

ATTACHMENT C
Hyd2o Permeability Testing



Borehole Permeameter : Field Result Analysis



Project/Site	Hammond Quarter - PM1 (1.5m test depth)	
Location	389817	mE
	6439309	mN

TEST 1

[illegible]

Soil Profile

Depth (m)	
1.0-1.5	Sand, medium-coarse grain, light grey.
1.5-3.0	Increasing coarseness and lighter colour.



location



course grained sand at depth

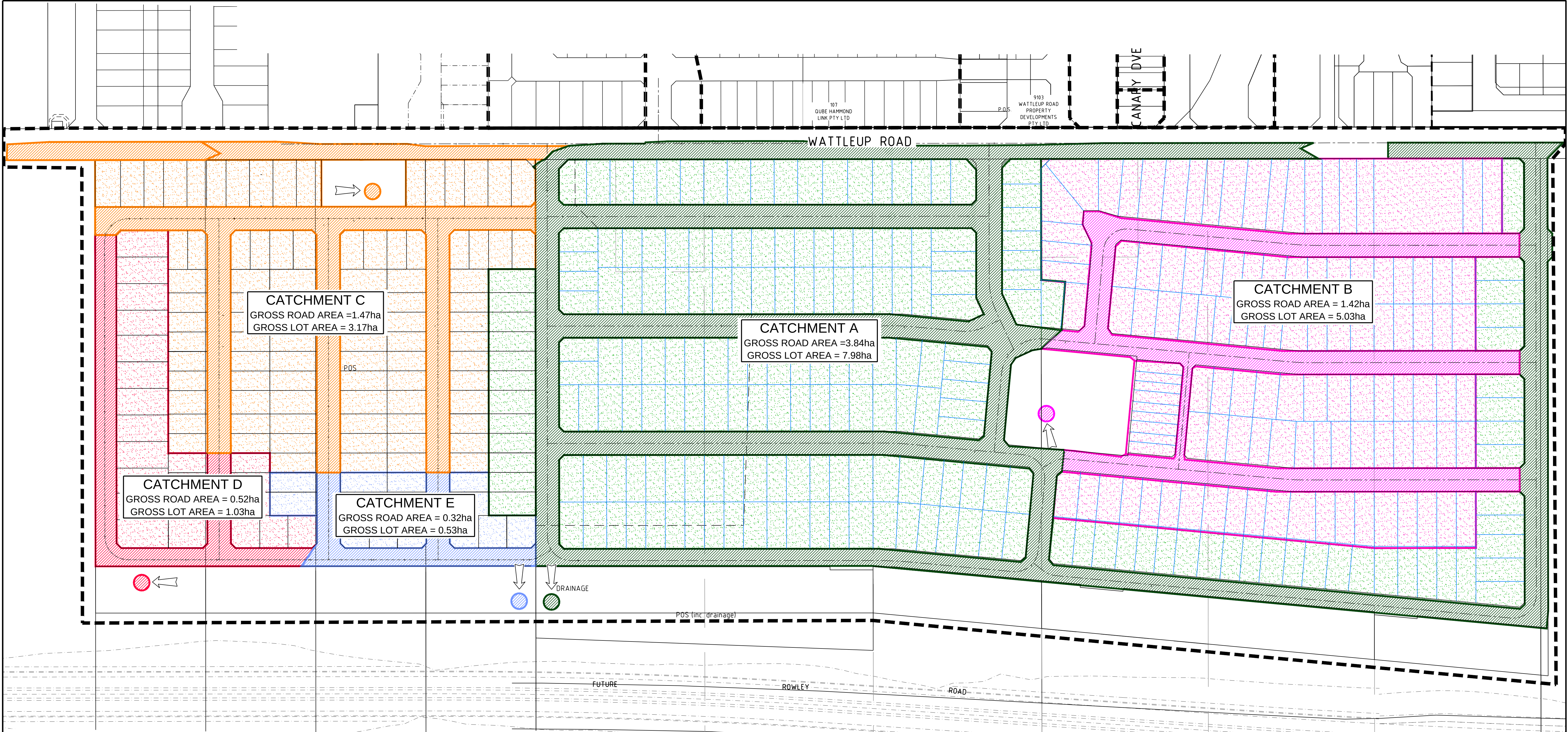
METHOD 1 : Elrick and Reynolds (1992)

Ks (cm/s)	0.0040
Ks (m/day)	3.44
Average (m/day)	3.44

METHOD 2 : Talsma and Hallam Method (recommended for low Ks only <2.9)

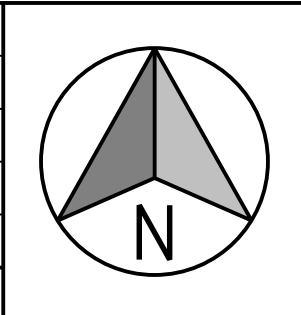
q (cm ³ /min)	383.3
r (cm)	5.5
H (cm)	17.0
$0.5\sinh^{-1}(H/2r)$	0.61
$-\sqrt{r((r/H)^2+0.25)}$	-0.60
r/H	0.32
Sum	0.34
Sum*4.4*q	569.80
$2*\pi*r*H^2$	1815.84
Ksat (cm/min)	0.3
Ksat (m/day)	4.52
Average (m/day)	4.52

ATTACHMENT D
Engineering Drawings



LEGEND	
DESCRIPTION	SYMBOL
DRAINAGE CATCHMENT BOUNDARY (ROADS)	---
DRAINAGE CATCHMENT BOUNDARY (LOTS)	---
CATCHMENT AREA (m ²)	1000
CATCHMENT AREA (ha)	0.100
PROPOSED DRAINAGE PIPE	---
EXISTING DRAINAGE PIPE	---
FUTURE DRAINAGE PIPE	---
PROPOSED ROAD	---
EXISTING ROAD	---
FUTURE ROAD	---
CATCHMENT A	
CATCHMENT B	
CATCHMENT C	
CATCHMENT D	
CATCHMENT E	

A	10 05 24	ACB		CATCHMENT AREA ALONG WATTLEUP ROAD UPDATED
REV	DATE	DRN	CKD	APP
				AMENDMENT



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This plan is not to be used for construction unless issued as revision 0 or higher.

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CLIENT		QUBE / PRIMWEST	
APPROVED		DESIGNED	
		ACB	
		SCALE	
		1:1250	

PROJECT		WATTLEUP SOUTH	
TITLE		DRAINAGE STRATEGY CONCEPT PLAN	
WAPC No.		148010 & 147989	
DRAWING No.		5910-ST-700	
REVISION		A	

ORIGINAL
SIZE
A1



Hammond Quarter West Amended Structure Plan Engineering Report

Lots 80, 815, 78 & 813 Wattleup Road, Wattleup

June 2024

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1. EXECUTIVE SUMMARY

This report has been prepared by Cossill & Webley Pty Ltd (CW) to inform the engineering requirements for the proposed development of Lots 80, 815, 78 & 813 Wattleup Road, Wattleup. This report supports the Amendment to the Hammond Quarter Structure Plan.

This report summarises the results of a review of the civil engineering issues which have influenced the form of the Plan as they relate to future servicing of the developed land and provides details of each major infrastructure type and a servicing strategy for implementation required for the development of the area. The level of detail is consistent with the requirements of a structure plan and acknowledges further, more detailed, work will be required at the time of subdivision.

The engineering review covers siteworks, roadworks, stormwater drainage, sewerage, water supply and utility services.

The investigation has found the land is suitable for development in accordance with the proposed Plan with logical progressive extension of infrastructure and base capacity.

The ground conditions and past uses are well suited to future urban development.

The available road access via Wattleup Road, and the future extension of Rowley Road, adjacent the development will provide excellent connectivity to the external arterial road system, and we anticipate will be progressively upgraded to accommodate the expected regional traffic demand.

Sewer infrastructure will be provided via connection to the existing Water Corporation pump station on Lot 74, via extension of the proposed gravity network.

Water supply, electrical supply, telecommunications and gas will all be available via the existing network in Wattleup Road. There is capacity within the existing infrastructure for servicing development of this site.

The investigation for this report is largely based on preliminary advice from the various service authorities, and is current as at June 2024.

2. INTRODUCTION

This report has been prepared by Cossill & Webley Pty Ltd (CW) to confirm the servicing requirements for Lots 80, 815, 78 & 813 Wattleup Road, Wattleup to support the Amendment to the Hammond Quarter Structure Plan.

This report summarises the results of a review of the civil engineering issues which have influenced the Plan as they relate to future servicing of the developed land. Figure 1 below presents the Hammond Quarter West Structure Plan.



Figure 1: Hammond Quarter West Structure Plan (Hatch, 2024)

The Site is located within the City of Cockburn and is bound by the existing Wattleup Road to the north, rural lots to the west, future residential lots to the east and the future Rowley Road Planning Control Area to the south.

The location of the Site will require a coordinated approach to development with neighbouring properties, for the connection of roads and services.

3. SITE DESCRIPTION

3.1 Site Vegetation

Historically, development has consisted of a mixture of semi-rural and agricultural uses resulting in the clearing of majority of the site as presented below in Figure 2. Lot 813 is currently being used for storage and is covered in hard stand and commercial sheds. There are also a number of existing dwellings on Lots 80, 815 and 78 which will require demolition and removal prior to the commencement of development.



Figure 2: Aerial Photography (MNG Maps 2024)

3.2 Geology

The Geological Survey of Western Australia Perth Metropolitan Region soils maps for Fremantle (part 2033I & 2033IV) indicates that the majority of the site is generally characterised by Sand derived from Tamala Limestone (Refer Figure 3 below). These soil types are well suited to urban development, with very good permeability anticipated. The soil maps indicate a small area of Peaty Clay may be present in the northern portion of Lot 78, which may require some remediation as part of the earthworks preparation for the Site. Development north of Wattleup Road has been completed, and Peaty Clay has not been present within 6 metres of the existing natural surface.

A site-specific geotechnical investigation will be undertaken at the detailed design stage to outline requirements for residential development and provide feedback on works required to obtain the desired site classification.

Based on experience east and west of the Site, we anticipate a Site Classification A will be provided in accordance with Australian Standard AS2870: "Residential Slabs and Footings".

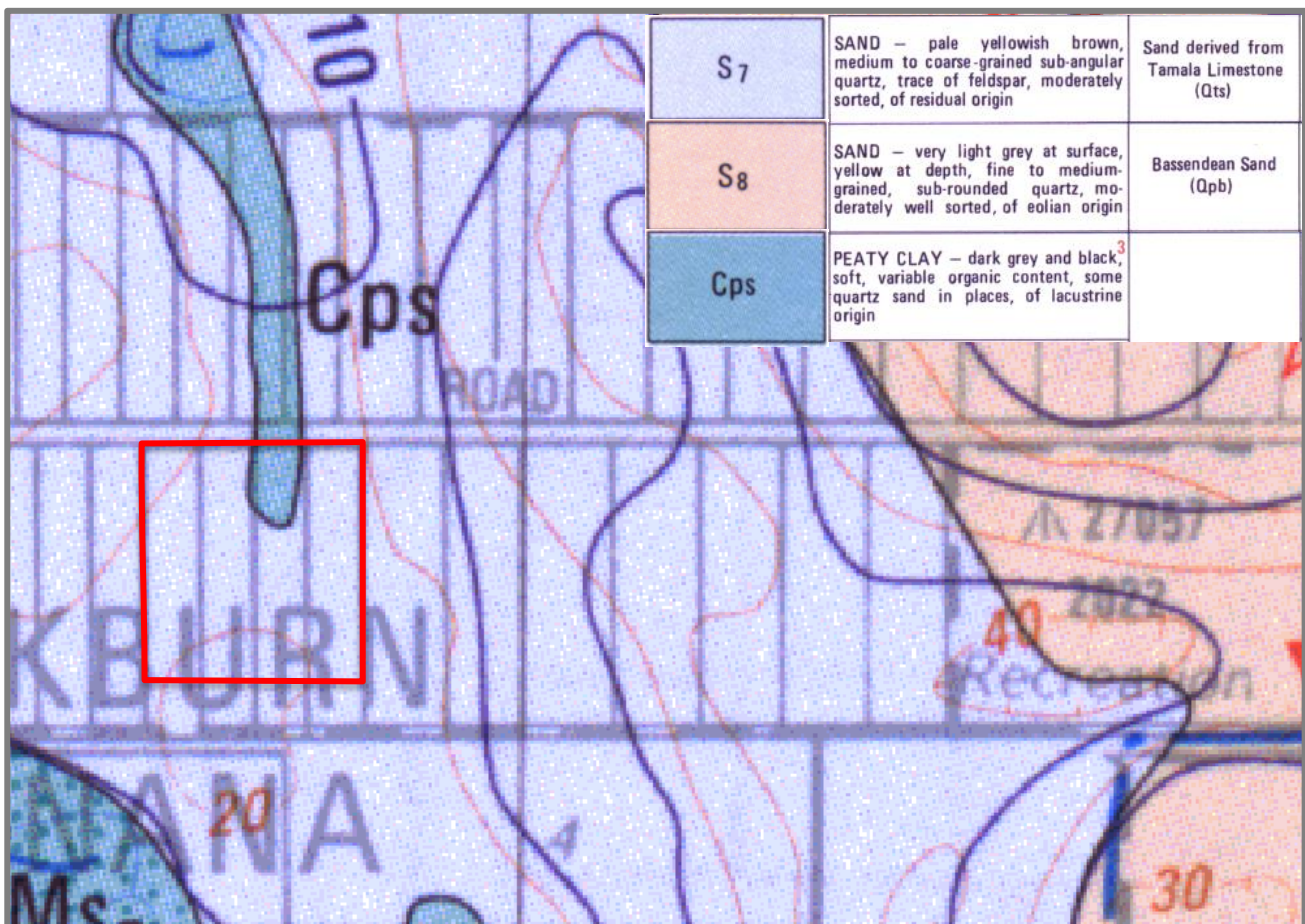


Figure 3: Geotechnical Information (Geological Survey of WA)

3.3 Topography

The Site gently grades from south to north, with levels generally ranging from a high point of RL 24m AHD at along the southern boundary of the Site to RL17.0m AHD adjacent Wattleup Road as presented below in Figure 4.



