

James McHugh



Onsite Wastewater Assessment: 17 Thompson Street, Scotland Island, NSW.

ENVIRONMENTAL



WATER



WASTEWATER



GEOTECHNICAL



CIVIL



PROJECT
MANAGEMENT



P2108321JR02V01
November 2021

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Contents

1 OVERVIEW.....	5
1.1 Background	5
1.2 Proposed Development	5
1.3 Scope of Work	5
1.4 Relevant Guidelines & Standards	6
2 SITE DESCRIPTION	7
2.1 Location and Setting	7
2.2 Field Investigations	8
2.3 Observed Geology and Soils	8
2.4 Groundwater	8
3 WASTEWATER ASSESSMENT	9
3.1 New Wastewater System	9
3.2 Design Wastewater Load	9
3.3 Land Capability Assessment for Effluent Reuse	9
3.4 Buffer Setbacks for Effluent Reuse Areas	11
3.5 Effluent Disposal Requirements	12
3.6 Geotechnical Considerations	13
3.7 Certification and Maintenance	13
3.8 Construction Certificate Requirements	13
4 REFERENCES	14
5 ATTACHMENT A – PROPOSED DEVELOPMENT PLANS	15
6 ATTACHMENT B – SITE WASTEWATER PLAN	16
7 ATTACHMENT C – BOREHOLE LOGS.....	17

1 Overview

1.1 Background

This report, prepared by Martens and Associates (MA), documents an onsite wastewater assessment undertaken at 17 Thompson Street (Lot 242 DP12749), Scotland Island, NSW ('the site'). The assessment was commissioned by the Client, James McHugh, to support a Development Application (DA) for a new dwelling and home office.

A geotechnical investigation was undertaken in conjunction with the onsite wastewater assessment and is documented in a separate report P2108321JR01V01 (MA, 2021).

Proposed development plans are provided in Attachment A.

1.2 Proposed Development

Based on the review of proposed development plans prepared by Design by Waves (REF: 2001, 31 October, 2021) (Attachment A), works include construction of:

- Two storey elevated dwelling with three bedrooms.
- Separate home office / studio.
- Rain water tank(s).

1.3 Scope of Work

Scope of works for the wastewater assessment included:

1. Site walkover and subsurface investigations.
2. Assessment of wastewater generation rates.
3. Development of an onsite wastewater management solution for DA.

1.4 Relevant Guidelines & Standards

This assessment was undertaken in accordance with the following:

- *Australian / New Zealand Standard 1547 (2012), Onsite domestic wastewater management.*
- Department of Local Government, NSW Environment Protection Authority, NSW Health Department, NSW Department of Land and Water Conservation and the NSW Department of Urban Affairs and Planning (1998), *Environment and Health Protection Guidelines - Onsite Wastewater Management for Single Households.*

2 Site Description

2.1 Location and Setting

Site information is summarised in Table 1.

Table 1: Site description summary.

Element	Description/Detail
Property address	17 Thompson Street, Scotland Island, NSW
Approximate site area (m ²)	1,377.8 m ² (WSS, 2021)
Lot / DP	Lot 242 / DP 12749
Existing site development	The site is mostly undeveloped. In the central portion, the site had been cut for construction purposes. Old pier and strip brick footings remain on site.
Aspect	North east
Typical slopes	Site slopes are approximately 40%. Site elevation ranges between approximately 26 mAHD along the north eastern boundary and 47 mAHD along the western boundary (WWS, 2021).
Vegetation	The site is generally densely vegetated with natural bush (grass, shrubs and trees).
Local Government Area (LGA)	Northern Beaches Council (NBC)
Drainage	Overland flow towards the north east onto Thompson Street.
Expected geology	Hawkesbury Sandstone comprising medium to coarse grained quartz sandstone with very minor shale and laminite lenses (Sydney 1:100,000 Geological Sheet 9130, 1983)
Expected soils	Watagan colluvial soils comprising of shallow to deep lithosols / siliceous sands and yellow podzolic soils on sandstones with moderately deep brown, red and greyed podzolic soils on shales (eSPADE 2021).

2.2 Field Investigations

Field investigations undertaken on 6 July, 2021 included:

1. Site walkover to assess existing conditions including vegetation, slopes, aspects, geology and hydrology.
2. Two boreholes BH104 and BH105 for wastewater assessment purpose by hand auger up to 1.4 m below ground level (mBGL) to characterise site soils (Attachment C) in potential onsite effluent disposal areas (Attachment B).
3. Additional borehole investigations: BH101, BH102, BH103a, BH103b were undertaken for geotechnical assessment (MA, 2021) to 0.6 mBGL along with four dynamic cone penetrometer tests up to 2.0 mBGL.

2.3 Observed Geology and Soils

BH104 and BH105 encountered clay loam to a depth of 0.2 mBGL overlaying fine sandy loam to a depth of 0.60 to 0.80 mBGL. Medium to light clays were observed under sandy loam to termination depths. BH104 was terminated at an investigation depth of 1.40 mBGL on weathered sandstone with BH105 terminated at 1.20 mBGL on weathered sandstone.

2.4 Groundwater

Groundwater was not observed during borehole drilling. A shallow groundwater table is not expected, however ephemeral groundwater may collect at the soil / rock interface after periods of substantial or prolonged rainfall.

3 Wastewater Assessment

3.1 New Wastewater System

Currently the site has no buildings or services, including no wastewater management system. The most suitable management system for the site, given the site characteristics and constraints, is a secondary treatment system coupled with a subsurface irrigation system.

An appropriate secondary wastewater treatment solution for the site would be provided by an aerated wastewater treatment system (AWTS) approved by NSW Department of Health.

3.2 Design Wastewater Load

Site population is calculated based on two persons for the first bedroom and one person for every other potential room. The proposed development (Attachment A) contains 3 bedrooms and an office which could be used as a bedroom. The design site occupancy is 5 persons.

Design hydraulic load for the proposed development scenario is provided in Table 2 and has been calculated using allowances from Table H1 of AS/NZS 1547 (2012). The proposed dwelling will be equipped with water reduction devices. Therefore, with a potential occupancy of 5 persons and a daily generation rate of 120 L/person/day the design wastewater load is 600 L/day (5 x 120 L/day).

Table 2: Design wastewater load for 17 Thompson Street, Scotland Island.

Total number of potential bedrooms	Design site occupants	Recommended wastewater flow allowance ¹	Design wastewater load (L/day)
4	5	120 L/person/day	600

Notes:

¹ Based on AS/NZ 1547, 2012, Table H3 where full water-reduction facilities are implemented on dwellings.

3.3 Land Capability Assessment for Effluent Reuse

Suitability for onsite effluent reuse is assessed according to Tables 4 and 6 of NSW Department of Local Government *et al.* (NSW DLG, 1998) and is summarised in Table 3.

Table 3: Site suitability for onsite effluent reuse, according to NSW Department of Local Government *et al.* (1998).

