LK Property Group

October 2025

Proposed multi-storey residential development, 84 Tallawong Rd, Rouse Hill

Geotechnical Desktop Study

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Proposed multi-storey residential development, 84 Tallawong Rd, Rouse Hill
Geotechnical Desktop Study

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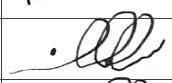
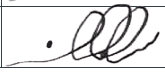
Reviewed by:	Saman Zargarbashi	22/10/2025	
Approved by:	Saman Zargarbashi	22/10/2025	

WSP acknowledges that every project we work on takes place on First Peoples lands.
We recognise Aboriginal and Torres Strait Islander Peoples as the first scientists and engineers and pay our respects to Elders past and present.

Table of contents

1 Executive summary 1

2 Introduction and Project Description 2

3 Purpose of this report 3

4 The Site 4

4.1 Site description 4

4.2 Regional geology 5

4.3 Soil Landscape 5

4.4 Soil salinity 6

4.5 Acid sulfate soils 6

4.6 Mine subsidence 6

4.7 Anticipated geotechnical conditions 7

4.8 Groundwater 7

5 Discussion and recommendations 9

5.1 Groundwater considerations 9

5.2 Earthworks 9

5.2.1 Excavations 9

5.2.2 Vibration induced by excavation plant 9

5.3 Earthquake loadings 10

5.4 Excavation Support and Retaining Systems 10

5.5 Foundation Considerations 10

5.6 Reactivity and Settlement 10

5.7 Durability and Salinity 11

5.8 Construction Considerations 11

5.9 Additional site investigation 11

6 Conclusions 12

References 13

1 Executive summary

This Geotechnical Desktop Study for the Proposed multi-storey residential development, 84-88 Tallawong Rd, Rouse Hill has been prepared by WSP to accompany a State Significant Development Application (SSDA) for residential development with in-fill affordable housing at 84 Tallawong Road, Rouse Hill (the site). This SSDA seeks consent to amend three existing consents (SPP-17-00031, SPP-17- 00032, and SPP-17-00033) for residential development comprising 1 mixed-use building and 5 residential flat buildings with a combined total of over 400 units.

The legal description of the site is Lot 63 in Deposited Plan 30186.

This assessment has been prepared to address the additional excavation required to facilitate the development proposed by this SSD. Specifically, this entails the rationalisation of the three approved basements to allow for the necessary up lift in car allowance to cater for the additional lots which form the basis for this application. This report has been prepared to address Item 12 (Ground and Groundwater Conditions) of the Secretary's Environmental Assessment Requirements (SEARs) issued for the project (SSD-80287510).

This report concludes that the proposed development is suitable and warrants approval subject to the implementation of the following mitigation measures:

- Undertake a site-specific geotechnical investigation (boreholes, lab testing, groundwater monitoring) prior to detailed design to confirm subsurface conditions and parameters.
- Determine the appropriate Salinity Management Response (SMR) in accordance with the Western Sydney Salinity Code of Practice and prepare a Salinity Management Plan for implementation during design and construction.
- Adopt and implement the additional comments and recommendations outlined in this report (Sections 5.1–5.9) to guide excavation support, groundwater management, foundation design, durability, and construction staging.

All comments and recommendations provided in this report have been formulated to be suitable for implementation as conditions of development consent. Following the implementation of the above mitigation measures, the remaining impacts are appropriate.

The changes associated with the SSDA and proposed amendments to the existing consents, including the revised basement configuration and associated excavation requirements, are not considered to have any material impact on the geotechnical information, commentary, or recommendations provided. Such changes are generally inconsequential to the geotechnical assessment and advice.

2 Introduction and Project Description

This report describes the geotechnical desktop study undertaken by WSP for the approximately 1.5 Ha of land proposed for development as six multi-storey residential apartment buildings (herein referred as Site). The residential development includes over 400 apartments, with some designated for affordable housing. A concept of the proposed development extracted from the concept drawing set provided by LK Property group titled “Potential Development Analysis”, dated February 2024 is shown in Figure 2.1. The purpose of the desktop assessment is to inform feasibility assessment and identify geotechnical constraints and opportunities that may affect the planning stages of the project.

Figure 2.1 Concept plan of proposed development.

