LOT A39 LAKES RD, NORTH DANDALUP

LAND CAPABILITY FOR ON-SITE EFFLUENT DISPOSAL

Prepared for

Valley Holdings WA Pty Ltd
252 Fitzgerald St
PERTH WA 6000

Report No. J25003
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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

1.0 INTRODUCTION

Valley Holdings WA Pty Ltd proposes to rezone Lot A39 (No. 1818) Lakes Road, North Dandalup (the subject land) for rural-residential use. The rezoning is intended to facilitate the future subdivision of the 194.7ha property into approximately 120 lots with a minimum size of 1ha. All lots will employ on-site effluent disposal. Figure 1 shows an aerial photograph of the subject land and surroundings.

Bayley Environmental Services was commissioned in March 2025 to undertake site investigations and prepare a report to demonstrate the capability of the subject land to support on-site effluent disposal. The investigations included:

- excavation of twelve test pits to depths of up to 2.7m to inspect soil profiles and search for confining layers (rock, clay) and shallow groundwater occurrence;
- constant-head infiltration tests to 0.5m depth at eight locations to measure soil permeability;
- inspection of site slope, aspect, surface conditions, vegetation and drainage;
- collation of information and data from previous investigations on the subject land; and
- assessment of the subject land's capability for effluent disposal in accordance with AS1547:2012 – *Onsite Domestic Wastewater Management* and the *Government Sewerage Policy 2019*.

A detailed Site and Soil Evaluation (SSE) report will be prepared in accordance with AS1547:2012 and the GSP prior to subdivision of the land.

2.0 EXISTING ENVIRONMENT

2.1 Climate

North Dandalup has a strongly seasonal rainfall, with most falling between May and September in association with winter cold fronts. Occasional heavy falls may occur from summer thunderstorms. The long-term average annual rainfall for Mandurah, the closest Bureau of Meteorology weather station in a similar geographical setting, is 882mm, of which over 80% falls between the months of May and September. Figure 2 shows rainfall occurrence for Mandurah.

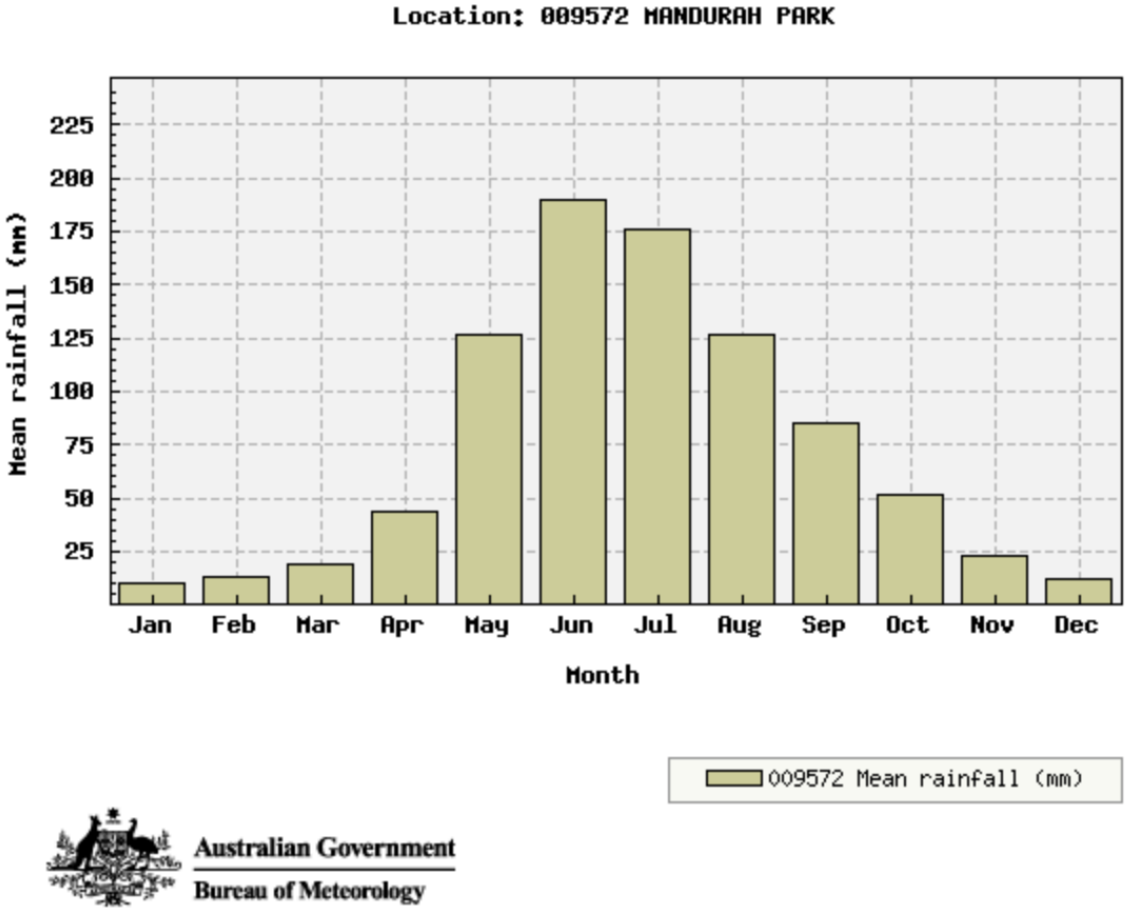

Figure 2 Mandurah Mean Rainfall

2.2 Topography

The north-western half (approximately) of the subject land is largely a low plain at an elevation of 22-26m AHD, sloping very gently to the south-west at a gradient of less than 0.4%. The south-eastern part is a mosaic of low sand dunes and intervening sandy swales at elevations of 20-27m AHD, with slopes ranging from 0.7% to 7%.

In the centre of the subject land, the land drops sharply into the incised channel of the North Dandalup River at elevations of 16.5-22.5m AHD.

2.3 Geology and Soils

The subject land is situated on the Pinjarra Plain, which consists of shallow sandy soils overlying alluvial silty clays. The Geological Survey of Western Australia (Archer *et al*, 1978) mapped most of the subject land as S10: Thin veneer of Bassendean sand over Guildford Formation sandy clay (Qpb/Qpa), while the higher areas and low dunes were mapped as S8: Deep grey Bassendean sand (Qpb). The watercourse of the North Dandalup River and its immediate surroundings was mapped as Alluvium (Qha).

The Department of Agriculture (Wells, 1989) mapped the lower-lying parts of the subject land as Pinjarra Plan (P1a, P1b, P8, P9) and the dunes as Bassendean Dune and Plain System (B1, B2). These land units are described by Wells (1989) as follows:

Pinjarra Plain
Broad low-relief plan west of the foothills, on mostly Pleistocene fluvial sediments and some Holocene alluvium associated with major active drainage systems. Major soils are naturally poorly drained and many swamps occur.

P1a Gently undulating plain with deep acid mottled yellow duplex soils having sand to sandy loam surface and generally shallow topsoil over clay subsoil.
P1b Gently undulating plain with deep acid mottled yellow duplex soils having sand to sandy loam surface and generally moderately deep topsoil over clay subsoil.
P8 Broad imperfectly to poorly drained flats and ill-defined stream channels with moderately deep to deep sands over mottled clays; acid gley and yellow duplex soils to uniform bleached pale brown sands over clay.
P9 Generally shallowly incised stream channels of minor creeks and rivers with deep acidic mottled yellow duplex soils.

Bassendean Dune and Plain System
Very low relief, leached, grey siliceous Pleistocene sand dunes, intervening sandy and clayey swamps and gently undulating plains; occurring immediately west of, and partly overlying, the Pinjarra Plain.

B1 Very low relief dunes and areas of undulating sand plain of deep bleached grey sands with either a pale yellow B horizon or an iron-organic hardpan at depths generally greater than 2m.
B2 Sand plain of deep well drained bleached grey sand with an iron-organic hardpan or less commonly a pale yellow B horizon, generally at 1 - 2m depth.

Test pitting at twelve locations across the subject land (Figure 3) found soil profiles in the lower areas (Pinjarra Plain) generally consisting of grey-brown and orange-brown silty or clayey sand overlying sandy or lateritic clay at about 1m. The test pits on the

dunes found a profile of grey to white sand over a yellow sand at about 1m, with an iron-enriched hardpan sometimes present at about 2.5m. These results generally accord with the GSWA and DoA mapping. Figure 3 shows the geology and soils of the subject land. Appendix A shows soil logs from the test pits.

2.4 Soil Permeability

Constant-head permeability tests at 0.5m depth at eight locations across the subject land May 2025 (Figure 3) returned permeabilities of between 1m/day and 21m/day. The result of 21m/day came from a site on a grey sandy Bassendean dune. Table 2.1 summarises the permeability test results. Appendix B shows the detailed test results.

