Soukutsu Pty Ltd

1290 Greendale Road

Water Sensitive Urban Design: Stormwater Assessment

November 2020

Table of contents

Table index

Figure index

Appendices

1. Introduction

1.1 Background

Soukutsu Pty Ltd ATF Wallacia Trust (Soukutsu) engaged GHD Pty Ltd (GHD) to undertake a Water Sensitive Urban Design: Stormwater Assessment to provide the relevant documentation in support of a Development Application (DA) to Liverpool City Council.

The subject of the DA is a proposed development comprising of the demolition of existing structures and construction of a cemetery, crematoria, community facilities, administration buildings, halls, chapels and other buildings and structures all associated with the operation of a cemetery with a garden, parkland and landscape setting. The proposal also includes internal roads, lakes and ponds.

The proposed development is located on the site identified as 1290 Greendale Road, Wallacia (see Figure 1-1) and legally described as Lot 1 in DP 776645 in the Liverpool City Council Local Government Area (LGA). The site is located on the western side of Greendale Road and eastern side of the Nepean River. The surveyed land area is approximately 73.46 ha.

Figure 1-1 Location of proposed development site

1.2 Purpose of this report

Purpose of this report is to compile a Water Sensitive Urban Design: Stormwater assessment at DA stage for the proposed development which will accompany the DA application to Liverpool City Council.

1.3 Scope and Limitations

This report: has been prepared by GHD for Soukutsu Pty Ltd and may only be used and relied on by Soukutsu Pty Ltd for the purpose agreed between GHD and the Soukutsu Pty Ltd as set out in this report.

GHD otherwise disclaims responsibility to any person other than Soukutsu Pty Ltd arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

GHD has prepared this report on the basis of information provided by Soukutsu Pty Ltd and others who provided information to GHD (including Government authorities), which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

2. Planning and Legislative Considerations

2.1 MKD Architects River Gardens Cemetery DA Masterplans

The development proposal (Appendix A) comprises of a cemetery, crematoria, community facilities, administration buildings, halls, chapels and other buildings and structures all associated with the operation of a cemetery with a garden, parkland and landscape setting. The proposal also includes internal roads, lakes, and ponds.

2.2 Liverpool City Council

Local government is the primary authority responsible for land use planning in NSW. The proposed development is in the Liverpool City Council LGA

2.2.1 Liverpool Local Environmental Plan (LEP) 2008

The LEP 2008 is a legal document containing development standards applying to land in Liverpool. It guides planning decisions and for each piece of land and specifies what may be built, what land may be used for, and what building heights and floor spaces are allowed.

The proposed development is in Rural Zone RU1 Primary Production.

Cemeteries and associated civil works are permissible in the RU1 zone, subject to complying with the objectives of the RU1 zone and relevant requirements contained in Liverpool LEP 2008 and Liverpool DCP 2008.

2.2.2 Liverpool Development Control Plan (DCP) 2008

Liverpool DCP guides growth in the Liverpool LGA, and Part 1 General Controls for all Development applies to all proposed developments. This includes Section 6 – Water Cycle Management. The DCP is supported by technical guidelines.

In addition to the complying with Part 1 of the Liverpool DCP, the proposal must also comply with Part 5 Development in Rural and Environmental Zones (Clause 9.13 Cemeteries, Crematoriums and Funeral Chapels).

2.2.3 Pre - Development Application Advice (PL-34/2020)

Following the pre-DA meeting of the 27 May 2020, Council issued the following requirements with respect to Stormwater Management and Water Sensitive Urban Design:

Stormwater

- *Stormwater drainage for the site must be in accordance with Council's Development Control Plan.*
- *A stormwater concept plan shall be submitted with the application.*
- *The stormwater concept plan shall be accompanied by a supporting report and calculations.*
- *On-site detention is required to be provided for the site.*
- *The on-site detention system must be within common property and accessible from the street without going through dwellings or private courtyards.*

- *Discharge point shall be shown on the stormwater plan, stormwater discharge shall not adversely impact any neighbouring properties.*
- *A water quality treatment device shall be provided in accordance with Council's Development Control Plan. A MUSIC model shall be submitted with the development application.*
- *There is a defined overland flow path crossing the site. The overland flood study shall confirm that the proposed developments will not have any adverse flooding impact in the vicinity.*

2.3 Acts

2.3.1 Environmental Planning and Assessment Act 1979

The EP&A Act, administered by the NSW Department of Planning, Industry and Environment, is the core legislation relating to planning and development activities in NSW and provides the statutory framework under which development proposals are assessed. The EP&A Act aims to encourage the proper management, development and conservation of resources, environmental protection and ecologically sustainable development.

2.3.2 Water Management Act 2000

The Water Management Act 2000, (WM Act) is administered by regulators including WaterNSW and Department of Industry: Water to manage water resources. The aim of the WM Act is to ensure that water resources are conserved and properly managed for sustainable use benefiting both present and future generations. It is also intended to provide formal means for the protection and enhancement of the environmental qualities of waterways and their in-stream uses as well as to provide for protection of catchment conditions. Fresh water sources throughout NSW are managed by water sharing plans (WSPs) under the WM Act.

Principles of the WM Act relating to drainage and floodplain management include the need to avoid or minimise land degradation including soil erosion, compaction, geomorphic instability, and waterlogging, and the need for controlled activity approval when working near watercourses.

2.3.3 Protection of the Environment Operations Act 1997

The Protection of the Environment Operations (POEO) Act 1997, is administered by the NSW Environment Protection Authority (EPA) and is implemented throughout NSW to protect, restore and enhance the quality of the environment. The aim of the POEO Act is to reduce risks to human health, provide increased opportunities for public involvement and participation in environment protection, rationalise, simplify and strengthen the regulatory framework for environment protection and improve the efficiency of administration of environment protection legislation.

To ensure that potential impacts on stormwater are managed in accordance with the objectives of the POEO Act, mitigation measures that would need to be implemented during the construction and operational phases.

2.4 Policies, Guidelines, and standards

2.4.1 NSW Floodplain Development Manual

The Floodplain Development Manual and NSW Flood Prone Land (NSW Government, 2005) policy concerns the management of flood-prone land within NSW. It provides guidelines in relation to the management of flood liable lands, including any development that has the potential to influence flooding, particularly in relation to increasing the flood risk to people and infrastructure. Activities of the project which have the potential to increase flood risk through, for example, increasing stormwater runoff would be subject to consideration under the Floodplain Development Manual.

2.4.2 Australian Rainfall and Runoff (ARR, 2019)

Australian Rainfall and Runoff (ARR, 2019) is the primary technical publication for stormwater and hydrological estimates and design considerations. The publication was the result of a number of years of updates to the previous version of Australian Rainfall and Runoff (Engineers Australia, 1987). The technical analysis and development of the hydrologic and hydraulic models, including the management and flooding at the site would need to consider this guideline.

2.4.3 Managing Urban Stormwater: Soils and Construction – Volume 1 (Landcom, 2004)

The document Managing Urban Stormwater: Soils and Construction, Volume 1 (Landcom, 2004) outlines the basic principles for the design and construction of sediment and erosion control measures. This document relates particularly to urban development sites, however it is relevant to the Project as it provides guidance on the configuration of erosion and sedimentation controls required during construction.

3. Site Analysis

3.1 Existing Site

The existing site generally comprises paddocks with little to no hardstand areas. Referring to Figure 3-1 there are four general areas of elevated topography. The site west of Elevated Topography 2 and 3 drains to the Nepean River, while the catchment east of this location drains to Duncans Creek. The site is located within the Nepean River floodplain.

Within the Nepean River floodplain, topographic levels are generally in the range of 36 to 38 m AHD, with Duncans Creek invert ranging between 32 to 35 m AHD depending on location. The Nepean River invert is approximately 23 to 24 m AHD with the elevated topography at 42 to 44 m AHD. Duncans Creek is thus elevated with respect to the Nepean River and there are significant topographic undulations across the site.

The Nepean River is located along the western boundary of the site draining in a northerly direction towards Wallacia. Duncans Creek bisects the site on the eastern half of the site, also draining in a northerly direction towards the confluence with the Nepean River. The site is flood affected by:

- The Nepean River breaking the banks and discharging across the site, in an easterly direction.
- The Nepean River, back flooding up Duncans Creek from the downstream confluence, entering the site along the northerly boundary.
- Duncans Creek flooding due to the local Duncans Creek catchment.

The Nepean River and Duncans Creek flooding occur as different modes, with the former being a much slower response due to the large catchment area. Duncans Creek on the other hand will have a much faster catchment response and faster rising flood hydrographs.

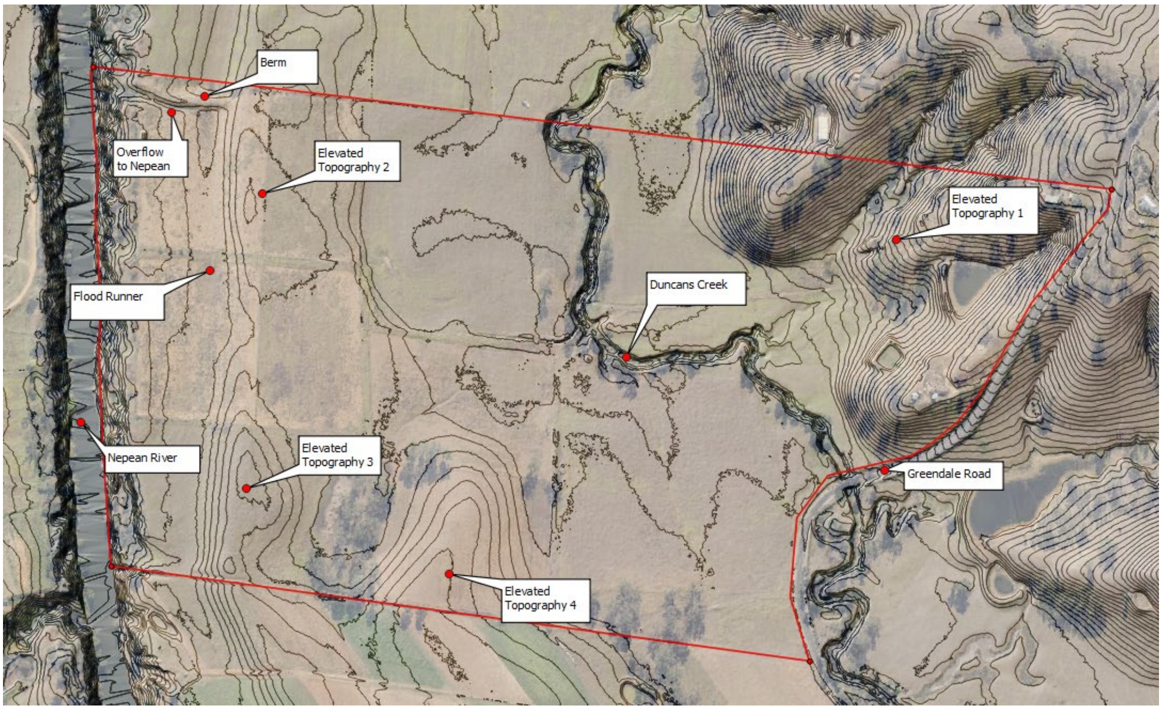


Figure 3-1 Existing Site

3.2 Proposed Development

With reference to Figure 3-2, the proposed development comprising four distinct pad areas with Pad 1 located east of Duncan’s Creek and pads 2 to 4 located west of Duncan’s Creek. These pads raise ground levels above the 1 in 100 AEP Nepean River flood level and are approximately located at the locations of the elevated topographies on the existing site. Referring to Appendix A:

- Pad 1, will comprise inground, traditional burial plots, and vertical stacking cremation walls. Pad 1 will also be the location of the Chapel, Crematorium, access roads and gatehouse and function facilities.
- Pads 2 to 4 will comprise inground, traditional burial plots, , and vertical stacking cremation walls in some locations
- To offset the loss of floodplain storage and win fill for the pads, the centre of the site is depressed (via excavation). This area will house five circular Mausoleums. A larger Mausoleum is located between Pad 2 and Pad 3.
- All pads are bisected by internal access roads, located at the pad level, and connected by bridges.

The central depressed area of the site will also house gardens and internal walkways together with maintenance walking tracks.

The development proposes to substantially regrade the site to provide flood free pads and the central depressed area required as floodplain storage compensation. The pad areas however will only introduce a small increase in the impervious percentages as follows:

- The traditional burial plots will be located within grassed areas and will shed stormwater onto adjacent buffer strips. Buffer strips will route stormwater to overland swales. There may be a small increase in hardstand (approximately 10%) for headstones and other burial features.
- Proposed buildings will increase the impervious areas adjacent to Pad 1.
- Internal roads and walkways will increase hardstand area, however these are minor across the site.

Overall, the increase in impervious areas is considered to be small.

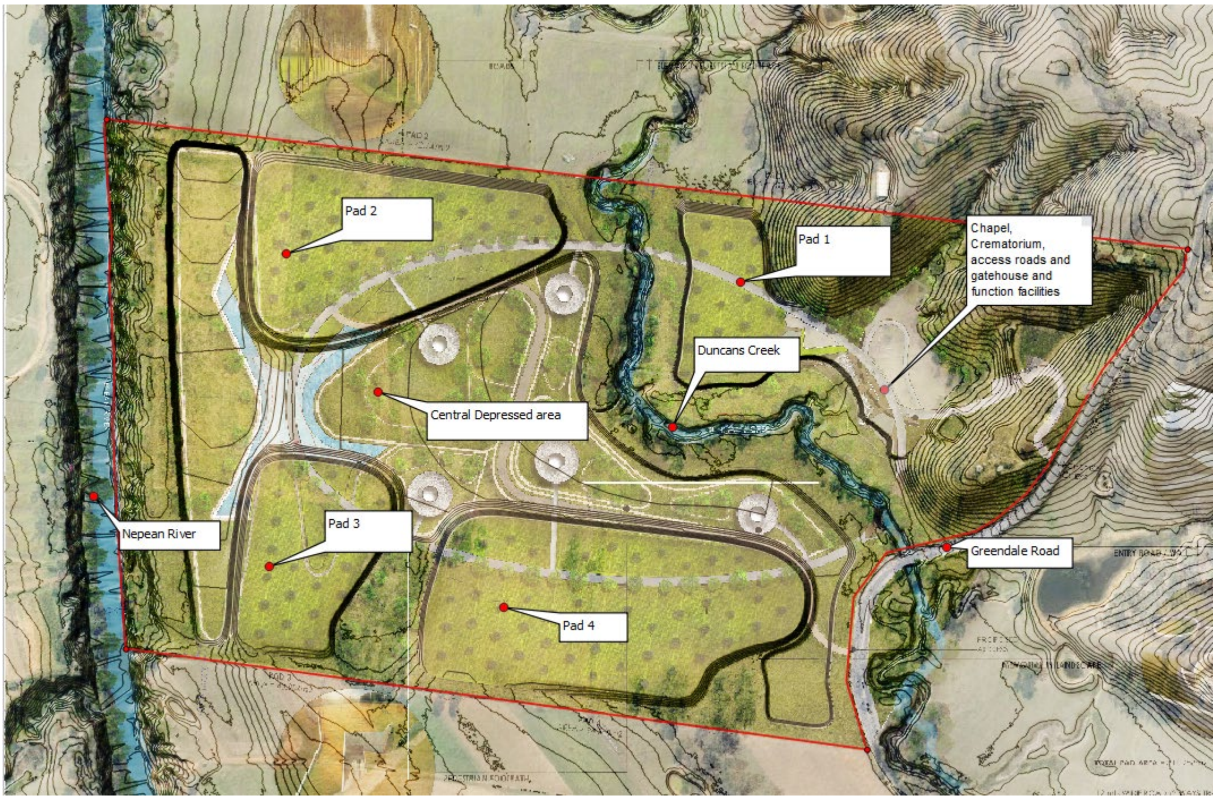


Figure 3-2 Proposed Site

4. Water Sensitive Urban Design: Stormwater - Risks and Opportunities

4.1 Potential Stormwater Impacts

In general, development of any kind could affect the hydrological cycle. This is due to changes in land use resulting in changes to stormwater discharge and pollution loads. The following key stormwater impacts considered are discussed in the context of the proposed development in the ensuing sections:

- Impacts to the water balance, in groundwater recharge.
- Stormwater pollution (by runoff and accidental spills entering the stormwater system).
- Stormwater peak flows and flood risk (onsite and offsite).
- Construction phase impacts, such as erosion and sedimentation.

4.1.1 Water Balance Impacts

As noted in Section 3.2, due to the proposed development the overall increase in impervious areas is considered to be small.

Table 4-1 Potential Water Balance Impacts

Potential Impact	Comment
Reduced rainfall infiltration to the soil results in decreased groundwater recharge, with potential impact on local base flows effecting streams, groundwater and water bodies (wetlands), particularly during dry weather.	The overall increase in impervious areas is considered small
Increased stormwater runoff volumes, which could affect downstream habitats. Sensitive habitats could be impacted in terms of flushing regimes (frequency, volume and rate), water quality, and wetting cycles	The overall increase in impervious areas is considered small. Some level of detention storage will need to be provided to manage increased runoff from roads and buildings, to prevent increases in stormwater runoff volumes.
Development and infrastructure on the site could lead to increased recharge due to removal of vegetation, over irrigation, and structural leakages.	The pervious nature of the site will be maintained under the proposed development.
Site compaction, fill, landform reshaping and underground structures could affect groundwater flow.	The pervious nature of the site will be maintained under the proposed development.

4.1.2 Stormwater Pollution

As part of the proposed development a stormwater system will be constructed to drain the site. This system will rely on swales and overland flow conveyance in preference to pit and pipe systems. Notwithstanding, the proposed development will still generate stormwater pollutants which will need to be managed.

Table 4-2 Potential Stormwater Pollution Impacts

Potential Impact	Comment
Runoff volume during regular rainfall events would entrain and mobilise pollutants (particularly first flush) and increase pollutant loads to the receiving environment	Stormwater pollutants under the proposed development will need to be managed as part of the proposed development.
The type of development and associated activities may introduce differing pollutant profiles; for example, vehicular traffic could increase hydrocarbon introduction	This will need to be managed as part of the proposed development.
The movement of vehicles, particularly during dry periods, could result in dust, and disturbed surfaces could provide a source of sediment, substantially contributing to the total suspended solids. In general, typical pollutants include litter, sediment, suspended solids, nutrients, hydrocarbons and toxicants. The generation of wind borne sediment/material by any of the operational activities could be deposited in, or transported to, the stormwater system.	This will need to be managed as part of the proposed development.
Accidental spills on unbunded areas of the site could discharge to the site stormwater system and the receiving environment. This could lead to groundwater contamination.	This will need to be managed as part of the proposed development.

4.1.3 Stormwater Peak Flows and Flood Risk

The flood risk associated with the Nepean River and Duncans Creek is documented in the separate Flooding Assessment report. Pads will be provided that raise the site above the Nepean River 1 in 100 AEP flood levels.

Table 4-3 Potential Stormwater Peak Flows and Flood Risk Impacts

Potential Impact	Comment
Onsite stormwater peak flows and volumes could be increased due to the increased impermeable surfaces. During moderate rainfall events, the resultant discharges can be highly erosive to stream beds banks and the receiving environment, thereby causing	The overall increase in impervious areas is considered small. Several detention basins will be located on the site to manage runoff and prevent increases in stormwater runoff peaks.

downstream degradation (for example of aquatic habitat).	
Increased peaks would raise onsite and offsite flood risk if not adequately managed. This could raise the flood risk (to life and property), compromise downstream infrastructure capacity and impact downstream environments leading to increased erosion and sedimentation.	The overall increase in impervious areas is considered small. Several detention basins will be located on the site to manage runoff and prevent increases in stormwater runoff peaks.
Flood risk at the site could also be impacted by local drainage channels that bisect or are in close proximity to the site, and that convey runoff from larger upstream catchment areas either through or past the site. Increased local flood levels could impact directly on the site leading risk to life and property and associated damages.	The overall increase in impervious areas is considered small. Several detention basins will be located on the site to manage runoff and prevent increases in stormwater runoff peaks.

4.1.4 Construction Phase Impacts

During the construction phase, clearing and earthmoving activities have the potential to impact on surface water quality near the plant site, especially during high rainfall events. 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 and clearing of land in advance of construction works.
- Stripping of topsoil, particularly in advance of construction works.
- Bulk earthworks and construction of pavements.
- Washing of construction machinery.
- Works within drainage paths, including depressions.
- Stockpiling of excavated materials.
- Storage and transfer of oils, fuels, fertilisers and chemicals.
- Maintenance of plant and equipment.

The construction phase impacts will need to be managed for all construction activities.

4.2 Stormwater Drainage Concept Plan (SDCP) - Management Measures and Opportunities

Several measures are proposed to effectively manage stormwater and mitigate the impacts of the development. A Stormwater Drainage Concept Plan (SDCP) has been provided in Appendix B. In general, the plan proposes the management of stormwater as follows:

- Management of water balance.
  - Provision of stormwater detention strategies.
  - Rainwater harvesting.
  - Management and monitoring of onsite activities (irrigation).
- Management of stormwater pollution (by runoff entering the stormwater system).
  - Treatment of stormwater, targeting pollutants.
  - Bunding.
  - First flush systems and Gross Pollutant Traps.
- Management of stormwater peak flows and flood risk (onsite and local).
  - Onsite detention strategies.
  - Flood planning levels.
  - Flood evacuation.
- Management of construction phases Impacts.
  - Soil and Water Management planning for construction activities.
  - Implementation of erosion and sediment control strategies.
  - Ongoing monitoring and maintenance of erosion and sediment control strategies.

These strategies are incorporated into the proposed design and measures to monitor their effectiveness would need to be included in the construction and operation environmental management plans.

4.2.1 Site Discharge Points

The proposed development has been graded such that all stormwater on the site discharges to Duncan's Creek. To this end, the site is configured with two site discharge locations for onsite stormwater. The western discharge point, discharges water from the central depressed area of the site. The eastern discharge point, discharges stormwater from the Pad 1.

No stormwater from the road, buildings, burial grounds or other pad areas will discharge to the Nepean River. There will be a third discharge point to the Nepean River to discharge surface water captured within the central depressed area of the site, west of the Pad 2 and 3.

4.2.2 Water Balance

The impacts on the water balance will be mitigated and managed by:

- The potential for increased stormwater volumes discharging from the site will be managed by providing onsite detention storage. Each pad will have its own dedicated detention pond to throttle stormwater runoff.
- Rainwater harvesting for reuse can be sourced from roofed areas and from above ground stormwater runoff. Water reuse on site is dependent upon water quality and finding a suitable use with effective yet minimal water treatment measures. An optimum storage volume will maximise the water supply while minimising the number of overflows from the storage facility. Roof water can be directed to a single or several holding tanks after first

flush treatment. This can be reused as toilet flushing or managed irrigation of landscaped areas, provided these areas do not discharge to groundwater. Above ground stormwater can be directed to in ground storage facilities and reused.

- Management and monitoring of onsite activities and infrastructure will be essential in managing the water balance.

4.2.3 Stormwater Pollution

Stormwater quality and pollution for the proposed plant site will be effectively managed and mitigated by providing bio-retention basins co-located within the detention basins on each pad.

- The traditional burial plots will be located within grassed areas and will shed stormwater onto adjacent buffer strips. Buffer strips will route stormwater to overland swales. The buffer strips and swales will capture stormwater pollutants before routing flows to the bio-retention basins co-located within the detention basins on each pad.
- Roads and other hardstand areas will discharge to swales and raingardens. Pit and pipe stormwater systems will discharge to the bio-retention basins co-located within the detention basins on each pad. Prior to discharge to the basins, Gross Pollutant Traps will be provided to capture pollutants.
- Hardstand areas will be directed to Gross Pollutant Traps or first flush basins. This captured runoff can be reused on site or discharged to the stormwater system if of suitable quality.
- Site maintenance will be the key to managing stormwater pollution. This may require frequent sweeping and regular housekeeping practices. Regular maintenance of stormwater infrastructure, particularly water quality strategies will be essential.

4.2.4 Stormwater Peak Flows and Flood Risk

Onsite detention in the form of above ground basins will be used to mitigate the increase in peak flows from each pad areas. The stormwater quantity management will be achieved by:

- A general site grading towards detention basins or bio-retention basins co-located within the detention basins on each pad. Gross Pollutant Traps will be provided at the inlet to the detention basin.
- Roadside and other swales to convey surface runoff to detention basins or bio-retention basins co-located within the detention basins on each pad. In some areas, kerbs and gutters are proposed on internal roads collecting runoff via an internal stormwater pipe network.
- Adopting flood-planning levels, which ensure that floor areas are located 0.5m above any flood levels.
- Providing a flood evacuation plan/strategy for the site.

4.2.5 Construction Phases Impacts

Construction phase impacts can be managed by implementation of a Construction Phase Soil and Water Management Plan detailing stormwater management strategies in accordance with Landcom Soil and Construction, Managing Urban Stormwater (Landcom, 2004). These would include amongst others:

- General site practices and responsibilities.
- Material management practices.
- Stockpile practises.

- Topsoil practices.
- Erosion control practices (earth sediment basins, straw bales, sediment fences, turbidity barriers, stabilised site accesses, diversions and catch drains).

4.2.6 Monitoring Program

Monitoring should be undertaken to ensure that stormwater management measures are working effectively. Monitoring would rely primarily on visual inspections and sampling. Visual inspections should be undertaken of sediment basins, pits, diversion and catch drains and all other stormwater conveyance structures. An inspection log detailing the monitoring program should be kept.

5. Stormwater Simulations

In support of the discussion in Section 4.2, conceptual stormwater simulations have been undertaken as follows:

- DRAINS stormwater models were established to calculate the site discharge for developed conditions and to provide indicative sizing of onsite detention storage to throttle stormwater flows to existing conditions.
- MUSIC stormwater pollution models were established to calculate the required treatment area to manage stormwater pollutants from the proposed site.

The modelling is conceptual and indicative at this stage. However, the modelling provides some indication of stormwater management infrastructure sizes and confidence that the stormwater can be managed.

5.1 Onsite Detention Storage (DRAINS)

The hydrology of catchments draining to the onsite detention basin were compiled using a DRAINS hydrologic model, using Australian Rainfall and Runoff 2019 (ARR 2019) procedures. Inputs to the DRAINS model were:

- ARR 2019 rainfall: Intensity Frequency Duration (IFD) Design Rainfall Depth (mm) issued on 02 October 2019 for the requested coordinates: Latitude, -33.909000, Longitude, 150.673000.
- Catchment and catchment impervious areas: The four pad areas were configured within DRAINS assuming approximately 10% impervious for traditional burial plots and 100% impervious for internal roads, car parks and buildings.
- Initial and continuing losses: The loss values adopted were obtained from the ARR 2019 data hub, with a factor of 0.4 applied to continuing losses as per NSW specific guidelines. Initial losses were taken as probability neutral losses and continuing losses were assumed as 1.48 mm/hr. For impervious areas, initial losses of 0 mm, and continuing losses of 1 mm/hr.
- No onsite stormwater infrastructure was modelled. All detention basins were assumed to be 1.0 m deep, underlain by a 1m filtration layer and providing 0.5m freeboard to the basin crest.

Simulations were undertaken for the 1 in 5 AEP, 1 in 20 AEP and 1 in 100 AEP storm events, reporting the median storm event discharging to the two discharge locations on Duncans Creek. The results in the table below demonstrate the required onsite detention for each pad. It must however be acknowledged that these results are subject to the assumptions listed above. The preliminary recommended parameters are listed in Table 5-2. The results show that the increased impervious areas due to the development can be adequately managed by the provision of basins on each pad. The basin outlets are indicative, and the overall basin design needs to be optimised during detailed design, as can the basin depth. Since the pads are elevated with respect to the outlets, this is considered readily achievable.

Table 5-1 Stormwater Onsite Detention Modelling Results

Storm Event	Pad	Existing Flood Peak (m^3/s)	Proposed Flood Peak (m^3/s)	Detention Volume (m3)
1 in 5 AEP	1	0.46	0.46	730
	2	0.85	0.85	190
	3	0.65	0.60	110
	4	1.62	1.58	320
1 in 20 AEP	1	0.78	0.69	1030
	2	1.42	1.39	270
	3	1.08	1.07	120
	4	2.72	2.69	330
1 in 100 AEP	1	1.15	0.91	1620
	2	2.11	2.10	350
	3	1.6	1.55	125
	4	4.04	4.04	400

Table 5-2 Preliminary Basin Parameters

Pad	Detention Volume (m^3)	Basin depth (m)	Basin Outlet
1	1620	1	2x DN525
2	350	1	2x Box Culvert 0.9m x 0.6m
3	125	1	2x Box Culvert 0.6m x 0.6m
4	400	1	3x Box Culvert 1.2m x 0.6m

5.2 Stormwater Pollution (MUSIC)

The MUSIC model simulates the stormwater treatment train efficiency in reducing stormwater pollutants, when comparing to the developed site without any treatment to the site. Given the tradition burial sites will incorporate buffer strip and swales which will be effective in capturing stormwater pollutants, the bioretention areas would capture pollutants from the roads and other hardstand areas, such as buildings and carparking areas. The bioretention areas will need to be located so that roads and other hardstand areas, such as buildings and carparking areas, with a faster response time will be capture and treated before the remaining runoff from the burial plots arrive.