This SSDA seeks modification of existing consents related to the site (SPP-17-00031, SPP-17-00032, and SPP-17-00033) in accordance with the consent authority’s powers under s4.17(1)(b) and (5) of the Environmental Planning and Assessment Act 1979. Those powers enable a consent authority to amend conditions in existing consents as part of the approval of a fresh development application including allowing substitution of plan references in conditions.

3 Purpose of this report

The scope of works for this geotechnical desktop study includes a review of existing information and providing a generalised ground model for the area, preliminary foundation levels, and any recommendations for further geotechnical works. Note that no subsurface investigations were undertaken as part of this assessment.

This report has been prepared in response to the requirements contained within the Secretary's Environmental Assessment Requirements (SEARs) dated 26 March 2025 and issued for the SSDA (SSD80287510). Specifically, this report has been prepared to respond to the SEARs requirement/s and government agency comments (if applicable) issued below.

Item	Description of Requirement	Section Reference
12. Ground and Groundwater Conditions	— Assess potential impacts on soil resources and relate infrastructure and riparian lands on and near the site and including soil erosion. — Where required provide a groundwater impact assessment in accordance with relevant Groundwater Guidelines. If proposed development in on land identified as having high salinity or acid sulfate soil potential in a n EPA provides a Salinity Management Plan and Acid Sulfate Soil Management Plan that includes appropriate management measures and strategies	Section 4 and Section 5

4 The Site

For this study, the borehole logs from the following locations were reviewed (see Figure A1 – Appendix A), which were considered to be in close proximity to the Site location:

- Borehole NWR-BH088 drilled at Tallawong Road; Rouse Hill (south of Site)
- BH1 drilled at 172 Tallawong Road, Rouse Hill (north of Site)
- BH108 drilled at Rouse Road, Rouse Hill (east of Site)

In addition, a review of the published geological, acid sulfate soils, salinity potential, soil landscape, and mine subsidence maps was also undertaken.

4.1 Site description

The Site is identified as Lot 63 in DP 30186, located at 84-88 Tallawong Road, Rouse Hill, within the North-West region of Sydney in the Blacktown City Council Local Government Area (LGA). The legal description of the site is Lot 63 in Deposited Plan 30186. It comprises a rectangular-shaped area of approximately 1.5 Ha on the eastern side of Tallawong Road, approximately 1.5 km southeast of the Rouse Hill Town Centre and north of Tallawong Metro Station. Figure 2.1 below shows the approximate location and site lot boundary.

The southwestern portion of the Site is bordered by Tallawong Road. To the northwest, the land adjoins existing low-density properties and Macquarie Road, while the eastern boundary lies adjacent to low-density residential property. The southern boundary forms part of a transition zone between established residential properties and areas of planned infrastructure upgrades.

Figure 4.1: Approximate location and site lot boundary.

4.2 Regional geology

The NSW Seamless Geology Dataset (Minview) and the Penrith 1:100,000 Geological Series Sheet 9030, indicate the proposed Site is underlain by Bringelly Shale of the Wianamatta Group, which is Triassic in age. The formation comprises shale, carbonaceous claystone, claystone, laminite, fine to medium grained lithic sandstone, with rare occurrence of coal and tuff. The Bringelly Shale unit is expected to be underlain by fine to medium grained Minchinbury Sandstone and the Ashfield Shale. A summary of the literature review findings on the geology in the region, together with their stratigraphic sequence, is presented in Table 4.1 below.

The Bringelly Shale (and associated residual soil) materials are typically weathered near surface and prone to softening when exposed, which has implications for basement excavation stability, retention wall design, and groundwater management. Basement support will likely require piles or soil-nailed walls with effective drainage and prompt shotcrete cover to limit deterioration, while foundations may comprise bored or socketed piles designed with appropriate allowances for shale strength reduction and groundwater seepage.

For surface works such as the access road, the residual shale soils are generally clay-rich and reactive, with low bearing capacity in wet conditions, requiring moisture control, stabilisation, and robust drainage in pavement design. Overall, the geology presents manageable but important considerations for excavation support, foundation design, groundwater control, and pavement performance that should be confirmed through targeted site investigation and testing.

Quaternary aged Alluvial valley deposits of silt, clay, and sands are mapped approximately 600m southwest of the Site. Figure B1 in Appendix B presents an overview of the mapped geology of the area.

