



# **Douglas Partners**

*Geotechnics | Environment | Groundwater*

Report on  
Desktop Geotechnical Assessment

Due Diligence Assessment  
1030 Mamre Road, Kemps Creek

Prepared for  
ResolveXO Pty Ltd

Project 208044.00  
September 2021

Integrated Practical Solutions



## Document History

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The undersigned, on behalf of Douglas Partners Pty Ltd, confirm that this document and all attached drawings, logs and test results have been checked and reviewed for errors, omissions and inaccuracies.

Signature	Date
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Reviewer 	15 September 2021



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# **Report on Desktop Geotechnical Assessment**

## **Due Diligence Assessment**

### **1030 Mamre Road, Kemps Creek**

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## **1. Introduction**

This report presents the results of a desktop geotechnical assessment undertaken for a due diligence assessment at 1030 Mamre Road, Kemps Creek. The assessment was commissioned in an email dated 31 August 2021 by Nick Blakely of ResolveXO Pty Ltd and was undertaken in accordance with Douglas Partners Pty Ltd (DP) proposal 208044.00.P.002.Rev0 dated 20 August 2021. The purpose of this report is to provide a preliminary assessment of the geotechnical risks on the site and its geotechnical suitability for future commercial redevelopment.

It is understood that the proposed development of the site will likely include the construction of a commercial subdivision separated into two lots each with three warehouses and hardstand areas, with associated access roads and detention basins on the eastern and western boundaries. Cut to fill is expected to be in the order of 5 m cut and 5 m fill, possibly higher for the building platform and basin near the eastern corner to 10 m.

The scope of work included:

- A review of information provided;
- A site walkover assessment by a geotechnical engineer;
- Review of publicly available geological, survey and other associated mapping;
- Review of in-house geotechnical information;
- Assessment and reporting on the site walkover findings and comments on potential geotechnical constraints including:
  - o The regional geology and likely subsurface conditions;
  - o Suggested site preparation and earthworks;
  - o Uncontrolled fill and stockpiles;
  - o Expected design CBR values;
  - o Anticipated suitable footings and preliminary design parameters;
  - o Salinity; and
  - o Possible additional detailed investigations;

## **2. Site Description**

The site is a near parallelogram shaped area with maximum plan dimensions of approximately 835 m (east west) and 315 m (north south). The site area is approximately 11.6 ha and is located on the eastern side of Mamre Road at Kemps Creek. It is bounded to the north, east and south by other rural properties similar to the subject site. At the time of inspection, the site comprised grassed paddocks



with multiple stockpiles in the western portion. A site plan with 2 m contour mapping along with the site boundary (shown in red) is presented in Figure 1.



**Figure 1: Site plan with 2 m contours**

Most of the site gently slopes down to the west with hills located in the eastern portion of site. The overall difference in level across the site is approximately 39 m from RL 82 m relative to Australian Height Datum (AHD) to RL 43 m. The eastern slopes in the hilly area of site are generally in the range of 10-20 degrees with peaks in excess of 20 degrees situated at the peak on the south eastern boundary with the ridge running in a north easterly direction. Further slope analysis is shown in Drawing 2 in Appendix A.

**Table 1: Site Identification**

Item	Details
Site Address	1030 Mamre Road, Kemps Creek
Legal Description	Lot 3 Deposited Plan 250002
Area	11.6 ha
Local Council Area	Penrith Council
Current Use	Rural land
Surrounding Uses	Rural residential/commercial land

### 3. Published Data

#### 3.1 Geology

The NSW Seamless Geological Series indicates that most of the site is underlain by Triassic Aged Bringelly Shale of the Wianamatta Group and a small portion along the western boundary by Cenozoic Aged alluvial floodplain deposits. The Bringelly Shale typically comprises shale, carbonaceous claystone, claystone, laminate, fine to medium-grained lithic sandstone with occasional coal and tuff. Bringelly shale typically weathers to form clays of medium to high plasticity. The alluvial deposits typically comprise silt, very fine to medium grained, lithic to quartz rich sand and clay. The distribution of geologies with the site boundary (shown in red) is presented in Figure 2.



