REF: 4932WW

VERSION [1.0]

DECEMBER 1, 2021

SOIL & SITE ASSESSMENT FOR ONSITE WASTEWATER DISPOSAL

90 CABBAGE TREE ROAD, BAYVIEW, NSW

LGA: Northern Beaches

Lot 22 DP 602041

CLIENT: Alex Jenkins & Paul O Farrell

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VERSION CONTROL

Title	Soil & Site Assessment for Onsite Wastewater Disposal			
Site address	90 Cabbage Tree Road, Bayview, NSW			
Description	Proposed Wastewater System for Existing Dwelling And Proposed Pool House Addition			
Approved by:	Sean Harris Msc Env Science (UOW), Grad dip Nat Res (UNE), BscAppSc, Agriculture (HAC)			
Date Created	1/12/2021			
Version Number	**Prepared By**	**Modifications Made**	**Date Modified**	**Status**
[1.0]	M.S	Issue for client review	1/12/2021	Complete
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TABLE OF CONTENTS

TABLES

FIGURES

APPENDICES

1. INTRODUCTION

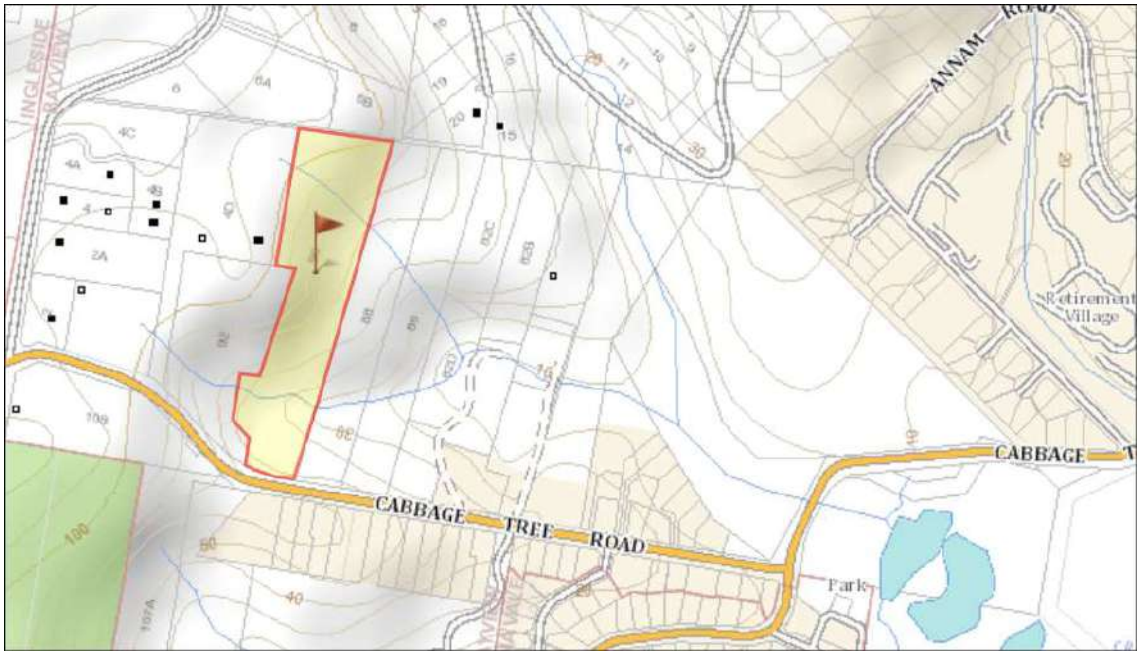
This Site and Soil Assessment for On-site Wastewater Management was prepared by Harris Environmental Consulting at the request of Suzanne Green. It relates to the proposed construction of a pool and cabanna on Lot 22 DP 602041 at 90 Cabbage Tree Road, Bayview, NSW. The proposed development will include a toilet and shower, but this will be used by the occupants of the dwelling so it will not generate additional wastewater.

Fieldwork was undertaken by Harris Environmental Consulting (HEC) on the 17th November 2021. This plan is based on the primary investigation of the soils, topography and hydrology of the site observed on the day of inspection. Soil samples and photos of the site were taken for further analysis. This assessment was undertaken for a proposal to install an Aerated Wastewater Treatment System (AWTS) for wastewater treatment and a soil absorption bed for treated wastewater disposal. It is proposed that an exisiting septic tank system on the property be fitted with a macerator pump in order to pump wastewater up-hill to the proposed AWTS. The proposed pool-house will also have a pump well and macerator pump installed for the same purpose.