Table 2.1 Permeability Test Results

Location (see Figure 3)	*Soil Type*	*Permeability (m/day)*
LI1	Brown sand on orange-brown pebbly silt	2
LI2	Yellow-brown sand	2.5
LI3	Yellow-brown clayey sand	1
LI4	Orange-brown clayey sand	1.5
LI5	White sand	4.5
LI6	White sand on pale brown sand	21
LI7	White sand on brown sand	7.5
LI8	Yellow-brown clayey sand	2

The test results show that the permeability of the shallow soils is generally moderate in the Pinjarra Plain soils and high to very high in the grey Bassendean sands.

2.5 Phosphorus Retention Index

No phosphorus retention index (PRI) tests have been carried out on the subject land to date, but previous testing on land to the immediate east and south has shown that the Pinjarra Plain soils generally have moderate to very high PRI (typically 20-120), while the Bassendean Sand soils have very low PRI (typically <1).

The Health Department does not require a minimum PRI beneath land application areas where secondary effluent treatment systems with nutrient removal capability are used. Nevertheless, soil PRI testing will be undertaken during the preparation of a Site & Soil Evaluation (SSE) report prior to subdivision.

2.6 Soil Category

The soil observations at 0.5m depth, together with the measured permeabilities, suggest that the soils of the P1a/b, P8 and P9 land units belong to soil category 2: Sandy Loams, while those in the B1 and B2 units are category 1: Gravels and Sands, as defined by AS1547:2012.

2.7 Acid Sulphate Soils

The soils of the site are mapped by DBCA as low to moderate ASS risk, mostly at depths of over 3m. The nearest mapped high ASS risk area is a wetland located about 1.8km north-west of the subject land.

The development of the subject land is expected to involve little excavation or dewatering (required for installation of underground power, water and communications only), and none below 3m depth. ASS is therefore not considered to be a significant issue on the subject land. If significant dewatering were proposed, it would be prudent to monitor the abstracted water and treat with lime before disposal if necessary.

2.8 Hydrology

2.8.1 Surface Drainage

The major surface drainage feature of the subject land is the North Dandalup River, which flows diagonally across the site from the north-east corner to the south-west corner. The river bed is deeply incised in parts and falls from an elevation of about 22.5m AHD at the north-eastern boundary of the subject land to about 16.5m AHD at the south-western boundary. The top of the bank falls from about 24.5m AHD to 19m AHD over the same distance. Away from the river, the land rises gently to the north-west and south-east at gradients of between about 3% and less than 0.2%

Two main tributaries enter the river within the subject land. The first is a creekline that rises adjacent to the South Western Highway 3.5km east of the subject land and joins the river just south of the centre of the subject land. The second is a minor creek that rises in farm paddocks 1.5km to the east and joins the river just before its exit from the subject land. Several shallow paddock drains flow into the river from the north-western part of the subject land. A number of small seasonal billabongs occur along the margins of the river and its tributaries, particularly in the south of the site. Figure 4 shows the surface hydrology of the subject land.

Pentium (2025) mapped parts of the subject land as susceptible to flooding in a 1-in-10 year (10% AEP) flood event. The flooding is wholly contained within the proposed foreshore reserve of the North Dandalup River and does not impinge on the

development area with the exception of two small areas in the south-east, which can be readily avoided for effluent disposal.

2.8.2 Groundwater

Groundwater occurs at shallow depth throughout the subject land. The regional groundwater flow is to the west-southwest but local flows and levels are influenced in winter by the creeks and drains on the subject land. The presence of low-permeability clay subsoils in parts of the site means that a perched water table is likely to develop in those areas during wet winter periods.

Figure 5 shows preliminary estimated maximum groundwater levels (MGL) based on on-site bore readings by Pentium in June 2025. Figure 5 also shows estimated depths to the MGL based on the Pentium groundwater data and detailed topographic surveys by Harley Dykstra. Due to the slope of the land, the groundwater table will not rise above the ground surface except in localised areas such as the billabongs mentioned in Section 2.8.1, most of which are within the foreshore reserve. Instead, where the groundwater table reaches the surface it will become surface runoff. Further late-winter groundwater measurements will be undertaken prior to the preparation of an SSE report in support of a subdivision application.

Parts of the subject land are susceptible to waterlogging by groundwater rise and ponding of rainfall during wet winters, with the extent depending on the seasonal and short-term rainfall. Figure 5 shows the extent of surface inundation or saturation visible in August 2017, which is the greatest extent visible on aerial photography by Nearmap and Landgate since 1974. Where inundation is likely to occur, filling, subsoil drains and/or shallow swales will be used to prevent its occurrence and remove any ponded water from the vicinity of land application areas.

2.8.3 Wetlands

The DBCA maps most of the subject land as palusplain (seasonally waterlogged plain). Three areas of higher dunes in the south are mapped as dry land. Site inspection shows that the North Dandalup River is a well-defined watercourse, not a palusplain.

2.9 Sewage Sensitive Area

The subject land is mapped as a sewage sensitive area (SSA) under the Government Sewerage Policy due to its location within the Peel-Harvey coastal plain catchment and its proximity to Conservation category wetlands.

3.0 CAPABILITY FOR ON-SITE EFFLUENT DISPOSAL

3.1 Soil Permeability

The results of permeability testing at eight locations in accordance with AS1547:2012 as described in Section 2.4 show that the soils of the site have adequate permeability to support on-site effluent disposal. The very high permeability of the soils on the Bassendean dunes (B1/B2 soil types) means that pressure dosing of leach drains may be required in these areas to ensure even distribution of effluent.

3.2 Watercourse Setbacks

The Government Sewerage Policy prohibits effluent disposal within 100m of waterways, significant wetlands and drains that discharge into waterways or significant wetlands without treatment. Figure 6 shows the areas within 100m of the North Dandalup River and its tributaries where effluent disposal will not be permitted. The paddock drains west of the river will be realigned to follow lot boundaries and planted to create living streams, and therefore will not require a 100m setback.

3.3 Groundwater Separation

Figure 5 shows that the MGL is expected to be within 1.5m of the ground surface over a large proportion of the subject land. Fill will be required on most lots to achieve the required 1.5m clearance from the effluent discharge point to the MGL.

Figure 6 shows the estimated fill requirements for subsoil drip irrigation or flatbed leach drains, including 0.1m of soil cover over the drip lines or leach drains. The fill will be composed of uncompacted permeable sand or loam with an *in situ* saturated hydraulic conductivity of at least 0.5m/day. Given the mandatory use of secondary treatment systems with nutrient removal capability, the Heath Department does not set PRI requirements for the soil beneath LAAs in sewage sensitive areas.

Where the MGL is predicted to be at the ground surface, subsoil drains will be installed at the natural ground level to limit groundwater rise into the fill.

3.4 Inundation

The Government Sewerage Policy prohibits effluent disposal on land that is subject to inundation in a 10-year storm. This includes inundation due to external (e.g. riverine flooding) and local (e.g. rainfall ponding) factors.

Figure 4 shows that the proposed development areas on the site are all outside of the predicted 10-year ARI floodplain of the North Dandalup River and tributaries with the exception of two small areas in the south-east, which can be readily avoided for effluent disposal.

In areas where the MGL is predicted to be at the ground surface, filling, subsoil drainage and/or shallow (~0.3m) swales will be used to prevent surface ponding and to drain any ponded water away from the vicinity of the land application areas. The swales and subsoil drains will discharge into roadside swales. Where the swales cross boundaries between lots, they will be protected by easements in favour of the Shire of Murray. The swales will be densely planted with native species to filter nutrients and sediments from the water prior to discharge from the subject land.

3.5 Site Capability Summary

The capability of the subject land to support on-site effluent disposal has been assessed against the criteria set out in AS1547:2012 and the Government Sewerage Policy 2019. Table 3.1 summarises the AS1547:2012 factors and the degree to which they are satisfied by the subject land.

Table 3.1 On-site Effluent Disposal Capability

Factor (AS1547:2012 or GSP)	*Criterion*	*Site Characteristics*	*Complies*
Slope	<20%	≤7%	Yes
Groundwater depth	1.5m below discharge point	0 – 4.5m	Fill required in some areas
Soil permeability (Ks)	>0.06 m/day	1 – 21 m/day at 0.5m	Yes
Soil PRI	>15	Very low to very high	Secondary treatment - soil amendment not required
Distance from surface watercourses, significant wetlands and untreated drains	>100m	All effluent disposal >100m from watercourses	Yes
Lot area	1ha in SSAs	1ha	Yes
Inundation and flooding	Not subject to inundation or flooding in a 10% AEP (1 in 10 year ARI) rainfall event	Local ponding may occur in places after heavy rainfall	Local drainage and filling required

The table shows that the subject land generally meets the requirements of the Government Sewerage Policy, but that filling and/or drainage will be required in some areas.