**Figure 2: Regional Geology**

#### 3.2 Hydrogeology

There was one small unnamed creek mapped to cross the site which drains into Kemps Creek approximately 250 m west of the site. The creek is generally aligned east west in the valleys created by the rolling hills.

Based on the regional topography and the inferred flow direction of nearby water courses, the anticipated flow direction of groundwater beneath the site is to the west, towards Kemps Creek, the likely receiving surface water body for the groundwater flow path.

Given the local geology (ie: Bringelly Shale), the groundwater in the fractured rock beneath the site is anticipated to be saline and very low yield. Accordingly, there would be no significant potential beneficial uses of the shallow groundwater. Beneath the shale at depths of approximately 150 m lies the



Hawkesbury sandstone which is known for containing significant water bearing zones. Current and proposed site activities will not impact on this deep aquifer. The watercourses with the site boundary (shown in red) are presented in Figure 3.



**Figure 3: Watercourses**

### 3.3 Soil Landscape

Reference to the Penrith 1:100 000 Soils Landscape Sheet indicates that the site is underlain by two main natural soils landscape groups, the Blacktown and Luddenham soil landscapes.

The Blacktown soil landscape (dark green) is characterised by topography of gently undulating rises on Wianamatta Group Shale, with local relief to 30 m and slopes usually less than 5%, typically represented by broad rounded crests and ridges with gently inclined slopes. This is a residual soil landscape, which the mapping indicates comprises multiple soil horizons that range from shallow red-brown podzolic soils comprising mostly clayey soils on crests and upper slopes, to deep brown to yellow clay soils on mid to lower slopes and in areas of poor drainage. These soils are typically of low fertility, are moderately reactive, highly plastic and generally have a low wet strength.

The Luddenham soil landscape group (pink) is an erosional unit found on undulating to rolling low hills on Wianamatta Group shales, often associated with Minchinbury Sandstone. Local relief is typically 50 – 80 m, with slopes of 5 – 20%. Narrow ridges, hillcrests and valleys are typical. This group has high soil erosion hazard, localised impermeable highly plastic subsoil, and is moderately reactive. The distribution of soil landscapes with the site boundary (shown in red) is presented in Figure 4.



