Westlink Industrial Estate, Kemps Creek

Stage 1 Civil Infrastructure and Water Management Strategy

ESR Development (Australia) Pty Ltd

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Commercial in Confidence

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1. Introduction

This report has been prepared by AT&L on behalf of ESR Australia in support of a State Significant Development Application (SSD-9138102) for the proposed development of the site located at 290-308 Aldington Road and 59-63 Abbotts Road, Kemps Creek (the Site).

1.1. Site Description

The extent of the site is presented in Figure 1.

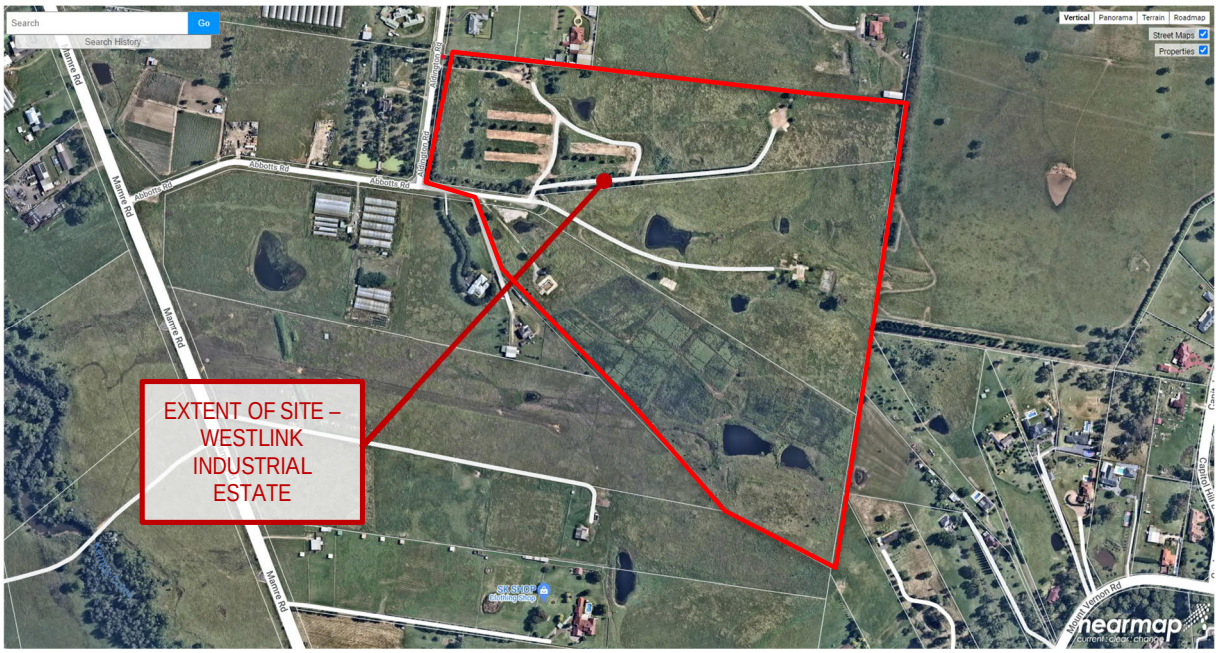


Figure 1: Site Extent (imagery from nearmap, dated 17 February 2022)

The site is located in the suburb of Kemps Creek, within the Penrith Local Government Area (LGA), and approximately 15 km south-east of the Penrith CBD and 5 km north-east of the under-construction Western Sydney Airport. The site is made up of the following allotments:

- Lot 11 DP253503 (63 Abbotts Road, Kemps Creek)
- Lot 12 DP253503 (59-62 Abbotts Road, Kemps Creek)
- Lot 13 DP253503 (290-308 Aldington Road, Kemps Creek)

The total area of the site is approximately 32 hectares.

The site is currently characterised as rural land and comprises residential dwellings, agricultural areas, sheds, greenhouses and some farm dams.

In June 2020, the site was rezoned *IN1 – General Industrial* under the *State Environmental Planning Policy (Western Sydney Employment Area) 2009*. The site is also located in the Mamre Road Precinct and is therefore subject to controls outlined in the *Mamre Road Precinct Development Control Plan 2021*.

1.2. Supporting Documentation

The following documentation is referred to throughout and should be read in conjunction with this report:

- Civil Drawings (AT&L), 20-748-C1000 (Infrastructure) and C2000 (on-lot) series – refer to Appendix 1.
- Aldington Road Concept Design, Stage 1 – Interim / Ultimate Civil Works Package (AT&L), 21-843-C500 series – refer to Appendix 2.

2. Compliance with SEARs

This report responds to the NSW Planning Secretary's Environmental Assessment Requirements (SEARs) issued by the NSW Department of Planning, Industry and Environment (DPIE) in September 2020 and subsequently updated in December 2020. Table 1 below summaries all key civil infrastructure and water management issues raised in the SEARs and how they have been addressed in this report.

Table 1: Planning Secretary's Environmental Assessment Requirements addressed in this report

Key Issue listed in the SEARs	Response
Traffic and Transport	
Connection of development to adjoining sites Detailing how the proposed development connects to adjoining sites to facilitate their future development for their intended purposes	Refer to the General Arrangement presented as drawing 20-748–C1005, which presents the proposed extension of Abbotts Road into the Westlink Industrial Estate. This road extension will provide connection to adjoining lots to the southeast for future development via further extension of Abbotts Road beyond the cul-de-sac currently proposed in the south-east of the proposed development. It is proposed that detailed coordination of precinct connectivity may occur post formal SSD exhibition stage to enable concurrent development of the Aldington Road Precinct Structure Plan – Local Road Network Structure Plan by TfNSW and Penrith City Council.
Site access and internal road layout Detailed plans of the site access and proposed layout of the internal road and pedestrian network and parking on site in accordance with the relevant Australian Standards and Council's DCP	Access for the site is off Abbotts Road via a proposed three-way junction at the intersection of Abbotts Road and Aldington Road. This three-way junction is designed to provide a future signalised intersection for future extension of Aldington Road south of Abbotts Road. Abbotts Road will be extended within the Westlink Industrial Estate, with a proposed cul-de-sac providing vehicular access to the overall development. Both junctions can provide future connection to the adjoining lands located to the south of the proposed development. Until the connection of Aldington Road to the future Southern Link Road (located to the north) is constructed, the access to Aldington Road will be provided from the North and South bound traffic via a signalised intersection on the South bound lane of the Mamre Road via Abbotts Road. Refer Roadworks and Stormwater Drainage Plans 20-748–C1041 to C1047 prepared by AT&L indicating site access along with the proposed road layouts. Note also pedestrian footpath included within the plans. Refer to Architectural plans prepared by NETTLETON TRIBE for internal parking layouts.
Swept path diagrams	Refer to Vehicle Turn Path drawings 20-748-C1311 to 20-748-C1312 prepared by AT&L for Abbotts Road vehicle analysis.

Key Issue listed in the SEARs	Response
Swept path diagrams depicting vehicles entering, exiting and manoeuvring throughout the site	For internal lot turning manoeuvres, refer to the traffic engineering report prepared by ASON.
Road upgrade detail Details of road upgrades, infrastructure works, or new roads or access points required for the development	All proposed upgrade works to Abbotts Road and Aldington Road along with details for new roads to the development have been documented within the AT&L Civil drawing series 21-843-C500 & 21-843-SKC026.
Soils and Water	
Topographic assessment A topographic assessment and justification the proposed earthworks are site responsive and contextually appropriate	A topographic assessment and justification on proposed earthworks are discussed within Section 6.
Detailed site water balance A detailed site water balance including identification of water requirements for the life of the project, measures that would be implemented to ensure an adequate and secure water supply is available for the development and a detailed description of the measures to minimise the water use at the site	Refer to Section 11 for an overview of site water requirements, water sources and measures to minimise potable water use.
Satisfactory arrangements for drinking, wastewater and recycled water Demonstration satisfactory arrangements for drinking water, wastewater and if required recycled water services have been made	Refer to Section 13 of this report for an overview of potable water, wastewater and recycled water servicing, including servicing advice received from Sydney Water.
Discharge water quality Characterisation of water quality at the point of discharge to surface and/or groundwater against the relevant water quality criteria (including proposed mitigation measures to manage any impacts to receiving waters and monitoring activities and methodologies)	Refer to Section 10.7 for details of the performance of the proposed stormwater quality management measures against the controls in the Mamre Road Precinct DCP.
Site specific integrated water management strategy A site-specific integrated water management strategy with details of stormwater/wastewater management system including how it will be designed, operated and maintained, including the capacity of onsite detention system(s), onsite sewage management and measures to treat, reuse (including indicative quantities) or dispose of water	Refer to Section 10 for details of the proposed Water Management Strategy.
Measures to minimise water use Description of the measures to minimise water use	Refer to Section 11.4 for discussion of potential measures to minimise water use within the estate.
Erosion and sediment control Description of the proposed erosion and sediment controls during construction	Erosion and sediment control measures are described in Section 8. Also note the Erosion and Sediment Control plan has been provided for the development assuming that the works will be completed in one stage. As the staging plan is developed, erosion and sediment control measures will be developed to suit the works.

Key Issue listed in the SEARs	Response
Infrastructure Requirements	
Description of infrastructure required on site A detailed written and/or graphical description of infrastructure required on the site, including any upgrades required	Infrastructure requirements for the site have been documented in the Services and Utilities Coordination Plans prepared by AT&L (drawings 20-748-C1101 to C1103 inclusive) and are also described in Section 13. Continued coordination with utility infrastructure providers will be undertaken concurrent to exhibition and assessment of SSD-9138102 to ensure that adequate arrangements are made for the provision of infrastructure when required.
Identification of infrastructure upgrades Identification of any infrastructure upgrades required off-site to facilitate the development, and describe any arrangements to ensure that the upgrades will be implemented in a timely manner and maintained	Refer to Section 13 for an overview of infrastructure upgrade works required to service the proposed development. Note all these works will need to be confirmed with the relevant service Authority during detailed design stages. Consultation with each of these Authorities has commenced as part of this SSD process and will continue during detailed design.
Infrastructure delivery and staging plan An infrastructure delivery and staging plan, including a description of how infrastructure on and off-site will be co-ordinated and funded to ensure it is in place prior to the commencement of construction	Refer to Section 14 for indicative infrastructure delivery and staging arrangements.
Development impact on existing utility infrastructure An assessment of the impacts of the development on existing utility infrastructure and service provider assets surrounding the site.	Any impacts to existing utility infrastructure will be discussed with the relevant service Authority during the detailed design phase. ESR and AT&L has, and will continue to, coordinate with utility authorities regarding the proposed SSD development to identify augmentations required to existing infrastructure because of the proposed development. No significant impacts on existing utility infrastructure surrounding the site are envisaged as part of the proposed Westlink Industrial Estate.
Agency Comments	
Penrith City Council	
Water Quality Management and Stormwater Management Water quality and water quantity are to be addressed. Post developed flows shall match pre-developed flows. Water quality shall be in accordance with Council's DCP and WSUD policies. It is Council's preference that on-lot water quality and water quantity treatment be provided for rather than large open basins. If large basins are proposed, then they shall remain under the ownership and maintenance of the development site. Council will not accept the dedication of any drainage basin as a public asset.	Refer to Section 10 where measures to manage stormwater quantity and quality are described. Stormwater quality and quantity management measures are proposed to ensure the controls in the Mamre Road Precinct DCP are satisfied. All estate-wide stormwater management measures are proposed to remain in the ownership and maintained by the Proponent and not be dedicated to Council.

3. Response to Submissions

Submissions from various agencies in relation to SSD-9138102 have been received and collated on the NSW Planning Portal. Submissions pertaining to civil infrastructure and water cycle management, as well as AT&L's response to these submissions, are summarised in Table 2.

Table 2: Summary of responses to submissions

Agency	Matter of concern	Request / Comment	AT&L Response
Endeavour Energy	Network Capacity / Connection	refer to letter from Endeavour Energy to NSW DPIE dated 18 July 2021, extracts of which are reproduced below: *Endeavour Energy's Asset Planning and Performance Branch has provided the following advice.* *The advice provided in the Civil Infrastructure Report is accurate.* *Asset Planning and Performance Branch has received an application for connection of urban industrial load UIL6041 for the first warehouse in Stage 1 with a load of 850 kVA which will be allowed to be connected to the existing network in Aldington and Abbott Roads which is supplied from Kemps Creek Zone Substation.* *The customer is advised to reticulate the estate with 22 kV cable and start making preparations for their new 22 kV feeder from South Erskine Park Zone Substation which will be required to supply the remainder of the development.* *The method of supply requires the establishment of a new 1000 kVA padmount substation located on the site.* *Neither the Architectural Plans nor the Plan of Subdivision show any provision for a padmount substation.* *Endeavour Energy's general requirements is for a padmount substation to be at ground level and have direct access from a public street (unless provided with appropriate easements for the associated underground cables and right of access).*	Refer to Section 13.5 for details of proposed electrical servicing.

Agency	Matter of concern	Request / Comment	AT&L Response
NSW DPIE (Biodiversity & Conservation)	Waterway health	refer to letter from NSW DPIE Biodiversity and Conservation Division to NSW DPIE Planning and Assessment Group dated 04/08/21.	The Water Management Strategy for Westlink Industrial Estate has been amended since the previous revision (Issue 06 dated 02/11/2021) to address the stormwater quality, quantity and flow targets adopted in the Mamre Road Precinct DCP (which was adopted on 19/11/2021). Refer to Section 10 for details.
NSW DPIE (Water) and Natural Resource Access Regulator (NRAR)	Water Balance, Use and Licencing	*The proponent should provide:* *a. A site water balance has not been included for the construction phase. Provide a water balance for the construction including but not limited to de-watering and ponds.*	All water captured on site, whether it be from rainfall on the catchment, runoff onto the site from the external catchments north and east of the site, or groundwater intercepted by bulk earthworks activities, will be managed in accordance with the site Soil and Water Management Plan (described in Section 8). Any water draining through the site will be discharged in accordance with the requirements of the Soil and Water Management Plan, with no water to be retained on site permanently during construction.
		b. Details of farm dam de-watering including volume and if water will be re-used, stored or released.	The existing farm dams that are to be removed as part of the site grading and earthworks will be dewatered and decommissioned. All water stored within the farm dams will be released in a controlled manner that is consistent with the requirements of the Dam Dewatering Plan.
	Groundwater	*The proponent should:* *a. provide a statement of impact against the 'minimal impact considerations' as defined in the NSW Aquifer Interference Policy (2012)*	The proposed development of the Westlink Industrial Estate will not result in impacts relating to water table, water pressure or water quality. There are no known groundwater dependent ecosystems, culturally significant sites or water supply works located in the vicinity of the site.

Agency	Matter of concern	Request / Comment	AT&L Response
		b. identify the predicted groundwater inflow volume generated by the cut and fill activities	The inflow volume to the site as a result of bulk earthworks activities cannot be quantified at this stage, as it would be highly variable and dependent on rainfall in the catchment. Any groundwater intercepted by bulk earthworks activities would be directed though the site in accordance with the site Soil and Water Management Plan.
		c. Report on whether the groundwater take is predicted to be less than 3ML licensing exemption offer under the Water Management (General) Regulation 2018, or if it is above this, and a licence is required.	Any groundwater intercepted by bulk earthworks activities would be directed through the site towards the legal point of discharge and would not be permanently retained on site. Temporary retention of intercepted groundwater would only be required to satisfy construction phase water quality controls. Therefore, a licence will not be required under the *Water Management (General) Regulation 2018*.
Penrith City Council	Compliance with Draft Mamre Road Precinct DCP	*The proposal as submitted includes a number of quite significant non-compliances to those controls with concerns raised regarding the retaining wall heights, setbacks and landscaping requirements as outlined within Clause 4.4 – Earthworks and Retaining Walls within the Draft DCP.*	The revised Estate Plan and site grading strategy has been amended to address the objectives and controls outlined in Section 4.4 of the Mamre Road Precinct DCP. Particular attention has been made in the revised Estate Plan to the controls relating to level transitions at the interface of the public road network. The maximum cumulative height of retaining walls adjacent to the public domain will be limited to 6 metres and will generally be in accordance with the indicative tiered retaining wall cross-section presented as Figure 23 in the DCP. Refer to civil drawings 20-748-C1021 to C1023 inclusive for sections at boundary interfaces, which demonstrate that where there is a level transition greater than 1 metre it is managed via tiered retaining walls and an increased landscape setback.

Agency	Matter of concern	Request / Comment	AT&L Response
Penrith City Council	Local Overland Flow Flooding	*- The site flood affected by local overland flow flooding from the local catchment and has been coded as being subject to flood related development controls.* *- The application must demonstrate that the development proposal is consistent with the Mamre Road Precinct Draft DCP Section 2.7 Flood Prone Land.* *- The application must be accompanied by an Overland Flow Flood Report prepared by a suitably qualified person to assess the developments impacts upon overland flows. Overland flows shall be managed through the site in a safe manner.*	Refer to Section 12 for an overview of overland flow flooding under existing and post-development conditions within the site. The proposed major / minor system stormwater drainage, including diversion of the external catchments to the east of the site, has been designed in accordance with the controls in the Mamre Road Precinct DCP and Penrith City Council's *Design Guidelines for Engineering Works for Subdivisions and Developments*.
Penrith City Council	Stormwater management	*Stormwater drainage for the site must be in accordance with the Mamre Road Precinct Draft DCP* *No objections are raised to the proposed methodology to separate internal treated stormwater flows from external catchment flows.* *The emergency overflow weir from the water quality / water quantity basin discharges onto the adjoining lot to the south. A drainage easement will be required to discharge water over the adjoining lot and evidence of owner's consent for the creation of easements over adjoining land should be secured to comply with legal point of discharge considerations.* *A stormwater pipe is proposed along Abbots Road to Mamre Road to cater for external catchment flows and flows in excess of the basins 1%AEP capacity. Any pipeline within Aldington Road shall be designed to cater for the future upgrade of Aldington Road, however Penrith Council and the Department of Planning have yet to agree upon the final alignment and configuration of the road.*	Refer to Section 9 for a summary of the design criteria adopted for stormwater drainage. Noted The proposed detention basin has been designed such that it would detain inflow from the estate for all design storm events up to and including the 1% AEP design event. Refer to drawing series 21-842-C500 for the proposed alignment of the trunk drainage line downstream of the Westlink Industrial Estate. This line will be designed to cater for outflow from the proposed detention basin, flow from the external catchments to the east of the site, and for flow from Aldington Road that will drain towards Abbotts Road.

Agency	Matter of concern	Request / Comment	AT&L Response
		The application is to demonstrate how stormwater discharge from the proposed development complies with the trunk drainage infrastructure as per the Mamre Road Precinct Draft DCP. Subdivision and development is to consider the coordinated staging and delivery of trunk drainage infrastructure. Development consent will only be granted to land serviced by trunk drainage infrastructure where suitable arrangements are in place for the delivery of trunk infrastructure (to the satisfaction of Council or other water management authority).	Refer to Section 9.3 for discussion of trunk drainage infrastructure as it applies to the Westlink Industrial Estate.
		The stormwater concept plan shall demonstrate how the development complies with the Mamre Road precinct Draft DCP water quality and water quantity controls for any interim and ultimate developments.	Refer to Section 10 for details of the Water Management Strategy and demonstration of compliance with the stormwater quality, quantity and flow controls for the Mamre Road Precinct.
Penrith City Council	Traffic modelling and further precinct wide design considerations	*The proposal may not fit with the ultimate Aldington Road, Abbotts Road, industrial roads and other roads and intersections in the Draft Mamre Road Precinct DCP which is yet to be determined.*	The proposed internal road network has been designed to comply with the road cross-sections adopted in the Mamre Road Precinct DCP.
		The road corridor setbacks for Addington Road, Aldington Road extension south of Abbotts Road to left out at Mamre Road, Abbotts Road and Mamre Road reconstruction have not been resolved and designed which could have significant implications on the design and arrangement of the proposed subdivision and master plan.	Refer to drawing series 21-843-C500 for details of the proposed Interim and Ultimate designs for the upgrade of Abbotts Road and Aldington Road.