This assessment was undertaken in accordance with:

- Northern Beaches Council's Development Control Plan
- Local Government Act 1993
- Australian Standard AS/NZS 3500 Plumbing and Drainage 2018
- Environment and Health Protection Guidelines (1998) On-site Sewage Management for Single Households (Department of Local Government)
- AS/NZS 1547:2012 On-site wastewater management (Standards Australia, 2012)

FIGURE 1 SITE LOCATION



Source: NSW Six Maps

2. SITE INFORMATION

Our Ref:	4932WW	
Project Manager:	Suzanne Green P: 0414 470 532 E: suzanne@suzannegreen.com.au	
Folio:	Lot 22 DP 602041	
Site address:	90 Cabbage Tree Road, Bayview, NSW	
Size of property:	3.1 ha	
Local Government Area:	Northern Beaches	
Water supply	Town	
Wastewater design load:	No. bedroom in the existing dwelling	3
	Total wastewater load	**900L/day**
Proposed wastewater treatment:	AWTS	
Proposed wastewater disposal	Soil absorption bed	
Date site assessed:	17/11/2021	
Date report prepared:	1/12/2021	
Site assessor:	 Msc Env Science (UOW), Grad dip Nat Res (UNE), BscAppSc, Agriculture (HAC) Sean Harris	

3. SITE ASSESSMENT

Climate - rainfall	Mona Vale Golf Club Rainfall Station (median annual 1080mm)
Flood potential	Proposed wastewater treatment system is above 1 in 100-year flood level; minor limitation. Proposed wastewater disposal area above 1 in 20-year flood level; minor limitation.
Frost potential	The site is not known to be subject to severe frosts, minor limitation
Exposure	Northern aspect; minor limitation
Slope	0-1%; minor limitation for soil absorption bed
Landform	Relatively flat levelled area adjacent to driveway, minor limitation
Run-on and seepage	Minor upslope stormwater run on; minor limitation
Erosion potential	Minor erosion potential
Site drainage	Well drained soil profile; minor limitation
Evidence of fill	Evidence of fill on battered slope below the proposed bed, but this is likely to be native soil that was pushed down the slope to create the levelled area. The indications of fill were limited to small clumps of clay intermixed with a deep topsoil; minor limitation
Domestic groundwater use	The Department of Primary Industries Office of Water search of groundwater bores found there is one **known groundwater bore** within 100m of the proposed soil absorption bed area, but it is not used for domestic purposes
Surface rock	Minor surface rock; minor limitation
Area available for effluent disposal	Area available for effluent disposal within designated Effluent Management Area (EMA), minor limitation

4. SOIL ASSESSMENT

Method	Crowbar / shovel		
Depth to bedrock (m)	1000mm; minor limitation for soil absorption bed		
Depth to high soil water table	No free water at 1000mm, minor limitation		
Coarse (%)	0-5% coarse fragments in subsoil, minor limitation		
pH (soil/water)	pH 5.5-6; minor limitation		
Electrical conductivity	0.04 dSm, minor limitation		
Salinity hazard	Minor salinity hazard.		
Soil Landscape Geological unit Topography Most similar soils	Wattagan Soil Landscape Narrabeen Group sediments Rolling to very steep low hills. Local relief is 60–120 m. Slope gradients are steeper than 25%. Crests and ridges are convex and narrow. Hillslopes are steep with talus slopes containing sandstone boulders. Occasional sandstone benches and colluvial benches are present. Slopes with gradients >70% often have cliffs and scarps >10 m high wn1–Loose, stony, **brownish-black sandy loam**. This is stony, brownish-black, loamy sand to loam-fine-sandy with loose apedal single-grained structure and sandy porous fabric. It usually occurs as topsoil (A1 horizon). Texture is commonly a fine sandy loam. Surface condition is generally loose but may also be friable when sufficient organic matter is present. Colour is usually **brownish-black** (10YR 2/2) or black (10YR 1.7/1). The pH ranges from moderately acid (pH 5.0) to slightly acid (pH 6.0). Strongly weathered, subrounded, small sandstone fragments, charcoal fragments and roots are common.		
Surface rock	No surface rock in proposed EMA; minor limitation		
Bulk density	Permeable, well drained soil profile; moderate limitation		
Soil profile:	Layer 1		DLR
	Texture Colour Depth Structure Coarse frag.	Clay loam Brown 0-1000mm Moderately 0-5%	30mm/d
	Layer 2		DLR
	Texture Colour Depth Structure Coarse frag.	Clayey sandy loam Olive 600-650mm Weakly No	

5. SUMMARY OF SOIL AND SITE CONSTRAINTS

There are no major soil or site constraints that would prevent the installation of an Aerated Wastewater Treatment System (AWTS) for wastewater treatment and soil absorption bed for as the proposed method of wastewater treatment. This will replace a septic tank and soil absorption trench.