**Figure 4: Soil Landscapes**

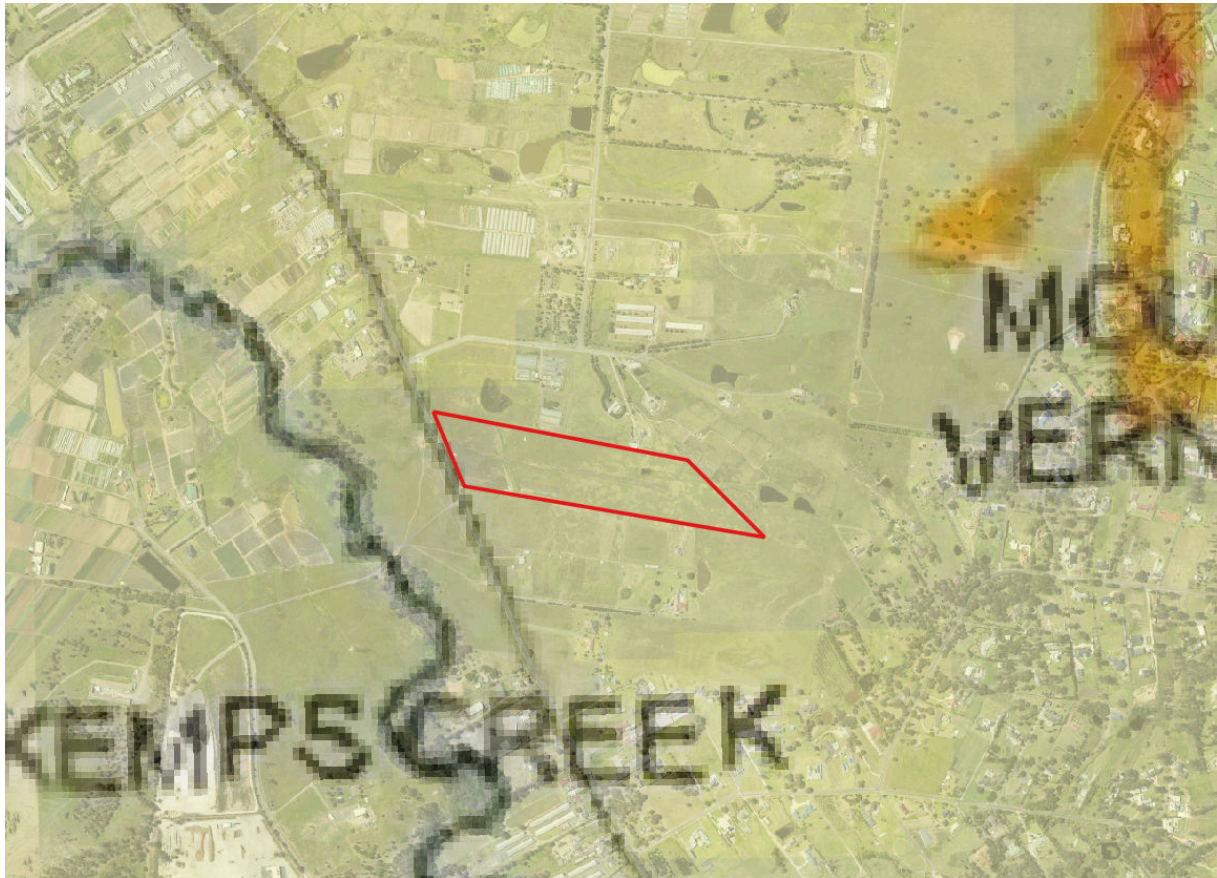
### **3.4 Acid Sulfate Soils**

The site is not in an area mapped as having any known occurrence of acid sulfate soils.

### **3.5 Salinity**

Reference to the Salinity Potential in Western Sydney Plan prepared by the Department of Infrastructure, Planning and Natural Resources in 2002, shows the site is located in an area with a moderate salinity potential. It is noted that the mapping is based on soil type, surface level and general groundwater considerations but is not generally ground-truthed, hence actual soil salinity needs to be assessed to confirm the potential salinity mapping indication. An extract of the salinity potential mapping with the site boundary (shown in red) is presented in Figure 5.





**Figure 5: Salinity Potential**

Where: Red = Known Salinity, Orange = High Salinity Potential, Yellow = Moderate Salinity Potential

#### **4. Site Walkover Inspection**

Inspection of the site and limited field mapping was carried out by a principal geotechnical engineer on 8 September 2021. The site conditions and main features observed are summarised below:

##### **Stability**

- Most of the site has gentle grades of 5 – 10 degrees upwards from Mamre Road on the western boundary (Photo 3);
- The grades steepen to 15 degrees in some areas near the north eastern boundary, then localised up to 20 degrees at the eastern corner (Photo 1);
- There is minimal change in grade from north to south (Photo 2);
- There was no evidence of recent slope instability on the site.

##### **Soil and Rock Profiles**

- No exposed rock was observed;
- Soil exposed in the proposed road alignment cutting as a residual gravelly clay (Photo 10);

### Uncontrolled Fill

- There are several stockpiles of uncontrolled fill on the site, approximately one third from the western boundary. They appear to be soil from the proposed road alignment cut in the centre of the site (Photos 3, 4 and 11);
- Some apparently fly tipped concrete waste was in the south western paddock near the Mamre Road boundary.