Agency	Matter of concern	Request / Comment	AT&L Response
		Council's Traffic Section does not support the Draft Mamre Road Precinct DCP road cross section for Distributor / Collector Roads including Aldington Road and Abbotts Road (from Aldington Road to Mamre Road). Council require that the cross section be 5.0m centre median, 2 X 3.5m through lanes both sides, 4.2m kerbside shoulder both sides, 5.6m verge with 2.5m sharded path both sides, all multi lane approach intersections to be Traffic Control Signals with pedestrian crossings facilities with 3.5m left turn and right turn lanes, 2.0m bicycle lane between left turn lanes and through lanes and additional widening to accommodate 36m B-triple heavy vehicle turn paths.	The design development of the proposed interim and ultimate upgrades of Abbotts Road and Aldington Road has progressed since Council's submission to the SSDA. AT&L and the Landowner Group (consisting of ESR, Frasers Property and FKC) are continuing to consult with Penrith City Council regarding the upgrade of Abbotts Road and Aldington Road.
Penrith City Council	Waterway and water quality management considerations	*With respect to riparian corridors, it is noted the site has two mapped first order Strahler streams which intersect and merge into a second order stream. Based on review of the plans, it seems that the creeks are proposed to be removed as a result of the development. It also appears that the proposal is inconsistent with the trunk drainage infrastructure included in the draft DCP. This needs to be clarified, and all works would need to be in accordance with NRAR requirements. The protection of the drainage line is an opportunity to include vital habitat and amenity to the area. It is recommended that a riparian corridor, particularly along the Strahler order 2 section of stream, be incorporated into the development which should be in the vicinity of 40m however advice from NRAR is a critical component to this consideration, which should also be discussed with the officers responsible for the preparation of the Precinct DCP.*	Refer to Section 5.2 for an overview of the existing drainage lines within and downstream of the Westlink Industrial Estate. Refer to Section 9.3 for an overview of the proposed trunk drainage infrastructure within and downstream of the Westlink Industrial Estate.

Agency	Matter of concern	Request / Comment	AT&L Response
		Council had also maintained a position that private stormwater treatment measures including all proposed stormwater treatment infrastructure (e.g., GPTs and bioretention basin) must remain in the ownership of the developer, in perpetuity (including all maintenance responsibilities). As such, appropriate conditions would need to be imposed.	No stormwater treatment measures will be dedicated to Council. All measures will remain in the ownership of either the Proponent or Sydney Water (as Waterway Manager).
		As has also been raised on other proposals in this precinct, there are opportunities to improve the stormwater strategy, so it has more of a focus on providing for a range of ecological services including integrated water management which maximises the opportunities passive irrigation of street trees etc., as to better contribute to urban cooling and to the Parkland City. This should be further considered and applied within the development.	In their role as Waterway Manager, Sydney Water is developing a scheme plan for regional stormwater management measures, which is anticipated to include precinct-wide stormwater harvesting and reticulation of recycled water throughout the Mamre Road Precinct. This will provide capacity for catchment-wide integrated water management opportunities such as irrigation of street trees and other areas of public open space.
NSW Rural Fire Service (RFS)	Access – Public Roads	*Access roads must comply with the general requirements of Table 5.3b of* Planning for Bush Fire Protection 2019*…*	The design of the public road network complies with the requirements of the RFS guideline *Planning for Bush Fire Protection 2019*.
NSW Rural Fire Service (RFS)	Water and Utility Services	*The provision of water, electricity and gas must comply with the following in accordance with Table 5.3c of* Planning for Bush Fire Protection 2019*…*	The design of water and utility services will comply with the requirement of the RFS guideline *Planning for Bush Fire Protection 2019*.
Sydney Water	Potable Water Servicing	*Cecil Park WSZs are currently supplied with rural drinking water infrastructure and do not have capacity to service developments within Mamre Road precinct prior to delivery of major system amplifications.* *Both the above Sydney Water and Developer delivered amplification works are required to be delivered prior to servicing being available for this development.*	Refer to Section 13.2 for details of and proposed potable water infrastructure that will be required to service the Westlink Industrial Estate.

Agency	Matter of concern	Request / Comment	AT&L Response
Sydney Water	Recycled Water Servicing	*Recycled water for non-drinking water uses will be provided in the Mamre Road Precinct. The Integrated Water Servicing Options analysis is currently underway. It will determine the extent to which recycled stormwater is integrated with recycled wastewater. Sydney Water is currently preparing a Development Servicing Plan (DSP) for the Mamre Road Precinct. This will include Developer Charges for the provision of recycled water services to the Precinct.*	Refer to Section 13.4 for details of proposed recycled water servicing.
Sydney Water	Wastewater Servicing	*The Mamre Road precinct does not have wastewater servicing available.* *This development is located within the proposed wastewater pumping station SP1222 catchment via proposed trunk wastewater carriers. The pumping station will be required to transfer flows to St Marys wastewater network for interim servicing to c2026 and after this time it is intended for the pumping station to transfer flows south to the proposed Upper South Creek Advanced Water Recycling Centre.*	Refer to Section 13.3 for details of proposed wastewater servicing.
Sydney Water	Stormwater	*If Sydney Water is nominated as the trunk drainage manager in the Mamre Road Precinct, then Sydney Water will confirm the requirements for trunk drainage services needed to be delivered before a Section 73 certificate can be issued. This may include trunk drainage channels as well as stormwater treatment and storage to facilitate precinct wide stormwater harvesting integrated with recycled wastewater. The Integrated Water Servicing Options analysis is currently underway in collaboration with the Department of Planning, Industry and Environment. This analysis will determine the extent to which recycled stormwater is integrated with recycled wastewater. More information surrounding the outcome of this discussion with the Department of Planning, Industry and Environment will be released once it is available.*	Refer to Section 9.3 for details of the proposed trunk drainage infrastructure within and downstream of the Westlink Industrial Estate. Demonstration of how the site can meet the waterway health requirements for the site under the Interim Arrangement (in the absence of a regional stormwater management scheme) is presented in Section 10.

Agency	Matter of concern	Request / Comment	AT&L Response
		Evidence may also be required by Sydney Water to demonstrate how the development has met the current waterway health and flood management requirements as specified in the Development Control Plan (DCP).	
Transport for NSW	Freight	*Comment* *Mamre Road Precinct will become a strategically significant industrial area in Western Sydney and this development should be designed to accommodate the largest expected vehicle to service the precinct. Access to the site is proposed to be via three-way junction at the Abbotts Road and Aldington Road intersection, sized appropriately to cater for B-Doubles.* *Recommendation* *During Response to Submissions (RtS) stage, the Proponent is to confirm the development will be using a 30m PBS Level 2B as the design vehicle rather than a standard 26m B-double. This is in line with the NSW Heavy Vehicle Access Policy Framework which identifies 30 metre PBS Level 2B Vehicles as the next PBS vehicle to be permitted wider access on NSW roads.*	Refer to Section 7 for clarification of the design vehicle adopted, being the 30m PBS Level 2B. Details of the proposed external road upgrades are presented in the 21-842-C500 series drawings contained in Appendix 2.
Western Sydney Airport	Wildlife attraction	*On-site detention basin and temporary bio-retention and sedimentation detention basin* *Insufficient detail has been provided within the EIS to identify how the onsite detention basin and temporary bio-retention basin and sedimentation basin will be designed, managed and monitored to minimise wildlife attraction. It is noted that there is conflicting information through the EIS documentation in relation to the size of the on-site detention basin, but assuming it is 10,974 m^2, it does have the potential to attract wildlife.*	Under the Ultimate Arrangement of the Water Management Strategy, the proposed detention basin would operate in a manner whereby it would not hold a permanent water volume. Depending on the intensity and duration of storm event, the detention basin would drain within 24 hours of the cessation of rainfall within the catchment. Measures will be incorporated into the Landscape Plan for the detention basin to detract wildlife that poses a bird-strike risk to Western Sydney Airport. This is likely to include measures such as selection of plant species that do not seed and do not provide habitat for high-risk bird species.

Agency	Matter of concern	Request / Comment	AT&L Response
DPE – EES (Waterway Health)		*EIS must describe background conditions for any water resource likely to be affected by the development including*	
		a. Risk-based Framework for Considering Waterway Health Outcomes in Strategic Land Use Planning Decisions	A summary of the application of the Risk-based Framework to the Westlink Industrial Estate is presented in Section 10.2.
		It is recommended that the applicant use the MUSIC modelling toolkit to demonstrate compliance with the objectives and targets.	The MUSIC Modelling Toolkit – Wianamatta has been adopted as the basis for stormwater quality and flow modelling, details are presented in Section 10.4.
		EES recommends that the flow targets can be met at a range of scale including lot, estate and catchment/regional	Noted. Summary of the performance of the proposed stormwater management measures under the Interim Arrangement against the flow targets is presented in Section 10.9.
DPE – Industry Assessments		*Clarify whether the interim and ultimate upgrades to the Aldington Road and Abbotts Road intersection will impact on the safe use of the existing driveways at 1016-1028 Mamre Road (Lot 2, DP 250002).*	The proposed interim and ultimate upgrade at the intersection of Abbotts Road and Aldington Road will not affect the safe use of the existing driveways at 1016-1028 Mamre Road. The eastern-most driveway (directly adjacent to the boundary of the Westlink Industrial Estate) will be reconstructed as shown on drawing 20-748-C1042 (Appendix A). The western driveway, located approximately 45 metres west of the Westlink Industrial Estate boundary, will be reconstructed as shown on drawing 21-843-C552 (Appendix B).
		Provide further details on the construction and function of the ponds shown at Lot 5 and 6, including whether they will e provided in the Stage 1 earthworks, and when it is anticipated that buildings will be subsequently constructed on these lots. Clarify whether the full development could comply with the requirements of Section 2.6 of the draft DCP if the ponds are removed and warehouses constructed on these lots.	The intent of the proposed evaporation ponds on lots 3 and 6 (previously shown on lots 5 and 6) is to demonstrate the stormwater quality and flow targets could be achieved with measures on-lot and within the Westlink Industrial Estate. The evaporation ponds would not be required under the Ultimate Arrangement, where stormwater management measures will be designed, delivered and operated by Sydney Water as the Waterway Manager for the Western Sydney Aerotropolis and Mamre Road Precincts.

Agency	Matter of concern	Request / Comment	AT&L Response
		Clarify that the end of the extension of Abbotts Road to the southern boundary of the site is at a level suitable for future extension into the adjoining property to the south and that proposed levels will not prevent orderly future development of that land and provide evidence of consultation with the adjoining landowner.	The temporary turning head at the southern end of Road 01 (shown on drawing 20-748-C1047) has been designed such that it will be suitable for future extension. The layout of the future extension will be consistent with the road layout adopted in the Mamre Road Precinct DCP.
		Clarify whether an ultimate signalised intersection at Abbotts Road and Aldington Road would be able to accommodated in the road reserve provided and whether the proposed retaining walls on Lot 1 fronting the roads will impede provision of a larger intersection.	The arrangement of the ultimate signalised intersection at Abbotts Road and Aldington Road will be accommodated within the future road reserve boundary, which is shown on drawing 20-748-C1042 (Appendix A) and drawing 21-843-C512 (Appendix B). The proposed retaining walls on Lot 1 have been designed based on the position of the future property boundary, allowing for road and intersection widening at Abbotts Road and Aldington Road.
		Provide further justification for the proposed earthworks and retaining walls with regard to the controls of Section 4.4 of the draft MRP DCP and the matters for consideration in Clause 33H of the WSEA SEPP.	Refer to Section 6 for justification of the proposed earthworks and retaining walls.
		Include an assessment against all relevant controls of Section 2.6 in the draft DCP including trunk drainage and figure 6.	Refer to Table 8 for a response to each of the development controls relating to waterway health, water sensitive urban design, trunk drainage and overland flow flooding.
		Ensure the figures in the plans (including floor areas and parking spaces) are consistent across the EIS, supporting reports and plans and updated assessments as required.	All figures in this report are consistent with the EIS.

4. Agency Consultation

This report summarises all consultation and correspondence undertaken with the relevant authorities during the design phase. The following table summarises and the relevant correspondence. It should be noted that not all authorities were consulted during the initial design phase.

Table 3: Summary of agency consultation

Agency	Correspondence
Sydney Water	Sydney Water's input to SEARs for SSD-9138102 dated 4 September 2020 have been acknowledged and servicing arrangements for the site and the Aldington Road Precinct.
Endeavour Energy	During the design phase of the SSDA, AT&L has begun the discussions with Endeavour Energy. As per the email conversation dated 25th September and the project specifics and EE's comments have been taken into consideration as part of design documentation. Section 11 highlights the EE servicing strategy for the site.
Transport for NSW	TfNSW's input for SSD-9138102 dated 16 July 2020 and meeting held on 21st September 2020 have been acknowledged and these comments have been considered as part design documentation and responded to accordingly.
WaterNSW	WaterNSW input for SSD-9138102 dated 25 September 2020 has been acknowledged and these comments have been considered as part design documentation and responded to accordingly.

5. Site Characteristics

5.1. Existing Topography and Catchments

The Site in its existing condition is characterised by undulating topography. The ground slope across most of the site has a general fall from the east to west towards Abbotts Road with existing levels ranging from RL92.5 in the southeast, RL 87.5 in the north-east, RL 58.5 in the north west and RL51.0 at the intersection of Abbotts Road and Aldington Road.

The eastern portion of the site consists of four ridgelines that are generally aligned in an east-west direction. Ground slopes off these ridgelines towards local gullies within the site are typically between 10% and 15%. The western portion of the site adjacent to Aldington Road and Abbotts Road is generally flatter than the eastern portion, with ground slopes typically in the range of between 2% and 8%.

Most of the site in its existing condition is pervious, other than some residential dwellings, sheds and access driveways.

Delineation of the existing internal drainage catchments and external catchment that drain through the site is presented as Figure 2.

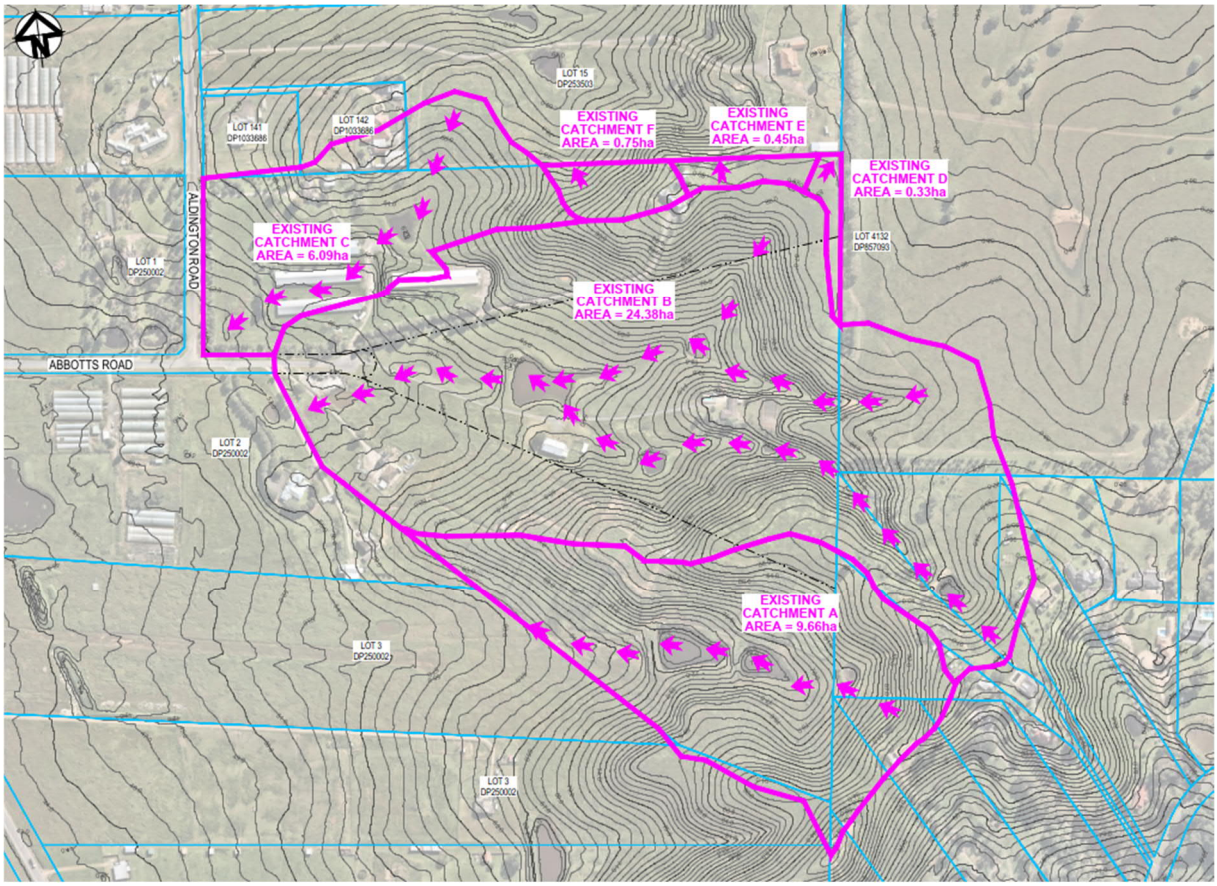


Figure 2: Catchment extents under existing conditions

A summary of the internal catchments under existing conditions is presented in Table 4.

Table 4: Description of internal and external catchments under existing conditions

Catchment ID	Area (ha)	Description
A	9.66	Discharges towards the eastern boundary of 1030-1048 Mamre Road (Lot 3 DP250002).
B	24.38	Discharges towards the eastern boundary of 1016-1028 Mamre Road (Lot 2 DP250002) and ultimately into a catch drain that runs along the southern edge of Abbotts Road.
C	6.09	Discharges towards the intersection of Abbotts Road and Aldington Road.
D	0.33	Discharges in a north-easterly direction towards 19-105 Capitol Hill Drive Mount Vernon (Lot 4132 DP857093)
E	0.45	Discharges in a northerly direction towards 272 Aldington Road (Lot 15 DP253053)
F	0.75	

There is currently no formal trunk stormwater infrastructure within the site.

5.2. Existing Drainage Lines

Based on large-scale topographic mapping (1:25,000 from NSW Six Maps), there are two mapped overland drainage lines within the site, refer to Figure 3.

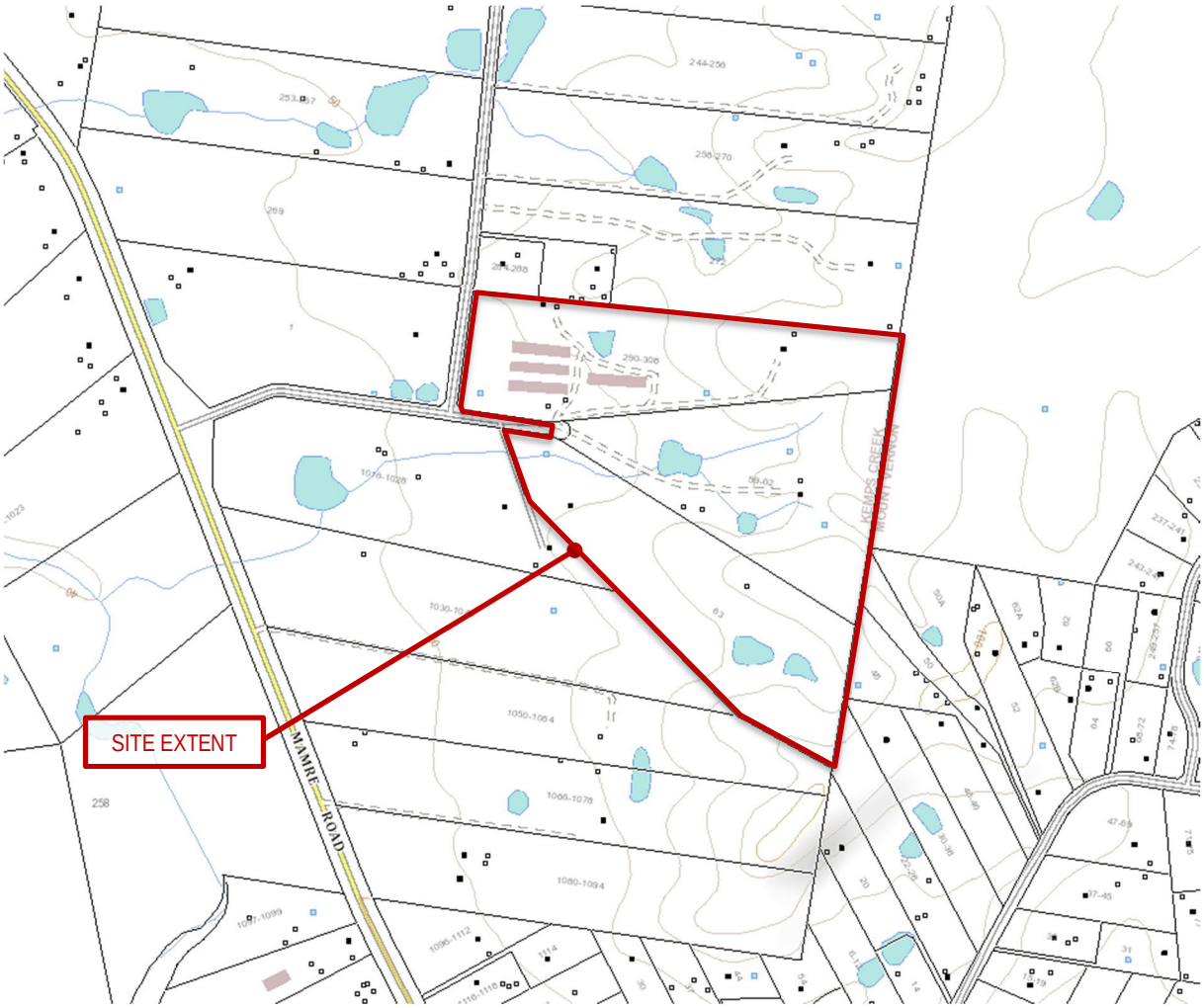


Figure 3: Topographic mapping showing drainage lines in the vicinity of the site (Source: NSW SIX Maps)

The *Mamre Road Precinct Waterway Assessment* (CTEnvironmental, April 2020), contained in the *Mamre Road Flood, Riparian Corridor, and Integrated Water Cycle Management Strategy* (Sydney Water, October 2020) presents the extents of waterways in the Mamre Road Precinct that have been the subject of a desktop review and field assessment to confirm the presence of mapped and unmapped waterways. An extract of mapping showing the extents of waterways in the Mamre Road Precinct is presented as Figure 4. This shows an unnamed tributary of Kemps Creek within the site.