Feature	Details of Irrigation Areas	Limitation Rating
Flood potential	> 1 in 20 yr flood	Minor
Sun and wind exposure	Moderate to high	Minor
Slope (%)	40%	Major
Landform	Side slope	Minor
Erosion potential	Low	Minor
Site drainage	No soil water logging	Minor
Fill	No fill	Minor
Rock outcrop (%)	<10	Minor
Geology/regolith	No major discontinuities	Minor
Depth to bedrock (m)	Expected >1 mBGL	Minor
Depth to water table (m)	Expected >1.5 mBGL	Minor
Soil permeability category	4	Minor
Coarse fragments (%)	5 to 10	Minor

Site slope is assessed as a major limitation to onsite effluent reuse. Remaining features are assessed as minor limitations. To address the slope limitation it is proposed that sub surface drip irrigation be used to mitigate the risk of surface runoff of applied effluent. In addition, the geotechnical report is to address any concerns regarding the risk of irrigation impacting slope stability.

3.3.1 Effluent Application Rates for Subsurface Irrigation

Soil properties and corresponding recommended design irrigation rates (DIRs) according to AS/NZS 1547 (2012) for subsurface irrigation are given in Table 4. These are based on site investigations and assumptions of soil properties based on our experience in similar soil environments.

Table 4: DIR and soil properties for the site.

Soil Category	Depth (m) ¹	Texture	Indicative Permeability (K _{sat}) (m/d)	Design Irrigation Rate (DIR) (mm/day)
Topsoil	0.0 – 0.2	Clay loam	0.5 – 0.15	3.5
Subsoil	0.2 – 0.8	Fine sandy loam	> 3.0	4.0
Subsurface irrigation design				3.5

Notes:

¹ Average value from 2 boreholes, depth of soil horizons varies across the site.

3.4 Buffer Setbacks for Effluent Reuse Areas

The final location of any proposed effluent management area (EMA) must provide for adequate buffer setbacks from property boundaries, sealed pathways, dwellings and surface waters. On the basis of our extensive experience with onsite systems in the local area (and in particular Scotland Island) we recommend and adopt site specific buffer setback distances. Adopted setback distances are in some instances less than those provided in DLG et al. (1998) and are considered appropriate. Table 5 provides a summary of recommended setback distances with DLG et al (1998) buffers in parentheses. Large trees have been provided with 1.5 m (from the trunk) buffer distance.

Table 5: Recommended buffer distances for absorption systems (DLG et al., 1998).

Site Feature	Buffer Distance (m)
Property Boundaries	2/1 (12/6) ^{1 2}
Dwellings	2/1 (6/3) ^{1 2}
Paths & Walkways	1 (6/3) ^{1 2}
Swimming Pools	6/3 ¹
Intermittent surface waters	40 (n/a) ³
Permanent surface waters	100 (n/a) ³

Note:

¹ X/Y = Downslope/Upslope of effluent disposal area.

² Recommended buffers for the site based on existing local experience with DLG et al. (1998) in parentheses.

³ The application of setbacks to Pittwater is not generally practical to be applied on Scotland Island.

Refer to the site plan in Attachment A for the proposed EMA, borehole locations, setback distances and location of the proposed building footprint (Attachment B).

3.5 Effluent Disposal Requirements

3.5.1 Irrigation Area

Based on the site design hydraulic load 600 L/day and adopted DIR of 3.5 mm/day, the required minimum irrigation area for effluent disposal is calculated in Table 6.

Table 6: Effluent disposal requirements for 17 Thompson Street, Scotland Island.

Treatment System	Effluent Volume (L/day)	DIR (mm/day)	Area Required (m ²)
Secondary (AWTS)	600	3.5	172

A suitable available EMA of 180 m² is shown in Attachment B which exceeds the required 172 m².

3.5.2 Effluent Disposal Recommendations

Effluent disposal system is to be constructed in accordance with AS/NZS 1547 (2012) to meet the following minimum specifications:

- EMA to be constructed as a subsurface irrigation system as shown on attached plan. Irrigation laterals are to be laid at 1 m centres parallel to site contours. Laterals are to be fixed in place. Laterals are to be laid directly into site topsoil at a depth of 150 mm.
- Irrigation laterals shall be pressure compensating dripline specifically designed for the purposes of subsurface effluent irrigation (e.g. 16 mm Netafim).
- Laterals are to be connected to a 25 mm distribution manifold running along the side of the EMA and to a 25 mm flushing main with manual control valve to allow for periodic flushing of solid materials from irrigation laterals. Flushing main is to be connected to the inlet of the AWTS.
- Minimum area of EMA to be 172 m².

- A 120 µm effluent filter is to be installed between the effluent storage tank / well and the EMA.
- No connection with other water reticulation systems is to occur and no standard hose fittings are to be connected to the system.
- Irrigation areas identified on the report plans are indicative only. Final location of all system elements are to be confirmed on site and to be subject of a Section 68 Local Government Act application to install a sewage facility.

3.6 Geotechnical Considerations

The proposed development geotechnical assessment is to take into account effluent being applied to site soils and any potential impact on slope stability. The geotechnical report is to address this risk as required.

3.7 Certification and Maintenance

The following certification and maintenance will be required:

- Inspection and certification of the system by Martens is required prior to commissioning.
- The wastewater management system should be maintained in accordance with manufacturer's recommendations and Council's requirements.
- All sewer works shall be installed in accordance with AS3500.2.2, National Plumbing and Drainage, Part 2.2, Sanitary Plumbing and Drainage.

3.8 Construction Certificate Requirements

Final system positioning and detailed designs of the sewage collection and reticulation systems shall be completed at the Section 68a approval stage.

4 References

Australian / New Zealand Standard 1547 (2012), Onsite domestic wastewater management. [AS/NZS 1547, 2012]

Department of Local Government, NSW Environment Protection Authority, NSW Health Department, NSW Department of Land and Water Conservation and the NSW Department of Urban Affairs and Planning (1998), Environment and Health Protection Guidelines - Onsite Wastewater Management for Single Households. [DLG et al., 1998]

Design Waves (2021) Architectural Drawings, Drawing Nos. 01, 10, 11, 20, SK06, 24, 25, Revision P4, dated 05 July 2021.

Geological Survey of NSW (1983), Sydney 1:100,000 Geological Series Sheet 9130.

Martens and Associates (2021), Preliminary Geotechnical Assessment: 17 Thompson Street, Scotland Island, NSW, report reference P2108321JR01V01.

NSW Department of Environment & Heritage (2020), eSPADE, NSW soil and land information, www.environment.nsw.gov.au, accessed May 2020 (eSPADE).