Figure 4: Existing Topography (MNG Maps 2024)

3.4 Groundwater

The Annual Average Maximum Groundwater Levels (AAMGL) vary from approximately RL10m AHD at the south-west boundary to RL13m AHD at the north-east boundary as presented below in Figure 5. We anticipate that preliminary earthworks levels will provide at least 4 metres clearance to groundwater, hence we do not anticipate groundwater will restrict or influence the development of the Site.

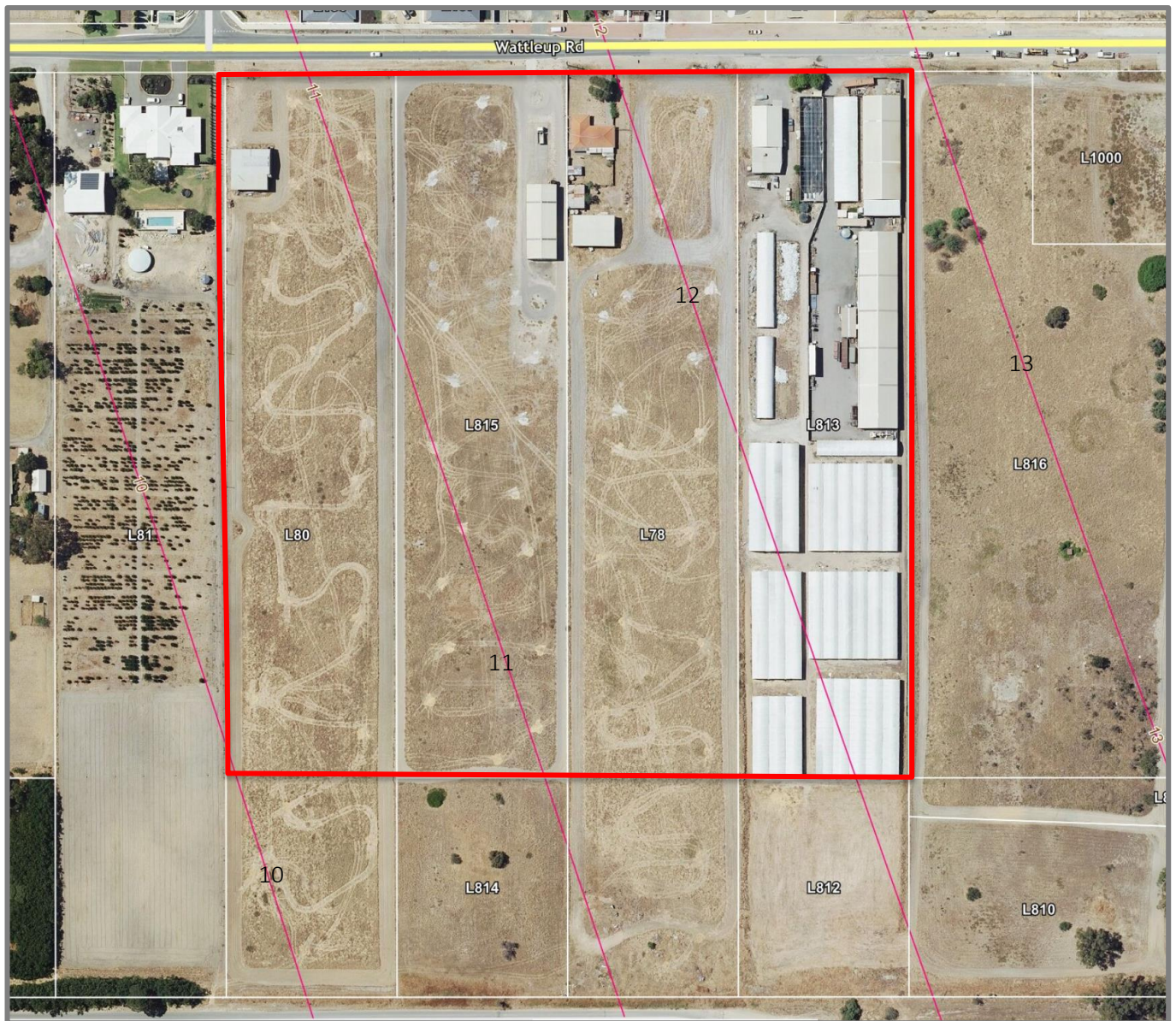


Figure 5: Department of Water Maximum Groundwater Levels (MNG Maps 2024)

3.5 Acid Sulphate Soils

A desk top review of the Department of Environment and Conservation’s ASS Risk Map for the South Metropolitan Region for potential acid sulphate soils (ASS) indicates the majority of the Site is classed as having a no risk of ASS potential within 3m, or deeper from the natural surface as presented below in *Figure 6*.

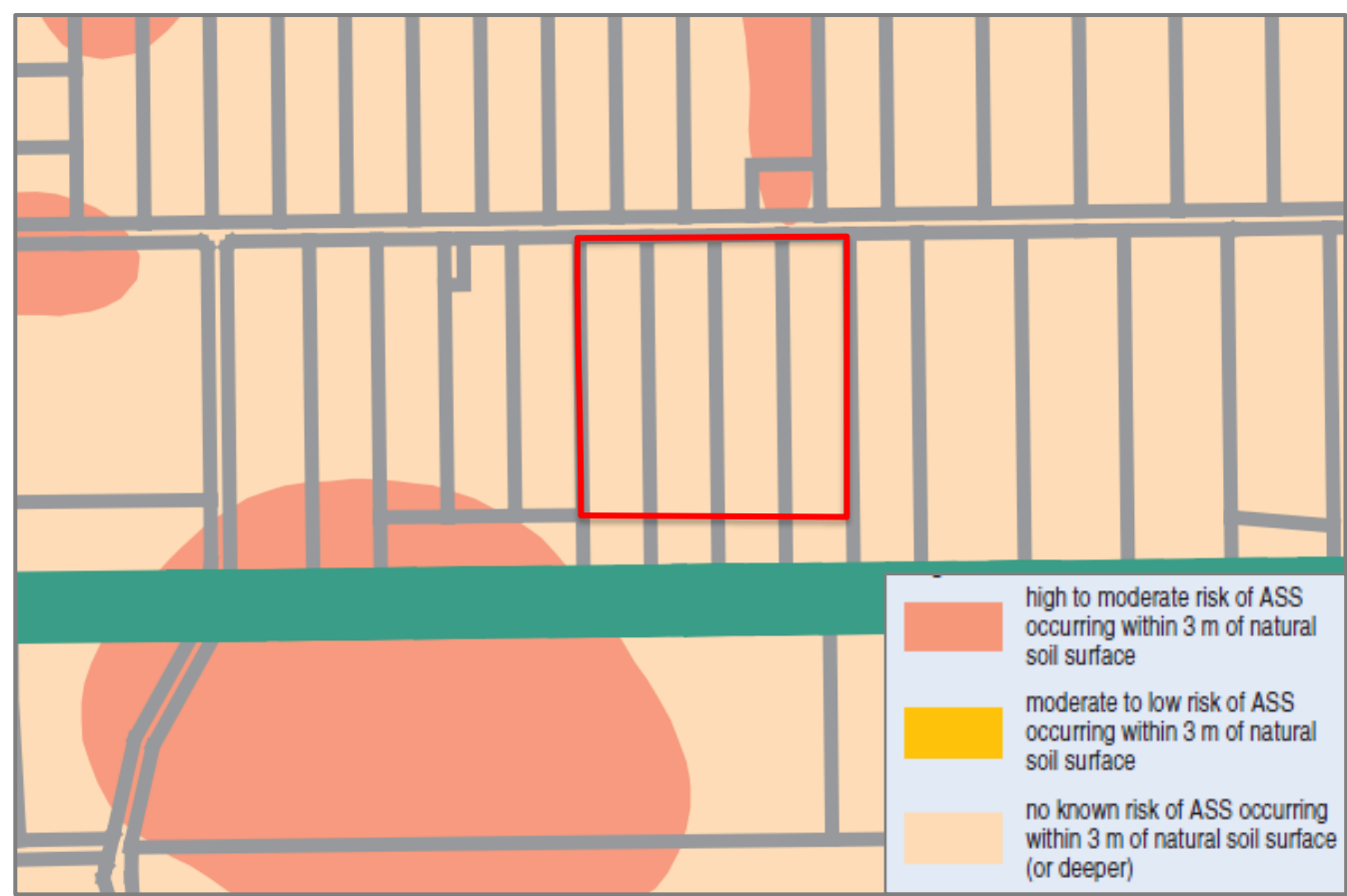


Figure 6: Acid Sulphate Soils Risk Mapping (April, 2024)

4. SITEWORKS & EARTHWORKS

Siteworks for urban development will generally comprise clearing of existing vegetation and, where necessary, earthworking the existing ground, to facilitate the required form of the development.

The extent of siteworks will be dictated by the density and nature of development. Increased densities and decreasing lot sizes has led to a current trend for the development areas to be fully earthworked to create level lots which are terraced between retaining walls.

This approach provides a number of positive outcomes:

- It reduces house building costs,
- It rationalises retaining wall layouts and designs consistent with Local Authority specifications,
- It enables lots to be terraced up natural slopes to maintain elevation and views.

We intend to earthwork the Site to provide a cut-to-fill balance across the development. This will generally involve cutting the southern higher areas of the Site and filling the lower areas at the north of the future development.

We will ensure earthworks levels tie in to existing levels at Wattleup Road, the existing rural lot to the west, proposed development levels to the east and the Rowley Road proposed levels to the south.

The site grades will also ensure grades across the site are within typical tolerances for roads, drainage and sewerage reticulation.

5. DRAINAGE AND GROUNDWATER MANAGEMENT

The landform through the area is generally steep with good separation from the groundwater table.

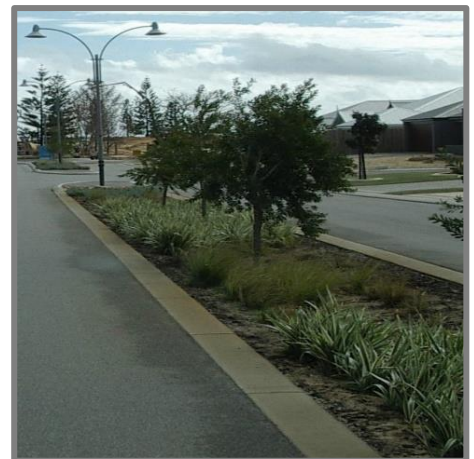
An Urban Water Management Plan (UWMP) has been prepared by Hyd20. The UWMP confirms the proposed storage and disposal strategy for stormwater runoff generated from the proposed development of the Site.

5.1 Stormwater Management

Groundwater recharge will be maximised through the adoption of 'Best Management Practices' that promote the dispersion and infiltration of runoff as close to source as possible. This will include incorporation of inter-allotment drainage soakwells to infiltrate runoff from building roofs and private open space areas and the disposal of road runoff into infiltration basins within the POS area adjacent to Wattleup Road. Roadside swales along the southern and western boundaries may be considered to reduce drainage storage in the central POS.

5.2 Water Quality Management

Recharge water quality will be improved through the adoption of 'Best Management Practices' which promote the disposal of runoff via water pollution control facilities (including vegetated swales and basins, detention storages and gross pollutant traps) and the implementation of non-structural source controls (including urban design, street sweeping, community education, low fertiliser landscaping regimes, etc).



5.3 Stormwater Collection & Disposal

Drainage from public roads and lanes would be collected via conventional gullies or open swales depending on the nature of the adjacent land uses and the extent of traffic and pedestrian activity.

The drainage collection and conveyance system will be designed to cater for the runoff from storms with up to a 20% Average Exceedance Probability (AEP). A series of detention basins will be designed to store runoff to the pre-development peak flow rates for the 20%, 10% and 1EY AEP events in accordance with the UWMP. In all cases roads and POS would be designed to cater for the surface overflow for more severe storms with building pad levels set at least 300 millimetres above the 1% AEP level in roadways and 500 millimetres above the 1% flood level for storage detention basins.

The dispersion of stormwater disposal throughout the site will maximise the area of recharge down through the soil profile to the shallow aquifer, thereby maximising the potential for nutrient stripping and water quality improvements.

6. WATER RETICULATION

The subject land is located within the current boundary of the Water Corporation's Water Supply Scheme and overall planning for the scheme has made provision for residential development over the subject land.

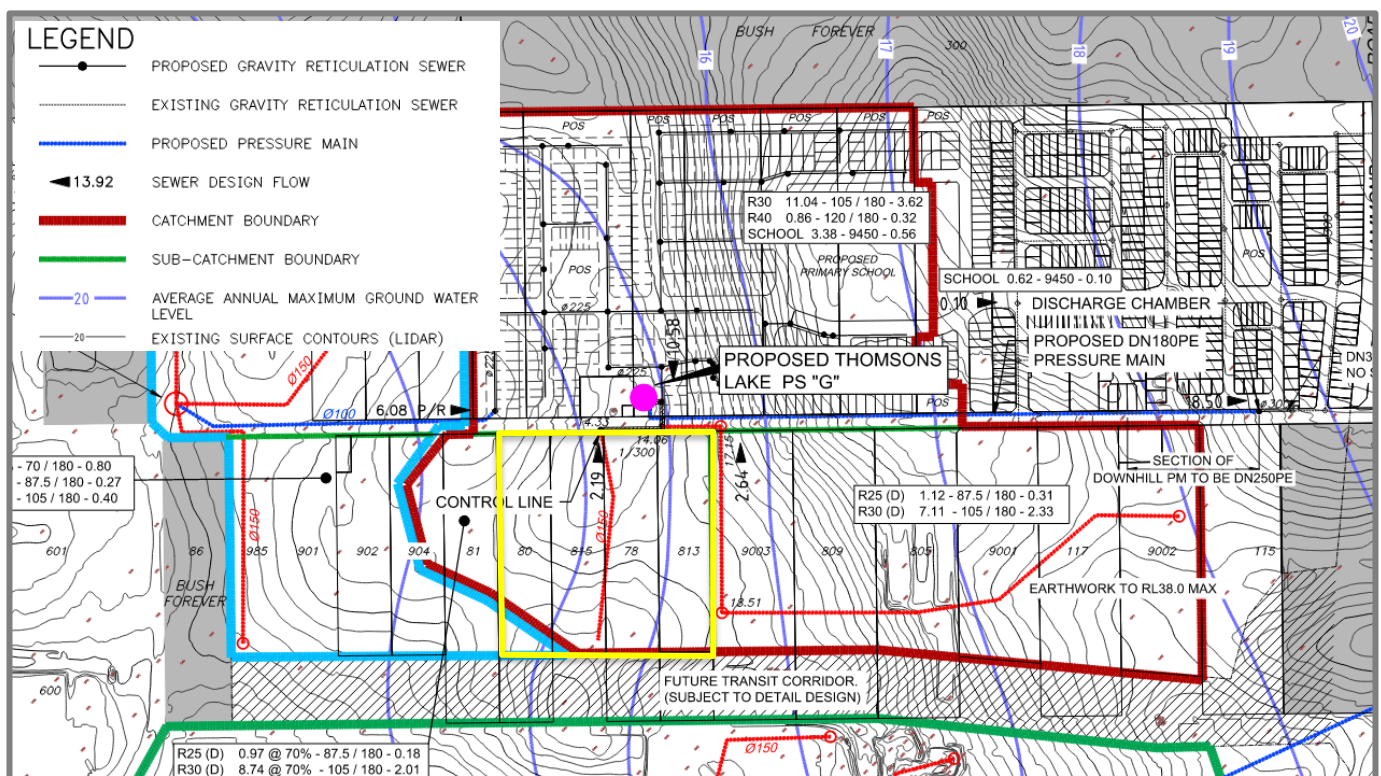
The current planning indicates the Site will ultimately be serviced via the extension of an existing 610mm distribution main in Hammond Road that currently terminates at the intersection of Hammond Road and Gaebler Road. The extension of this main further south to Wattleup Road will be a Water Corporation capital project, as demand requires, however the Water Corporation has advised that the implementation of the project is in part dependent upon the extension and upgrade south of Hammond Road along Frankland Avenue, as the alignment and profile of the main will be dictated by final road levels and embankments.

