REF: 6352WW

VERSION [1.0]

OCTOBER 19, 2023

SOIL AND SITE ASSESSMENT FOR ONSITE WASTEWATER DISPOSAL

759 Oura Road, Eunanoreenya, NSW

LGA: Wagga-Wagga

Lot 3 DP 751405

Owner: Scouts NSW

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VERSION CONTROL

Title	Soil and Site Assessment for Onsite Wastewater Disposal			
Site address	759 Oura Road, Eunanoreenya, NSW			
Proposed development	Proposed campsite upgrade			
Created By	Katherine Rose Kilpatrick B. Sci (Geology) (UOW)			
Approved by:	Sean Harris Msc Env Science (UOW), Grad dip Nat Res (UNE), BscAppSc, Agriculture (HAC)			
Date Created	Tuesday, 3 October 2023			
Version Number	**Modified By**	**Modifications Made**	**Date Modified**	**Status**
[0.1]	K.K.	Issue for client review	13/10/2023	Draft
[1.0]	K.K.	Issue for client review	19/10/2023	Complete

Limitations

The findings and recommendations in this report are based on the objectives and scope of work outlined above. Harris Environmental Consulting performed the services in a manner consistent with the normal level of care and expertise exercised by members of the environmental assessment profession. The report and conclusions are based on the information obtained at the time of the assessment. Changes to the site conditions may occur subsequent to the investigation described herein, through natural processes or through the intentional or accidental addition of contaminants, and these conditions may change with space and time. The results of this assessment are based upon site assessment conducted by HEC personnel and information provided by the client and site management. All conclusions regarding the property are the professional opinions of the HEC personnel involved with the project, subject to the qualifications made above. While normal assessments of data reliability have been made, HEC assumes no responsibility or liability for errors in any data obtained from regulatory agencies, information from sources outside of HEC, or developments resulting from situations outside the scope of this project.

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1. INTRODUCTION

This Site and Soil Assessment for On-site Wastewater Management was prepared by Harris Environmental Consulting at the request of Scouts NSW. It relates to the proposed development to the campsite on Lot 3 DP 751405 at 759 Oura Road, Eunanoreenya, NSW.

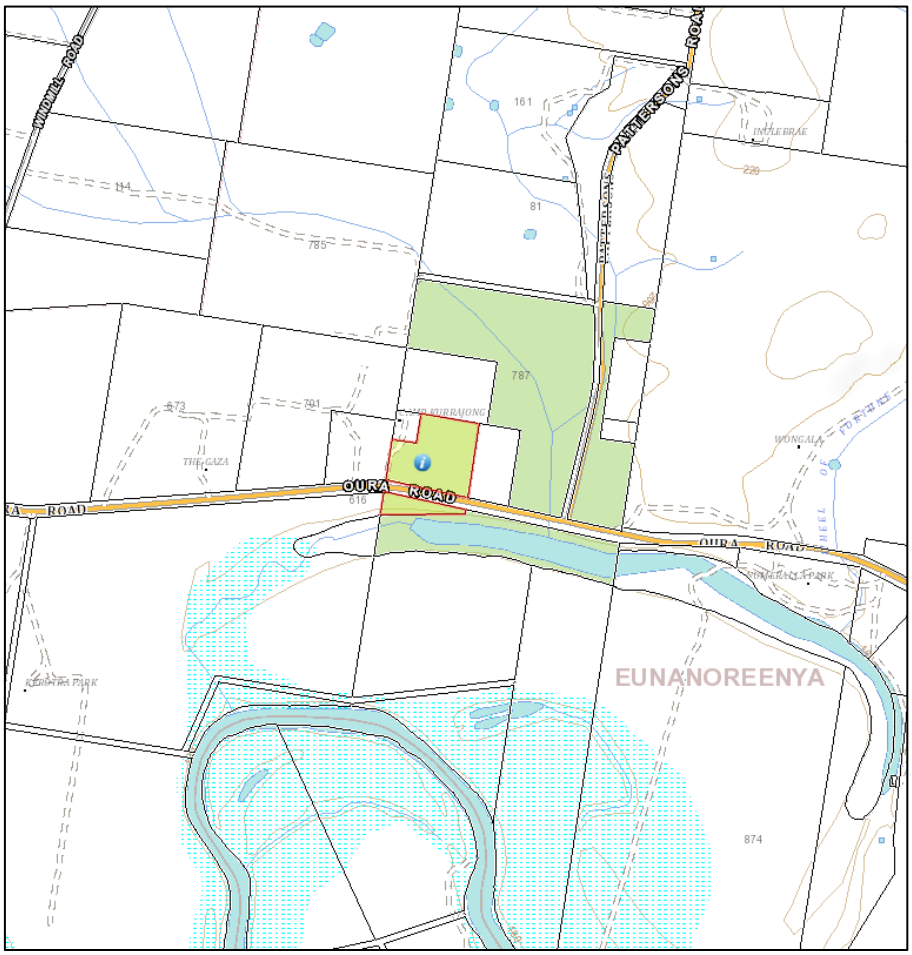
Fieldwork was undertaken by Harris Environmental Consulting (HEC) on 12th September 2023. This plan is based on the primary investigation of the soils, topography and hydrology of the site observed on the day of inspection. Soil samples and photos of the site were taken for further analysis. This assessment was undertaken for a proposal to install 4 new septic tanks and retain 1 septic tank for wastewater treatment and the installation of 4 new soil absorption beds for wastewater disposal.

The assessment was prepared to assess compliance with related requirements described in:

- Wagga Wagga Development Control Plan (2010)
- 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/NZ 1547:2012 On-site wastewater management (Standards Australia, 2012)
- Sydney Catchment Authority Neutral or Beneficial Effect (NorBE) on Water Quality Assessment Guideline (2011)

The location of the property is shown in Figure 1

FIGURE 1 LOCATION OF PROPERTY



Source: NSW Sixmaps

2. PROJECT DETAILS

Our Reference:	6352WW	
Client	Scouts NSW P: 0403 766 132 E: paul.mcintyre@nsw.scouts.com.au	
Folio:	Lot 3 DP 751405	
Site address:	759 Oura Road, Eunanoreenya, NSW	
Size of property:	~13.2 ha	
Local Government Area:	Wagga-Wagga	
Water supply	Tank	
Wastewater design load: *(As per NSW Health Septic Tank and Collection Well Accreditation Guidelines (December 2001))*	No. of visitors per fortnight *Expected Friday - Sunday*	100-200
	Design Wastewater Generation	***= 5,900L - 11,800L/day***
	Daily Treatment Volume	***3200L/day***
Proposed wastewater treatment:	Septic tank	
Proposed wastewater disposal	Soil absorption bed	
Date site assessed:	12 September 2023	
Date report prepared:	13 October 2023	
Report prepared by:	Katherine Rose Kilpatrick B. Sci (Geology) (UOW)	
Site assessor:	 Msc Env Science (UOW), Grad dip Nat Res (UNE), BscAppSc, Agriculture (HAC) Sean Harris	

3. SITE INFORMATION

Method:	Mechanical augur/crowbar/shovel
Depth to bedrock (m):	1000mm to restrictive layer; minor limitation
Depth to high soil watertable:	No groundwater or subsoil mottling encountered at a depth of 1000mm; minor limitation
Slope (%):	1-2 % Slope, minor limitation
Coarse (%):	No coarse rock fragments in subsoil, minor limitation
pH (soil/water):	pH 5.5-6; minor limitation
Electrical conductivity:	<4dSm, minor limitation
Salinity hazard:	No evidence of salinity was observed in area of existing soil absorption bed or within immediate vicinity; minor limitation
Domestic groundwater use:	The Department of Primary Industries Office of Water search of groundwater bores found there is no **known groundwater bores** within 100m of the proposed effluent management area.
Native vegetation and environmentally sensitive vegetation	No native vegetation or environmentally sensitive vegetation within 1m of the proposed EMA.
Geological Unit *(From Geoscience Australia Portal)* Soil Landscapes *(From eSPADE by NSW DPIE)*:	*Alluvium 38485 – Channel and floodplain alluvium; gravel, sand, silt, clay; may be locally calcreted.* Kurrajong Plain – *moderately deep (80 – 150 cm) Eutrophic Brown Dermosols and Eutrophic Brown Kandosols.*

Surface rock:	No surface rock in the proposed effluent management area		
Bulk density:	Moderate to well-drained soil profile; minor limitation		
Soil profile, from two similar soil profiles in EMA:	Layer 1		DLR
	Texture Colour Depth Structure Coarse frag.	Loam Dark Brown 0-100mm Moderately Structured N/A	N/A
	Layer 2		DLR
	Texture Colour Depth Structure Coarse frag.	Clay Loam Brown 100-1000mm Moderately structured N/A	10 mm/day

Photo 1 Onsite Soil Assessment.