At a preliminary conceptual level, the MUSIC model was simulated to determine the bio-retention treatment area required. This bio retention area would be co-located within the onsite detention basin on each pad. The bioretention area would comprise a 500 mm deep infiltration median, underlain with subsoil collector drainage pipes. The results of the simulations below, have been compared to pollution reduction performance targets based on the Liverpool City Council DCP (DCP 2008). The table below shows the bio-retention area required to manage the storm water pollution, to levels within the Liverpool City Council DCP (DCP 2008) performance target.

This treatment does not necessarily need to be in one location on the site but could be distributed across the site within raingardens and swales. The table shows that the stormwater pollutant reduction target levels can be achieved using bio-retention area targeting the capture of pollutants from the roads and other hardstand areas, such as buildings and carparking areas. The bio-retention areas can be co-located within detention basins or distributed across the site, with due consideration of contributing catchment areas.

Table 5-3 Stormwater Pollution Modelling Results

Storm Event	Pollution Reduction Performance Targets (LCC DCP 2008)	Pollution Reduction Performance Achieved			
		Pad 1	Pad 2	Pad 3	Pad 4
	Bio-retention Treatment Area (m^2)	320	106	40	140
Gross Pollutants	90%	100%	100%	100%	100%
Total Suspended Solids	85%	85%	85%	85%	85%
Total Phosphorous	65%	66%	67%	68%	67%
Total Nitrogen	45%	49%	48%	49%	49%

6. Liverpool City Council Planning Control Assessment

The table below documents an assessment against key relevant Liverpool City Council stormwater planning controls, Section 6. The table shows that the proposed development can meet the requirement of these controls.

Table 6-1 Liverpool City Council Planning Control Assessment

Clause	Subject		
6.1	Easements	Easements	No new drainage easements required
	Stormwater Drainage Concept Plan (SDCP)	Stormwater Drainage Concept Plan (SDCP)	Discussed in Section 4.2 and provided in Appendix B
	Visual impact	All drainage structures and storage areas are to be designed to be visually unobtrusive and sympathetic with the environment	Water Sensitive Urban Design strategies adopted for stormwater management
	Surface flow Paths	• Surface flow paths, including the provision of an emergency overflow to cater for blockage of the system or flows more than the 100-year ARI storm flow must be provided. • The flow route must be capable of carrying the flows generated by a 100-year ARI storm with a freeboard of 300mm to the adjacent habitable floor levels of the development site and adjoining properties. • Development must not cause any adverse impact on adjoining or any other properties. This includes maintaining surface flow paths and not increasing water levels in these flow paths. Diverting flows from one catchment to another will not be permitted.	Swales and other surface flow paths will be provided across the site Note, and there are no habitable areas on the site. All stormwater will be managed on the site using Water Sensitive Urban Design strategies.
	Runoff from adjacent properties	Surface runoff from upstream properties shall not be allowed to enter OSD systems	OSD only manages onsite stormwater
	Floor and Ground Levels	All habitable floor levels are to be a minimum of 300mm and garage/non habitable floor levels to be a minimum of 150mm above the maximum design storage water surface level and flow path levels	There are no habitable areas on the site. Freeboard to non-habitable areas will be provided
	On-Site Stormwater Detention	On-Site Detention (OSD) systems provide temporary storage of stormwater runoff from developments and restrict discharge from the site at a rate which council's existing drainage system is capable of accommodating	Onsite detention will be provided for each pad, to manage roads, buildings and other hard stand areas resulting in increased impervious areas. Stormwater runoff modelling with DRAINS showed that the increased impervious areas due to the development can be adequately managed by the provision of basins on each pad.
6.2	Gravity drainage to a creek system	All buildings shall be setback a minimum of 40m from the top of the bank of a creek or river, subject limitations imposed by flooding or Foreshore Building Lines.	No buildings are within 40m of a creek.

Clause	Subject		
		Nutrient loading/effluent: Depending on the proposed use there may be a need to provide a permanent water quality basin to minimise any contaminated runoff. Erosion protection of creek banks: All outlet structures discharging to a creek system shall provide scour protection and energy dissipaters.	Permanent bio-retention basis will be provided Erosion protection and energy dissipators will be provided.
6.3	Gross Pollutant Traps	• A minimum of one gross pollutant trap shall be required between the last downstream stormwater pit or pollution source and prior to discharge from the site. • Gross pollutant traps shall not be located within the banks of watercourses or within riparian zones. • Where a valve is required to isolate a site during a pollution spill, consideration shall be given to the location of the valve in relation to gross pollutant traps. • The design of the gross pollutant trap shall comply with Council’s drainage design specifications. • Details of the proposed gross pollutant trapping system, performance and compliance with Council’s drainage design specifications shall be included in the Stormwater Drainage Concept Plan.	Gross pollutant traps will be provided at the entry to the detention and bioretention basins, and elsewhere on site.
6.4	Stormwater Runoff Quality	• The post development stormwater runoff quality shall be improved to achieve the following reduction targets when compared to predevelopment levels: o 45% reduction in the baseline annual pollutant load of total nitrogen (TN); o 65% reduction in the baseline annual pollutant load of total phosphorus (TP); o 85% reduction in the baseline annual pollutant load of total suspended solids (TSS); and o 90% reduction in the baseline annual pollutant load of litter and vegetation larger than 5mm, through provision of GPT. • In the case of areas were council has adopted a master plan or in Part 2 specifying water quality targets, the requirements of those documents shall be utilised in preference to the targets listed above. • In the case of green field developments where Council has not adopted a master plan or is not included in Part 2 of the DCP specifying water quality targets the above targets shall be utilised by comparing post development water quality with that of a conventional stormwater drainage design without water quality treatment for an urbanised development.	Stormwater quality modelling using MUSIC showed that the Liverpool City Council stormwater pollutant reduction target levels can be achieved using bio-retention area targeting the capture of pollutants from the roads and other hardstand areas, such as buildings and carparking areas. The bio-retention areas can be co-located within detention basins or distributed across the site, with due consideration of contributing catchment areas.
6.5	Stormwater Quality Management	• The post development stormwater runoff quality shall be improved to achieve the following reduction targets when compared to pre development levels: o 45% reduction in the baseline annual pollutant load of total nitrogen (TN); o 65% reduction in the baseline annual pollutant load of total phosphorus (TP);	Stormwater quality modelling using MUSIC showed that the Liverpool City Council stormwater pollutant reduction target levels can be achieved using bio-retention area targeting the capture of pollutants from the roads and other hardstand areas, such as buildings and carparking areas. The bio-retention areas

Clause	Subject		
		○ 85% reduction in the baseline annual pollutant load of total suspended solids (TSS); and ○ 90% reduction in the baseline annual pollutant load of litter and vegetation larger than 5mm, through provision of GPT. • Developments that this subsection applies to, including residential development of land area greater than 2,000m2, are to submit a stormwater quality management assessment demonstrating that necessary water quality improvement targets are achieved.	can be co-located within detention basins or distributed across the site, with due consideration of contributing catchment areas.

7. Summary and Conclusions

- Soukutsu Pty Ltd ATF Wallacia Trust (Soukutsu) engaged GHD Pty Ltd (GHD) to undertake a Water Sensitive Urban Design: Stormwater Assessment to provide the relevant documentation in support of a Development Application (DA) to Liverpool City Council. The subject of the DA is a proposed development comprising of the demolition of existing structures and construction of a cemetery, crematoria, community facilities, administration buildings, halls, chapels and other buildings and structures all associated with the operation of a cemetery with a garden, parkland and landscape setting. The proposal also includes internal roads, lakes and ponds. The proposed development is located on the site identified as 1290 Greendale Road, Wallacia and legally described as Lot 1 in DP 776645 in the Liverpool City Council Local Government Area (LGA).
- The existing site generally comprises paddocks with little to no hardstand areas. There are four general areas of elevated topography. The site west of Elevated Topography 2 and 3 drains to the Nepean River, while the catchment east of this location drains to Duncans Creek. The site is located within the Nepean River and Duncans Creek floodplains.
- The proposed development can be discretised into four distinct pad areas with Pad 1 located east of Duncan's Creek and pads 2 to 4 located west of Duncan's Creek. These pads raise ground levels above the 1 in 100 AEP Nepean River flood level and are approximately located at the locations of the elevated topographies on the existing site.
- Several measures have been implemented to effectively manage and mitigate the stormwater impacts of the proposed development, in the context of Water Sensitive Urban Design. These include measures to manage the water balance, management and monitoring of onsite activities, management of stormwater pollution, treatment of stormwater, targeting pollutants, management of stormwater peak flows and flood risk (onsite and local) and management of construction phases impacts.
- Stormwater runoff modelling with DRAINS showed that the increased impervious areas due to the development can be adequately managed by the provision of basins on each pad. Stormwater quality modelling using MUSIC showed that the Liverpool City Council stormwater pollutant reduction target levels can be achieved using bio-retention area targeting the capture of pollutants from the roads and other hardstand areas, such as buildings and carparking areas. The bio-retention areas can be co-located within detention basins or distributed across the site, with due consideration of contributing catchment areas.
- The assessment against key relevant Liverpool City Council stormwater planning controls shows that the proposed development can meet the requirement of these controls. It is thus considered that the proposed development can meet the requirements of the Liverpool City Council DCP 2008.

Appendices

Appendix A – Development Proposal

PROPOSED MASTERPLAN

mkdarchitects
Nominated Architect: Carl Salim 7498
mkdarchitects.com.au

Project Address: 1290 GREENDALE PARK ROAD / WALLACIA
Client: SOUKUTSU PTY LTD
Project Number: 20971
Project Status: DA

Drawing Name: PROPOSED MASTERPLAN
Drawing Scale @ A1: 1 : 2000

Drawing Number: DA-B4.01
Revision: A (NOV 2020)

mkdarchitects

Nominated Architect: Carl Salim 7498

mkdarchitects.com.au

Project Address: 1290 GREENDALE PARK ROAD / WALLACIA

Client: SOUKUTSU PTY LTD

Project Number: 20971

Project Status: DA

Drawing Name: PROPOSED MASTERPLAN SITE CONSTRAINTS

Drawing Scale @ A1: 1 : 2000

Drawing Number: DA-B4.02

Revision: A (NOV 2020)

mkdarchitects
Nominated Architect: Carl Salim 7498
mkdarchitects.com.au

Project Address: 1290 GREENDALE PARK ROAD / WALLACIA
Client: SOUKUTSU PTY LTD
Project Number: 20971
Project Status: DA

Drawing Name: PROPOSED BUILDINGS LOCATION PLAN
Drawing Scale @ A1: 1 : 2000
Drawing Number: DA-B4.03
Revision: A (NOV 2020)

mkdarchitects

Project Address: 1290 GREENDALE PARK ROAD / WALLACIA
Client: SOUKUTSU PTY LTD
Project Number: 20971
Project Status: DA

Drawing Name: PROPOSED BURIAL TYPES LOCATION PLAN
Drawing Scale @ A1: 1 : 2000
Drawing Number: DA-B4.04
Revision: A (NOV 2020)

mkdarchitects

Project Address: 1290 GREENDALE PARK ROAD / WALLACIA
Client: SOUKUTSU PTY LTD
Project Number: 20971
Project Status: DA
Drawing Name: PROPOSED SITE SECTIONS
Drawing Scale @ A1: 1 : 2000
Drawing Number: DA-B4.05
Revision: **A** (NOV 2020)

mkdarchitects
Nominated Architect: Carl Salim 7498
mkdarchitects.com.au

Project Address: 1290 GREENDALE PARK ROAD / WALLACIA	Project Number: 20971	Drawing Name: PROPOSED SITE SECTIONS	Drawing Number: DA-B4.06
Client: SOUKUTSU PTY LTD	Project Status: DA	Drawing Scale @ A1: 1 : 2000	Revision: **A** (NOV 2020)

PROPOSED RESIDENTIAL SUBDIVISION
1290 GREENDALE ROAD, GREENPARK
CIVIL ENGINEERING WORKS
FOR DEVELOPMENT APPLICATION

COORDINATION NOTES

1. REFER ELECTRICAL CONSULTANTS DRAWINGS FOR ELECTRICAL RETICULATION SETOUT.
2. REFER LANDSCAPE ARCHITECTS DRAWINGS FOR SOIL STABILATION AND PLANTING DETAILS.
3. REFER SERVICE AUTHORITY FOR LOCATION AND CONSTRUCTION REQUIREMENTS APPLICABLE TO EXISTING SERVICES.

GENERAL NOTES

1. ALL WORK IS TO CONFORM TO THE CURRENT COUNCIL STANDARDS, DRAWINGS AND SPECIFICATIONS U.N.O.
2. WHERE CONNECTION IS TO BE MADE TO EXISTING CONSTRUCTION THE CONTRACTOR SHALL CONFIRM THE LOCATION AND LEVEL OF THIS CONSTRUCTION PRIOR TO COMMENCING WORK ON ANY CRITICAL SECTION. THE SUPERINTENDENT MAY VARY LEVELS AND GRADIENTS OF NEW WORKS TO ACHIEVE A SATISFACTORY CONNECTION.
3. LEVEL DATUM IS AHD.
4. ALL DIMENSIONS ARE IN METRES U.N.O.
5. PRIOR TO CONSTRUCTION THE CONTRACTOR WILL SATISFY HIMSELF OF THE CORRECT LOCATIONS OF ALL EXISTING SERVICES WHETHER INDICATED OR NOT ON THE PLANS. ANY DAMAGE TO EXISTING SERVICES IS TO BE RECTIFIED AT THE CONTRACTORS EXPENSE.
6. PRIOR TO CONSTRUCTION THE CONTRACTOR SHALL VERIFY BENCH MARK LEVELS AND ADVISE THE SUPERINTENDENT OF ANY DISCREPANCIES.
7. PRIOR TO CONSTRUCTION THE CONTRACTOR IS TO CONFIRM WITH THE SUPERINTENDENT THE FOLLOWING:
   - 7.A. ALL INSPECTION HOLD POINTS, AND;
   - 7.B. ALL COMPLIANCE TESTING REQUIREMENTS.
8. ANY WORK ON EXISTING SERVICES THAT REQUIRE RELOCATION BY AUTHORITIES SHALL BE CARRIED OUT BY THE RELEVANT AUTHORITY, BUT WITHIN TERMS OF THE CONTRACT, AND SHALL BE CO-ORDINATED BY THE CONTRACTOR.
9. AT COMPLETION OF CONSTRUCTION THE CONTRACTOR SHALL ARRANGE FOR AN INDEPENDENT LICENSED SURVEYOR TO CARRY OUT A "WORKS AS CONSTRUCTED" SURVEY IN ACCORDANCE WITH THE CURRENT COUNCIL STANDARDS AND SUBMIT THE DETAILS SHOWN ON A PLAN TO THE SUPERINTENDENT.
10. ALL VERGES ARE TO BE FULLY TURFED WITH COUCH REFER TO LANDSCAPE ARCHITECTS PLANS FOR DETAILS.

LOCALITY PLAN
N.T.S

DRAWING SCHEDULE

DRG No.	DESCRIPTION	REV
GENERAL		
ACE171359.CIV.CC.000	COVER SHEET AND LOCALITY PLAN	A
ACE171359.CIV.CC.001	EXISTING SERVICES AND DEMOLITION PLAN	A
EROSION AND SEDIMENT		
ACE171359.CIV.CC.100	EROSION AND SEDIMENT CONTROL PLAN	A
ACE171359.CIV.CC.101	SEDIMENT AND EROSION CONTROL DETAILS SHEET 1 OF 3	A
ACE171359.CIV.CC.102	SEDIMENT AND EROSION CONTROL DETAILS SHEET 2 OF 3	A
ACE171359.CIV.CC.103	SEDIMENT AND EROSION CONTROL DETAILS SHEET 3 OF 3	A
EARTHWORKS		
ACE171359.CIV.CC.200	BULK EARTHWORKS PLAN	A
ACE171359.CIV.CC.201	BULK EARTHWORKS SECTIONS SHEET 1 OF 2	A
ACE171359.CIV.CC.202	BULK EARTHWORKS SECTIONS SHEET 2 OF 2	A
ROADWORKS		
ACE171359.CIV.CC.300	OVERALL ROADWORKS AND DRAINAGE LAYOUT PLAN	A
ACE171359.CIV.CC.301	ROADWORKS AND DRAINAGE LAYOUT PLAN SHEET 1 OF 4	A
ACE171359.CIV.CC.302	ROADWORKS AND DRAINAGE LAYOUT PLAN SHEET 2 OF 4	A
ACE171359.CIV.CC.303	ROADWORKS AND DRAINAGE LAYOUT PLAN SHEET 3 OF 4	A
ACE171359.CIV.CC.304	ROADWORKS AND DRAINAGE LAYOUT PLAN SHEET 4 OF 4	A
ACE171359.CIV.CC.305	TYPICAL CROSS SECTION AND SWALE SECTION	A
ACE171359.CIV.CC.310	ROAD 1 LONGITUDINAL SECTIONS SHEET 1 OF 2	A
ACE171359.CIV.CC.311	ROAD 1 LONGITUDINAL SECTIONS SHEET 2 OF 2	A
ACE171359.CIV.CC.312	ROAD 2 LONGITUDINAL SECTIONS SHEET 1 OF 2	A
ACE171359.CIV.CC.313	ROAD 2 LONGITUDINAL SECTIONS SHEET 2 OF 2	A
ACE171359.CIV.CC.314	ROAD 2 LONGITUDINAL SECTIONS SHEET 3 OF 3	A
ACE171359.CIV.CC.320	ROAD 1 CROSS SECTIONS SHEET 1 OF 2	A
ACE171359.CIV.CC.321	ROAD 1 CROSS SECTIONS SHEET 2 OF 2	A
ACE171359.CIV.CC.322	ROAD 2 CROSS SECTIONS SHEET 1 OF 4	A
ACE171359.CIV.CC.323	ROAD 2 CROSS SECTIONS SHEET 2 OF 4	A
ACE171359.CIV.CC.324	ROAD 2 CROSS SECTIONS SHEET 3 OF 4	A
ACE171359.CIV.CC.325	ROAD 2 CROSS SECTIONS SHEET 4 OF 4	A
RETAINING WALL		
ACE171359.CIV.CC.400	RETAINING WALL TYPICAL CROSS SECTION	A
EXTERNAL WORKS PACKAGE		
ACE171359.CIV.CC.700	GREENDALE ROAD INTERSECTION LAYOUT PLAN SHEET 1 OF 2	A
ACE171359.CIV.CC.701	GREENDALE ROAD INTERSECTION LAYOUT PLAN SHEET 2 OF 2	A

EARTHWORKS NOTES

1. EARTHWORKS NOTES ARE TO BE READ IN CONJUNCTION WITH THE GENERAL AND COORDINATION NOTES.
2. EARTHWORKS SHALL BE CARRIED OUT IN ACCORDANCE WITH PROCEDURES SET DOWN IN AS3798 'GUIDELINES ON EARTHWORKS FOR COMMERCIAL AND RESIDENTIAL DEVELOPMENTS'.
3. BULK EARTHWORKS INCLUDING CLEARING, FILLING AND TESTING, ARE TO BE CARRIED OUT IN ACCORDANCE WITH THE CURRENT COUNCIL STANDARDS, DRAWINGS AND SPECIFICATIONS. COUNCIL STANDARDS SUPERSEDE ANY NOTES OR SPECIFICATIONS WRITTEN ON THE DESIGN DRAWINGS.
4. BULK EARTHWORKS LEVELS SHALL BE DETERMINED RELATIVE TO THE FINISHED SURFACE LEVELS. REFER ARCHITECTURAL DRAWINGS FOR SLAB LEVELS, TO THE STRUCTURAL ENGINEERS DRAWINGS FOR BUILDING AND PATH SLAB THICKNESS AND TO THE CIVIL ENGINEERS DRAWINGS FOR EXTERNAL FINISHED SURFACE LEVELS AND EXTERNAL PAVEMENT THICKNESSES
5. TOPSOIL SHALL BE STOCKPILED AS DIRECTED BY THE SUPERINTENDENT ON SITE.
6. PRIOR TO PLACEMENT OF ANY FILLING ALL TOPSOIL AND ORGANIC MATERIAL IS TO BE REMOVED AND THE SUBGRADE SHALL BE UNIFORMLY COMPACTED TO THE MINIMUM DRY DENSITY RATIOS SHOWN IN NOTE 10. ANY SOFT SPOTS REVEALED BY COMPACTION SHALL BE REMOVED AS DIRECTED BY THE SUPERINTENDENT AND BACKFILLED WITH COMPACTED SELECT FILL.
7. MOISTURE CONTENT OF COMPACTED FILL SHOULD BE MAINTAINED WITHIN 2% OF OPTIMUM MOISTURE CONTENT.
8. FILL SHALL BE COMPACTED IN MAXIMUM 200mm THICK LAYERS (LOOSE THICKNESS) TO THE FOLLOWING MINIMUM DRY DENSITY RATIOS (STANDARD COMPACTION A.S.1289.5-1).
   - 8.A. UPPER 0.3m OF PAVEMENT SUBGRADE = 100%;
   - 8.B. UNDER BUILDINGS = 98%;
   - 8.C. GENERAL FILL = 95%.
9. ALL FILL MATERIAL PLACED ON THE SITE SHALL COMPRISE ONLY NATURAL EARTH AND ROCK, AND IS TO BE FREE OF CONTAMINANTS (AS DEFINED BY SECTION 11 OF THE ENVIRONMENTAL PROTECTION ACT 1994), NOXIOUS, HAZARDOUS, DELETERIOUS AND ORGANIC MATERIALS. NO DEMOLITION MATERIAL IS TO BE USED. SUITABLE FILL MATERIAL IS DEEMED TO COMPLY WITH THE REQUIREMENTS OF CLAUSE 4.3 OF AS3798, 'GUIDELINES ON EARTHWORKS FOR COMMERCIAL AND RESIDENTIAL DEVELOPMENTS'.
10. IMPORTED FILL SHALL COMPLY WITH THE FOLLOWING:
    - 10.A. SOAKED CBR = MINIMUM OF 15%;
    - 10.B. LIQUID LIMIT = 30% MAX;
    - 10.C. PLASTICITY INDEX = 15% MAX;
    - 10.D. MAXIMUM AGGREGATE SIZE = 75mm;
    - 10.E. PASSING 0.075mm SIEVE = 30% MAX;
    - 10.F. SHRINK/SWELL INDEX = 1.0% MAX.
11. THE CONTRACTOR IS TO ENGAGE, AT THEIR EXPENSE, AN APPROVED NATA REGISTERED LABORATORY TO CARRY OUT SITE CONTROL TO 'LEVEL 1' STANDARD AS SET OUT IN APPENDIX B OF AS3798-2007 'GUIDELINES ON EARTHWORKS FOR COMMERCIAL AND RESIDENTIAL DEVELOPMENTS' AND PROVIDE A 'LEVEL 1' REPORT ON COMPLETION OF EARTHWORKS.

DRAINAGE NOTES

1. DRAINAGE NOTES ARE TO BE READ IN CONJUNTION WITH THE GENERAL AND COORDINATION NOTES.
2. CONTRACTOR IS TO CHECK THAT THE PROPOSED PIPE WORKS DO NOT CLASH WITH EXISTING SERVICES PRIOR TO ANY TRENCH EXCAVATION. THE CONTRACTOR SHALL NOTIFY THE ENGINEER IF ANY CLASHES ARE FOUND FOR ADVICE ON ANY DESIGN REQUIREMENTS.
3. STRUCTURES HAVE BEEN DESIGNED FOR OPERATIONAL LOADS ONLY. THE CONTRACTOR IS RESPONSIBLE FOR THE ASSESSMENT OF CONSTRUCTION LOADS AND PROVISION OF ANY TEMPORARY BRACING, PROPPING, ETC. REQUIRED DURING CONSTRUCTION. STRUCTURES SHALL BE MAINTAINED IN A STABLE CONDITION AND NO PART SHALL BE OVERSTRESSED.
4. ALL TRENCH EXCAVATIONS AND CONSTRUCTION IS TO BE IN ACCORDANCE WITH THE WORKPLACE HEALTH AND SAFETY 1989 AS AMENDED AND THE MINE REGULATIONS ACT.
5. ALL TRENCHES IN TRAFFICABLE AND NON TRAFFICABLE ZONES SHALL BE BACKFILLED TO DENSITY RATIOS, FREQUENCIES AND LAYER INTERVALS IN ACCORDANCE WITH THE CURRENT COUNCIL STANDARDS. ALL TEST RESULTS SHALL FORWARDED TO THE SUPERINTENDENT AS THEY BECOME AVAILABLE.
6. ALL PRECAST CONCRETE PIPES ARE TO BE MANUFACTURED IN ACCORDANCE WITH AS 4058. STORMWATER PIPES SHALL BE TO FOLLOWING CLASSES U.N.O.
   - 6.A. REINFORCED CONCRETE PIPES (RCP) = CLASS 2;
   - 6.B. FIBRE REINFORCED PIPES (FRC) = CLASS 2;
   - 6.C. uPVC = CLASS 'SEH'.
7. ALL RCP PIPES SHALL HAVE THE FOLLOWING JOINTS U.N.O.
   - 7.A. RCP <=600 DIA = RUBBER RING JOINTED (RRJ).
   - 7.B. RCP >600 DIA = FLUSH JOINTED (FJ);
8. ROOFWATER PIPES SHALL BE uPVC PIPES CLASS 'SH' U.N.O.
9. REFER TO STORMWATER LONGITUDINAL SECTIONS FOR ALL STRUCTURE TYPES, SIZES, LEVELS AND GRATE TYPES. GRATES SHALL BE TRAFFICABLE CLASS 'D' U.N.O.
10. MANHOLE AND FIELD INLET ACCESS SHALL BE INSTALLED AS DESCRIBED BELOW IN ACCORDANCE WITH AS1657:
    - 10.A. GULLY/FIELD INLETS >1.35m DEPTH: STEP IRONS;
    - 10.B. MANHOLES 0.850m-3.0m DEPTH: STEP IRONS;
    - 10.C. MANHOLES >3.0m DEPTH: FIXED ACCESS LADDER.
11. TEST CERTIFICATES AND MATERIAL CERTIFICATION DOCUMENTATION IS REQUIRED FOR ALL PIPES, FITTINGS, BOX CULVERTS AND OTHER PRECAST CONCRETE PRODUCTS.
12. ALL STORMWATER SETOUT IS TO CENTRE OF STRUCTURE U.N.O.
13. FOR PIPE BEDDING DETAILS (MODIFIED FOR CONSTRUCTION LOADS) REFER TO UMB15123.CIV.CC - 300

EROSION AND SEDIMENT CONTROL NOTES

1. EROSION & SEDIMENT CONTROL (ESC) NOTES ARE TO BE READ IN CONJUNCTION WITH THE GENERAL AND COORDINATION NOTES.
2. ALL ESC MEASURES SHALL BE IN ACCORDANCE CURRENT COUNCIL STANDARDS, DRAWINGS AND SPECIFICATIONS U.N.O.
3. CONSTRUCTION OF ALL SEDIMENT CONTROL MANAGEMENT DEVICES SHALL BE TO THE SATISFACTION OF THE SUPERINTENDENT. THE CONTRACTOR IS TO FOLLOW THE CONSTRUCTION PHASE AS OUTLINED:
   - 3.A. CONSTRUCTION OF EROSION AND SEDIMENT DEVICES;
   - 3.B. STRIPPING TOPSOIL;
   - 3.C. BULK EARTHWORKS;
   - 3.D. SERVICES, BUILDING, PAVEMENT AND ROAD CONSTRUCTION;
   - 3.E. LANDSCAPED AREAS TO BE TOPSOILED, TURFED, MULCHED OR PLANTED.
4. THE CONTRACTOR IS TO PROVIDE A CONSTRUCTION TRAFFIC SHAKEDOWN DEVICE AT ALL RELEVANT POINTS OF EXIT FROM THE SITE. THE CONTRACTOR SHALL CLEAN OUT AND MAINTAIN THE SHAKEDOWN DEVICE REGULARLY TO ENSURE EFFICIENT OPERATION.
5. THE CONTRACTOR SHALL PROVIDE SILT FENCES IMMEDIATELY DOWNSTREAM OF ANY SOIL STOCKPILES.
6. BOTH TEMPORARY AND PERMANENT ESC MEASURES SHALL BE MAINTAINED AT A SUITABLE LEVEL/CONDITION THROUGHOUT CONSTRUCTION TO THE SATISFACTION OF THE SUPERINTENDENT.
7. ALL TEMPORARY ESC MEASURES SHALL BE MAINTAINED AND FULLY OPERATIONAL DURING THE CONSTRUCTION AND MAINTENANCE PERIOD, AND ARE TO BE REMOVED AFTER THE SATISFACTORY COMPLETION OF AN 'OFF MAINTENANCE' INSPECTION BY THE SUPERINTENDENT.
8. ALL ESC MEASURES ARE TO BE INSPECTED AT LEAST DAILY, PRIOR TO EXPECTED RAINFALL AND AFTER RAINFALL. ANY DAMAGE OR EXCESS EROSION/SEDIMENT IS TO BE REPAIRED/MANAGED AS REQUIRED TO MAINTAIN CONTROL DEVICES.
9. ALL ESC MEASURES MUST SUIT THE PREVAILING CLIMATE/WEATHER CONDITIONS AT THE TIME OF CONSTRUCTION.
10. THE CONTRACTOR IS TO ENSURE THE SUPPRESSION OF DUST AT ALL TIMES DURING THE CONSTRUCTION AND MAINTENANCE PERIOD OF THE DEVELOPMENT. ENVIRONMENTAL HARM AND NUISANCE FROM DUST IS TO BE PREVENTED. ACCEPTABLE METHODS INCLUDE:
    - 10.A. WATERING;
    - 10.B. PROMOTING VEGETATION IN WIND EROSION PRONE AREAS;
    - 10.C. CONSTRUCTING WIND BREAKS;
    - 10.D. MULCHING.
11. THE CONTRACTORS VEHICLES & PLANT SHALL NOT OPERATE OUTSIDE THE LIMITS OF THE IMMEDIATE CONSTRUCTION AREA AND ARE RESTRICTED FROM CROSSING OR DISTURBING AREAS NOT SUBJECT TO CONSTRUCTION.
12. ANY WATER TRAPPED WITHIN THE TEMPORARY SEDIMENT BASIN IS TO BE REGULARLY TESTED DURING THE COURSE OF CONSTRUCTION. REFER WATER QUALITY MONITORING TABLE FOR DETAILS.
13. ALL DISTURBED GROUND IS TO BE GRASS SEEDED TO PREVENT EROSION IF THE DISTURBED GROUND IS TO BE LEFT "OPEN" FOR A PERIOD OF GREATER THEN ONE (1) MONTH.
14. REFER DRAWING AS ACE171359 - 100 TO 101 FOR EROSION AND SEDIMENT CONTROL DETAILS.