Table 4.1 Geological Units (review of Minview Seamless Geology, (Lovering, JF 1954), and Geoscience Australia).

	Stratigraphic unit	Details
Wianamata group	Bringelly Shale	Dark green and black shales with abundant plant fragments and iron oxide nodules. Thin graywacke-type sandstone lenses and bands.
	Minchinbury Sandstone	Calcareous graywacke-type sandstone with black shale lenses and sideritic nodules. Approximately 6 m thick.
	Ashfield Shale	Black mudstones and silty shales with frequent sideritic mudstone (clay-ironstone) bands.

4.3 Soil Landscape

Reference to the soil profile information published by the NSW Department of Planning, Industry and Environment dataset (eSPADE) and the Penrith 1:100,000 Soil Landscape Series Sheet 9030 indicates that the Site is within the Blacktown Soil Landscape, formed on Wianamatta Group shales of the Cumberland Plain. The terrain comprises low hills and rises with gentle slopes and typically no rock outcrop. Soils in this landscape are described as clayey, moderately to highly plastic, and locally reactive, consistent with weathered shale profiles.

From a geotechnical perspective, these soils are expected to present challenges including moderate to high reactivity, shrink–swell behaviour, low natural permeability and occasional perched water. Such conditions are relevant to basement excavation stability, foundation design, and pavement support for access roads. These characteristics highlight the need for appropriate subgrade treatments, control of surface water infiltration, and consideration of long-term movement when designing structures and services.

4.4 Soil salinity

In accordance with the Western Sydney Salinity Code of Practice (DIPNR, 2004), a Level 2 Salinity Management Response (SMR) is anticipated for the Site, reflecting its mapped moderate salinity potential. A Level 2 SMR requires site-specific geotechnical investigation and laboratory testing of soil and groundwater to confirm salinity conditions, and the preparation of a Salinity Management Plan. The plan must address the implications of salinity for basement excavation, foundations, retaining structures, services, and landscaping, and incorporate appropriate mitigation measures such as durable concrete specifications (AS 3600), pile and anchor durability requirements (AS 2159), waterproofing and drainage details, and use of non-saline backfill. This ensures that salinity risks are identified, managed, and integrated into the design and construction of the apartment development.

Depending on the results of the site investigation and whether basement excavation intercepts groundwater, the response may need to be escalated to a Level 3 SMR, which involves more detailed hydrogeological assessment and long-term management measures.

Figure B2 (Appendix B) shows the mapped salinity potential in the site locality.

4.5 Acid sulfate soils

Reference to Acid Sulfate Soil Risk database for the area, accessed through the Central Resource for Sharing and Enabling Environmental Data (SEED) in NSW, indicates that the Site is not located within an acid sulfate risk zone.

4.6 Mine subsidence

In reference to the NSW Planning Portal and Mine Subsidence District maps published in the portal by the Subsidence Advisory, the Site is not located within a mine subsidence district.

4.7 Anticipated geotechnical conditions

Based on the results of regional investigations and our broader understanding of the local geology, the subsurface conditions at the Site are expected to comprise the sequence of materials summarised in Table 4.2, listed in increasing depth order.

The anticipated depths to unit boundaries have been inferred from borehole records located more than 100 m from the Site, including investigations along Tallawong Road (south), Rouse Road (east), and at 172 Tallawong Road (north). These data provide a broad indication of stratigraphy; actual depths and material properties at the Site will require confirmation by targeted investigation.

Table 4.2 Anticipated Subsurface Profile (inferred from regional boreholes >500 m from Site, within the same geological unit)

Unit	Inferred Origin	Material Description	Anticipated depth to base of unit (mBGL)	Anticipated RL to base of unit (m AHD)
Unit 1	Fill / Topsoil	CLAY / silty CLAY: with organic material	<0.5	-
Unit 2	Residual	Silty CLAY / clayey SILT: high plasticity, red-grey mottled, with fine to medium sub-angular gravel; firm to very stiff.	1-2.5	~ 61.5 - 63.0
Unit 3a	Bringelly Shale (XW–HW)	Extremely to highly weathered SILTSTONE with sandstone laminae; very low to low strength; indistinct bedding.	~5-7	~ 57- 59
Unit 3b	Bringelly Shale (DW–SW to FR)	LAMINITE (siltstone/sandstone interbeds); thin (0–5°) laminations; medium strength increasing with depth.	≥10-15	~ 49 - 54
Unit 3c	Minchinbury-type beds within Bringelly	SANDSTONE beds/laminations (fine–med. grained); locally medium–high strength; interbedded with laminite.	>15-20 (non-proven)	< 44- 49