Photo 2 Location of proposed soil absorption beds.

Photo 3 Location of proposed soil absorption beds (secondary view).

Photo 4 Existing septic tank located near northern amenities to be retained and refurbished.

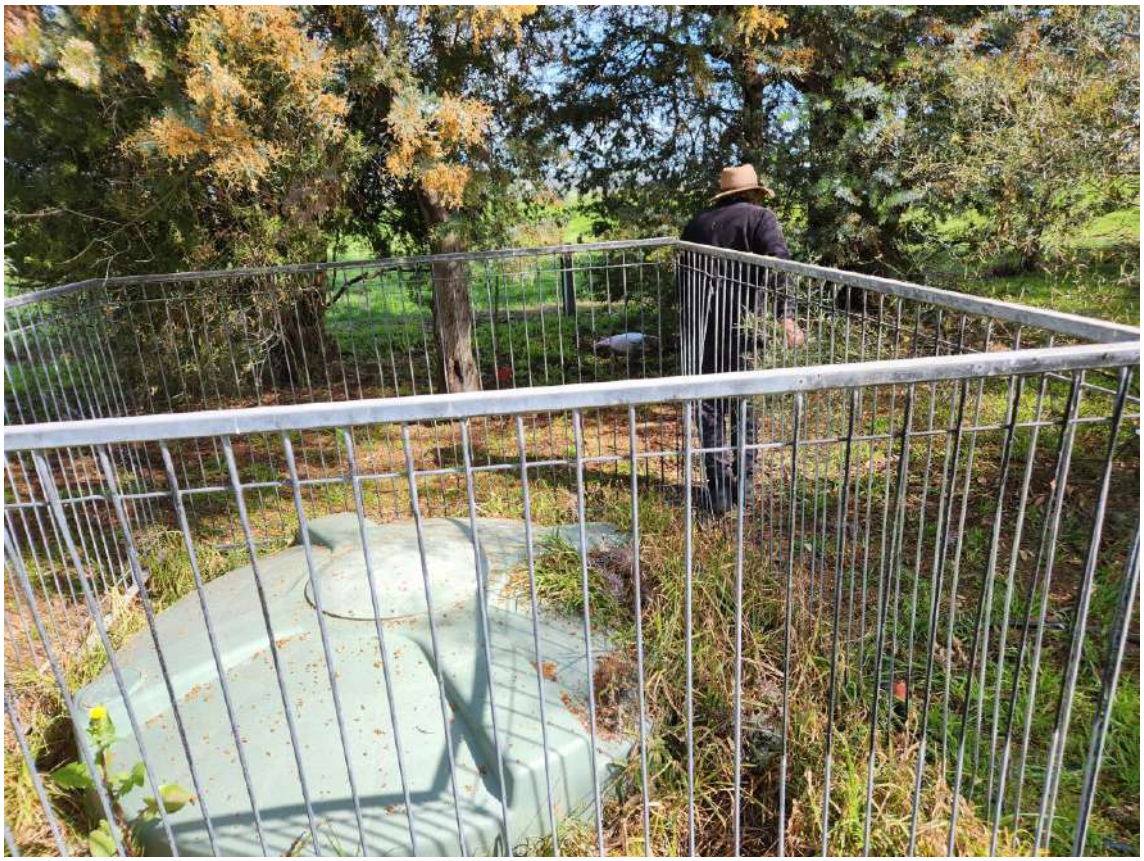


Photo 5 Existing holding tank with a capacity of ~43,320L.

4. SUMMARY OF SOIL AND SITE CONSTRAINTS

There are no major soil or site constraints that would prevent the installation of new septic tanks and retention of one existing septic tank for wastewater treatment and soil absorption beds for wastewater disposal for the proposed development.

The proposed location of the new soil absorption beds is heavily vegetated and will need to be cleared to provide at least a 1m buffer around the proposed beds. Should the existing disposal area (to become reserve area) ever need to be used, the vegetation will need to be cleared.

This location for disposal has been chosen because it the highest point on the property and is a distance from land that will be used for camp sites and recreation. Furthermore, the existing wastewater infrastructure is located nearby to this proposed area and this assessment recommends the continued use of some of the infrastructure.

The proposed soil absorption beds are at a location that is compliant with the buffers and setback distances required by Wagga-Wagga Council and Water NSW. This includes:

- More than 100m from permanent watercourses, 40m from drainage depressions and dams.
- 6m from downslope driveways/boundary lines
- 3m from upslope driveways/ boundary lines
- 6m from downslope buildings and 2m from upslope buildings

The clay loam subsoil has suitable permeability and nutrient absorption properties for this method of wastewater treatment and disposal.

5. EXISTING WASTEWATER INFRASTRUCTURE

On site at 759 Oura Road, Eunanoreenya, there are multiple pieces of wastewater infrastructure already installed and operational. These pieces include:

- 43,320L black holding tank located in the northwest of the property, north of the maintenance buildings.
- 1 septic tank and pumpwell located near the northern amenities.
- 1 septic tank and pumpwell located near the existing accommodation building, on the eastern side.
- 1 septic tank and pumpwell located near the existing amenities and office building on the western side.
- Existing ~30m long trench north of the existing holding tank

The existing trench is to be retained for reserve effluent disposal, in the event there is a power or pump failure that prevents the new beds from operating, and temporary relief is necessary. The new wastewater disposal area will be located east of this trench.

The septic tank and pumpwell located near the existing office and amenities block will be decommissioned, whereas the septic tank and pumpwell near the existing accommodation block can either be decommissioned or used as a junction for all southern pipework to merge before pumping north to the existing 43,320L holding tank.

6. SYSTEM DESIGN

6.1 REQUIRED CAPACITY OF A SEPTIC TANK

Septic tanks are to be sized in accordance with NSW Health Septic Tank and Collection Well Accreditation Guidelines (December 2001) Annexure 3:6-calculations 'Camping Grounds and/or Caravan Parks', as shown in Table 1.

TABLE 1 ALL WASTE SEPTIC TANK OPERATIONAL CAPACITIES

Camping Grounds and/or Caravan Parks	WC, urinal, basin	27	4 x No. of Sites x 27	Estimate 4 persons/site/day
	WC, urinal, basin, kitchen	32	4 x No. of Sites x 32	
	WC, urinal, basin, kitchen, & showers	59	4 x No. of Sites x 59	Septic tank capacity = daily flow + 1550 Litres
	WC, urinal, basin, kitchen, showers, & laundry	86	4 x No. of Sites x 86	

Septic Tank and Collection Well Accreditation Guideline December 2001 - Page16

For the proposed development, numerous septic tanks are required to manage the effluent being generated around the campsite. The use of a septic tank and pumpwell at each effluent source will allow for the treatment of effluent before pumping the wastewater to the main existing holding tank. Table 2 explores the required size of each septic tank at each source, stating the minimum volume of the tank.

TABLE 2 SEPTIC TANK SIZING FOR DIFFERENT SOURCE LOCATIONS

	Section 1 - Northern Amenities	Section 2 - Southern Amenities	Section 3 - Duty Manager Cottage	Section 4 - Conference Room	Section 5 - Accommodation Cabins	Section 6 - Merritt Building
Assumed WW Load (L)	-	-	59	27	59	59
People	-	-	2	138	60	16
Toilets	8	8	1	6	24	1
Showers	4	4	1	-	14	1
Septic Tank Calculations (L)				3,726	3,540	944
Sludge Allowance (L)	1,550	1,550	1,550	1,820	1,550	1,550
Minimum Septic Tank Size(L)	3,000	3,000	1,668	5,546	5,090	2,494
						6,034

From the above table, the septic tanks located near the northern amenities, southern amenities, Duty Manager Cottage, and the Merritt Buildings will need a 3000L minimum-sized tank. The Conference Room and Accommodation Cabins will require a septic tank of a minimum size of 5,600L. Furthermore, due to the close proximity of the Accommodation Hall and Merritt Buildings, if found to be preferable, only 1 septic tank and pumpwell may be installed to service the buildings. This source would require a 6,500L septic tank to service the 2 buildings, as seen in Table 2.