DISCLAIMER

ALL INFRASTRUCTURE INFORMATION (MAINS, SEWER, PIPES ETC.) IS DERIVED FROM COUNCIL'S "AS CONSTRUCTED" RECORDS.

EVERY EFFORT WAS MADE TO ENSURE ACCURACY OF THESE RECORDS WHEN COMPILED.

NO WARRANTY IS GIVEN TO CURRENCY OF DEPTHS AND LEVELS DUE TO THE POSSIBILITY OF SUBSEQUENT ALTERATION OF LEVELS THROUGH FILLING OR EXCAVATION.
USERS OF THE INFORMATION IN THIS DRAWING/DESIGN SHOULD TAKE
ALL REASONABLE STEPS TO VERIFY THE RELEVANT INFORMATION BEFORE COMMENCING EXCAVATING OR CONSTRUCTION WORK.

UMBRELLA CIVIL CONSULTING ENGINEERS TAKE NO RESPONSIBILITY FOR APPARENT ERRORS OR INACCURACIES IN THE INFORMATION PROVIDED.

IT IS THE CONTRACTOR RESPONSIBILITY TO CONTACT "DIAL BEFORE YOU DIG" OR PHONE 1100 FOR THE LOCATION OF EXISTING PUBLIC UTILITIES, PRIOR TO EXCAVATION.

DANGER :

LOCATION OF ALL EXISTING UNDERGROUND SERVICES SHOWN ARE APPROXIMATE AS TAKEN OFF DBYD INFO. EXTREME CAUTION TO BE EXERCISED WHEN WORKING IN THE VICINITY OF AND AROUND THESE SERVICES. PLEASE CALL THE RELEVANT AUTHORITIES TWO DAYS PRIOR TO CONSTRUCTION FOR A MORE EXACT LOCATION OF THE EXISTING SERVICES

NOT FOR CONSTRUCTION

Issue	Description	Date	Design	Manager
A	ISSUE FOR DEVELOPMENT APPLICATION	27/11/2020	M.M.	J.B.

-1 0 1cm at full size 10cm 20cm

Certification By:

Architect: mkd architects

Scale

AUSTRALIAN CONSULTING ENGINEERS.
PTY LTD - A.C.N. 084 059 941
LEVEL 4, 470 CHURCH STREET NORTH PARRAMATTA NSW 2150
PH: (02) 9763 1500 FX: (02) 9763 1515
EMAIL: info@aceeng.com.au

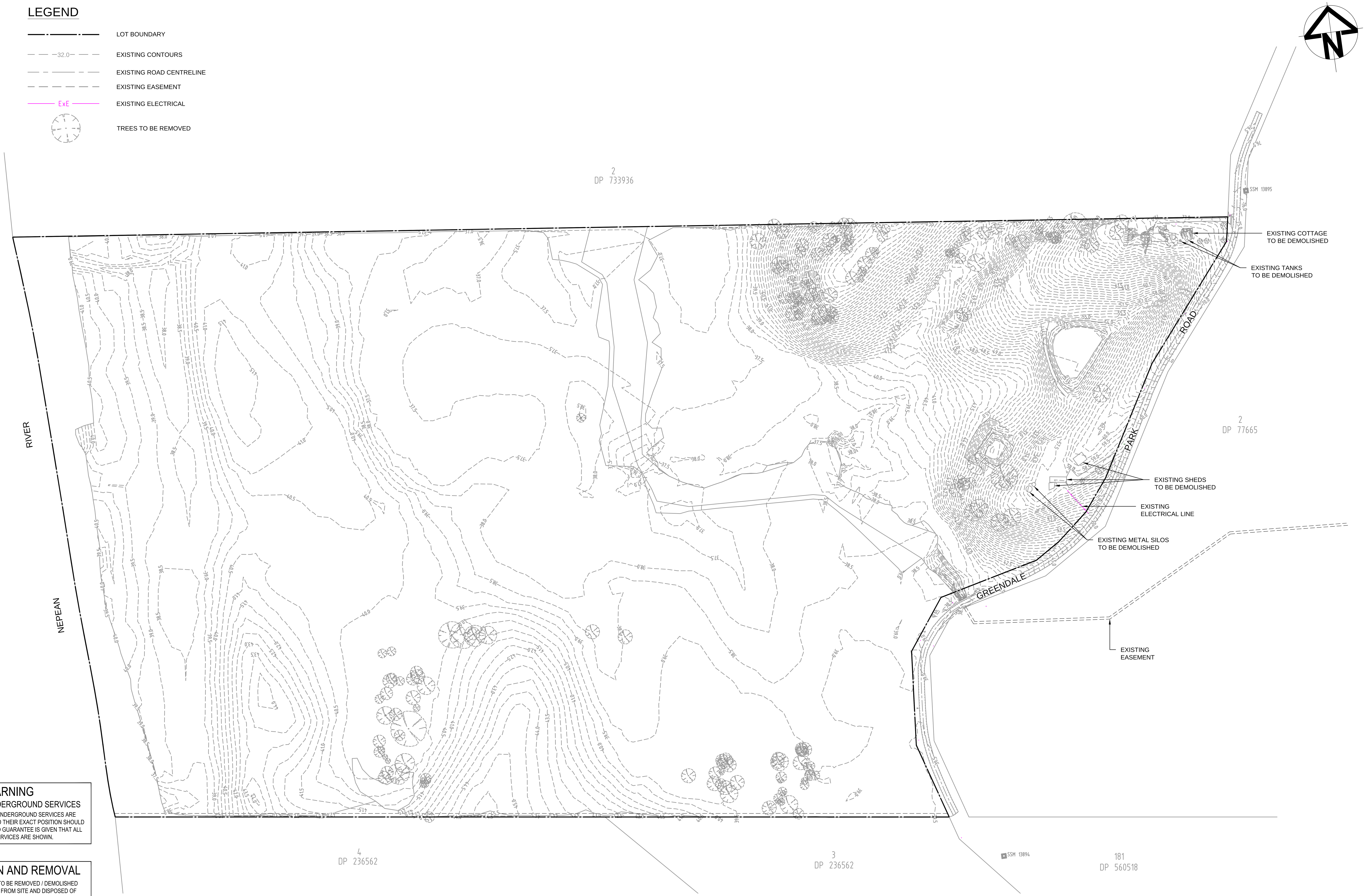
Project: 1290 GREENDALE ROAD, GREENPARK PUBLIC DOMAIN WORKS CIVIL ENGINEERING PLANS DEVELOPMENT APPLICATION

Drawing Title: GENERAL NOTES, LOCALITY PLAN AND DRAWING SCHEDULE

Scale	A1	Project No.	Dwg. No.	Issue
N.T.S.		200597	000	A

LEGEND

	LOT BOUNDARY
32.0	EXISTING CONTOURS
	EXISTING ROAD CENTRELINE
	EXISTING EASEMENT
ExE	EXISTING ELECTRICAL
	TREES TO BE REMOVED



WARNING

BEWARE OF UNDERGROUND SERVICES

THE LOCATIONS OF UNDERGROUND SERVICES ARE APPROXIMATE ONLY AND THEIR EXACT POSITION SHOULD BE PROVEN ON SITE. NO GUARANTEE IS GIVEN THAT ALL EXISTING SERVICES ARE SHOWN.

DEMOLITION AND REMOVAL

ALL ITEMS THAT ARE TO BE REMOVED / DEMOLISHED ARE TO BE REMOVED FROM SITE AND DISPOSED OF IN ACCORDANCE WITH ALL RELIANT COUNCIL DETAILS AND SPECIFICATIONS.

NOT FOR CONSTRUCTION

Issue	Description	Date	Design	Manager
A	ISSUE FOR DEVELOPMENT APPLICATION	27/11/2020	M.M.	J.B.

Certification By:

Architect

mkd architects

Scale

0 40 80 120 m

SCALE 1:2000 @ A1

AUSTRALIAN CONSULTING ENGINEERS.
AUSTRALIAN CONSULTING ENGINEERS PTY LTD - A.C.N. 084 059 941
LEVEL 4, 470 CHURCH STREET NORTH PARRAMATTA NSW 2150
PH: (02) 9763 1500 FX: (02) 9763 1515
EMAIL: info@aceeng.com.au

Project

1290 GREENDALE ROAD, GREENPARK
PUBLIC DOMAIN WORKS
CIVIL ENGINEERING PLANS
DEVELOPMENT APPLICATION

Drawing Title

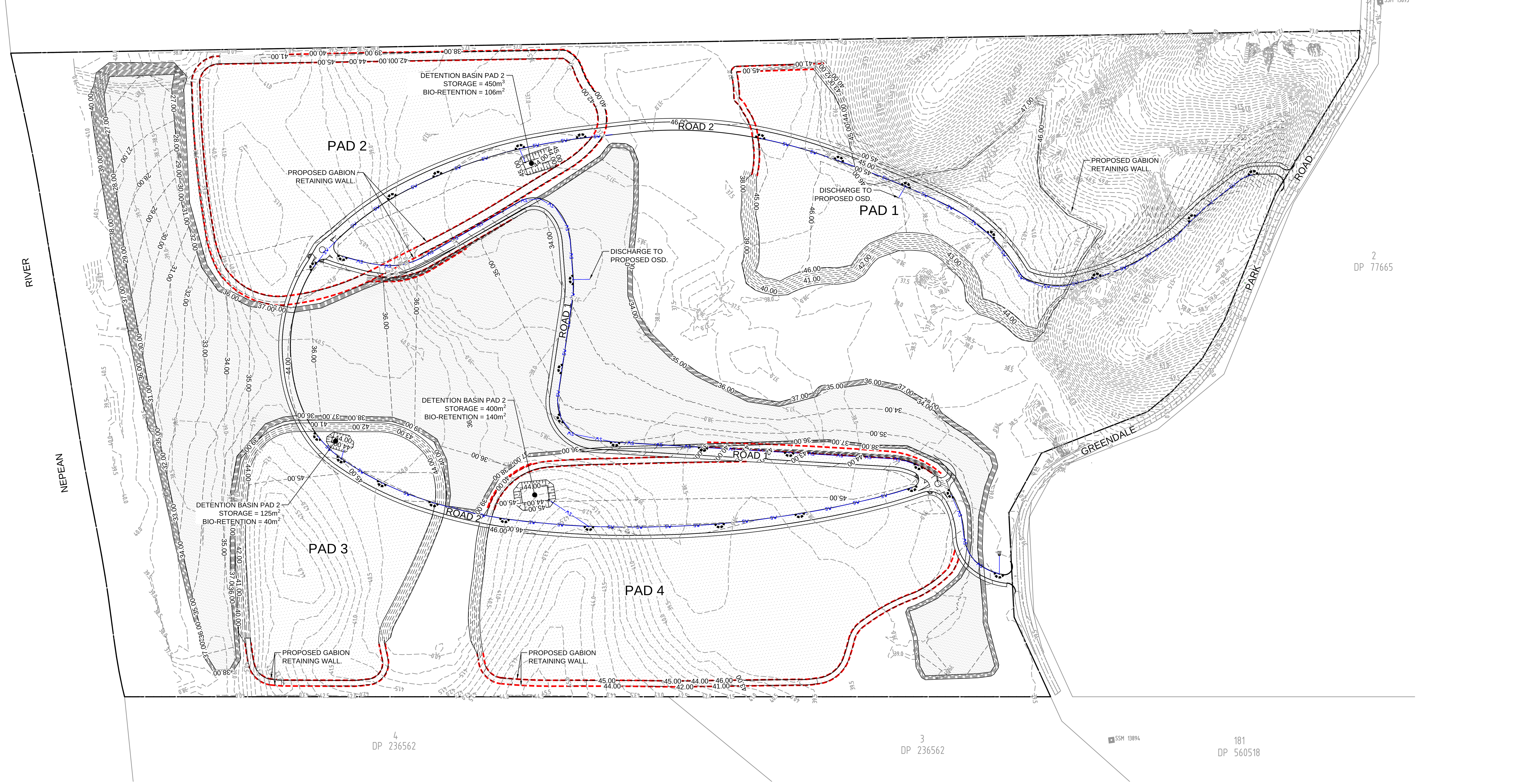
EXISTING SERVICES AND DEMOLITION PLAN

Scale A1	Project No.	Dwg. No.	Issue
1:2000	200597	001	A

LEGEND

- LOT BOUNDARY
- PROPOSED KERB ONLY (KO)
- DESIGN CONTOURS (32.0)
- PROPOSED STORMWATER PIPE (SW)
- PROPOSED GULLY PIT
- DENOTES FILL AREA
- DENOTES CUT AREA
- TEMPORARY STABILISED SITE EXIT (WITH SHAKEDOWN) REFER TO DETAIL
- TEMPORARY FIELD INLET TRAP REFER TO DETAIL
- TEMPORARY INLET PROTECT FOR GULLY REFER TO DETAIL
- ROCK CHECK DAM
- CLEAN WATER DIVERSION SWALE
- DIRTY WATER DIVERSION SWALE
- PROPOSED GABION RETAINING WALL
- EXISTING CONTOURS (32.0)
- EXISTING ROAD CENTRELINE

NOTE:
SITE CLEARING NOTE EXISTING TREES AND STRUCTURES TO BE DEMOLISHED AND REMOVED FROM SITE AS DIRECTED BY SUPERINTENDENT



NOT FOR CONSTRUCTION

Issue	Description	Date	Design	Manager
A	ISSUE FOR DEVELOPMENT APPLICATION	27/11/2020	M.M.	J.B.

Certification By:

Architect: mkd architects

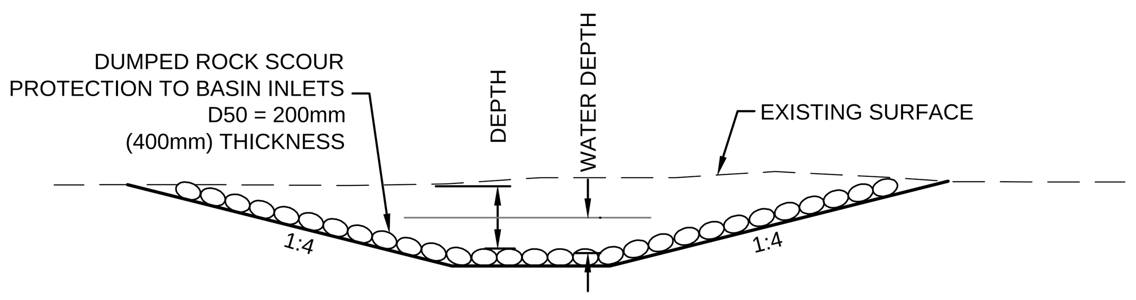
Scale: 0 40 80 120 m — SCALE 1:2000 @ A1

AUSTRALIAN CONSULTING ENGINEERS.
PTY LTD - A.C.N. 084 059 941
LEVEL 4, 470 CHURCH STREET NORTH PARRAMATTA NSW 2150
PH: (02) 9763 1500 FX: (02) 9763 1515
EMAIL: info@aceeng.com.au

Project: 1290 GREENDALE ROAD, GREENPARK
PUBLIC DOMAIN WORKS
CIVIL ENGINEERING PLANS
DEVELOPMENT APPLICATION

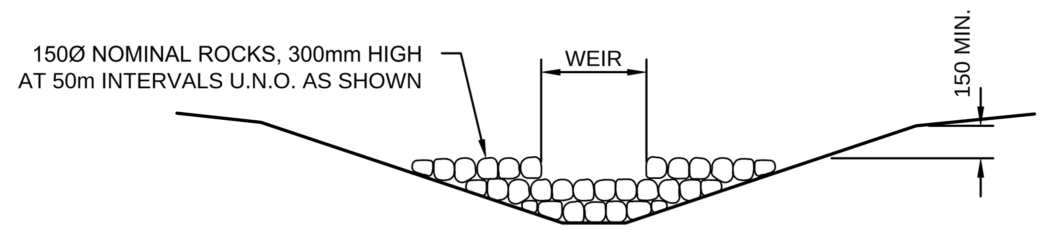
Drawing Title: SEDIMENT AND EROSION CONTROL PLAN

Scale	A1	Project No.	Dwg. No.	Issue
1:2000		200597	100	A



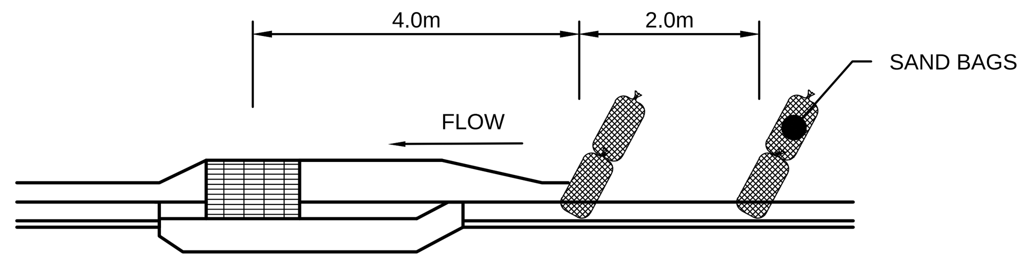
SCOUR INLET PROTECTION INTO BASIN

MINIMUM GRADE 1in200. FINAL SIZE AND LOCATION TO BE DETERMINED ON SITE BY THE SUPERINTENDENT
N.T.S.



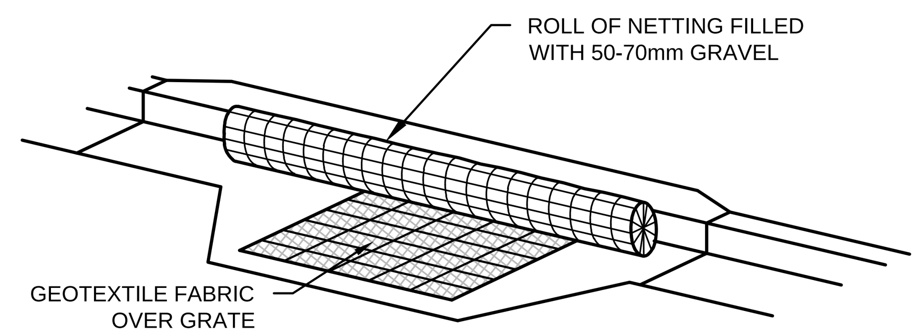
ROCK CHECK DAM DETAIL

N.T.S.



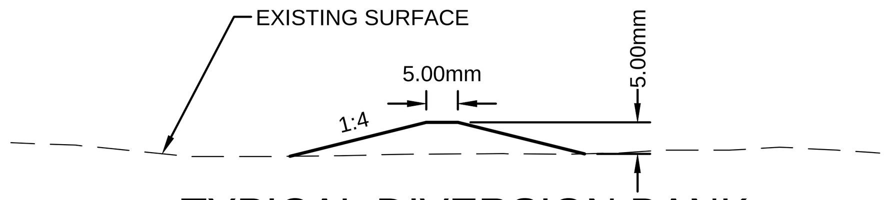
KERB INLET PROTECTION GULLIES ON GRADE

N.T.S.



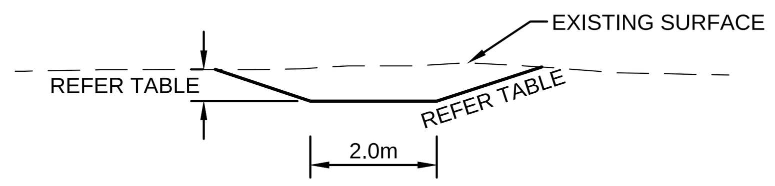
KERB INLET PROTECTION SAG GULLIES

N.T.S.



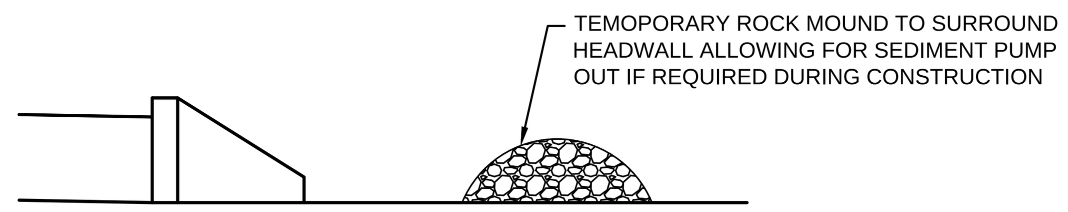
TYPICAL DIVERSION BANK

N.T.S.



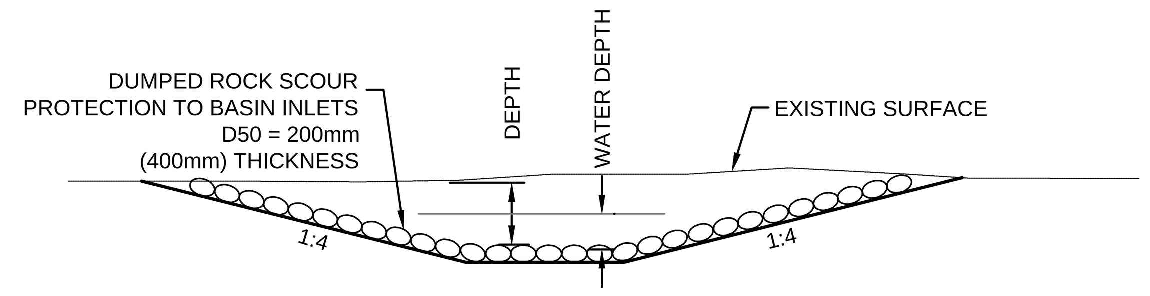
CLEAN/DIRTY WATER DIVERSION SWALE DETAIL

FINAL SIZE AND LOCATION TO BE DETERMINED ON SITE BY THE SUPERINTENDENT
N.T.S.



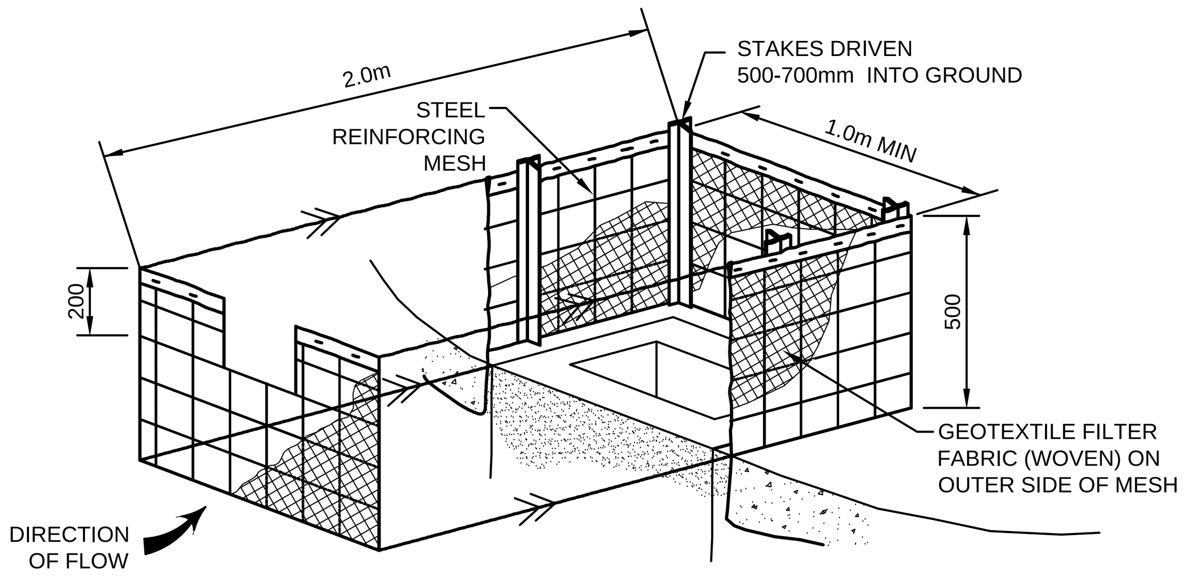
OUTLET ROCK PROTECTION DETAIL

N.T.S.



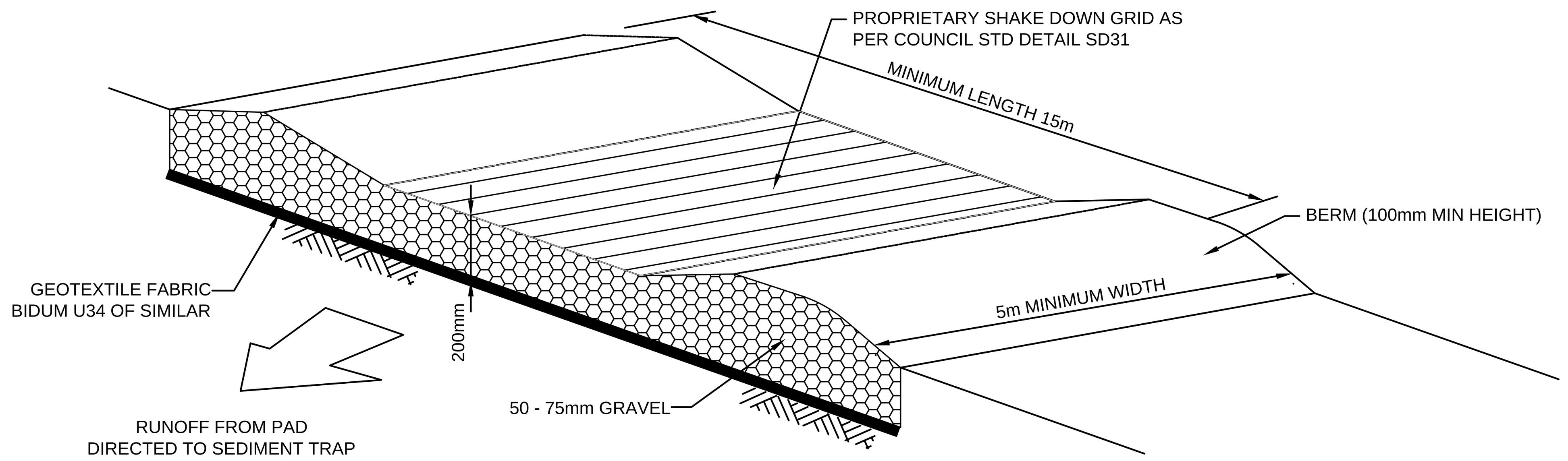
SCOUR INLET PROTECTION INTO BASIN

MINIMUM GRADE 1in200. FINAL SIZE AND LOCATION TO BE DETERMINED ON SITE BY THE SUPERINTENDENT
N.T.S.