4.0 CONCLUSION AND RECOMMENDATIONS

This investigation has found that the subject land is capable of supporting on-site effluent disposal on one-hectare or larger lots. Some special measures are required to ensure that the effluent disposal is environmentally sustainable.

- The minimum lot size of 1ha meets the minimum for lots in sewage sensitive areas. All lots will have ample space for a land application area sized in accordance with Section 3.3.

- Filling will be required in some areas to meet the required 1.5m depth to the maximum groundwater level. The fill should be composed of uncompacted permeable sand or loam with an *in situ* saturated hydraulic conductivity of at least 0.5m/day.

- Shallow swales may be required in some areas to eliminate surface ponding after heavy rainfall in areas where the MGL is predicted to reach the ground surface.

- All effluent disposal systems will be located at least 100m from surface watercourses.

- The soils have adequate permeability for effluent disposal.

- If leach drains are used in areas of Bassendean Sand (B1 and B2 soils), pressure distribution of effluent will be required to ensure even distribution of effluent over the base of the leach drain. The general use of ATU systems will ensure that this is achieved.

A Site and Soil Evaluation (SSE) report will be prepared prior to application for subdivision. The SSE will include the results of late-winter measurements and soil PRI testing, and will include conceptual sizing and location of land application areas on all lots within the subdivision.

5.0 REFERENCES

Archer R.H., Biggs E.R., Hirschberg K.-J.B. & Wilde S.A. (1978). *Pinjarra Urban Geology 2032-I.* 1:50,000 Urban Geology Series. GSWA, Perth.

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Government of Western Australia (2019). *Government Sewerage Policy.* Dept of Planning, Lands & Heritage, Perth.

Health Department of Western Australia (2001). *Code of Practice for the Design, Manufacture, Installation and Operation of Aerobic Treatment Units (ATUs).* Health Department of WA, Perth.

Standards Australia (2012). *Australian/New Zealand Standard 1547:2012 – On-site Domestic Wastewater Management.* SAI Global Ltd, Sydney.

Wells M.R. (1989). *Land Capability Study of the Shires of Mandurah and Murray*. Land Resources Series No. 2, Department of Agriculture, WA.

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Figures

Figure 1

THE SITE AND SURROUNDINGS

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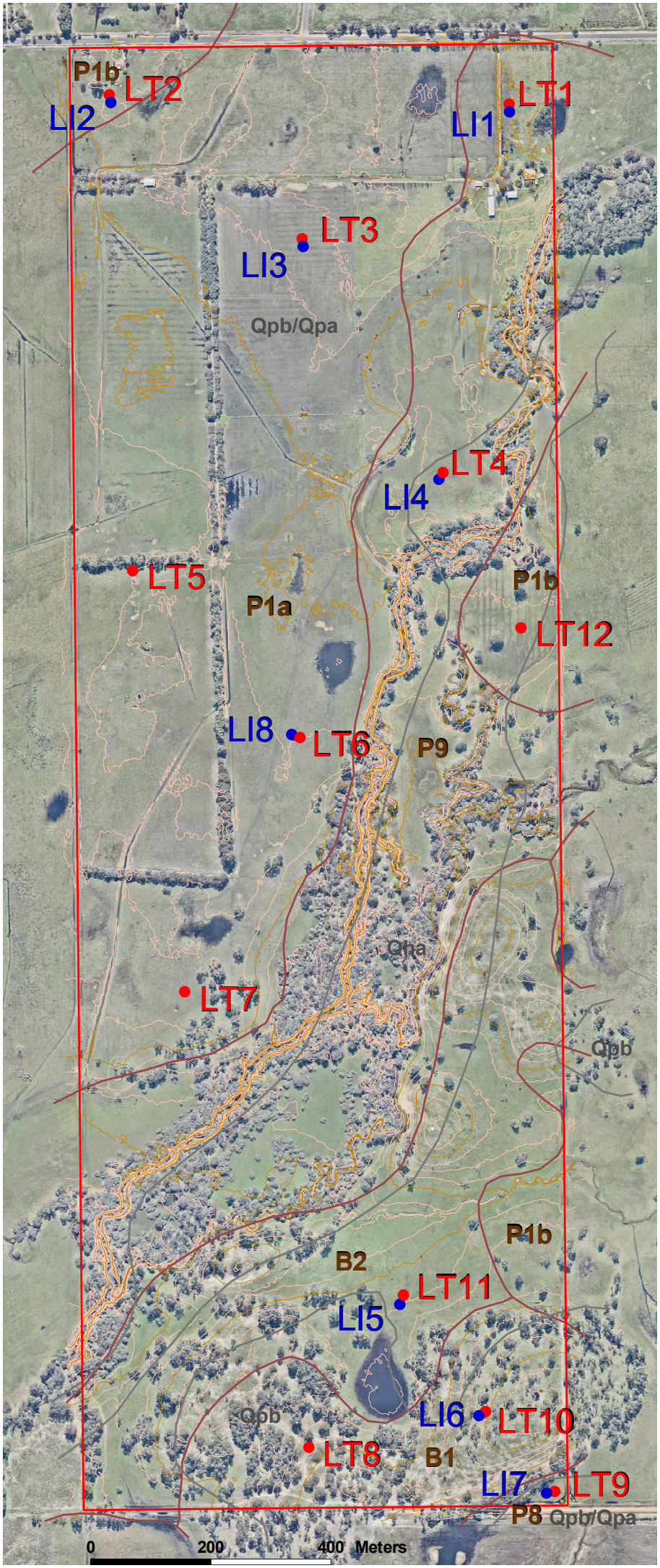

- Subject land boundary
- 1m topo contour
- 0.25m topo contour
- Geology boundary (GSWA)
- Soil/landform boundary (DoA)
- Test pit
- Permeability test

Figure 3

PHYSIOGRAPHY

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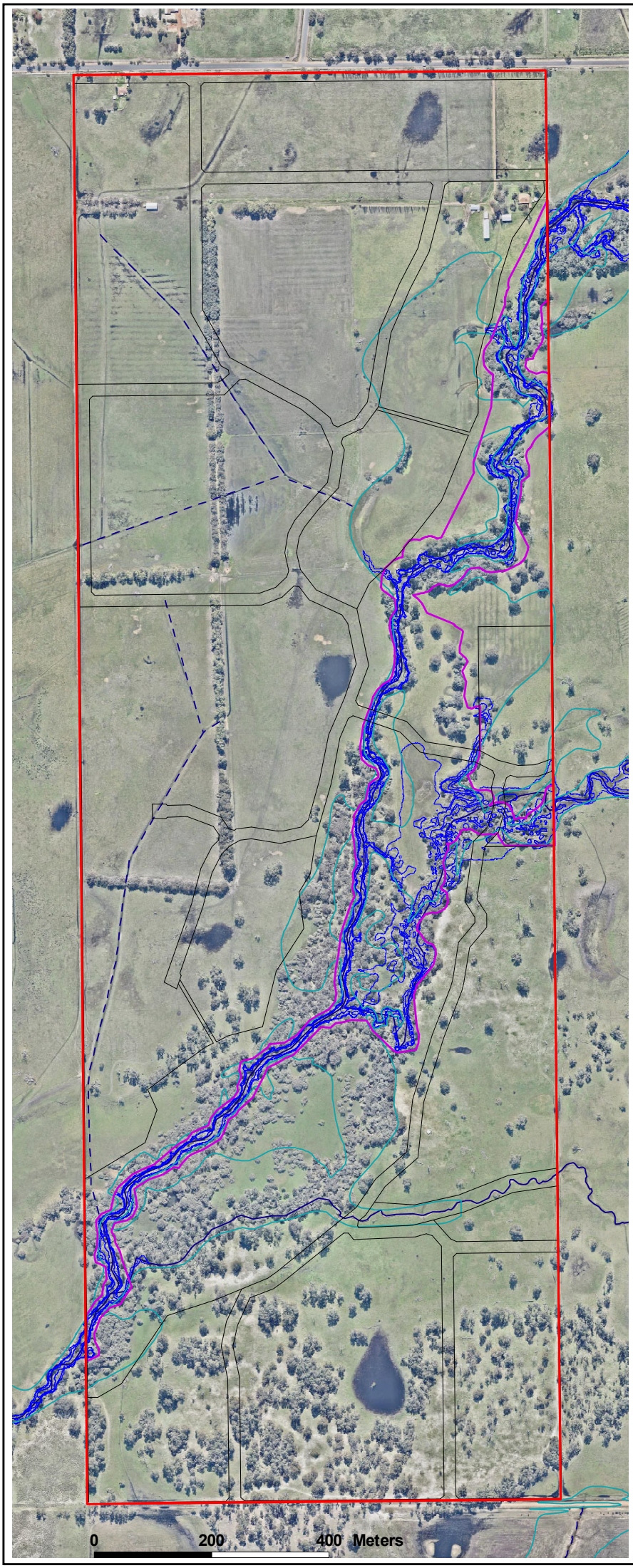