The Water Corporation has confirmed the Site can be serviced off the existing DN150 main in Wattleup Road.

7. SEWERAGE RETICULATION

The Site forms part of the Water Corporation's Thompson's Lake Waste Water Reticulation System and preliminary planning occurred to develop strategies for providing reticulated sewerage to all proposed urban land within the subject area. An excerpt of the Water Corporation's catchment plan for the area is presented below in *Figure 7*.

The Site is proposed to be serviced by connection to the reticulation sewer that runs along the Wattleup Road north of the Site. This new line grades to a Type 40 Waste Water Pumping Station (WWPS) "Thomsons Lake Pump Station G", located at the natural low point within Lot 74. The pump station was commissioned in 2023 and is now in use. There are no impediments to the provision of sewerage infrastructure to service the Site.



8. POWER

The Site can readily be serviced via the existing overhead high voltage cable located on the southern side of Wattleup Road.

Based on Western Power's predicted Network Capacity in October 23, there is sufficient capacity in this existing network to support the proposed development. All power to the proposed development will be underground and fed from transformers located strategically within the development.

9. GAS SUPPLY

ATCO Gas has advised the existing network has the capacity to supply the development from the existing frontal main in Wattleup Road.

10. TELECOMMUNICATIONS

10.1 NBN

The Site is within the fixed line footprint of the NBN, and hence can be serviced with optic fibre under their roll-out scheme for greenfield developments via connection to the existing network in Wattleup Road.

Under the Federal Government's Telecommunications in New Developments Policy, developers are responsible for contributing to the cost of delivering the NBN network in new developments. This includes contributing to part of the costs of the build (civils and any backhaul required) as well as a \$600 per lot deployment charge.

The current design practice for road reserves, pavement and verge provisions will make adequate allowance for services including broadband in accordance with the agreed Utilities Service Providers handbook. There will be some local land requirements for equipment sites, similar to current provisions which will be accommodated at detailed subdivision stage.

10.2 Existing Telecommunications Infrastructure

Telecommunications providers Optus, Telstra and TPG have been consulted on the coverage, capacity and quality of the existing infrastructure surrounding the Site and its ability to service the proposed development.

Telstra has advised the development is not likely to significantly impact on the coverage, capacity and quality of the existing Telstra Wireless services in the area, all of which are currently well within normal KPIs. Further to this, Telstra has advised no Telstra Wireless infrastructure upgrades are likely to be required as a result of the development.

Optus has advised the existing infrastructure has adequate coverage and capacity to service the Site from existing network sites and have confirmed they do not require any additional network infrastructure sites to provide coverage/capacity to the proposed subdivision. It is also noted that Optus are planning on coverage and capacity improvements as part of their new P0955 Wandri North infrastructure, which is forecast for completion in March 2024.

TPG were contacted for comment however have not provided a response.

11. ROADWORKS & FOOTPATHS

11.1 Abutting Roads and Access Points

The Site will be well serviced with good transit options to the broader regional network. Wattleup Road abuts the Site to the north, and a transit corridor for the future extension of Rowley Road abuts the southern boundary.

Wattleup Road has been identified by Main Roads WA as a “Regional Distributor Road” and forms part of the MRWA RAV network for heavy vehicles and is currently being upgraded to an urban standard including kerbing drainage, paths and lighting. We note that the existing vertical geometry of Wattleup Road cannot be amended due to tying in with existing dwellings that will be retained, and the existing k values do not comply with Austroad Standards for Safe Stopping Distance for the current speed zoning.

Upon completion of the upgrades, Wattleup Road will consist of twin 3.5m carriageways with a 3m median. A Traffic Impact Assessment has been completed to inform the ultimate design of Wattleup Road by Stantec.

A Traffic Impact Assessment has also been completed by PTG to accompany this Amendment to the Hammond Quarter Structure Plan and confirms that the Wattleup Road intersection proposed at the eastern boundary of the Site will have sufficient capacity to accommodate proposed traffic from this project.

Rowley Road will be extended across the south boundary of the Site in the future, and will provide improved transport route options between Kwinana Freeway and the coast, as well as relieving the traffic burden from Wattleup Road.

11.2 Internal Road Network

Internal road designs will comply with Liveable Neighbourhoods and the City of Cockburn Standards.

In all cases the road cross-sections will be designed to cater for utility services, on standard verge alignments, street trees, parking embayments where appropriate and footpaths. Where roads abut public open space, verges can be reduced to a minimum of 0.5m if no parking is required.

11.3 Footpaths

Footpaths will be provided in accordance with *Liveable Neighbourhoods* and the City of Cockburn standards and will consist of one path in every road.

12. STAGING

It is anticipated that development will begin at the eastern boundary for connection to the existing road and service infrastructure. Stages will progress westwards as per market demands.

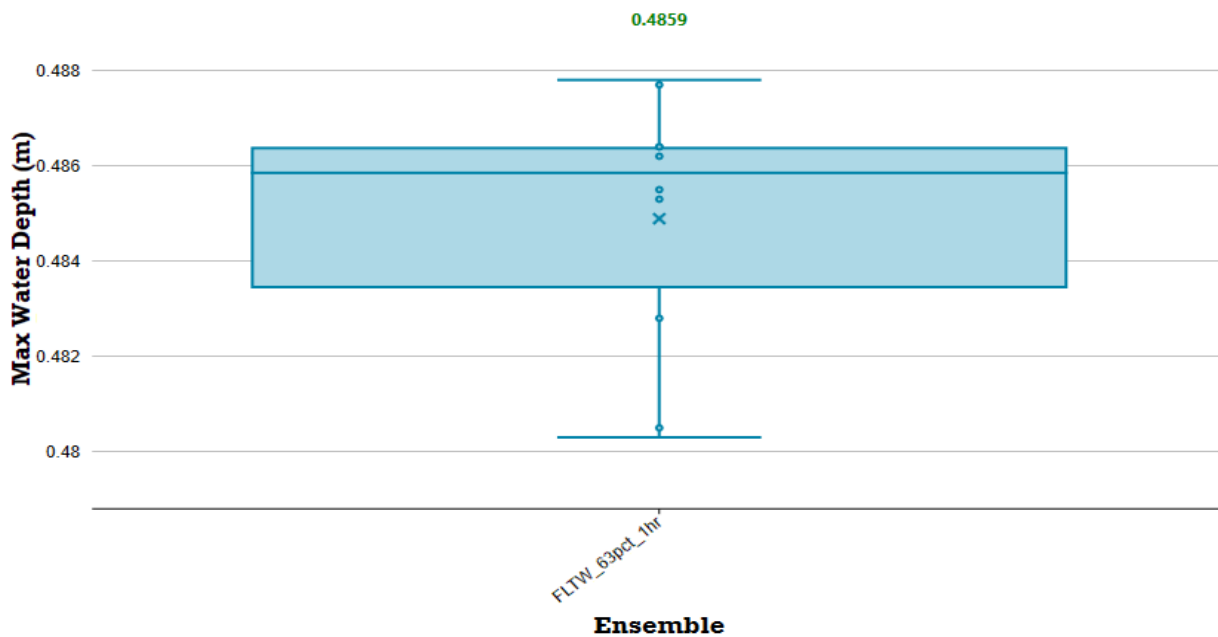
13. CONCLUSION

Based on the advice received from various servicing authorities, consultants and the City of Cockburn, we consider there are no impediments to the development of the Site. The ground conditions and past uses will not limit the proposed urban development, and the Site can be easily incorporated into the existing and planned future road network. Water supply, sewerage and other public utility services are available and are currently being upgraded along Wattleup Road.

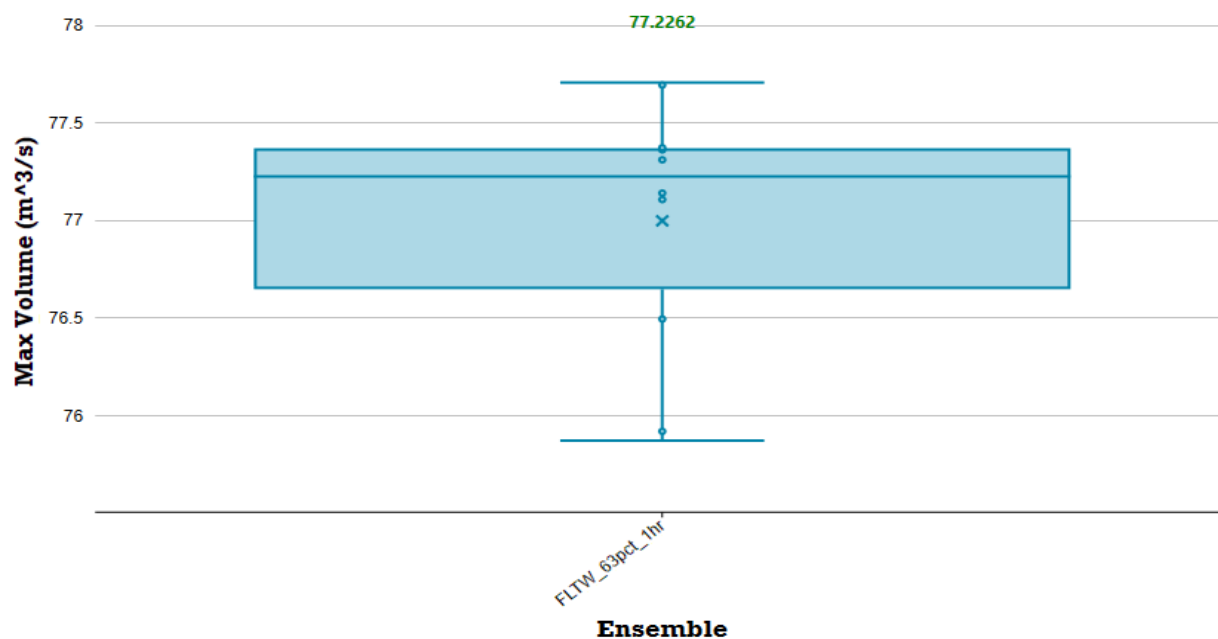
The investigation for this report is largely based on preliminary advice from the various service authorities, and is current at April 24.