The location of the soil absorption trench was not identified during the site assessment, but it will be within 40m of the gully, within native vegetation and soil depth is likely to be less than 1000mm (min depth for soil absorption bed). Therefore, a new wastewater management system is necessary regardless of the proposed development.

The proposed poolhouse will be used by the occupants of the dwelling, and is the same as having these facilities within the house. This assessment makes no additional allowance for wastewater generated from, the proposed pool house amenities.

It is not practical to install the AWTS downslope of the dwelling and proposed pool house because of the steep slope, rock and access. The wastewater from the dwelling and proposed pool house will be pumped upslope to the AWTS. A pumpwell /macerator pump will be fitted within the existing septic tank, and another will be installed below the proposed pool house.

The location of the proposed soil absorption bed is on a levelled area north of the exisiting driveway. The soil depth is much deeper than what is naturally occurring as topsoil an a natural slope. The soil has been excavatred and filled to create the level area and soil deth where beds are proposed is at least 1m deep.

The proposed beds are at a location that is compliant with all buffers and setback distances required by Northern Beaches Council. This includes being more than 40m from drainage depressions, 12m from downslope boundary lines, 6m from upslope boundary lines. The buffer to the driveway must be reduced from 3m to 2m to allow space for the 1.5m bed.

There is sufficient space for a reserve soil absorption bed adjacent to the installed bed. The soil absorption bed will need to be fenced to protect it from vehicles, which will damage the beds if allowed to park or drive on surface.

Photo 1 On-site soil assessment profile

Photo 2 Looking towards the proposed soil absorption bed

6. SYSTEM DESIGN

6.1 WASTEWATER TREATMENT SYSTEM

An Aerated Wastewater Treatment System is proposed for wastewater treatment. The owner is required to provide the Council with the AWTS manufacturer's specifications of the proposed treatment system. (Information on proposed AWTS can be obtained from the manufacturer or NSW Heath Register of Accredited Sewage Management Systems at http://www.health.nsw.gov.au/publichealth/environment/water/waste_water.asp).

The owner will need to lodge an application to install/operate a Sewage Management System under the Local government act 1993, Section 68. Council will require the owner to have selected an AWTS manufacturer and provide Council with the necessary plans and specifications including NSW Health Accreditation, tank dimensions and capacity, operation and maintenance details, plus Licensed Plumber's name, address, phone number and license number.

The AWTS will be installed and maintained in accordance with Section 5 of the guidelines 'On-site Sewage Management for Single Households' (Department of Local Government, 1998) and AS/NZS 1547-2012 'On-site Domestic Wastewater Management' (Standards Australia, 2012). Upon approval from Northern Beaches Council, the owner is to enter into a servicing contract with an approved servicing agent for the life of the system. Copies of the written service reports should be lodged with Northern Beaches Council following each quarterly service.

6.2 LOCATION OF PROPOSED AWTS

The location of the AWTS should be decided in conjunction with the licensed plumber in consultation with the property owner. The AWTS must be positioned on a stable, level base and be downslope of the building so there is sufficient fall from drainage outlets in the dwelling. The location of AWTS must be

- Downslope of the buildings from where wastewater is generated;
- at least 2.5m away from the building
- at least 5m from the property boundary
- at least 6m downslope from any in ground water storage tanks.

AWTS installation must comply with the manufacturer's recommendations, AS/NZS 3500.2:2015 Plumbing and Drainage Part 2 Sanitary Plumbing and Drainage' and Council requirements.

7.2 INSTALLATION OF PIPES

The sewer pipes between the plumbing amenities, AWTS and irrigation area must conform with 'AS/NZS 3500(Set):2018 Plumbing and Drainage Set' specifying the nominal pipe sizes and respective minimum grades. Table 1 contains these specifications.

In addition, where a sewer carrying untreated wastewater to a treatment system is longer than 60 metres, the minimum grade should be doubled, and inspection ports should be installed at least every 30 metres or at an angle or change of grade.