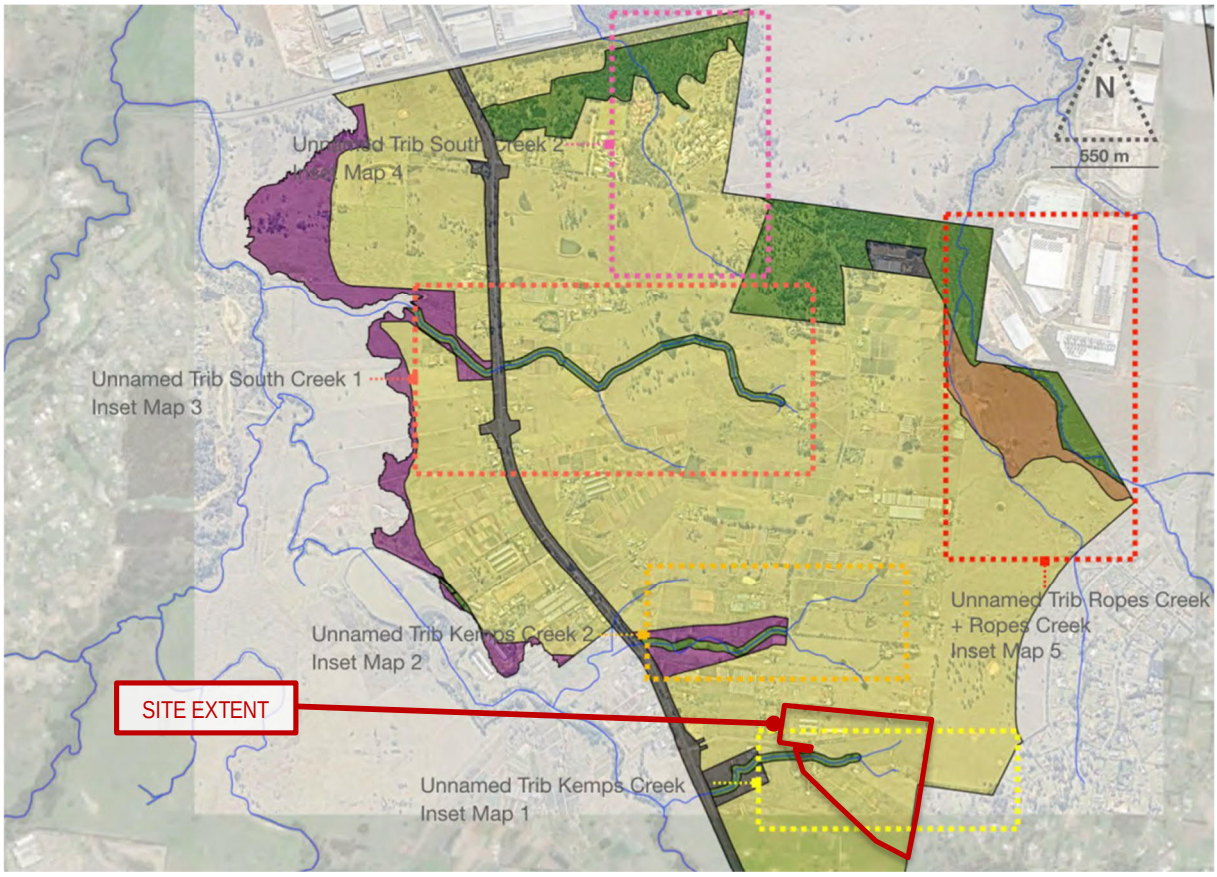


Figure 4: Extract of waterway mapping (CTEnvironmental, April 2020)

Results of the inspection of the unnamed tributary of Kemps Creek are described in the *Mamre Road Precinct Waterway Assessment* (CTEnvironmental, April 2020), and are summarised below:

- Two first order watercourses were evident in the headwaters which run to the north and south of the recently demolished house on 59-62 Abbotts Road.
- A clear flow path was evident below the confluence of the two first order watercourses, which validated the presence of a second order watercourse.
- The flow path did not have defined bed and banks, likely due to the presence of three upstream farm dams.
- From a point approximately 200 metres downstream (west) of the confluence of the first order watercourses, the flow path was observed to be heavily modified and formed into a drainage channel that runs parallel to and on the southern side of Abbotts Road. The flow path continues to Mamre Road.
- The section of mapped watercourse downstream of the Westlink Industrial Estate was not present, refer to Figure 5.
- Due to the lack of vegetation along the upper section of the headwater and significant modification to the drainage channel in the lower section, the watercourse had minimal ecological value.

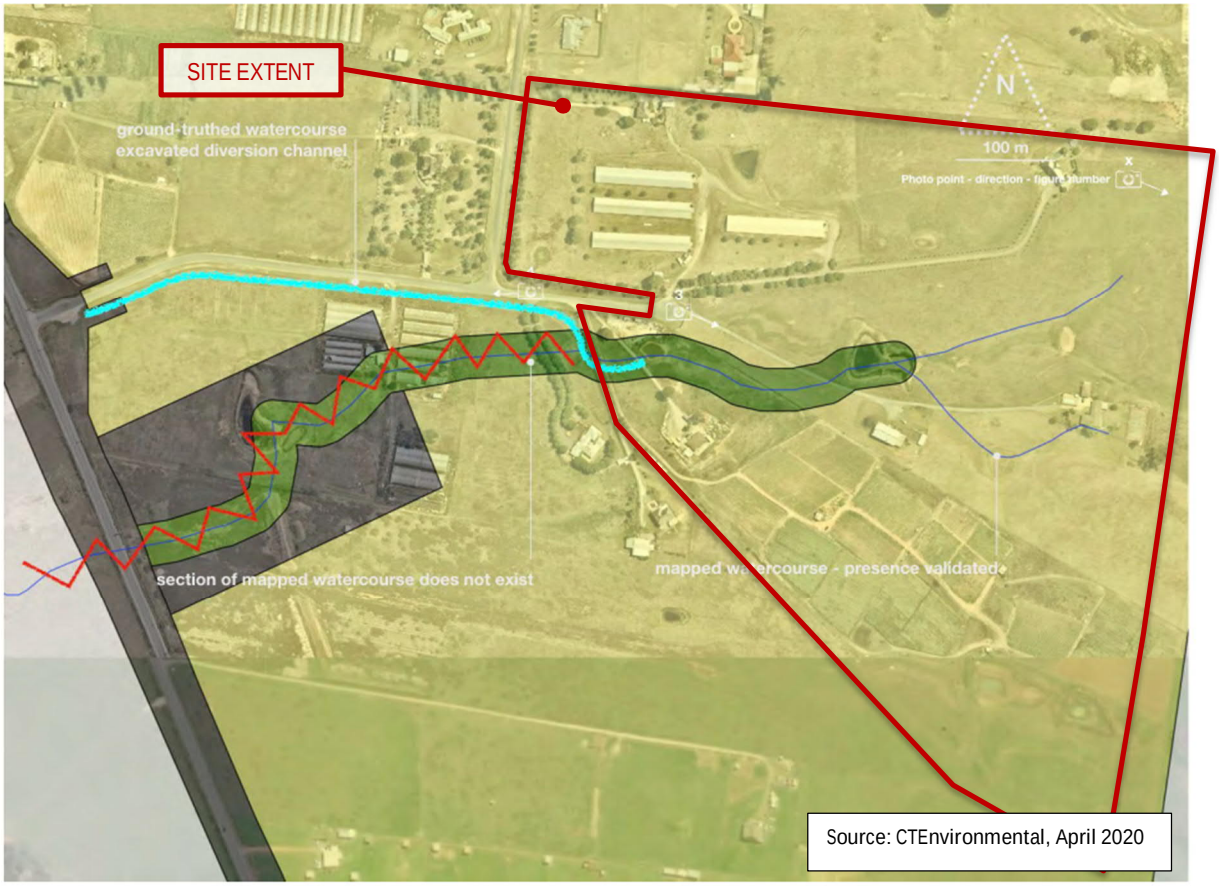


Figure 5: Field validated flow paths and watercourses within and downstream of the site

5.3. Existing Geology

Based on the Preliminary Geotechnical Investigation undertaken by Douglas Partners (reference: 92352.00, dated August 2019) for 59-63 Abbotts Road and the Geotechnical Investigation Report prepared by Alliance Geotechnical (reference: 9687-GR-1-1, dated October 2019) for 290-308 Aldington Road, the following inferred sub surface soils were encountered across the site:

- TOPSOIL / topsoil filling to depths of 0.1 - 0.6m
- FILL to depths of 2.3m over parts of the site
- Residual Soil – variably stiff to hard silty clay, to depths in the range 2.5-3.5m
- BEDROCK - initially extremely low to very low strength shale or sandstone at first contact at depths of 0.7

6. Earthworks and Retaining Walls

6.1. Proposed Earthworks Strategy

The site in its existing condition is characterised by undulating topography. It is the intent of the proposed development to produce several "flat" pads to facilitate the development of large-scale industrial lots. This will require earthworks across the site to achieve a benched site, refer to drawing 20-748-C1030 and C1033 for a bulk earthworks cut/fill plan showing the proposed extent of earthworks within the site.

The cut / fill requirements within the site have been defined through multiple iterations and careful consideration of the following:

- Undulating topography within the Aldington Road Precinct resulting in the requirement for extensive cut and fill operations to allow ESR Development to facilitate economic development and provide flexibility to cater for the range of industrial customer requirements.
- Provisioning for connectivity to adjoining lands and managing existing upstream catchment flows.
- Mitigate extensive cut in bedrock sub-surface units.
- Meet the requirements for the site to cater for *IN1 – General Industrial* employment which requires large flexible allotments.

It is recommended that the proposed earthworks design contained within the AT&L documentation provides the most contextually and economically appropriate design in consideration of the above requirements.

Bulk earthworks cut / fill plans have been prepared for two scenarios:

1. Earthworks and site grading within the Westlink Industrial Estate Stage 1 only.
2. Earthworks and site grading within the entire Westlink Industrial Estate (Stage 1 and 2)

A summary of the proposed cut and fill volumes across the site is presented below in Table 5.

Table 5: Summary of proposed cut and fill volumes across the site

Item	Westlink Industrial Estate (Stage 1)	Westlink Industrial Estate (Stage 2) – not part of this application
	Volume (m^3)	Volume (m^3)
Stripping of existing topsoil (to be blended with general Fill)	- 40,490	-73,060
Excavation of existing creeks and dams (to be exported from site)	- 10,467	-10,467
Net Cut	- 728,890	-852,570
Net Fill	+ 475,790	+1,331,580
Bulking Factor on Rock Excavation to Fill Placement		-119,842
Allowance for Imported Structural Fill for retaining walls		-180,000
Allowance for Builders Soil (On Lot Sediment Basins to be filled)		-115,000
Spoil from Estate Utilities Infrastructure		-65,000
Balance	- 212,610* (Stage 1 residual lot fill – no export)	-832 (export)**

*For Stage 1 the balance material is proposed to be used within the residual lands to the east. Stage 2 earthworks volumes take this into account.

Whilst exact cut volumes for these items have not been determined at this stage, it is assumed when included into the overall earthworks cut/fill analysis for the entire site that the net import into site will be close to zero and as such the site will be a net cut to fill balance as per the requirements of the Mamre Road DCP.

It is assumed that all topsoil from the site will be re-used on site as per the specification of the Geotechnical Engineer.

All import materials will comply with the requirements of the requirements of the Import Fill Protocol and Geotechnical Specifications for the Development. Topsoil stripping, blending and placement will be completed in accordance with the Geotechnical Engineering Specifications for the project.

6.2. Retaining Walls

Where possible, batter slopes will be provided to accommodate level changes. Where this is not possible retaining walls will be constructed adjacent to the road reserve, in between allotments and adjacent to the proposed detention basin. The extent and height of each wall will be based on the current civil and earthworks design. A keystone product or other similar face block will be adopted for all retaining walls and will be detailed on the civil drawings. Refer to Figure 6 and Figure 7 for examples of keystone walls.

Figure 6: Example of retaining wall in location of fill adjacent to road reserve

Figure 7: Example of retaining wall in location of cut

'Boulder' retaining walls are considered another potential retaining wall option for the site. Potential locations of 'boulder' walls will be identified during the detailed design. The walls will be designed and constructed to the structural engineer's specification. Refer to Figure 8 for an example of the potential "boulder" retaining wall.

Figure 8: Tiered boulder retaining wall

The proposed retaining walls will be built to the manufacturers design guideline requirements and verified by a structural engineer prior to construction. This practice has previously been adopted other developments within the Penrith City Council LGA and considered input from the geotechnical engineer, utility coordination as well as entry and exit points from proposed lots.

Retaining is required along the north, east, and southern site boundary where the proposed building pad levels will be altered from existing levels. Refer to Drawing 20-748-C1080 and C1081 for cut and fill wall locations. Retaining walls will be designed and constructed using standard industry practices.

All retaining walls will be constructed on a staged basis and as required to suit the development earthworks and stormwater basin works. Where the walls are not constructed a batter of 1 in 4 will be maintained for stability purposes.

All retaining walls will be located within private property and not within the road reserve areas, unless within drainage easements.

All retaining walls will have pedestrian and vehicular safety barriers (if required) in accordance with Austroads Guidelines as required.

6.3. Post-Development Catchment Extents

A post-development catchment plan based on the proposed site grading is presented as Figure 9.

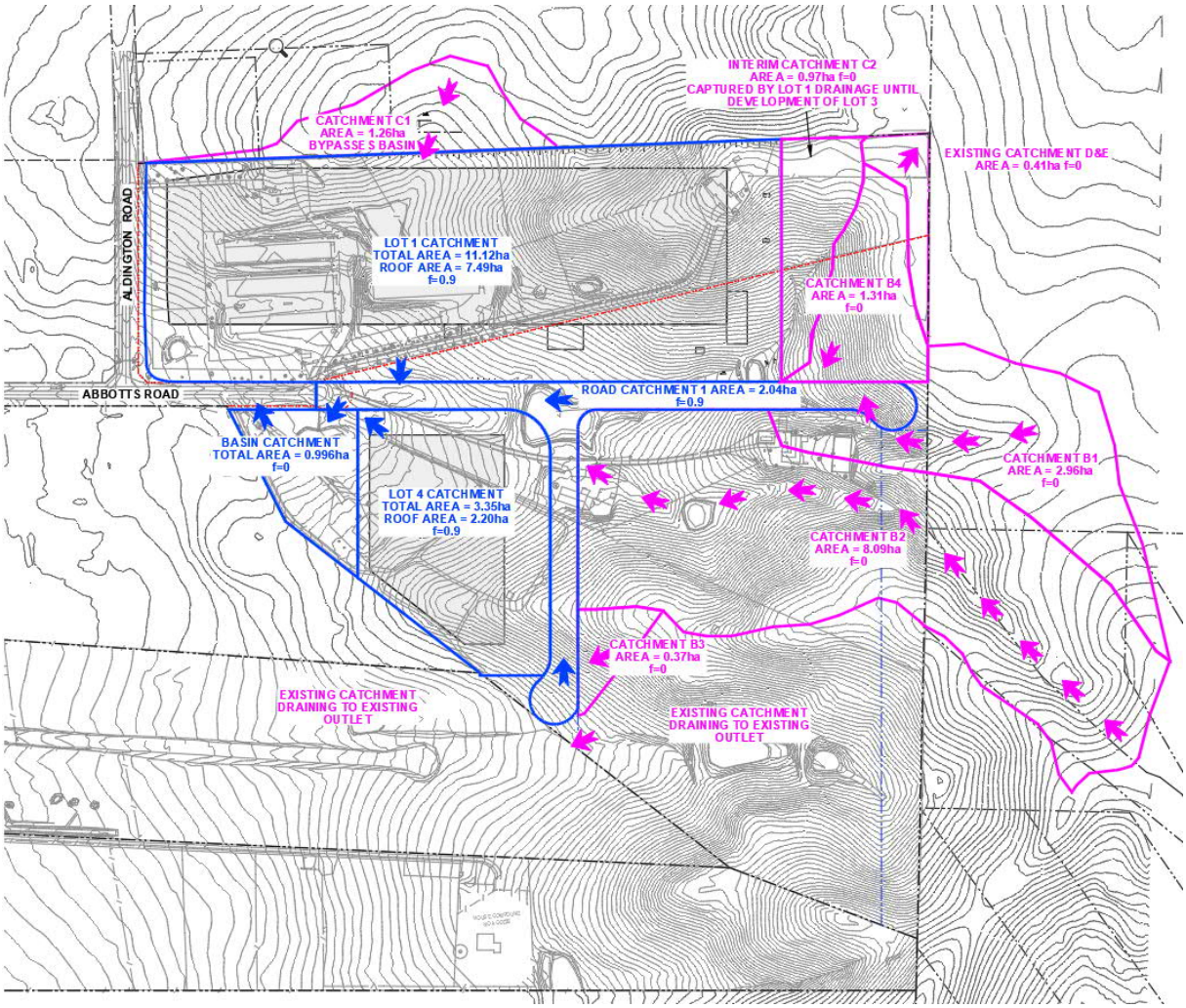


Figure 9: Catchment extents under proposed conditions

Based on the proposed site grading there will be a single point of discharge from the site adjacent to the north-western corner of proposed Basin A. Discharge from the basin will be via a controlled outlet that will connect to the proposed stormwater drainage network in Abbotts Road. Further details of the proposed basin outlet are presented on drawing 20-748-C1071 and are described in Section 10.5.2.

7. Road Design

7.1. External Road Network

The existing Abbotts Road and Aldington Road could be classified as rural roads. They currently have a 6-8 metre wide sealed pavement with tables drains on either side within a 20.1m road reserve (refer to Figure 10 and Figure 11).

Figure 10: View of Abbotts Road looking west from Aldington Road (Google Streetview, December 2020)

Figure 11: View of Aldington Road looking north from Abbotts Road (Google Streetview, December 2020)

The design of the upgrade of Abbotts Road (between Mamre Road and the intersection at Aldington Road) and Aldington Road (between Abbotts Road and the Stockland Fife Kemps Creek (FKC) site approximately 2 km north of Abbotts Road) is currently being undertaken by AT&L. The upgrade has generally been designed to meet Austroads requirements and Australian Standards to accommodate B-Double truck movements.

Typical sections showing the proposed geometry of Abbotts Road and Aldington Road adjacent to the Westlink site are presented below as Figure 12 and Figure 13 respectively.