However, this assessment recommends each new septic tank be oversized to 10,000L to allow for surge capacity, as the usage of each amenities block can vary. All new and existing tanks should be fitted with alarms, that are both visual and audible, and that sound at 80% capacity.

With each new septic tank, an associated pumpwell is required to be installed to collect and transfer the treated effluent to the existing holding tank. Any existing septic tanks and pumps will need to be connected to the existing holding tank, if not already connected.

The collection/pump wells shall be fitted with a submersible vortex pump that pumps treated effluent to the disposal area when triggered by a float switch, with the installer to decide the

specifications of the required pumps, so as to be site-specific. NSW Health requires any pumpwell (also known as a collection tank) to be of a minimum capacity of 2000 litres. In the case of the septic tank and pumpwell being installed as separate units, the float switch will operate when the volume of wastewater in the tank reaches a certain volume. The installing plumber is to decide this volume, as to be site-specific. Should the pumpwell and septic tank be constructed as a single unit, this requirement may be unnecessary, given its purpose is to ensure the tank remains bedded.

The existing septic tank and pumpwell located near the northern amenities may be retained for wastewater treatment, conditional on the existing system being found in good working order.

The location of any new treatment system is to be located downslope of the source buildings. However, please note:

- The exact location of the septic tank is to be decided by the installer in consultation with the property owner.
- It is to be at least 1.5m from any building.
- Shall be located above the 1% AEP (1:100) flood contour.

6.2 OUTLET FILTER

An effluent filter is to be installed at the outlet of the septic tank.

- Outlet filters reduce TSS and BOD which are known to be the key factors in clogging soil-based absorption systems and resulting in hydraulic failure.
- Septic tank outlet filters provide a warning as to when maintenance of the system is required and involve the user in the oversight and maintenance of their systems.
- Manufacturers include Taylex, Everhard, XtraTreat, OSI FTi, Biotube, and Zoeller WW.

6.3 PIPES

The sewer pipes between the plumbing amenities, treatment system, and effluent disposal area must conform with 'AS/NZS 3500(Set):2018 Plumbing and Drainage Set' specifying the nominal pipe sizes and respective minimum grades. Table 3 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, septic tank, and effluent disposal area must be buried at a depth that provides protection against mechanical damage or deformation, in accordance with 'AS/NZS 3500(Set):2018 Plumbing and Drainage Set'. Table 4 shows the minimum pipe depth for trafficable areas.

TABLE 3 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 4 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'

Upon installation, if the installing plumber identifies a more efficient, site-specific means of installing the above-mentioned wastewater management systems and pipework, they may do so providing it meets all standards and required Council Guidelines, and tanks maintain their required capacities, as outlined in this report.

7. SIZING OF SOIL ABSORPTION BEDS

The effluent disposal area will need to be sized for such a volume that the exiting holding tank is emptied before ethe following fortnights visitors. Appendix I shows a balance sheet that includes these calculations for differing event number and durations. Visitor numbers shown represent the capacity of the system. From the flow balancing, **the daily treatment volume has been calculated at 3,200L/day.**

The soil absorption bed can be constructed within the range of widths and depths shown in Table 5 (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 the ground surface (300mm aggregate and 150mm topsoil).

TABLE 5 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) recommends a DLR of 10mm/day for clay loam soils, receiving primary treated effluent.

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 **(3200L/day)**
W = Width in m **(4m)**
DLR = Design Loading Rate in mm/d **(10mm/day)**

Based on the above formulae and assumptions described in this report, the soil absorption beds must be **20m long, or 80m^2 each, with 4 beds being installed, for a total area of 320m^2.**

7.1 DISTRIBUTION BOX

A splitter distribution box is required to provide an even flow to each bed. Splitter boxes should be checked as part of performance monitoring inspections to confirm that an even flow of effluent is being directed to each distribution line. An example of a splitter box is shown in Figure 2.

FIGURE 2 DISTRIBUTION BOX

8. SUMMARY

The assessment was prepared for the proposed Camp Kurrajong developments. This assessment recommends the following:

- The installation of 4 new septic tanks and pumpwells, sized accordingly for the associated source building, as described in this report, and shown in site plans.
- Retention of the existing septic tank and pumpwell located near the northern amenities, if found to be in good working order.
- Retention of the existing 43,320L holding tank as a collection well for all treated effluent before disposal.
- This holding tank will transfer 3,200L/day to the absorption beds.
- Installation of 320m^2 of soil absorption bed as four (4), 20m long x 4m wide beds, as described in the Appendix and shown on the Site Plan.
- The beds need to receive a proportionate distribution of wastewater, which can be achieved manually using gate valves or similar.
- Retention of the existing trench for reserve effluent disposal in the event the primary system fails.

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.

Sydney Catchment Authority Neutral or Beneficial Effect on Water Quality Assessment Guideline (2011).

Designing and Installing On Site Wastewater Systems. A Sydney Catchment Authority Current Recommended Practice (May 2012).

APPENDIX I FLOW BALANCING SHEET

		beds = 59L	camping = 59L	Total Occpancy	WW Load	Daily Treatment Volume (L)	Daily Net Change in Volume (L)	0
Week 1	Monday	0	0	0	0	3200	-3200	0
	Tuesday	0	0	0	0	3200	-3200	0
	Wednesday	0	0	0	0	3200	-3200	0
	Thursday	0	0	0	0	3200	-3200	0
	Friday	120	80	200	11800	3200	8600	8600
	Saturday	120	80	200	11800	3200	8600	17200
	Sunday	120	80	200	11800	3200	8600	25800
Week 2	Monday	0	0	0	0	3200	-3200	22600
	Tuesday	0	0	0	0	3200	-3200	19400
	Wednesday	0	0	0	0	3200	-3200	16200
	Thursday	0	0	0	0	3200	-3200	13000
	Friday	0	0	0	0	3200	-3200	9800
	Saturday	0	0	0	0	3200	-3200	6600
	Sunday	0	0	0	0	3200	-3200	3400
Week 3	Monday	0	0	0	0	3200	-3200	200
	Tuesday	0	0	0	0	3200	-3200	0
	Wednesday	0	0	0	0	3200	-3200	0
	Thursday	0	0	0	0	3200	-3200	0
	Friday	100	0	100	5900	3200	2700	2700
	Saturday	100	0	100	5900	3200	2700	5400
	Sunday	100	0	100	5900	3200	2700	8100
Week 4	Monday	100	0	100	5900	3200	2700	10800
	Tuesday	100	0	100	5900	3200	2700	13500
	Wednesday	100	0	100	5900	3200	2700	16200
	Thursday	100	0	100	5900	3200	2700	18900
	Friday	100	0	100	5900	3200	2700	21600
	Saturday	100	0	100	5900	3200	2700	24300
	Sunday	100	0	100	5900	3200	2700	27000
Week 5	Monday	100	0	100	5900	3200	2700	29700
	Tuesday	100	0	100	5900	3200	2700	32400
	Wednesday	100	0	100	5900	3200	2700	35100
	Thursday	100	0	100	5900	3200	2700	37800
	Friday	100	0	100	5900	3200	2700	40500
	Saturday	100	0	100	5900	3200	2700	43200
	Sunday	0	0	0	0	3200	-3200	40000
Week 6	Monday	0	0	0	0	3200	-3200	36800
	Tuesday	0	0	0	0	3200	-3200	33600
	Wednesday	0	0	0	0	3200	-3200	30400
	Thursday	0	0	0	0	3200	-3200	27200
	Friday	0	0	0	0	3200	-3200	24000
	Saturday	0	0	0	0	3200	-3200	20800
	Sunday	0	0	0	0	3200	-3200	17600