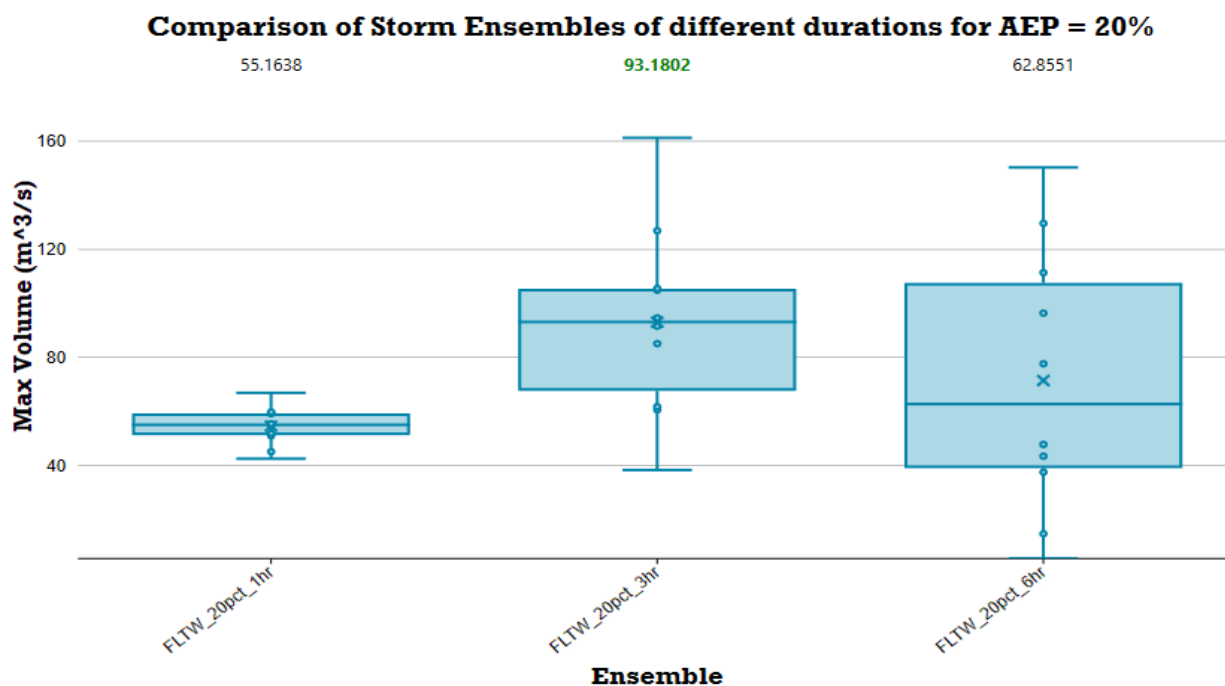
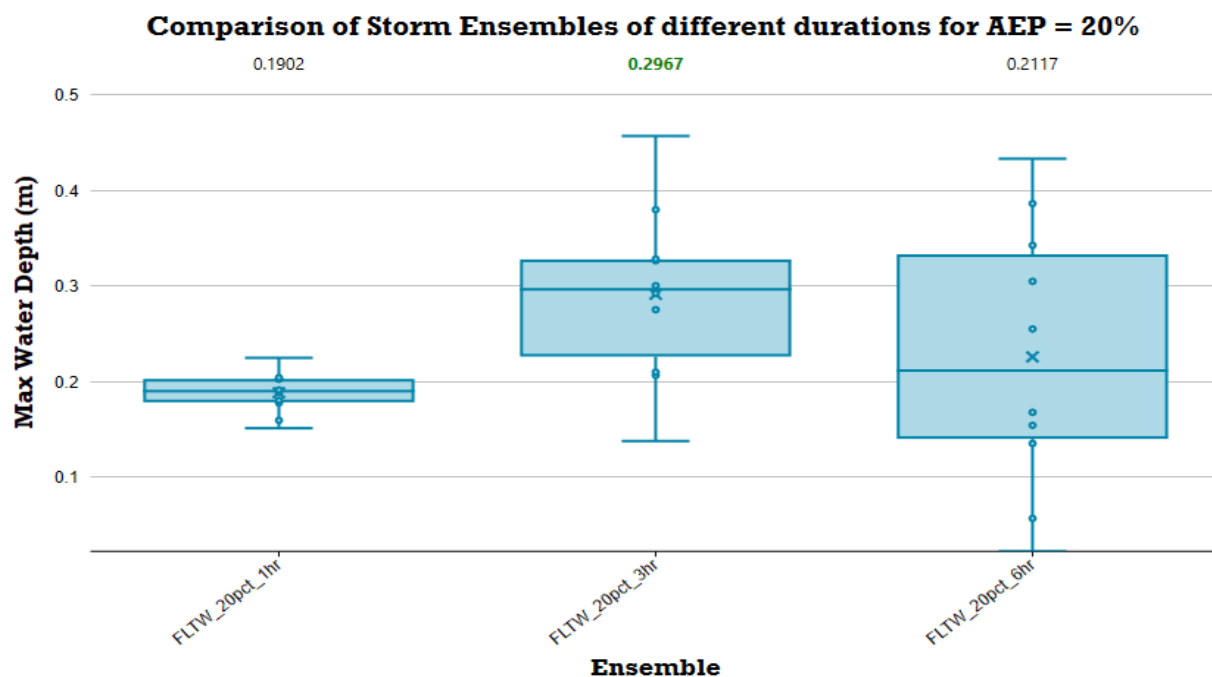
ATTACHMENT E
Stormwater Modelling Outputs

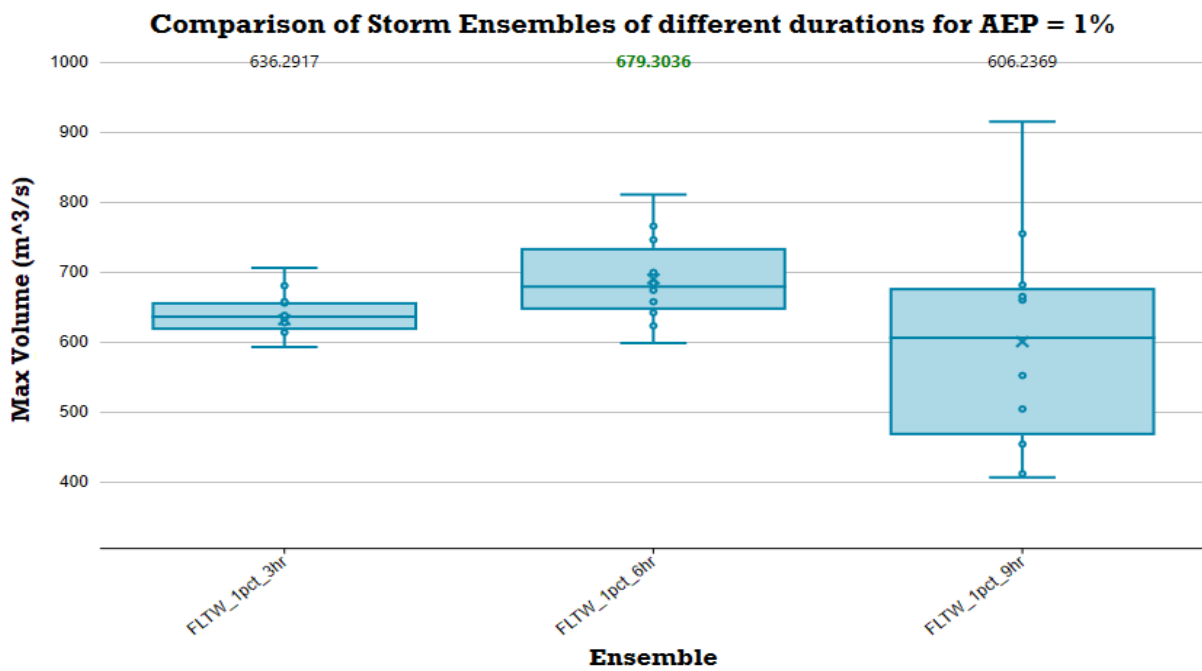
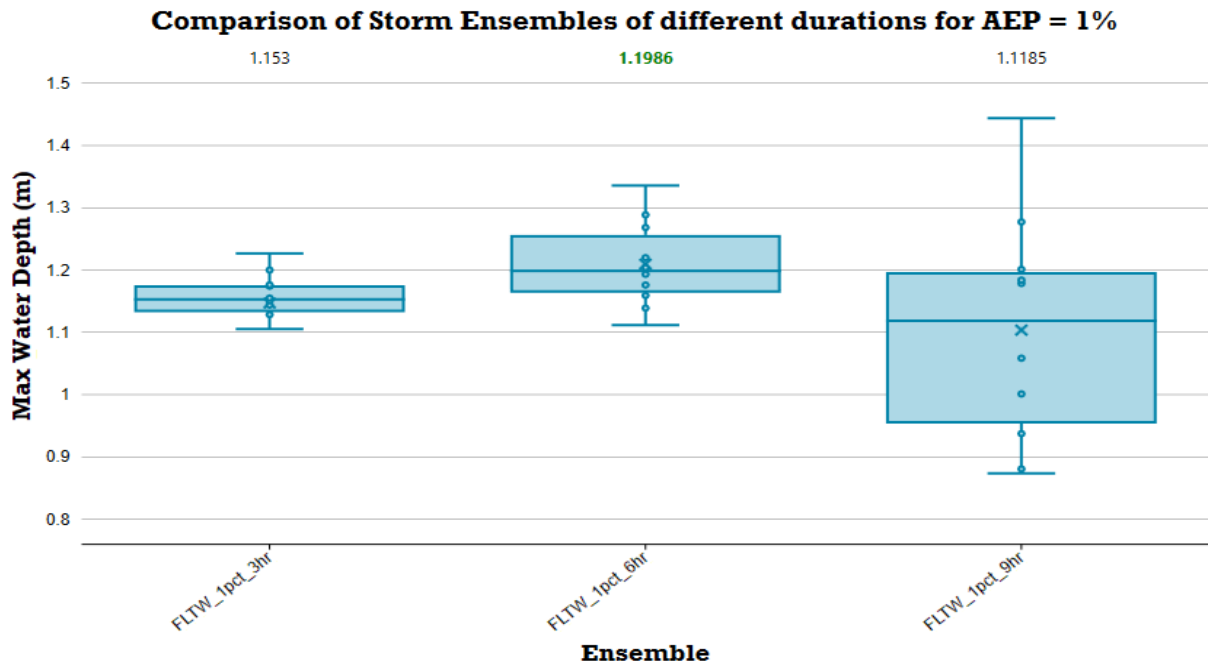
Comparison of Storm Ensembles of different durations for AEP = 63.2%

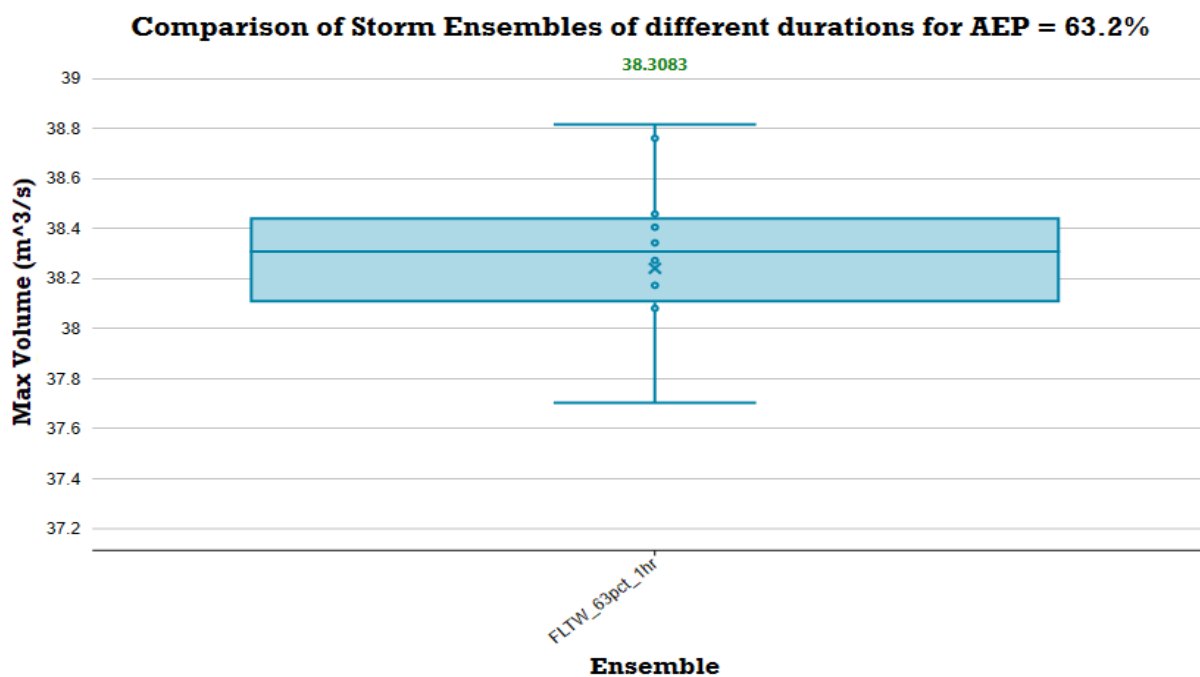
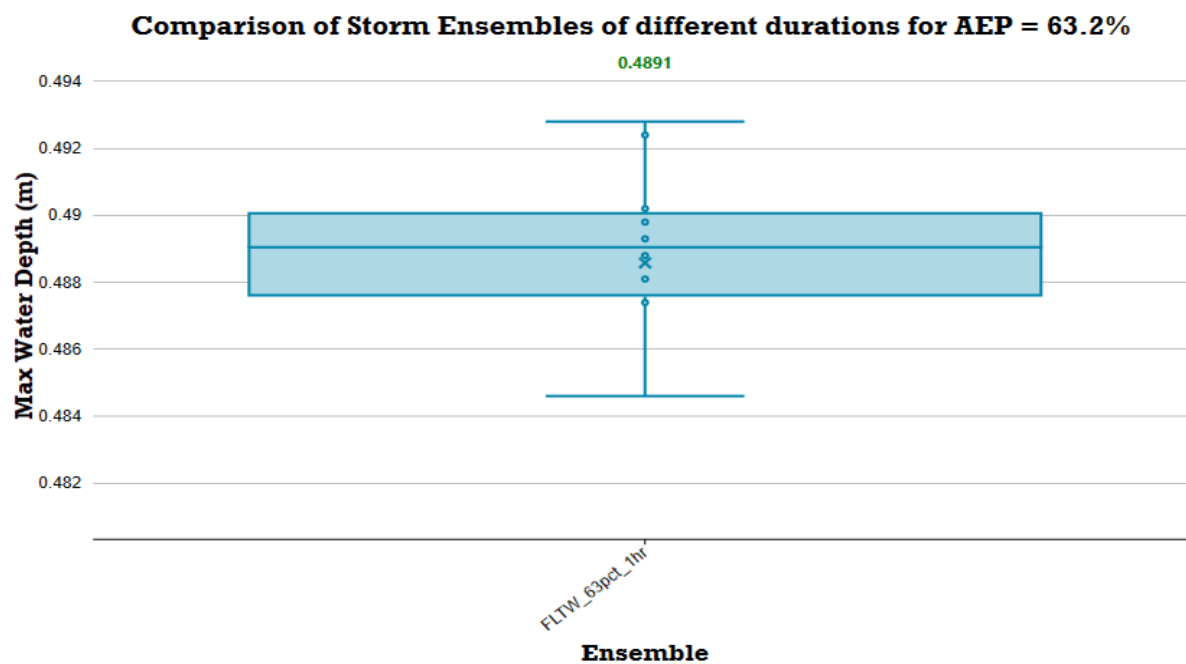