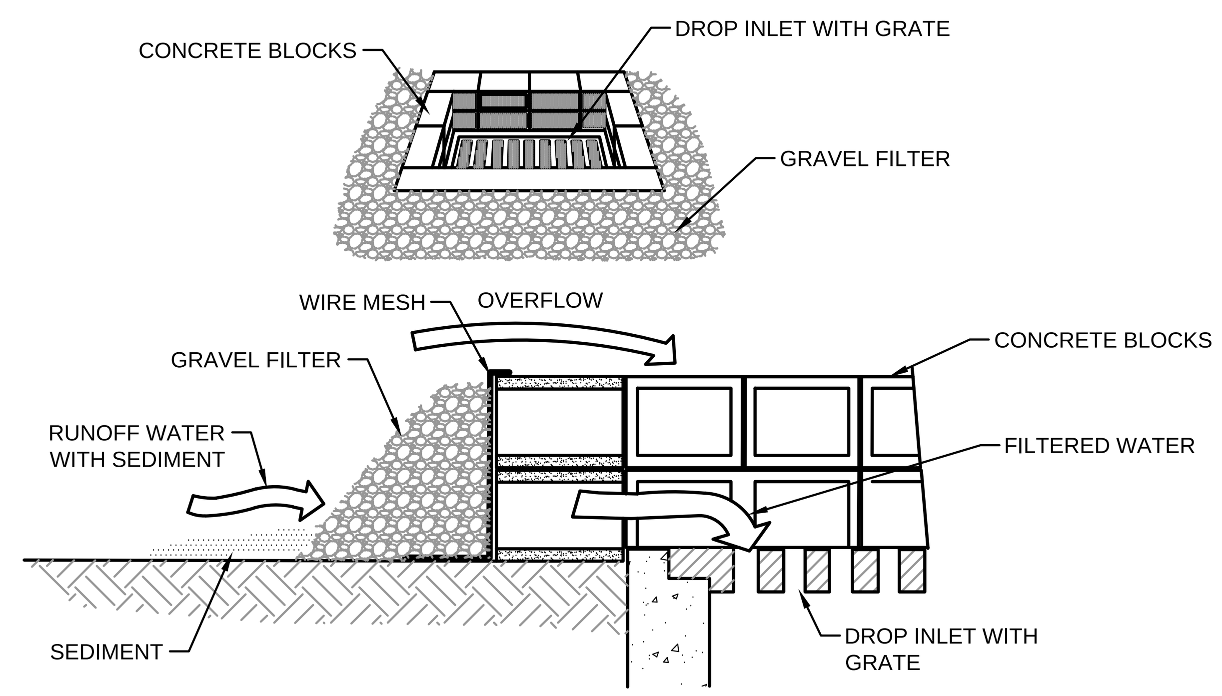
FIELD INLET SEDIMENT TRAP

N.T.S.



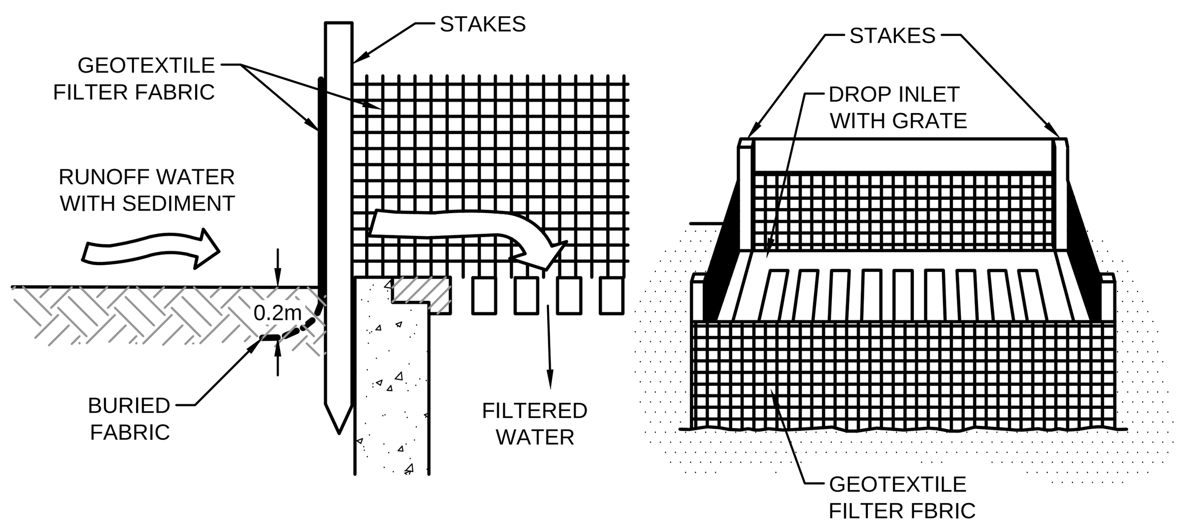
SHAKEDOWN DEVICE

N.T.S



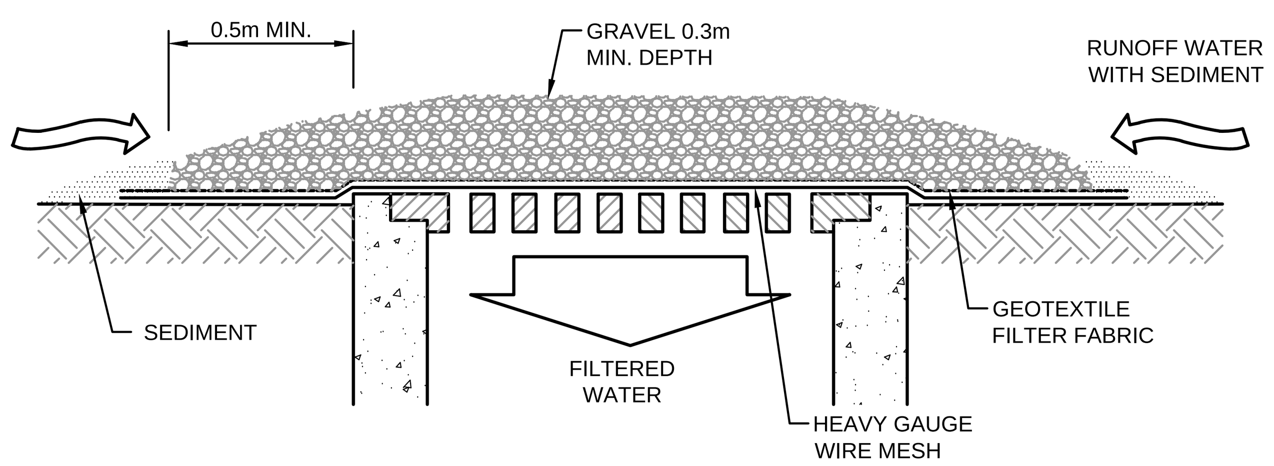
BLOCK AND GRAVEL DROP INLET SEDIMENT TRAP

SCALE N.T.S



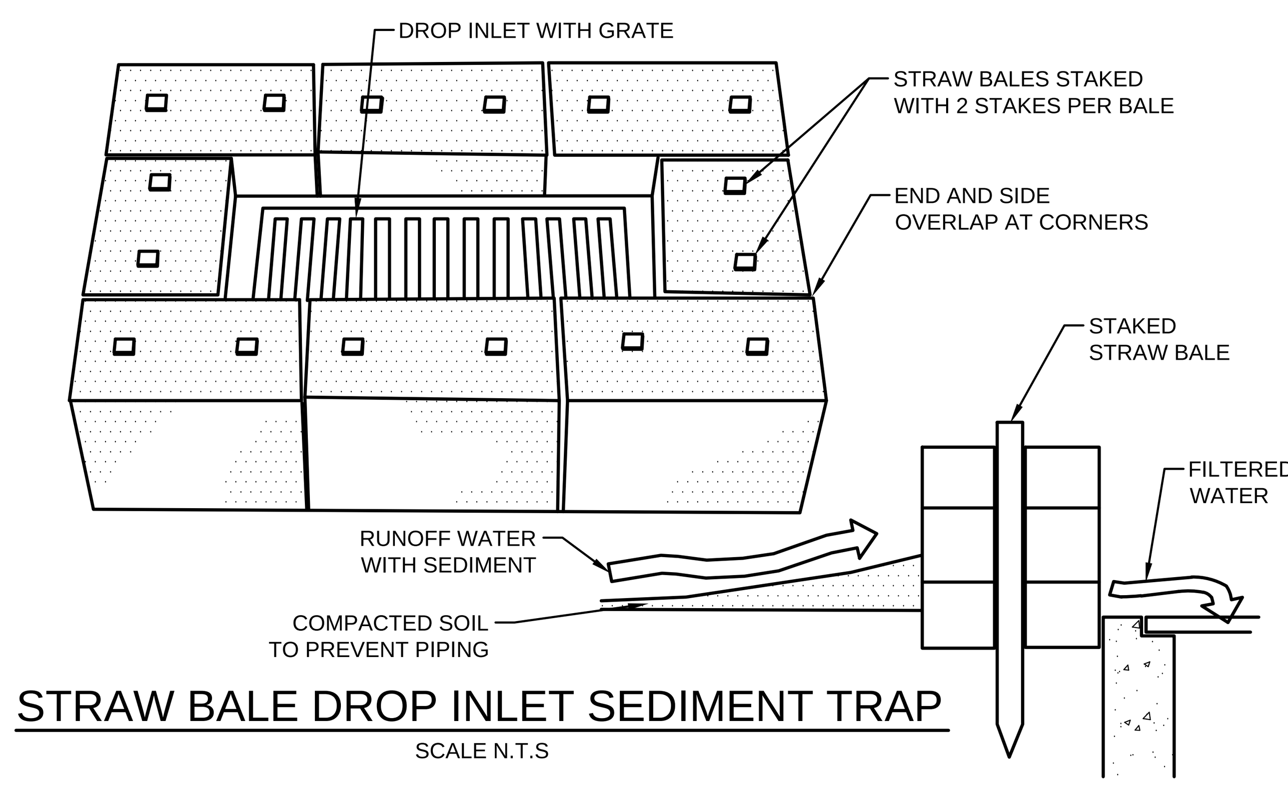
GEOTEXTILE FILTER FABRIC DROP INLET SEDIMENT TRAP

SCALE N.T.S



WIRE MESH AND GRAVEL DROP INLET SEDIMENT TRAP

SCALE N.T.S



STRAW BALE DROP INLET SEDIMENT TRAP

SCALE N.T.S

NOT FOR CONSTRUCTION

Issue	Description	Date	Design	Manager
A	ISSUE FOR DEVELOPMENT APPLICATION	27/11/2020	M.M.	J.B.

1cm at full size — 10cm — 20cm

Certification By:

Architect: mkd architects

Scale: 0 40 80 120 m — SCALE 1:2000 @ A1

AUSTRALIAN CONSULTING ENGINEERS.
PTY LTD - A.C.N. 084 059 941
LEVEL 4, 470 CHURCH STREET NORTH PARRAMATTA NSW 2150
PH: (02) 9763 1500 FX: (02) 9763 1515
EMAIL: info@aceeng.com.au

Project: 1290 GREENDALE ROAD, GREENPARK PUBLIC DOMAIN WORKS CIVIL ENGINEERING PLANS DEVELOPMENT APPLICATION

Drawing Title: SEDIMENT AND EROSION CONTROL DETAILS SHEET 1 OF 2

Scale	A1	Project No.	Dwg. No.	Issue
1:2000		200597	101	A

COORDINATION NOTES

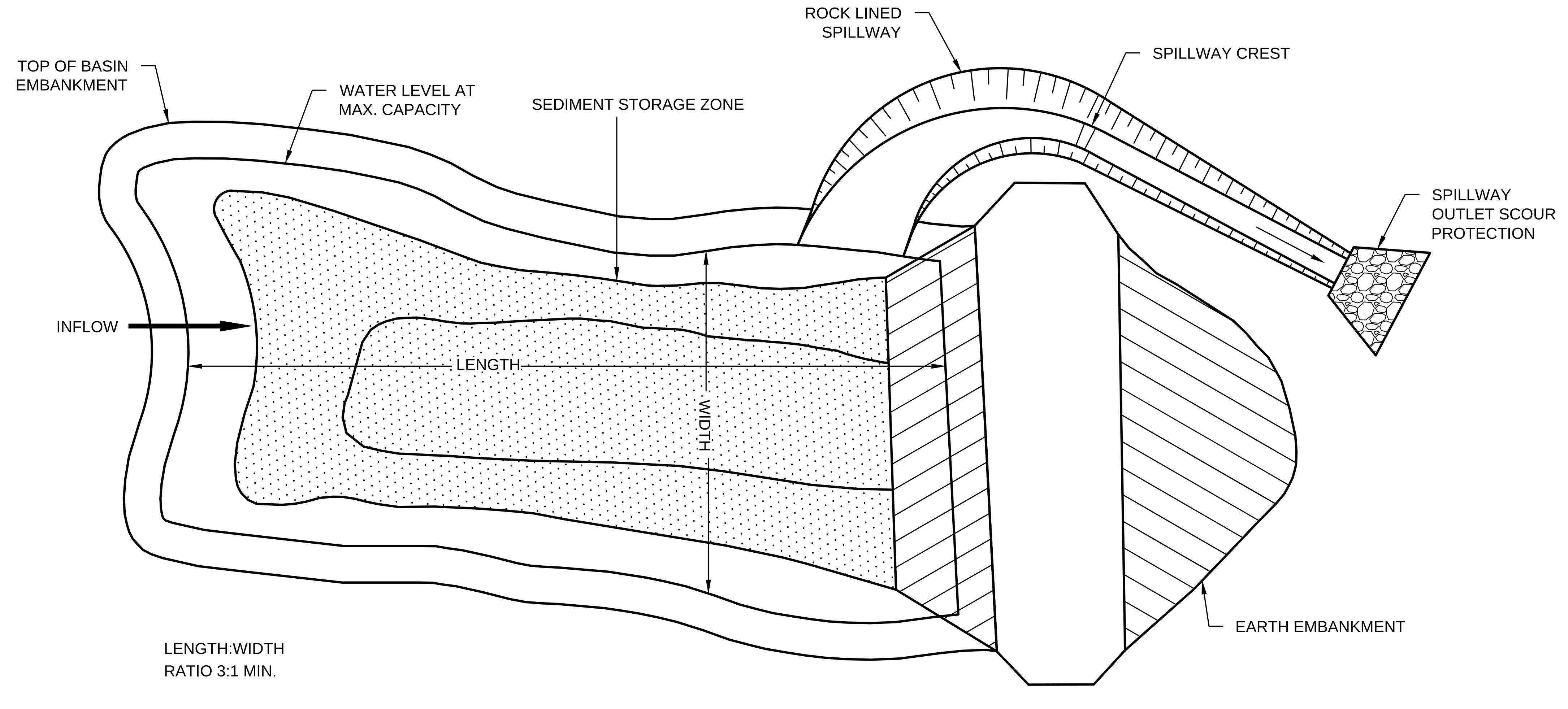
1. REFER ELECTRICAL CONSULTANTS DRAWINGS FOR ELECTRICAL RETICULATION SETOUT.
2. REFER LANDSCAPE ARCHITECTS DRAWINGS FOR SOIL STABILATION AND PLANTING DETAILS.
3. REFER SERVICE AUTHORITY FOR LOCATION AND CONSTRUCTION REQUIREMENTS APPLICABLE TO EXISTING SERVICES.

GENERAL NOTES

1. ALL WORK IS TO CONFORM TO BLACKTOWN CITY COUNCIL'S ENGINEERING GUIDE FOR DEVELOPMENT CIVIL WORKS SPECIFICATIONS.
2. WHERE CONNECTION IS TO BE MADE TO EXISTING CONSTRUCTION THE CONTRACTOR SHALL CONFIRM THE LOCATION AND LEVEL OF THIS CONSTRUCTION PRIOR TO COMMENCING WORK ON ANY CRITICAL SECTION. THE SUPERINTENDENT MAY VARY LEVELS AND GRADIENTS OF NEW WORKS TO ACHIEVE A SATISFACTORY CONNECTION.
3. LEVEL DATUM IS AHD.
4. ALL DIMENSIONS ARE IN METRES U.N.O.
5. PRIOR TO CONSTRUCTION THE CONTRACTOR WILL SATISFY HIMSELF OF THE CORRECT LOCATIONS OF ALL EXISTING SERVICES WHETHER INDICATED OR NOT ON THE PLANS. ANY DAMAGE TO EXISTING SERVICES IS TO BE RECTIFIED AT THE CONTRACTORS EXPENSE.
6. PRIOR TO CONSTRUCTION THE CONTRACTOR SHALL VERIFY BENCH MARK LEVELS AND ADVISE THE SUPERINTENDENT OF ANY DISCREPANCIES.
7. PRIOR TO CONSTRUCTION THE CONTRACTOR IS TO CONFIRM WITH THE SUPERINTENDENT THE FOLLOWING:
   7.A. ALL INSPECTION HOLD POINTS, AND;
   7.B. ALL COMPLIANCE TESTING REQUIREMENTS.
8. ANY WORK ON EXISTING SERVICES THAT REQUIRE RELOCATION BY AUTHORITIES SHALL BE CARRIED OUT BY THE RELEVANT AUTHORITY, BUT WITHIN TERMS OF THE CONTRACT, AND SHALL BE CO-ORDINATED BY THE CONTRACTOR.
9. AT COMPLETION OF CONSTRUCTION THE CONTRACTOR SHALL ARRANGE FOR AN INDEPENDENT LICENSED SURVEYOR TO CARRY OUT A "WORKS AS CONSTRUCTED" SURVEY IN ACCORDANCE WITH THE CURRENT COUNCIL STANDARDS AND SUBMIT THE DETAILS SHOWN ON A PLAN TO THE SUPERINTENDENT.
10. ALL VERGES ARE TO BE FULLY TURFED WITH COUCH REFER TO LANDSCAPE ARCHITECTS PLANS FOR DETAILS.

EROSION AND SEDIMENT CONTROL NOTES

1. EROSION & SEDIMENT CONTROL (ESC) NOTES ARE TO BE READ IN CONJUNCTION WITH THE GENERAL AND COORDINATION NOTES.
2. ALL ESC MEASURES SHALL BE IN ACCORDANCE CURRENT COUNCIL STANDARDS, DRAWINGS AND SPECIFICATIONS U.N.O.
3. CONSTRUCTION OF ALL SEDIMENT CONTROL MANAGEMENT DEVICES SHALL BE TO THE SATISFACTION OF THE SUPERINTENDENT. THE CONTRACTOR IS TO FOLLOW THE CONSTRUCTION PHASE AS OUTLINED:
   3.A. CONSTRUCTION OF EROSION AND SEDIMENT DEVICES;
   3.B. STRIPPING TOPSOIL;
   3.C. BULK EARTHWORKS;
   3.D. SERVICES, BUILDING, PAVEMENT AND ROAD CONSTRUCTION;
   3.E. LANDSCAPED AREAS TO BE TOPSOILED, TURFED, MULCHED OR PLANTED.
4. THE CONTRACTOR IS TO PROVIDE A CONSTRUCTION TRAFFIC SHAKEDOWN DEVICE AT ALL RELEVANT POINTS OF EXIT FROM THE SITE. THE CONTRACTOR SHALL CLEAN OUT AND MAINTAIN THE SHAKEDOWN DEVICE REGULARLY TO ENSURE EFFICIENT OPERATION.
5. THE CONTRACTOR SHALL PROVIDE SILT FENCES IMMEDIATELY DOWNSTREAM OF ANY SOIL STOCKPILES.
6. BOTH TEMPORARY AND PERMANENT ESC MEASURES SHALL BE MAINTAINED AT A SUITABLE LEVEL/CONDITION THROUGHOUT CONSTRUCTION TO THE SATISFACTION OF THE SUPERINTENDENT.
7. ALL TEMPORARY ESC MEASURES SHALL BE MAINTAINED AND FULLY OPERATIONAL DURING THE CONSTRUCTION AND MAINTENANCE PERIOD, AND ARE TO BE REMOVED AFTER THE SATISFACTORY COMPLETION OF AN 'OFF MAINTENANCE' INSPECTION BY THE SUPERINTENDENT.
8. ALL ESC MEASURES ARE TO BE INSPECTED AT LEAST DAILY, PRIOR TO EXPECTED RAINFALL AND AFTER RAINFALL. ANY DAMAGE OR EXCESS EROSION/SEDIMENT IS TO BE REPAIRED/MANAGED AS REQUIRED TO MAINTAIN CONTROL DEVICES.
9. ALL ESC MEASURES MUST SUIT THE PREVAILING CLIMATE/WEATHER CONDITIONS AT THE TIME OF CONSTRUCTION.
10. THE CONTRACTOR IS TO ENSURE THE SUPPRESSION OF DUST AT ALL TIMES DURING THE CONSTRUCTION AND MAINTENANCE PERIOD OF THE DEVELOPMENT. ENVIRONMENTAL HARM AND NUISANCE FROM DUST IS TO BE PREVENTED. ACCEPTABLE METHODS INCLUDE:
    10.A. WATERING;
    10.B. PROMOTING VEGETATION IN WIND EROSION PRONE AREAS;
    10.C. CONSTRUCTING WIND BREAKS;
    10.D. MULCHING.
11. THE CONTRACTORS VEHICLES & PLANT SHALL NOT OPERATE OUTSIDE THE LIMITS OF THE IMMEDIATE CONSTRUCTION AREA AND ARE RESTRICTED FROM CROSSING OR DISTURBING AREAS NOT SUBJECT TO CONSTRUCTION.
12. ANY WATER TRAPPED WITHIN THE TEMPORARY SEDIMENT BASIN IS TO BE REGULARLY TESTED DURING THE COURSE OF CONSTRUCTION. REFER WATER QUALITY MONITORING TABLE FOR DETAILS.
13. ALL DISTURBED GROUND IS TO BE GRASS SEEDED TO PREVENT EROSION IF THE DISTURBED GROUND IS TO BE LEFT "OPEN" FOR A PERIOD OF GREATER THEN ONE (1) MONTH.
14. REFER DRAWING AS ACE177022.CIV.CC - 100 TO 101 FOR EROSION AND SEDIMENT CONTROL DETAILS.



TYPICAL PLAN
N.T.S

SEDIMENT BASIN SIZING CALCULATIONS - BASIN A

$Vs = 10 * R_{(Y\%,5\text{-day})} * C_V * A$

WHERE,

Vs = VOLUME OF SETTLING ZONE (m^3)

$R_{(Y\%,5\text{-day})}$ = Y%, 5-DAY RAINFALL DEPTH (mm)

C_V = VOLUMETRIC RUNOFF COEFFICIENT

A = EFFECTIVE CATCHMENT SURFACR AREA CONNECTED TO THE BASIN (ha)

$R_{(Y\%,5\text{-day})}$ = 25 mm

C_V = 0.5

A = 1.41 ha

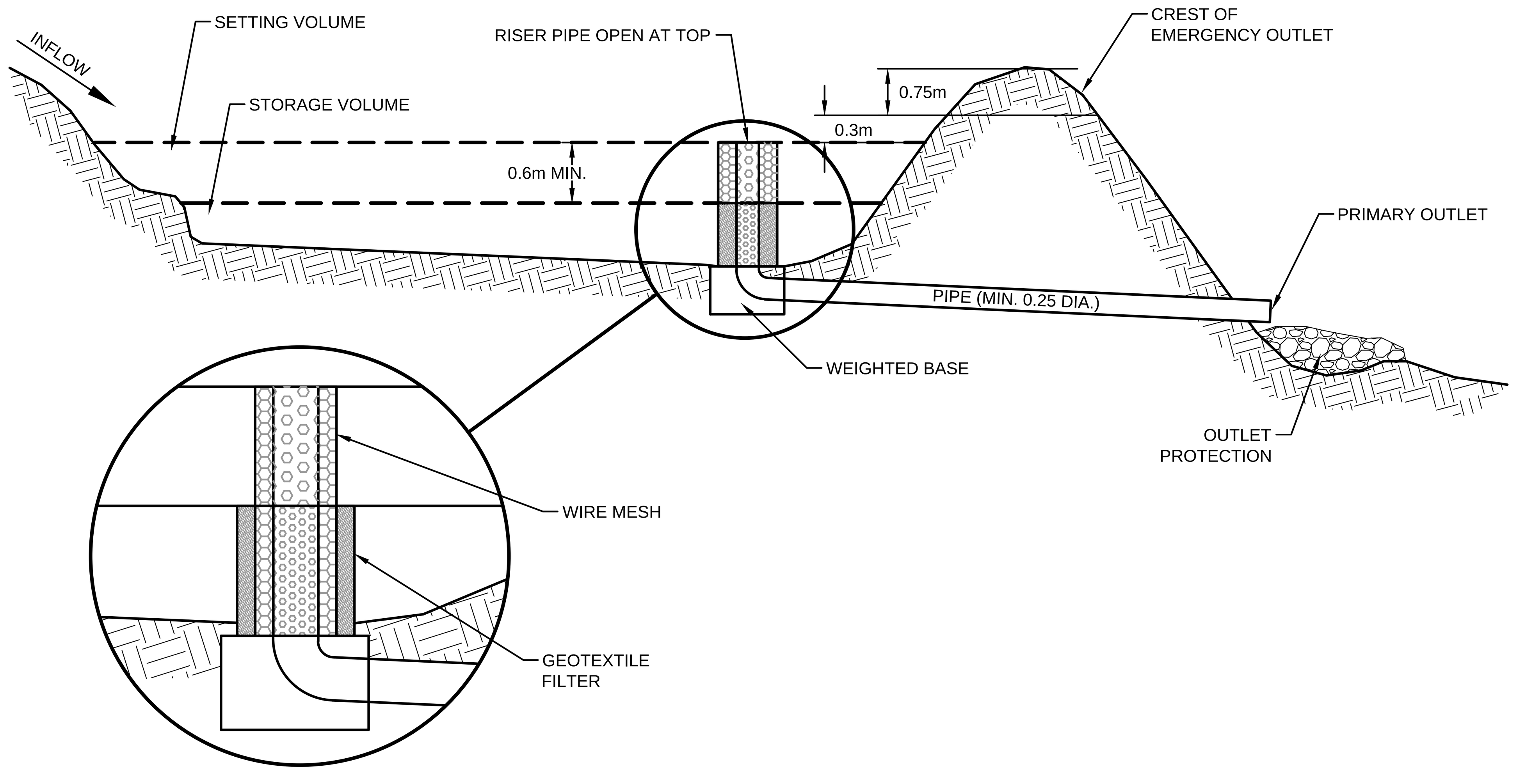
SETTLING ZONE VOLUME = 176.25 m^3

SEDIMENT STORAGE VOLUME = 50% SETTLING ZONE VOLUME = 88.1 m^3

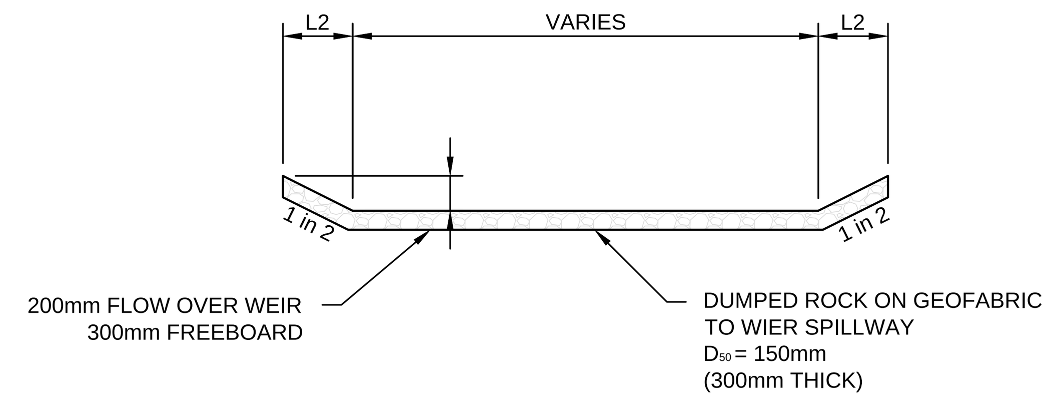
TOTAL SEDIMENT BASIN VOLUME = 264.375 m^3

SEDIMENT BASIN CONSTRUCTION NOTES

1) BASIN CONSTRUCTION AND MAINTENANCE SHALL BE IN ACCORDANCE WITH: MANAGING URBAN STORMWATER SOILS AND CONSTRUCTION VOLUME 1 LANDCOM.
2) EARTH FILL: CLEAN SOIL WITH EMERSON CLASS 2(1), 3, 4, OR 5, AND FREE OF ROOTS, WOODY VEGETATION, ROCKS AND OTHER UNSUITABLE MATERIAL. SOIL WITH EMERSON CLASS 4 AND 5 MAY NOT BE SUITABLE DEPENDING ON PARTICLE SIZE DISTRIBUTION AND DEGREE OF DISPERSION. CLASS 2(1) SHOULD ONLY BE USED UPON RECOMMENDATION FROM GEOTECHNICAL SPECIALIST.
3) SPILLWAY ROCK: HARD, ANGULAR, DURABLE, WEATHER RESISTANT AND EVENLY GRADED ROCK WITH 50% BY WEIGHT LARGER THAN THE SPECIFIED NOMINAL (D50) ROCK SIZE. LARGE ROCK SHOULD DOMINATE, WITH SUFFICIENT SMALL ROCK TO FILL THE VOIDS BETWEEN THE LARGER ROCK. THE DIAMETER OF THE LARGEST ROCK SIZE SHOULD BE NO LARGER THAN 1.5 TIMES THE NOMINAL ROCK SIZE. THE SPECIFIC GRAVITY SHOULD BE AT LEAST 2.5.
4) GEOTEXTILE FABRIC: HEAVY-DUTY, NEEDLE-PUNCHED, NON-WOVEN FILTER CLOTH, MINIMUM BIDIM A24 OR EQUIVALENT.