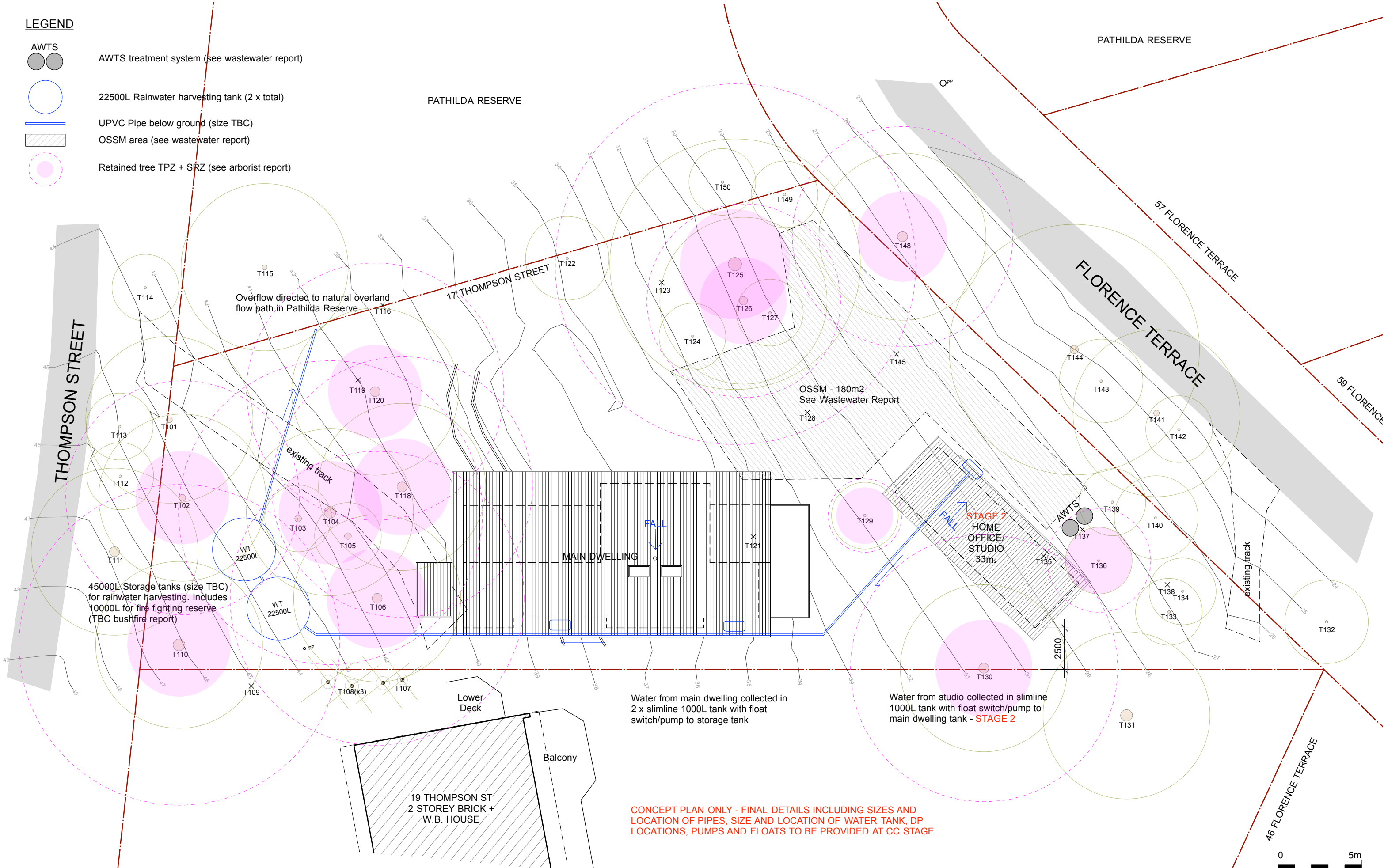
Waterview Surveying Services (2021) Survey Plan, Project No 1323, dated 12 April 2020 (WSS, 2021).

5 Attachment A – Proposed Development Plans

LEGEND

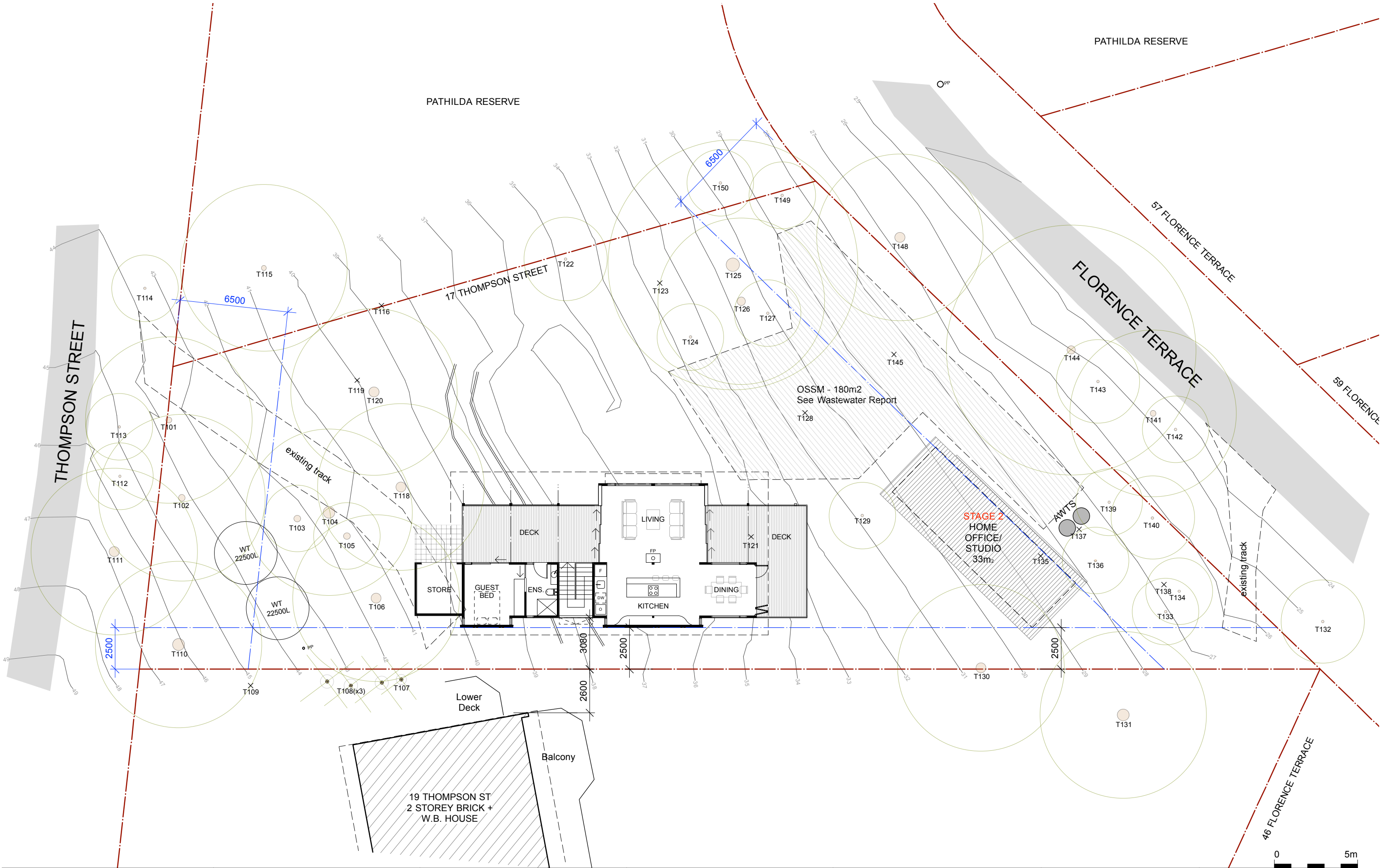
- AWTS

AWTS treatment system (see wastewater report)
-
- 22500L Rainwater harvesting tank (2 x total)
-
- UPVC Pipe below ground (size TBC)
-
- OSSM area (see wastewater report)
-
- Retained tree TPZ + SRZ (see arborist report)