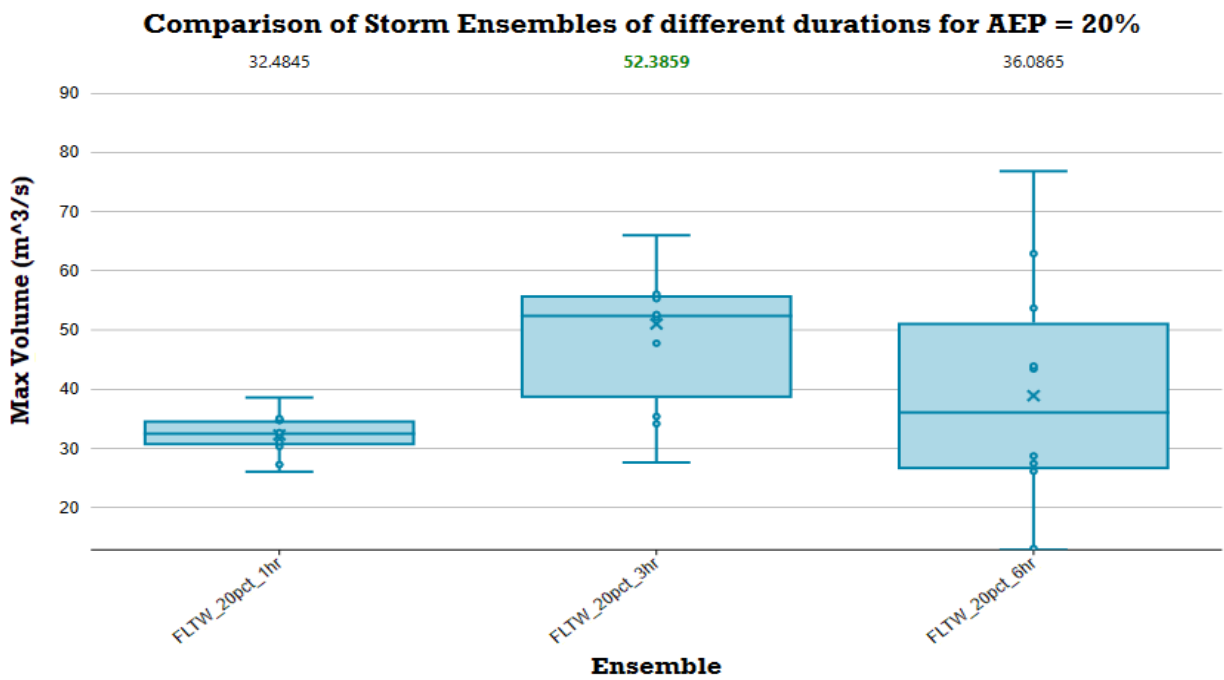
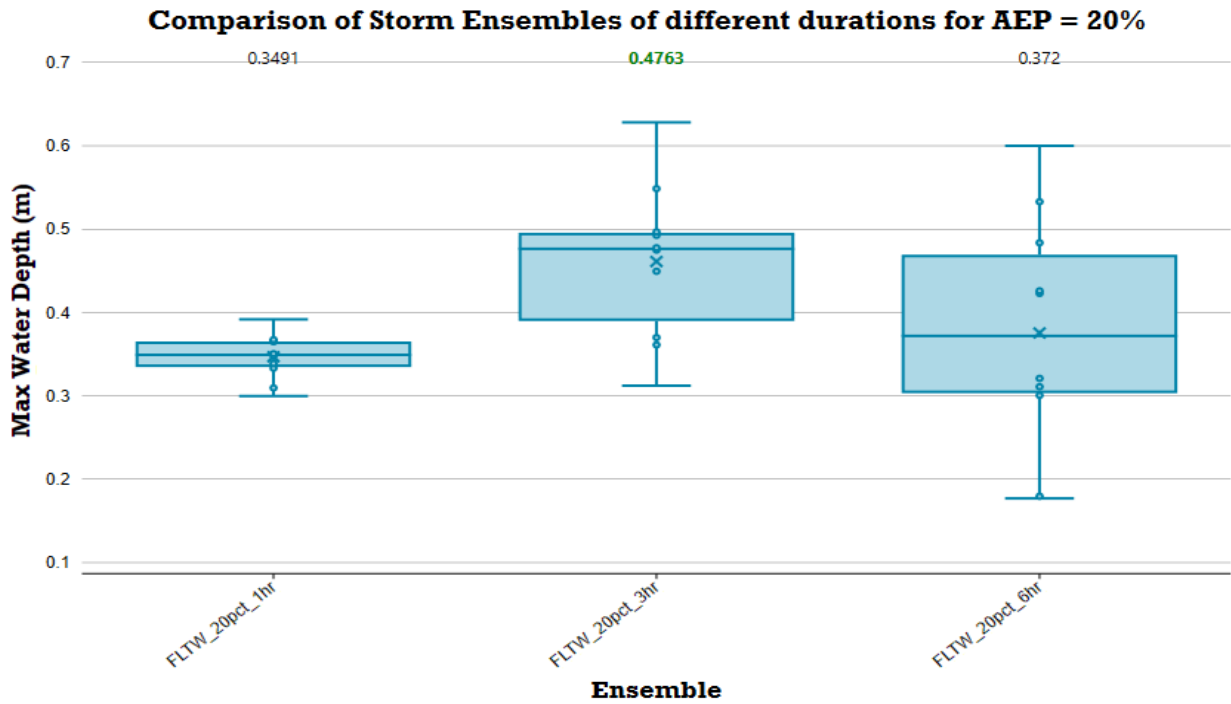
Comparison of Storm Ensembles of different durations for AEP = 63.2%

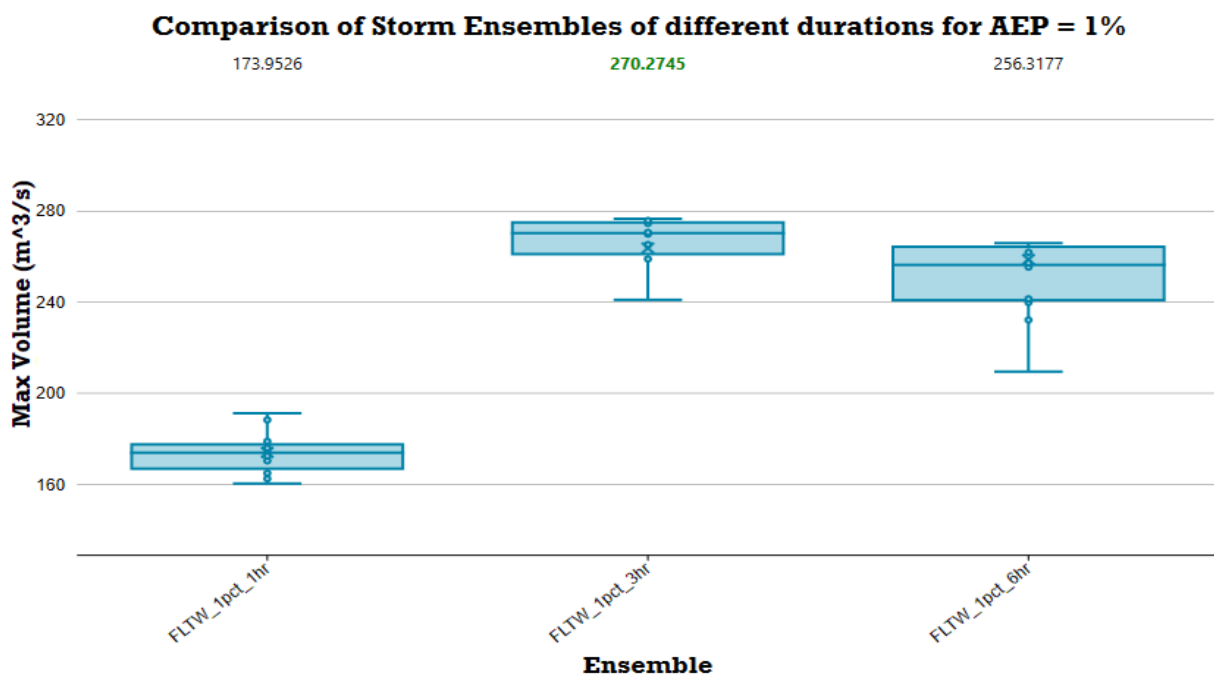
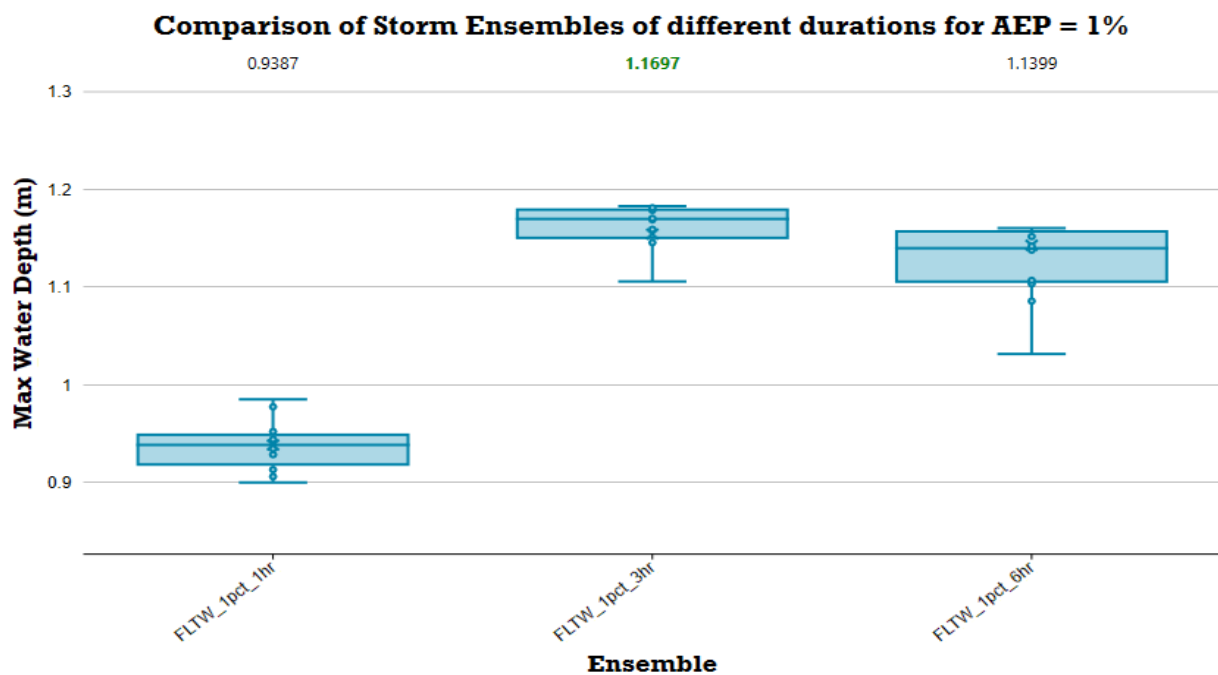


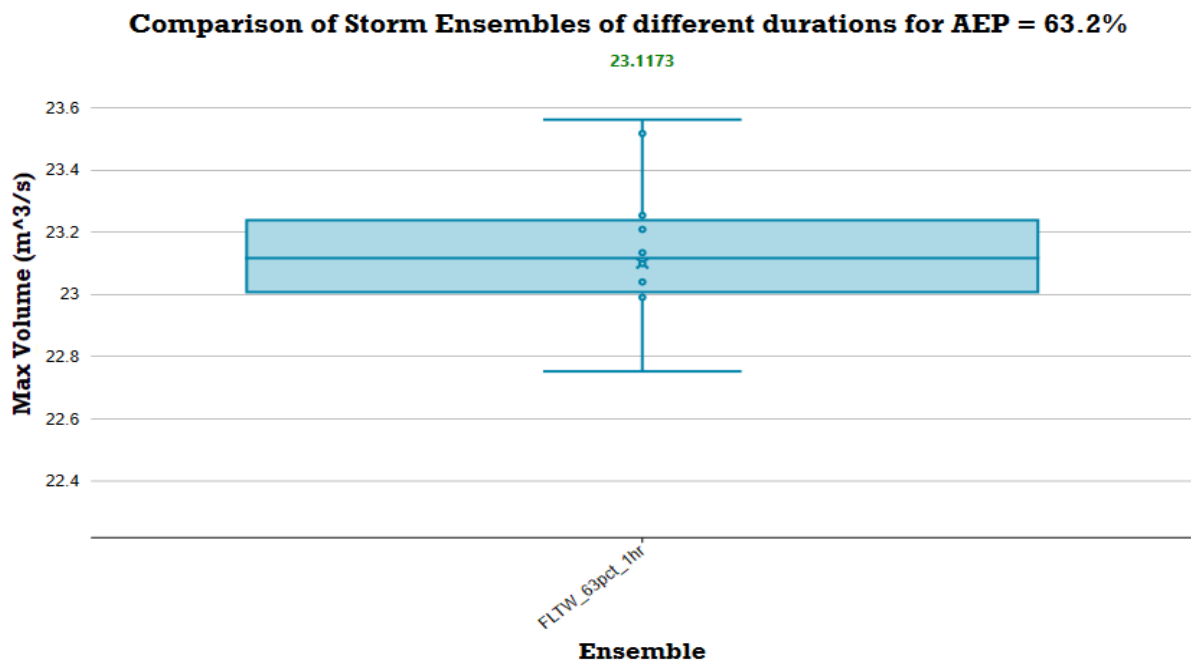
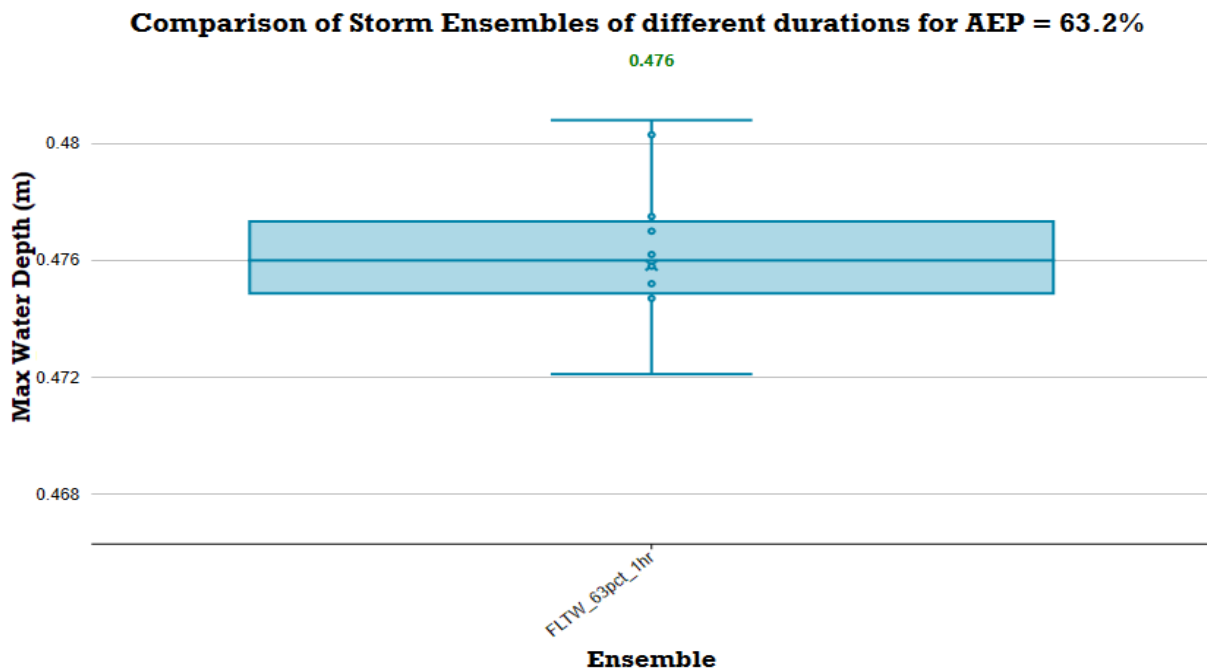