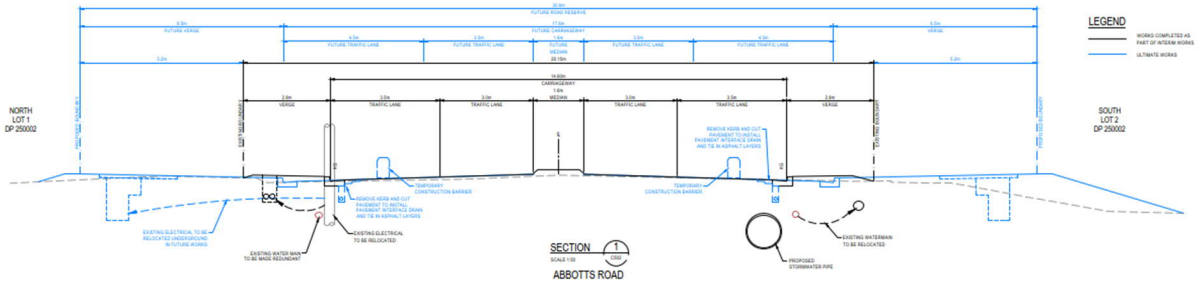


Figure 12: Typical section of the proposed upgrade of Abbotts Road

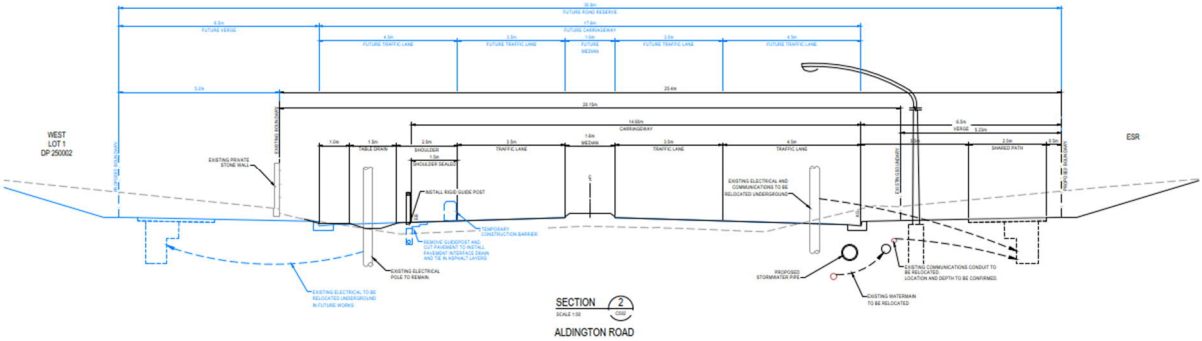


Figure 13: Typical section of the proposed upgrade of Aldington Road

Subject to Penrith City Council approval, it is anticipated that works will need to be undertaken on Aldington Road for the frontage of the site (adjacent to proposed Lot 1). The following works are anticipated:

- Access the Westlink Industrial Estate via an upgraded intersection at Mamre Road and Abbotts Road to Transport for NSW requirements. This intersection upgrade would be an interim design and not intended to accommodate the future upgrade of Mamre Road.
- Abbotts Road and Aldington Road are proposed to be upgraded from Mamre Road and the site generally as shown in Figure 12 and Figure 13.

Access to the site is proposed to be via 3-way junction at the Abbotts Road and Aldington Road intersection. The layout provided is intended to be constructed in the interim until the final Aldington Road upgrade is completed. An indicative future road and intersection layout is presented on drawings 20-748-C1041 and 20-748-C1042.

7.2. Internal Road Network

The proposed internal road network has been designed to service the intended land use within the site, being large-format industrial lots. A large proportion of the traffic within the site will be heavy vehicles, including semi-trailers (typically up to 19m long) and B-Doubles (up to 30m long). These vehicles are on average 2.5m wide and when navigating the local road network, can regularly consume all the travel lane and more so around corners where the swept path can extend beyond the average travel lane width.

A summary of the general design criteria adopted for the internal estate roads, which is consistent with the *Mamre Road Precinct Development Control Plan*, is summarised in Table 6.

Table 6: General road design criteria

Road Type	Industrial Road (24.0m)
Roads within the estate	Road 01
Design Speed	60 km/h (signposted 50 km/h)
Design Vehicle	30m long Performance Based Standards (PBS) Level 2 Type B vehicle (Type 2B), refer to example below from the National Heavy Vehicle Regulator approved PBS vehicle combinations:  3-axle prime mover B-double (3-3)
Check Vehicle	36.5m long Performance Based Standards (PBS) Level 3 Type A vehicle (Type 3A), refer to example below from the National Heavy Vehicle Regulator approved PBS vehicle combinations:  3-axle prime mover A-double (3-3-3)
Pedestrian and cycle path (within verge width)	Verge 1 – 1.5m Verge 2 – 2.5m
Through traffic lanes	2 x 3.5m
Kerbside lanes	2 x 4.0m
Median width	N/A
Road carriageway width (kerb to kerb)	15.0m
Verge width	Verge 1 – 4.0m Verge 2 – 5.0m
Road Reserve	24.0m

The internal road network will be designed and constructed in accordance with the Penrith City Council design and construction specifications.

Cul-de-sacs will also be designed and constructed in accordance with the Council guidelines requiring a 16.5m radius on the turn heads and to accommodate the design vehicle (PBS Type 2B).

7.3. Pavement Design

Pavement will be designed based on the requirements of Austroads Pavement Design Guide – A Guide to the Structural Design of Road Pavements and recommendations provided by Douglas Partners and Alliance Geotechnical reports submitted as part of this SSDA.

The basis of this design is:

- Design Traffic Loading: N =1x107 ESA (in accordance with Penrith City Council requirements for Heavy Industrial)
- Design subgrade CBR = 2% (based on Section 6.7.1 of the Douglas Partners and Alliance Geotechnical Reports)

Based on these parameters the indicative pavement design is as follows:

- 70mm AC 14 320 Bitumen
- 7mm Spray Seal
- 250mm DGB 20 (placed in two layers)
- 500mm Select Sandstone Fill with minimum CBR = 35% (placed in three layers)

If the subgrade CBR = 5% the bottom 200mm of select sandstone fill can be replaced with select fill with minimum CBR of 5%.

CBR testing is proposed to be undertaken at the subgrade level to confirm this pavement design. Polymer modified asphalt will be used within all cu-de-sacs with the asphalt concrete layer becoming a 75mm thick polymer modified AC14.

7.4. Batter Design

Any permanent batters steeper than 1 in 4 will be vegetated in accordance with the requirements of the Mamre Road Precinct DCP. All external batters to the development have been limited to 1 in 4 at steepest generally, with the maximum localised batter being 1 in 3.

Any temporary batters constructed during the works will be in accordance with the geotechnical report and ongoing advice from the Level 1 supervisor.

8. Soil and Water Management

8.1. Construction Phase Erosion and Sediment Control

An Erosion and Sediment Control Plan (ESCP) has been prepared in accordance with the guideline document titled *Managing Urban Stormwater – Soils and Construction* (Landcom, 2004). The key objectives of the ESCP are:

- Acknowledging the activities on a construction site that may contribute to erosion, sedimentation and water quality impacts.
- The implementation of industry best management practices to minimise adverse water quality and sedimentation impacts brought about through construction activities on waterbodies surrounding the work.
- Establishment of processes that effectively manage erosion, sedimentation and water quality practices during the life of the project.

8.2. Sources of Pollution

The activities and aspects of the works that have potential to lead to erosion, sediment transport, siltation and contamination of natural waters include:

- Earthworks undertaken immediately prior to rainfall periods.
- Work areas that have not been stabilised.
- Extraction of construction water from waterways during low rainfall periods.
- Clearing of vegetation and the methods adopted, particularly in advance of construction works.
- Stripping of topsoil, particularly in advance of construction works.
- Bulk earthworks and construction of pavements.
- Works within drainage paths, including depressions and waterways.
- Stockpiling of excavated materials.
- Storage and transfer of oils, fuels, fertilisers and chemicals.
- Maintenance of plant and equipment.
- Ineffective implementation of erosion and sediment control measures.
- Inadequate maintenance of environmental control measures; and
- Time taken for the rehabilitation / revegetation of disturbed areas.

8.3. Potential Impacts

The major potential impacts on waterway health relate to erosion of distributed areas or stockpiles and sediment transportation. Potential adverse impacts from erosion and sediment transportation can include:

- Loss of topsoil.
- Increased water turbidity.
- Decreased levels of dissolved oxygen.
- Changed salinity levels.
- Changed pH levels.
- Smothering of stream beds and aquatic vegetation.
- Reduction in aquatic habitat diversity.
- Increased maintenance costs.
- Decrease in waterway capacity leading to increased flood levels and durations.

8.4. RUSLE Analysis

To inform the design of the ESCP, an analysis using the Revised Universal Soil Loss Equation (RUSLE) has been undertaken in accordance with the "Blue Book". This analysis has been undertaken to predict the long term, average and annual soil loss from sheet and rill flow from the site under specified management conditions.

Estimating soil loss for a proposed development has four important applications to soil and water management. These are to:

a) Assess the erosion risk at a site.
b) Identify suitable measures to overcome the erosion risk.
c) Estimate the required capacity of sediment retarding basins.
d) Compare the effectiveness of various erosion control measured.

Refer to Table 7 below for estimates of soil loss on the site.

Table 7: RUSLE Analysis

Parameter	Value
Rainfall Erosivity Factor, R	1,897.10
Soil Erodibility Factor, K (Table C20, Blue Book)	0.05
Slope Length/Gradient Factor, LS	1.19
Erosion Control Practice Factor, P	1.20
Ground Cover and Management Factor, C	1
Computed Soil Loss (tonnes/ha/year), (A = R x K x LS x P x C)	135.45
Soil Loss Class	1 (Table 4.2 of the Blue Book)
Erosion Hazard	Very Low (Table 4.2 of the Blue Book)

It is noted the following parameters/assumptions were used for the analysis of this site:

- Rainfall Erosivity Factor (R) = 1,897.1 from (Equation 2, Appendix A2 Blue Book).
- Soil Erodibility Factor (K) = 0.05 (from Appendix C, Table C19 of Blue Book).
- Slope Length (LS): Is assumed to not exceed 80m immediately before forecast rainfall or during shutdown periods and a maximum grade of 5%.
- Erosion Control Factor (P): Is the ratio of soil loss with a nominated surface condition ploughed up and down the slope (from Appendix A5, Blue Book); and
- Cover Factor (C): Is the ratio of soil loss from land under specified crop or mulch conditions to the corresponding loss from continuously tilled, bare soil. With the proposed ESC measures being installed post bulk earthworks, it is assumed that all soil is recently disturbed, thus a C factor of 1 is chosen.

8.5. Design of Erosion and Sediment Control Measures

Suitable erosion and sediment controls shall be provided by the Contractor and maintained throughout all stages of works, including at completion of the bulk earthworks.

All design, documentation, installation and maintenance of sediment and erosion controls will be in accordance with the requirements of:

- *Protection of the Environment Operations Act*
- Penrith City Council's guidelines and specifications

- *Managing Urban Stormwater: Soils and Construction*, Landcom, (4th Edition) (The "Blue Book") Volume 1 and Volume 2

With the proposed site being larger than 2,500m^2 in disturbed area, sediment basins are required to be incorporated into the ESCP. Refer to drawing 20-748-C1201 'Earth Basin Wet' SD6-4 for details.

The proposed stormwater detention basin is proposed to be used temporarily as sitewide sediment basin during the bulk earthworks construction. For this approval it has been assumed that the on-lot works will be completed simultaneously, negating the need for individual sediment basins. Ultimately, the final temporary sediment basin locations and sizes will be provided to suit development staging requirements and will be sized and maintained in accordance with the requirements of the above-mentioned authority documents.

8.6. Construction Methodology

The following construction methodology will be followed to minimise the impact of sedimentation due to construction works:

- Diversion of "clean" water away from the disturbed areas and discharge via suitable scour protection.
- Provision of hay bale type flow diverters to catch drainage and divert to "clean" water drains.
- Diversion of sediment-laden water into temporary sediment control basins to capture the design storm volume and undertake flocculation (if required).
- Provision of construction traffic shaker grids and wash-down to prevent vehicles carrying soils beyond the site.
- Provision of catch drains to carry sediment-laden water to sediment basins.
- Provision of silt fences to filter and retain sediments at source.
- Rapid stabilisation of disturbed and exposed ground surfaces with hydro-seeding areas where future construction and building works are not currently proposed.
- All temporary sediment basins will be located clear of the 1% AEP flood extent from catchments upstream of the site.
- The proposed detention basin will be utilised as temporary sediment control basins.

Refer to AT&L Drawings 20-748-1201 for Erosion and Sediment Control Plans, for all proposed control and protection measures across the site until completion of on lot works.

Suitable temporary erosion and sediment controls shall be designed by a suitably qualified Engineer. Erosion and sediment controls shall be installed and maintained by the Contractor throughout all stages of works. Such controls shall be in accordance with the relevant requirements in the latest version of *Managing Urban Stormwater: Soils and Construction* (Landcom, 2004).

8.7. Site Inspection and Maintenance

The inspection and maintenance requirements outlined in this section must be carried out while either earthworks or quarrying is being conducted, and all areas re-established.

The Contractor will be required to inspect the site after every rainfall event and at least weekly, and will:

- Inspect and assess the effectiveness of the SWMP and identify any inadequacies that may arise during normal work activities or from a revised construction methodology.
- Construct additional erosion and sediment control works as necessary to ensure the desired protection is given to downstream lands and waterways.
- Ensure that drains operate properly and to affect any repairs.
- Remove spilled sand or other materials from hazard areas, including lands closer than 5 metres from areas of likely concentrated or high velocity flows especially waterways and paved areas.
- Remove trapped sediment whenever less than design capacity remains within the structure.
- Ensure rehabilitated lands have affectively reduced the erosion hazard and to initiate upgrading or repair as appropriate.

- Maintain erosion and sediment control measures in a fully functioning condition until all construction activity is completed and the site has been rehabilitated.
- Remove temporary soil conservation structures as the last activity in the rehabilitation.
- Inspect the sediment basin during the following periods:
  - During construction to determine whether machinery, falling trees, or construction activity has damaged and components of the sediment basin. If damage has occurred, repair it.
  - After each runoff event, inspect the erosion damage at flow entry and exit points. If damage has occurred, make the necessary repairs.
  - At least weekly during the nominated wet season (if any), otherwise at least fortnightly; and
  - Prior to, and immediately after, periods of 'stop work' or site shutdown.
- Clean out accumulated sediment when it reaches the marker board/post and restore the original volume. Place sediment in a disposal area or, if appropriate, mix with dry soil on the site.
- Do not dispose of sediment in a manner that will create an erosion or pollution hazard.
- Check all visible pipe connections for leaks, and repair as necessary.
- Check all embankments for excessive settlement, slumping of the slopes or piping between the conduit and the embankment, make all necessary repairs.
- Remove the trash and other debris from the basin and riser; and
- Submerged inflow pipes must be inspected and de-silted (as required) after each inflow event.

8.8. Sediment Basin Maintenance

The site contains 'Type F' soils, or soils that contain a significant proportion of fine grained (33% or more of finer than 0.02mm) and require a much longer residence time to settle.

Stormwater within the settling zone should be drained or pumped out within 5 days (design time), if the nominated water quality targets can be met, to the satisfaction of the superintendent. Flocculation should be employed where extended settling is likely to fail to meet the objectives within the 5-day period.

Flocculation is when flocculating agents are applied to the sediment basins causing the colloidal particles to clump into larger units or 'floc' that can either settle in a reasonable time or be filtered.

Refer to Appendix E4 of the Blue Book for flocculation methodologies and manufacturer's instructions for application rates, regarding the proposed sediment basins.

8.9. Summary

The erosion control measures proposed for the site will comply with the requirements of Penrith City Council Engineering Guidelines and the Department of Planning and Environment (DPE).

The proposed ESCP will ensure that the best management practice is applied to the development site in controlling and minimising the negative impacts of soil erosion.

9. Stormwater Drainage

9.1. Stormwater Drainage Design Criteria

Design criteria and requirements for the proposed site stormwater management and stormwater drainage are outlined in the following documents:

- AS 3500.3 – Plumbing and drainage – Stormwater drainage
- Commonwealth of Australia (Geoscience Australia), *Australian Rainfall and Runoff: A guide to flood estimation*, 2019.
- NSW Department of Planning, Industry and Environment (DPIE), *Mamre Road Precinct Development Control Plan 2021*.
- NSW Department of Planning, Industry and Environment (DPIE), *MUSIC Modelling Toolkit – Wianamatta*, 2 August 2021.
- Penrith City Council, *Design Guidelines for Engineering Works for Subdivisions and Developments*, as amended 20 November 2013.
- Penrith City Council, *Water Sensitive Urban Design (WSUD) Policy*, December 2013.
- Penrith City Council, *WSUD Technical Guidelines*, Version 4 – October 2020.

9.2. Proposed Site Stormwater Drainage

The proposed drainage network within the estate has been designed to safely convey major and minor flows prior to discharging to neighbouring properties to the south and west. The following criteria have been adopted for the proposed drainage system:

- Major system (pit and pipe network, overland flow paths and channels): 1% AEP
- Minor system (pit and pipe network): minimum 5% AEP and increased where required to address major system design requirements.
- Flood Impacts from external catchments are to be minimised to an acceptable level for all floods up to the PMF.

The internal site stormwater drainage has been designed to drain towards the proposed detention basin located on the southern side of Abbotts Road. The basin will discharge into a new stormwater drainage line that will be constructed on the southern side of Abbotts Road, which will connect to future stormwater drainage that will ultimately drain towards Mamre Road.

9.3. Trunk Drainage Infrastructure

The *Mamre Road Precinct DCP* includes indicative locations of trunk drainage infrastructure across the precinct, refer to Figure 14. An indicative trunk drainage line is situated within the ESR Westlink site, which would drain in a westerly direction on the southern side of Abbotts Road and ultimately towards Mamre Road. No indication of connectivity between this trunk drainage channel and Kemps Creek has been identified in the Mamre Road Precinct DCP.

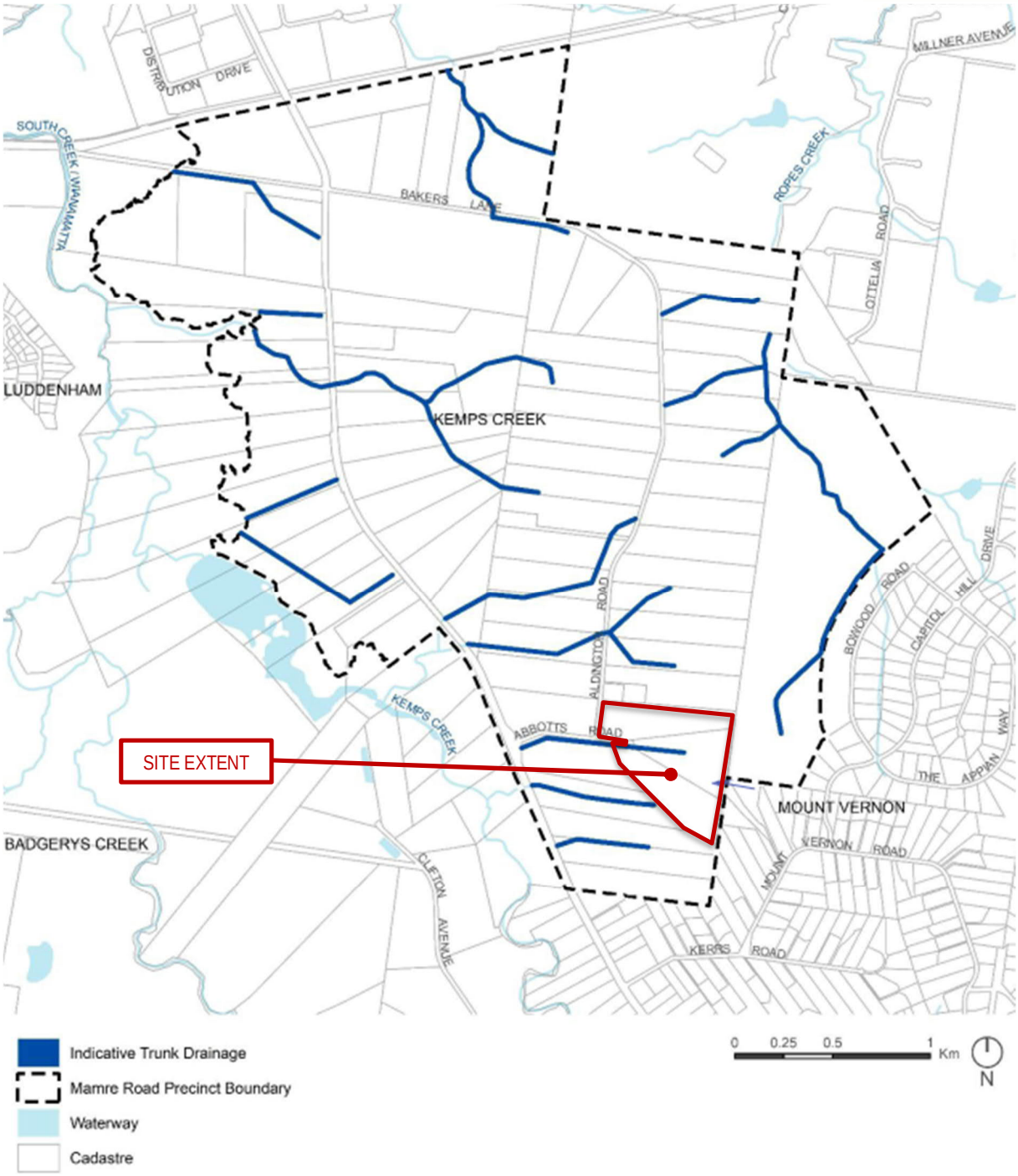


Figure 14: Trunk drainage infrastructure identified in the Mamre Road Precinct DCP

Due to the site topography and the proposed built landform, pits and pipes will be implemented within the Westlink Industrial Estate for trunk drainage infrastructure. There will be two major drainage lines within Road 01:

- Minor system drainage (minimum 5% AEP capacity) to capture and convey stormwater runoff from the proposed allotments and Road 01. This line will discharge to the detention basin on proposed Lot 2, with outflow from the basin draining to a proposed 1800mm diameter line on the southern side of Abbotts Road.

