Appendix A. Stage 1 Contamination Assessment

The Northern Road Upgrade

Mersey Road to Glenmore Parkway

Roads and Maritime Services

Stage 1 Contamination Assessment

15 May 2017

The Northern Road Upgrade - Stage 1 Contamination Assessment

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Rev V7	15/05/2017	Final for Exhibition – updated project description	M Stacey	15/05/2017	15/05/2017

Contents

Important note about your report

The sole purpose of this report is to present the findings of a Stage 1 contamination assessment carried out by Jacobs Group (Australia) Pty Ltd (Jacobs) for the Roads and Maritime Services (Roads and Maritime) in upgrading the 16 km section of The Northern Road between Mersey Road, Bringelly and Glenmore Parkway, Glenmore Park (the project).

The scope of services was not intended to provide a definitive or quantitative investigation of the environmental impacts, performance and compliance of the project area. Environmental conditions may exist within the project area that are beyond the scope of our investigations and this report.

The findings presented in this report are professional opinions based solely upon information and data provided or made available by Roads and Maritime or otherwise available in the public domain including:

- Visual observations of the project area and its vicinity
- Publically available information sources.

Jacobs has relied upon and presumed that this data is accurate and representative of the environmental conditions at the project area. Except as otherwise stated in the report, Jacobs has not attempted to verify the accuracy or completeness of any such information. If the information is subsequently determined to be false, inaccurate or incomplete, or if site conditions change beyond the agreed dates then it is possible that our conclusions as expressed in this report may change.

Jacobs has prepared this report in accordance with the usual care and thoroughness of the consulting profession and by reference to applicable auditing procedures and practice at the date of issue of this report. For the reasons outlined above however, no other warranty or guarantee, whether expressed or implied, is made as to the data, observations and findings expressed in this report.

Except as specifically stated in this report, Jacobs makes no statement or representation of any kind concerning the suitability of the project area for any purpose or the permissibility of any use. Use of the project area for any purpose may require planning and other approvals and, in some cases, EPA (or OEH) and accredited site auditor approvals. Jacobs offers no opinion as to the likelihood of obtaining any such approvals, or the conditions and obligations which such approvals may impose, which may include the requirement for additional environmental investigations and/or works.

This report should be read in full and no excerpts are to be taken as representative of the findings. No responsibility is accepted by Jacobs for use of any part of this report in any other context.

This report has been prepared on behalf of and for the exclusive use of Roads and Maritime, and is subject to and issued in accordance with the contract between Jacobs and Roads and Maritime. Jacobs accepts no liability or responsibility whatsoever for or in respect of any use of or reliance upon this report by any third party.

1. Introduction

1.1 General

The Roads and Maritime Services (Roads and Maritime) has commissioned Jacobs to prepare an environmental impact statement (EIS) to address the requirements issued by the Secretary of the NSW Department of Planning and Environment (DPE) on 9 March, 2016 and the relevant provisions of Schedule 2 of the Environmental *Planning and Assessment Regulation 2000* for The Northern Road Upgrade - Mersey Road, Bringelly to Glenmore Parkway, Glenmore Park (the project).

An overview of the project is presented as **Figure 1**.

As part of the EIS, Jacobs has prepared this Stage 1 contamination assessment report detailing the results of the contamination desktop investigation undertaken including a review of publically available information and project specific historical aerial photography, site inspection, identification of potential Areas of Environmental Interest (AEIs), and recommendations on further contamination sampling / investigations, if required.

1.2 Overall project description

The project involves upgrading the 16 km section of The Northern Road between Mersey Road, Bringelly and Glenmore Parkway, Glenmore Park.

The project generally comprises the following key features:

- A six-lane divided road between Mersey Road, Bringelly and Bradley Street, Glenmore Park (two general traffic lanes and a kerbside bus lane in each direction). The wide central median would allow for an additional travel lane in each direction in the future, if required
- An eight-lane divided road between Bradley Street, Glenmore Park and about 100 m south of Glenmore Parkway, Glenmore Park (three general traffic lanes and a kerbside bus lane in each direction separated by a median)
- About eight kilometres of new road between Mersey Road, Bringelly and just south of the existing Elizabeth Drive, Luddenham, to realign the section of The Northern Road that currently bisects the Western Sydney Airport site and to bypasses Luddenham
- About eight kilometres of upgraded and widened road between the existing Elizabeth Drive, Luddenham and about 100 m south of Glenmore Parkway, Glenmore Park
- Closure of the existing The Northern Road through the Western Sydney Airport site
- Tie-in works with the following projects:
  - The Northern Road Upgrade, between Peter Brock Drive, Oran Park and Mersey Road, Bringelly (to the south)
  - The Northern Road Upgrade, between Glenmore Parkway, Glenmore Park and Jamison Road, South Penrith (to the north)
- New intersections including:
  - A traffic light intersection connecting the existing The Northern Road at the southern boundary of the Western Sydney Airport, incorporating a dedicated u-turn facility on the western side
  - A traffic light intersection for service vehicles accessing the Western Sydney Airport, incorporating 160 m of new road connecting to the planned airport boundary
  - A traffic light intersection connecting the realigned The Northern Road with the existing The Northern Road (west of the new alignment) south of Luddenham
  - A ‘give way’ controlled intersection (that is, no traffic lights) connecting the realigned The Northern Road with Eaton Road (east of the new alignment, left in, left out only)
  - A four-way traffic light intersection formed from the realigned Elizabeth Drive, the realigned The

Northern Road and the existing The Northern Road, north of Luddenham

- A traffic light intersection at the Defence Establishment Orchard Hills entrance, incorporating a u-turn facility

- New traffic lights at four existing intersections:
  - Littlefields Road, Luddenham
  - Kings Hill Road, Mulgoa
  - Chain-O-Ponds Road, Mulgoa
  - Bradley Street, Glenmore Park incorporating a u-turn facility
- Modified intersection arrangements at:
  - Dwyer Road, Bringelly (left in, left out only)
  - Existing Elizabeth Drive, Luddenham (left out only)
  - Gates Road, Luddenham (left in only)
  - Longview Road, Luddenham (left in, left out only)
  - Grover Crescent south, Mulgoa (left in only)
  - Grover Crescent north, Mulgoa (left out only)
- Dedicated u-turn facilities at:
  - The existing The Northern Road at Luddenham, south-west of Elizabeth Drive
  - The existing Elizabeth Drive, Luddenham around 800 m east of The Northern Road
  - Chain-O-Ponds Road, Mulgoa
- Twin bridges over Adams Road, Luddenham
- Local road changes and upgrades, including:
  - Closure of Vicar Park Lane, east of the realigned The Northern Road, Luddenham
  - Eaton Road cul-de-sac, west of the realigned The Northern Road, Luddenham
  - Eaton Road cul-de-sac, east of the realigned The Northern Road, Luddenham
  - Elizabeth Drive cul-de-sac, about 300 m east of The Northern Road with a connection to the realigned Elizabeth Drive, Luddenham
  - Extension of Littlefields Road, east of The Northern Road, Mulgoa
  - A new roundabout on the Littlefields Road extension, Mulgoa
  - A new service road between the Littlefields Road roundabout and Gates Road, including a ‘give way’ controlled intersection (that is, no traffic lights) at Gates Road, Luddenham
  - Extension of Vineyard Road, Mulgoa between Longview Road and Kings Hill Road
  - A new roundabout on the Vineyard Road extension at Kings Hill Road, Mulgoa
- A new shared path on the western side of The Northern Road and footpaths on the eastern side of The Northern Road
- A new shared path on the western side of The Northern Road and footpaths on the eastern side of The Northern Road where required
- The upgrading of drainage infrastructure
- Operational ancillary facilities including:
  - Heavy vehicle inspection bays for both northbound and southbound traffic, adjacent to Grover Crescent, Mulgoa and Longview Road, Mulgoa respectively
  - An incident response facility on the south-western corner of the proposed four-way traffic light

intersection at Elizabeth Drive, Luddenham

- New traffic management facilities including variable message signs (VMS)
- Roadside furniture and street lighting
- The relocation of utilities and services
- Changes to property access along The Northern Road (generally left in, left out only)
- Establishment and use of temporary ancillary facilities and access tracks during construction
- Property adjustments as required
- Clearance of undetonated explosive ordinance (UXO) within the Defence Establishment Orchard Hills as required.

The project assessed in this EIS does not include surveys, sampling or investigation to inform the design or assessment, such as test drilling, test excavations, geotechnical investigations, or other tests. It also does not include adjustments to, or relocation of, existing utilities infrastructure undertaken prior to commencement of construction. These would be subject to separate assessment and approval as appropriate.