CONCEPT PLAN ONLY - FINAL DETAILS INCLUDING SIZES AND LOCATION OF PIPES, SIZE AND LOCATION OF WATER TANK, DP LOCATIONS, PUMPS AND FLOATS TO BE PROVIDED AT CC STAGE

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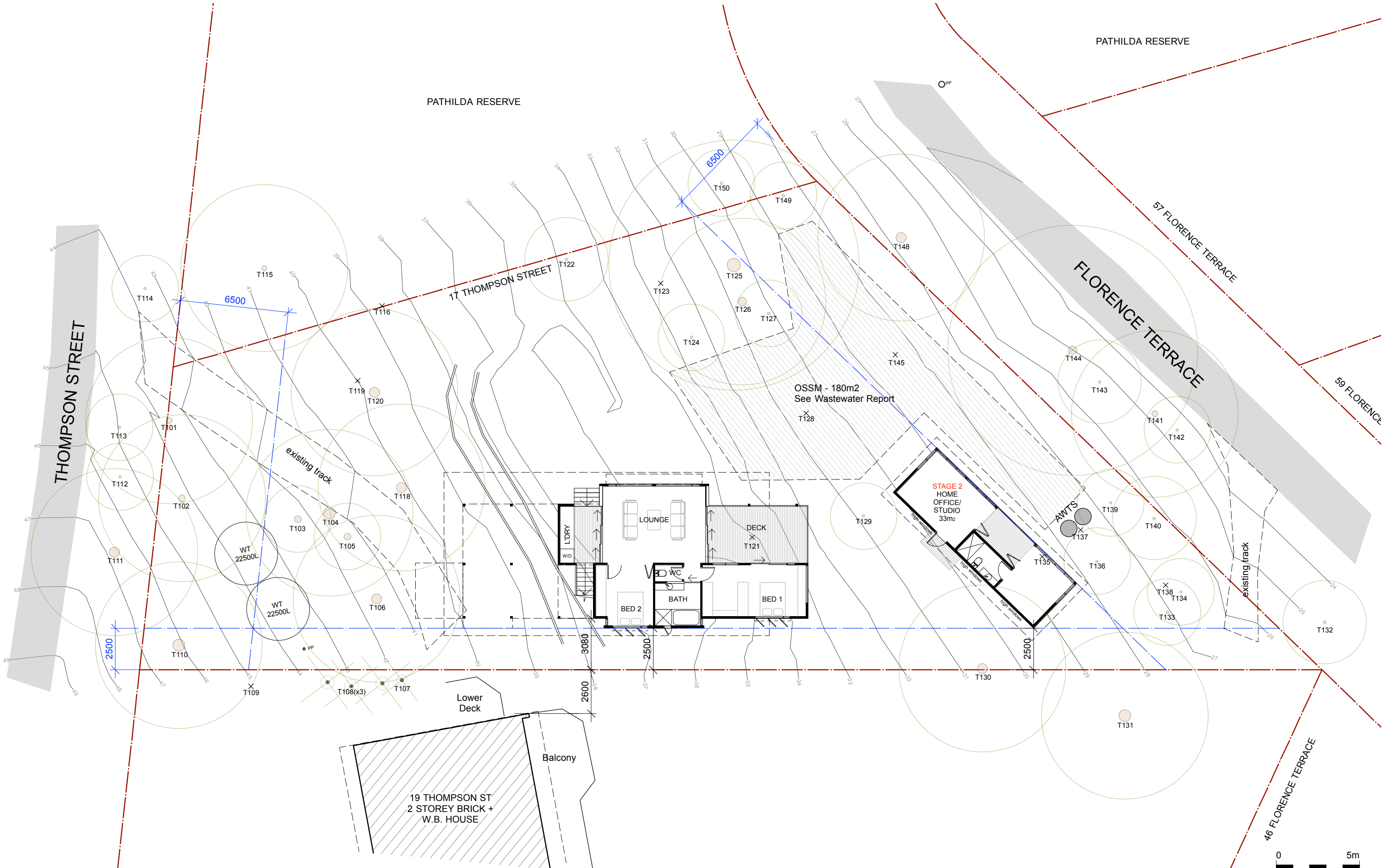