- Major system drainage (minimum 1% AEP capacity) to capture and convey stormwater runoff from the external catchments to the east of Westlink Industrial Estate, and the internal drainage. During stage 1 works, the external catchments to the east of the site are captured into the piped system which is sufficiently sized due to the provision for future allotments. Stormwater in the piped system is conveyed to the Abbot's Rd basin where flows from the 50% to the 1% AEP storms are attenuated to the existing catchment flows. A bypass pipe to take the external existing catchments has been proposed which runs through the road and bypasses the detention basin, however it is only conveying limited catchment during the constructed stage 1 case. In the future, all external catchments to the east of the site will be conveyed through this pipe. Reference is made to Penrith City Council's submission on the SSDA documentation in their letter to DPIE dated 21 July 2021, which states: '*No objections are raised to the proposed methodology to separate internal treated stormwater flows from external catchment flows*'. This comment was provided based on the proposal to construct the external catchment diversion line within the Road 01 / Abbotts Road road reserve and under the road pavement. A flood impact assessment is also underway to ensure the effect of these external catchments does not cause safety issues in large storm events.
- Trunk Drainage as defined in the DCP (15ha of contributing catchment) does not occur in the drainage system until the detention basin is reached. Only the detention basin as well as its outlet drainage has 15ha of upstream catchment, so they are both to be considered trunk drainage. There is no downstream allowance for a naturalised trunk drain, so the outlet piping from the basin must be conveyed in the road reserve, with an easement if necessary. The waterway health objectives are met downstream of the detention basin despite the piped system.

10. Water Management Strategy

This section summarises the proposed water management strategy for the site, including details of the proposed stormwater management measures and characterisation of water quality, quantity and flow volume at the points of discharge at the site boundary against the controls outlined in the Mamre Road Precinct DCP.

10.1. Water Management Strategy Objectives and Controls

The main objectives pertaining to the management of stormwater within the proposed development site are outlined in Section 2.4 of the Mamre Road Precinct DCP. Controls relating to stormwater quantity management and the requirement to attenuate peak flow rates are outlined in Section 2.5 of the DCP.

Specific controls relating to water management, as well as a response to these controls, is summarised below in Table 8.

Table 8: Response to DCP controls relating to water management

DCP Controls	Response
Waterway health and Water Sensitive Urban Design	
1) Development applications must demonstrate compliance with the stormwater quality targets in Table 4 (DCP) and the stormwater flow targets during construction and operation phases in Table 5 (DCP) and Table 6 (DCP) at the lot or estate scale to ensure the NSW Government's waterway objectives (flow and water quality) for the Wianamatta-South Creek catchment are achieved (see Appendix D). Where the strategy for waterway management is assessed at an estate level, the approval should include for individual buildings within the estate, which may be the subject of future applications.	Performance of the proposed water management strategy against the stormwater quality targets is presented in Table 17. Performance against the construction phase stormwater flow targets is presented in Section 8. Performance of the proposed water management strategy against the operational stormwater flow targets is presented in Table 19.

DCP Controls	Response
2) The stormwater flow targets during operation phase (Table 5) include criteria for a mean annual runoff volume (MARV) flow-related option and a flow duration-related option. Applicants must demonstrate compliance with either option.	Performance of the proposed water management strategy against the operational stormwater flow targets is presented in Table 19.
3) Development applications must include a Water Management Strategy (WMS) detailing the proposed Water Sensitive Urban Design (WSUD) approach, how the WMS complies with stormwater targets (i.e., MUSIC modelling), and how these measures will be implemented, including ongoing management and maintenance responsibilities. Conceptual designs of the stormwater drainage and WSUD system must be provided to illustrate the functional layout and levels of the WSUD systems to ensure the operation has been considered in site levels and layout.	The Water Management Strategy for the site is outlined in Section 10, and includes the approach to WSUD for the site, performance of the proposed stormwater management measures against the DCP targets, and description of delivery, ongoing management and maintenance of each proposed measure. Design drawings showing the layout and levels of the proposed stormwater management elements are included in the AT&L civil package.
4) The design and mix of WSUD infrastructure shall consider ongoing operation and maintenance. Development applications must include a detailed lifecycle cost assessment (including capital, operation/maintenance, and renewal costs over 30 years) and Maintenance Plan for WSUD measures.	Ongoing management and maintenance considerations are addressed in Section 10.10. All costs associated with the delivery, operation and maintenance of the estate-based water management measures will be borne by the proponent.
5) WSUD infrastructure may be adopted at a range of scales (i.e., allotment, street, estate, or sub-precinct scale) to treat stormwater, integrate with the landscape and maximise evaporative losses to reduce development flow runoff. Vegetated WSUD measures, naturalised trunk drainage and rainwater/stormwater reuse are preferred. Acceptable WSUD measures to retain stormwater within the development footprint and subdivision are shown in Table 7 (DCP).	A summary of the proposed WSUD infrastructure adopted in the water management strategy is presented in Table 9.
6) Development must not adversely impact soil salinity or sodic soils and shall balance the needs of groundwater dependent ecosystems.	Refer to Geotechnical Investigation Reports prepared by Douglas Partners (for 59-63 Abbotts Road) and Alliance Geotechnical (for 290-308 Aldington Road) for details of soil salinity, sodicity and groundwater.
7) Infiltration of collected stormwater is generally not supported due to anticipated soil conditions in the catchment. All WSUD systems must incorporate an impervious liner unless a detailed Salinity and Sodicity Assessment demonstrates infiltration of stormwater will not adversely impact the water table and soil salinity (or other soil conditions).	The proposed water management strategy does not incorporate infiltration of collected stormwater.
8) Where development is not serviced by a recycled water scheme, at least 80% of its non-potable demand is to be supplied through allotment rainwater tanks.	Refer to Section 10.5.5 for details of proposed rainwater tanks and demand statistics.

DCP Controls	Response
9) Where a recycled water scheme (supplied by stormwater harvesting and/or recycled wastewater) is in place, development shall: ▪ *Be designed in a manner that does not compromise waterway objectives, with stormwater harvesting prioritised over reticulated recycled water;* ▪ *Bring a purple pipe for recycled water to the boundary of the site, as required under Clause 33G of the WSEA SEPP. Not top up rainwater tanks with recycled water unless approved by Sydney Water; and* ▪ *Design recycled water reticulation to standards required by the operator of the recycled water scheme.*	Stormwater harvesting in the form of rainwater tanks on the proposed lots will form one of the components of the Interim Arrangement. The supply of harvested rainwater for non-potable uses within the development will be prioritised over reticulated recycled water. It is envisaged that reticulated recycled water would supply the shortfall in supply from the rainwater tank and would not top up rainwater tanks unless approved by Sydney Water.
Trunk Drainage Infrastructure	
10) Indicative naturalised trunk drainage paths are shown in Figure 4 (DCP)	Reproduced in this report for context as Figure 14.
11) Naturalised trunk drainage paths are to be provided when the: ▪ *Contributing catchment exceeds 15ha; or* ▪ *1% AEP overland flows cannot be safely conveyed overland as described in Australian Rainfall and Runoff – 2019;* *unless otherwise agreed by the consent authority.*	Details of the proposed trunk drainage infrastructure are included in Section 9.3. 15ha contributing catchment only occurs at the detention basin and in pipes downstream of the basin, which are therefore trunk drainage assets.
12) The design and rehabilitation of naturalised trunk drainage paths is to be generally in accordance with NRAR requirements (refer to Section 2.3) that replicates natural Western Sydney streams. An example of a naturalised trunk drainage path is shown in Figure 3.	It is proposed that trunk drainage infrastructure in the form of a pit and pipe system be provided in lieu of open channel(s) within the site, downstream of the basin, as there is no downstream provision for a naturalised trunk.
13) Naturalised trunk drainage paths shall be designed to: ▪ *Contain the 50% AEP flows from the critical duration event in a low flow natural invert;* ▪ *Convey 1% AEP flows from the critical duration event with a minimum 0.5m freeboard to applicable finished floor levels and road/driveway crossings; and* ▪ *Provide safe conveyance of flows up to the 1% AEP flood event.*	As described above, trunk drainage infrastructure in the form of a pit and pipe system is proposed to be provided within the site. This system will have sufficient capacity to capture and convey flows up to the 1% AEP design event.

DCP Controls	Response
14) Where naturalised trunk drainage paths traverse development sites, they may be realigned to suit the development footprint, provided that they: ▪ *Comply with the performance requirements for flow conveyance and freeboard;* ▪ *Are designed to integrate with the formed landscape and permit safe and effective access for maintenance;* ▪ *Do not have adverse flood impacts on neighbouring properties; and* ▪ *Enter and leave the development site at the existing points of flow entry and exit.*	The proposed trunk drainage lines within the site will: ▪ Comply with requirements for flow conveyance and freeboard. ▪ Incorporate sufficient access points for maintenance – maximum spacing of pits will not exceed 75 metres, which is consistent with Penrith City Council's *Design Guidelines for Engineering Works for Subdivisions and Developments* (considered an appropriate reference in the absence of any specific Sydney Water guideline or standard). ▪ Have sufficient capacity to capture and convey flow from the external catchments to the east of the Westlink Industrial Estate, and will therefore not result in adverse flood impacts on neighbouring properties. This is currently being confirmed by a flood impact assessment underway. ▪ Discharge from the Westlink Industrial Estate to a point of discharge within the Abbotts Road reserve, to proposed drainage that will be constructed as part of the upgrade of Abbotts Road.
15) Trunk drainage paths shall remain in private ownership with maintenance covenants placed over them to the satisfaction of Council (standard wording for positive covenants is available from Council). Easements will also be required to benefit upstream land.	The proposed trunk drainage lines will be located in Road 01 / Abbotts Road, downstream of the detention basin. The need or otherwise for maintenance covenants to be placed over the proposed stormwater drainage will be confirmed subject to further discussion and coordination with the road authority (Penrith City Council) and the Waterway Manager (Sydney Water).
16) Where pipes/ culverts are implemented in lieu of naturalised trunk drainage paths, they must remain on private land and not burden public roads, unless otherwise accepted by Council.	As the downstream connection is within the road reserve, and the adjacent land is not owned by ESR, the trunk drainage downstream of the detention basin we recommend be implemented in the road reserve. Approximately 45m of trunk drainage would otherwise need to be contained in a different landowner's land to then connect into the downstream trunk drainage already in the road reserve.
17) High vertical walls and steep batters shall be avoided. Batters shall be vegetated with a maximum batter slope 1V:4H. Where unavoidable, retaining walls shall not exceed 2.0m in cumulative height.	Based on the proposal to implement pit and pipe drainage for trunk drainage infrastructure, this control is not considered relevant as it is intended to apply to naturalised trunk drainage channels.
18) Raingardens and other temporary water storage facilities may be installed online in naturalised trunk drainage paths to promote runoff volume reductions.	Not applicable to the Westlink Industrial Estate.

DCP Controls	Response
19) Subdivision and development are to consider the coordinated staging and delivery of naturalised trunk drainage infrastructure. Development consent will only be granted to land serviced by trunk drainage infrastructure where suitable arrangements are in place for the delivery of trunk infrastructure (to the satisfaction of the relevant Water Management Authority).	The proposed trunk drainage infrastructure will be staged and delivered commensurate with the staging of earthworks and infrastructure across the estate. The trunk drainage infrastructure will form a critical component of the site water management strategy throughout construction and will be incorporated into the Erosion and Sediment Control Plan and Construction Environmental Management Plan. The final form of the trunk drainage lines, including connections to infrastructure downstream of the Westlink Industrial Estate, will be undertaken at a suitable stage of development and will be subject to further consultation with the Sydney Water (the nominated Waterway Manager).
20) Stormwater drainage infrastructure, upstream of the trunk drainage, is to be constructed by the developer of the land considered for approval.	All stormwater drainage upstream of the proposed trunk drainage lines will be designed and delivered by the proponent.
21) All land identified by the Water Management Authority as performing a significant drainage function and where not specifically identified in the Contributions Plan, is to be covered by an appropriate "restriction to user" and created free of cost to the Water Management Authority.	Noted – subject to further consultation with Sydney Water (the nominated Waterway Manager).
22) All proposed development submissions must clearly demonstrate via 2-dimensional flood modelling that: *1) Overland flow paths are preserved and accommodated through the site;* *2) Runoff from upstream properties (post development flows) are accommodated in the trunk drainage system design;* *3) Any proposed change in site levels or drainage works are not to adversely impact and upstream or downstream, or cause a restriction to flows from upstream properties;* *4) There is no concentration of flows onto an adjoining property; and* *5) No flows have been diverted from their natural catchment to another.*	Refer to Section 12 for details of overland flow flooding through the site. Refer to the Cardno "Flood Impact Assessment Westlink Industrial Estate – Stage 1 290-308 Aldington Road, Kemps Creek" report for further detail on how Stage 1 satisfies these criteria.

DCP Controls	Response
Overland Flow Flooding	
10) Development should not obstruct overland flow paths. Development is required to demonstrate that any overland flow is maintained for the 1% AEP overland flow with consideration for failsafe of flows up to the PMF.	The proposed major and minor system drainage has been designed such that development within the estate will not obstruct any overland flow paths. Suitable allowance for overland flow has been made within the design of the major and minor system. The bypass pipe built for future external flows is to be designed to intercept overland flows at existing flows. Any future development in the external catchments must be attenuated to this flow regime. The flood impact assessment will address storms above the 1% AEP.
11) Where existing natural streams do not exist, naturalised drainage channels are encouraged to ensure overland flows are safely conveyed via vegetated trunk drainage channels with 1% AEP capacity plus 0.5m freeboard. Any increase in peak flow must be offset using on-site stormwater detention (OSD) basins.	Refer to Section 9.3 for details of the proposed trunk drainage infrastructure. Refer to Section 10.5.2 for details of the proposed detention basin that will attenuate peak flows within the estate prior to discharge across the estate boundary and into the proposed drainage system in Abbotts Road. Note that naturalised flow regime is not established until flows exit the detention basin. A naturalised drainage channel upstream of the basin would convey a purely urban flow regime and provide little waterway health benefit.
12) OSD is to be accommodated on-lot, within the development site, or at the subdivision or estate level, unless otherwise provided at the catchment level to the satisfaction of the relevant consent authority.	The location of the proposed detention basin within the estate is presented on drawing 20-748-C1071. On site detention is provided on an estate level, not an allotment level.
13) Stormwater basins are to be located above the 1% AEP.	The site is not subject to mainstream flooding, and therefore the proposed detention basins will be located outside the extent of 1% AEP mainstream flooding.
14) Post-development flow rates from development sites are to be the same or less than pre-development flow rates for the 50% to 1% AEP events.	The performance of the proposed detention basin against the stormwater quantity targets in the Mamre Road Precinct DCP is summarised in Table 18.
15) OSD must be sized to ensure no increase in 50% and 1% AEP peak storm flows at the Precinct boundary or at Mamre Road culverts. OSD design shall compensate for any local roads and/or areas within the development site that does not drain to OSD.	As demonstrated in Table 18, the proposed detention basin has been sized to ensure no increase in peak flows at the discharge point from the estate. All bypass flows are considered in the attenuation requirements.

10.2. Water Management Strategy Overview

Since the release of the Draft Mamre Road Precinct DCP in November 2020, AT&L has been working with several landowners in the Mamre Road Precinct, Government, other Industry Bodies, and experts in water management to resolve practical solutions that will address the stormwater flow targets that have been adopted in the final DCP.

The Draft *Mamre Road Flood, Riparian Corridor and Integrated Water Cycle Management Report* (FRCIWCM) (Sydney Water, 2020) addresses links between waterway health, hydrology and water quality targets. The stormwater management objectives outlined in the FRCIWCM Report, which have ultimately been adopted in the Mamre Road Precinct DCP, were developed by applying the *Risk-based Framework for Considering Waterway Health Outcomes in Strategic Land-use Planning Decisions* (NSW OEH, 2017). The effects-based assessment outlined in the FRCIWCM Report addressed three metrics relating to waterway health and stormwater management:

1. Flow volume – mean annual runoff volume (MARV), measured in ML/ha/year. The target adopted in the Mamre Road Precinct DCP is 2 ML/ha/year (revised from 1.9 ML/ha/year in the Draft DCP). The outcomes for the Westlink Industrial Estate are summarised in Section 10.9.

2. Seasonal pulses – as shown by flow duration curves. The targets and outcomes demonstrated by a flow duration curve under post-development conditions is presented in Section 10.9.

3. Water quality – as indicated by stormwater pollution reduction. The targets and outcomes demonstrated as reduction in average annual pollutant load are summarised in Section 10.7. Note that as this design contains significant natural catchment, we have adopted the concentration targets as provided in the 20/04/2022 "MUSIC MODELLING TOOLKIT – WIANAMATTA" produced by DPE.

In the FRCIWCM, Sydney Water also discussed the potential for regional facilities to be implemented to satisfy the stormwater flow objectives for the Mamre Road Precinct. The FRCIWCM report states:

> *"It is noted that the most cost-effective way to achieve stormwater volume load reductions is via open water bodies and these have a maintenance implication for developers and a wildlife risk.*
>
> *Through master planning of the Wianamatta South Creek precinct, it will be possible to integrate regional wetlands and water bodies and offset the need for wetlands and open water to be distributed through the Precinct on private lands.*
>
> *This centralised management of water is preferable as it provides a more appropriate scale of WSUD assets for more cost-effective maintenance and management outcomes."*

In March 2021, in response to the Draft DCP and the Draft FRCIWCM, AT&L prepared a detailed report in response to the stormwater flow objectives and controls in the Draft DCP, which concluded that if stormwater flow targets were to be adopted, Government would need to consider a Precinct or Regional approach to managing stormwater.

Subsequent to the release of the Draft DCP and Draft FRCIWCM, the Mamre Road Landowners Group (of which ESR Australia is a participant) has consulted with Sydney Water on several occasions to discuss the potential for regional stormwater management interventions to at least partially achieve the stormwater flow targets for the precinct. Sydney Water has indicated they are in the early stages of developing scheme plans for a precinct-wide stormwater management scheme, which would consist of a series of open water bodies (wetlands or ponds) and stormwater harvesting infrastructure (pumps, water treatment and a recycled water reticulation network throughout the precinct). Whilst it is understood the proposed regional stormwater management scheme is at a very early stage of planning and design, this Water Management Strategy has been prepared on the basis that the regional stormwater management scheme will eventuate, albeit the timing of its delivery is uncertain at this stage.

The Water Management Strategy for Stage 1 has been developed to satisfy the flow targets fully without the regional solution being in place. It is important to note that for the full site to satisfy the flow duration and MARV arrangements, the stage 1 measures may need to be altered, particularly by retrofitting the detention basin. By the time that the future stages are under assessment, it may also be the case that the regional scheme is further progressed, and these measures may be reduced. This report focuses on the "Estate" level flow duration and MARV strategies.

A summary of the proposed stormwater management measures that would be required to satisfy stormwater quality, quantity and flow controls under both the "Estate" and "Regional" Arrangements is presented in Table 9.