1.3 Objectives

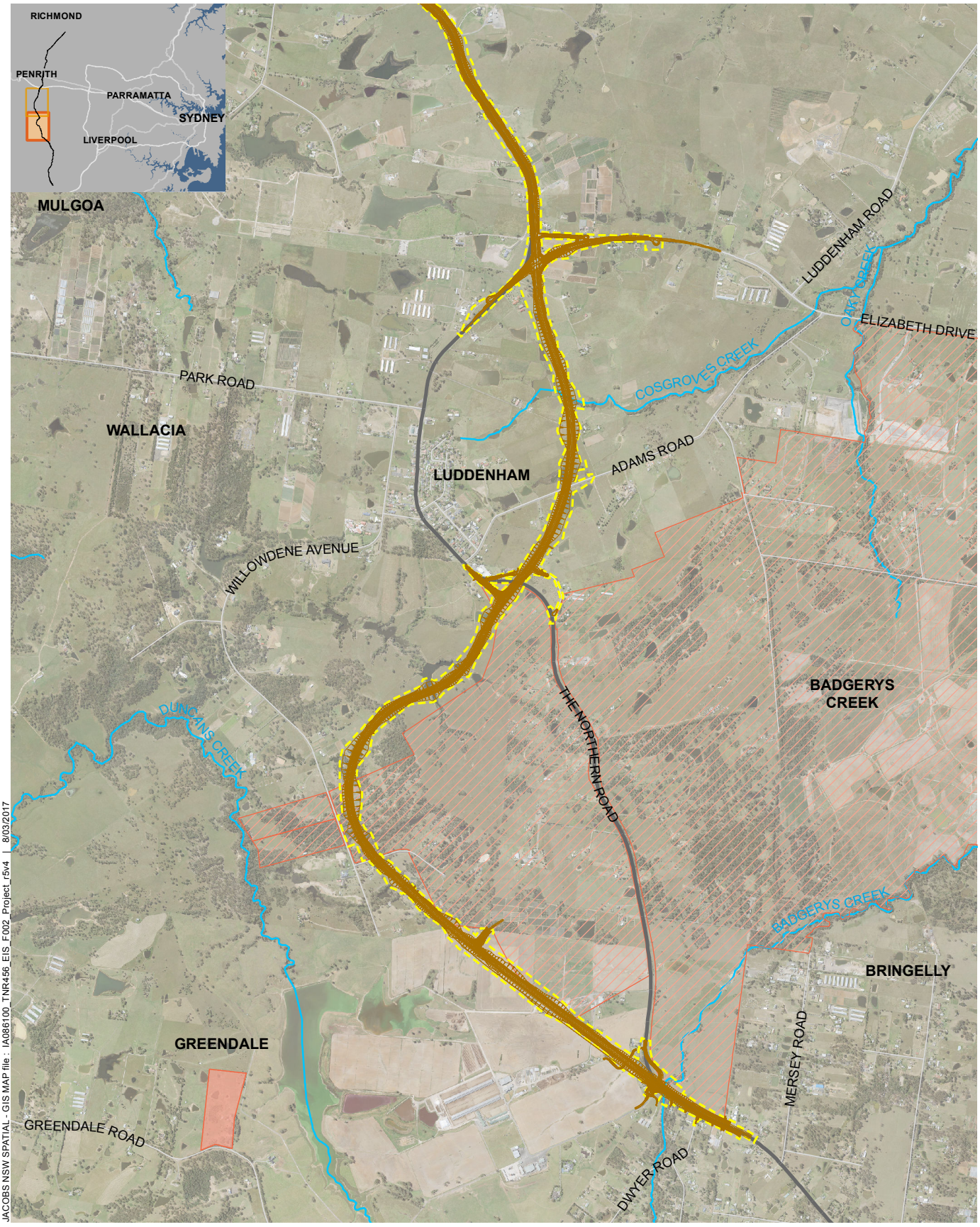
The objectives of the Stage 1 contamination assessment were to identify potential AEI which would assist in identifying construction limitations/constraints within the project area with respect to contamination.

The AEIs were considered to be those potential risks associated with soil, groundwater and vapour contamination which may be present as a result of historic and / or current activities undertaken on and / or adjacent to the project area.