Notes: XW: Extremely Weathered, HW: Highly Weathered, DW: Distinctly Weathered, SW: Slightly Weathered, FR: Fresh

4.8 Groundwater

Based on the geotechnical investigation results reported and groundwater data accessed through the SEED resource, groundwater at the Site is anticipated to occur as a perched system at the soil/rock interface, typically in the range of 4.5 m to 6.5 m below ground level (BGL). A summary of historical records of real time water data accessed through the WaterNSW database, together with groundwater observations from boreholes drilled in the surrounding area, is presented in Table 4.3.

It should be noted that groundwater and soil moisture levels are subject to seasonal and climatic variability, as well as local influences such as topography, structural geological features, and surface modifications associated with past or present land use.

Table 4.3 Historical ground water observations.

Site	Date	Groundwater depth below surface level (m BGL)	Groundwater depth RL (m AHD)
GW100443[1]	06/11/1996	4.5	43.2[2]
NWR-BH088 (Tallawong Road, Rouse Hill)	20/12/2011	6.5	57.6

Notes:

(1) Groundwater well bore data, accessed through the WaterNSW website (realtimedata.waternsw.com.au).

(2) Based on elevation data accessed through the NSW Planning, Industry and Environment Elvis website (fsdf.org.au).

5 Discussion and recommendations

5.1 Groundwater considerations

Groundwater seepage is likely to be encountered at the soil/rock interface and along bedding or fracture planes within the shale bedrock. Inflows may be intermittent and influenced by seasonal recharge and surface drainage. Any seepage can typically be managed using strip drains behind retaining systems, with pump-and-sump methods adopted as necessary during excavation. Water should be directed to a sedimentation tank or basin for testing and, if required, treatment prior to discharge to the stormwater or sewer system in accordance with Council requirements. Groundwater monitoring during the detailed design and excavation phases is recommended to confirm levels and variability.

5.2 Earthworks

We have reviewed and considered the revised basement configuration and associated excavation requirements. The purpose of this section is to outline the geotechnical considerations and recommendations for earthworks and excavation activities.

5.2.1 Excavations

Excavations to depths of up to approximately 9 m (to ~RL 50.5 m AHD) are anticipated. Upper soils and extremely weathered shale should be readily excavatable with conventional earthmoving plant, while zones of stronger rock may require ripping or localised rock breaking. Indicative excavatability guidance is summarised in Table 5.1; however, actual requirements should be confirmed by site-specific investigation and contractor assessment. All excavation works must comply with the SafeWork NSW "Code of Practice: Excavation" and incorporate appropriate temporary support measures where excavation depths exceed 1.5 m or where adjacent structures are present.

Table 5.1 Indicative excavatability requirements (based on anticipated subsurface profile in Table 4.2)

Material	Strength	Likely minimum plant requirements (1)
Units 1 and 2	Generally, soil and very low strength rock	Bulldozer blade, excavator bucket. Localised hard fragments may require ripping.
Unit 3a	Very low to low strength rock	Bulldozer with ripper, excavator bucket. Harder zones may require a rock breaker.
Unit 3b and 3c	Medium to high strength rock	Excavator with rock breaker; rotary rock grinder or saw attachments may be required near shoring to minimise overbreak and vibration. Higher strength bands may require a rock breaker.

Notes:

1. Plant requirements are indicative only and should be confirmed by the excavation contractor based on site-specific investigation, trial excavation and productivity assessment (Look, B. 2002).

For excavations less than 1.5 m deep, the need for temporary support should be assessed by a geotechnical engineer, taking into account the proximity of adjacent structures, ground conditions, and the expected duration that the excavation will remain open. Where groundwater inflows are encountered, localised dewatering of the excavation footprint may be required.

5.2.2 Vibration induced by excavation plant

The surrounding area is currently undergoing urban development, and there are no vibration-sensitive structures in the immediate vicinity of the Site. Excavation of medium- to high-strength rock, if encountered, may generate some

vibration from ripping or rock breaking, but this is not expected to pose a constraint for the development. General good practice would still be for the contractor to adopt excavation methods that minimise excessive vibration and noise.

