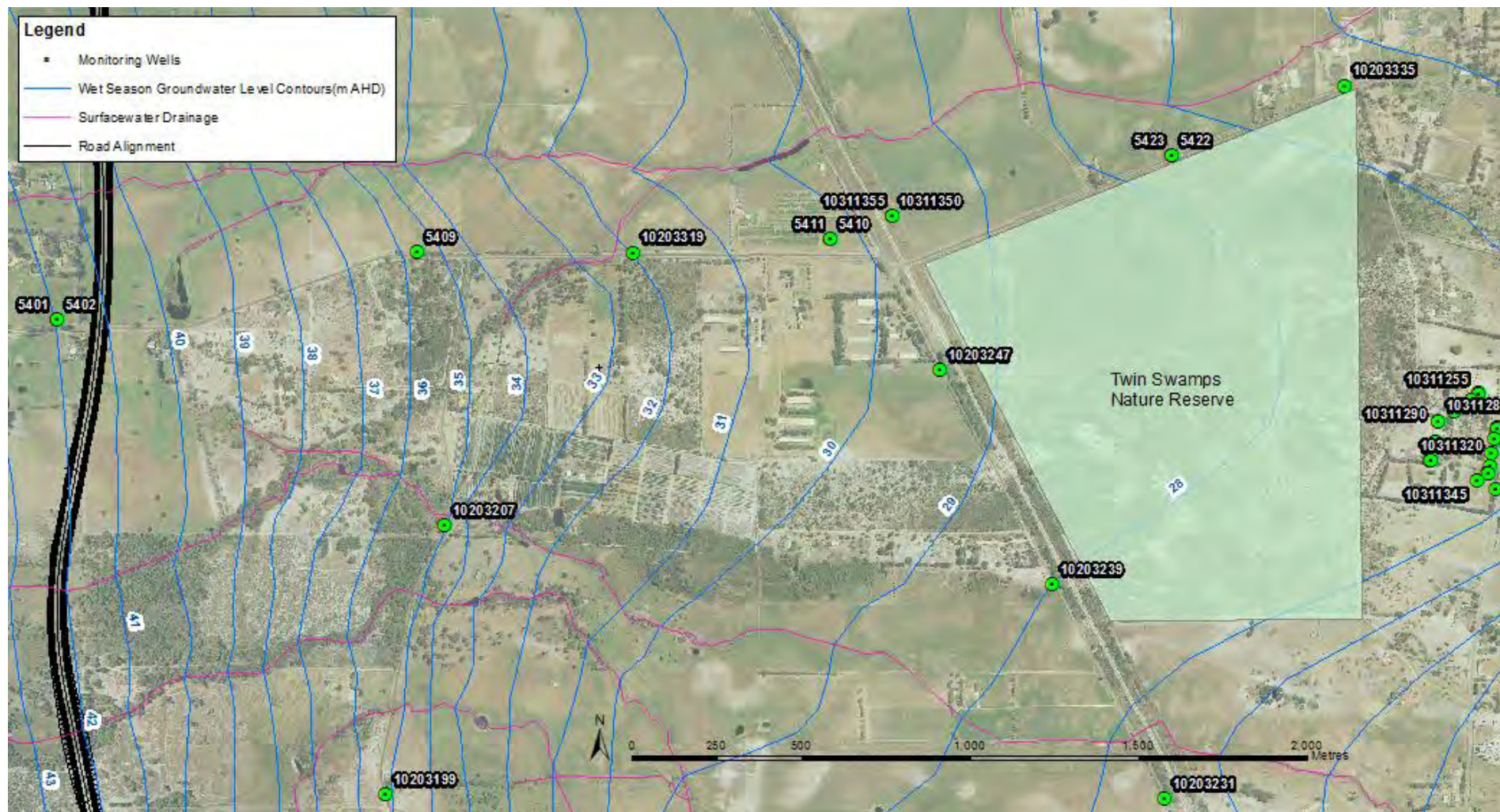


Figure 3: Groundwater flow contours between PDNH and Twin Swamps





### **Groundwater Quality**

Given that the Twin Swamps are fed by groundwater, a change in groundwater quality up-gradient of the Twin Swamps could eventually lead to a change in water quality within the swamps. Therefore a change in groundwater quality due to the construction and presence of the road (over less than 500 m length of the alignment) could impact the water quality in the Twin Swamps. The level of impact would depend on the contaminant and its concentration the effectiveness of emergency response procedures in the case of a spill, how road runoff is managed (i.e. whether it is passed through vegetated swale before infiltrating into the groundwater system) and the natural attenuation that would occur of the analyte/contaminant over the 60 year travel period in groundwater from the road to the Twin Swamps.

Given the slow travel time of the groundwater there would be ample time to implement any necessary monitoring and corrective measures following a spill, between the road and the Twin Swamps to capture any pollutants in the event that groundwater contamination (e.g. a spill) occurs during construction or operation. Impacts to groundwater quality from PDNH on the Twin Swamps are therefore considered to be very low risk and manageable.

## **4 POSITION**

It is the position of NorthLink WA that surface flows from the PDNH alignment will not flow directly into the Twin Swamps nature reserve.

A groundwater assessment indicates that groundwater levels at, and groundwater flow to, the Twin Swamps will not be impacted by PDNH.

A change in quality of groundwater flowing across less than 500 m length of the road alignment could eventually interact with and degrade groundwater which may impact water quality in the Twin Swamps. However, the risk of contaminated groundwater impacting the water quality at Twin Swamps is considered very low and manageable:

- Where an adequate Environmental Management Plan is in place which includes best practice management in relation to the generation, storage, handling and release of pollutants, including an emergency spill response procedure.
- Promotion of road runoff for small rainfall events onto the ground as close to the source as possible for infiltration, through the most appropriate infiltration drainage mechanism (i.e. vegetated/grassed swales/verge) which will assist in the removal of contaminants through settling, filtering process and/or biological action.
- The natural attenuation that would occur of the analyte/contaminant over the 60 year travel period in any contaminated groundwater from the road to the Twin Swamps.



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APPENDIX A

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# Western Swamp Tortoise Policy Area