Figure 4

HYDROLOGY

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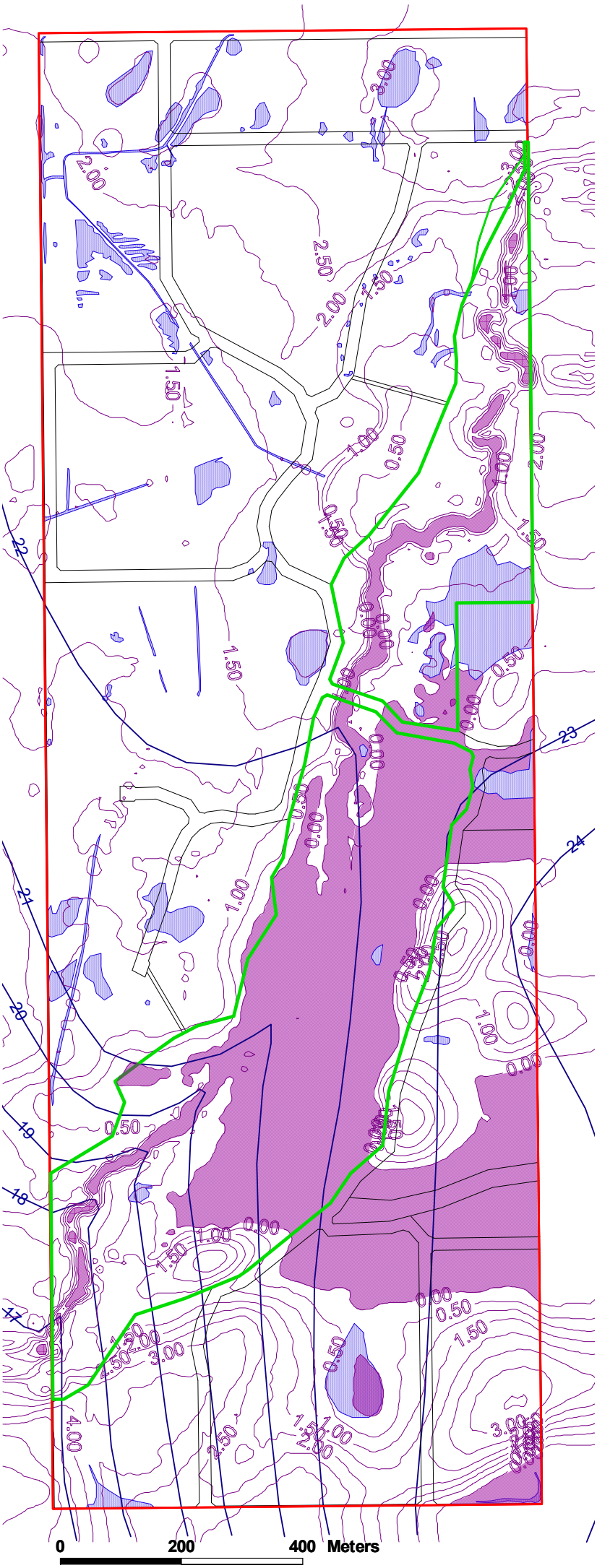

Figure 5

MAXIMUM GROUNDWATER LEVEL

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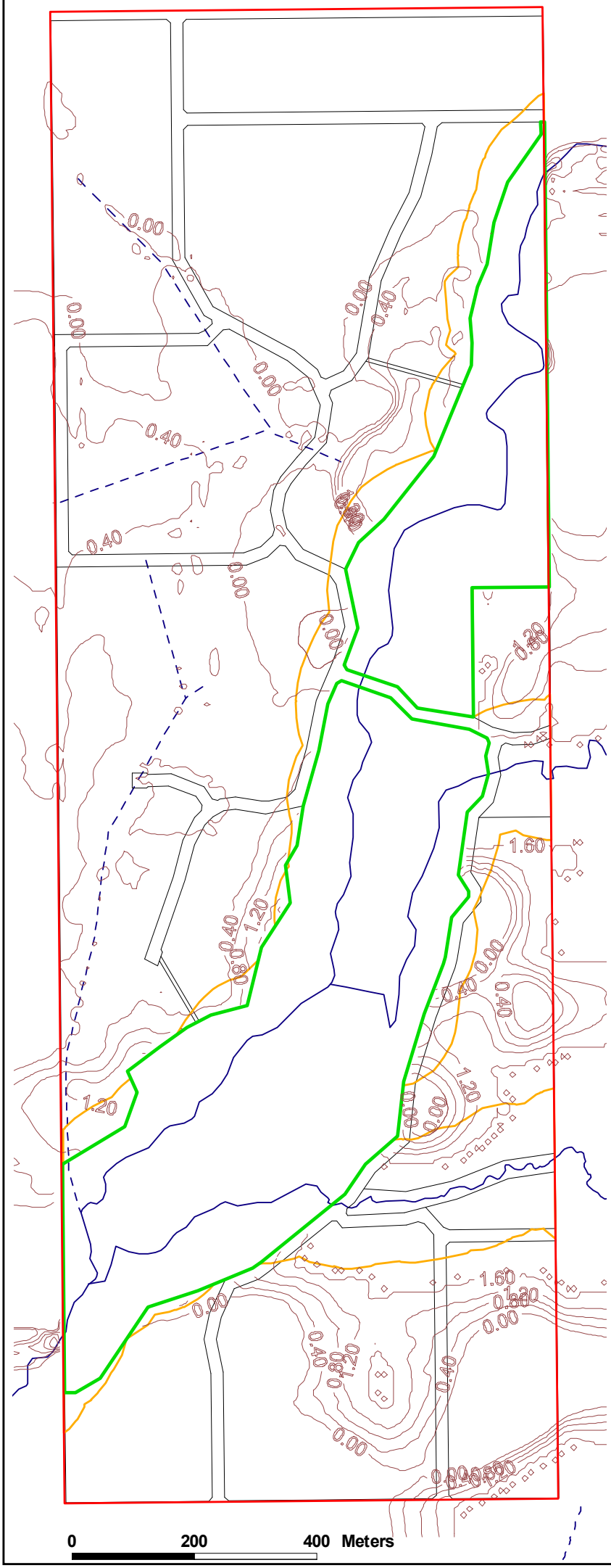

Figure 6

ON-SITE EFFLUENT DISPOSAL CONSTRAINTS

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Appendix A

Soil Logs

SOIL PROFILE LOG

PROJECT NUMBER:	J25003
SITE ID:	**LT1**
EASTING:	399199
NORTHING:	6401617
METHOD:	400mm auger
TOTAL DEPTH (mbgl):	2.7
REFUSAL (Y/N):	N
DATE:	22/05/2025
DEPTH TO WATER (mbgl)	-

SOIL PROFILE		**SAMPLE DATA**	
DEPTH (m)	SOIL DESCRIPTION	SAMPLE ID	INTERVAL (m)
0 - 0.5	Grey sandy topsoil		
0.5 - 1.2	Yellow-brown gravelly silty sand with stones to 20mm		
1.2 - 2.2	Orange/grey mottled silty clay with red ironstone nodules, becoming hard and more lateritic at 1.8m		
2.2 - 2.5	Grey/orange/red mottled lateritic clay with ironstone nodules		
2.5 - 2.7	Grey/orange dull mottled sandy clay with ironstone nodules to 40mm		

SOIL PROFILE LOG

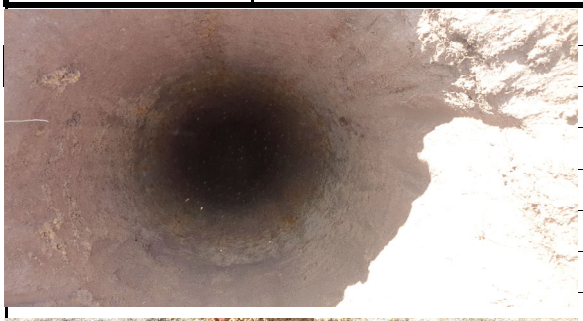
PROJECT NUMBER:	J25003
SITE ID:	**LT2**
EASTING:	398536
NORTHING:	6401635
METHOD:	400mm auger
TOTAL DEPTH (mbgl):	2.7
REFUSAL (Y/N):	N
DATE:	22/05/2025
DEPTH TO WATER (mbgl)	-

SOIL PROFILE		**SAMPLE DATA**	
DEPTH (m)	SOIL DESCRIPTION	SAMPLE ID	INTERVAL (m)
0 - 0.2	Grey sand		
0.2 - 0.5	Pale grey sand		
0.5 - 0.7	Pale yellow-brown silty sand		
0.7 - 2.0	Pale grey/brown/orange slightly mottled clayey sand, becoming cemented with depth		
2.0 - 2.7	Orange/grey/brown slightly mottled hard gravelly silty clay with stones to 30mm		