Week 7	Monday	0	0	0	0	3200	-3200	14400
	Tuesday	0	0	0	0	3200	-3200	11200
	Wednesday	0	0	0	0	3200	-3200	8000
	Thursday	0	0	0	0	3200	-3200	4800
	Friday	0	0	0	0	3200	-3200	1600
	Saturday	0	0	0	0	3200	-3200	0
	Sunday	0	0	0	0	3200	-3200	0
Week 8	Monday	0	0	0	0	3200	-3200	0
	Tuesday	0	0	0	0	3200	-3200	0
	Wednesday	0	0	0	0	3200	-3200	0
	Thursday	0	0	0	0	3200	-3200	0
	Friday	0	0	0	0	3200	-3200	0
	Saturday	0	0	0	0	3200	-3200	0
	Sunday	0	0	0	0	3200	-3200	0
Week 9	Monday	0	0	0	0	3200	-3200	0
	Tuesday	0	0	0	0	3200	-3200	0
	Wednesday	0	0	0	0	3200	-3200	0
	Thursday	0	0	0	0	3200	-3200	0
	Friday	120	80	200	11800	3200	8600	8600
	Saturday	120	80	200	11800	3200	8600	17200
	Sunday	120	80	200	11800	3200	8600	25800
Week 10	Monday	0	0	0	0	3200	-3200	22600
	Tuesday	0	0	0	0	3200	-3200	19400
	Wednesday	0	0	0	0	3200	-3200	16200
	Thursday	0	0	0	0	3200	-3200	13000
	Friday	0	0	0	0	3200	-3200	9800
	Saturday	0	0	0	0	3200	-3200	6600
	Sunday	0	0	0	0	3200	-3200	3400
Week 11	Monday	0	0	0	0	3200	-3200	200
	Tuesday	0	0	0	0	3200	-3200	0
	Wednesday	0	0	0	0	3200	-3200	0
	Thursday	0	0	0	0	3200	-3200	0
	Friday	100	0	100	5900	3200	2700	2700
	Saturday	100	0	100	5900	3200	2700	5400
	Sunday	100	0	100	5900	3200	2700	8100
Week 12	Monday	0	0	0	0	3200	-3200	4900
	Tuesday	0	0	0	0	3200	-3200	1700
	Wednesday	0	0	0	0	3200	-3200	0
	Thursday	0	0	0	0	3200	-3200	0
	Friday	0	0	0	0	3200	-3200	0
	Saturday	0	0	0	0	3200	-3200	0
	Sunday	0	0	0	0	3200	-3200	0

APPENDIX II CONSTRUCTION OF SOIL ABSORPTION BEDS

The following is a summary of construction notes from WaterNSW (2019) and should be read in conjunction with Standard Drawing attached. Refer to these documents if further clarification is required.

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 beds along the contours and use laser leveling 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.

The basal area of the beds has been determined according to the procedures in AS/NZS 1547(2012) and WaterNSW (2019). This includes a minimum bed length to width ratio of 3:1, beds must be installed parallel to the site contours and beds must be of the same basal area if they are receiving the same volume of wastewater.

Always avoid cutting bed through existing weakened ground (e.g., through the alignments of former underground pipes, cables or conduits) as they may provide preferential pathways for the effluent to escape from the bed. If they cut downslope through the ground occupied by a series of bed, effluent may preferentially flow to the lowest bed causing it to fail or surcharge. Where it is unavoidable to cut into alignment or it happens accidentally, seal the weaknesses in the bed walls with cement or bentonite grout.

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 beds promptly to avoid foreign material being washed into the open bed. In particular, avoid puddling, where clay settles out at the bottom of a water filled trench exposed to rain, as clay settling on the base of the bed will reduce bed performance.

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.

- Where beds are dug by excavator in clayey soils, any smearing of the bed walls and floor must be fixed by scarifying the surface.

Step 5 Construction

- Install arch drain (Reln) that complies with AS/NZS1547:2012.
- Ensure that the sides of beds are not damaged or caused to collapse when the beds are filled with gravel or sand.
- Beds can be filled with gravel (typically 20-40 millimetres).
- Lay geotextile filter cloth over the gravel and under the topsoil to ensure that the topsoil does not penetrate and block the bed.
- 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

- Beds may be gravity-fed or pressure-dosed using pumps or dosing siphons. Raised pressure-dosed absorption beds are a possible alternative where there are shallow limiting layers present (e.g., bedrock, clay or water table) and not enough separation distance from that layer. The linear loading rate must be addressed in these situations.
- Install a hydraulically operated indexing valve that delivers effluent to a different trench / bed or set of laterals at each pump cut in.
- Checklist 10.1 details matters that should be checked when trenches or beds are installed. Plumbers/ installers and Council inspectors can use this checklist to ensure installation has been completed properly - see http://www.sca.nsw.gov.au/publications/publications/designing-and-installing-on-site-wastewater-systems

APPENDIX III 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 IV REQUIRED BUFFERS

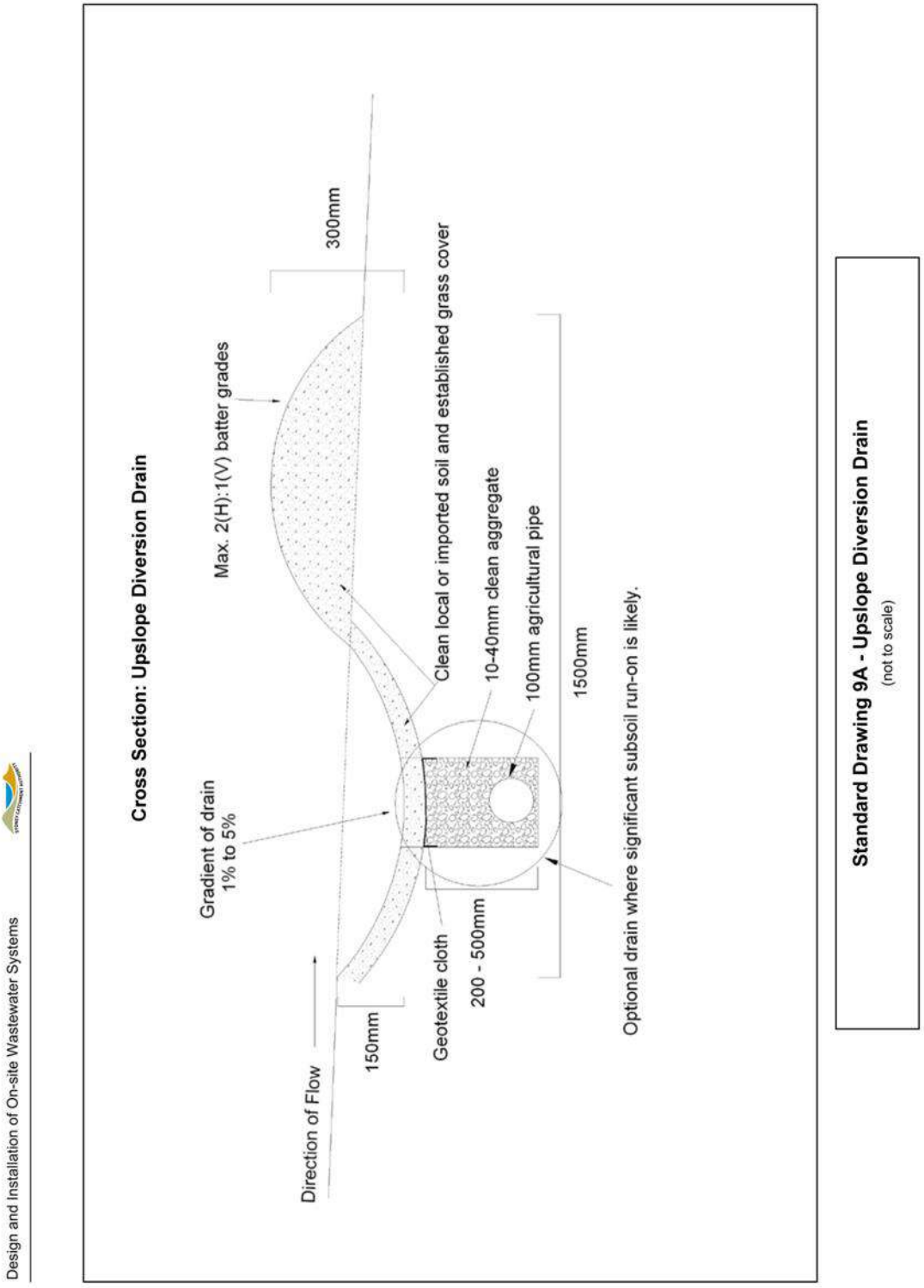
The following buffers must be applied when installing all onsite sewage management systems in accordance with WaterNSW (2019) and the Wagga-Wagga Council's Development Control Plan.