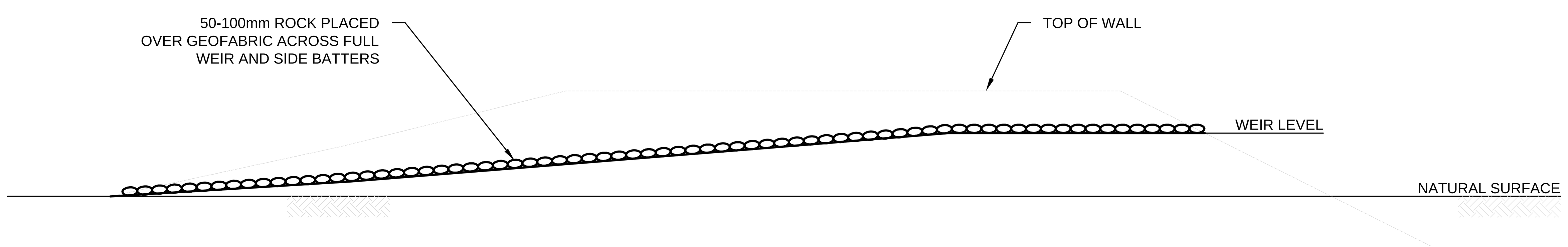
CROSS SECTION OF TYPICAL SEDIMENT BASIN
SCALE N.T.S



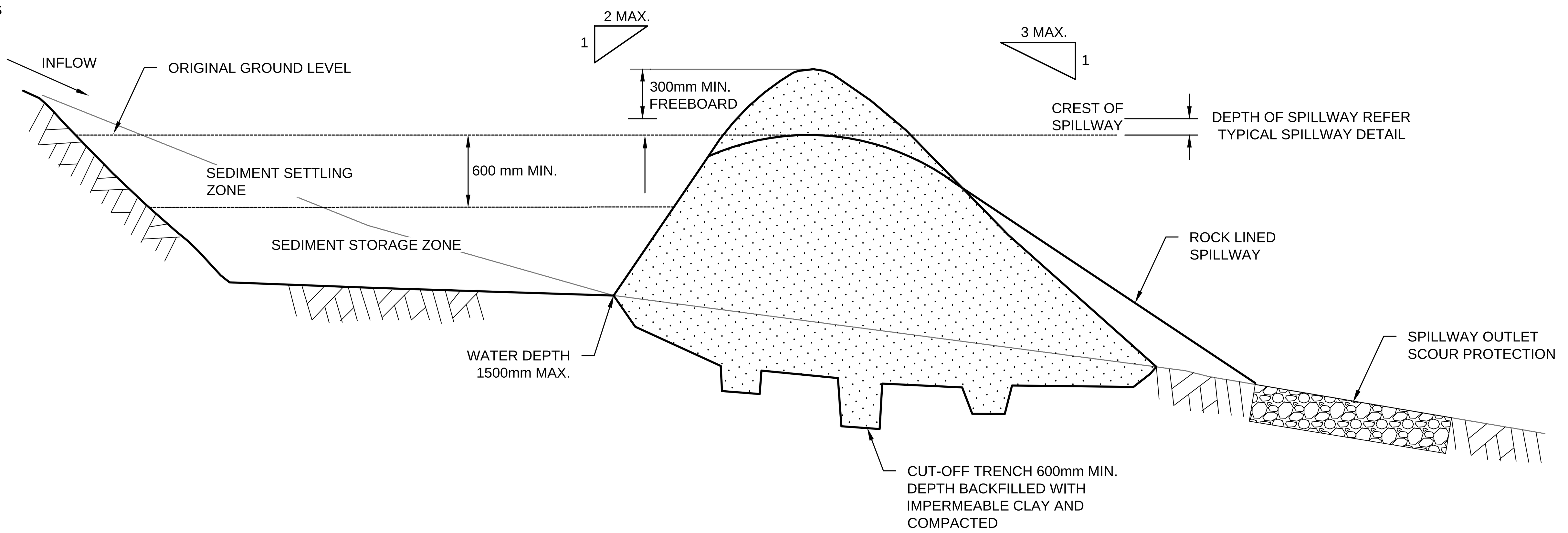
TYPICAL SPILLWAY DETAIL
SCALE 1:10

SPILLWAY BATTER SLOPES DETAIL

H	L2
0.3	0.6
0.4	0.8
0.5	1.0
0.6	1.2



SPILLWAY PROTECTION TYPICAL DETAIL
N.T.S



TYPICAL CROSS SECTION
N.T.S

TYPICAL SEDIMENT BASIN DETAILS
TYPE D/F

NOT FOR CONSTRUCTION

Issue	Description	Date	Design	Manager
A	ISSUE FOR DEVELOPMENT APPLICATION	27/11/2020	M.M.	J.B.

1 0 1cm at full size 10cm 20cm

Certification By:

Architect
mkd architects

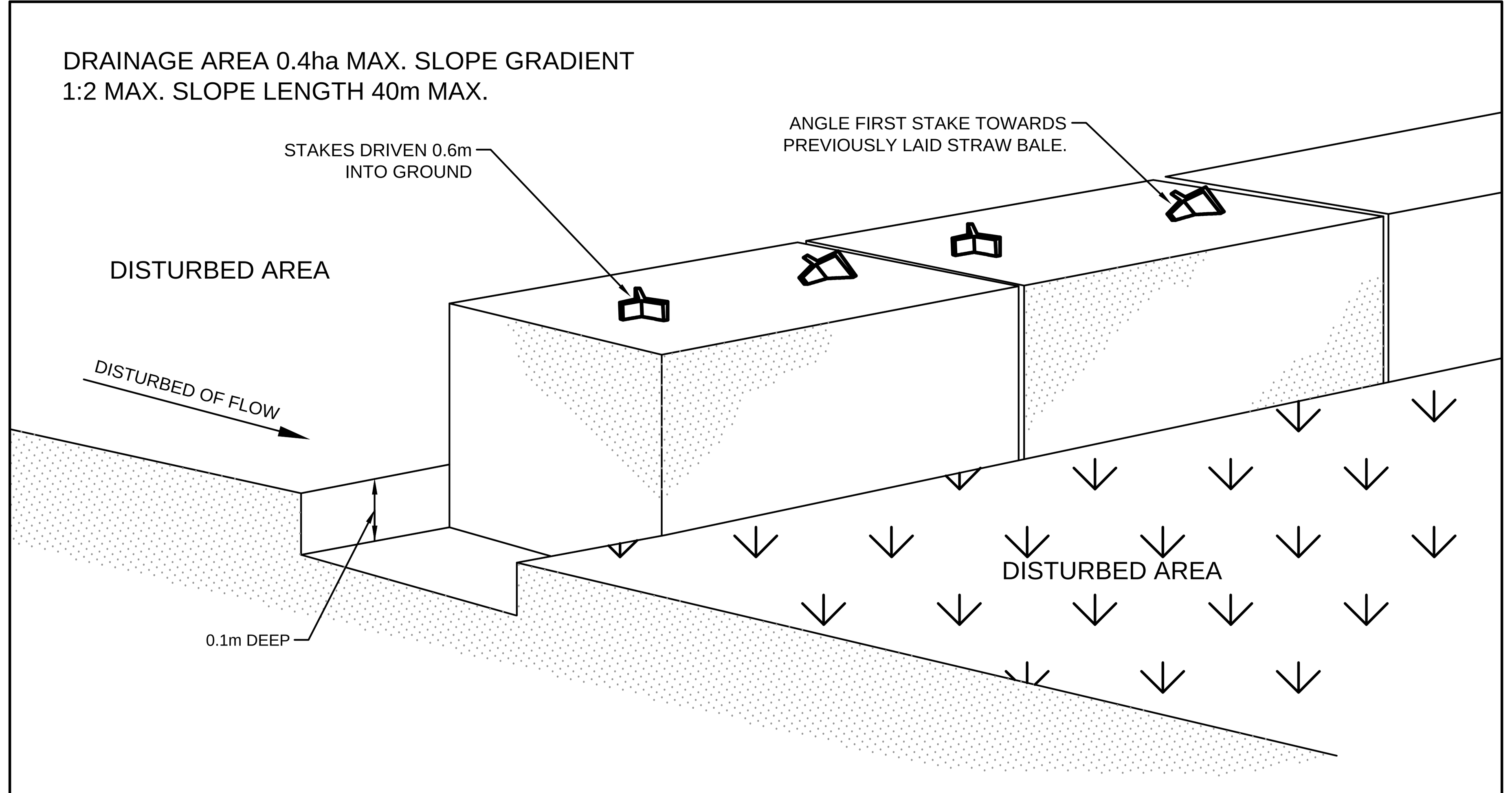
Scale
0 40 80 120 m
SCALE 1:2000 @ A1

AUSTRALIAN CONSULTING ENGINEERS.
AUSTRALIAN CONSULTING ENGINEERS.
PTY LTD - A.C.N. 084 059 941
LEVEL 4, 470 CHURCH STREET NORTH PARRAMATTA NSW 2150
PH: (02) 9763 1500 FX: (02) 9763 1515
EMAIL: info@aceeng.com.au

Project
1290 GREENDALE ROAD, GREENPARK
PUBLIC DOMAIN WORKS
CIVIL ENGINEERING PLANS
DEVELOPMENT APPLICATION

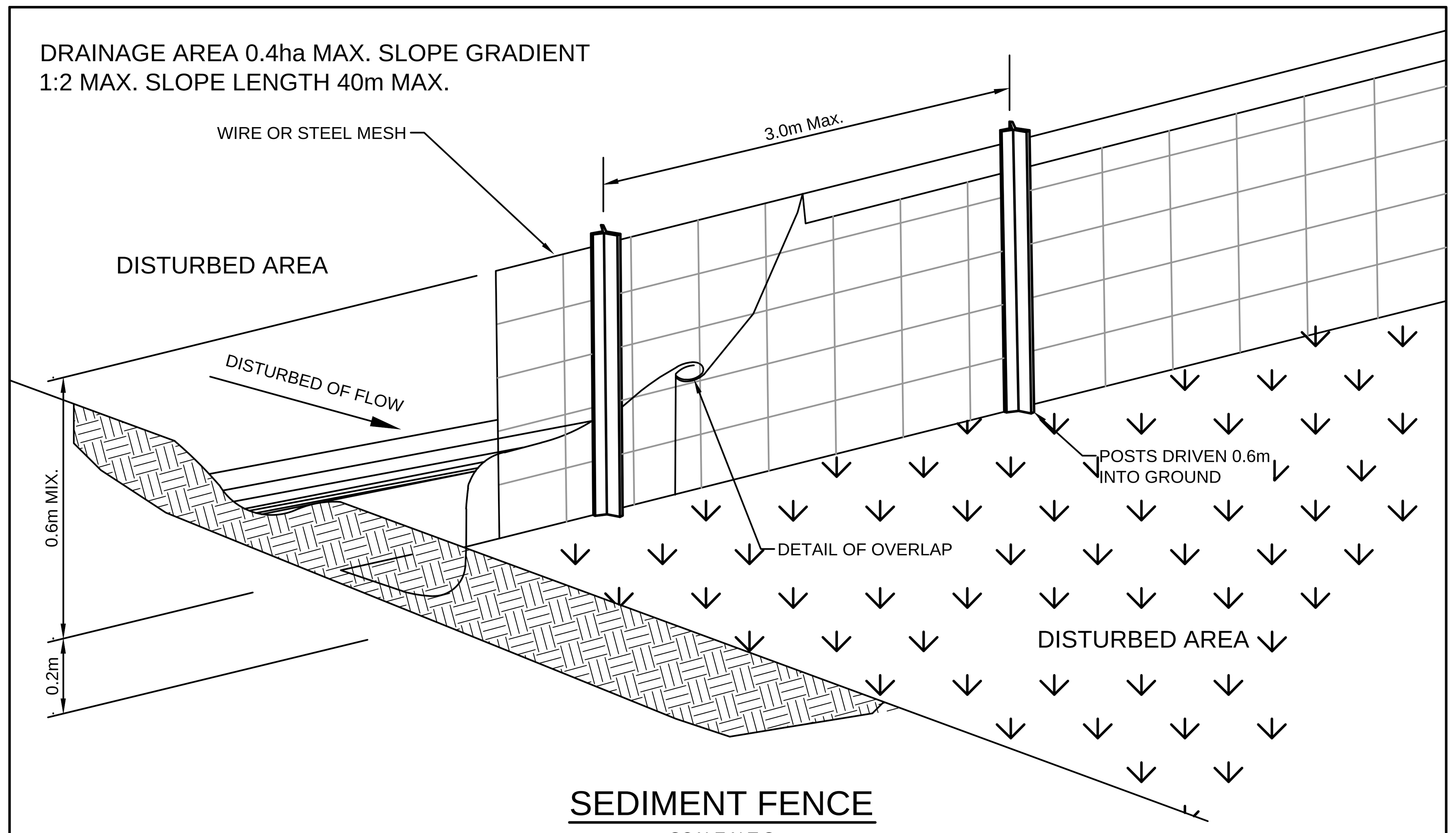
Drawing Title
SEDIMENT AND EROSION CONTROL DETAILS
SHEET 2 OF 3

Scale	A1	Project No.	Dwg. No.	Issue
1:2000		200597	102	A



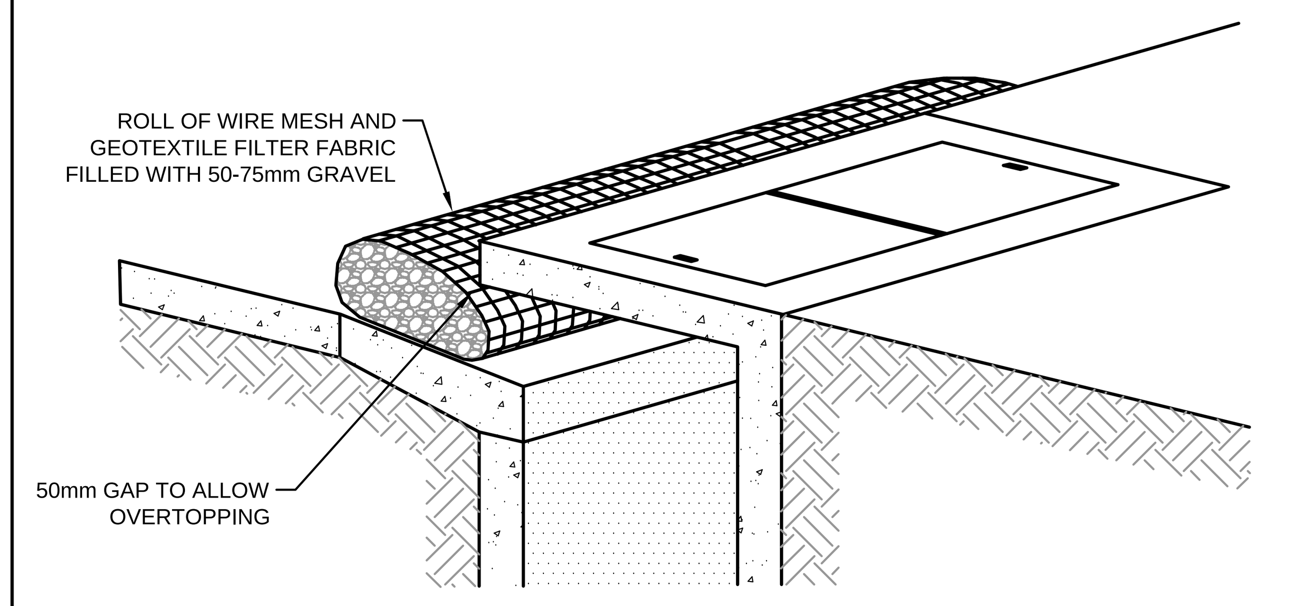
STRAW BALE SEDIMENT FILTER

SCALE N.T.S



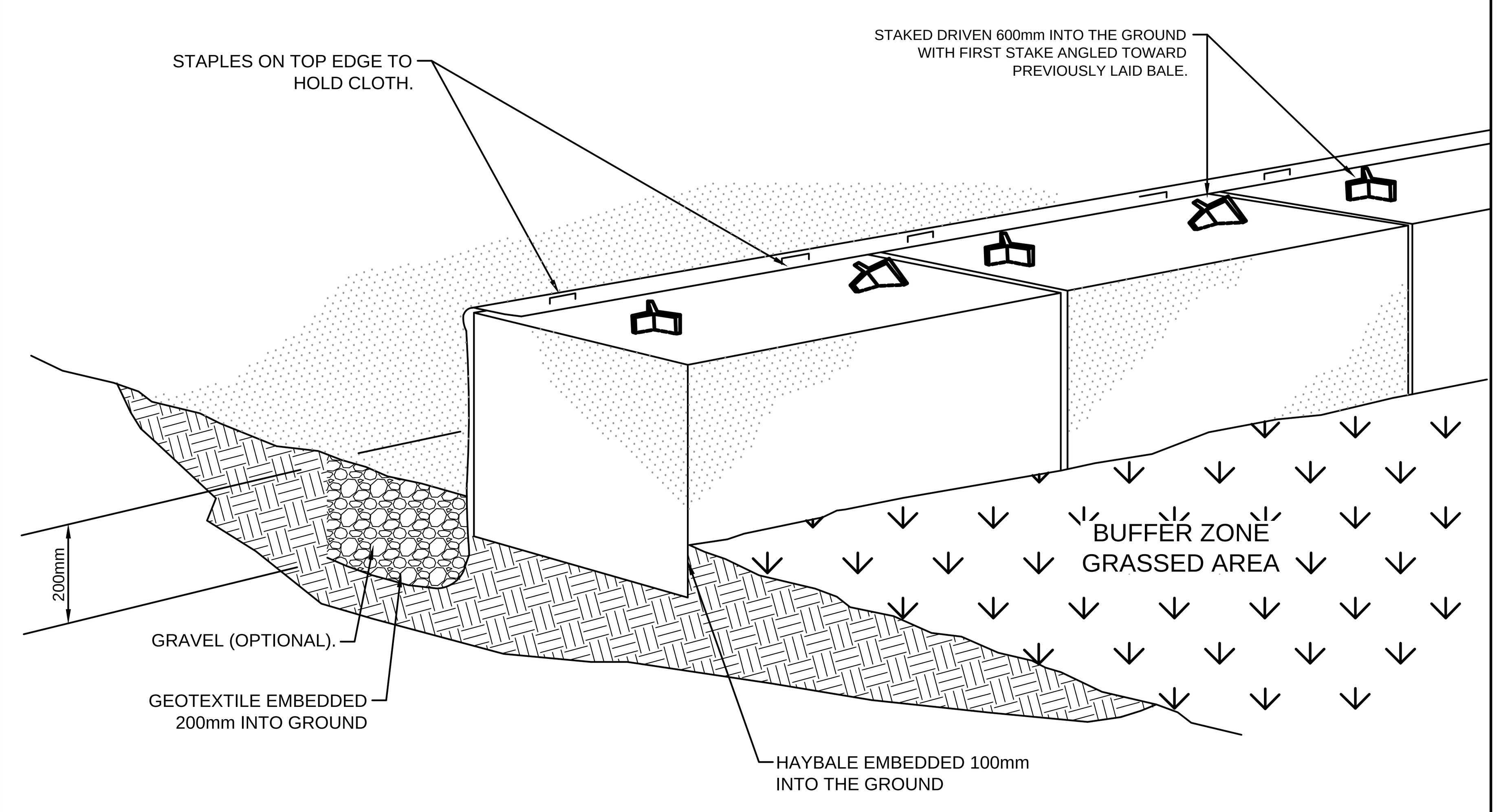
SEDIMENT FENCE

SCALE N.T.S



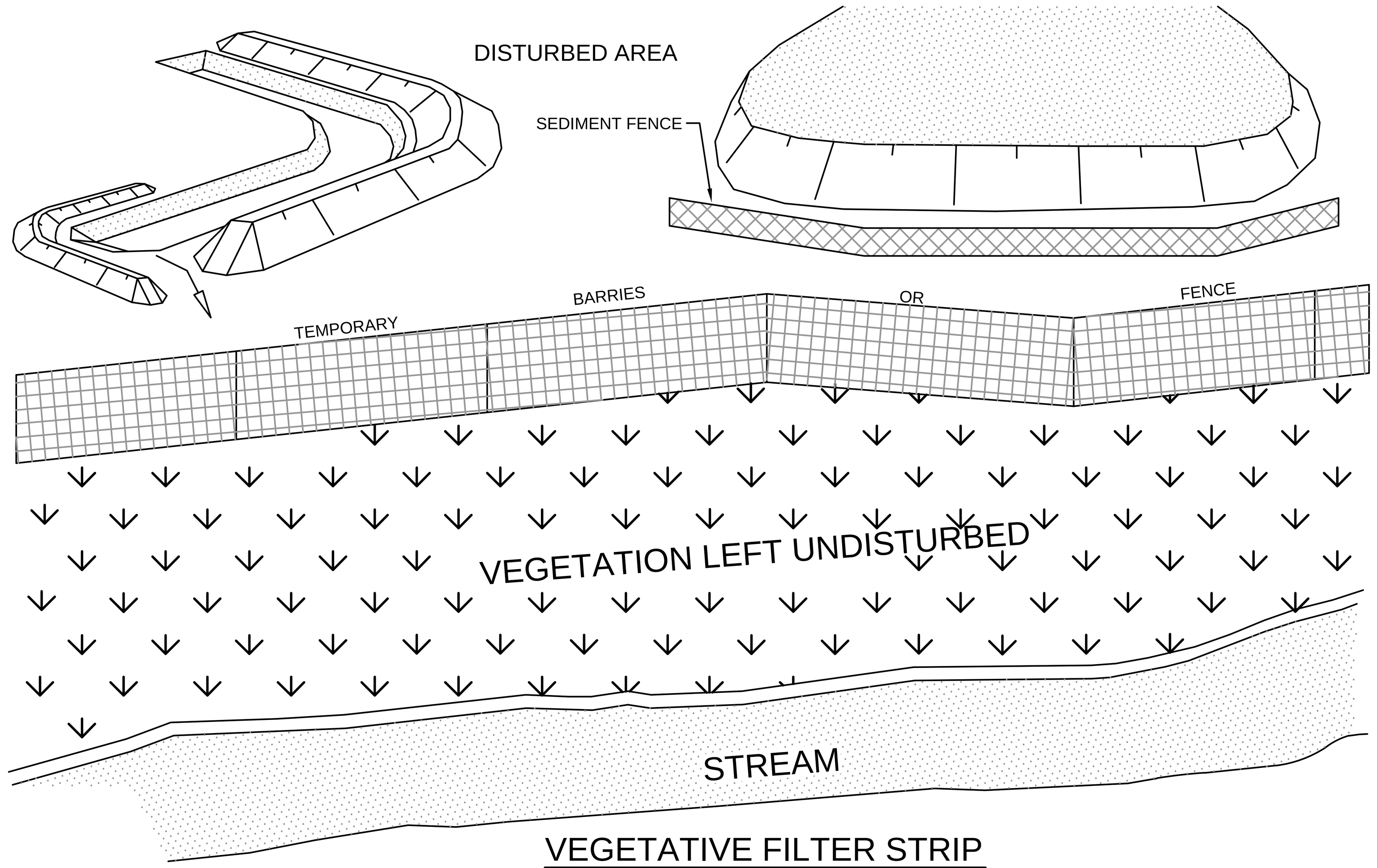
PORTABLE GRAVEL KERB INLET SEDIMENT TRAP

SCALE N.T.S



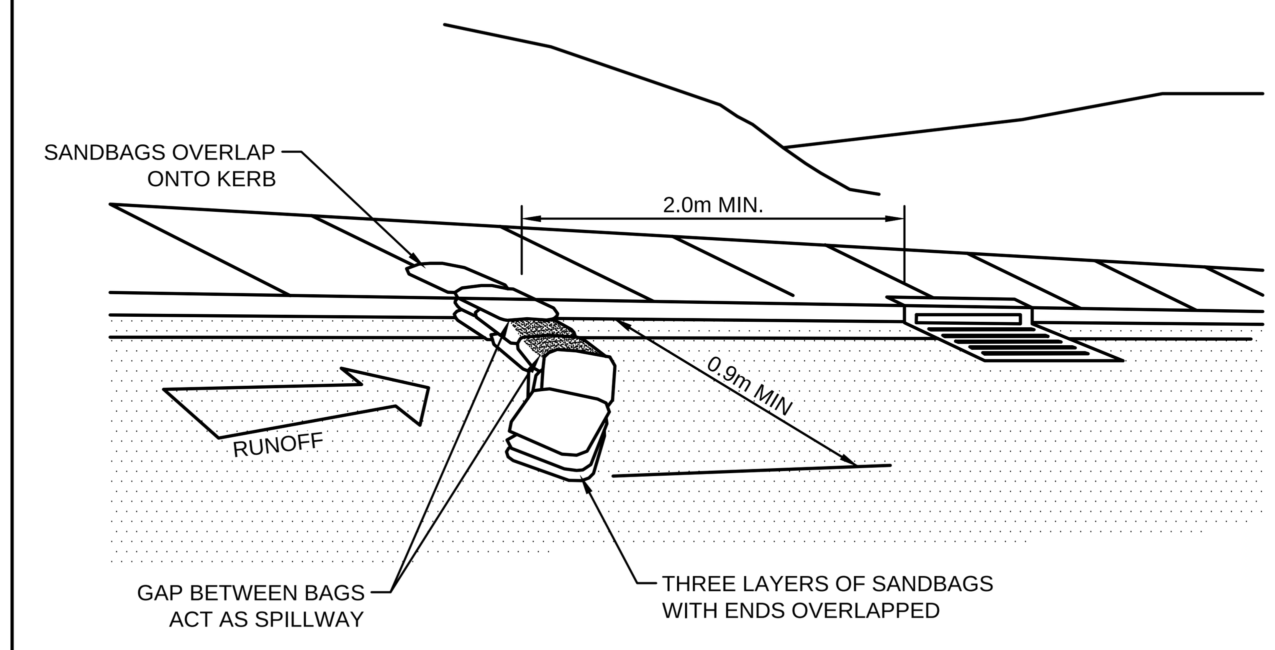
STRAW BALE AND GEOTEXTILE
SEDIMENT FILTER

SCALE N.T.S



VEGETATIVE FILTER STRIP

SCALE N.T.S



SANDBAG KERB INLET SEDIMENT TRAP

SCALE N.T.S

SEDIMENT FENCE AND FILTERS

SCALE N.T.S

SEDIMENT TRAP FOR KERB INLETS

SCALE N.T.S

NOT FOR CONSTRUCTION

Issue	Description	Date	Design	Manager
A	ISSUE FOR DEVELOPMENT APPLICATION	27/11/2020	M.M.	J.B.