1.4 Scope of works

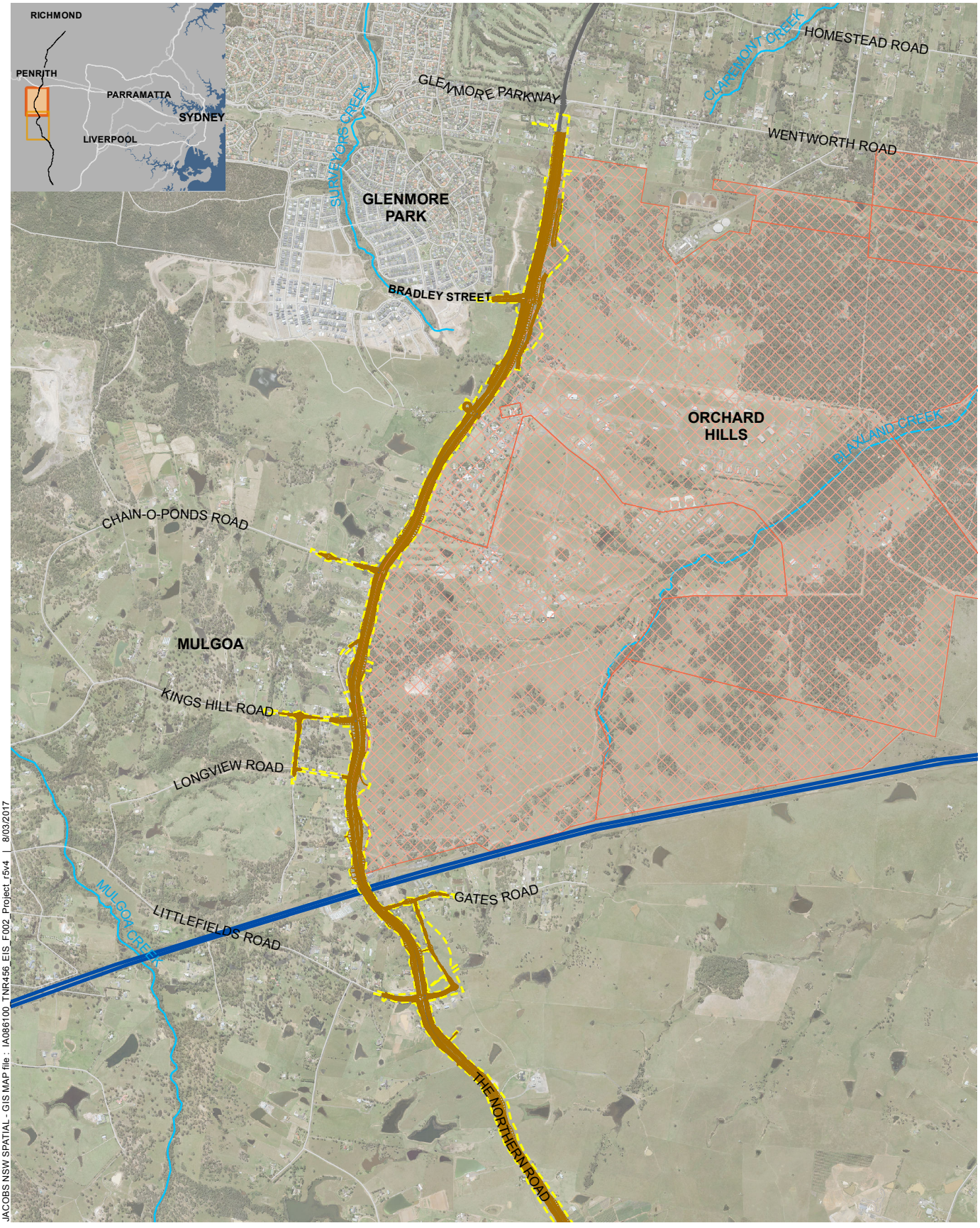
To achieve these objectives, Jacobs undertook the following scope of works:

- Review of publically available information (NSW EPA, CSIRO ASRIS database, NSW Department of Primary Industries groundwater database, Department of Defence UXO database)
- Review of historical aerial photography of the general project area
- Site walkover and inspection
- Preparation of a Stage 1 contamination assessment report based on the data obtained from the desktop background review and observations from the inspection of the project area. The expected ground conditions are presented together with any contamination issues identified and recommendations for further investigations, if required.