SOIL PROFILE LOG

PROJECT NUMBER:	J25003
SITE ID:	**LT3**
EASTING:	398859
NORTHING:	6401395
METHOD:	400mm auger
TOTAL DEPTH (mbgl):	2.7
REFUSAL (Y/N):	N
DATE:	22/05/2025
DEPTH TO WATER (mbgl)	-

SOIL PROFILE		**SAMPLE DATA**	
DEPTH (m)	SOIL DESCRIPTION	SAMPLE ID	INTERVAL (m)
0 - 0.1	Grey-brown sand		
0.1 - 0.8	Brown silty sand, slightly damp		
0.8 - 2	Grey/orange dull mottled sandy clay		
2 - 2.7	Grey/orange/red mottled clay with ironstone nodules to 50mm		



SOIL PROFILE LOG

PROJECT NUMBER:	J25003
SITE ID:	**LT4**
EASTING:	399089
NORTHING:	6401004
METHOD:	400mm auger
TOTAL DEPTH (mbgl):	2.5
REFUSAL (Y/N):	N
DATE:	22/05/2025
DEPTH TO WATER (mbgl)	-

SOIL PROFILE		**SAMPLE DATA**	
DEPTH (m)	SOIL DESCRIPTION	SAMPLE ID	INTERVAL (m)
0 - 0.1	Grey-brown sand		
0.1 - 0.6	Orange silty sand		
0.6 - 1.8	Orange/red/grey mottled sandy clay		
1.8 - 2.5	Grey/orange mottled clayey sand		

SOIL PROFILE LOG

PROJECT NUMBER:	J25003
SITE ID:	**LT5**
EASTING:	398576
NORTHING:	6400844
METHOD:	400mm auger
TOTAL DEPTH (mbgl):	2.0
REFUSAL (Y/N):	Y
DATE:	22/05/2025
DEPTH TO WATER (mbgl)	–

SOIL PROFILE		**SAMPLE DATA**	
DEPTH (m)	SOIL DESCRIPTION	SAMPLE ID	INTERVAL (m)
0 - 0.1	Brown sand		
0.1 - 1.2	Yellow-brown silty sand		
1.2 - 1.8	Pale brown/grey/orange mottled sandy clay		
1.8 - 2	Hard orange/red/grey mottled laterite		
2	Refusal on laterite		

SOIL PROFILE LOG

PROJECT NUMBER:	J25003
SITE ID:	**LT6**
EASTING:	398850
NORTHING:	6400565
METHOD:	400mm auger
TOTAL DEPTH (mbgl):	2.7
REFUSAL (Y/N):	N
DATE:	22/05/2025
DEPTH TO WATER (mbgl)	-

SOIL PROFILE		**SAMPLE DATA**	
DEPTH (m)	SOIL DESCRIPTION	SAMPLE ID	INTERVAL (m)
0 0.1	Brown silty sand		
0.1 - 0.7	Yellow-brown silty sand		
0.7 - 1.5	Brown/orange slightly mottled clayey sand		
1.5 - 2	Brown/orange mottled lateritic sandy clay with stones to 50mm		
2 - 2.7	Grey/orange/red mottled gritty clay with stones to 100mm		

SOIL PROFILE LOG

PROJECT NUMBER:	J25003
SITE ID:	**LT7**
EASTING:	398662
NORTHING:	6400139
METHOD:	400mm auger
TOTAL DEPTH (mbgl):	2.4
REFUSAL (Y/N):	Y
DATE:	22/05/2025
DEPTH TO WATER (mbgl)	–

SOIL PROFILE		**SAMPLE DATA**	
DEPTH (m)	SOIL DESCRIPTION	SAMPLE ID	INTERVAL (m)
0 - 1	Brown silty sand		
1 - 2.0	Yellow-brown/grey mottled clayey sand		
2 - 2.4	Red/orange/grey mottled lateritic clay with stones to 50mm		
2.4	Refusal on lateritic clay		

SOIL PROFILE LOG

PROJECT NUMBER:	J25003
SITE ID:	**LT8**
EASTING:	398869
NORTHING:	6399381
METHOD:	400mm auger
TOTAL DEPTH (mbgl):	2.7
REFUSAL (Y/N):	N
DATE:	22/05/2025
DEPTH TO WATER (mbgl)	-

SOIL PROFILE		**SAMPLE DATA**	
DEPTH (m)	SOIL DESCRIPTION	SAMPLE ID	INTERVAL (m)
0 - 0.1	Grey sand		
0.1 - 2	Pale grey sand		
2 - 2.5	Yellow sand, becoming cemented, with ironstone nodules to 20mm		
2.5 - 2.6	Brown hardpan		
2.6 - 2.7	Pale brown/orange/red mottled clayey sand, damp		

SOIL PROFILE LOG

PROJECT NUMBER:	J25003
SITE ID:	**LT9**
EASTING:	399275
NORTHING:	6399307
METHOD:	400mm auger
TOTAL DEPTH (mbgl):	2.7
REFUSAL (Y/N):	N
DATE:	22/05/2025
DEPTH TO WATER (mbgl)	-

SOIL PROFILE		**SAMPLE DATA**	
DEPTH (m)	SOIL DESCRIPTION	SAMPLE ID	INTERVAL (m)
0 - 0.1	Grey sand		
0.1 - 0.3	V pale grey sand		
0.3 - 0.8	Red-brown slightly mottled silty sand		
0.8 - 1.2	Yellow-brown/orange mottled silty sand		
1.2 - 2.3	Grey/orange mottled moderately structured clay with red ironstone nodules		
2.3 - 2.7	Hard red/grey mottled lateritic clay		

SOIL PROFILE LOG

PROJECT NUMBER:	J25003
SITE ID:	**LT10**
EASTING:	399160
NORTHING:	6399435
METHOD:	400mm auger
TOTAL DEPTH (mbgl):	2.7
REFUSAL (Y/N):	N
DATE:	22/05/2025
DEPTH TO WATER (mbgl)	-

SOIL PROFILE		**SAMPLE DATA**	
DEPTH (m)	SOIL DESCRIPTION	SAMPLE ID	INTERVAL (m)
0 - 0.2	Pale grey sand		
0.2 - 0.5	Very pale grey sand		
0.5 - 0.8	Pale yellow sand		
0.8 - 2.7	Yellow sand		

SOIL PROFILE LOG

PROJECT NUMBER:	J25003
SITE ID:	**LT11**
EASTING:	399025
NORTHING:	6399635
METHOD:	400mm auger
TOTAL DEPTH (mbgl):	2.7
REFUSAL (Y/N):	N
DATE:	22/05/2025
DEPTH TO WATER (mbgl)	1.7

SOIL PROFILE		**SAMPLE DATA**	
DEPTH (m)	SOIL DESCRIPTION	SAMPLE ID	INTERVAL (m)
0 - 0.2	Grey sand		
0.2 - 1	Pale yellow-brown sand		
1 - 1.9	Grey/brown/red mottled sandy clay with ironstone nodules		
1.9 - 2.7	Grey coarse well-structured gritty clay		

SOIL PROFILE LOG

PROJECT NUMBER:	J25003
SITE ID:	**LT12**
EASTING:	399223
NORTHING:	6400748
METHOD:	400mm auger
TOTAL DEPTH (mbgl):	1.7
REFUSAL (Y/N):	Y
DATE:	22/05/2025
DEPTH TO WATER (mbgl)	-

SOIL PROFILE		**SAMPLE DATA**	
DEPTH (m)	SOIL DESCRIPTION	SAMPLE ID	INTERVAL (m)
0 - 0.1	Brown clayey silt		
0.1 - 1.5	Orange-brown sandy clay		
1.5 - 1.6	Orange/grey mottled silty clay		
1.6 - 1.7	V pale yellow, very hard dry clay		
1.7	Refusal on hard clay		