### Buried Services

- There appears to be a functioning water reticulation system of pvc pipes to fill troughs along the northern boundary;
- No other underground services were noted;

### Water Logging, Erosion and Salinity

- Water logging was noted in the north western corner of the site in the vicinity of the mapped creek line, possibly backfilled.
- Water logging was also noted near the centre of northern boundary, below a dam on the neighbouring allotment.
- There is minor erosion of the banks and wall of the farm dam in the upper eastern portion of the site.

## 5. Data Review

No intrusive subsurface investigation was carried out on this site and the comments are based on information provided, published information and information from DP records of previous work on adjacent and nearby sites including:

- 59 – 63 Abbots Road, Kemps Creek (Project 92352.00, dated August 2019). Industrial Subdivision
- 253 – 267 Aldington Road, Kemps Creek (Project 204098.00, dated July 2021). Industrial Subdivision
- 244 – 270 Aldington Road, Kemps Creek (Project 205819.00, dated June 2021). Industrial Subdivision

### 5.1 Survey and Aerial Photos

Review of historical aerial indicate that:

- Prior to 2005 the site was grass covered rural land with large stockpiles, that are currently on-site, positioned in the western portion of the site. There is an exposed haul road running west to east through the centre of the site;
- Between 2011 and 2014 a small un-walled shelter was constructed next to the grazing paddock; and
- There do not appear to be any significant changes to the site between 2014 and the time of this report.

## 6. Proposed Development

It is understood that the 16.6 ha site is to be developed for commercial warehousing with lots ranging in area from 46 490 m<sup>2</sup> to 59 310 m<sup>2</sup>. Based on information provided by the client, the development will include bulk earthworks along with the construction of pavements, basins and installation of services. The following sections provide general comments on geotechnical development constraints related to the assessment. The assessment has been based on the surface profiles encountered during the site walkover. It is noted that further investigations will need to be undertaken as the planning and design of the subdivision proceeds.

## 7. Comments

### 7.1 Geotechnical Model

Review of the aerial photography and reports set out in Section 5, along with the site walkover, indicate that the subsurface conditions are likely to comprise limited areas of uncontrolled fill overlying alluvial soil deposits and residual clay, then siltstone, shale and sandstone bedrock. It is anticipated that the soil profile could exceed depths of 3 m in the lower lying areas of the site with poor drainage, with a shallower soil profile encountered toward to the central portion of site along the exposed road and the south eastern boundary, as the surface elevation increases and drainage improves. Bedrock is generally anticipated to be of initially very low to low strength, increasing up to potentially high strength, with variable strength layers, within the proposed deep cut areas up to 10 m.

The material properties of the fill and stockpiles could be highly variable. The identified water logged areas, and where the watercourse passes through the lower-lying western portion of the site, indicate the potential for perched water.

### 7.2 Slope Instability

There does not appear to be any evidence of significant slope instability on the site. It is noted the grades on the northern boundary are increasing to 15 – 20 degrees and care will be required to ensure that earthworks and excavation do not adversely affect slopes which extend into the neighbouring properties.

### 7.3 Erosion Potential

Soils of the Blacktown soil landscape are typically of moderate to high erodibility. The more sodic or saline soils can have a high to very high erodibility and the erosion hazard for these landscapes is estimated as moderate to very high.

It is considered that the erosion hazard within the areas proposed for development would be within usually accepted limits and could be managed by good engineering and land management practices.

## 7.4 Soil Salinity

The site is likely to be affected by salinity and soil aggressivity to both steel and concrete. Notwithstanding this, the salinity potential of the site would most likely be within usually accepted limits which could be managed by good engineering and land management practices. Further assessment of salinity and preparation of salinity management plans (if required) will be required prior to construction.

## 7.5 Rock Depth

No investigation of rock depth has been undertaken by DP. Nearby and adjacent investigations by others suggest the potential for relatively shallow rock depths of 1 – 3 m over the site but there are likely to be areas with greater than 2 - 4 m depth to rock. The site walkover results indicated exposed weathered rock along the haul road running through the centre of site, which was excavated to depths of up to approximately 1 m. Information provided by the client indicates that maximum depth of excavation will be on eastern boundary to about 10 m. Intrusive investigation (boreholes) should be done to provide information on rock types and depths. If there is high strength rock within bulk excavation level, there can be significant effect on the costs of excavation and reuse of materials.