Certification By:

Architect: mkd architects

Scale: 0 40 80 120 m — SCALE 1:2000 @ A1

AUSTRALIAN CONSULTING ENGINEERS.
PTY LTD - A.C.N. 084 059 941
LEVEL 4, 470 CHURCH STREET NORTH PARRAMATTA NSW 2150
PH: (02) 9763 1500 FX: (02) 9763 1515
EMAIL: info@aceeng.com.au

Project: 1290 GREENDALE ROAD, GREENPARK
PUBLIC DOMAIN WORKS
CIVIL ENGINEERING PLANS
DEVELOPMENT APPLICATION

Drawing Title: SEDIMENT AND EROSION CONTROL DETAILS SHEET 3 OF 3

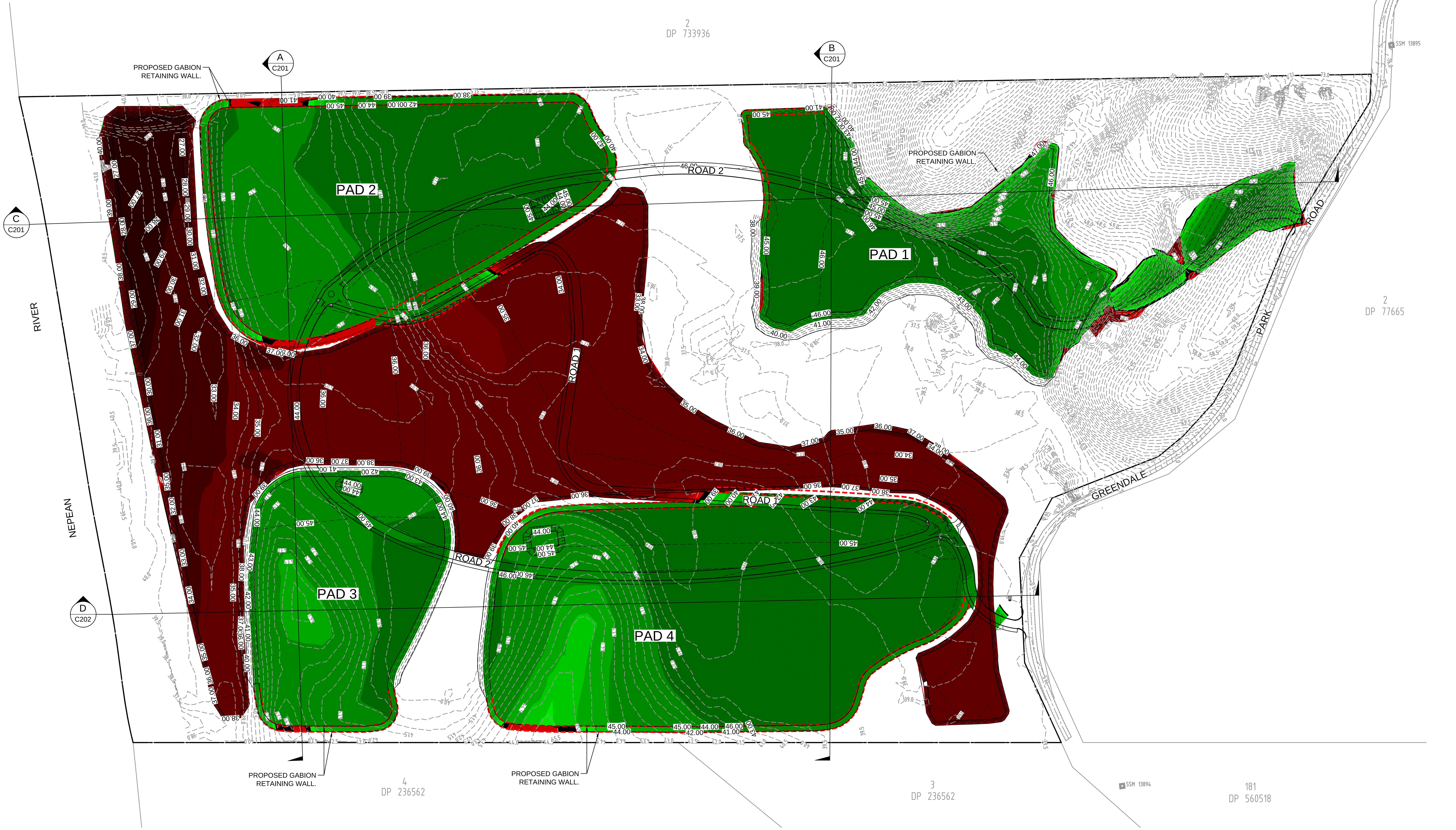
Scale	A1	Project No.	Dwg. No.	Issue
1:2000		200597	103	A

LEGEND

LOT BOUNDARY	DENOTES -15m ; -10m (CUT)
PROPOSED KERB ONLY (KO)	DENOTES -10m ; -5m (CUT)
DESIGN CONTOURS (32.0)	DENOTES -5m ; -2m (CUT)
EXISTING CONTOURS (32.0)	DENOTES -2m ; -1m (CUT)
EXISTING ROAD CENTRELINE	DENOTES -1m ; -0.50m (CUT)
PROPOSED GABION RETAINING WALL	DENOTES -0.50m ; -0.25m (CUT)
	DENOTES -0.25m ; 0m (CUT)

DENOTES 0m ; 0.25m (FILL)
DENOTES 0.25m ; 0.5m (FILL)
DENOTES 0.05m ; 1m (FILL)
DENOTES 1m ; 2m (FILL)
DENOTES 2m ; 5m (FILL)
DENOTES 5m ; 10m (FILL)
DENOTES 10m ; 15m (FILL)

NOTE:
SITE CLEARING NOTE EXISTING TREES AND STRUCTURES TO BE DEMOLISHED AND REMOVED FROM SITE AS DIRECTED BY SUPERINTENDENT



NOT FOR CONSTRUCTION

Issue	Description	Date	Design	Manager
A	ISSUE FOR DEVELOPMENT APPLICATION	27/11/2020	M.M.	J.B.

Certification By:

Architect: mkd architects

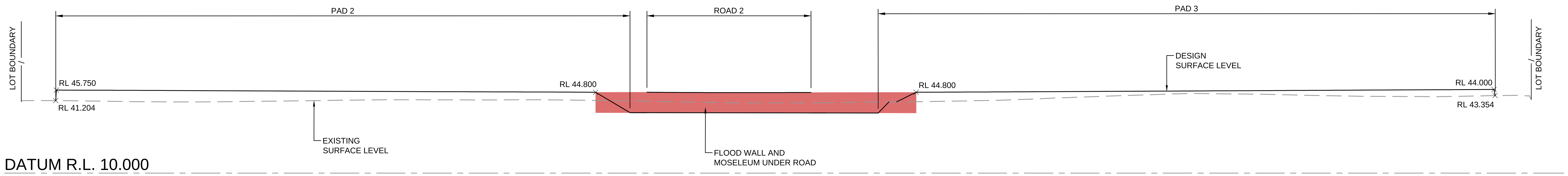
Scale: 0 40 80 120 m — SCALE 1:2000 @ A1

AUSTRALIAN CONSULTING ENGINEERS.
PTY LTD - A.C.N. 084 059 941
LEVEL 4, 470 CHURCH STREET NORTH PARRAMATTA NSW 2150
PH: (02) 9763 1500 FX: (02) 9763 1515
EMAIL: info@aceeng.com.au

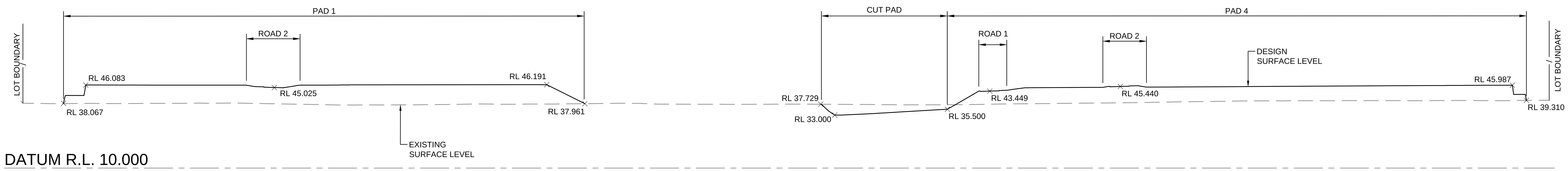
Project: 1290 GREENDALE ROAD, GREENPARK
PUBLIC DOMAIN WORKS
CIVIL ENGINEERING PLANS
DEVELOPMENT APPLICATION

Drawing Title: BULK EARTHWORKS PLAN

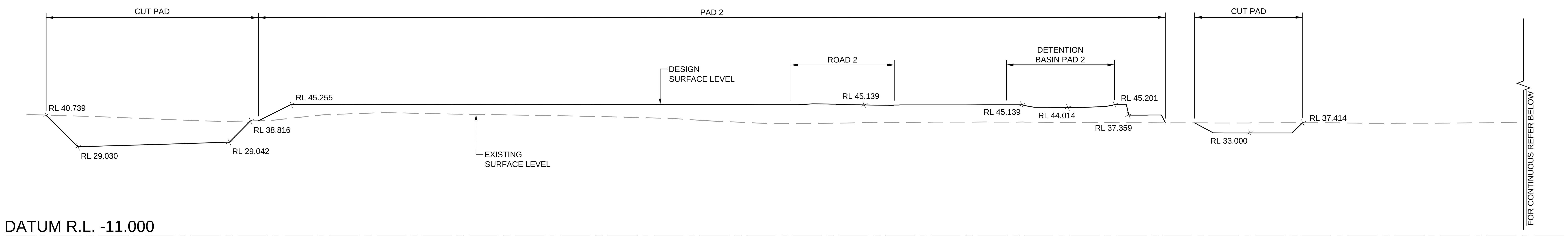
Scale	A1	Project No.	Dwg. No.	Issue
1:2000		200597	200	A



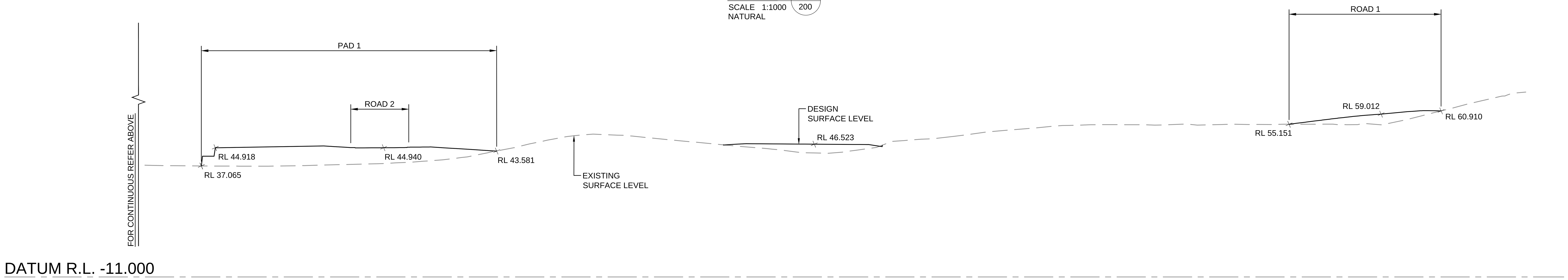
SECTION A / 200
SCALE 1:1000
NATURAL



SECTION B / 200
SCALE 1:1000
NATURAL



SECTION C / 200
SCALE 1:1000
NATURAL



SECTION C / 200
SCALE 1:1000
NATURAL

NOT FOR CONSTRUCTION

Issue	Description	Date	Design	Manager
A	ISSUE FOR DEVELOPMENT APPLICATION	27/11/2020	M.M.	J.B.

Certification By:

Architect
mkd architects

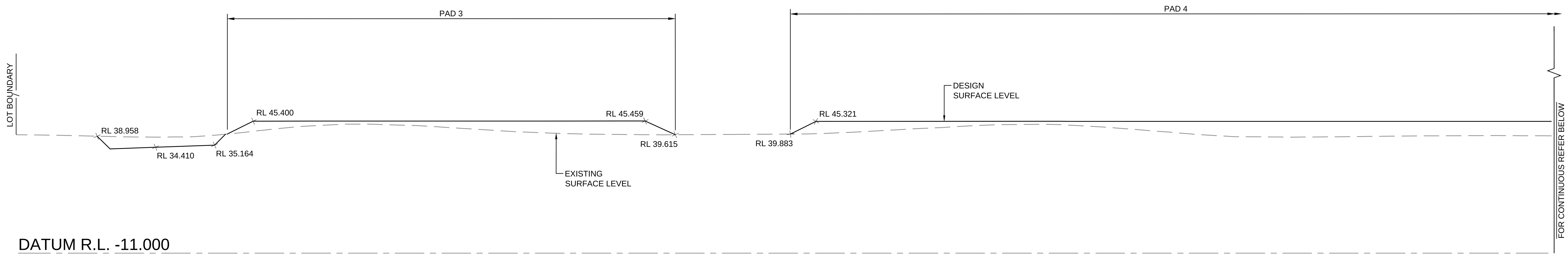
Scale
0 20 40 60 m
SCALE 1:1000 @ A1

AUSTRALIAN CONSULTING ENGINEERS.
PTY LTD - A.C.N. 084 059 941
LEVEL 4, 470 CHURCH STREET NORTH PARRAMATTA NSW 2150
PH: (02) 9763 1500 FX: (02) 9763 1515
EMAIL: info@aceeng.com.au

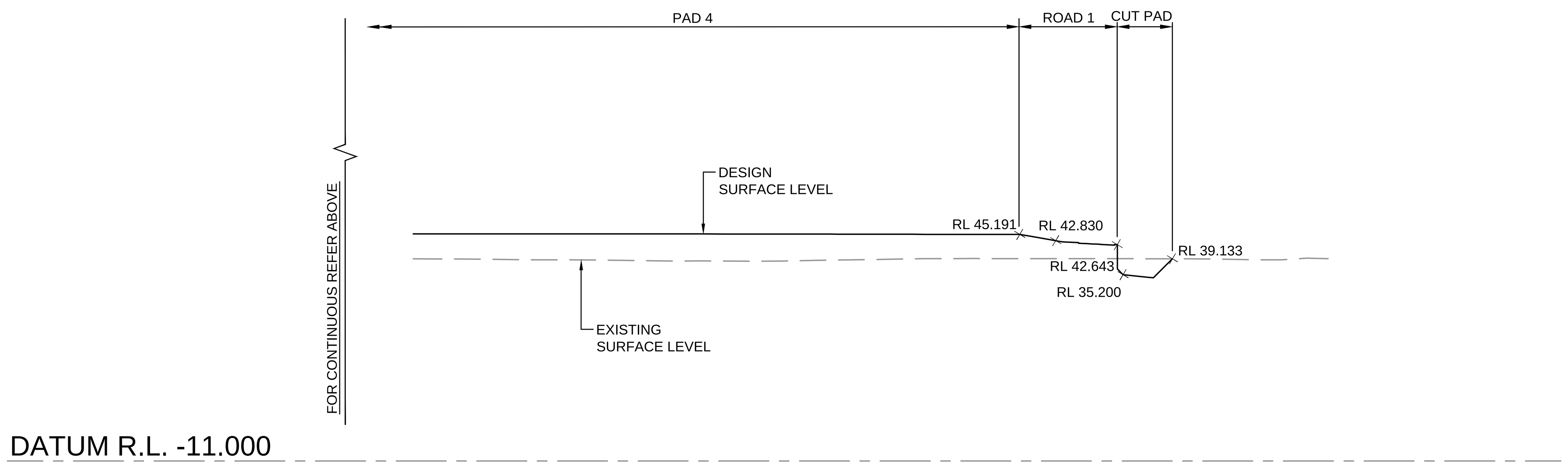
Project
1290 GREENDALE ROAD, GREENPARK
PUBLIC DOMAIN WORKS
CIVIL ENGINEERING PLANS
DEVELOPMENT APPLICATION

Drawing Title
BULK EARTHWORKS SECTIONS
SHEET 1 OF 2

Scale	A1	Project No.	Dwg. No.	Issue
1:1000		200597	201	A



SECTION D/200
SCALE 1:1000
NATURAL



SECTION D/200
SCALE 1:1000

NOT FOR CONSTRUCTION

Issue	Description	Date	Design	Manager
A	ISSUE FOR DEVELOPMENT APPLICATION	27/11/2020	M.M.	J.B.

Certification By:

Architect
mkd architects

Scale
0 20 40 60 m
SCALE 1:1000 @ A1

AUSTRALIAN CONSULTING ENGINEERS.
PTY LTD - A.C.N. 084 059 941
LEVEL 4, 470 CHURCH STREET NORTH PARRAMATTA NSW 2150
PH: (02) 9763 1500 FX: (02) 9763 1515
EMAIL: info@aceeng.com.au

Project
1290 GREENDALE ROAD, GREENPARK
PUBLIC DOMAIN WORKS
CIVIL ENGINEERING PLANS
DEVELOPMENT APPLICATION

Drawing Title
BULK EARTHWORKS SECTIONS
SHEET 2 OF 2

Scale A1	Project No.	Dwg. No.	Issue
1:1000	200597	202	A

LEGEND

LOT BOUNDARY	PROPOSED ROAD PAVEMENT
PROPOSED KERB ONLY (KO)	PROPOSED ROAD OVER MOSELEUM
PROPOSED ROAD CENTERLINE	PROPOSED BRIDGE
FINISHED CONTOURS (32.0)	PROPOSED CONCRETE FOOTPATH
PROPOSED STORMWATER PIPE (SW)	PROPOSED PRAM RAMP
PROPOSED GULLY PIT	PROPOSED GABION RETAINING WALL
	EXISTING ROAD CENTRELINE

NOTE:
FOR GENERAL NOTES REFER TO DRG No. ACE200597.CIV.DA.000

NOT FOR CONSTRUCTION

Issue	Description	Date	Design	Manager
A	ISSUE FOR DEVELOPMENT APPLICATION	27/11/2020	M.M.	J.B.

Certification By:

Architect: mkd architects

Scale: 0 40 80 120 m — SCALE 1:2000 @ A1

AUSTRALIAN CONSULTING ENGINEERS.
PTY LTD - A.C.N. 084 059 941
LEVEL 4, 470 CHURCH STREET NORTH PARRAMATTA NSW 2150
PH: (02) 9763 1500 FX: (02) 9763 1515
EMAIL: info@aceeng.com.au

Project: 1290 GREENDALE ROAD, GREENPARK
PUBLIC DOMAIN WORKS
CIVIL ENGINEERING PLANS
DEVELOPMENT APPLICATION

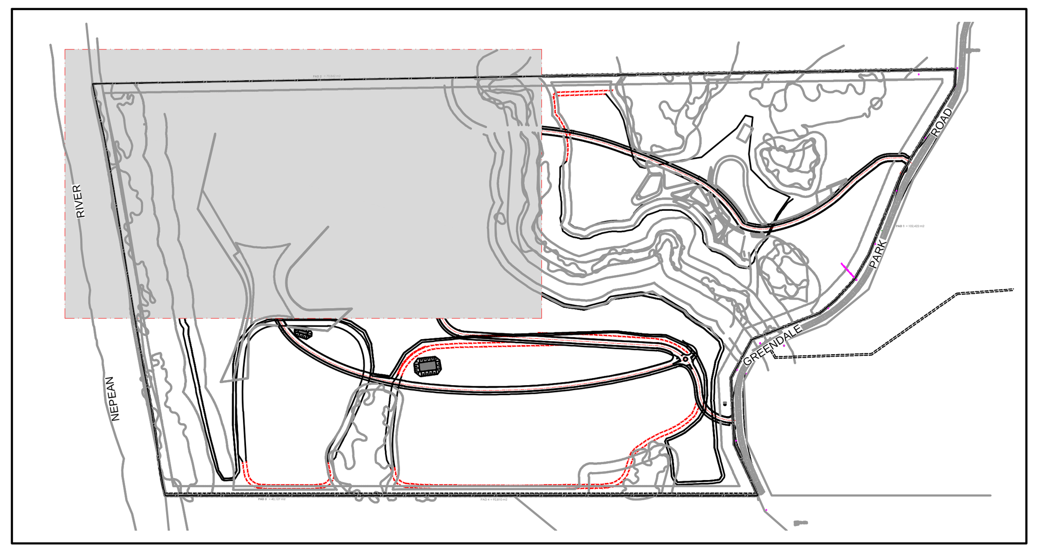
Drawing Title: OVERALL ROADWORKS AND DRAINAGE LAYOUT PLAN

Scale	A1	Project No.	Dwg. No.	Issue
1:2000		200597	300	A

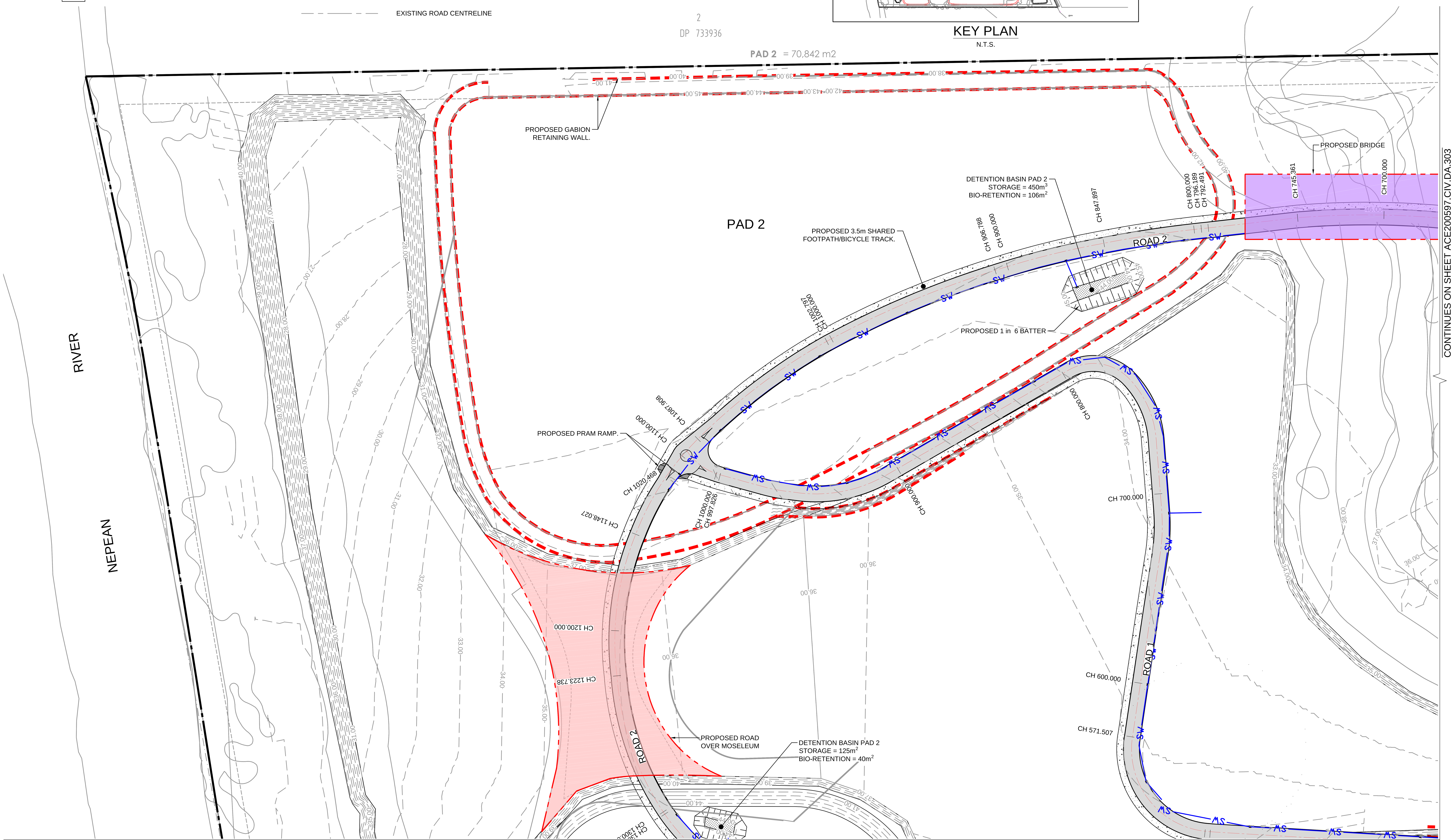
LEGEND

- LOT BOUNDARY
- KO — PROPOSED KERB ONLY
- PROPOSED ROAD CENTERLINE
- 32.0 — FINISHED CONTOURS
- SW — PROPOSED STORMWATER PIPE
- PROPOSED GULLY PIT
- PROPOSED ROAD PAVEMENT
- PROPOSED ROAD OVER MOSELEUM
- PROPOSED BRIDGE
- PROPOSED CONCRETE FOOTPATH
- PROPOSED PRAM RAMP
- PROPOSED GABION RETAINING WALL
- EXISTING ROAD CENTRELINE

NOTE:
FOR GENERAL NOTES REFER TO DRG No. ACE200597.CIV.DA.000



KEY PLAN
N.T.S.



CONTINUES ON SHEET ACE200597.CIV.DA.303

CONTINUES ON SHEET ACE200597.CIV.DA.303

NOT FOR CONSTRUCTION

Issue	Description	Date	Design	Manager
A	ISSUE FOR DEVELOPMENT APPLICATION	27/11/2020	M.M.	J.B.

Certification By:

Architect: mkd architects

Scale: 0 20 40 60 m — SCALE 1:1000 @ A1

AUSTRALIAN CONSULTING ENGINEERS.
PTY LTD - A.C.N. 084 059 941
LEVEL 4, 470 CHURCH STREET NORTH PARRAMATTA NSW 2150
PH: (02) 9763 1500 FX: (02) 9763 1515
EMAIL: info@aceeng.com.au

Project: 1290 GREENDALE ROAD, GREENPARK
PUBLIC DOMAIN WORKS
CIVIL ENGINEERING PLANS
DEVELOPMENT APPLICATION

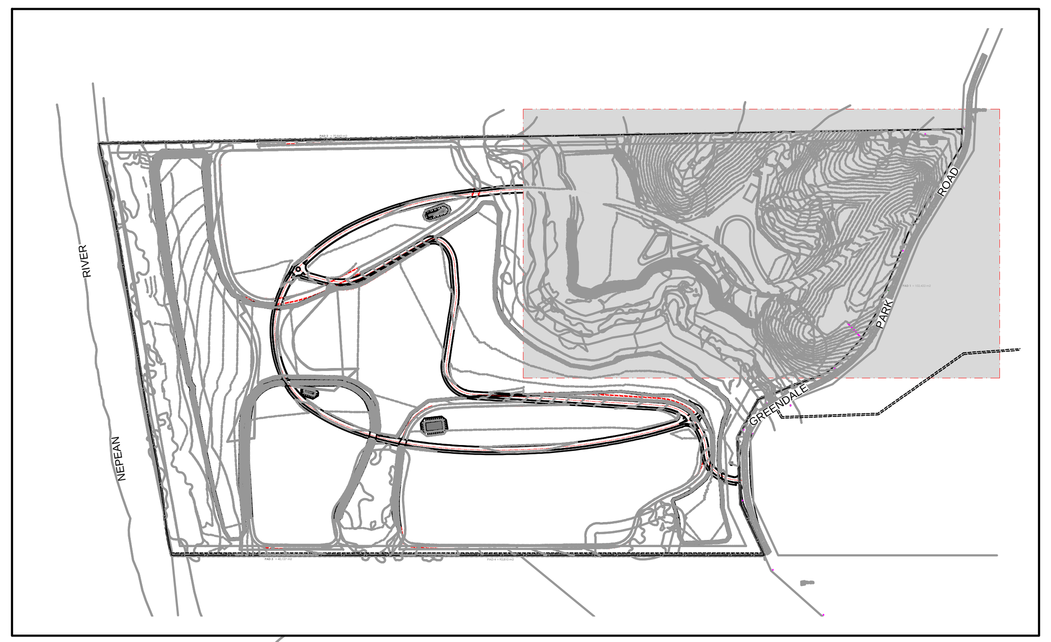
Drawing Title: ROADWORKS AND DRAINAGE LAYOUT PLAN SHEET 1 OF 4

Scale	A1	Project No.	Dwg. No.	Issue
1:1000		200597	301	A

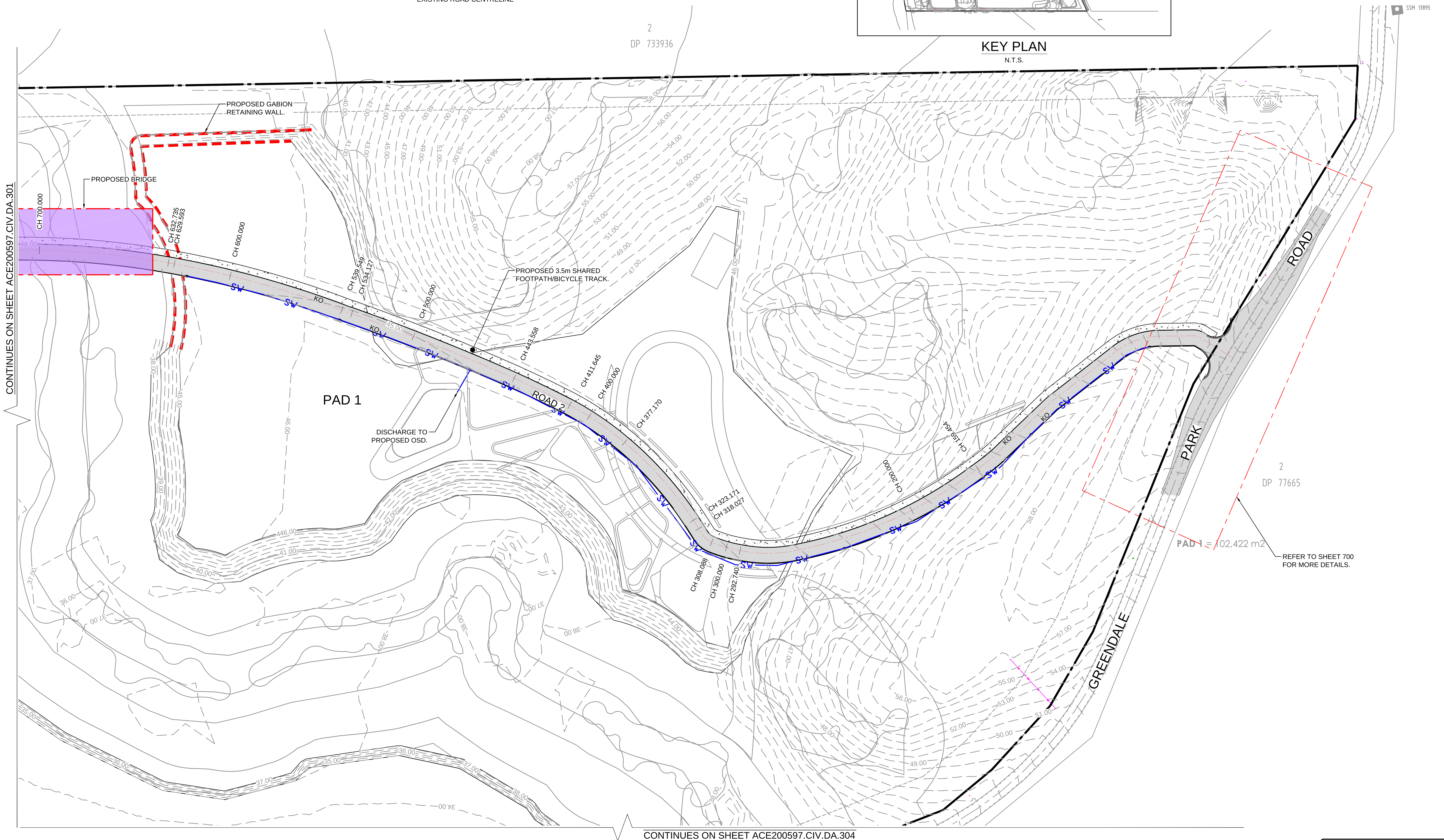
LEGEND

- LOT BOUNDARY
- KO — PROPOSED KERB ONLY
- PROPOSED ROAD CENTERLINE
- 32.0 — FINISHED CONTOURS
- SW — PROPOSED STORMWATER PIPE
- PROPOSED GULLY PIT
- PROPOSED ROAD PAVEMENT
- PROPOSED ROAD OVER MOSELEUM
- PROPOSED BRIDGE
- PROPOSED CONCRETE FOOTPATH
- PROPOSED PRAM RAMP
- PROPOSED GABION RETAINING WALL
- EXISTING ROAD CENTRELINE

NOTE:
FOR GENERAL NOTES REFER TO DRG No. ACE200597.CIV.DA.000



KEY PLAN
N.T.S.