5.3 Earthquake loadings

The Australian Standard for Earthquake Actions, AS 1170.4 (2007), specifies a hazard factor (Z) of 0.09 for the Sydney region. Based on the anticipated subsurface profile (residual soils overlying Bringelly Shale), the site is provisionally classified as Class Ce – shallow soil site in accordance with Section 4.2 of AS 1170.4.

This classification should be regarded as **indicative only** for the purposes of this desktop study. Confirmation of the final site class will require targeted geotechnical investigation, including in-situ testing during the design phase.

5.4 Excavation Support and Retaining Systems

Basement excavations to approximately 9 m depth will require temporary and permanent retaining wall to maintain stability and protect adjacent land during construction and in long-term, respectively. Options for temporary support typically include contiguous or secant pile walls with shotcrete facing, soldier piles with lagging, or soil nails depending on excavation geometry, depth, actual subsurface condition and groundwater inflows. The choice of support system will depend on the final building layout, excavation staging, and the ability to extend support elements beyond property boundaries if anchors are proposed. Site-specific geotechnical parameters are to be confirmed by investigation for design of a suitable basement retention system.

5.5 Foundation Considerations

The final foundation system for the apartment buildings will depend on the adopted structural loads and the confirmed strength and consistency of the underlying materials. At the proposed basement excavation level (~RL 50.5 m AHD), it is anticipated that excavation will extend into extremely to highly weathered shale/siltstone (Unit 3a) or stronger material at depth. Subject to site investigation results, this may provide a suitable founding horizon for pad or raft footings supporting the building structure.

If design loads require higher capacity or reduced settlement risk, deeper foundations such as piles socketed into more competent rock (Units 3b–3c) may be considered. The choice between shallow and deep foundations should therefore be confirmed once geotechnical parameters (strength, stiffness, settlement characteristics) are established through site-specific drilling and laboratory testing.

Shallow footings or rafts may be feasible for ancillary structures or pavements, subject to confirmation of near-surface soil reactivity and strength. Foundation design must also address potential long-term softening of shale and variability in the weathering profile, with pile sockets or end-bearing levels to be selected based on confirmed rock strength.

5.6 Reactivity and Settlement

The residual clays derived from weathered Bringelly Shale are expected to be moderately to highly reactive, with potential for shrink–swell movements under seasonal moisture changes. This may affect slabs, pavements, and shallow services if not mitigated. Reactivity should be confirmed by shrink–swell index testing. Basement excavation will remove much of the reactive soil within the building footprint, but external areas (such as access roads and landscaping) will remain exposed to these movements. Pavement and slab-on-ground design should therefore incorporate moisture control layers, adequate drainage, and stiffened raft or deepened edge beams where appropriate. Differential settlement risks across fill/soil/rock transitions should also be considered.

5.7 Durability and Salinity

Regional mapping indicates the Site is within a zone of moderate salinity potential. Combined with known chemical aggressivity of shale-derived soils, there is potential for sulfate- or chloride-related durability impacts on buried concrete and steel. A Level 2 Salinity Management Response (SMR) is expected, with possible escalation to Level 3 if groundwater interaction is confirmed. Durability design should comply with AS 3600 (Concrete Structures) and AS 2159 (Piling), including: appropriate cover, use of blended or sulfate-resistant cements, waterstops in basement walls and slabs, and specification of non-saline backfill against retaining structures, where applicable. Aggressivity testing of soil and groundwater (pH, sulfate, chloride, EC) is recommended as part of the intrusive investigation.

5.8 Construction Considerations

Residual clays and weathered shale are sensitive to wet-weather handling, softening when exposed and drying/cracking in hot conditions. Construction staging should therefore include surface water diversion, prompt shotcrete application, and rapid placement of permanent works to limit deterioration. Excavation programs should allow flexibility in plant selection, as rock strength can vary from rippable to requiring localised breaking or saw cutting. Standard erosion and sediment controls will be necessary to manage dispersive fines and runoff during construction.

5.9 Additional site investigation

A program of intrusive investigation is required prior to construction, and is ideally undertaken before completion of detailed design to inform the final design and minimise the risk of late design changes.