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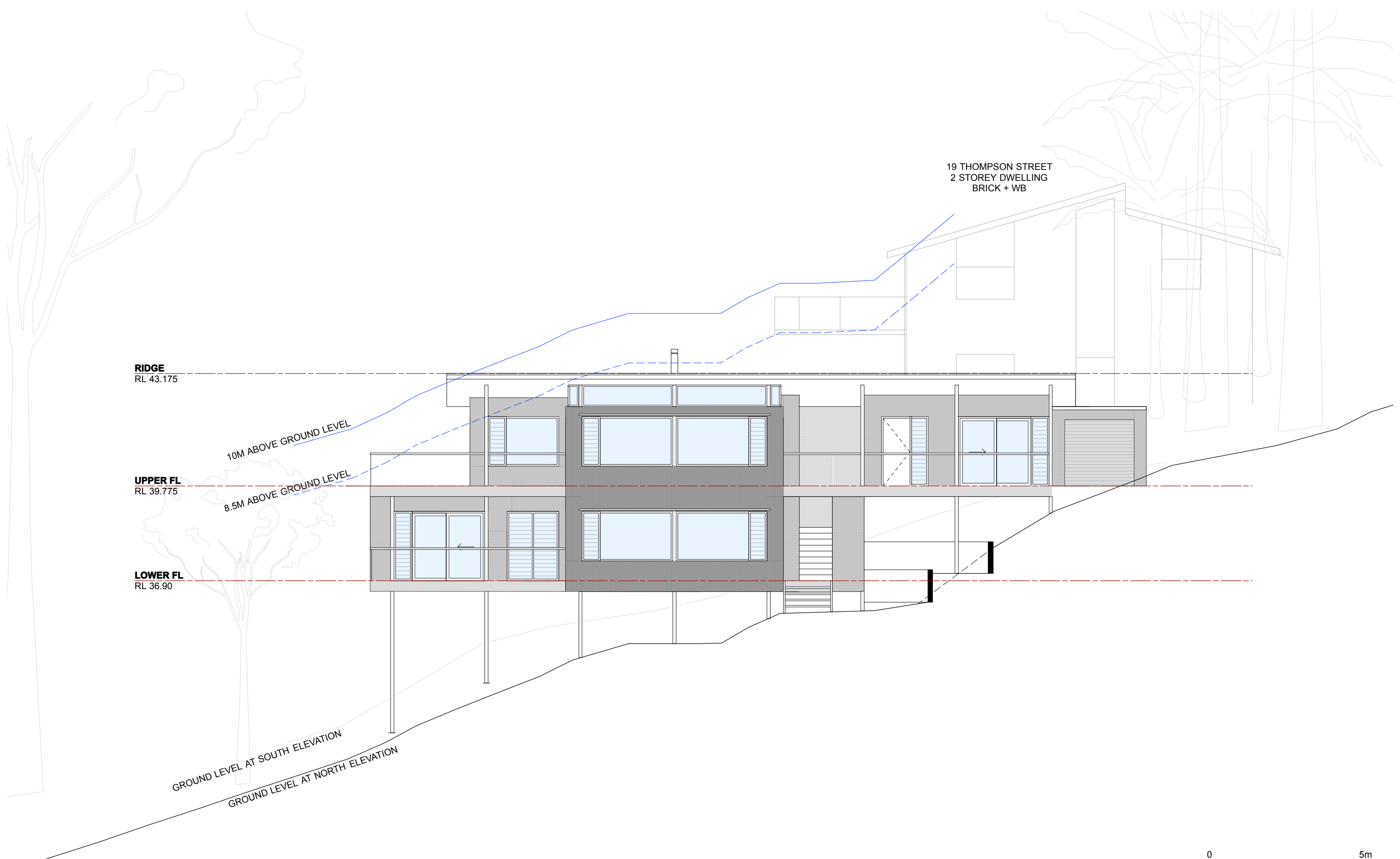
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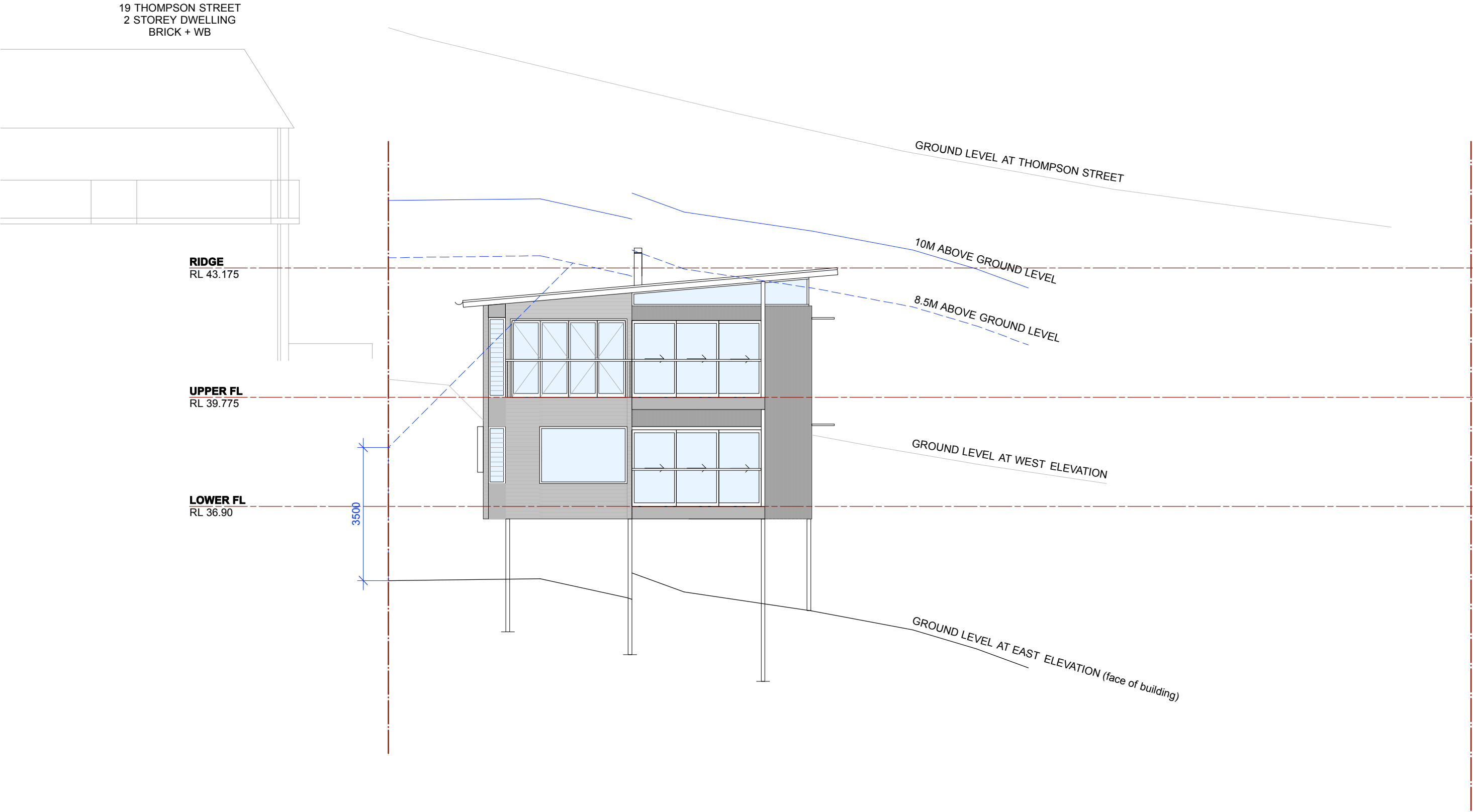
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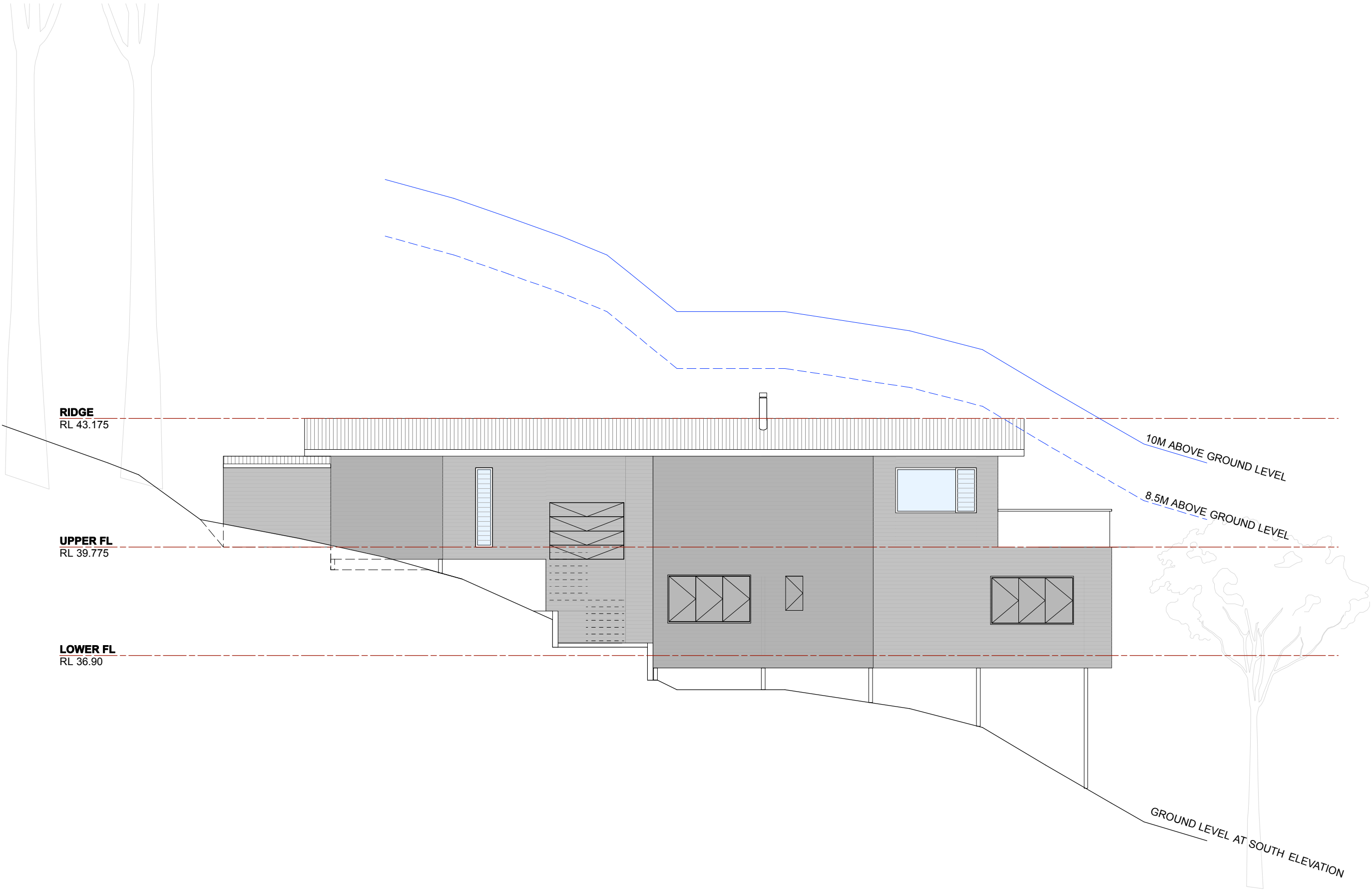
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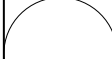