The sewer pipes between the plumbing amenities, AWTS and irrigation area must be buried at a depth that provides protection against mechanical damage or deformation, in accordance with 'AS/NZS 3500.2:2018 Plumbing and Drainage Set'. Table 2 shows the minimum pipe depth for trafficable areas.

TABLE 1 MINIMUM PIPE DIAMETER AND GRADE CALCULATIONS

Nominal pipe size (DN)	Minimum grade %	Minimum grade ratio
65	2.5	1:40
80	1.65	1:60
100	1.65*	1:60
125	1.25	1:80
150	1.00	1:100
* Except for drains from septic tanks, sewage treatment plants and unvented discharge pipes from tundishes, which may have a minimum grade of 1%, Source: 'AS/NZS 3500.2:2018 Plumbing and drainage Part 2 Sanitary plumbing and drainage' Table 3.4.1. NB: pipe grades are expressed as a percentage of vertical to horizontal distances.		

TABLE 2 MINIMUM PIPE DEPTH FOR TRAFFICABLE AREAS

Location	Minimum depth of cover (mm) for all materials other than cast iron
Where subject to vehicular traffic	500
Elsewhere	300
Source: 'AS/NZS 3500 (Parts 0-4):2018 Plumbing and drainage Set'. Table 3.7.2 Minimum Cover for Buried Pipes'	

6.4 SIZING OF SOIL ABSORPTION BEDS

The soil absorption bed can be constructed within the range of widths and depths shown in Table 3 (ASNZ1547, 2012). The bed can be no deeper than 600mm and no wider than 4m. For this site, the proposed base of the bed is 450mm below ground surface (300mm aggregate and 150mm topsoil).

TABLE 3 DIMENSIONS FOR CONSTRUCTING SOIL ABSORPTION BED

	Typical dimensions (mm)	Maximum (mm)	Minimum (mm)
Width	1000-4000	4000	1000
Depth of aggregate	300-600	600	300
Depth of topsoil	100-150	150	100
Spacing between adjacent beds	-	NA	1000
Source: 'AS/NZS 1547:2012 *On-site* domestic wastewater management			

The size of the soil absorption bed is calculated using the formulae in AS/NZ 1547(2012). It is based on design flow rate, design width and Design Loading Rate (DLR), which is the amount of effluent that, over the long-term, be applied each day per area of an infiltrative surface without failure of the infiltrative surface. ASNZ1547(2012) recommend a DLR of 30mm/day.

The AS/NZ1547(2012) method for calculating bed size is as follows:

$$L = \frac{Q}{DLR \times W}$$

Where

L = Length in m
Q = Design daily flow in L/day (**900L/day**)
W = Width in m
DLR = Design Loading Rate in mm/d (**30mm/d**)

Based on the above formulae and assumptions described in this report, the soil absorption bed must be **30m^2. The proposed configuration will include ONE x 20m wide x 1.5m long bed. The configuration may need to be adusted to suit the site constraints and soil depth.**

As per AS/NZS 1547:2012, an additional 100% reserve area must be set aside for future use or expansion of the soil absorption bed. Reservation of 30m^2 of land for reserve soil absorption bed as shown on the Site Plan.

7. COMPLETION OF WORKS

The last stage of this process involves submitting an Installation Certificate provided by the installer. This is to certify that the systems have been installed according to the System Design. A copy of the installation certificate must be provided to the council and the system designer. A council certifier will make a final inspection before the system is approved for use.

The treatment and application systems must be installed by a contractor(s) licensed by NSW Fair Trading. That could be a licensed plumped or a licensed irrigation contractor (or both), each with at least three years' experience in effluent disposal.

8. SUMMARY

This assessment recommends the following:

- Installation of an Aerated Wastewater Treatment System (AWTS) with a suitable capacity to treat wastewater from the existing dwelling and proposed pool house;
- Installation of 30m^2 of soil absorption bed as ONE x 20m long x 1.5m wide bed, as described in the Appendix and shown on the Site Plan. It is expected that the configuration of this bed may need to be adjusted when the bed construction is underway.
- As per AS/NZS 1547:2012, an additional 100% reserve area must be set aside for future use or expansion of the soil absorption bed. Reservation of 30m^2 of land for a reserve soil absorption bed as shown on the Site Plans.

9. REFERENCES

Department of Local Government (1998) On-site Sewage Management for Single *Households*. NSW Government.

Standards Australia (2012) Australian/New Zealand Standard 1547:2012 *On-site* domestic wastewater management. Standards Australia.