## 7.6 Dam Desilting

A methodology may need to be developed for desilting and filling of the dam and would incorporate:

- Disposal of water away from the dam and spreading on the ground surface;
- Excavation of the silt and water affect material then moisture conditioning (drying) prior to blending;
- Removal of the uncontrolled fill in the dam wall, drying and blending for use as controlled fill; and
- Placement of controlled fill to design levels.

## 7.7 Site Preparation and Earthworks

The majority of the site should be suitable for conventional site preparation and earthworks that would typically comprise:

- Stripping of topsoils;
- Removal of stockpiles and any uncontrolled fill;
- Test rolling of exposed subgrades;
- Cutting (where required) to achieve design levels; and
- Placement of controlled fill in accordance AS3798 2007 Guidelines on Earthworks for Commercial and Residential Development.

It should be noted that there may be space constraints in order to undertake earthworks and develop the south eastern corner of site where cuts of up to 10 m are proposed along the boundaries along with the potential for high strength rock. Consideration may need to be given to retaining structures within these areas where construction of batters is not suitable.



## 7.8 Residential Development

Following bulk earthworks it should be possible to reclassify each lot in the development in accordance with AS2870:2011 Residential Slabs and Footings. Likely lot classifications would be in the range of S (Slightly reactive) where shallow rock is encountered to H1 or H2 (Highly reactive), where the profile will be predominantly clay.

## 7.9 Water logging

Water logging may be a significant constraint to development in the low-lying creek areas and in the eastern portion of the site where a leaking dam from the neighbouring site has saturated soils. Further investigation should be undertaken once flood studies for the site have determined the extent of flood-affected land. Further investigation must include test pit excavation to determine soil moisture profiles.

## 7.10 Anticipated Geotechnical Constraints

Based on the site walkover and available information, the following issues would be the major geotechnical constraints that need to be considered for the proposed development:

- Removal or management of large stockpiles;
- Water logging of the site through the low-lying north western portion of site and along the eastern boundary where the leaking dam has saturated site soils;
- Earthworks involved with developing the south eastern portion of site; and
- Slope instability and support of the eastern corner and boundaries.

## 8. Further Investigations

Further investigation will be required as the project planning and design progresses. Additional work will also be required during the project's construction phase. Specific investigation would include (but not necessarily be limited to):

- Rock depth and rippability assessment incorporating a topsoil assessment.
- Detailed geotechnical assessment in the steeper areas, possibly including drilling to determine suitability and methodology for development.
- Assessment of the site for development with respect to water logging.
- Additional salinity investigations for site soils and surface waters (i.e. dams). Additional testing of site soils for erosion and dispersion for the detailed design and construction of future water bodies and the ability of the soils to be used as clay liners, or similar.
- Detailed geotechnical investigation to determine pavement thickness designs, lot classifications and founding conditions as well as lot specific issues.
- Routine inspections and earthworks monitoring during construction.

## 9. Conclusion

The results of the preliminary geotechnical assessment indicate that the proposed commercial development of the site should be feasible from a geotechnical perspective. Additional investigation will be required as the detailed design progresses and any relevant geotechnical comments or recommendations arising from this work will be required to be incorporated into the design.

The planning, design and construction should be carried out in accordance with good engineering practice.

## 10. References

NSW Seamless Geology, Department of Regional NSW, Australia.

Soil Conservation Service of New South Wales, Soil Landscapes of Wollongong-Port Hacking 1:100 000 Sheet, Sydney.

NSW DECC (2008) Soil and Land Resources of the Hawkesbury – Nepean Catchment, digital dataset, NSW Department of Environment and Climate Change, Sydney, Australia.