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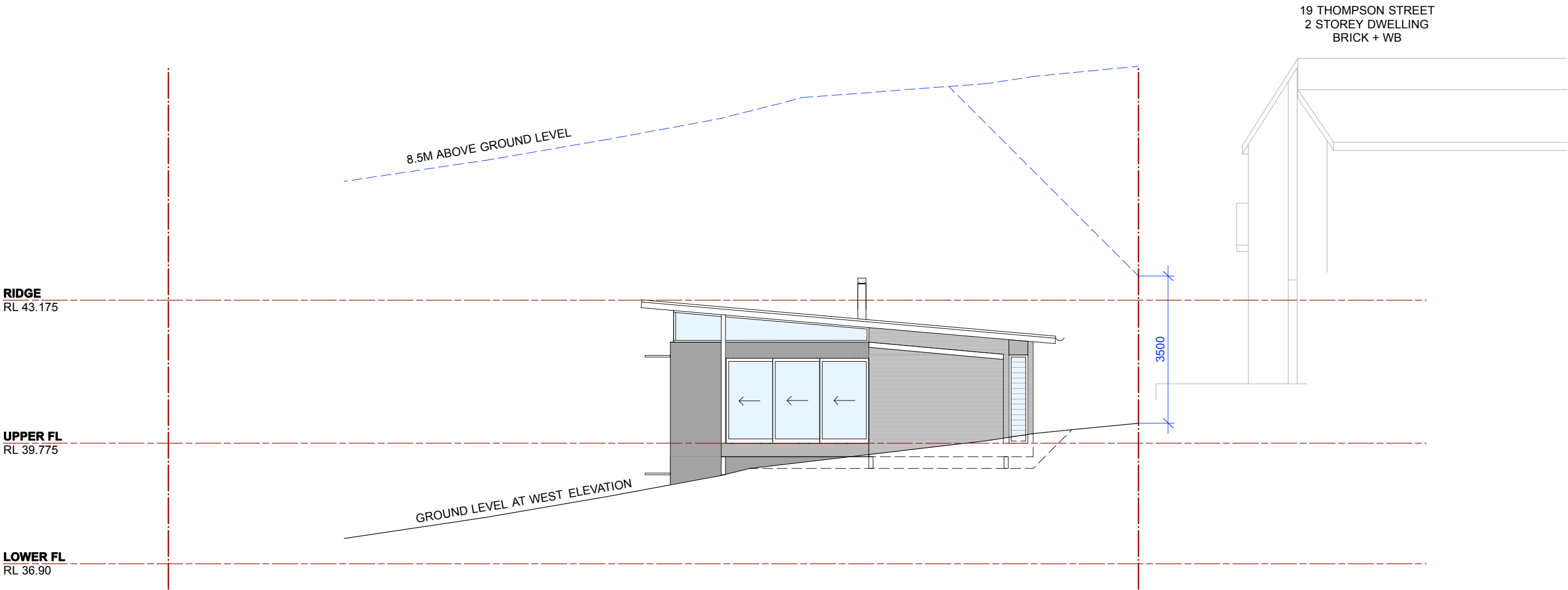
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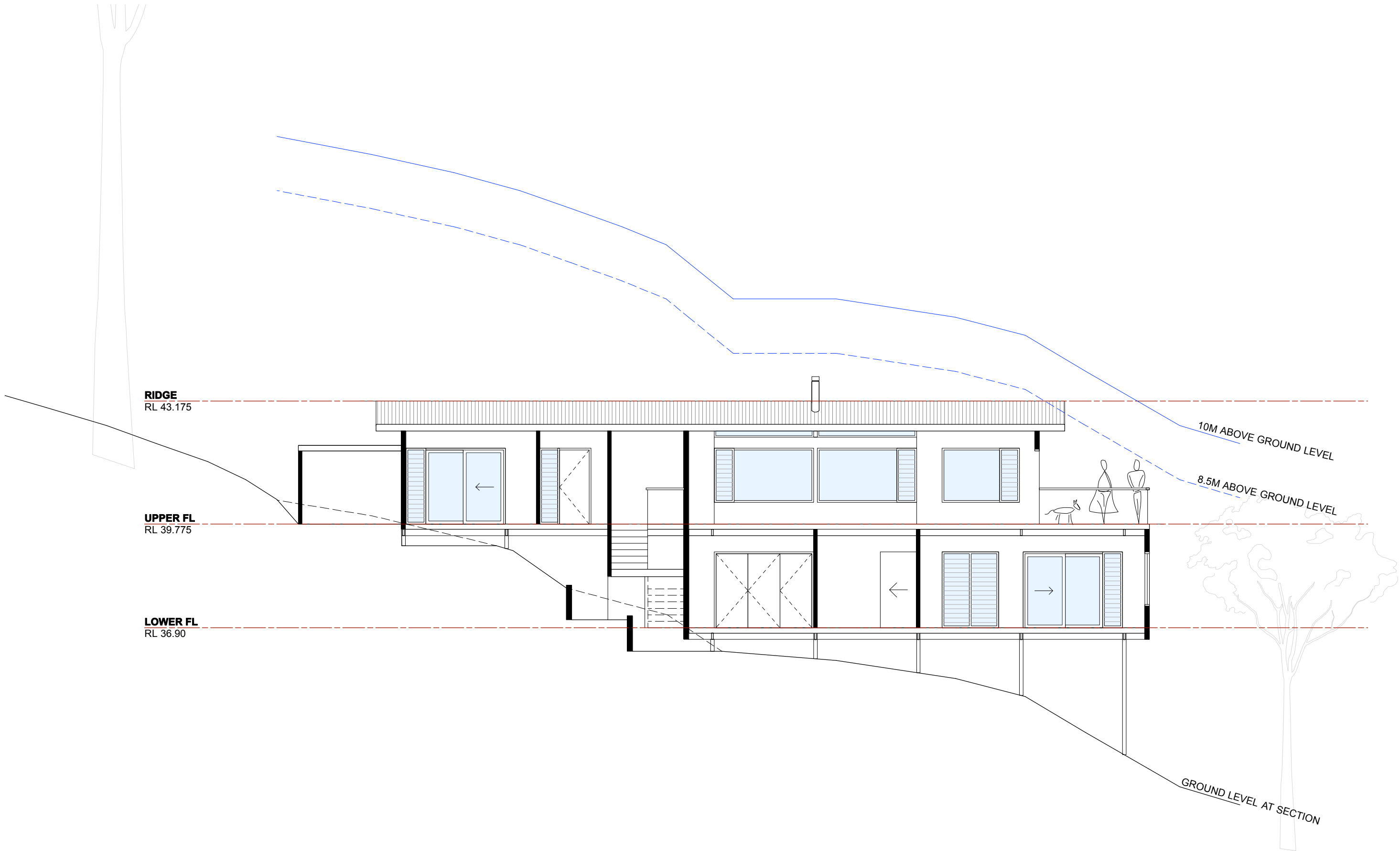
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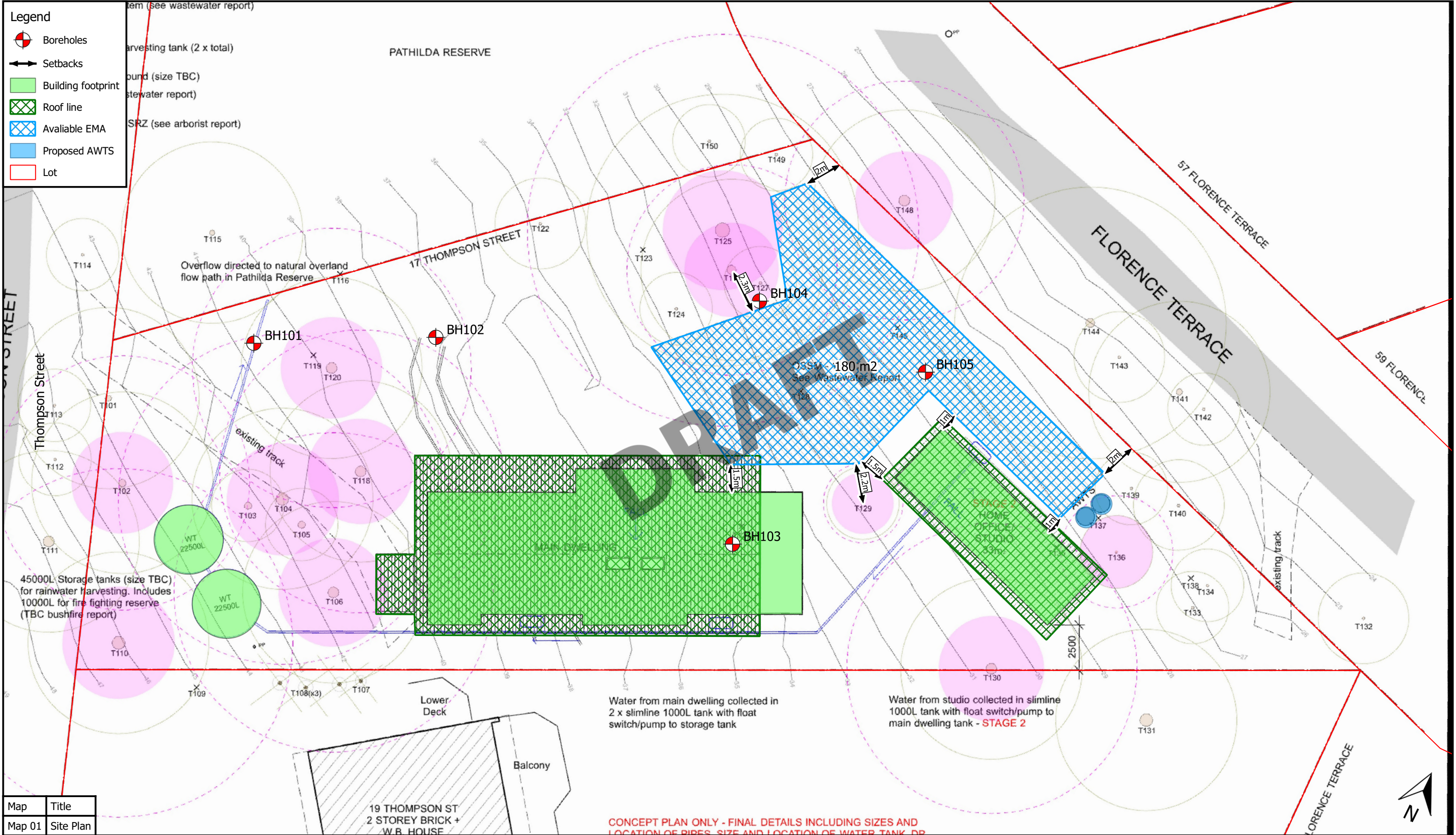
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6 Attachment B – Site Wastewater Plan