Table 2.6 – Buffer distances

Feature	Level of effluent treatment	Effluent application method	Buffer distance (minimum)	Achievable
Buildings, retaining walls	Primary	Subsoil	2.0m downslope and where flat, or 6.0m upslope of the feature	□ Yes □ No □ N/A
	Secondary (disinfected)	Subsurface and surface (including drip or trickle) irrigation	2–6m (<3m only for drip irrigation on low rate)	□ Yes □ No □ N/A
Premises boundaries, paths and walkways, recreation areas	Primary	Subsoil	3.0m downslope and where flat, or 6.0m upslope of the feature; 15m to recreation areas, if by LPED irrigation	□ Yes □ No □ N/A
	Secondary (disinfected)	Subsurface irrigation	3.0m downslope and where flat, or 4.0m upslope of the feature	□ Yes □ No □ N/A
		Surface irrigation	15m up- or downslope of the feature	□ Yes □ No □ N/A
In ground potable water tanks, in ground swimming pools	Primary	Subsoil	15m and downslope from water tank or pool	□ Yes □ No □ N/A
	Secondary (disinfected)	Subsurface and surface irrigation	4.0m - should not be located upslope of feature	□ Yes □ No □ N/A
Watercourse, lakes and the full supply level for all water supply reservoirs	Primary	Subsoil	100m from the high water level	□ Yes □ No □ N/A
	Secondary (disinfected)	Subsurface and surface irrigation	100m from the high water level	□ Yes □ No □ N/A
Bore or well licenced for domestic^ consumption	Primary	Subsoil	100m	□ Yes □ No □ N/A
	Secondary (disinfected)	Subsurface and surface irrigation	100m	□ Yes □ No □ N/A

Feature	Level of effluent treatment	Effluent application method	Buffer distance (minimum)	Achievable
Drainage depressions, farm dams and roadside drainage and lot scale stormwater quality improvement devices	Primary	Subsoil	40m from the high water level	◻ Yes ◻ No ◻ N/A
	Secondary (disinfected)	Subsurface and surface irrigation	40m from the high water level	◻ Yes ◻ No ◻ N/A
^ If within 100 metres of a bore or well licenced for domestic consumption, a draw-down analysis is required using an appropriate methodology, such as Cromer, Gardner and Beavers, 2001 'An improved viral die-off method to estimate setback distances'. Domestic consumption is taken to mean for drinking, watering of edible plants etc.				

APPENDIX V STANDARD DRAWING 9A - UPSLOPE DIVERSION DRAIN



SITE PLAN: KEY

- SUBJECT PROPERTY BOUNDARY - as provided by client
- NEIGHBOURING PROPERTY BOUNDARIES
- 2m CONTOURS
- 25mm (ID) POLY PIPE - pressurised
- 100mm PVC PIPE - gravity fed
- EXISTING 43,320L HOLDING TANK - to be retained
- EXISTING SEPTIC TANK - to be retained
- EXISTING PUMPWELL/COLLECITON WELL - to be retained
- GATE VALVE or similar
- EXISTING SEPTIC TANK + PUMPWELL- to be decomissioned
- PROPOSED SEPTIC TANK - final location to be decided in conjunction with owner and installer
- PROPOSED PUMPWELL/COLLECITON WELL
- PROPOSED SOIL ABSORPTION BEDS - 320sqm
- EXISTING EFFLUENT DISPOSAL TRENCH - ~30sqm
- EXISTING STRUCTURES - to be demolished
- EXISTING MAINTANCE BUILDINGS
- EXISTING ACCOMMODATION ROOMS - Merritt
- PROPOSED ACCOMMODATION HALL
- PROPOSED CONFERENCE ROOM/HALL
- PROPOSED DUTY MANAGER COTTAGE
- PROPOSED NORTHERN AMENITIES
- PROPOSED SOUTHERN AMENITIES
- PROPOSED INTERNAL ROADS/PATHS

HARRIS

7.5m
7.5m
20.0m
4.0m
0.6m
~30.0m
4.0m
20.0m
4.0m
20.0m
~58.0m
4.0m
23.8m
36.0m

0 10 20 30 40 50 100

scale: – 1:1250

Issue:	Description:	Date	Drawn	Approved
v0.1	Issue for client review	28.09.23	KK	SH
v1.0	Issue for client review	11.10.23	KK	SH
v1.1	Issue for client review	19.10.23	KK	SH

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Wastewater | Bushfire | Stormwater

Project:
PROPOSED NEW WASTEWATER DISPOSAL SYSTEM
LOT 179 DP 751405
LOT 3 DP 751405
LOT 7004 DP 1069230
759 OURA ROAD, EUNANOREENYA, NSW
LGA: WAGGA WAGGA

Drawing Title:
WASTEWATER MANAGEMENT PLAN DETAILS SHEET No.1

Drawn:	Date:	Paper Size:	Q.A. Check:	Date:
KK	19.10.2023	ISO Expand A3	Complete	19.10.2023
Designed:	Our reference:	Scale:	Issue:	
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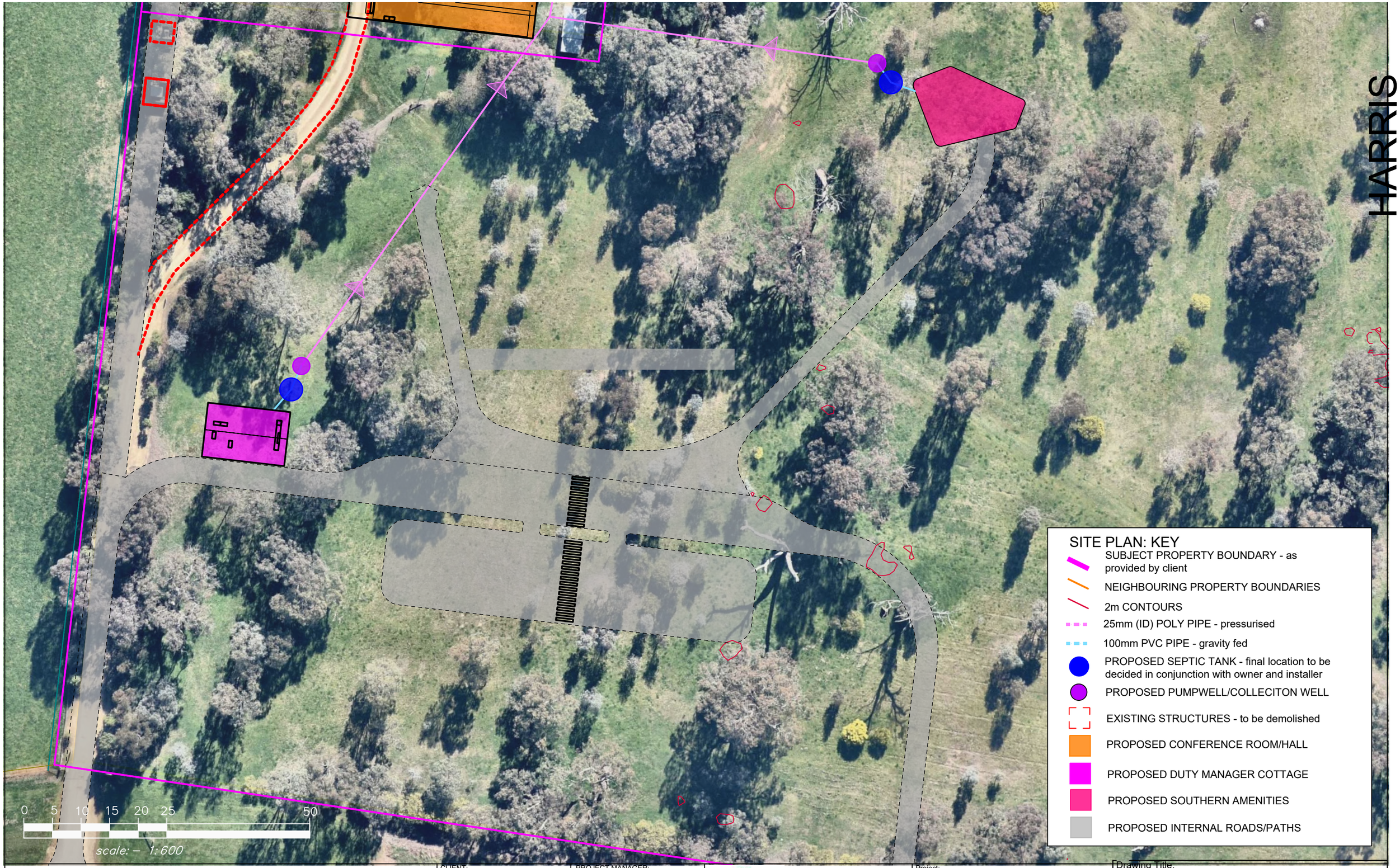