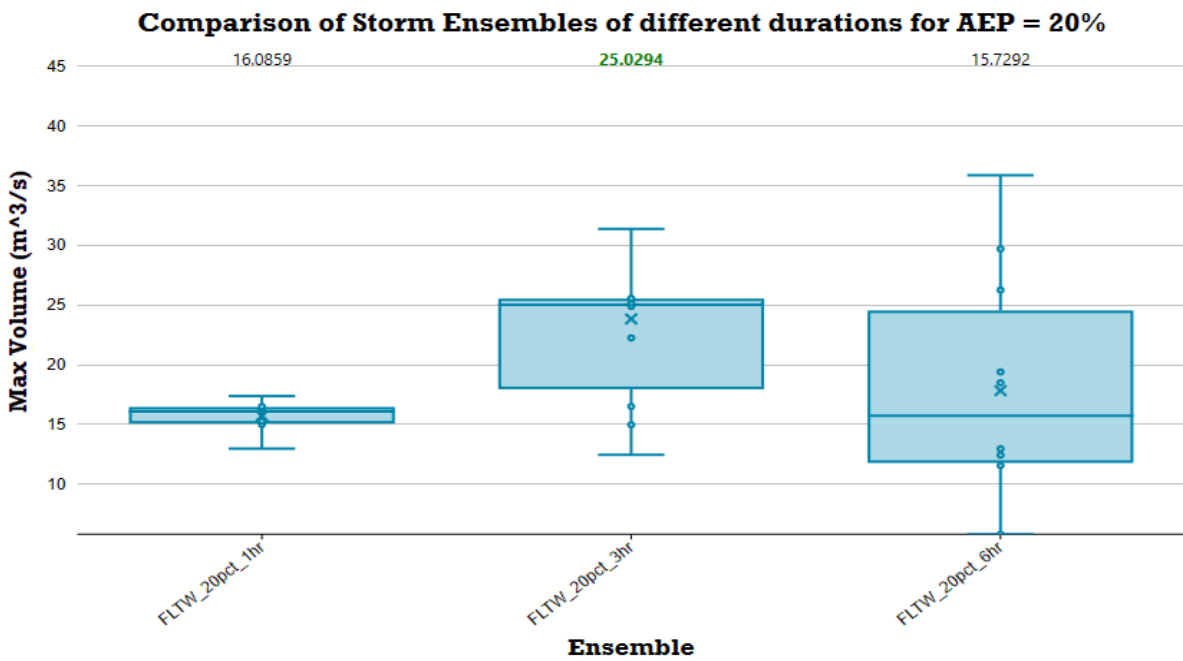
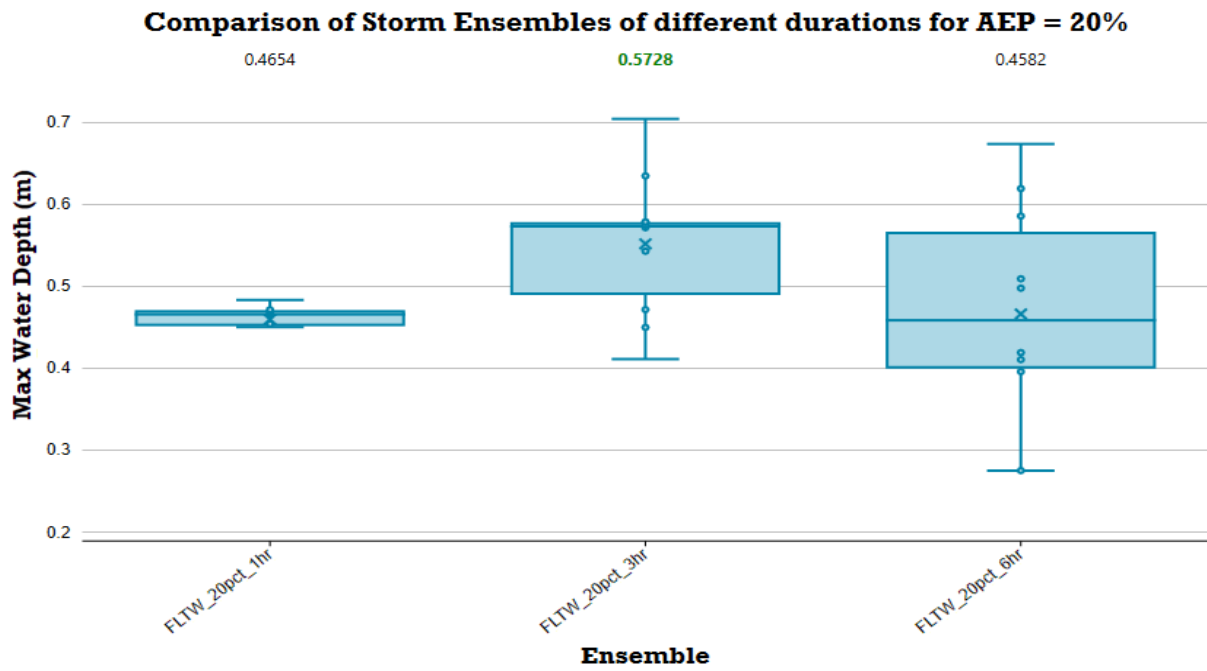


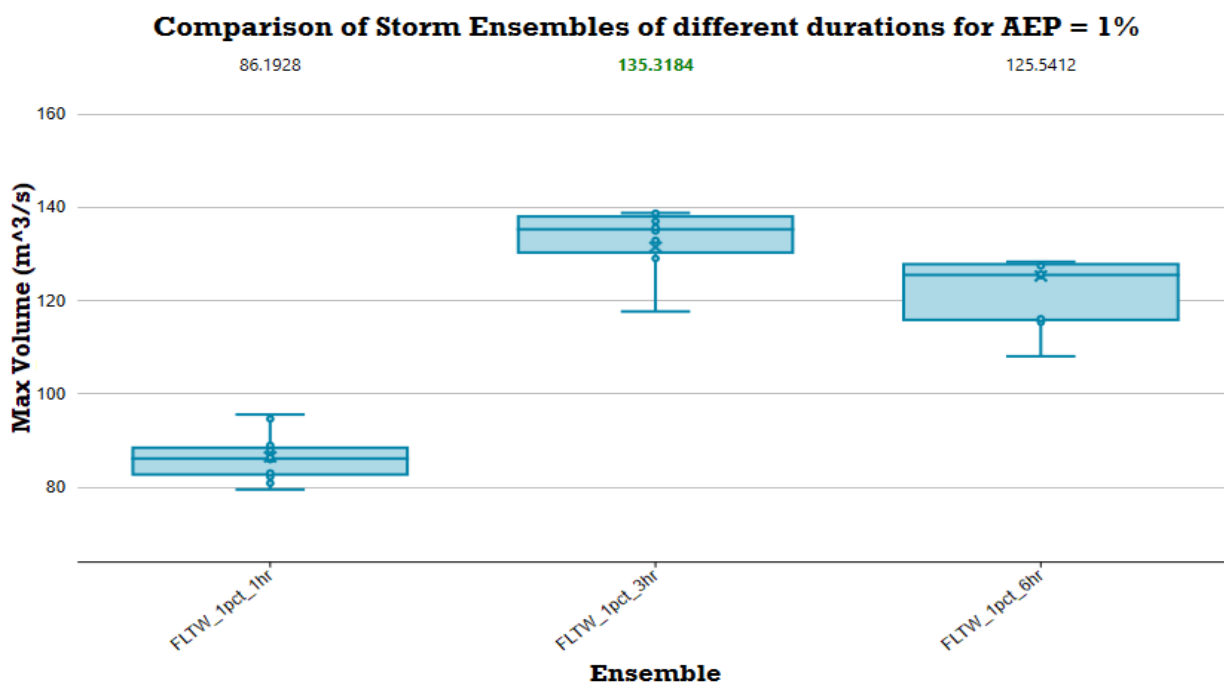
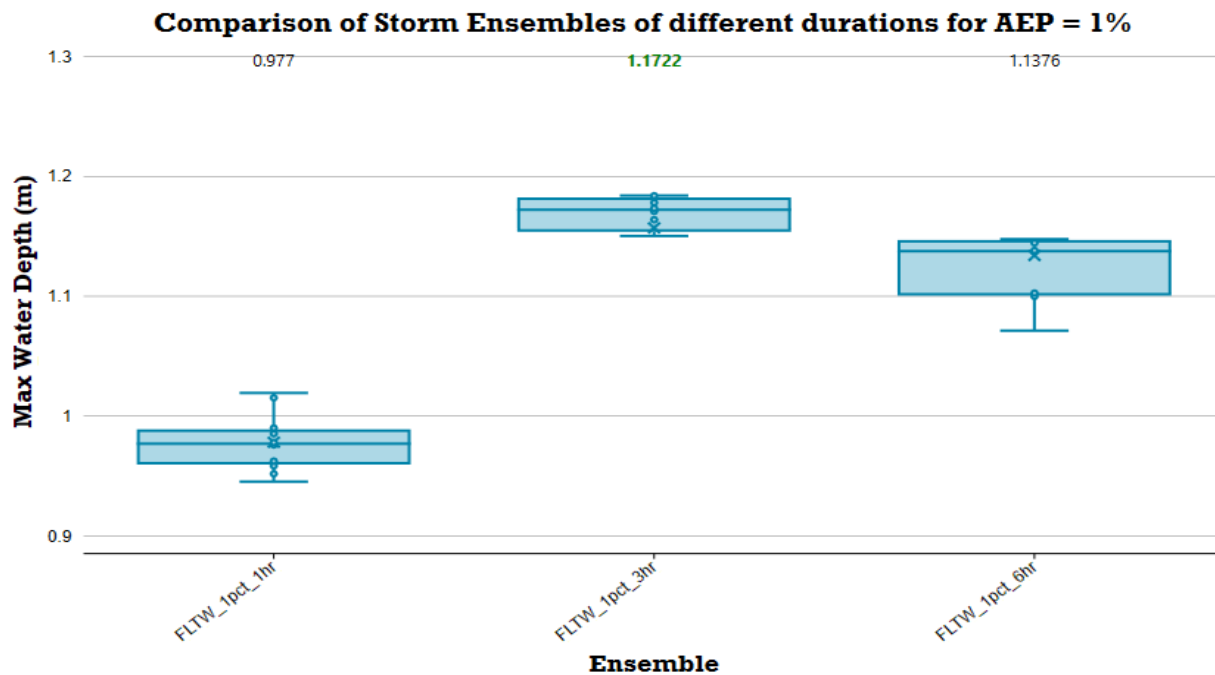




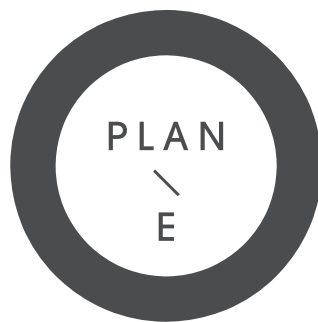








ATTACHMENT F
Landscape Plans



LANDSCAPE ARCHITECTS
LEVEL 1 278 RAILWAY PDE WEST LEEDERVILLE WA 6007
T: (08) 9388 9566 E: mail@plane.com.au

HAMMOND QUARTER - LSP AMENDMENT
PREPARED FOR QUBE MANDOGALUP PTY LTD
JUNE 2024

M1.101
REV B
1:1250 @ A1





TERRACING

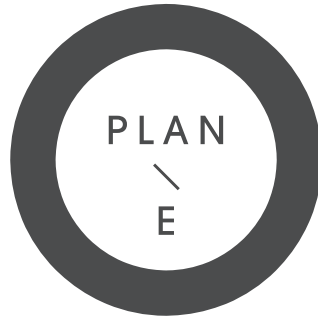
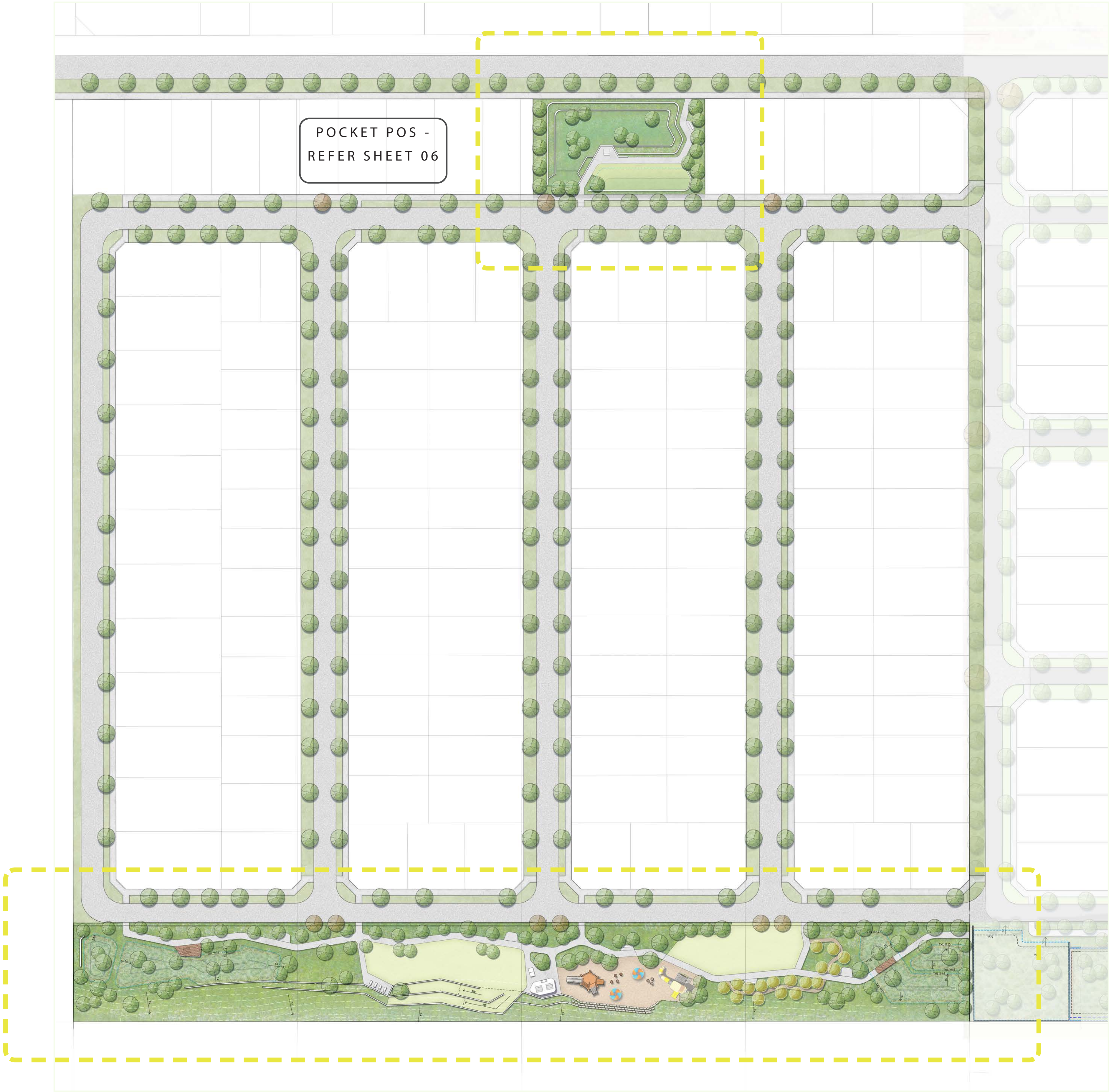