Map Title / Figure:
Site Plan

7 **Attachment C – Borehole Logs**

CLIENT	James McHugh	COMMENCED	06/07/2021	COMPLETED	06/07/2021	REF BH101 Sheet 1 OF 1 PROJECT NO. P2108321	
PROJECT	Preliminary Geotechnical Investigation	LOGGED	AG	CHECKED	KB		
SITE	17 Thompson St, Scotland Island, NSW	GEOLOGY	Hawkesbury Sandstone	VEGETATION	Shrubs		
EQUIPMENT	Hand Auger	LONGITUDE	151.29368	RL SURFACE	41 m	DATUM	AHD
EXCAVATION DIMENSIONS	ø75 mm x 0.60 m depth	LATITUDE	-33.6398	ASPECT	North	SLOPE	50 - 60%

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS / ASCS CLASSIFICATION	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
HA	L	Not Encountered	41.00		0.15/S/1 D 0.15 m			SC	TOPSOIL: Clayey SAND; fine to medium grained; dark grey and dark brown; with silt; trace rootlets.	M	VL	TOPSOIL
			0.20	40.80				SP	SAND; fine to medium grained; brown, pale brown and grey; with clay; trace silt; trace ironstone and sandstone gravels.		L	COLLUVIUM
			0.60								MD	
			0.6	0.60					Hole Terminated at 0.60 m			0.60: Hand auger refusal on cobbles.
			0.8									
			1.0									
			1.2									
			1.4									
			1.6									
			1.8									

EXCAVATION LOG TO BE READ IN CONJUNCTION WITH ACCOMPANYING REPORT NOTES AND ABBREVIATIONS



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**Engineering Log -
BOREHOLE**

CLIENT	James McHugh	COMMENCED	06/07/2021	COMPLETED	06/07/2021	REF BH102 Sheet 1 OF 1 PROJECT NO. P2108321	
PROJECT	Preliminary Geotechnical Investigation	LOGGED	AG	CHECKED	KB		
SITE	17 Thompson St, Scotland Island, NSW	GEOLOGY	Hawkesbury Sandstone	VEGETATION	Shrubs		
EQUIPMENT	Hand Auger	LONGITUDE	151.29388	RL SURFACE	34.84 m	DATUM	AHD
EXCAVATION DIMENSIONS	ø75 mm x 0.10 m depth	LATITUDE	-33.63987	ASPECT	North	SLOPE	5%