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LGA: WAGGA WAGGA

Drawing Title:
WASTEWATER MANAGEMENT PLAN DETAILS SHEET No.2 - Duty Manager Cottage & Southern Amenities

Drawn:	Date:	Paper Size:	Q.A. Check: Date:
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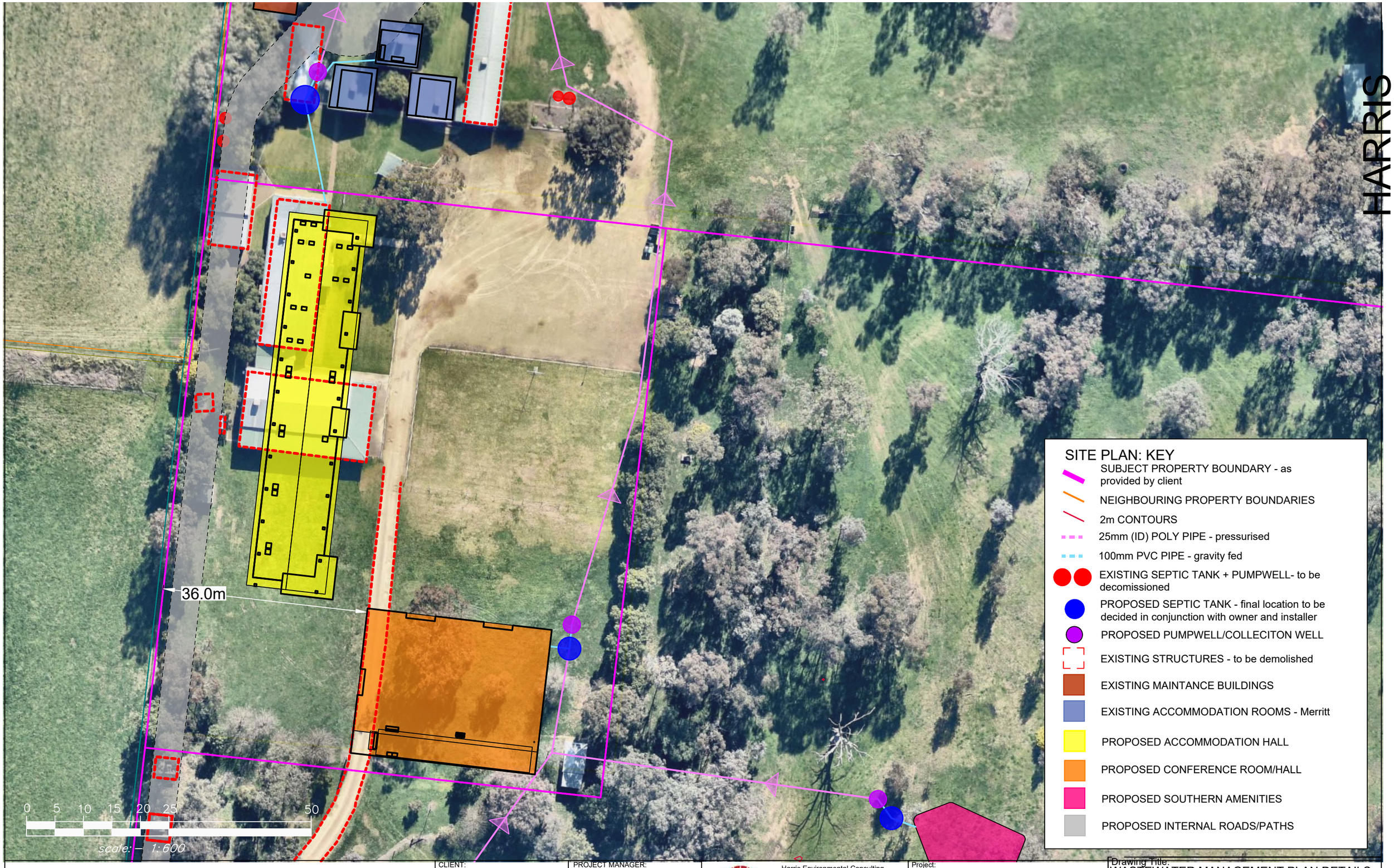
Designed:	**Our reference:**	**Scale:**	**Issue:**
KK	6352WW	1:600	v1.1



Issue:	Description:	Date	Drawn	Approved
v0.1	Issue for client review	28.09.23	KK	SH
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759 OURA ROAD, EUNANOREENYA, NSW
LGA: WAGGA WAGGA

Drawing Title:
WASTEWATER MANAGEMENT PLAN DETAILS SHEET No.3 - Accommodation Hall, Merritt Buildings & Conference Room

Drawn:	Date:	Paper Size:	Q.A. Check:	Date:
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Designed:	Our reference:	Scale:	Issue:	
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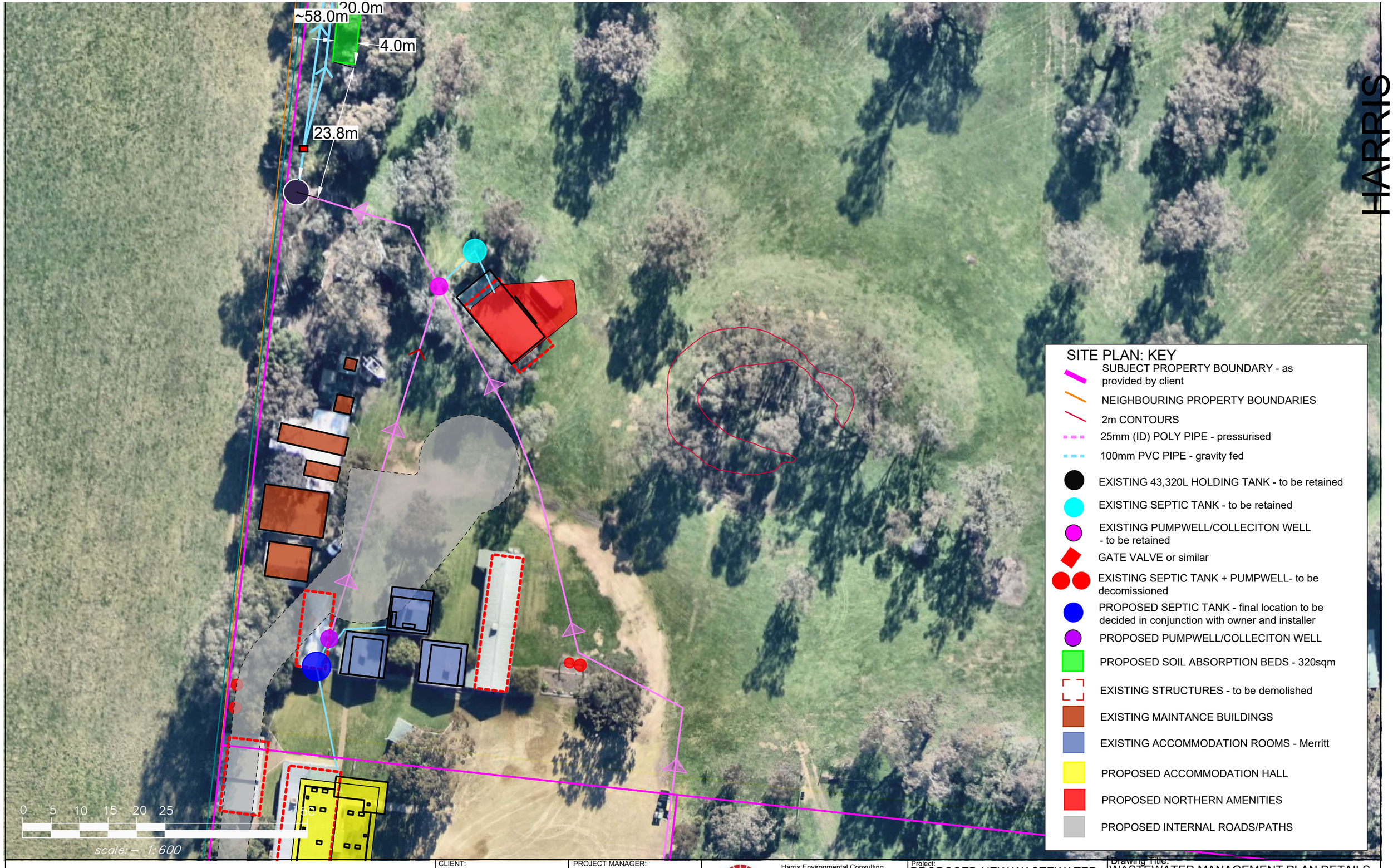