NSW DIPNR (2002) Salinity Potential in Western Sydney Plan, Sydney, Australia

## 11. Limitations

Douglas Partners Pty Ltd has prepared this report for this project at 1030 Mamre Road, Kemps Creek in accordance with DP's proposal dated 20 August 2021 and acceptance received from Nick Blakely of ResolveXO Pty Ltd dated 31 August 2021. The work was carried out under a professional Services agreement. This report is provided for the exclusive use of ResolveXO Pty Ltd for this project only and for the purposes as described in the report. It should not be used by or relied upon for other projects or purposes on the same or other site or by a third party. Any party so relying upon this report beyond its exclusive use and purpose as stated above, and without the express written consent of DP, does so entirely at its own risk and without recourse to DP for any loss or damage. In preparing this report DP has necessarily relied upon information provided by the client and/or their agents.

The results provided in the report are indicative of the conditions on the site only at the locations observed at the time the work was carried out. Sub-surface conditions can change abruptly due to variable geological processes and also as a result of human influences.

The assessment of atypical safety hazards arising from this advice is restricted to the geotechnical components set out in this report and based on known project conditions and stated design advice and assumptions. While some recommendations for safe controls may be provided, detailed 'safety in design' assessment is outside the current scope of this report and requires additional project data and assessment.

This report must be read in conjunction with all of the attachments and should be kept in its entirety without separation of individual pages or sections. DP cannot be held responsible for interpretations or conclusions made by others unless they are supported by an expressed statement, interpretation, outcome or conclusion stated in this report.

This report, or sections from this report, should not be used as part of a specification for a project, without review and agreement by DP. This is because this report has been written as advice and opinion rather than instructions for construction.

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**Douglas Partners Pty Ltd**

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## Appendix A

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About This Report  
Drawings 1 and 2

# About this Report

# Douglas Partners



## Introduction

These notes have been provided to amplify DP's report in regard to classification methods, field procedures and the comments section. Not all are necessarily relevant to all reports.

DP's reports are based on information gained from limited subsurface excavations and sampling, supplemented by knowledge of local geology and experience. For this reason, they must be regarded as interpretive rather than factual documents, limited to some extent by the scope of information on which they rely.

## Copyright

This report is the property of Douglas Partners Pty Ltd. The report may only be used for the purpose for which it was commissioned and in accordance with the Conditions of Engagement for the commission supplied at the time of proposal. Unauthorised use of this report in any form whatsoever is prohibited.

## Borehole and Test Pit Logs

The borehole and test pit logs presented in this report are an engineering and/or geological interpretation of the subsurface conditions, and their reliability will depend to some extent on frequency of sampling and the method of drilling or excavation. Ideally, continuous undisturbed sampling or core drilling will provide the most reliable assessment, but this is not always practicable or possible to justify on economic grounds. In any case the boreholes and test pits represent only a very small sample of the total subsurface profile.

Interpretation of the information and its application to design and construction should therefore take into account the spacing of boreholes or pits, the frequency of sampling, and the possibility of other than 'straight line' variations between the test locations.

## Groundwater

Where groundwater levels are measured in boreholes there are several potential problems, namely:

- In low permeability soils groundwater may enter the hole very slowly or perhaps not at all during the time the hole is left open;

- A localised, perched water table may lead to an erroneous indication of the true water table;
- Water table levels will vary from time to time with seasons or recent weather changes. They may not be the same at the time of construction as are indicated in the report; and
- The use of water or mud as a drilling fluid will mask any groundwater inflow. Water has to be blown out of the hole and drilling mud must first be washed out of the hole if water measurements are to be made.

More reliable measurements can be made by installing standpipes which are read at intervals over several days, or perhaps weeks for low permeability soils. Piezometers, sealed in a particular stratum, may be advisable in low permeability soils or where there may be interference from a perched water table.