Appendix B

Permeability Test Results

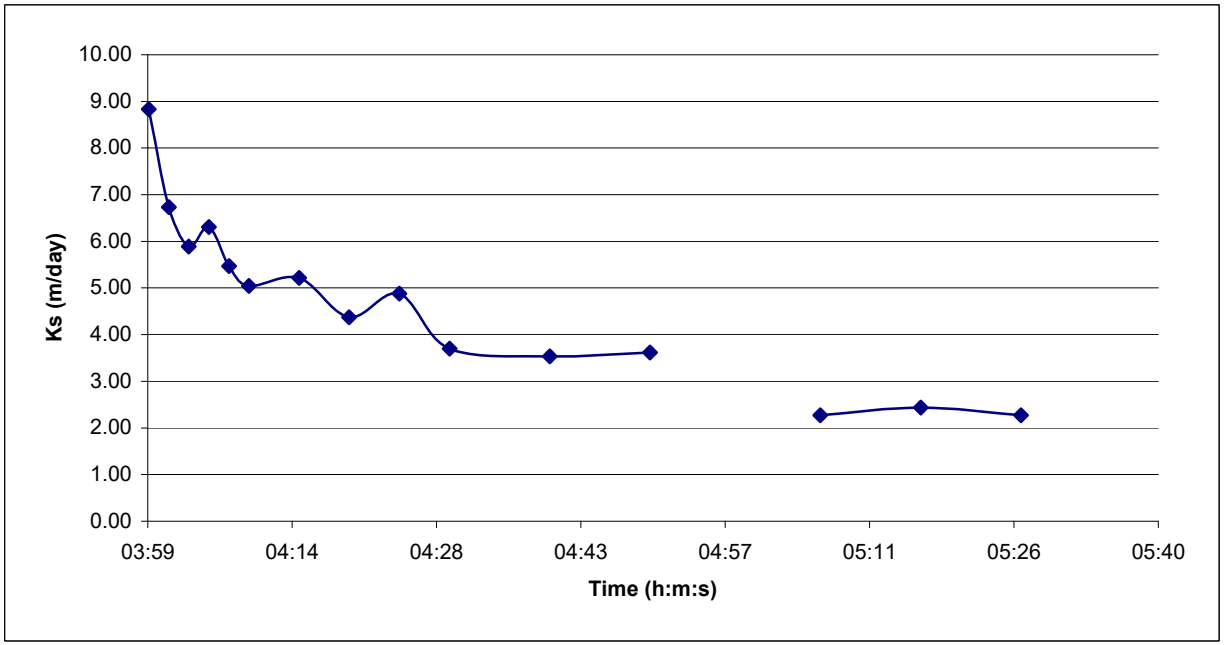
SOIL PERMEABILITY TEST

Site No.	**LI1**
Date	22/05/25
Easting	393203
Northing	6401616
Depth	0.5

Brown sand on orange-brown pebbly silt

Time (h:m:s)	Weight (kg)	Change in Weight (kg)	Ks (m/d)
03:58:00	42.9		
04:00:00	40.8	2.1	**8.83**
04:02:00	39.2	1.6	**6.73**
04:04:00	37.8	1.4	**5.89**
04:06:00	36.3	1.5	**6.31**
04:08:00	35	1.3	**5.47**
04:10:00	33.8	1.2	**5.05**
04:15:00	30.7	3.1	**5.22**
04:20:00	28.1	2.6	**4.37**
04:25:00	25.2	2.9	**4.88**
04:30:00	23	2.2	**3.70**
04:40:00	18.8	4.2	**3.53**
04:50:00	14.5	4.3	**3.62**
		14.5	
04:57:00	41.9		
05:07:00	39.2	2.7	**2.27**
05:17:00	36.3	2.9	**2.44**
05:27:00	33.6	2.7	**2.27**
		33.6	

H =	25
r =	**4.5**



Ks = 2 m/day

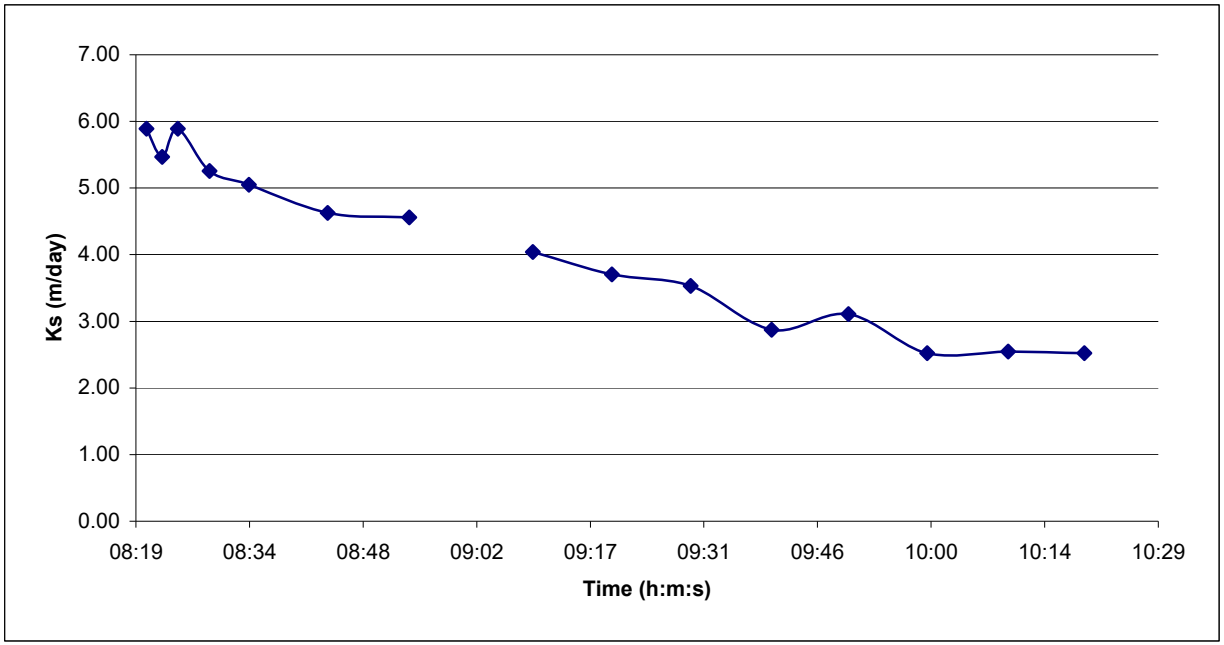
SOIL PERMEABILITY TEST

Site No.	**LI2**
Date	23/05/25
Easting	398540
Northing	6401624
Depth	0.5

Yellow-brown sand

Time (h:m:s)	Weight (kg)	Change in Weight (kg)	Ks (m/d)
08:19:00	34.5		
08:21:00	33.1	1.4	**5.89**
08:23:00	31.8	1.3	**5.47**
08:25:00	30.4	1.4	**5.89**
08:29:00	27.9	2.5	**5.26**
08:34:00	24.9	3	**5.05**
08:44:00	19.4	5.5	**4.63**
08:54:20	13.8	5.6	**4.56**
09:00:00	43.8		
09:10:00	39	4.8	**4.04**
09:20:00	34.6	4.4	**3.70**
09:30:00	30.4	4.2	**3.53**
09:40:15	26.9	3.5	**2.87**
09:50:00	23.3	3.6	**3.11**
10:00:00	20.3	3	**2.52**
10:10:15	17.2	3.1	**2.54**
10:19:55	14.3	2.9	**2.52**
		14.3	

H =	25
r =	**4.5**



Ks = 2.5 m/day

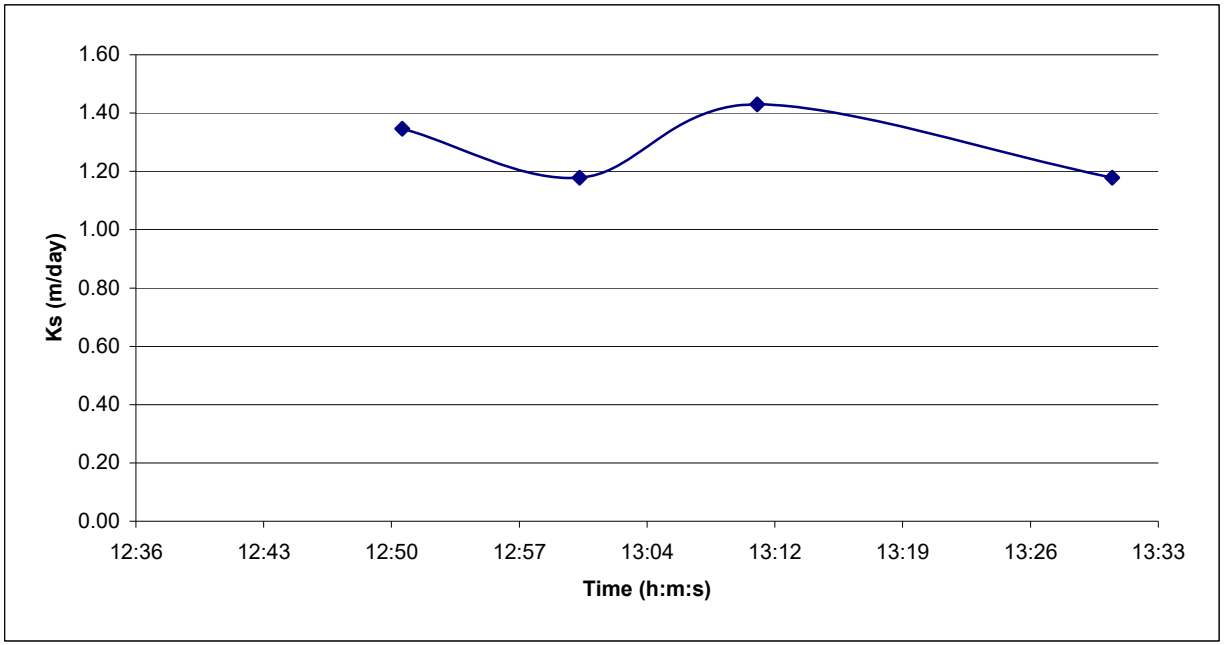
SOIL PERMEABILITY TEST

Site No.	**LI3**
Date	23/05/25
Easting	398858
Northing	6401385
Depth	0.5

Yellow-brown clayey sand

Time (h:m:s)	Weight (kg)	Change in Weight (kg)	Ks (m/d)
12:41:00	20.8		
12:51:00	19.2	1.6	**1.35**
13:01:00	17.8	1.4	**1.18**
13:11:00	16.1	1.7	**1.43**
13:31:00	13.3	2.8	**1.18**
		13.3	