Drilling				Sampling			Field Material Description						
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS / ASCS CLASSIFICATION	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY	DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
HA	L	Not Encountered		34.84				CL- CI	TOPSOIL: Clayey SILT; low to medium plasticity; dark grey and dark brown; trace sand.	M (=PL)			TOPSOIL
				0.10							Hole Terminated at 0.10 m		0.10: Hand auger refusal on cobbles and boulders.
			0.2										
			0.4										
			0.6										
			0.8										
			1.0										
			1.2										
			1.4										
			1.6										
			1.8										

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**Engineering Log -
BOREHOLE**

CLIENT	James McHugh	COMMENCED	06/07/2021	COMPLETED	06/07/2021	REF BH103A Sheet 1 OF 1 PROJECT NO. P2108321	
PROJECT	Preliminary Geotechnical Investigation	LOGGED	AG	CHECKED	KB		
SITE	17 Thompson St, Scotland Island, NSW	GEOLOGY	Hawkesbury Sandstone	VEGETATION	Shrubs		
EQUIPMENT	Hand Auger	LONGITUDE	151.2939	RL SURFACE	34.1 m	DATUM	AHD
EXCAVATION DIMENSIONS	ø75 mm x 0.50 m depth	LATITUDE	-33.63993	ASPECT	North	SLOPE	5%

Drilling				Sampling			Field Material Description						
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS / ASCS CLASSIFICATION	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY	DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
HA	L	Not Encountered		34.10	0.3/S/1 D 0.30 m			SC	TOPSOIL: Clayey SAND; fine to medium grained; dark grey and dark brown; with silt; trace rootlets.	M	L		TOPSOIL
			0.2			SP	SAND; fine to medium grained; brown, pale brown and grey; with clay; trace silt; trace ironstone and sandstone gravels.	COLLUVIUM					
				0.20 33.90									
				0.50					Hole Terminated at 0.50 m				0.50: Hand auger refusal on cobbles and boulders.
				0.6									
				0.8									
				1.0									
				1.2									
				1.4									
				1.6									
				1.8									

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**Engineering Log -
BOREHOLE**

CLIENT	James McHugh	COMMENCED	06/07/2021	COMPLETED	06/07/2021	REF BH103B Sheet 1 OF 1 PROJECT NO. P2108321	
PROJECT	Preliminary Geotechnical Investigation	LOGGED	AG	CHECKED	KB		
SITE	17 Thompson St, Scotland Island, NSW	GEOLOGY	Hawkesbury Sandstone	VEGETATION	Shrubs		
EQUIPMENT	Hand Auger	LONGITUDE	151.29334	RL SURFACE	34.1 m	DATUM	AHD
EXCAVATION DIMENSIONS	ø75 mm x 0.60 m depth	LATITUDE	-33.63993	ASPECT	North	SLOPE	5%

Drilling					Sampling		Field Material Description						
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS / ASCS CLASSIFICATION	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY	STRUCTURE AND ADDITIONAL OBSERVATIONS	
HA	L	Not Encountered		34.10	0.4/S/1 D 0.40 m			SC	TOPSOIL: Clayey SAND; fine to medium grained; dark grey and dark brown; with silt; trace rootlets.	M	L	TOPSOIL	
	0.2		0.20 33.90				SP	SAND; fine to medium grained; brown, pale brown and grey; with clay; trace silt; trace ironstone and sandstone gravels.			COLLUVIUM		
	0.30 33.80						CL-CH	CLAY; medium to high plasticity; brown, pale yellow and orange; trace ironstone gravels; trace silt.			RESIDUAL SOIL		
0.4													
	M-H									M (<PL)	F H		
			0.6	0.60									
									Hole Terminated at 0.60 m			0.60: Handauger refusal on weathered rock.	

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CLIENT	James McHugh			COMMENCED	06/07/2021	COMPLETED	06/07/2021	REF BH104	
PROJECT	Preliminary Geotechnical Investigation			LOGGED	AG	CHECKED	KB	Sheet 1 OF 1	
SITE	17 Thompson St, Scotland Island, NSW			GEOLOGY	Hawkesbury Sandstone	VEGETATION	Shrubs	PROJECT NO. P2108321	
EQUIPMENT	Hand Auger			LONGITUDE	151.2939	RL SURFACE	29.75 m	DATUM	AHD
EXCAVATION DIMENSIONS	ø75 mm x 1.40 m depth			LATITUDE	-33.6398	ASPECT	North	SLOPE	35 - 40%

Drilling				Sampling		Field Material Description								
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS / ASCS CLASSIFICATION	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY	DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS	
HA	L		Not Encountered	29.75				CL	Clay LOAM; dark brown and dark grey; moderate structure; trace roots; trace sand.				COLLUVIUM	
				0.20				S	Fine Sandy LOAM; brown, pale brown and grey; trace ironstone and sandstone gravels.					
				29.55										
				0.4										
				0.6										
				0.8										
				0.80				CL-CH	CLAY; yellow, brown, orange and pale grey; moderate structure.					
				28.95										
				1.0										
1.2														
1.4				1.40					Hole Terminated at 1.40 m				1.40: Hand auger refusal on weathered rock/hard clay.	
1.6														
1.8														

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MARTENS 2.00 LIB GLB Log MARTENS BOREHOLE P2108321BH101-9H105V01.GPJ <DrawingFile> 23/07/2021 14:14 10/02/00.04 D:\glb\lib and in situ\Tool - DGD\ Lib: Martens 2.00 2016-11-13 Proj: Martens 2.00 2016-11-13

CLIENT	James McHugh			COMMENCED	06/07/2021	COMPLETED	06/07/2021	REF BH105						
PROJECT	Preliminary Geotechnical Investigation			LOGGED	AG	CHECKED	KB	Sheet 1 OF 1						
SITE	17 Thompson St, Scotland Island, NSW			GEOLOGY	Hawkesbury Sandstone	VEGETATION	Shrubs	PROJECT NO. P2108321						
EQUIPMENT	Hand Auger			LONGITUDE	151.29417	RL SURFACE	28.34 m	DATUM	AHD					
EXCAVATION DIMENSIONS	ø75 mm x 1.20 m depth			LATITUDE	-33.6399	ASPECT	East	SLOPE	30 - 40%					
Drilling		Sampling		Field Material Description										
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS / ASCS CLASSIFICATION	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY	DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS	
HA	L	Not Encountered	28.34					CL	Clay LOAM; dark brown and dark grey; moderate structure; trace roots; trace sand.				COLLUVIUM	
			0.20											
			28.14											
M			0.4						Fine Sandy LOAM; brown, pale brown and grey; moderate structure; trace ironstone and sandstone gravels.	M			RESIDUAL SOIL	
			0.6											
			27.74											
H			0.8											
			1.0											
			1.2											
			1.20						Hole Terminated at 1.20 m				1.20: Hand auger refusal on weathered rock/hard clay.	
			1.4											
			1.6											
			1.8											
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