NSW Health Septic Tank Accreditation Guidelines (2001).

Hazelton, P.A and Murphy, B.W ed. (1992) What Do All the Numbers Mean? A Guide for the Interpretation of Soil Test Results. Department of Conservation and Land Management (incorporating the Soil Conservation Service of NSW), Sydney.

Northern Beaches Council Development Control Plan

APPENDIX I CONSTRUCTION OF SOIL ABSORPTION BEDS

The process for constructing soil absorption beds is described below:

Step 1 Site Preparation

Obtain a copy of the council approved plans and conditions of consent. Accurately locate beds as shown on the site plans and according to the specified and approved design and/or any covenant. Check the location of all constructed beds against the approved site plans. If there is any change in their position from the site plans, a Section 96 application (from the *Environmental Planning and Assessment Act 1979)* must be made to the council to alter their position.

Step 2 Positioning

Build the bed along the contours and use laser levelling to ensure that the base is exactly level. If this does not happen, distribution will not be even and one part of the bed will be more heavily loaded. This could cause the most heavily loaded part of the bed to fail prematurely, with further creeping failure as the effluent is forced to more distant parts of the bed.

Step 3 Timing

Build beds during fine weather. If it rains before beds are completed, they should be covered to protect them from rain damage. Once dug, complete the bed promptly to avoid foreign material being washed into the open bed.

Step 4 Excavation

Carefully excavate the base of any bed and level it with a dumpy or laser level. The bed must be level along and across the line of the bed. If there is a slope across the base of the bed, the effluent will drain to and preferentially load the downslope side of the bed, which may then fail or overflow.

Where beds are dug along the contour on sloping ground by an excavator that does not have a pivoting bucket, the base of the bed will probably be cut parallel to the ground surface. In this case, the base of the bed will have a fall towards the downslope side. The bed should be further hand dug to level the base and stop excessive effluent accumulating against the downslope wall of the bed.

Step 5 Construction

The pipe work that distributes effluent into each bed shall include a tap/valve to enable flows to be managed between beds so individual beds can be rested off-line. A brief resting phase is needed to break down the microbial biomass that develops around the bed that can eventually lead to its failure.

The effluent will be distributed in the bed using a 100mm PVC pipe laid level onto a 200mm depth of 20-40mm aggregate.

The pipe will be drilled out with 10mm deburred holes every 30cm, and 20 degrees off the bottom of the pipe. Seep holes of 5mm should be sited at 2m intervals along the bottom of the pipe.

Once laid, the pipe has a 50mm cover of aggregate. Total aggregate depth is 300mm. The end of each length of pipe will have a capped riser to allow flushing of the distribution pipe.

A capped inspection port to be inserted on downhill side of the trench, using 50mm PVC pipe, slotted entire depth of gravel bed.

Cover gravel with geotextile to prevent topsoil mixing with gravel bed.

Ensure that the sides of beds are not damaged or caused to collapse when the beds are filled with gravel or sand.

Bed can be filled with gravel (typically 20-40 millimetres), but it should not be compacted. Appropriate consideration should be given to bed storage capacity where beds are filled with material other than gravel.
Test the beds with clean water before filling with gravel to ensure effective and even distribution of effluent.

Apply 150 to 200 millimetres of topsoil to the top of the bed and leave it slightly mounded above ground level to allow it to settle and to encourage incident rainfall to be shed away from the top of the bed.

The top of the absorption bed area should be turfed or grass planted to establish vegetation cover promptly after construction. This ensures the best uptake of effluent by evapotranspiration. Ensure that larger deep-rooting plants are not planted close to bed to reduce the chance of root intrusion and clogging of the beds.

A stormwater diversion berm/ drain should be built on sloping sites upslope of the absorption beds.

Step 6 Dosing

Bed is to be pressure-dosed from the AWTS.

Run-on stormwater is to be diverted around bed means of a berm or diversion drain.

APPENDIX II GENERAL RECOMMENDATIONS TO MANAGE WATER QUALITY AND QUANTITY

Insinkerator style kitchen garbage disposal units should be avoided as they increase water consumption and raise the nutrient and BOD concentrations of household effluent.