Issue:	Description:	Date	Drawn	Approved
v0.1	Issue for client review	28.09.23	KK	SH
v1.0	Issue for client review	11.10.23	KK	SH
v1.1	Issue for client review	19.10.23	KK	SH

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LOT 7004 DP 1069230
759 OURA ROAD, EUNANOREENYA, NSW
LGA: WAGGA WAGGA

Drawing Title:
WASTEWATER MANAGEMENT PLAN DETAILS SHEET No.4 - Merritt Buildings, Maintance Buildings & Northern Amenities

Drawn:	Date:	Paper Size:	Q.A. Check:	Date:
KK	19.10.2023	ISO Expand A3	Complete	19.10.2023
Designed:	Our reference:	Scale:	Issue:	
KK	6352WW	1:600	v1.1	

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- 100mm PVC PIPE - gravity fed
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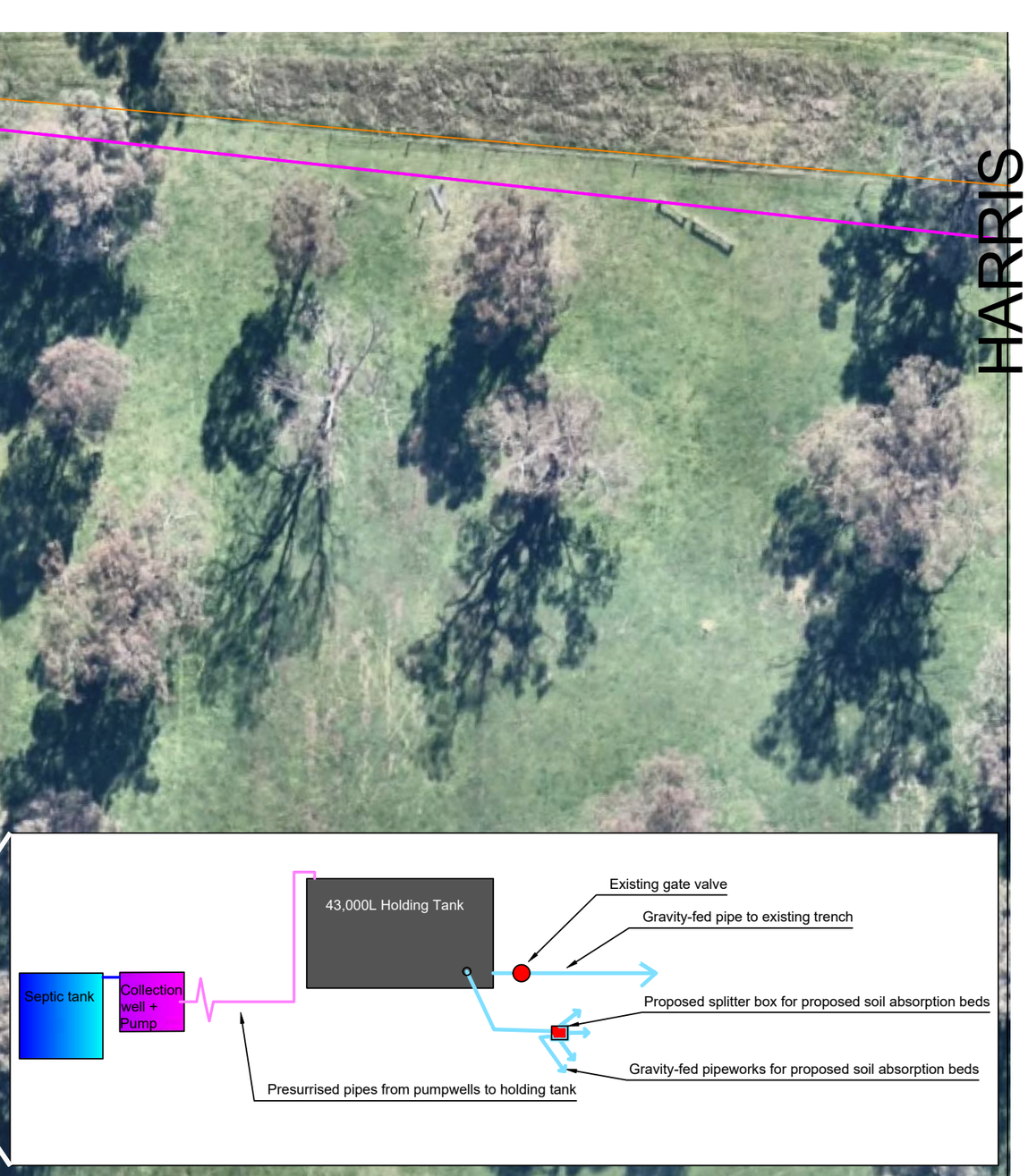
- EXISTING SEPTIC TANK - to be retained
- EXISTING PUMPWELL/COLLECITON WELL - to be retained
- GATE VALVE or similar
- PROPOSED SEPTIC TANK - final location to be decided in conjunction with owner and installer
- PROPOSED PUMPWELL/COLLECITON WELL
- EXISTING EFFLUENT DISPOSAL TRENCH - ~30sqm

~0.6m

~30.0m

~58.0m

HARRIS



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Issue:	Description:	Date	Drawn	Approved
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v1.0	Issue for client review	11.10.23	KK	SH
v1.1	Issue for client review	19.10.23	KK	SH

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Wastewater | Bushfire | Stormwater

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LGA: WAGGA WAGGA

Drawing Title:
WASTEWATER MANAGEMENT PLAN
DETAILS SHEET No.5 - existing trench

Drawn: KK	Date: 19.10.2023	Paper Size: ISO Expand A3	Q.A. Check: Complete Date: 19.10.2023
Designed: KK	Our reference: 6352WW	Scale: 1:500	Issue: v1.1