CONTINUES ON SHEET ACE200597.CIV.DA.301

CONTINUES ON SHEET ACE200597.CIV.DA.304

NOT FOR CONSTRUCTION

Issue	Description	Date	Design	Manager
A	ISSUE FOR DEVELOPMENT APPLICATION	27/11/2020	M.M.	J.B.

Certification By:

Architect: mkd architects

Scale: 0 20 40 60 m — SCALE 1:1000 @ A1

AUSTRALIAN CONSULTING ENGINEERS.
PTY LTD - A.C.N. 084 059 941
LEVEL 4, 470 CHURCH STREET NORTH PARRAMATTA NSW 2150
PH: (02) 9763 1500 FX: (02) 9763 1515
EMAIL: info@aceeng.com.au

Project: 1290 GREENDALE ROAD, GREENPARK
PUBLIC DOMAIN WORKS
CIVIL ENGINEERING PLANS
DEVELOPMENT APPLICATION

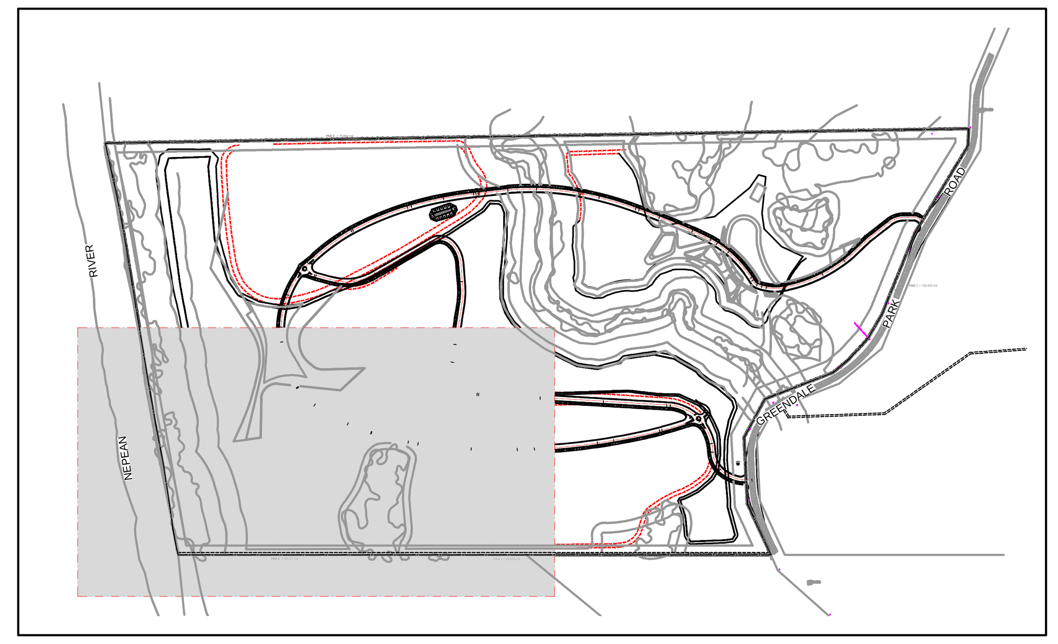
Drawing Title: ROADWORKS AND DRAINAGE LAYOUT PLAN SHEET 2 OF 4

Scale	A1	Project No.	Dwg. No.	Issue
1:1000		200597	302	A

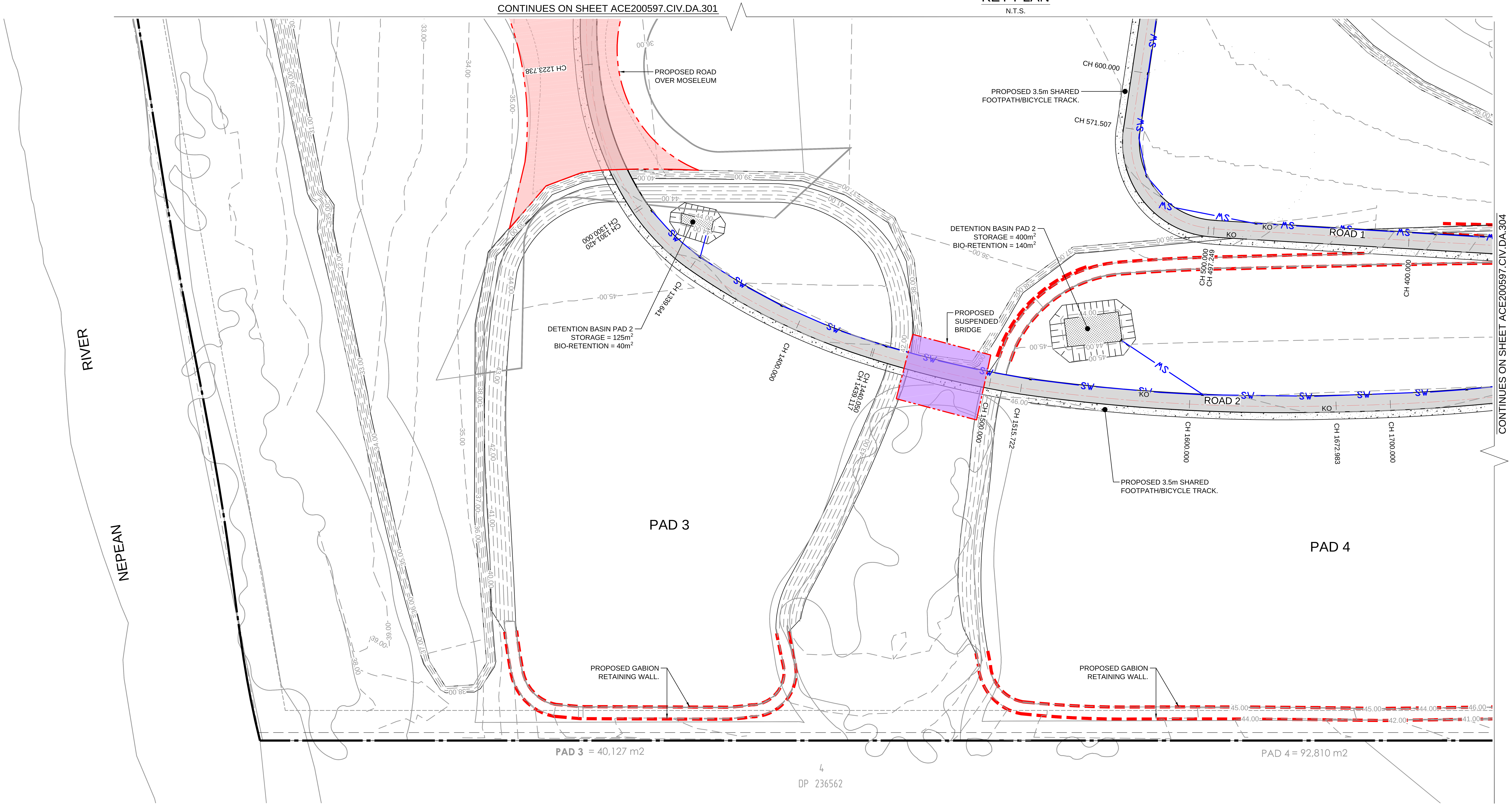
LEGEND

LOT BOUNDARY	PROPOSED ROAD PAVEMENT
PROPOSED KERB ONLY (KO)	PROPOSED ROAD OVER MOSELEUM
PROPOSED ROAD CENTERLINE	PROPOSED BRIDGE
FINISHED CONTOURS (32.0)	PROPOSED CONCRETE FOOTPATH
PROPOSED STORMWATER PIPE (SW)	PROPOSED GABION RETAINING WALL
PROPOSED GULLY PIT	EXISTING ROAD CENTRELINE

NOTE:
FOR GENERAL NOTES REFER TO DRG No. ACE200597.CIV.DA.000



KEY PLAN
N.T.S.



NOT FOR CONSTRUCTION

Issue	Description	Date	Design	Manager
A	ISSUE FOR DEVELOPMENT APPLICATION	27/11/2020	M.M.	J.B.

Certification By:

Architect: mkd architects

Scale: 0 20 40 60 m — SCALE 1:1000 @ A1

AUSTRALIAN CONSULTING ENGINEERS.
PTY LTD - A.C.N. 084 059 941
LEVEL 4, 470 CHURCH STREET NORTH PARRAMATTA NSW 2150
PH: (02) 9763 1500 FX: (02) 9763 1515
EMAIL: info@aceeng.com.au

Project:
1290 GREENDALE ROAD, GREENPARK
PUBLIC DOMAIN WORKS
CIVIL ENGINEERING PLANS
DEVELOPMENT APPLICATION

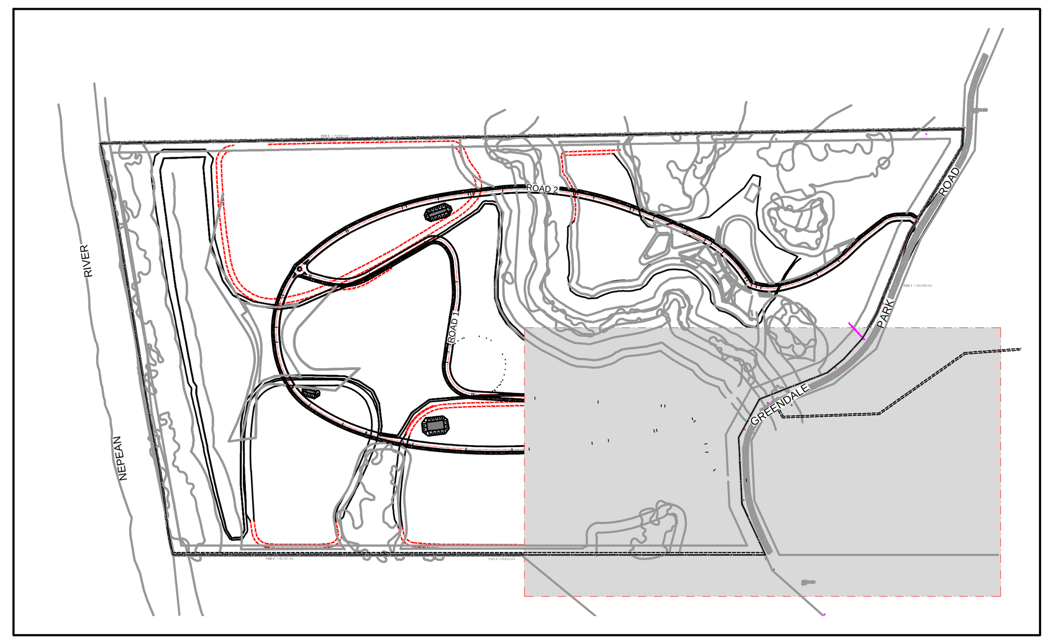
Drawing Title:
ROADWORKS AND DRAINAGE LAYOUT PLAN
SHEET 3 OF 4

Scale A1	Project No.	Dwg. No.	Issue
1:1000	200597	303	A

LEGEND

	LOT BOUNDARY		PROPOSED ROAD PAVEMENT
KO	PROPOSED KERB ONLY		PROPOSED ROAD OVER MOSELEUM
	PROPOSED ROAD CENTERLINE		PROPOSED BRIDGE
32.0	FINISHED CONTOURS		PROPOSED CONCRETE FOOTPATH
SW	PROPOSED STORMWATER PIPE		PROPOSED PRAM RAMP
	PROPOSED GULLY PIT		PROPOSED GABION RETAINING WALL
			EXISTING ROAD CENTRELINE

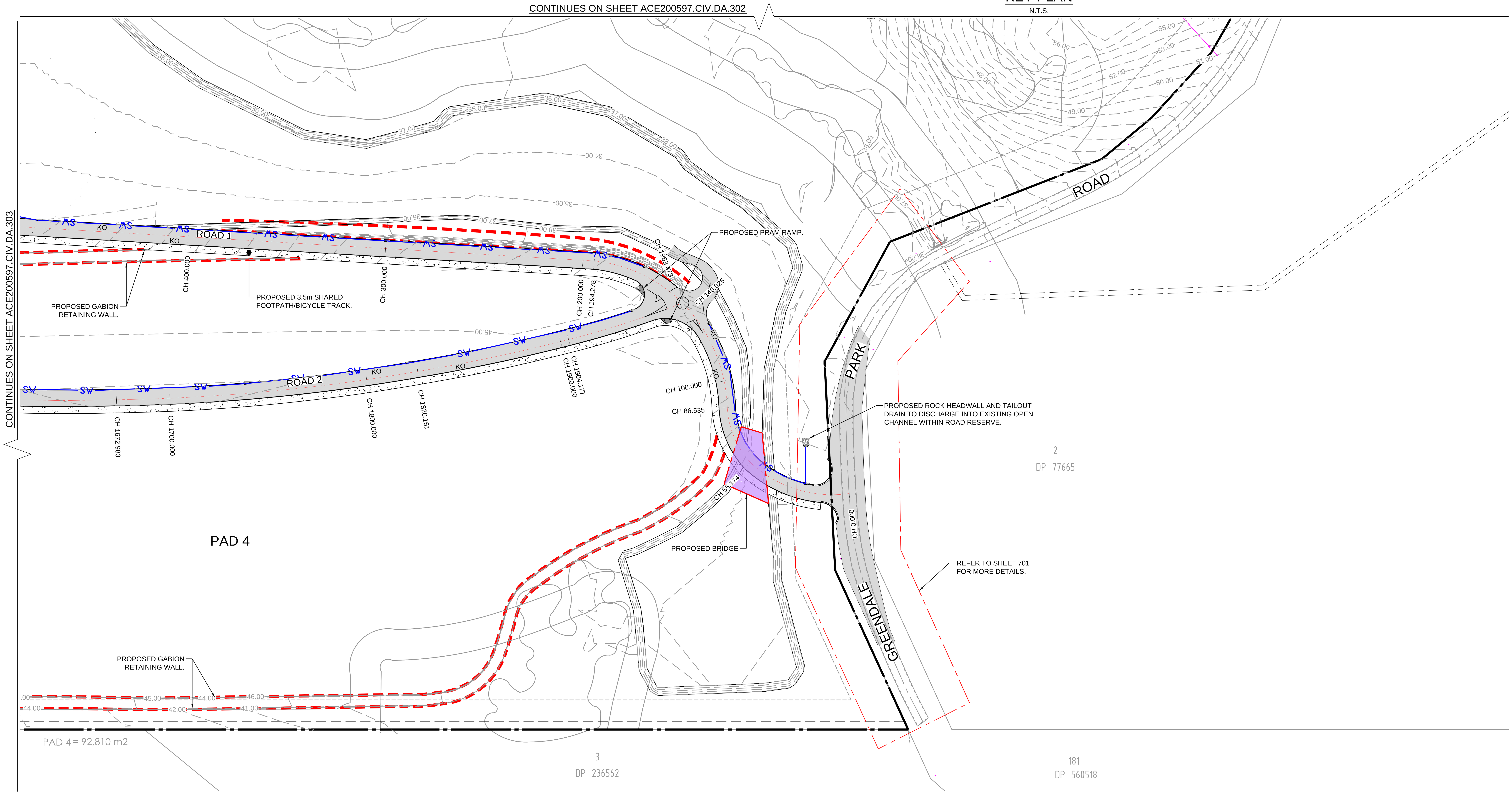
NOTE:
FOR GENERAL NOTES REFER TO DRG No. ACE200597.CIV.DA.000



KEY PLAN
N.T.S.

CONTINUES ON SHEET ACE200597.CIV.DA.302

CONTINUES ON SHEET ACE200597.CIV.DA.303



NOT FOR CONSTRUCTION

Issue	Description	Date	Design	Manager
A	ISSUE FOR DEVELOPMENT APPLICATION	27/11/2020	M.M.	J.B.

Certification By:

Architect: mkd architects

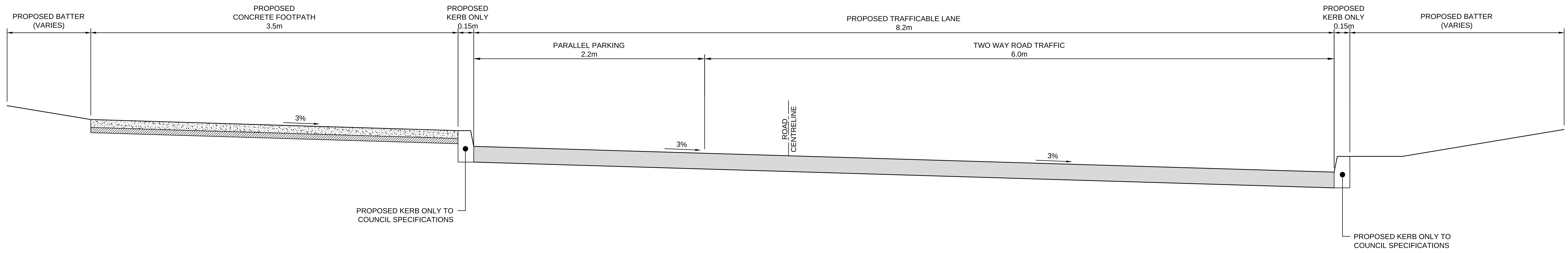
Scale: 0 20 40 60 m — SCALE 1:1000 @ A1

AUSTRALIAN CONSULTING ENGINEERS.
PTY LTD - A.C.N. 084 059 941
LEVEL 4, 470 CHURCH STREET NORTH PARRAMATTA NSW 2150
PH: (02) 9763 1500 FX: (02) 9763 1515
EMAIL: info@aceeng.com.au

Project: 1290 GREENDALE ROAD, GREENPARK
PUBLIC DOMAIN WORKS
CIVIL ENGINEERING PLANS
DEVELOPMENT APPLICATION

Drawing Title: ROADWORKS AND DRAINAGE LAYOUT PLAN SHEET 4 OF 4

Scale	A1	Project No.	Dwg. No.	Issue
1:1000		200597	304	A



TYPICAL CROSS ROAD SECTION

SCALE 1:20

NOT FOR CONSTRUCTION

Issue	Description	Date	Design	Manager
A	ISSUE FOR DEVELOPMENT APPLICATION	27/11/2020	M.M.	J.B.

-1 0 1cm at full size 10cm 20cm

Certification By:

Architect

mkd architects

Scale

0 400 800 1200 mm

SCALE 1:20 @ A1

AUSTRALIAN CONSULTING ENGINEERS
AUSTRALIAN CONSULTING ENGINEERS.
PTY LTD - A.C.N. 084 059 941
LEVEL 4, 470 CHURCH STREET NORTH PARRAMATTA NSW 2150
PH: (02) 9763 1500 FX: (02) 9763 1515
EMAIL: info@aceeng.com.au

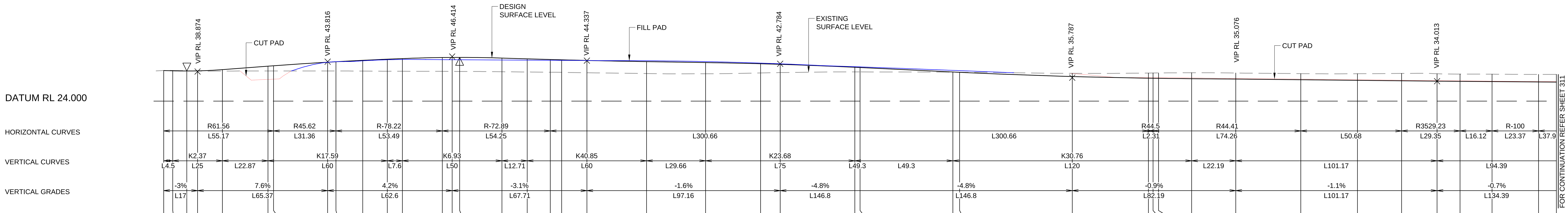
Project

1290 GREENDALE ROAD, GREENPARK
PUBLIC DOMAIN WORKS
CIVIL ENGINEERING PLANS
DEVELOPMENT APPLICATION

Drawing Title

TYPICAL ROAD CROSS SECTION
AND SWALE SECTION

Scale	A1	Project No.	Dwg. No.	Issue
1:20		200597	305	A



CHAINAGE	DESIGN SURFACE LEVEL	FILL PAD	CUT PAD	EXISTING SURFACE LEVEL
0	39.384			39.384
4.503	39.249			39.420
11.605	39.142			39.219
17.003	39.204			39.139
29.503	39.819			39.105
52.375	41.548		34.921	39.160
55.174	41.757		35.046	39.162
82.375	43.560	43.573		39.167
86.535	43.799	43.829		39.166
100	44.504	44.253		39.097
112.375	45.061	44.785		39.030
119.971	45.376	44.936		39.007
140.025	45.918	44.837		38.973
144.971	45.963	44.807		38.931
148.723	45.973	44.785		38.908
169.971	45.647	44.659		38.763
182.683	45.257	44.582		38.639
194.278	44.918	44.514		38.524
200	44.763	44.480		38.455
212.683	44.447	44.404		38.250
242.683	43.857	44.320		37.868
272.344	43.383	43.896		37.747
300	42.780	43.138		38.154
309.844	42.487	42.784		38.359
347.344	40.996	41.319		38.676
350	40.870	41.224		38.666
396.646	38.647	39.482		38.549
400	38.489	39.351		38.523
456.646	36.372		37.888	37.947
494.937	35.532		35.815	38.108
497.249	35.497		35.809	38.134
500	35.457		35.802	38.164
516.646	35.268		35.699	38.256
538.835	35.076		35.391	38.119
571.507	34.733		35.111	37.816
600	34.434		34.798	37.771
622.191	34.200		34.554	37.909
640	34.013		34.357	37.764
651.539	33.930		34.229	37.591
667.654	33.813		34.050	37.528
691.024	33.643		33.838	37.405
700	33.578		33.817	37.397

ROAD 1 - LONGITUDINAL SECTION

SCALE 1:1000 (NATURAL)

NOT FOR CONSTRUCTION

Issue	Description	Date	Design	Manager
A	ISSUE FOR DEVELOPMENT APPLICATION	27/11/2020	M.M.	J.B.

Certification By:

Architect: mkd architects

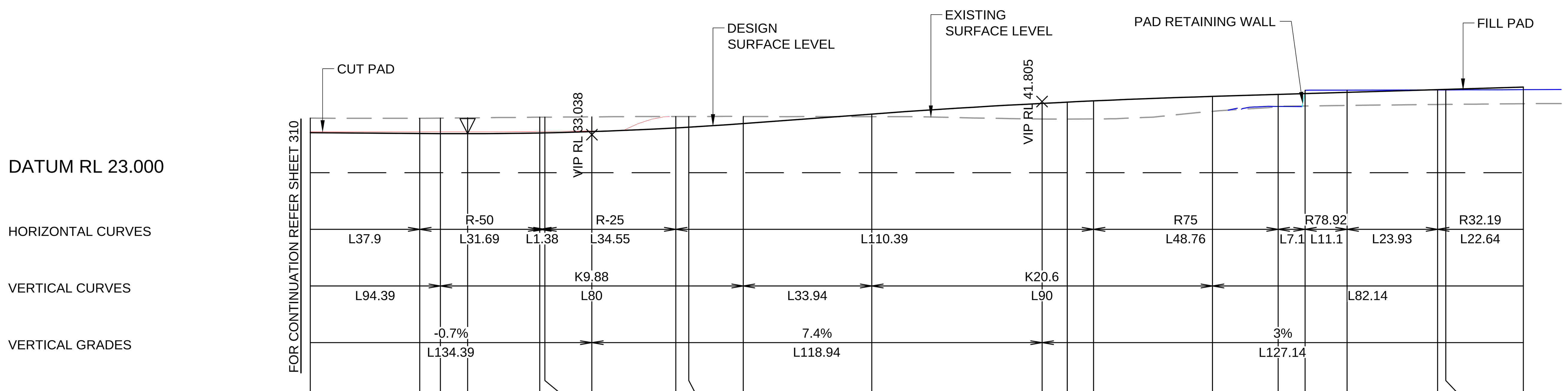
Scale: 0 20 40 60 m — SCALE 1:1000 @ A1

AUSTRALIAN CONSULTING ENGINEERS.
PTY LTD - A.C.N. 084 059 941
LEVEL 4, 470 CHURCH STREET NORTH PARRAMATTA NSW 2150
PH: (02) 9763 1500 FX: (02) 9763 1515
EMAIL: info@aceeng.com.au

Project: 1290 GREENDALE ROAD, GREENPARK PUBLIC DOMAIN WORKS CIVIL ENGINEERING PLANS DEVELOPMENT APPLICATION

Drawing Title: ROAD 1 LONGITUDINAL SECTIONS SHEET 1 OF 2

Scale	A1	Project No.	Dwg. No.	Issue
1:1000		200597	310	A



DESIGN SURFACE LEVEL	33.578	33.368	33.328	33.302	33.486	33.514	33.848	34.832	35.030	35.986	38.488	41.313	41.648	41.974	43.156	43.677	43.890	44.223	44.942	45.007	45.621
FILL PAD																40.506	44.360	44.830	44.874	44.878	44.941
CUT PAD	33.817	33.799	33.799	33.809	33.893	33.903	34.020														
EXISTING SURFACE LEVEL	37.397	37.390	37.428	37.492	37.665	37.675	37.760	37.853	37.857	37.850	37.792	37.176	37.167	37.193	39.223	40.453	40.620	40.785	41.027	41.049	41.233
CHAINAGE	700	728.926	734.391	741.561	760.616	761.995	774.391	796.545	800	814.391	848.33	893.33	900	906.937	938.33	955.693	962.793	973.895	997.826	1000	1020.468

ROAD 1 - LONGITUDINAL SECTION

SCALE 1:1000 (NATURAL)

NOT FOR CONSTRUCTION

Issue	Description	Date	Design	Manager
A	ISSUE FOR DEVELOPMENT APPLICATION	27/11/2020	M.M.	J.B.