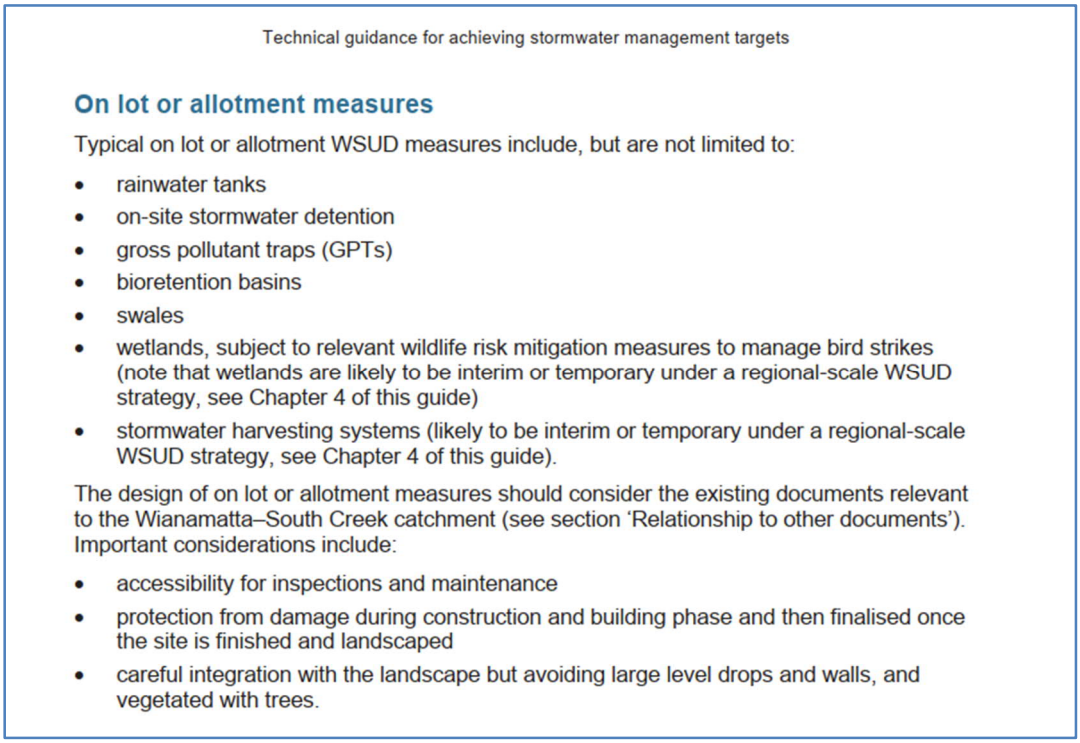
Table 9: Proposed water management measures under the Estate and Regional Arrangements

	Estate Arrangement (Stage 1) (prior to implementation of regional stormwater management scheme)		Regional Arrangement (with regional stormwater scheme to be operated by Sydney Water)	
Rainwater tanks for non-potable reuse (refer to Section 10.5.5 for further details)	✓	Assumed to be required for proposed Lots 1 and 4 to comply with the following DCP control: *Where development is not serviced by a recycled water scheme, at least 80% of its non-potable demand is to be supplied through allotment rainwater tanks.*	×	Rainwater tanks would not be required under the Ultimate Arrangement, on the basis that a reticulated recycled water scheme is in place and is deemed to be a more commercially viable solution than rainwater tanks for the supply of non-potable water throughout the estate.
Gross pollutant traps (GPTs) (refer to Section 10.5.1 for further details)	✓	GPTs with capacity for hydrocarbon and sediment removal (SPEL Stormceptor® or equivalent) to be installed upstream of the proposed detention basin as a pre-treatment measure for the regional stormwater management scheme.	✓	GPTs with capacity for hydrocarbon and sediment removal (SPEL Stormceptor® or equivalent) to be installed upstream of the proposed detention basin as a pre-treatment measure for the regional stormwater management scheme.
Detention basin (refer to Section 10.5.2 for further details)	✓	Required to satisfy stormwater quantity controls.	✓	Required to satisfy stormwater quantity controls.
Evaporation ponds (refer to Section 10.5.3 for further details)	✓	Required to satisfy stormwater flow controls and stormwater quality treatment.	×	Will not be required on the basis that stormwater flow controls and stormwater quality treatment will be incorporated into the regional stormwater management scheme.
Stormwater Harvesting for Irrigation (refer to Section Error! Reference source not found. for further details)	✓	Required to satisfy stormwater flow controls.	~	May not be required on the basis that stormwater flow controls will be incorporated into the regional stormwater management scheme. May still be required for the regional management scheme to achieve reuse outcomes

10.2.1. Technical Guidance for achieving Wianamatta-South Creek stormwater management targets

In September 2022 The Department of Planning and Environment released a *Technical guidance for achieving Wianamatta-South Creek stormwater management targets.* This guideline was prepared to give advice on modelling to undertake, assumptions to make and which data is to be used to demonstrate that the water targets are being achieved. It also provided a range of example WSUD strategies that could be utilised to meet the water quantity targets.

Refer to Figure 15 below for extract from the Technical Guidelines (page 14) which indicates typical WSUD measures which could be implemented to meet the required water quantity targets.



Technical guidance for achieving stormwater management targets

On lot or allotment measures

Typical on lot or allotment WSUD measures include, but are not limited to:

- rainwater tanks
- on-site stormwater detention
- gross pollutant traps (GPTs)
- bioretention basins
- swales
- wetlands, subject to relevant wildlife risk mitigation measures to manage bird strikes (note that wetlands are likely to be interim or temporary under a regional-scale WSUD strategy, see Chapter 4 of this guide)
- stormwater harvesting systems (likely to be interim or temporary under a regional-scale WSUD strategy, see Chapter 4 of this guide).

The design of on lot or allotment measures should consider the existing documents relevant to the Wianamatta–South Creek catchment (see section 'Relationship to other documents'). Important considerations include:

- accessibility for inspections and maintenance
- protection from damage during construction and building phase and then finalised once the site is finished and landscaped
- careful integration with the landscape but avoiding large level drops and walls, and vegetated with trees.

Figure 15 - Extract from Technical Guidance

For this SSD all the dot points as noted within Figure 15 with the exception of a wetland are being incorporated into the civil design to ensure the water quantity targets are met. Refer to Section 10.5 for additional details.

10.3. Hydrological and Hydraulic Modelling

DRAINS modelling software has been used to calculate the Hydraulic Grade Line (HGL) of the proposed estate-wide stormwater network, including pits, pipes, overland flow paths and detention basins. DRAINS is a software package used for designing and analysing urban stormwater drainage systems and catchments. It is widely accepted by Council's across NSW as the basis for stormwater design and has been confirmed by Penrith City Council as the preferred stormwater software analysis package.

A summary of the key hydrological and hydraulic design parameters adopted in DRAINS to develop a major and minor system drainage design for the proposed development are as follows:

- Minor system (pit and pipe) drainage has been designed to accommodate the 5% AEP storm event.
- The combined pit and pipe drainage and overland flow paths have been designed to accommodate the 1% AEP storm event.

- Where trapped low points are unavoidable and potential for flooding private property is a concern, an overland flow path capable of carrying the total 1% AEP storm event has been provided. Alternatively, the pipe and inlet system has been upgraded to accommodate the 1% AEP storm event.
- Rainfall intensities have been adopted using the Bureau of Meteorology Design Rainfall Data System (2016).
- Times of concentration for each sub catchment have been determined using the kinematic wave equation.
- The width of flow in the gutter does not exceed 2.5 metres and pits are spaced no further than 75 metres apart.
- Velocity x depth product shall not exceed 0.4 m^2/s for all storms up to and including the 1% AEP event.
- Bypass from any pit on grade shall not exceed 15% of the total flow at the pit.
- Blockage factors of 20% and 50% shall be adopted for on-grade and sag pits respectively.
- A hydraulic grade line HGL design method shall be adopted for all road pipe drainage design.
- Pipelines in roadways shall have a minimum diameter of 375mm.
- A desirable minimum grade of 1% for all pipelines is preferred for self-cleansing under low flow velocities. An absolute minimum grade of 0.5% has been adopted.
- The minimum cover over pipes shall be 450mm in grassed areas and 600mm within carriageways.
- Where minimum cover cannot be achieved due to physical constraints the pipe class shall be suitably increased.
- All pipes in trafficable areas will be Reinforced Concrete Pipes (RCP) or Fibre Reinforced Cement (FRC) equivalent.
- Pipes discharging to an overland flow path shall adopt a minimum tailwater level equivalent to respective overland flow level.
- Pit Loss coefficients have been calculated in accordance with the Hare Charts as documented in the Queensland Urban Drainage Manual.
- A minimum 150mm freeboard has been maintained between pit HGL and pit surface levels for the minor design storm event (5% AEP).
- Overland flow paths maintain a minimum of 300mm freeboard to all habitable floor levels.

10.4. Stormwater Quality Modelling

The proposed stormwater treatment train has been modelled using the MUSICX software package (Version 1.1.0). Modelling has been undertaken in accordance with the *MUSIC Modelling Toolkit – Wianamatta* (NSW DPIE, 2021).

Rainfall and evaporation data

Penrith City Council's MUSIC-link climate data (rainfall and evapotranspiration) was adopted in the MUSIC model. The default meteorological data includes:

- Pluviometer data (six-minute rainfall intensity and evapotranspiration) for Penrith Lakes AWS (Station 67113) for the period between 1999 and 2008 inclusive (average annual rainfall over this period = 691mm).
- Monthly potential evapotranspiration (PET) as per the *MUSIC Modelling Toolkit - Wianamatta*.

Rainfall-runoff parameters

The rainfall-runoff parameters adopted in the MUSIC model are consistent with the parameters adopted in *MUSIC Modelling Toolkit – Wianamatta*, refer to Table 10.

Table 10: Rainfall-runoff parameters adopted in MUSIC

Parameter	Unit	Value
Impervious area parameters		
Rainfall Threshold	mm/day	1.0
Pervious area parameter		
Soil Storage Capacity	mm	150
Initial Storage	% of Capacity	30
Field Capacity	mm	130
Infiltration Capacity Coefficient α	-	175
Infiltration Capacity Coefficient β	-	2.5
Groundwater properties		
Initial Depth (groundwater)	mm	10
Daily Recharge Rate	%	25
Daily Baseflow Rate	%	1.4
Daily Seepage Rate	%	0.0

Source nodes and pollutant generation

Pollutant events mean concentrations (EMCs) for base flow and storm flow scenarios have been adopted from Table 6 of Blacktown City Council's WSUD developer handbook (consistent with the *MUSIC Modelling Toolkit - Wianamatta*). The EMC values are applied to source nodes in the MUSIC model to estimate annual pollutant loads exported from the site under the proposed ultimate development scenario. The adopted pollutant EMCs for various catchment types are summarised in Table 11.

Table 11: Stormwater quality parameters for MUSIC source nodes

Landuse category		log10 TSS (mg/l)		log10 TP (mg/l)		log10 TN (mg/l)	
		Base flow	Storm flow	Base flow	Storm flow	Base flow	Storm flow
Roof areas	Mean	1.20	1.30	-0.85	-0.89	0.11	0.30
	Std dev	0.17	0.32	0.19	0.25	0.12	0.19
Road areas	Mean	1.20	2.43	-0.85	-0.30	0.11	0.34
	Std dev	0.17	0.32	0.19	0.25	0.12	0.19
Pervious areas	Mean	1.20	2.15	-0.85	-0.60	0.11	0.30
	Std dev	0.17	0.32	0.19	0.25	0.12	0.19

10.5. Proposed Stormwater Management Measures

A series of stormwater quantity and quality control measures are proposed to be adopted within the site to satisfy the stormwater management strategy objectives listed in Section 10.1. A general description of the proposed stormwater treatment train components is presented in the following sections.

10.5.1. Gross Pollutant Traps

The proposed stormwater treatment train under the Interim Arrangement would consist of a gross pollutant trap (GPT) upstream of the proposed detention basin as a means of primary stormwater treatment. GPTs are designed to capture litter, debris, coarse sediment, as well as some oils and greases.

A high-flow bypass for the GPTs would nominally be equivalent to the 4 EY (3-month ARI) peak flow rate discharging to the GPT. Design flows for the GPTs and their final configuration would be confirmed at the detailed design phase.

The Ocean-Save GPTs specified have been extensively used and approved within Western Sydney LGAs including within Penrith City Council. The GPT provided adopts the same treatment parameters approved and used by Blacktown City Council and as such is deemed suitable to form as part of the water treatment train.

10.5.2. Detention Basins

As discussed in Section 5.1, the site in its existing condition is broadly divided into six internal catchments, with external catchments draining through the site via the northern and eastern boundaries of the site.

Surface water runoff from the proposed lots and within the internal roads is proposed to be collected via pits and pipes and discharge into the proposed detention basin. Refer to drawings 20-748-C1042 to C1047 inclusive for the layout of the proposed internal stormwater drainage.

Surface water runoff from the external catchments is proposed to be managed as follows:

- Existing catchment B1 – to be collected via a catch drain on the eastern boundary into the ultimate bypass pipes (all B-catchments will drain here in the ultimate design).
- Existing catchments B2 to B4 – to be collected via a catch drain into the minor drainage system, conveyed into the detention basin. Catchment B2 also has an evaporation pond before being captured into the piped system
- External catchment C1 – to be collected adjacent to the northern boundary and conveyed in a new pit and pipe system and ultimately into the proposed stormwater drainage system in Aldington Road.
- Existing catchment C2 – To be collected by drainage in Lot 1 and conveyed to the basin. Lot 1 drainage will not capture this flow when the estate is fully developed (it will be part of lot 3).
- Existing Catchments D & E – Flow out of the site as per existing conditions
- Catchments south of the B catchments – Catchments remain in existing conditions. These areas eventually drain to Kemps creek at roughly the same point as the other catchments.

For the post-development scenario, it is proposed to maintain the existing points of discharge as close as possible and to design a solution where post-development peak flow rates are no greater than pre-development peak flow rates at each discharge point. Controlled outlets from the detention basin will include surcharge pits connected to subsurface drainage pipes (for low flows) and an emergency spillway across the basin crests (for high flows). Refer to drawing 20-748-C1071 for the detention basin details.

A summary of the key detention basin parameters and DRAINS model results for the major and minor system flow is presented in Table 12.

Table 12: Key detention basin parameters and DRAINS model results

Parameter	Unit	Basin A
Base level	mAHD	49.05
Pond Still Water Level	mAHD	51.55
Low Flow orifice level	mAHD	52.05
Low Flow orifice diameter	mm	450
Mid flow pit level	mAHD	53.25
Mid flow pit dimension	mm	1800x1800
High Flow pit level	mAHD	53.90
High flow pit dimension	mm	2100x2100

Parameter	Unit	Basin A
Outlet pipe diameter	mm	1500
Outlet pipe upstream IL	mAHD	48.923
Outlet pipe downstream IL	mAHD	48.623
Outlet pipe length	m	30
Spillway level	mAHD	54.70
Spillway width	m	10
Embankment Level	mAHD	55.00
5% AEP		
Inflow	m^3/s	7.45
Outflow through pit and pipe	m^3/s	2.98
Outflow over spillway	m^3/s	0.00
Peak basin water level	mAHD	54.01
Peak basin storage	m^3	7600
1% AEP		
Inflow	m^3/s	10.7
Outflow through pit and pipe	m^3/s	5.38
Outflow over spillway	m^3/s	0.00
Peak basin water level	mAHD	54.28
Peak basin storage	m^3	9056

10.5.3. Evaporation Ponds

Ponds are considered to provide an effective means of reducing runoff volume from the site as water would be lost via evaporation over a large area. A pond can capture large quantities of stormwater runoff, while also being relatively easy to maintain.

Large-scale MUSIC modelling undertaken by AT&L indicates that, in combination with other measures, ponds can achieve a relatively high reduction of stormwater runoff volume.

This Water Management Strategy under the Estate Arrangement (in the absence of the regional stormwater management scheme), which addresses the stormwater flow targets adopted in the Mamre Road Precinct DCP, incorporates an evaporation pond within the detention basin base, and also one intercepting catchment B2. Key parameters adopted for the ponds are summarised below in Table 13. Pond B2 is interim only until the full site is developed. As Pond 2 is an interim arrangement only capturing existing catchment, and in place of an existing farm dam, it may use the exfiltration rate of clay, however the basin pond will have a liner built.

Table 13: Adopted estate-wide evaporation pond parameters

Parameter	Basin Evaporation Pond	Catchment B2 Evaporation Pond
Inflow from:	All Catchments	Catchment B2
Outflow to:	Abbots Rd	Road 01
Low flow bypass (l/s)	0	0
Surface Area (m^2)	2700	5700
Permanent pool volume (m^3)	5500	2850

Parameter	Basin Evaporation Pond	Catchment B2 Evaporation Pond
Extended Detention volume (m^3)	325	N/A
Exfiltration rate (mm/hr)	0	0
Evaporative loss (% of PET)	100	100
Extended Detention outlet diameter (mm)	40	N/A
Low Flow Outlet diameter (mm)	450	N/A

10.5.4. Stormwater Harvesting for Irrigation

As per the Technical guidance for achieving Wianamatta-South Creek stormwater management targets stormwater harvesting and reuse is another effective way to reduce stormwater flow volumes from frequent flows events to achieve the water quantity targets.

Water runoff from the roofs of the industrial sheds is proposed to be stored in below or above ground tanks for use as irrigation in the residual lands within the Estate (Future Lot 6). Refer to Drawing 20-748 C1220 for extent of residual lands to be irrigation via stormwater harvest tanks / The storage tanks required for irrigation have been amalgamated into rainwater reuse tanks for non-potable water reuse. A total of 12 hectares of residual land is to be irrigated at a rate of 600mm/year.

A summary of the rainwater tanks total sizing for all reuse purposes adopted in MUSIC is presented in Table 14.

10.5.5. Rainwater Tanks

Rainwater tanks retain a significant proportion of stormwater that falls on roof areas. Given the large-scale industrial development proposed on the site, rainwater tanks can provide a significant contribution to the objective of minimising the total volume of runoff discharging from the site.

A rainwater tank reuse system on individual lots can be installed in many different configurations, including placing the tank above or below ground and using gravity or pressure systems (pumps) to supply rainwater for non-potable domestic uses. These uses typically include toilet flushing, laundry, hot water installations, car washing and irrigation.

The MUSIC model was developed to estimate the rainwater tank volume required to satisfy the Mamre Road Precinct DCP requirement. To determine the tank volume required to meet at least 80% of non-potable demand on individual lots, the following assumptions have been made:

- Non-potable demand of 0.1 kL/toilet/day has been adopted. The number of toilets within each lot has been estimated based on the floor area of warehouses and offices and Australian Standards. Fixed daily demands have been pro-rated based on the warehouses and offices being occupied six days per week (Monday to Saturday).
- Non-potable demand of 3.2 ML/ha/year has been adopted for irrigation of landscape areas on each lot. Irrigation demand has been estimated based on potential evapotranspiration minus rainfall (PET – rain) to account for the likely variability in irrigation demand throughout the year (i.e., high demand in summer, low demand in winter).
- 100% of the total warehouse roof area would drain to the rainwater tanks.

A summary of the rainwater tanks total sizing for all reuse purposes adopted in MUSIC is presented below in Table 14.

Table 14: Summary of Stormwater Harvest tank parameters under the Stage 1 Arrangement

Lot	Total Lot Area (ha)	Roof area to storage tank for irrigation (ha)	Estimated annual irrigation demand (ML/yr)	Adopted roof harvest tank volume (ML)
1	8.94	7.49	66	7
4	3.40	2.20	20	2.5

10.6. Scenario Modelling

A MUSIC model was created to simulate post-development mean annual loads under the Stage 1 scenario. The post-development model has been created based upon the proposed post-development catchment extents presented in Figure 9. Source nodes for each of the proposed lots have been adopted based on typical large-scale industrial land uses, including those depicted in the Estate Plan prepared by Nettleton Tribe. The layout of the post-development scenario is presented in Figure 16.