The additional site investigation typically involves drilling several boreholes across the proposed apartment building footprints, drilled to at least 1.5 m below the proposed basement excavation level (approx. RL 50.5 m AHD) to confirm founding conditions. Continuous core recovery is recommended through the weathered rock profile to assess strength, structure, and variability.

Installation of standpipe piezometers in selected boreholes is advised to monitor groundwater levels and seasonal fluctuations, given the likelihood of perched water at the soil/rock interface.

Typical laboratory testing would include:

- Atterberg limits / Particle Size Distribution – for material classification.
- Soil & Groundwater Aggressivity testing (pH, Sulphate, Chloride & EC) – for assessment of concrete or steel durability.
- Shrink swell index – to evaluate potential for volume change due to moisture change.
- California Bearing Ratio (CBR) – for access road pavement design.
- Soil and groundwater salinity testing – to inform salinity management requirements.

Additional testing, such as uniaxial compressive strength (UCS) and point load index on rock cores, may be required if deep foundations or retention piles are adopted. The results of the investigation should be integrated into an updated geotechnical model for design development.

The proposed additional site investigation, as outlined in this section, can be implemented as a condition of DA approval and should be completed prior to commencement of construction.

6 Conclusions

The findings and conclusions presented in this geotechnical assessment are based on the review of available information and investigations conducted by others on nearby sites. Additional site-specific geotechnical subsurface investigation, testing, and analysis will be necessary prior to construction as described in Section 5.9 to confirm that the preliminary recommendations provided in this report are appropriate for the proposed development.

The requirement for additional site-specific geotechnical investigation, as described in Section 5.9, and other recommendations made in this report can be adopted as a condition of development consent to ensure all recommendations are appropriately addressed prior to construction.

The changes associated with the amended Development Application, including the revised basement configuration and associated excavation requirements, do not alter the geotechnical commentary, recommendations, or conclusions presented for the proposed development.

This report should be read in conjunction with the 'Limitations of Geotechnical Site Investigation' provided in Appendix C, which provides important information regarding geotechnical investigation and assessment.

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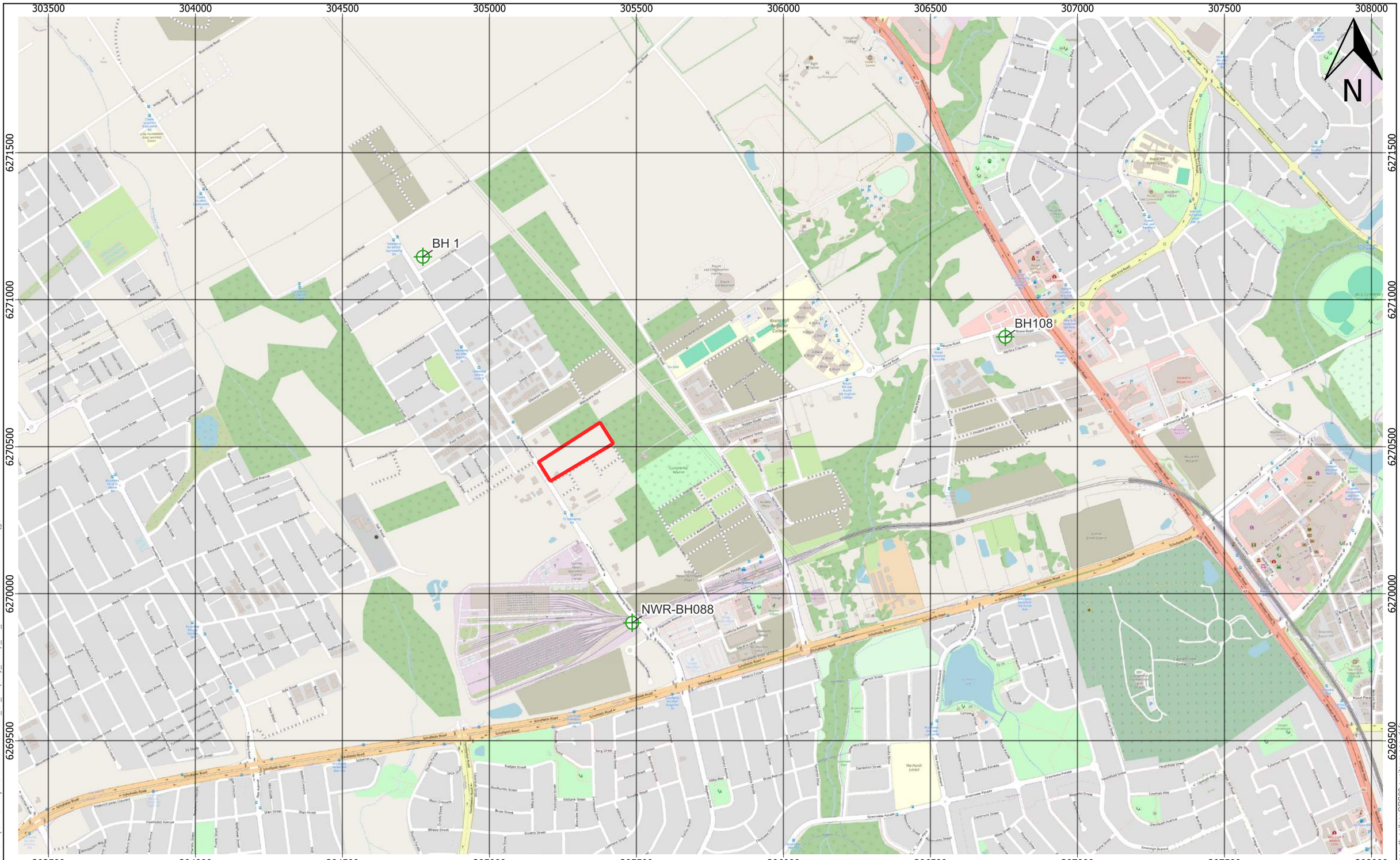
Appendix A