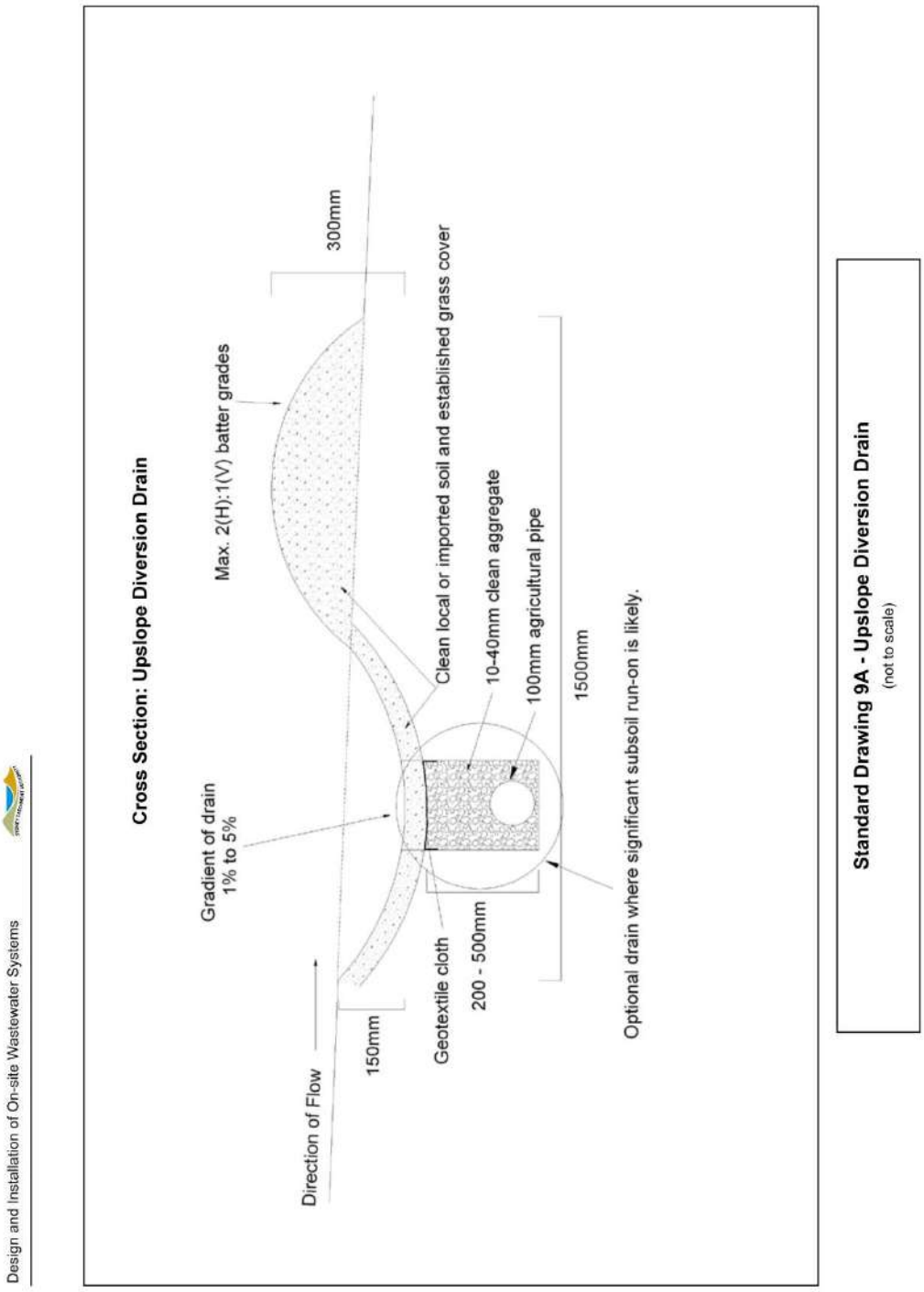
Water conservation can reduce the volume of wastewater that needs to be treated and discharged on-site. The residence should include appliances that are rated under the Water Efficiency Labelling and Standards (WELS) Scheme that includes:

i. 4-star dual-flush toilets;
ii. 3-star showerheads;
iii. 4-star taps (for all taps other than bath outlets and garden taps);
iv. 3-star urinals; and
v. Water-efficient washing machines and dishwashers are to be specified and used wherever possible.

Chemical cleaning compounds and other chemicals that enter the treatment system should be low in phosphate and salt.

Anti bacterial chemical cleaning compounds and other chemicals that enter the treatment system should be avoided. This includes chlorine, disinfectants, bleaches etc.