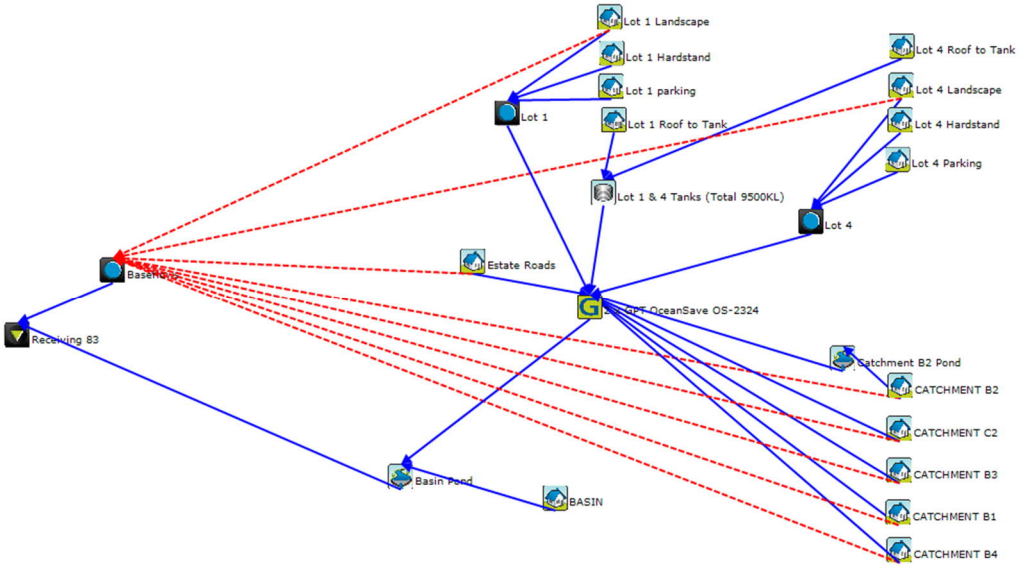


Figure 16: Post-development MUSIC model layout (Stage 1 Arrangement)

The proposed land use breakdown for the proposed lots under the post-development scenario is presented in Table 15.

Table 15: Post-development scenario land use breakdown under the Interim Arrangement

Catchment	Total Area (ha)	Roof area – warehouses and offices (ha)	Awning (Covering Hardstand) (ha)	Un-covered Hardstand area (ha)	Landscape area (ha)
1	11.00	6.68	0.81	2.30	1.21
4	3.35	1.92	0.28	1.14	0.29
Basin	1.00	-	-	0	1.00
Access Roads	2.04	-	-	1.836	0.204

The post-development scenario model under the Interim Arrangement incorporates the following stormwater management measures:

- Rainwater tanks, as per the parameters presented in Section 10.5.5.
- GPTs, as per the parameters described in Section 10.5.1.
- Detention basins, as per the parameters described in Section 10.5.2.
- Evaporation ponds within the detention basin and in existing catchment B2 as per the parameters presented in Section 10.5.3.
- Stormwater harvest tank for irrigation, as per the parameters presented in Section Error! Reference source not found..
- Landscape irrigation, at 3.0ML/ha of pervious space (600mm/year with 50% of area irrigated).
- Residual land irrigation at 6.0ML/ha (600mm/year with 100% of area irrigated)
- Baseflow from pervious surfaces is assumed to drain directly to the receiving node over time (red dashed arrows in Figure 16).

The attributes for each of the proposed stormwater management measures have been determined such that they will satisfy the stormwater quality, quantity and flow targets outlined in Section 10.1.

10.7. Performance against stormwater quality targets

The "MUSIC MODELLING TOOKIT – WIANAMATTA" Published on 20/04/2022 by DPE, supplied to "support assessments and development of proposals for State Significant Development", provides two options for operational phase stormwater quality targets. The first option is the traditional "reduction in mean annual load from unmitigated development", while the new Option 2 provides a concentration based target. The targets are shown below in Table 16 below (total catchment area = 31.09ha).

MUSIC model results presented as mean annual loads at the receiving node indicate that the adopted stormwater quality target reductions are achieved, as shown in Table 17.

Table 16: Summary of MUSIC modelling results against stormwater quality targets (% Reduction)

Parameter	Target Reduction (%) – Mamre Road Precinct DCP	Proposed Reduction (%)
TSS (kg/yr)	90	89.2
TP (kg/yr)	80	75.3
TN (kg/yr)	65	68.4
Gross Pollutants (kg/yr)	90	100.0

Table 17: Summary of MUSIC modelling results against stormwater quality targets (kg/ha/year)

Parameter	Target allowable Mean Annual Load (kg/ha/yr)	Proposed Residual Load for Stage 1 (kg/ha/yr)
TSS (kg/yr)	80	52.7
TP (kg/yr)	0.3	0.26
TN (kg/yr)	3.5	2.43
Gross Pollutants (kg/yr)	16	0

The MUSIC model results presenting treatment train effectiveness shows that while the development does not meet the traditional percentage reduction in pollutants (Option 1), it adequately satisfies the concentration based targets (Option 2). Due to the large proportion of un-developed land contributing to the treatment train, the reduction targets are less feasible than a fully developed estate assessment.

Under the Sydney Water Regional strategy, stormwater quality management measures would be incorporated into the regional stormwater management scheme to be designed, delivered and operated by Sydney Water, and therefore the ponds proposed would not be required.

10.8. Performance against stormwater quantity targets

Table 18 presents the pre-development and post development flow rates, generated by hydrologic and hydraulic modelling in DRAINS, for a range of events between and including the 50% AEP and 1% AEP design storm events at the discharge points from the site.

Table 18: Pre-development and post-development peak flow rates (Interim and Ultimate Arrangements)

Design Storm Event	Pre-Development Peak Flow Rate (m^3/s)	Post-Development Peak Flow Rate (m^3/s)
50% AEP	0.79	0.61
20% AEP	2.6	1.37
10% AEP	4.08	2.46
5% AEP	5.68	3.32
2% AEP	7.74	4.99
1% AEP	9.65	5.97

The DRAINS model results demonstrate that the post-development peak flow rates would be less than or equal to pre-development peak flow rates for a range of storm events between (and including) the 50% AEP and 1% AEP design events. Therefore, the stormwater drainage system and detention basins as proposed would satisfy the development controls relating to stormwater quantity management.

Note that on development of the future allotments for the catchment, the basin properties are likely to change, in particular the outlet heights and permanent pond depth in the basin. The basin has ample capacity for these future flows with these upgraded outlets based on preliminary calculations.

10.9. Performance against stormwater flow targets

MUSIC model results demonstrating performance of the proposed stormwater management measures in the Interim Arrangement against the stormwater flow targets are presented below in Table 19. The resultant flow duration curve is presented as Figure 17.

Table 19: Summary of MUSIC model results against stormwater flow targets (Interim Arrangement)

Parameter	Result	DCP Target	Complies with DCP target	
			DCP Option 1 (MARV approach)	DCP Option 2 (Flow Duration Curve approach)
Mean annual runoff volume (ML/ha/yr)	1.52	2.0	Yes	n/a
95%ile flow (L/ha/day)	13780	3000 to 15000	n/a	Yes
90%ile flow (L/ha/day)	4972	1000 to 5000	Yes	Yes
75%ile flow (L/ha/day)	2044	100 to 1000	n/a	No
50%ile flow (L/ha/day)	85.7	5 to 100	Yes	Yes
10%ile flow (L/ha/day)	0.22	0	Yes*	n/a
Cease to flow	7.1%	10% to 30%	n/a	Yes

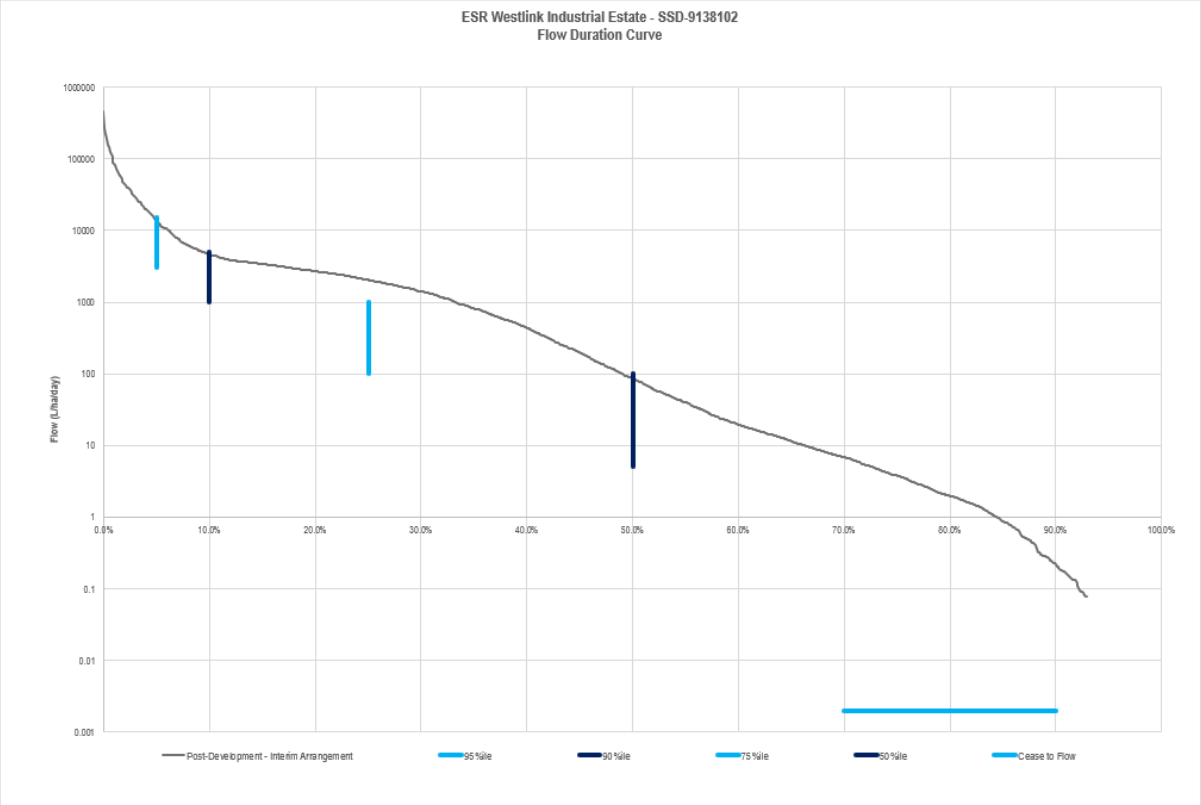


Figure 17: Flow duration curve for the proposed stormwater management measures

The results presented in Table 19 demonstrate the proposed stormwater management measures that will be implemented under the Interim Arrangement satisfy the Option 1 DCP stormwater flow targets for the site. The 10 percentile flow of 0.22L/ha/day is a result of the baseflow of pervious surfaces contributing to Kemps Creek as modelled in MUSIC, which cannot easily be reduced by built measures. We argue that it is so close to zero as to be negligible.

10.10. Ongoing Management and Maintenance

All proposed water management measures that make up the Interim Arrangement of the water management strategy would be managed and maintained by the proponent. An Inspection and Maintenance Plan will be prepared and lodged with the construction certificate for the subdivision works once final design details and the extent and layout of all proposed water management measures is confirmed. It is anticipated that the Inspection and Maintenance Plan would be prepared using current best practice guidance such as *Water sensitive urban design inspection and maintenance guidelines* (Blacktown City Council, 2019) and would describe:

- Each of the functional components of each water management measure
- Expertise required to inspect, maintain and (where necessary) repair or replace components
- Minimum required frequency of inspection, repair or replacement activities
- Inspection and maintenance forms that list all necessary activities and contain a record of activities completed.

As described in Section 10.2, the Estate Arrangement would incorporate some estate-based measures such as on-lot rainwater tanks, GPTs and an estate-wide detention basin. These measures would be managed and maintained by the proponent, with inspection and maintenance requirements consistent with those described above. The planned regional stormwater management scheme, which would incorporate measures to manage stormwater quality and volume across the Mamre Road Precinct, would be managed and maintained by Sydney Water.

11. Site Water Balance

11.1. Water Balance Overview

Potable water supplies in the Sydney area are in recognised short supply with projected population increases, potential climate change and periods of extended drought. It is acknowledged that any development in the Sydney region places greater demand on an already limited water supply. As a result, government bodies, together with Sydney Water have encouraged sustainable development by the implementation of an integrated approach to water cycle management (potable water, sewerage, stormwater and rainwater) to minimise potable water demand and maximise the potential for non-potable water sources to replace potable water demand where possible.

With the appointment of Sydney Water as the regional Waterway Manager and the announcement of a regional stormwater management scheme, opportunities for water reuse within the Mamre Road Precinct will include regional stormwater harvesting and reticulated recycled water.

11.2. Water Requirements

Water requirements within the Westlink Industrial Estate will be typical of large format warehouses and distribution centres. Sources of demand for water within the proposed allotments and public domain will include:

- Office amenities (kitchen, bathrooms)
- Landscape irrigation
- Dust suppression (depending on end user requirements)

11.3. Water Sources

The primary source of water to the Westlink Industrial Estate will be Sydney Water's potable water reticulation network. Details of existing and proposed infrastructure that will be required to service the estate is presented in Section 13.2.

A "third-pipe" reticulated recycled water network will supply non-potable water throughout the Mamre Road Precinct. Non-potable water will be supplied from two sources:

- Stormwater harvested within precinct-wide wetlands / ponds, to be delivered and operated by Sydney Water as part of a regional stormwater management scheme.
- Recycled water from the planned Upper South Creek Advanced Recycled Water Centre.

11.4. Water Use Minimisation

Sydney Water provides a wide range of advice and guidance relating to water use minimisation and water efficiency. Whilst warehouses and distribution centres are relatively low water users in comparison to other industrial users, the following water use minimisation principles will apply to development within the Westlink Industrial Estate:

- Avoid using water where possible, such as sweeping hard surfaces instead of washing them.
- Reduce water use by installing water-efficient appliances and equipment (e.g., toilets, urinals, shower heads).
- Reuse water from manufacturing or cooling processes to toilet flushing, landscape irrigation and dust suppression.

12. Overland Flow Flooding

The site is located outside the extent of the Flood Planning Area identified in the *Penrith Local Environment Plan 2010*, refer to Figure 18.

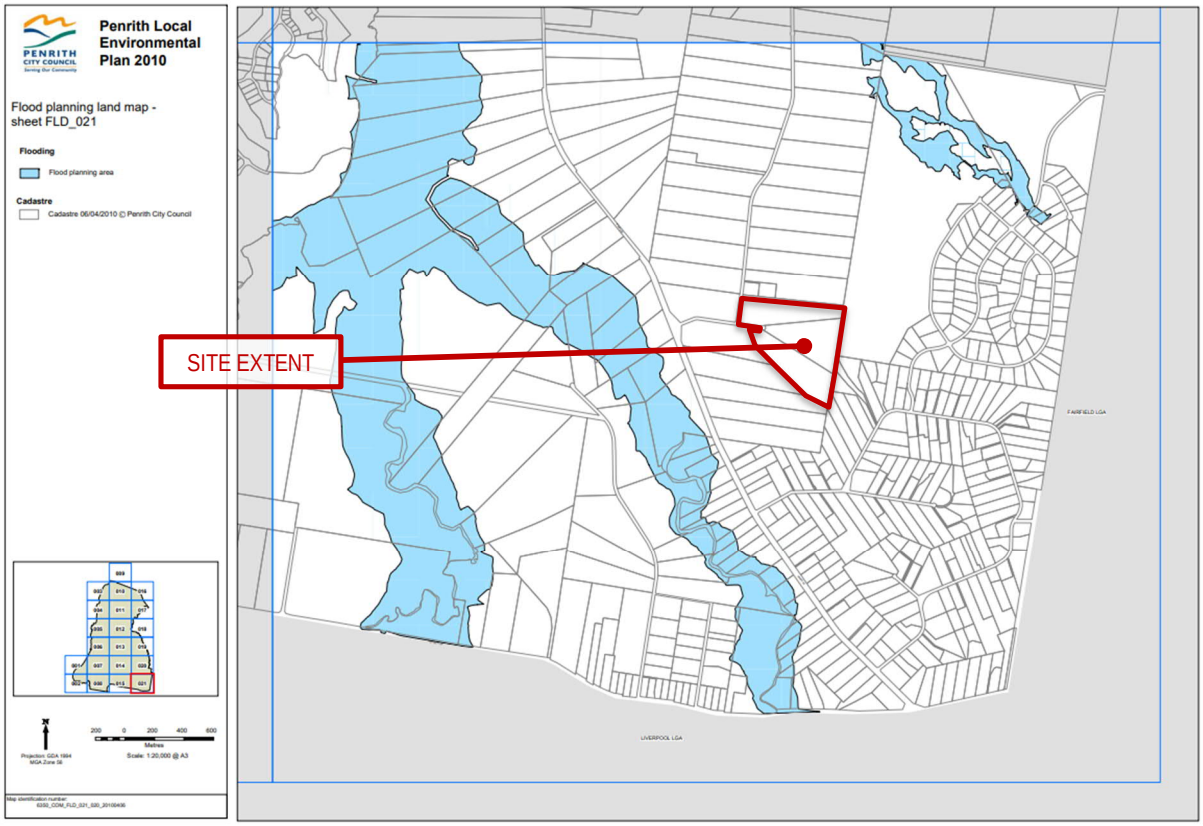


Figure 18: Extract of flood planning land map (Penrith LEP 2010)

Mapping of the 1% AEP flood extent from local catchments within the Mamre Road Precinct is presented in the *Mamre Road Flood, Riparian Corridor and Integrated Water Cycle Management Strategy* (Sydney Water, October 2020), and is reproduced as Figure 19. This mapping shows the extent and depth of overland flow from local catchments within the site.

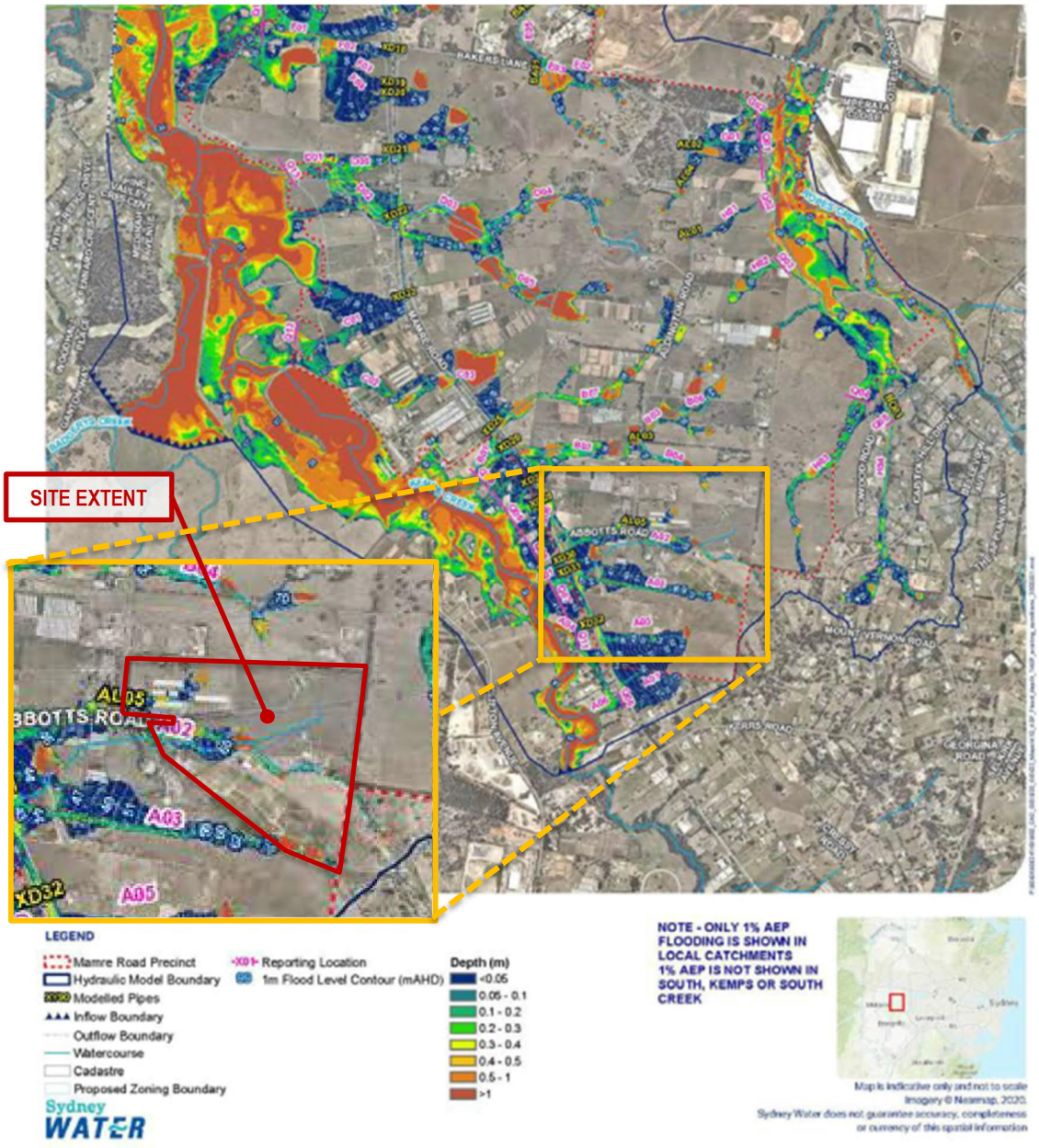


Figure 19: 1% AEP flood depth from local catchments under existing conditions (Sydney Water, 2020)

The proposed development of the site, including bulk earthworks, construction of a major and minor drainage system and construction of the proposed detention basin, will satisfy the development controls related to flood prone land outlined in Section 2.5 of the Mamre Road Precinct DCP.