Site maps



LEGEND

- Site boundary
- Borehole locations

For Review

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CLIENT
LK Property Group

PROJECT
Proposed multi-storey residential development
84-88 Tallawong Road, Rouse Hill

CONSULTANT
WSP

YYYY-MM-DD	2025-05-28
DESIGNED	OB
PREPARED	OB
REVIEWED	SG
APPROVED	SG

TITLE
Site Locality Plan

PROJECT NO	DOC	REV.	FIGURE
PS221837	**000**	**A**	**A1**

305100 305200 305300 305400 305500

6270600

6270500

6270400

N

LEGEND

Site boundary

For Review

1:1,500

10 0 10 20 30 40 m

CLIENT
LK Property Group

CONSULTANT
WSP

PROJECT
Proposed multi-storey residential development
84-88 Tallawong Road, Rouse Hill

TITLE
Aerial View of Proposed Development Site

YYYY-MM-DD	2025-05-28
DESIGNED	OB
PREPARED	OB
REVIEWED	SG
APPROVED	SG

PROJECT NO	DOC	REV.	FIGURE
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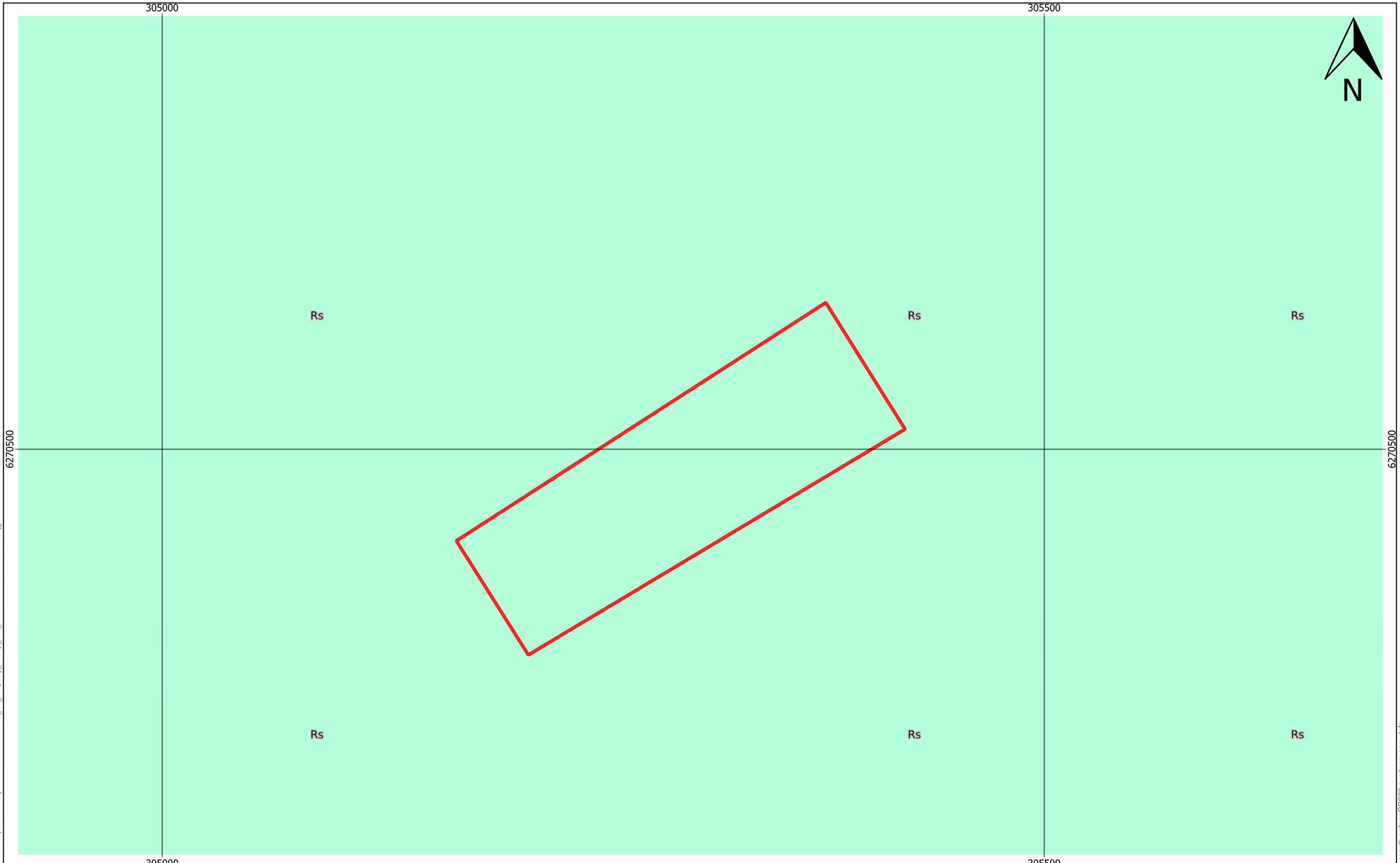
Appendix B

Geology and Salinity Plans



LEGEND

- Site boundary
- Wianamatta Group

For Review

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CLIENT
LK Property Group

CONSULTANT
WSP

YYYY-MM-DD	2025-05-28
DESIGNED	OB
PREPARED	OB
REVIEWED	SG
APPROVED	SG

PROJECT
Proposed multi-storey residential development
84-88 Tallawong Road, Rouse Hill

TITLE
Regional geology map

PROJECT NO	DOC	REV.	FIGURE
PS221837	**001**	**A**	**B1**

304500 305000 305500 306000

6271000

6270500

6270000