## Reports

The report has been prepared by qualified personnel, is based on the information obtained from field and laboratory testing, and has been undertaken to current engineering standards of interpretation and analysis. Where the report has been prepared for a specific design proposal, the information and interpretation may not be relevant if the design proposal is changed. If this happens, DP will be pleased to review the report and the sufficiency of the investigation work.

Every care is taken with the report as it relates to interpretation of subsurface conditions, discussion of geotechnical and environmental aspects, and recommendations or suggestions for design and construction. However, DP cannot always anticipate or assume responsibility for:

- Unexpected variations in ground conditions. The potential for this will depend partly on borehole or pit spacing and sampling frequency;
- Changes in policy or interpretations of policy by statutory authorities; or
- The actions of contractors responding to commercial pressures.

If these occur, DP will be pleased to assist with investigations or advice to resolve the matter.

# *About this Report*

## **Site Anomalies**

In the event that conditions encountered on site during construction appear to vary from those which were expected from the information contained in the report, DP requests that it be immediately notified. Most problems are much more readily resolved when conditions are exposed rather than at some later stage, well after the event.

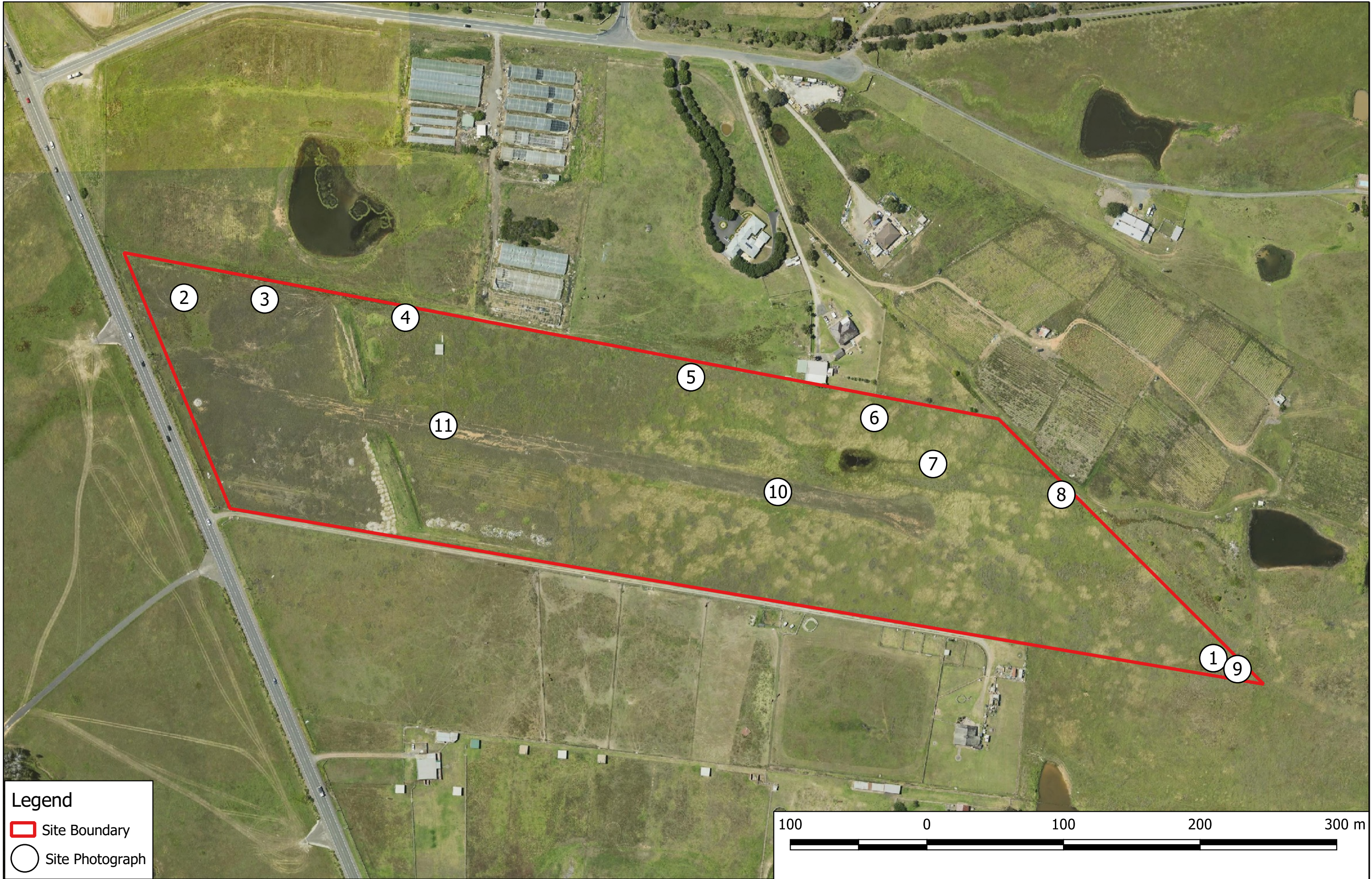
## **Information for Contractual Purposes**