H =	25
r =	**4.5**



Ks = 1 m/day

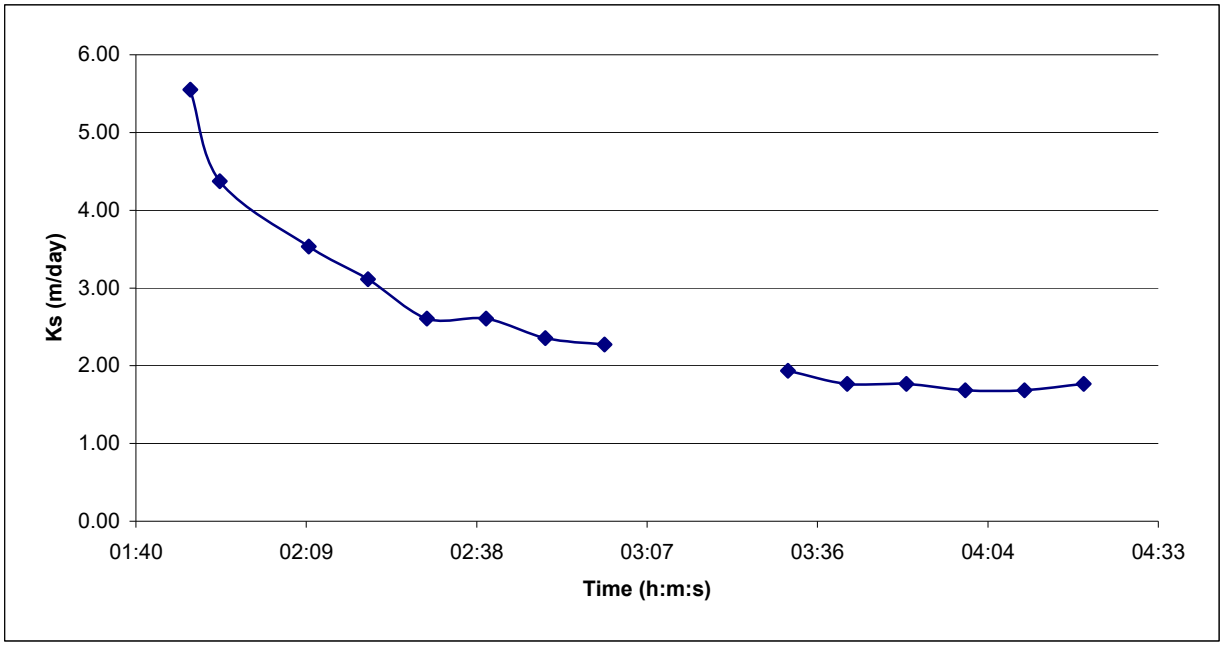
SOIL PERMEABILITY TEST

Site No.	**LI4**
Date	23/05/25
Easting	399084
Northing	6400998
Depth	0.5

Orange-brown clayey sand

Time (h:m:s)	Weight (kg)	Change in Weight (kg)	Ks (m/d)
01:45:00	40.5		
01:50:00	37.2	3.3	**5.55**
01:55:00	34.6	2.6	**4.37**
02:10:00	28.3	6.3	**3.53**
02:20:00	24.6	3.7	**3.11**
02:30:00	21.5	3.1	**2.61**
02:40:00	18.4	3.1	**2.61**
02:50:00	15.6	2.8	**2.36**
03:00:00	12.9	2.7	**2.27**
		12.9	
03:21:00	44.3		
03:31:00	42	2.3	**1.94**
03:41:00	39.9	2.1	**1.77**
03:51:00	37.8	2.1	**1.77**
04:01:00	35.8	2	**1.68**
04:11:00	33.8	2	**1.68**
04:21:00	31.7	2.1	**1.77**
		31.7	

H =	25
r =	**4.5**



Ks = 1.5 m/day

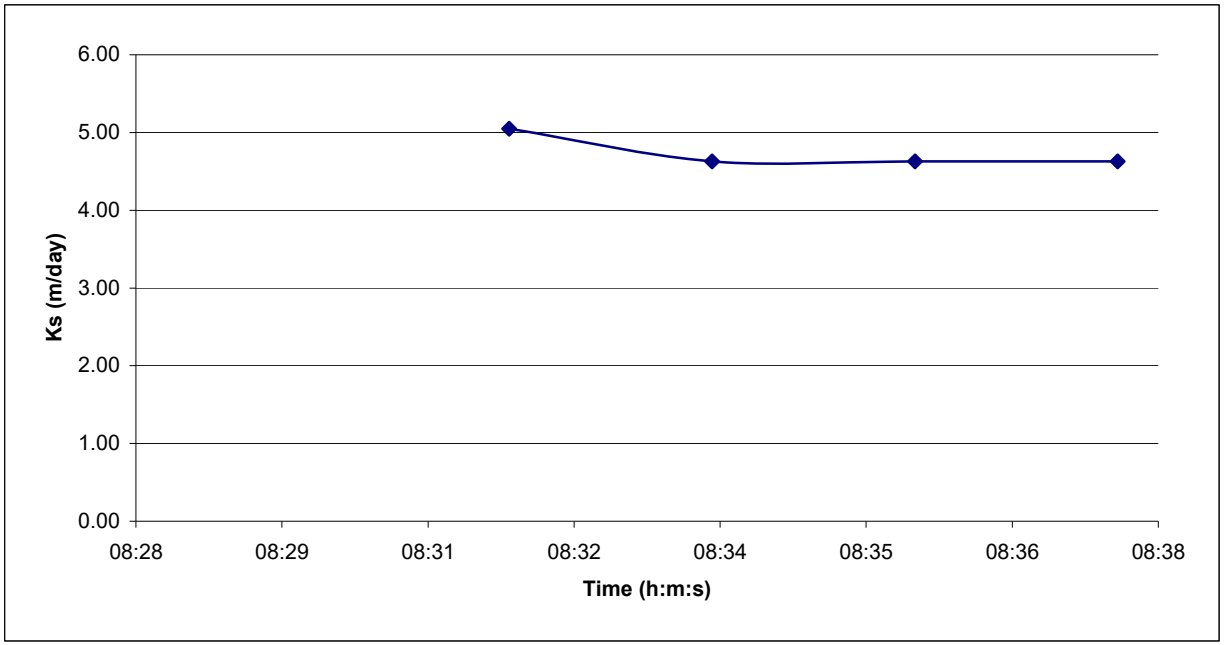
SOIL PERMEABILITY TEST

Site No.	**LI5**
Date	26/05/25
Easting	399021
Northing	6399619
Depth	0.5

White sand

Time (h:m:s)	Weight (kg)	Change in Weight (kg)	Ks (m/d)
08:30:00	41.8		
08:32:00	40.6	1.2	**5.05**
08:34:00	39.5	1.1	**4.63**
08:36:00	38.4	1.1	**4.63**
08:38:00	37.3	1.1	**4.63**
		37.3	