MANUFACTURED SHADE



LINEAR POS -
REFER SHEET 03

POCKET POS -
REFER SHEET 06



LANDSCAPE ARCHITECTS
LEVEL 1 278 RAILWAY PDE WEST LEEDERVILLE WA 6007
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HAMMOND QUARTER - LSP AMENDMENT
PREPARED FOR QUBE MANDOGALUP PTY LTD
JUNE 2024

M1.102
REV B
1:700 @ A1



03

LINEAR POS
PLAN

LEGEND

- PROPOSED TREE PLANTING

01 CONCRETE FOOTPATH EXTENDS LINEAR POS WALKABLE NETWORK

02 FUTURE PATH CONNECTION WITH HAMMON SOUTH LINEAR POS

03 BRIDGE CONNECTION OVER 1:100 BASIN

04 PLANTED 1:100 ARI DETENTION BASIN

05 PLANTED 1:1 ARI BIORETENTION BASIN WITH WINTER-WET NATIVE TREES AND PLANT SPECIES.

06 LARGE TURF KICKABOUT AREA

07 SHADE STRUCTURE WITH SEATING AND BBQ

08 PLAYGROUND AREA

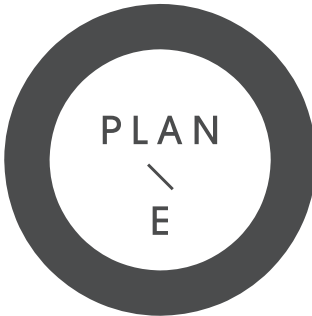
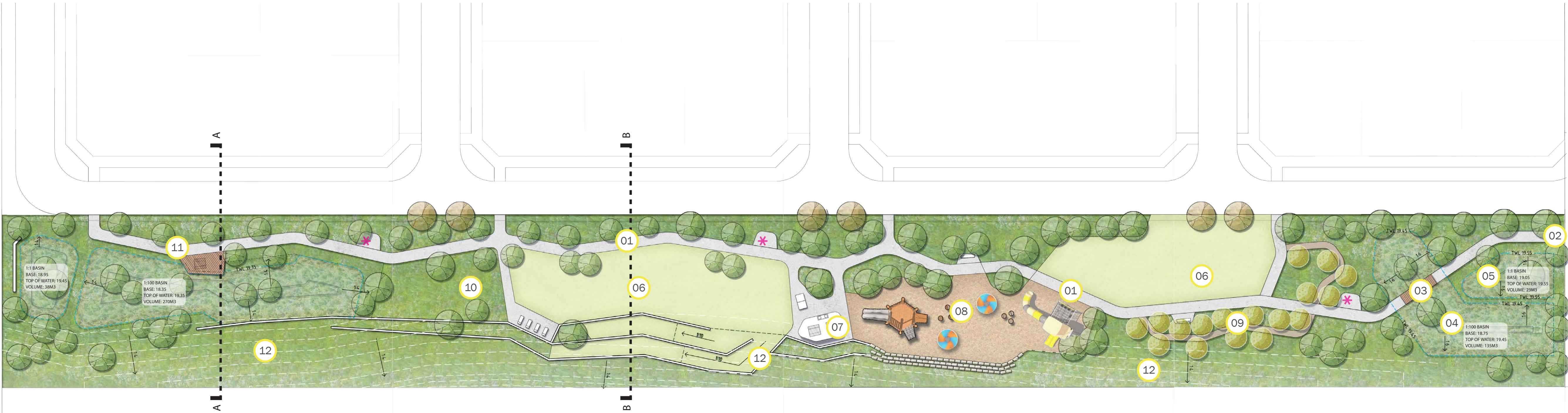
09 INFORMAL PATH THROUGH COMMUNITY ORCHARD

10 REFLECTIVE NODE: LOUNGE SEATING OVERLOOKING TURF AND BASIN

11 RAISED SEATING PLATFORM OVERLOOKING BASIN

12 1:4 MAX EARTHWORKS BATTER

✱ ALL-AGES FITNESS EQUIPMENT NODE

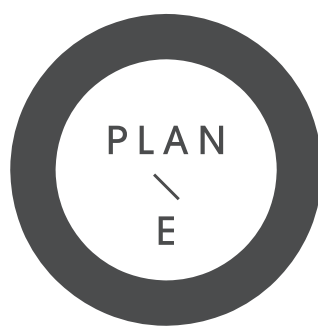
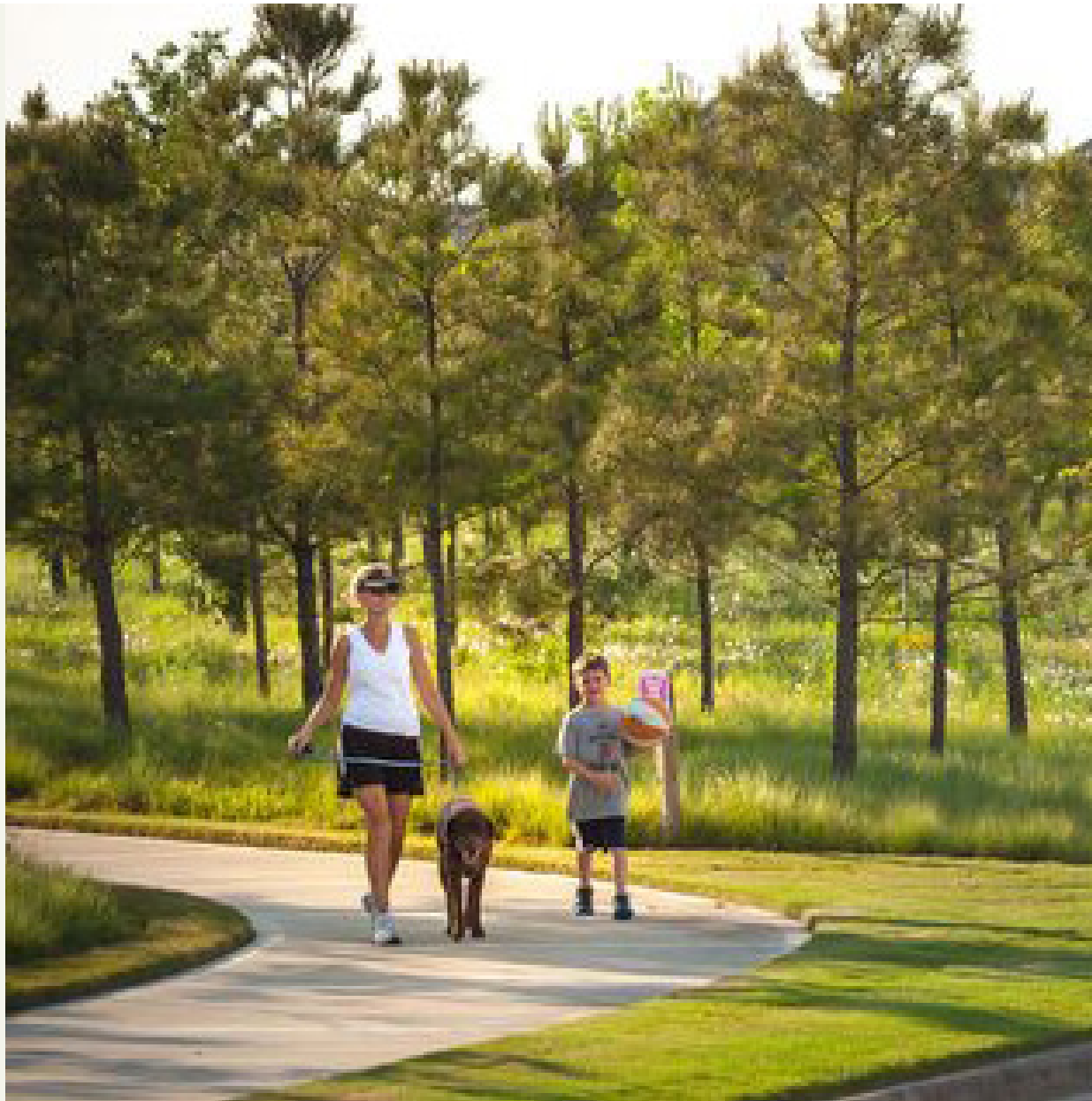


LANDSCAPE ARCHITECTS
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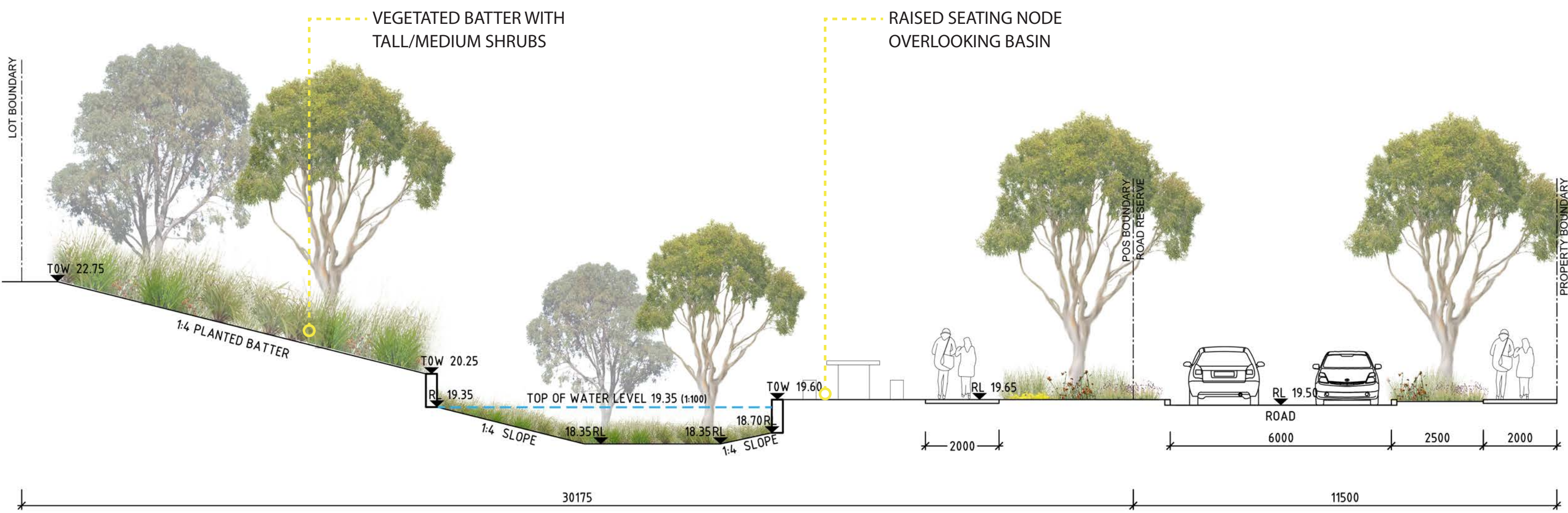
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PREPARED FOR QUBE MANDOGALUP PTY LTD
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M1.103
REV B
1:400 @ A1