JACOBS NSW SPATIAL - GIS MAP file : IA086100_TNR456_EIS_F002_Project_r5v4 | 8/03/2017

Figure 1 | Location of the project area



The Northern Road upgrade - Mersey Road to Glenmore Parkway

The Northern Road (Existing)

WaterNSW supply pipelines

Operational boundary

Western Sydney Airport site (Commonwealth Land)

Defence Establishment Orchard Hills (Commonwealth Land)

Commonwealth Lands

0 0.5 1 km

N

2

1

Figure 1 | Location of the project area

2. Existing environment

The information presented below is based on a review of publically available information, and observations made during a project area inspection undertaken from publically accessible areas by Jacobs on 19 November 2015.

2.1 Location and zoning

The project area spans about 16 km generally within The Northern Road corridor from Bringelly in the south to Glenmore Park in the north. The southern portion of the project area also extends into an agricultural area within the suburbs of Greendale and Luddenham.

At the time of preparing this report, the project area was within a range of land zonings as classed by the Penrith and Liverpool City Council Local Environmental Plans including:

- SP1 – Specialist Activities
- R1 – General Residential
- R2 Low Density Residential
- R3 – Medium Density Residential
- B7 - Business Park
- RE1 – Public Recreation
- RE2 – Private Recreation
- R2 – Rural Landscape
- RU1 – Primary Production
- E4 – Environmental Living
- SP1 – Special Activities
- SP2 – Infrastructure.

2.2 Topography and drainage

The project area is part of an elevated ridge system dividing the Nepean River to the west from the South Creek catchment to the east. The topography within the project area is characterised by rolling landscapes typically of the Bringelly Shale.

Localised drainage lines and creeks within and adjacent to the project area are expected to flow away from The Northern Road to the west towards the Nepean River and east towards South Creek.

The majority of rain falling onto the project area would fall onto unsealed areas with minor run-off from impermeable areas (i.e. roads, roofs of buildings). Runoff during rainfall events is expected to infiltrate into sub-soils and/or run off into localised drainage lines, river, creeks and/or dams.

2.3 Geology

The Penrith 1:100,000 Geological Series Sheet 9030 (NSW Department of Mineral Resources, 1991) indicated that the project area is predominately underlain by Bringelly Shale, the Luddenham Dyke and Quaternary alluvium.

The Bringelly Shale belongs to the Wianamatta Group which is the upper most geological unit of the Permo-Triassic sequence mainly comprising claystone and siltstone, with some areas of sandstone. It is interpreted as a coastal alluvial plain sequence that contains lagoonal – coastal marsh sequence at the base through to terrestrial, alluvial plain sediments at the top of the formation.

Luddenham Dyke is a Jurassic dyke which intersects the proposed alignment at about chainage 5600. The dyke comprises of olivine basalt and has been mapped as being 6 to 12 metres wide. Very hard indurated shales may be found adjacent to the dyke due to contact metamorphism.

Alluvium comprising of fine sands, silt and clay is likely to be deposited along the Cosgrove and Badgerys Creek systems. According to the Western Sydney Airport Draft Environmental Impact Statement the alluvium deposits can be up to five metres thick and are typically made up of fine sands, silts and clays with some areas of gravelly clay.

A description of the geological formations underlying the project area is provided in **Table 2-1** below.

Table 2-1: Geological units underlying the project area.

Unit	Description
Bringelly Shale (Rwb)	Shale, carbonaceous claystone, laminate, coal in parts
Luddenham Dyke (Jd)	Basalt, dolerite
Quaternary Alluvium (Qal)	Fine grained sand, silt, clay.

2.4 Soils

The Penrith 1:100,000 Soil Landscape sheet 9030 (Soil Conservation Service of NSW, 1990) indicated that the soil landscape groups within the project area consist of erosional Luddenham (lu), residual Blacktown (bt) and fluvial South Creek (sc) soil landscape groups. **Table 2-2** describes the soil landscape groups within the project area.

Table 2-2: Soil units underlying the project area.

Unit	Description
Luddenham (lu)	• Landscape – found on undulating to rolling hills on Wianamatta Shales, with slopes between 5-20% and local relief between 50 and 80m, narrow ridges, hills and valleys. • Soils – shallow podzolic soils and massive clays on crests, moderately deep red podzolic soils on upper slopes and moderately deep yellow podzolic soils and prairie soils on lower slopes and drainage lines • Limitations – high soil erosion hazard, localised impermeable highly plastic subsoil, moderately reactive.
Blacktown (bt)	• Landscape - found on gently undulating rises on Wianamatta Group shales with local reliefs of up to 30 metres and slopes of less than 5 per cent. • Soils - shallow to moderately deep hardsetting mottled texture contrast soils, red and brown podzolic soils on crests grading to yellow podzolic soils on lower slopes and in drainage lines. • Limitations - moderately reactive, highly plastic subsoil, with low fertility and poor drainage.
South Creek (sc)	• Landscape - found on floodplains, valley flats and drainage depressions of the channels on the Cumberland Plain. • Soils – deep layered sediments over bedrock or relic soils. Structured plastic slays and loams in and adjacent to drainage lines, red and yellow podzolic soils on terraces. • Limitations – erosion hazard, frequent flooding.