The design of major system drainage elements is consistent with the principles of the NSW Government *Floodplain Development Manual* and Penrith City Council's *Stormwater Drainage Specification for Building Developments*. Under the post-development scenario, overland flow will be safely contained within the proposed road reserve and within trunk drainage infrastructure that has been incorporated into the design of the subdivision works.

As presented in Table 18, the post-development peak flow rates will be less than the pre-development peak flow rates at each of the discharge points for all design storm events between (and including) the 50% AEP and the 1% AEP event.

Refer to "Flood Impact Assessment Westlink Industrial Estate – Stage 1 290-308 Aldington Road, Kemps Creek" by Cardno for further details including 2D flood modelling of downstream impacts.

13. Utility Services

13.1. Existing utilities in the vicinity of the site

Based on an initial desktop study conducted from information obtained from Dial Before You Dig (DBYD) records, the following utility services are located within the vicinity of the Site:

- Potable water – Sydney Water
- Electrical – Endeavour Energy
- Telecommunications – Telstra

No sewer or gas was noted to be located within the vicinity of the Site.

Investigations of the Site were carried out based on:

- Site inspection
- Dial Before You Dig (DBYD) search
- Sydney Water Hydra System
- LIDAR Survey information
- Sydney Water South West Growth Servicing Plan 2017-2022

13.2. Potable Water

13.2.1. Existing Services

Dial Before You Dig (DBYD) indicates the following water services within the area:

- 100mm diameter CICL potable watermain on the southern side of Abbotts Road
- 150mm diameter DICL potable watermain on the northern side of Abbotts Road
- 180mm diameter uPVC PE on eastern side of Aldington Road.

13.2.2. Proposed Services

Based on our investigations and ongoing discussions with Sydney Water, connection to the Oakdale West infrastructure will be utilised to provide water services to the site is proposed.

As part of the Oakdale West Development (north of the site), a Local Area Servicing Plan (LASP) was prepared and endorsed by Sydney Water that will provide additional trunk water infrastructure for the area. Included within these works is an extension of a 300mm diameter main from Lenore Drive through to Bakers Lane.

Subject to Sydney Water approval and further modelling, it is proposed to extend the above-mentioned 300mm main along Aldington Road to service the Site. The main will be cross connected to the existing water mains and through connected to the existing 2 x 150mm diameter main within Mamre Road. This main will be fully reimbursable subject to Sydney Water approval.

The internal reticulation will consist of either a DN200 or DN250 main within the Westlink Industrial Estate.

Refer to Figure 20 below for the proposed potable water services to the site.

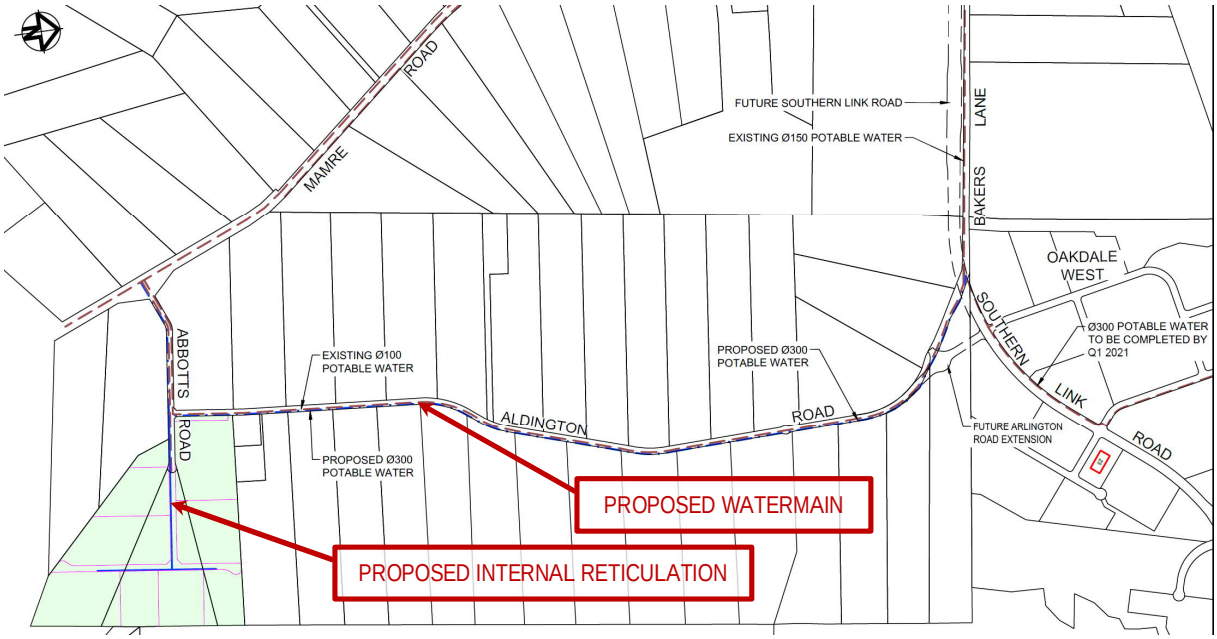


Figure 20: Proposed potable water supply strategy

13.3. Wastewater

13.3.1. Existing Services

Dial Before You Dig (DBYD) indicates there is no existing sewer infrastructure located at or adjacent to the Site.

13.3.2. Proposed Services

The Site is located within the western catchment of the Mamre Road Precinct that drains to a proposed wastewater pumping station via proposed trunk wastewater carriers. The pumping station will be required to transfer flows to St Marys wastewater network for interim servicing to 2026 and after this time it is intended for the pumping station to transfer flows south to the proposed Upper South Creek Advanced Water Recycling Centre.

Sydney Water planned to start concept design in November 2020, for the wastewater pumping station and carriers servicing the western catchment. Concept design will include environmental approvals, geotechnical investigations, survey, etc.

The delivery date for servicing the western catchment is planned for 2023/24 and will be subject to funding approval.

An indicative wastewater servicing plan is presented below as Figure 21.

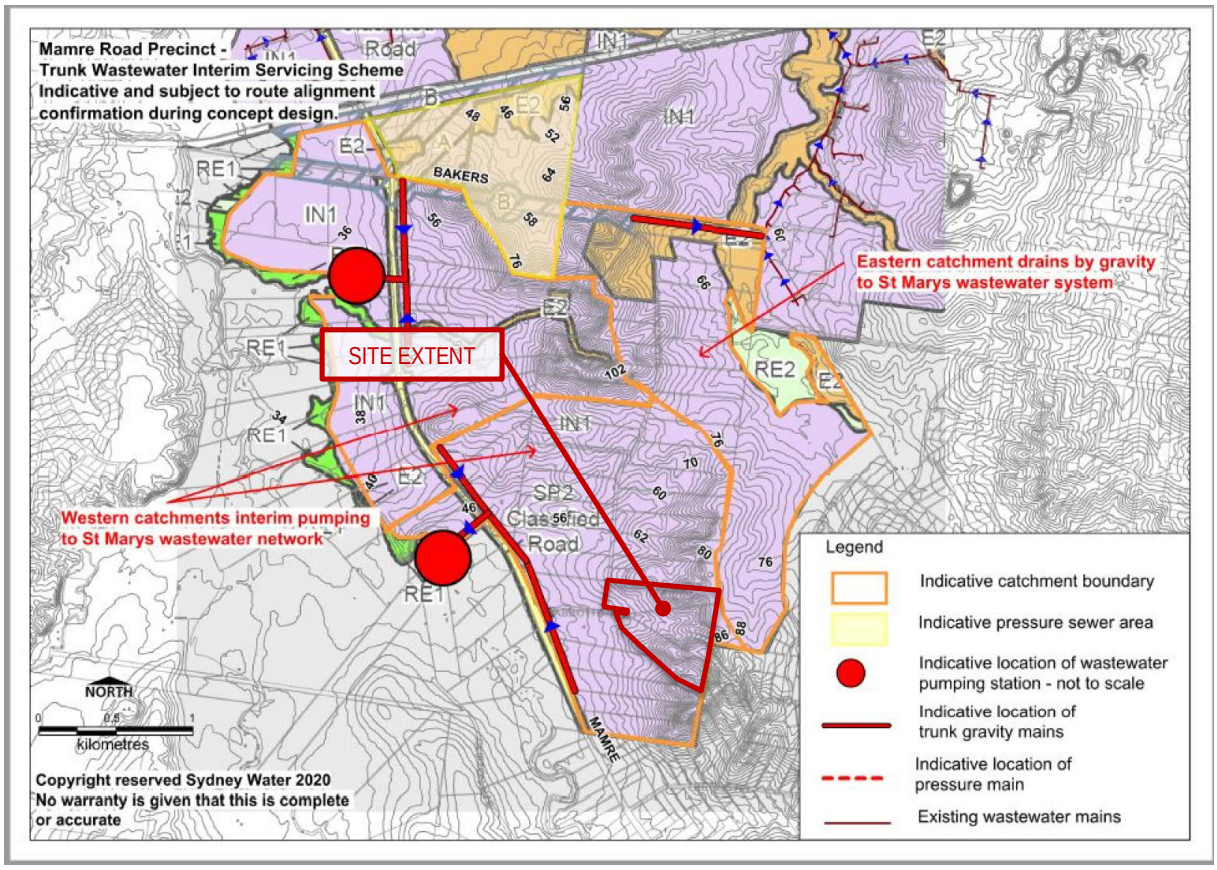


Figure 21: Indicative wastewater servicing plan (Sydney Water)

Note - all the assets are in planning stage, indicative and subjected to route alignment confirmation during concept and detailed design. Additional reticulation mains are required to service the development and are required to be sized to service the natural catchment as per the WSAA Code.

If the site is developed in advanced of Sydney Water's proposed works and sufficient infrastructure is not available, an Interim Operating Procedure (IOP)will need to be developed to allow for wastewater to be constructed to service the site. The IOP will need to be raised and will be subject to approval from Sydney Water.

13.4. Recycled Water

13.4.1. Existing Infrastructure

There is no existing recycled (non-potable) water infrastructure within or in the vicinity of the site.

13.4.2. Proposed Infrastructure

The Mamre Road Precinct Flood, Riparian Corridor and Integrated Water Cycle Management Strategy (2020) documents Sydney Water's commitment to the provision of recycled water to the Mamre Road Precinct from the Upper South Creek AWRC.

In their submission to SSD-9138102 dated 6 August 2021, Sydney Water confirmed that recycled water for non-drinking purposes will be provided in the Mamre Road Precinct. The Integrated Water Servicing Options analysis is currently underway and will determine the extent to which recycled stormwater is integrated with recycled wastewater. Sydney Water is currently preparing a Development Servicing Plan (DSP) for the Mamre Road Precinct. This will include Developer Charges for the provision of recycled water services to the Precinct.

Sydney Water's draft recycled water scheme plan for the Mamre Road Precinct is reproduced below as Figure 22. It is subject to change depending on the outcome of the Integrated Water Servicing options analysis.

Sydney Water will confirm the requirement for recycled water connections on finalisation of the scheme plan for the Precinct. It is likely that the requirements will be a combination of the following:

- Each lot in the subdivision must have a frontage to a recycled water main that is the right size and can be used for connection of the lot to the recycled water main.
- The proponent must construct a recycled water main extension to serve the lots appropriately. The extension must comply with the standards for Dual Water Reticulation Systems.

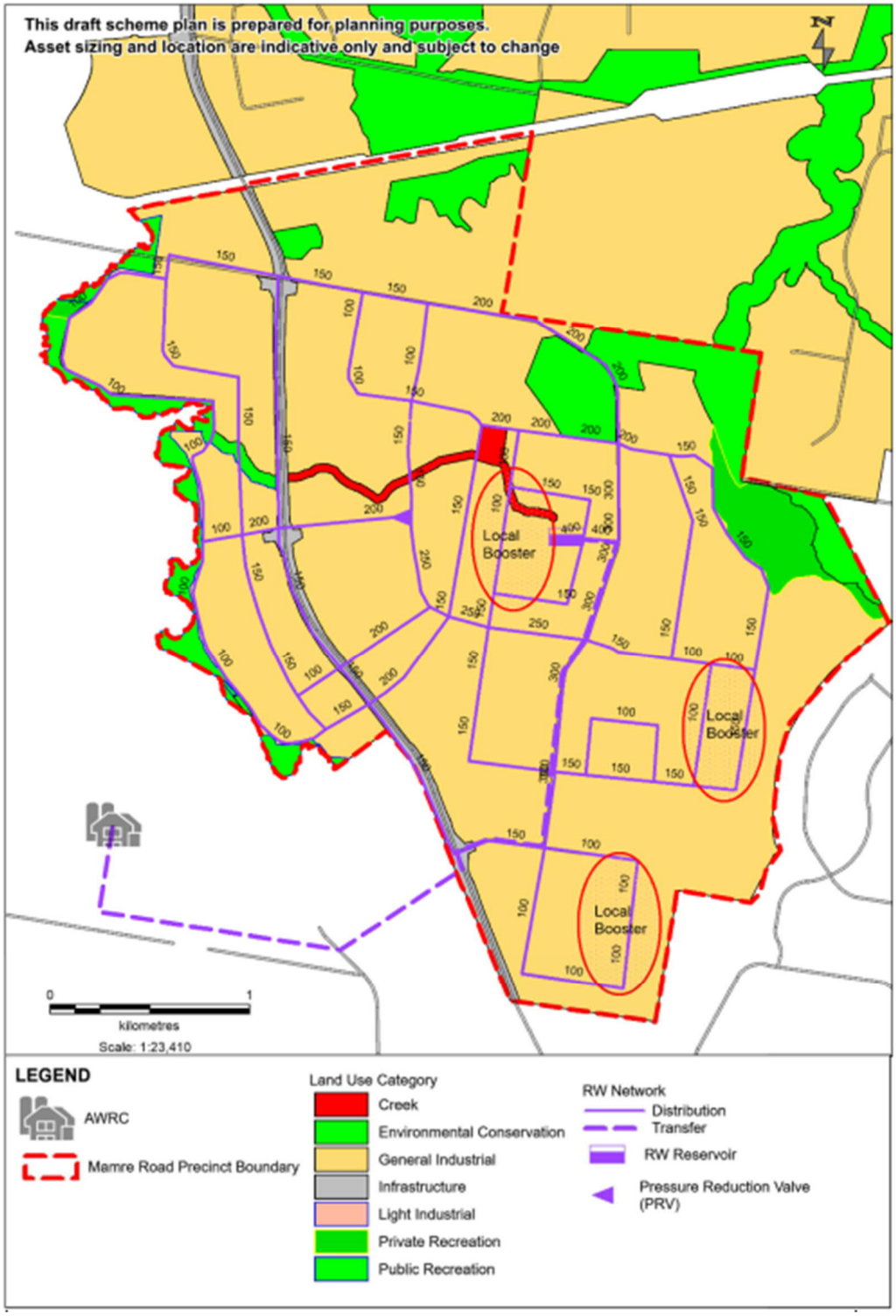


Figure 22: Draft Mamre Road Recycled Water Scheme Plan

13.5. Electrical

13.5.1. Existing Services

Recent site inspection indicates that there is an overhead power line (11kV and 240v) on the eastern side of Aldington Road reserve parallel to the boundary. Dial Before You Dig (DBYD) indicates that there are no underground services within the vicinity of the Site.

13.5.2. Proposed Services

Consultation has been undertaken with Endeavour Energy regarding electrical servicing strategies for the Broader Western Sydney Employment Area (BWSEA), which includes the wider Mamre Road Precinct.

The Endeavour Energy 'Western Sydney Priority Growth Area – Area Plan April 2018' indicates the proposed high voltage network to be delivered as part of the wider Endeavour Energy electrical network required to service the Aerotropolis.

Endeavour Energy's Asset Planning & Performance Branch has provided the following advice:

- Asset Planning & Performance have met with consultants for ESR Westlink and discussed power servicing requirements at an early high-level stage.
- Based on standard warehousing load estimations, the client was advised that a new 11 kV feeder would be required to be established from Kemps Creek Zone Substation located at 120 Cross Street Kemps Creek (Lot 1 DP 532554) to the site to provide the required capacity. This is due to the existing electrical infrastructure in the vicinity having insufficient capacity to support the proposed large-scale development along Mamre Road and Aldington Road with several partial developments involving a number of warehouses which have been processed and allowed to connect.
- This has subsequently resulted in no further spare capacity being available without extensive new capital investment required to provide new capacity in addition to and in advance of the proposed new 132kV / 22 kV zone substation within the Oakdale West Precinct known as South Erskine Park Zone Substation by the current expected commissioning date of October 2022. This substation will service both the Oakdale West and Mamre Precincts and limited parts of the Oakdale South Precinct.
- Developments which are running ahead of Endeavour Energy's infrastructure delivery timeline are being advised to make alternative arrangements to access spare capacity from either Kemps Creek Zone Substation or Mamre Zone Substation located at 8 John Morphett Place Erskine Park (Lot 9 DP 1097134) depending on where they are located until supply can be redirected from the new South Erskine Park Zone Substation. Some warehousing has been accommodated where possible on an interim basis until the new zone substation is available.
- Asset Planning & Performance are happy to meet with ESR to continue conversations regarding the provision of capacity ahead of South Erskine Park Zone Substation which may entertain connection of one or two warehouses dependent on the load requirement, some infrastructure augmentation is still likely to be required due to the rural construction type of existing infrastructure.

Although it was not identified which option would be the most suitable option, Connect Infrastructure has advised that further consultation with Endeavour Energy will be required and based on the risk / reward profile, a suitable option can be determined.

In their submission to SSD-9138102 dated 18 July 2021, Endeavour Energy advised that the proponent should reticulate the estate with 22 kV cable and commence preparations for a new 22 kV feeder from the South Erskine Park Zone Substation, which will be required to supply the full extent of development.

The method of supply will require the establishment of a new 1000 kVA padmount substation within the estate.

13.6. Gas

13.6.1. Existing Services

There are no existing Jemena gas mains located within the vicinity of the Site.

13.6.2. Future Services

No contact has been made with Jemena to determine if there are plans to service the area in future. Any possible future upgrades would need to be assessed for capacity and commercial viability.

13.7. Telecommunications

13.7.1. Existing Services

Dial Before You Dig (DBYD) indicates that Telstra below-ground conduits are located within the Aldington Road Reserve parallel to the boundary.

Site inspection has identified there are aboveground assets along the western side of Aldington Road.

13.7.2. Proposed Services

It is expected connection could be made from the existing infrastructure located within Aldington Road. Subject to the requirements of the relevant telecommunications authority, new pit and pipe may need to be installed from Aldington Road to the Site.

NBN requires an application for connection to be made with appropriate lead times to ensure the network can be delivered to the site.

14. Infrastructure Delivery and Staging

14.1. Staging

The estate wide civil infrastructure works will be undertaken within Stage 1 of the development of the site. The infrastructure works will include, but are not limited to:

- Upgrade of Abbotts Road and Aldington Road.
- Extension of Abbotts Road within the development site.
- Earthworks and retaining walls / structures.
- Stormwater drainage systems, including diversion of external catchments through the site.
- Stormwater management measures, including on-site detention and any interim measures that may be required to satisfy the stormwater quality and flow targets for the estate.
- Utility services (water, sewerage, power, communications), including lead-in works as required.

Stage 1 will include external road upgrades and service lead-in works. The delivery of construction will be undertaken progressively to meet end user requirements.

14.2. Funding Arrangements

The assumed funding arrangement for civil infrastructure works will be as follows:

- Abbotts Road and Aldington Road Upgrades (including roundabout): Proposed to be delivered as Works in Kind Agreement against Section 7.11 and/or Section 7.12 contributions (subject to authority approvals).
- Lead-in services: Proponent funded with potential reimbursements subject to relevant authority approvals and procurement processes.
- Internal works: Proponent funded.

APPENDIX 1 – CIVIL DRAWINGS

- 20-748-C1000 SERIES (INFRASTRUCTURE)
- 20-748-C2000 SERIES (ON-LOT)

APPENDIX 2 – ABBOTTS ROAD / ALDINGTON ROAD – STAGE 1 INTERIM / ULTIMATE UPGRADE

- 21-843-C500 SERIES

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