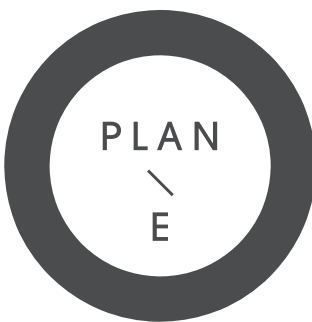
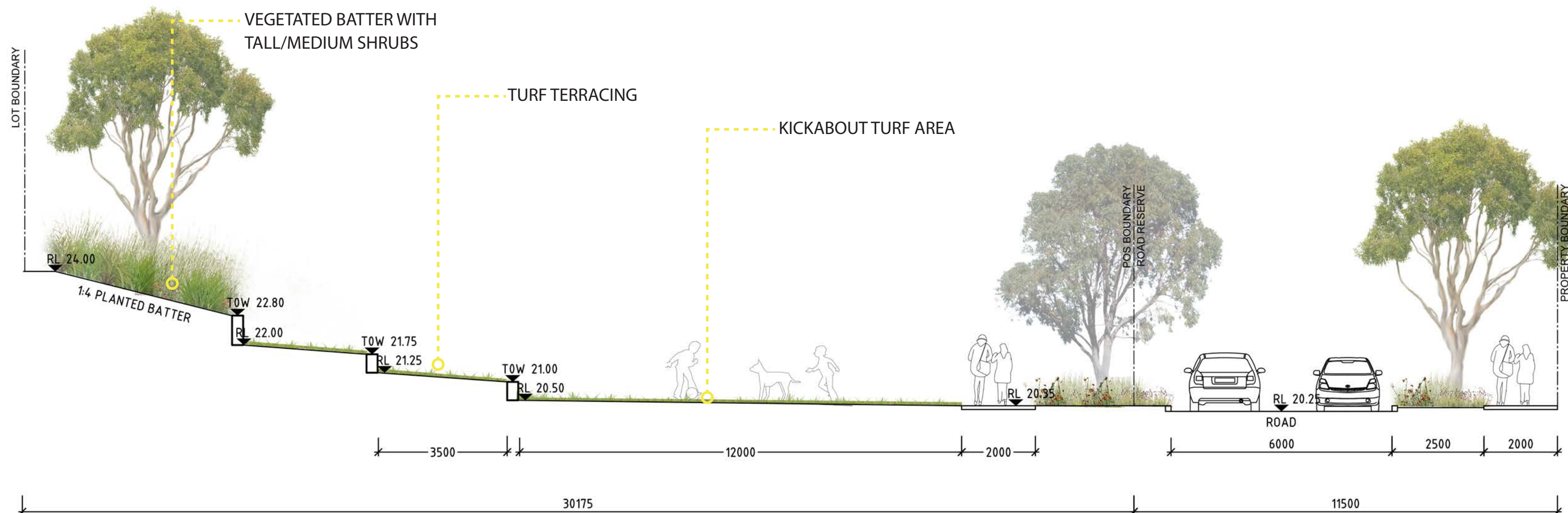




SECTION A - A



SECTION B - B



LANDSCAPE ARCHITECTS

LEVEL 1 278 RAILWAY PDE WEST LEEDERVILLE WA 6007
T: (08) 9388 9566 E: mail@plane.com.au

HAMMOND QUARTER - LSP AMENDMENT

PREPARED FOR QUBE MANDOGALUP PTY LTD
JUNE 2024

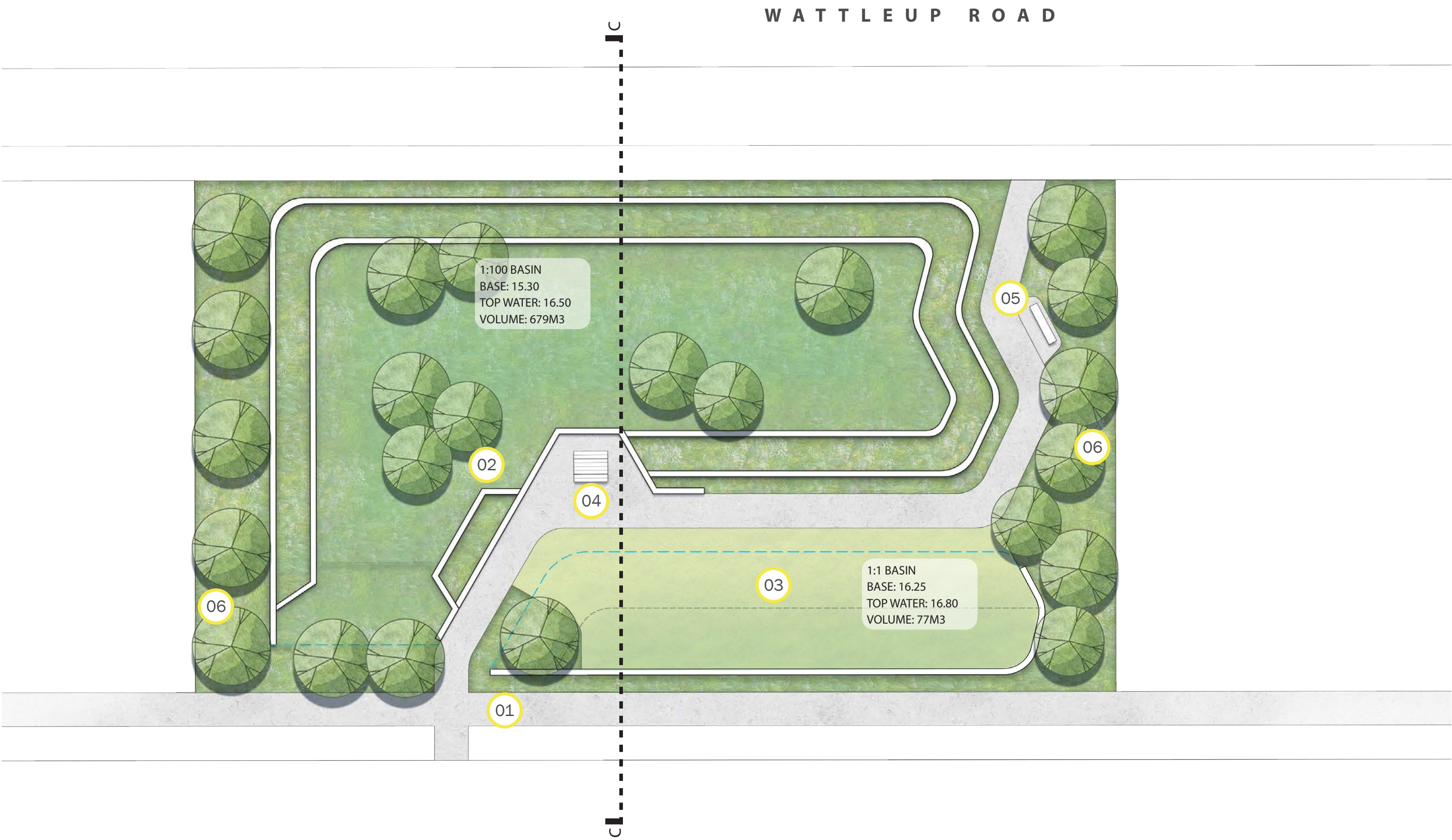
M1.105

REV B
1:100 @ A1

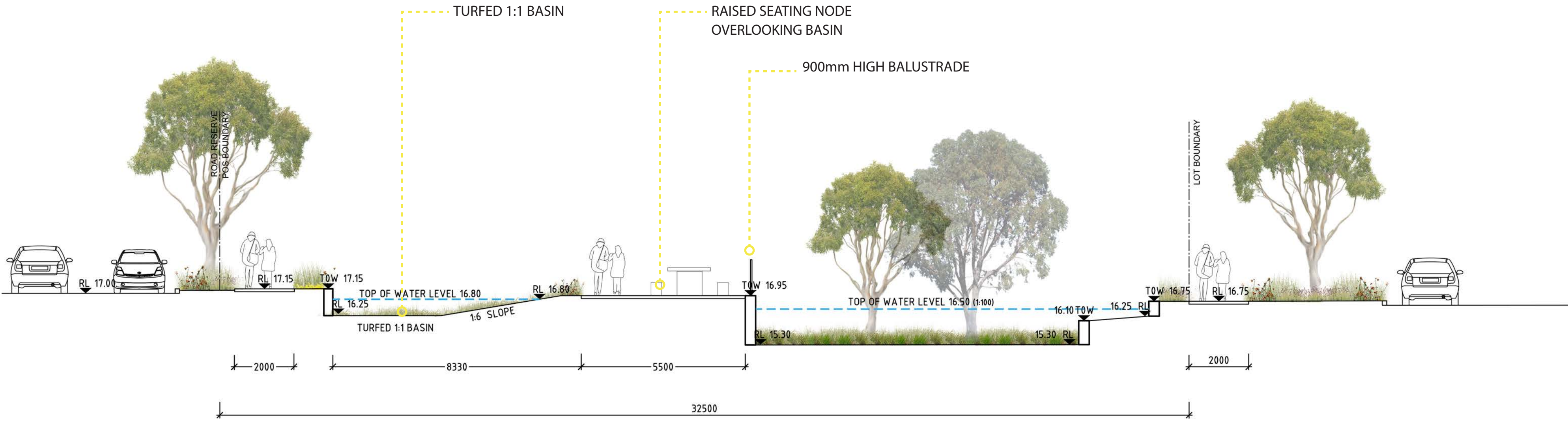


LEGEND

- 
- PROPOSED TREE PLANTING.
- 01 CONCRETE FOOTPATH
 - 02 PLANTED 1:100 ARI DETENTION BASIN
 - 03 TURF 1:1 ARI BIORETENTION BASIN
 - 04 RAISED SEATING PLATFORM OVERLOOKING BASIN
 - 05 SEATING NODE
 - 06 SCREENING TREES AND PLANTING ALONG LOT BOUNDARY



SECTION C - C





EXPOSED CONCRETE



EXPOSED CONCRETE



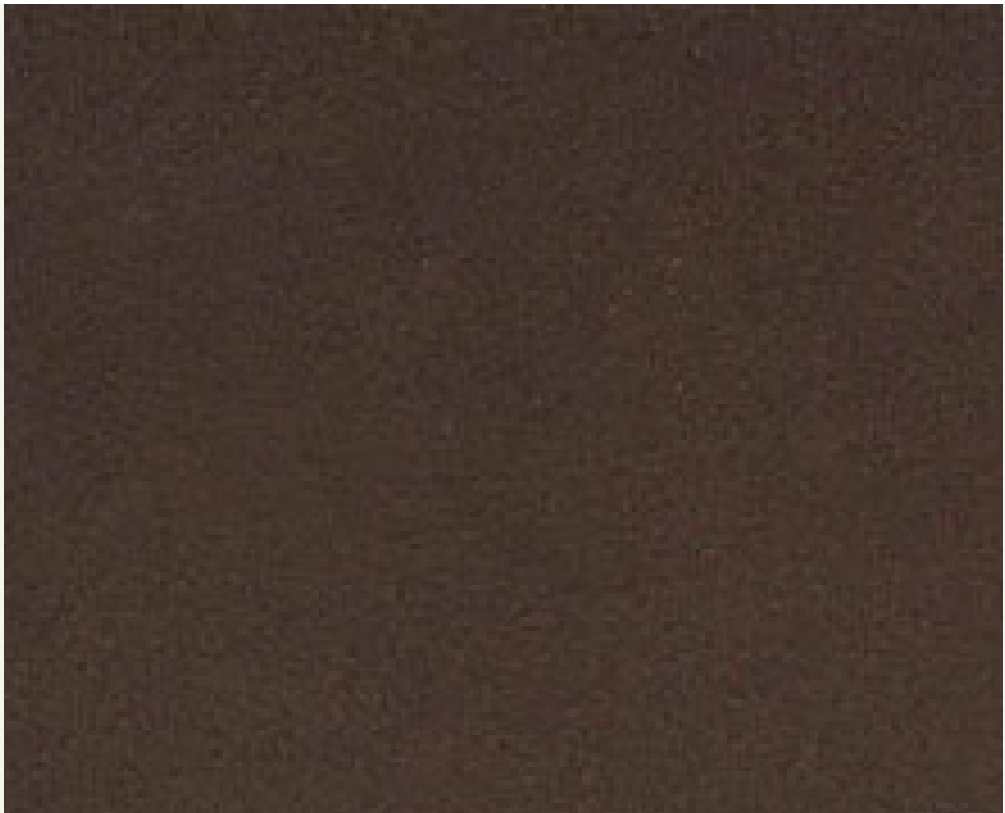
ROCK SALT CONCRETE



COMPOSITE DECKING



LIMESTONE RETAINING WALLS



POWDER COATING



RAMMED EARTH WALL



LIMESTONE BOULDERS RETAINING



FEATURE BRICK

BANKSIA WOODLAND



SMALL TREES



LARGE TREES



GROUNDCOVERS



ACACIA SALIGNA GREEN CARPET



CONOSTYLIS CANDICANS



CALOTHAMNUS QUADRIFIDUS PROSTRATE



DAMPIERA LINEARIS



KENNEDIA PROSTRATA



MYOPORUM PARVIFOLIUM FINE LEAF

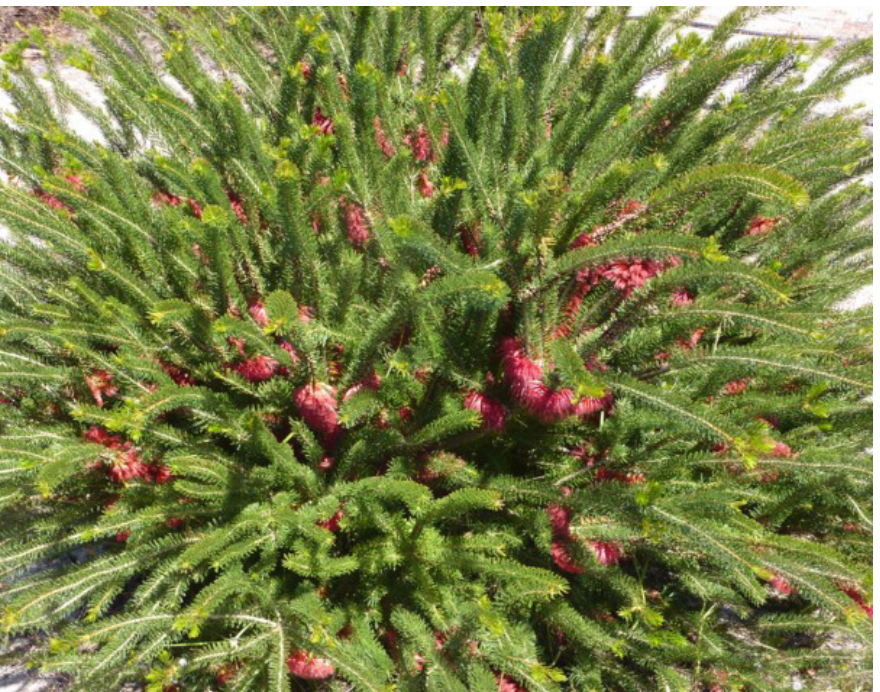
SHRUBS LOW



ANIGOZANTHOS HUMILIS



BANKSIA NIVEA PROSTRATE



CALOTHAMNUS CLEAN AND GREEN



CONOSTYLIS ACULEATA



DIANELLA REVOLUTA



PATTERSONIA OCCIDENTALIS

SHRUBS



ANIGOZANTHOS MANGLESSII



HAKEA PROSTRATA



HIBBERTIA HYPERICOIDES



MELALEUCA HUEGELII



SCAEVOLA CRASSIFOLIA



VERTICORDIA DENSIFLORA