H =	25
r =	**4.5**



Ks = 4.5 m/day

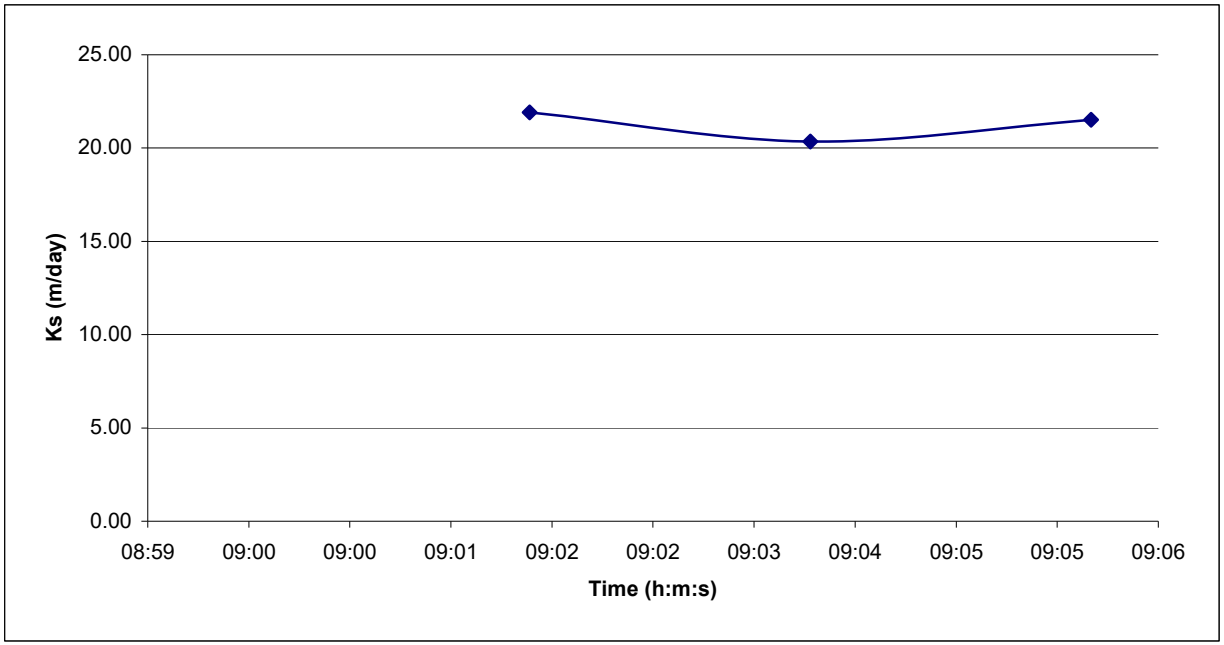
SOIL PERMEABILITY TEST

Site No.	**LI6**
Date	26/05/25
Easting	399154
Northing	6399434
Depth	0.5

White sand on pale brown sand

Time (h:m:s)	Weight (kg)	Change in Weight (kg)	Ks (m/d)
09:00:00	28.4		
09:02:00	22.8	5.6	**21.92**
09:04:00	17.6	5.2	**20.35**
09:06:00	12.1	5.5	**21.52**
		12.1	

H =	25
r =	**5**



Ks = 21 m/day

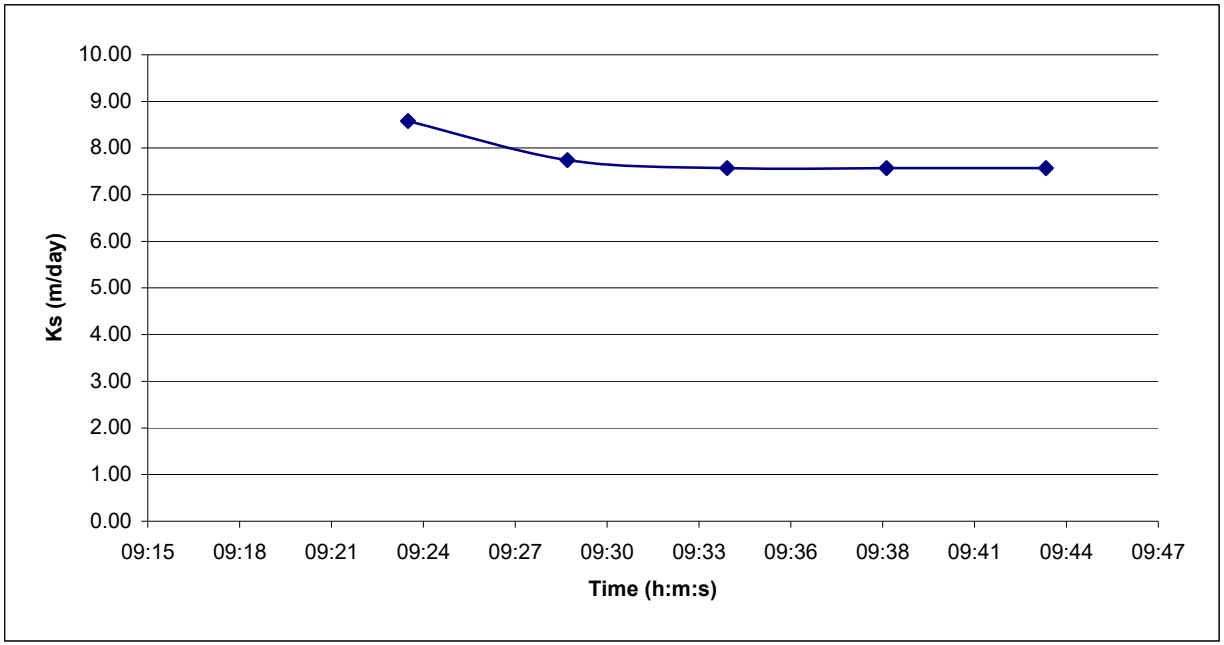
SOIL PERMEABILITY TEST

Site No.	**LI7**
Date	26/05/25
Easting	399266
Northing	6399305
Depth	0.5

White sand on brown sand

Time (h:m:s)	Weight (kg)	Change in Weight (kg)	Ks (m/d)
09:19:00	39.5		
09:24:00	34.4	5.1	**8.58**
09:29:00	29.8	4.6	**7.74**
09:34:00	25.3	4.5	**7.57**
09:39:00	20.8	4.5	**7.57**
09:44:00	16.3	4.5	**7.57**
		16.3	

H =	25
r =	**4.5**



Ks = 7.5 m/day

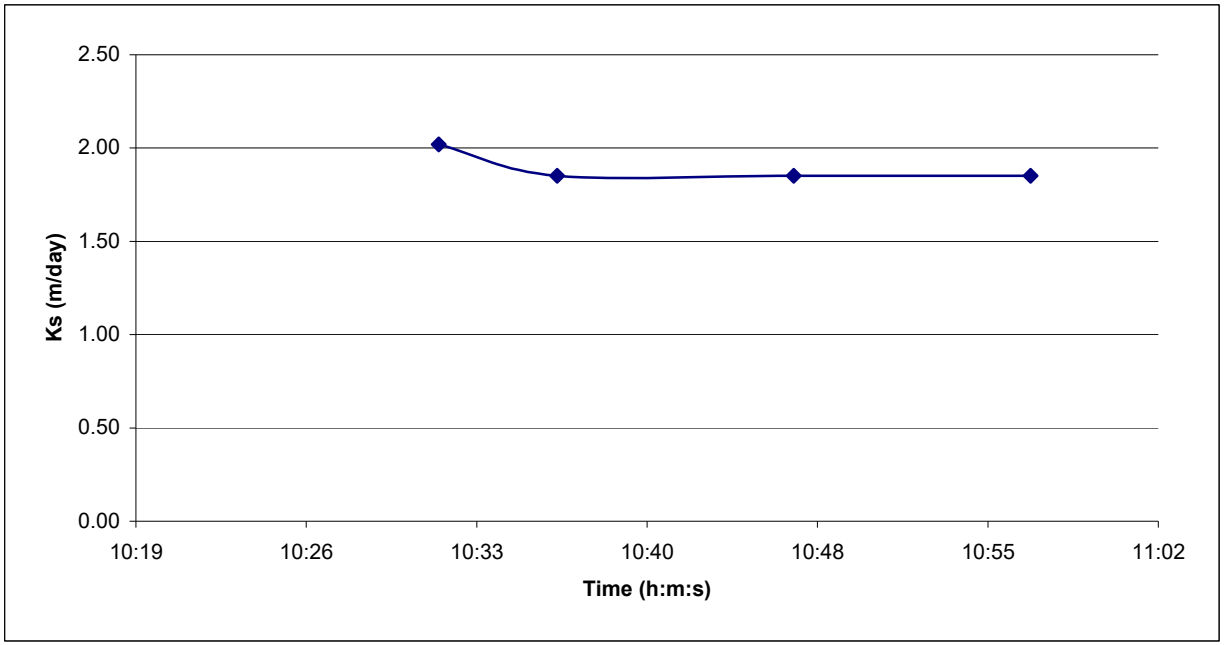
SOIL PERMEABILITY TEST

Site No.	**LI8**
Date	26/05/25
Easting	398844
Northing	6400566
Depth	0.5

Yellow-brown clayey sand

Time (h:m:s)	Weight (kg)	Change in Weight (kg)	Ks (m/d)
10:27:00	41.4		
10:32:00	40.2	1.2	**2.02**
10:37:00	39.1	1.1	**1.85**
10:47:00	36.9	2.2	**1.85**
10:57:00	34.7	2.2	**1.85**
		34.7	

H =	25
r =	**4.5**



Ks = 2 m/day