APPENDIX III STANDARD DRAWING 9A - UPSLOPE DIVERSION DRAIN



Standard Drawing 9A - Upslope Diversion Drain
(not to scale)

Design and Installation of On-site Wastewater Systems

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HARRIS

Issue:	Description:	Date	Drawn	Approved
A	Issue for client review	2/12/21	MS	SH

North

N

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Wastewater | Bushfire | Stormwater

Project:

PROPOSED AWTS AND SOIL ABSORPTION BEDS

LOT 22 DP 602041

90 Cabbage Tree Road, Bayview, NSW

LGA: NORTHERN BEACHES

Drawing Title:

WASTEWATER MANAGEMENT PLAN DETAILS SHEET No.1

Drawn:	Date:	Paper Size:	Q.A. Check:	Date:
MS	2/12/21	ISO Expand A3	Complete	2/12/21
Designed:	**Our reference:**	**Scale:**	**Dwg. No.**	**Issue:**
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SITE PLAN: KEY

- PROPERTY BOUNDARY
- 2m CONTOURS
- EXISTING DWELLING
- PROPOSED POOL-HOUSE
- PROPOSED AWTS
- PROPOSED PUMPWELL CONCEPT LOCATION
- PROPOSED PUMPWELL CONCEPT LOCATION
- PROPOSED SOIL ABSORPTION BED
- PROPOSED RESERVE SOIL ABSORPTION BED
- 100mm PVC PIPE
- 25mm ID POLY PIPE
- DRAINAGE GULLY

HARRIS

29.9m

45.9m

20m

10.1m

3m

5m

1.5m

2m

0 2.5 5.0 7.5 10 20

scale: – 1:200

Issue:	Description:	Date	Drawn	Approved
A	Issue for client review	2/12/21	MS	SH

North

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Project:
PROPOSED AWTS AND SOIL ABSORPTION BEDS
LOT 22 DP 602041
90 Cabbage Tree Road, Bayview, NSW
LGA: NORTHERN BEACHES