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- GATE VALVE or similar
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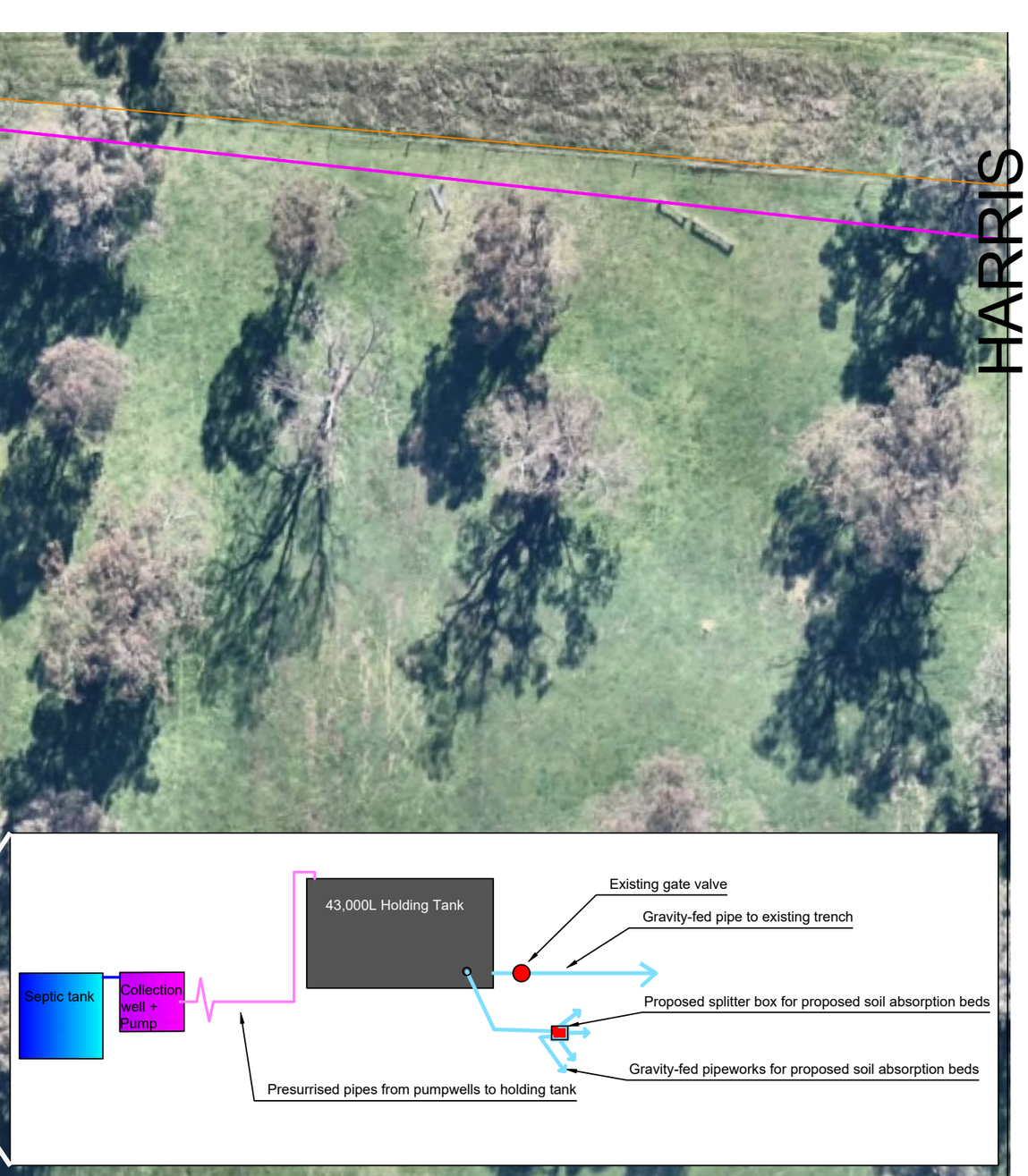
- PROPOSED PUMPWELL/COLLECITON WELL
- PROPOSED SOIL ABSORPTION BEDS - 320sqm

7.5m
7.5m
20.0m
4.0m
20.0m
4.0m
20.0m
4.0m
20.0m
4.0m
23.8m

HARRIS



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Issue:	Description:	Date	Drawn	Approved
v0.1	Issue for client review	28.09.23	KK	SH
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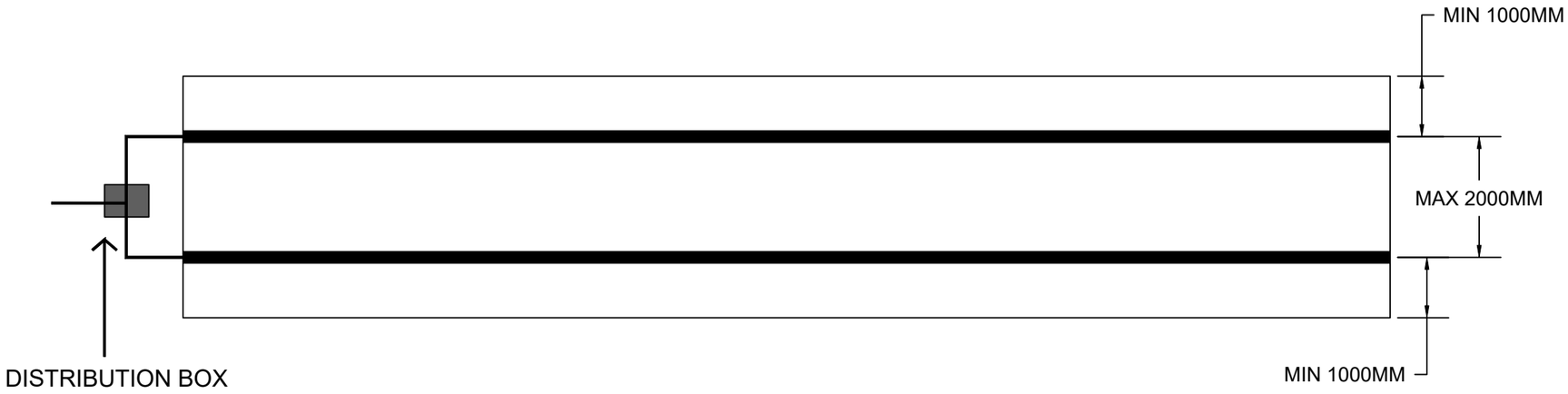
Drawing Title:
WASTEWATER MANAGEMENT PLAN DETAILS SHEET No.6 - proposed EMA

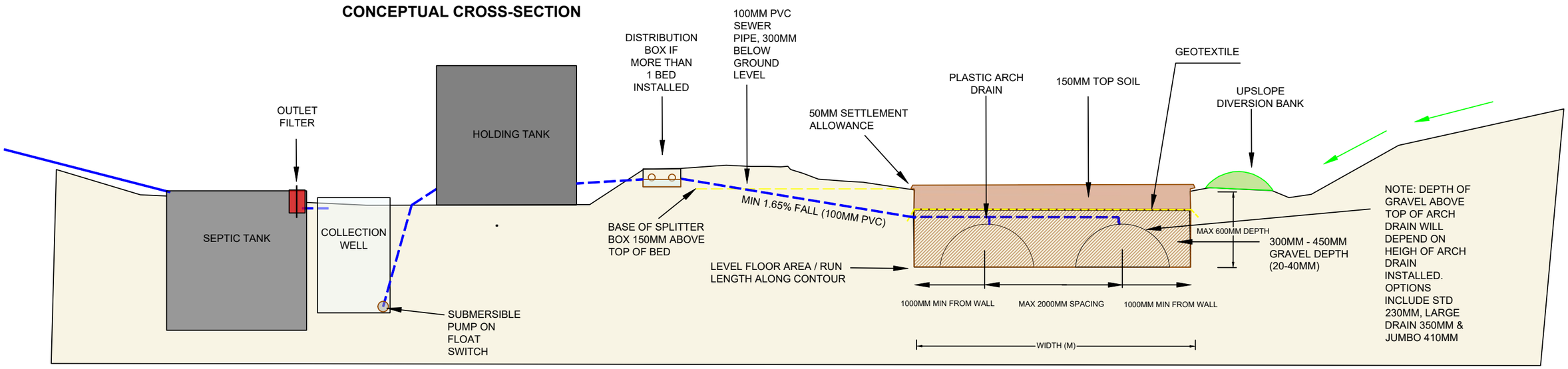
Drawn:	Date:	Paper Size:	Q.A. Check: Date:
KK	19.10.2023	ISO Expand A3	Complete 19.10.2023
Designed:	**Our reference:**	**Scale:**	**Issue:**
KK	6352WW	1:500	v1.1

PLAN VIEW: TYPICAL BED



HARRIS

CONCEPTUAL CROSS-SECTION



Issue:	Description:	Date	Drawn	Approved
A	HEC Standard Drawing	28/09/2023	KK	SH

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Wastewater | Bushfire | Stormwater

Project

Drawing Title:
SOIL ABSORPTION BED WITH PUMP WELL & HOLDING TANK STANDARD DRAWING

Drawn:	Date:	Scale:	Q.A. Check:	Date:
KK	28/09/2023	NTS		
Designed:	Our reference:		Dwg. No.	Issue:
SH				A