Where information obtained from this report is provided for tendering purposes, it is recommended that all information, including the written report and discussion, be made available. In circumstances where the discussion or comments section is not relevant to the contractual situation, it may be appropriate to prepare a specially edited document. DP would be pleased to assist in this regard and/or to make additional report copies available for contract purposes at a nominal charge.


## **Site Inspection**


The company will always be pleased to provide engineering inspection services for geotechnical and environmental aspects of work to which this report is related. This could range from a site visit to confirm that conditions exposed are as expected, to full time engineering presence on site.





**Legend**

 Site Boundary

 Site Photograph



 <b>Douglas Partners</b> Geotechnics   Environment   Groundwater	CLIENT: ResolveXO Pty Ltd		TITLE: <b>Aerial Photograph with Site Photograph Locations</b> Desktop Geotechnical Assessment 1030 Mamre Road, Kemps Creek	 MGA	PROJ. #: 208044.00
	OFFICE: Macarthur	DRAWN BY: NG			DRAWING No: 1
	SCALE: As shown	DATE: 15 Sep 2021			REVISION: 0





**Legend**

- Site Boundary
- 0-10 Degrees
- 10-15 Degrees
- 15-20 Degrees
- >20 Degrees



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## **Appendix B**

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Site Photographs (Photo Plates 1 – 6)



Photograph 1 - View of site from top of eastern corner. Grades 15 to 20% limited to this area



Photograph 2 - Grassed western portion. Waterlogged beneath grass



Site Photographs

Desktop Geotechnical Assessment

1030 Mamre Road, Kemps Creek

CLIENT: ResolveXO Pty Ltd

PROJECT: 208044.00

PLATE No: 1

REV: 0

DATE: Sep-21





Photograph 3 - View of grassed paddocks looking west from north western corner



Photograph 4 - Stockpiles (probably topsoil from road alignment) near lower third of site





Photograph 5 - Central paddocks looking south



Photograph 6 - Farm dam near upper third of site



**Douglas Partners**  
Geotechnics | Environment | Groundwater

Site Photographs

Desktop Geotechnical Assessment

1030 Mamre Road, Kemps Creek

CLIENT: ResolveXO Pty Ltd

PROJECT: 208044.00

PLATE No: 3

REV: 0

DATE: Sep-21





Photograph 7 - Proposed road turning circle cut into topsoil and upper residual clay layers



Photograph 8 - Waterlogged area on eastern boundary below dam on adjacent site



Site Photographs

Desktop Geotechnical Assessment

1030 Mamre Road, Kemps Creek

CLIENT: ResolveXO Pty Ltd

PROJECT: 208044.00

PLATE No: 4

REV: 0

DATE: Sep-21





Photograph 9 - Hillslope continues up from eastern corner



Photograph 10 - Gravelly clay soil exposed in proposed road cutting





Photograph 11 - Fence line at lower third paddock