N

NWR-BH088

LEGEND

- Site boundary

SalinityPotentialWesternSydney

- HIGH
- MODERATE
- SALT

For Review

40 0 40 80 120 1:5,000 160 m

CLIENT
LK Property Group

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WSP

YYYY-MM-DD	2025-05-28
DESIGNED	OB
PREPARED	OB
REVIEWED	SG
APPROVED	SG

PROJECT
Proposed multi-storey residential development
84-88 Tallawong Road, Rouse Hill

TITLE
Salinity potential of Western Sydney map

PROJECT NO	DOC	REV.	FIGURE
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Appendix C

Limitations

Limitation Statement

This Report is provided by WSP Australia Pty Limited (*WSP*) for LK Property Group (*Client*) in response to specific instructions from the Client and in accordance with WSP's proposal dated 7 February 2025 and agreement with the Client dated 26 August 2025 (*Agreement*).

PERMITTED PURPOSE

This Report is provided by WSP for the purpose described in the Agreement and no responsibility is accepted by WSP for the use of the Report in whole or in part, for any other purpose (*Permitted Purpose*).

QUALIFICATIONS AND ASSUMPTIONS

The services undertaken by WSP in preparing this Report were limited to those specifically detailed in the Report and are subject to the scope, qualifications, assumptions and limitations set out in the Report or otherwise communicated to the Client.

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