2.5 Acid sulfate soils risk

Acid sulfate soils (ASS) are the common name given to naturally occurring sediments and soils containing iron ASS are soils and sediments containing iron sulphides that, when disturbed and exposed to oxygen, generate sulfuric acid and toxic quantities of aluminium and other heavy metals. The sulfuric acid and heavy metals are produced in forms that can be readily released into the environment, with potential adverse effects on the natural and built environment and human health. The majority of ASS are formed by natural processes under specific environmental conditions. This generally limits their occurrence to low lying sections of coastal floodplains, rivers and creeks where surface elevations are less than about five metres Australian Height Datum (AHD).

The Australian Soil Resource Information System (ASRIS, 2015) provides online access to the best publicly available information on soil and land resources across Australia. ASRIS provides a national map of available ASS mapping that is classified with a nationally consistent legend that includes risk assessment criteria and correlations between Australian and International Soil Classification Systems.

The ASRIS ASS map was consulted to determine the presence and risk of ASS along the project alignment. The Acid Sulfate Soil Probability within the project alignment was classified as Extremely Low Probability of occurrence. ASS is therefore not considered to be a risk to the project.

2.6 Soil salinity

Salinity is a complex issue relating to salt and water cycles both above and below the ground. Surface waters and groundwater can dissolve and mobilise salts and cause their accumulation in other areas. Excessive concentrations of salt in such areas can affect plant growth, soil chemistry and cause weakening and degradation of construction materials such as masonry, concrete and bitumen.

An assessment of the salinity potential within the project area was undertaken using the map of Salinity Potential in Western Sydney (Department of Infrastructure, Planning and Natural Resources, 2002). The majority of the project area occurs in areas of moderate salinity potential with isolated areas of high salinity potential and areas of known salinity occurrence in the vicinity of Cosgrove Creek.

2.7 Hydrogeology

The direction of groundwater flow could not be definitively assessed based on current information, although the surrounding topography of the project area and location of water bodies suggests that regional groundwater would shed away from The Northern Road to the west towards the Nepean River and east towards South Creek. Localised groundwater flows would be influenced by creeks, drainage lines and dam structures.

2.7.1 Groundwater bore search

A search of the Department of Primary Industries groundwater database identified eight registered groundwater wells within a 500 metre radius of the project area. Details of the registered bores, use and proximity to the project area are summarised in **Table 2-3**.

Table 2-3: Registered DPI boreholes within 0.5 kilometre of the Project.

Borehole ID	Impact potential	Depth (m)	Use	Proximity to project area
GW102305	1km west of Elizabeth Drive and The Northern Road intersection	61	Stock	Outside
GW106198	300m west of Elizabeth Drive and The Northern Road intersection	-	Stock, domestic	Outside
GW108933	600m west of Luddenham town	268	Irrigation	Outside
GW104979	Within property located to the east of Willowdene Avenue	180	Stock, domestic	Within
GW104215	2km west of The Northern Road and Dwyer Road Intersection	222.5	Stock, domestic	Outside
GW105959	2km west of The Northern Road and Dwyer Road Intersection	337	Stock, farming, irrigation	Outside

2.8 Sensitive environments

Based on the available information, sensitive environments which could be impacted by contamination within the project area (if present) are detailed below:

- Blue Hills Wetland, Glenmore Park.
- Blaxland Creek, Orchard Hills
- Mulgoa Creek, Luddenham
- Tributaries of Duncan Creek, Luddenham
- Badgerys Creek, Bringelly
- Various dams, wetlands within project area.

Jacobs undertook a review of the Bureau of Meteorology Groundwater Dependant Ecosystems (GDE) Atlas to assess the presence of GDEs in the near vicinity (within about 500 m) of the project area. The review indicated that no GDEs were present within or in the near vicinity of the project area.

2.9 Previous site investigations

At the time of preparing the report, no previous environmental investigations are known to have been undertaken across the project area or were made available for review.