Drawing Title:
WASTEWATER MANAGEMENT PLAN DETAILS SHEET No.1

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DESIGN AND CONSTRUCTION

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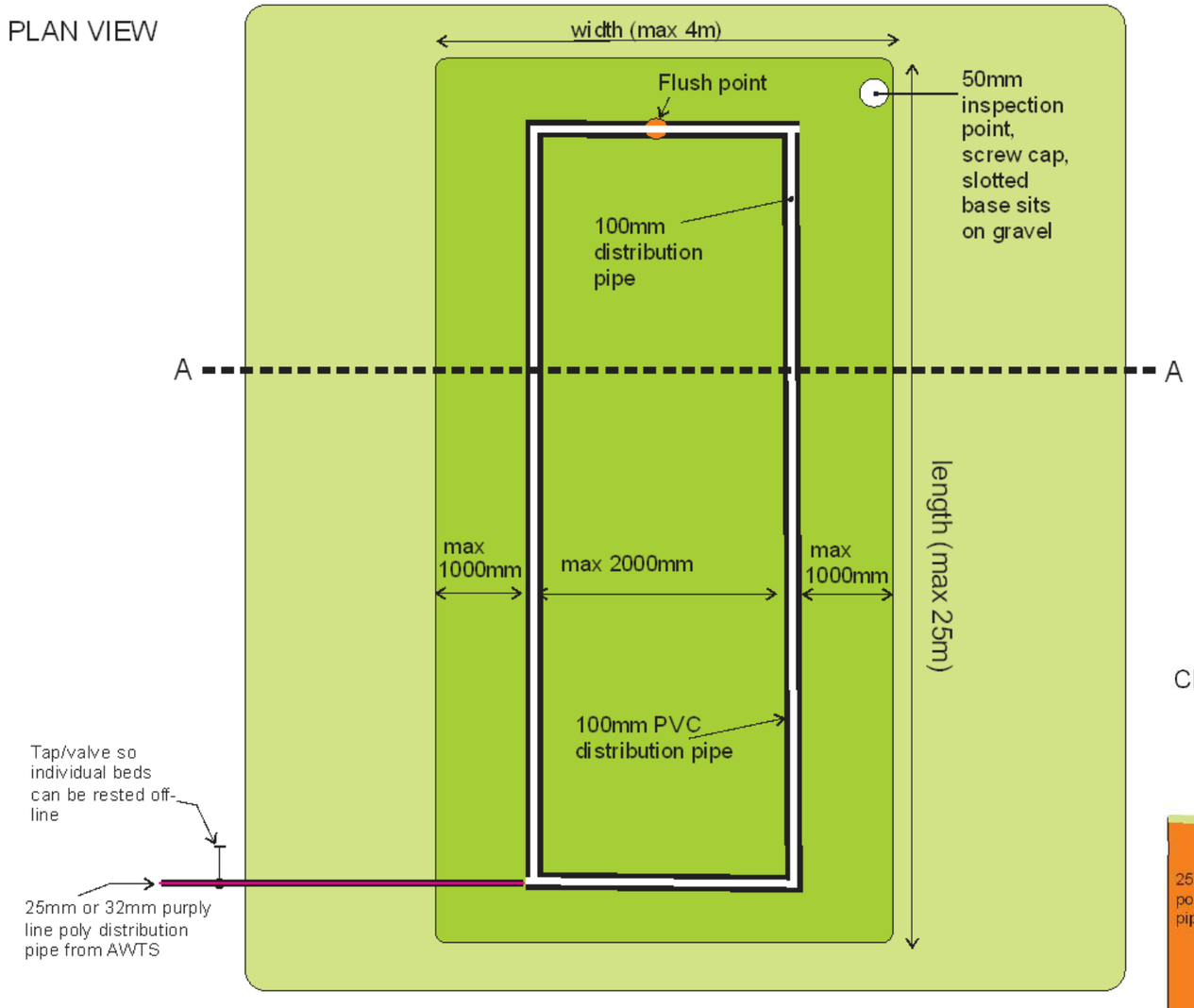
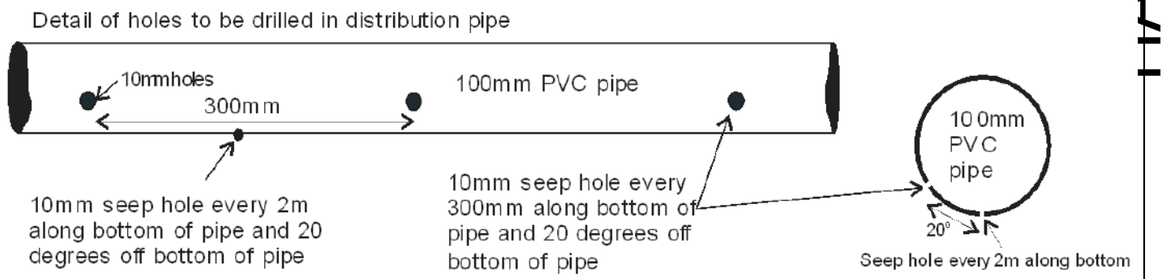
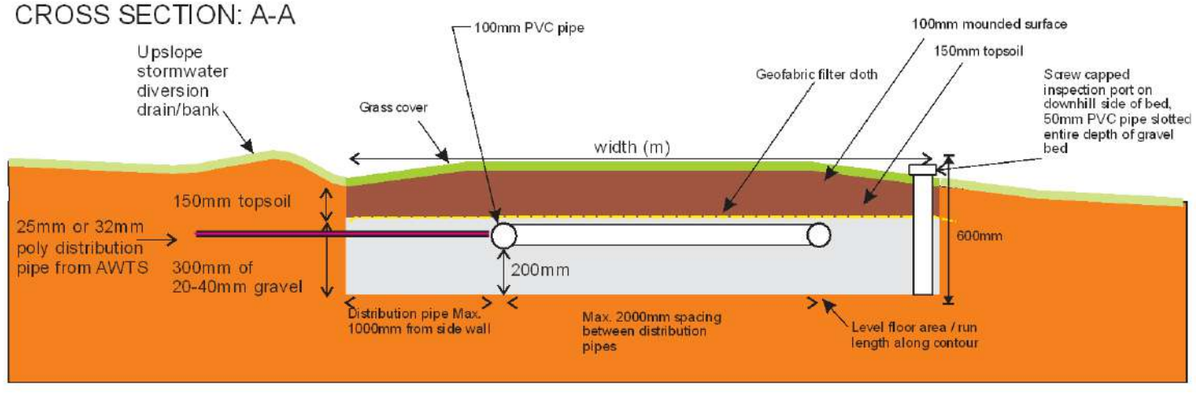
PLAN VIEW



DISTRIBUTION PIPE



CROSS SECTION: A-A



Issue:	Description:	Date	Drawn	Approved
A	HEC Standard Drawing		PS	SH

North

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Project

Drawing Title:
SOIL ABSORPTION BED STANDARD DRAWING

Drawn:	Date:	Scale:	Q.A. Check: Date:	
PS		NTS		
Designed:	Our reference:		Dwg. No.	Issue:
PS				