Certification By:

Architect: mkd architects

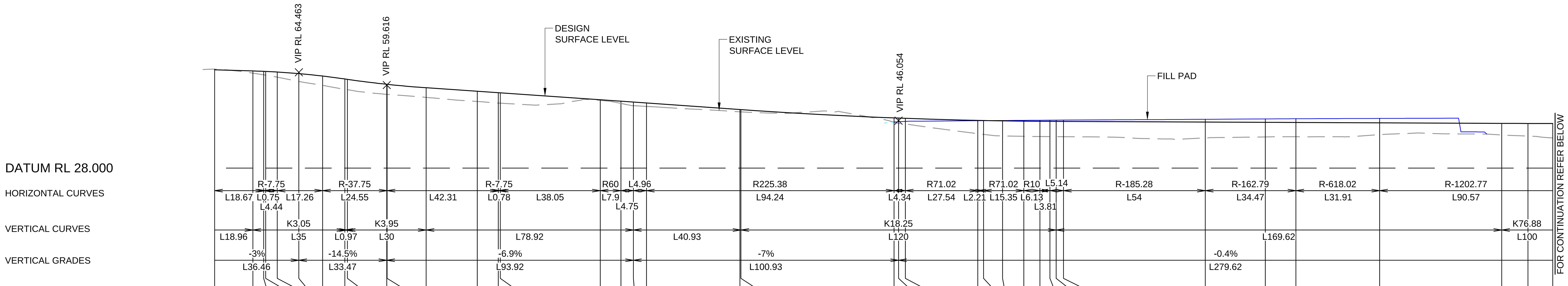
Scale: 0 20 40 60 m SCALE 1:1000 @ A1

AUSTRALIAN CONSULTING ENGINEERS.
PTY LTD - A.C.N. 084 059 941
LEVEL 4, 470 CHURCH STREET NORTH PARRAMATTA NSW 2150
PH: (02) 9763 1500 FX: (02) 9763 1515
EMAIL: info@aceeng.com.au

Project: 1290 GREENDALE ROAD, GREENPARK
PUBLIC DOMAIN WORKS
CIVIL ENGINEERING PLANS
DEVELOPMENT APPLICATION

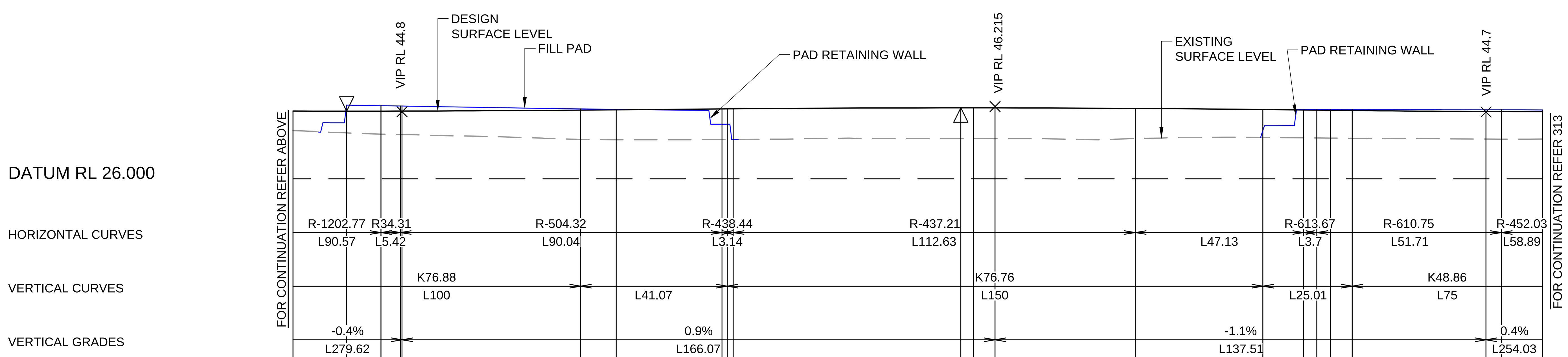
Drawing Title: ROAD 1
LONGITUDINAL SECTIONS
SHEET 2 OF 2

Scale	A1	Project No.	Dwg. No.	Issue
1:1000		200597	311	A



CHAINAGE	DESIGN SURFACE LEVEL	FILL PAD	CUT PAD	EXISTING SURFACE LEVEL
0	65.426			65.665
14.569	64.988			64.146
18.672	64.838			63.496
19.423	64.804			63.377
23.858	64.568			62.605
32.069	63.961			60.988
41.121	63.035			59.489
49.569	61.929			57.982
50.535	61.789			57.825
65.535	59.901			56.082
65.671	59.886			56.073
80.535	58.582			54.907
100	57.241			53.356
107.979	56.691			52.753
108.758	56.638			52.701
146.806	54.016			53.786
154.706	53.471			52.624
159.454	53.144			51.764
164.414	52.796			51.480
200	50.296			49.432
200.387	50.269			49.413
258.649	47.106	45.578		45.491
260.387	47.040	45.663		45.034
262.991	46.945	45.776		44.752
290.531	46.163	46.025		41.108
292.74	46.118	46.043		40.843
300	45.990	46.103		40.230
308.088	45.882	46.165		40.084
314.221	45.823	46.210		40.004
318.027	45.797	46.235		39.982
320.387	45.785	46.250		39.969
323.171	45.773	46.268		39.953
377.17	45.530	46.563		39.484
400	45.428	46.711		39.867
411.645	45.376	46.782		39.918
443.558	45.233	46.905		40.722
490.01	45.024			40.621
500	44.986			40.178
509.454	44.962			39.469

ROAD 2 - LONGITUDINAL SECTION
SCALE 1:1000 (NATURAL)



CHAINAGE	DESIGN SURFACE LEVEL	FILL PAD	CUT PAD	EXISTING SURFACE LEVEL
509.454	44.962			39.469
524.491	44.947	46.630		38.856
534.127	44.953	46.464		38.519
539.549	44.962	46.370		38.391
540.01	44.963	46.362		38.383
590.01	45.226	45.571		37.024
600	45.311	45.448		36.949
629.593	45.563	41.300		36.994
631.078	45.576	41.300		37.002
632.735	45.590	37.000		37.009
696.493	45.855			37.274
700	45.854			37.264
706.078	45.849			37.248
745.361	45.699			37.287
781.078	45.389	39.497		37.574
792.491	45.263	45.389		37.473
796.189	45.222	45.386		37.437
800	45.180	45.381		37.400
806.087	45.113	45.372		37.356
843.587	44.844	45.314		37.128
847.897	44.831	45.304		37.096
859.454	44.817	45.281		37.157

ROAD 2 - LONGITUDINAL SECTION
SCALE 1:1000 (NATURAL)

NOT FOR CONSTRUCTION

Issue	Description	Date	Design	Manager
A	ISSUE FOR DEVELOPMENT APPLICATION	27/11/2020	M.M.	J.B.

Certification By:

Architect: mkd architects

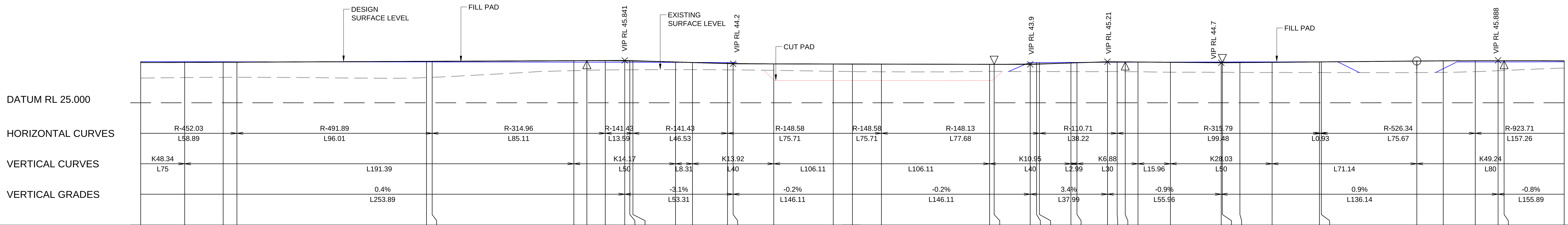
Scale: 0 20 40 60 m SCALE 1:1000 @ A1

AUSTRALIAN CONSULTING ENGINEERS. PTY LTD - A.C.N. 084 059 941
LEVEL 4, 470 CHURCH STREET NORTH PARRAMATTA NSW 2150
PH: (02) 9763 1500 FAX: (02) 9763 1515
EMAIL: info@aceeng.com.au

Project: 1290 GREENDALE ROAD, GREENPARK PUBLIC DOMAIN WORKS CIVIL ENGINEERING PLANS DEVELOPMENT APPLICATION

Drawing Title: ROAD 2 LONGITUDINAL SECTIONS SHEET 1 OF 3

Scale	A1	Project No.	Dwg. No.	Issue
1:1000		200597	312	A



CHAINAGE	DESIGN SURFACE LEVEL	FILL PAD	CUT PAD	EXISTING SURFACE LEVEL
859.454	44.820	45.281		37.157
881.087	44.869	45.236		37.411
900	44.954	45.193		37.515
906.788	44.984	45.176		37.528
1000	45.403	45.104		37.428
1002.797	45.416	45.104		37.547
1072.475	45.729	45.005		40.811
1078.845	45.743	44.990		40.963
1087.908	45.714	44.967		41.160
1097.475	45.621	44.942		41.233
1100	45.585	44.935		41.243
1101.495	45.562	44.931		41.249
1122.475	45.072	44.890		41.295
1130.782	44.816	44.868		41.300
1148.027	44.392	44.816		41.217
1150.782	44.344	44.807		41.192
1170.782	44.159		36.256	40.955
1200	44.099		35.962	40.489
1209.454	44.080		35.949	40.375
1223.738	44.050		35.933	40.267
1276.891	43.941		35.917	40.445
1279.138	43.939		36.804	40.457
1296.891	44.083	44.801		40.340
1300	44.138	44.811		40.347
1301.42	44.166	44.816		40.350
1316.891	44.590	44.868		40.362
1319.877	44.693	44.879		40.355
1334.877	45.047	44.930		40.359
1339.641	45.091	44.945		40.369
1343.605	45.102	44.957		40.344
1349.877	45.073	44.976		40.301
1365.836	44.928	45.022		40.057
1390.836	44.812	45.081		39.984
1391.386	44.811	45.083		39.982
1400	44.825	45.100		39.943
1415.836	44.918	45.128		39.903
1439.117	45.121	45.162		39.852
1440.05	45.129	45.163		39.855
1486.98	45.539			39.859
1500	45.635	41.763		39.959
1515.722	45.706	45.114		40.336
1526.98	45.725	45.123		40.788
1529.934	45.726	45.125		40.914
1559.454	45.638	45.146		42.072

ROAD 2 - LONGITUDINAL SECTION

SCALE 1:1000 (NATURAL)

NOT FOR CONSTRUCTION

Issue	Description	Date	Design	Manager
A	ISSUE FOR DEVELOPMENT APPLICATION	27/11/2020	M.M.	J.B.

-1 0 1cm at full size 10cm 20cm

Certification By:

Architect

mkd architects

Scale

0 20 40 60 m

SCALE 1:1000 @ A1

AUSTRALIAN CONSULTING ENGINEERS.
AUSTRALIAN CONSULTING ENGINEERS.
PTY LTD - A.C.N. 084 059 941
LEVEL 4, 470 CHURCH STREET NORTH PARRAMATTA NSW 2150
PH: (02) 9763 1500 FX: (02) 9763 1515
EMAIL: info@aceeng.com.au

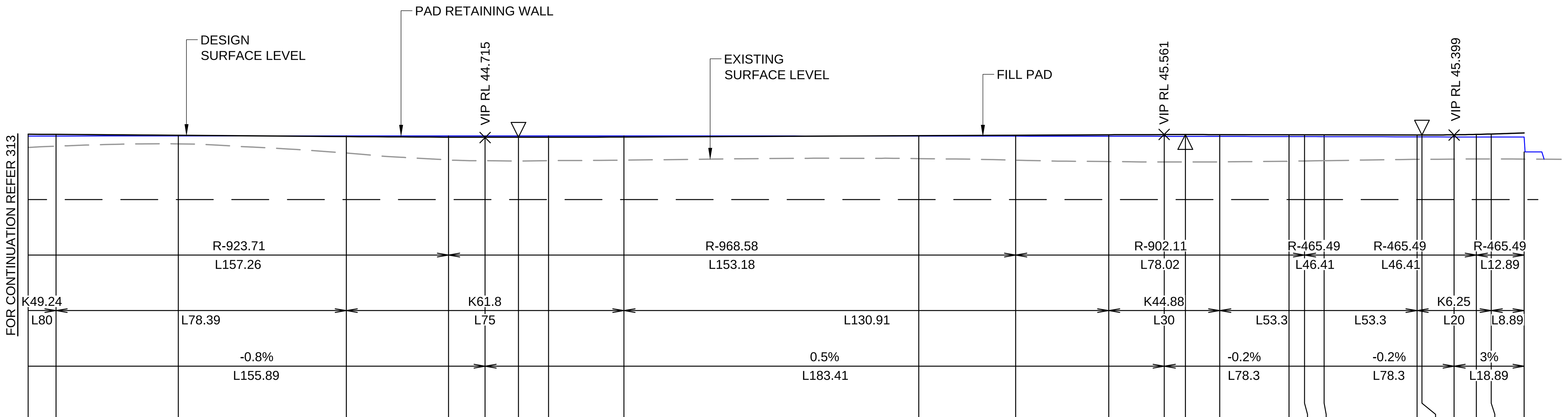
Project

1290 GREENDALE ROAD, GREENPARK
PUBLIC DOMAIN WORKS
CIVIL ENGINEERING PLANS
DEVELOPMENT APPLICATION

Drawing Title

ROAD 2
LONGITUDINAL SECTIONS
SHEET 2 OF 3

Scale	A1	Project No.	Dwg. No.	Issue
1:1000		200597	313	A



DATUM RL 28.000

HORIZONTAL CURVES

VERTICAL CURVES

VERTICAL GRADES

DESIGN SURFACE LEVEL	45.638	45.587	45.338	44.997	44.851	44.829	44.822	44.827	44.888	45.255	45.376	45.492
FILL PAD	45.146	45.151	45.169	45.179	45.179	45.180	45.178	45.177	45.173	45.133	45.113	45.087
CUT PAD												
PAD RET WALL	45.146	45.151	45.169	45.179	45.179	45.180	45.178	45.177	45.173	45.133	45.113	45.087
EXISTING SURFACE LEVEL	42.072	42.425	43.033	40.556	38.694	38.472	38.407	38.487	38.620	39.055	38.634	38.247
CHAINAGE	1559.454	1566.98	1600	1645.374	1672.983	1682.874	1691.869	1700	1720.374	1800	1826.161	1851.283

DESIGN SURFACE LEVEL	45.536	45.539	45.530	45.491	45.482	45.471	45.419	45.418	45.479	45.591	45.698	
FILL PAD	45.066	45.055	45.038	45.005	44.998	44.985	44.922	44.917	44.884	44.869	44.865	40.868
CUT PAD												
PAD RET WALL	45.066	45.055	45.038	45.005	44.998	44.985						
EXISTING SURFACE LEVEL	38.139	38.148	38.164	38.337	38.411	38.500	38.851	38.860	38.919	38.951	38.972	38.929
CHAINAGE	1866.283	1871.987	1881.283	1900	1904.177	1909.454	1934.583	1935.877	1944.583	1950.583	1954.583	1963.473

ROAD 2 - LONGITUDINAL SECTION

SCALE 1:1000 (NATURAL)

NOT FOR CONSTRUCTION

Issue	Description	Date	Design	Manager
A	ISSUE FOR DEVELOPMENT APPLICATION	27/11/2020	M.M.	J.B.

Certification By:

Architect
mkd architects

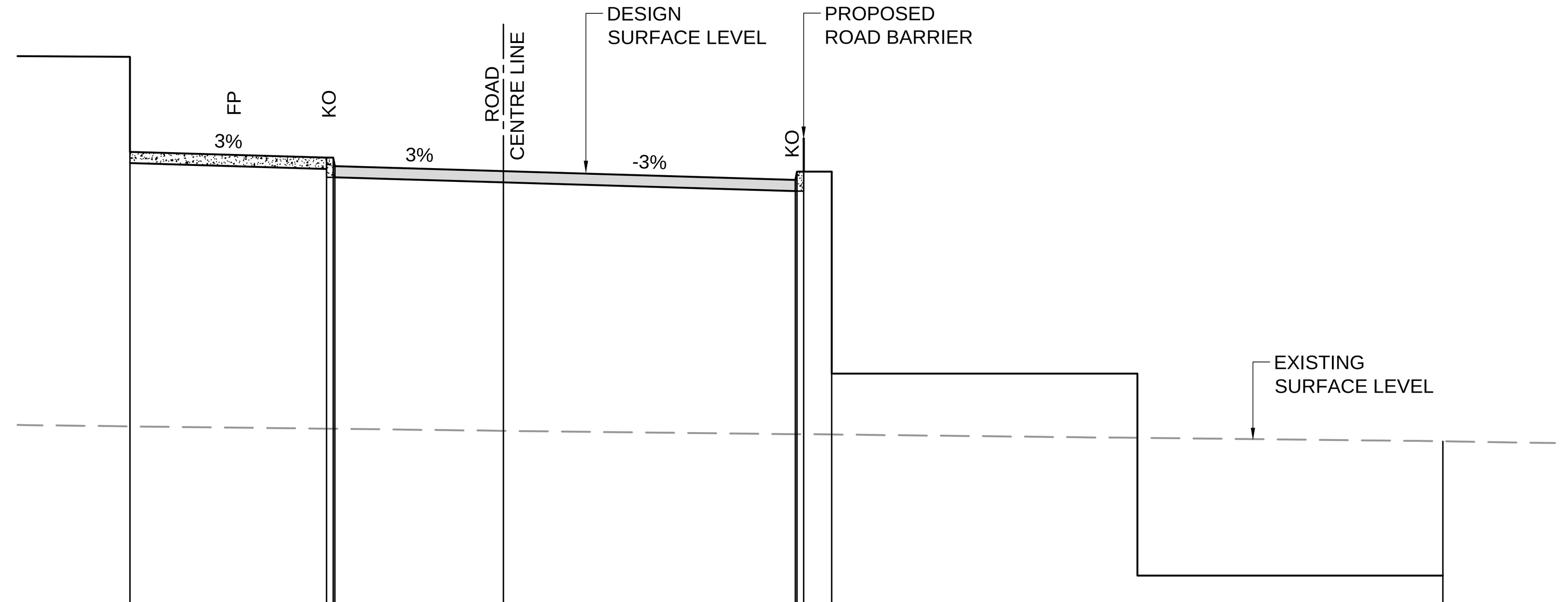
Scale
0 20 40 60 m
SCALE 1:1000 @ A1

AUSTRALIAN CONSULTING ENGINEERS.
PTY LTD - A.C.N. 084 059 941
LEVEL 4, 470 CHURCH STREET NORTH PARRAMATTA NSW 2150
PH: (02) 9763 1500 FX: (02) 9763 1515
EMAIL: info@aceeng.com.au

Project
1290 GREENDALE ROAD, GREENPARK
PUBLIC DOMAIN WORKS
CIVIL ENGINEERING PLANS
DEVELOPMENT APPLICATION

Drawing Title
ROAD 2
LONGITUDINAL SECTIONS
SHEET 3 OF 3

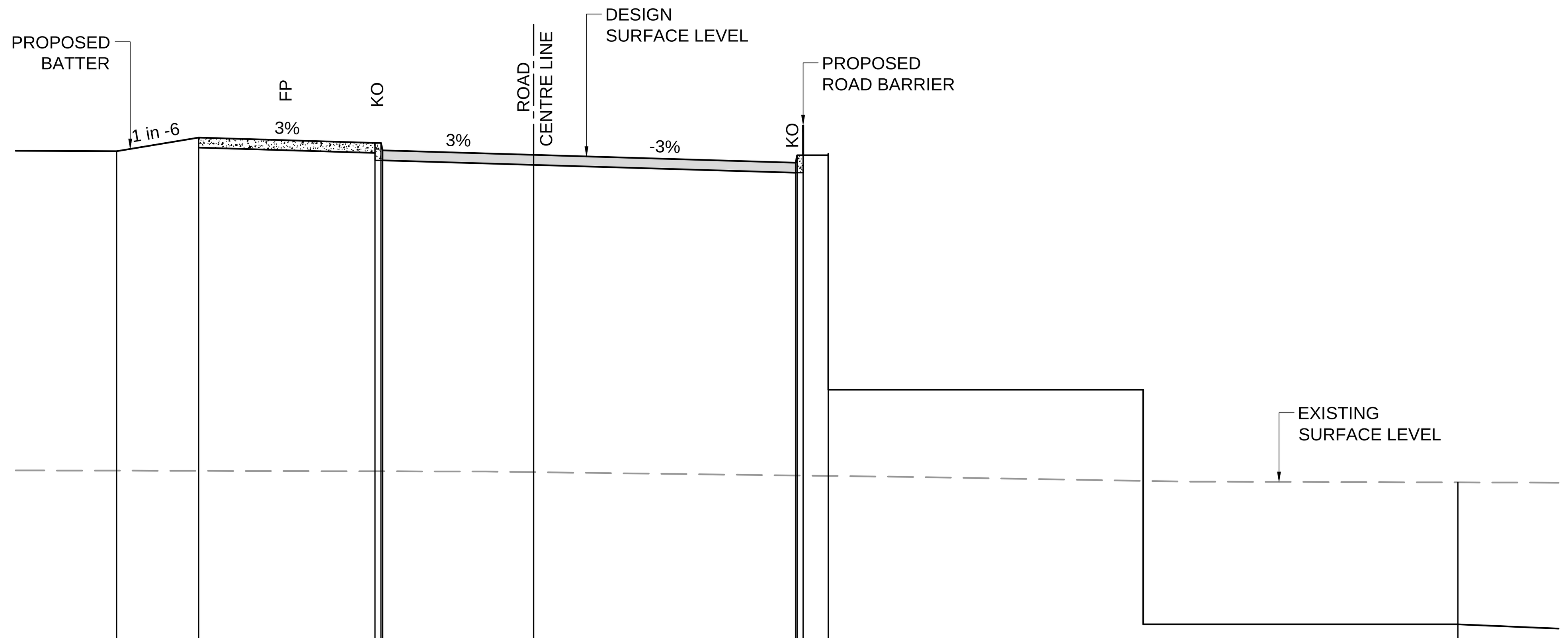
Scale	A1	Project No.	Dwg. No.	Issue
1:1000		200597	314	A



DATUM RL 34.500

DESIGN SURFACE LEVEL	44.818 / 43.125	43.020	43.020	42.870	42.780	42.624	42.774	42.774	42.774 / 39.175	39.175 / 35.576	35.576
EXISTING SURFACE LEVEL	38.234	38.192	38.191	38.190	38.154	38.096	38.095	38.094	38.088	38.028	37.967
OFFSET	-6.650	-3.150	-3.030	-3.000	0.000	5.200	5.230	5.350	5.850	11.291	16.732

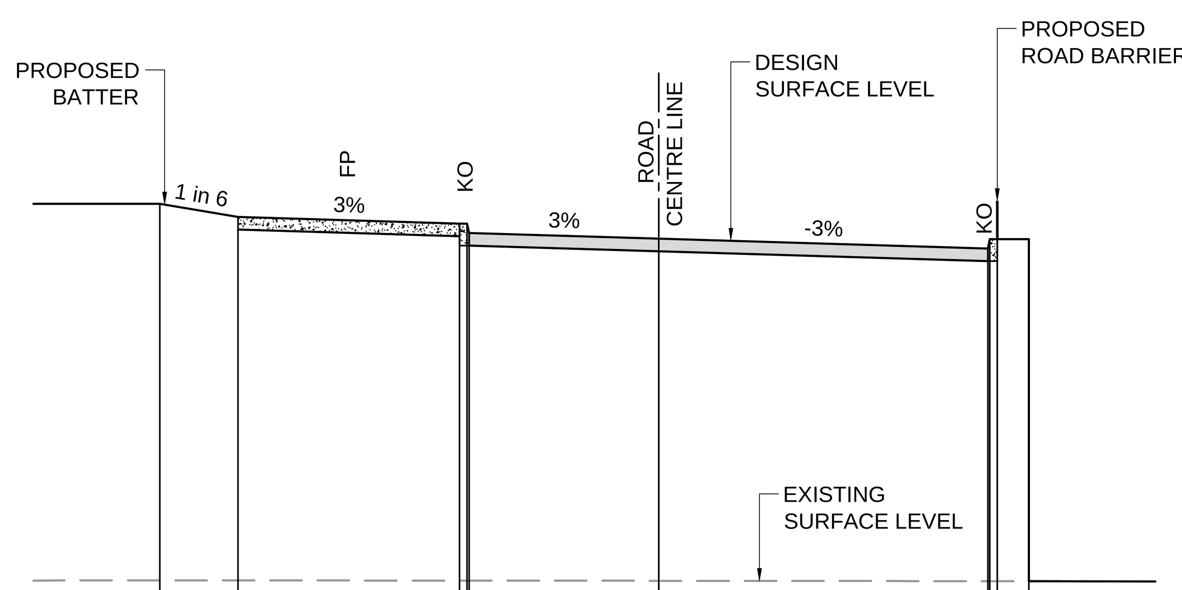
CHAINAGE 300



DATUM RL 34.500

DESIGN SURFACE LEVEL	44.836	45.108	45.003	45.003	44.853	44.763	44.607	44.757	44.757	44.757 / 40.093	40.093 / 35.429	35.429
EXISTING SURFACE LEVEL	38.485	38.481	38.473	38.472	38.472	38.455	38.389	38.389	38.387	38.381	38.279	38.252
OFFSET	-8.282	-6.650	-3.150	-3.030	-3.000	0.000	5.200	5.230	5.350	5.850	5.850	18.351

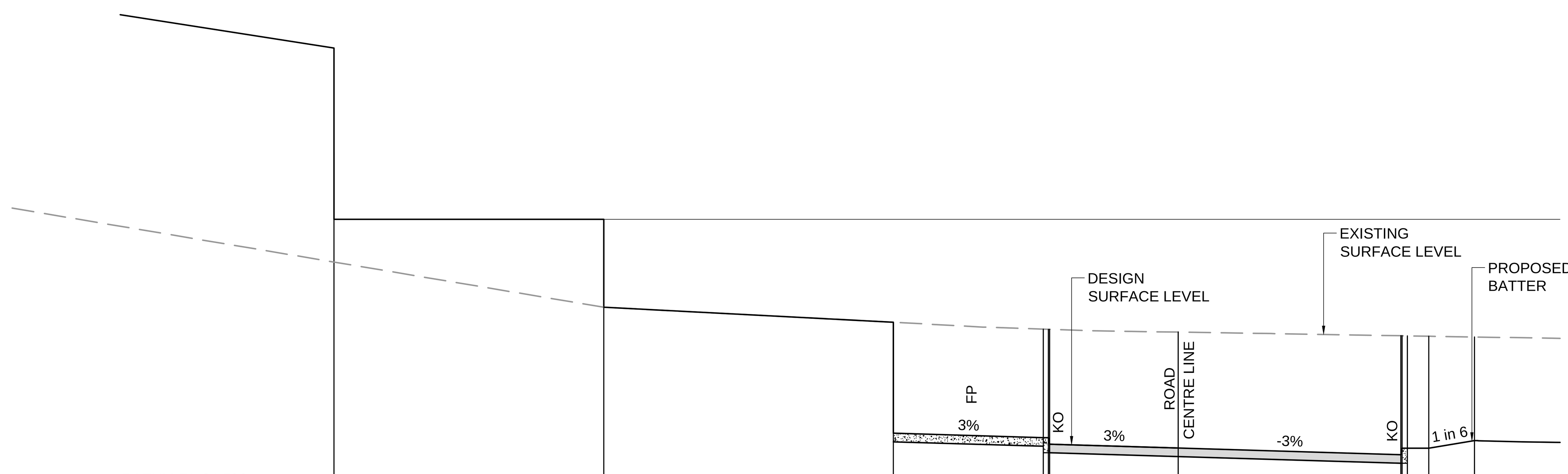
CHAINAGE 200



DATUM RL 38.500

DESIGN SURFACE LEVEL	45.055	44.849	44.744	44.744	44.594	44.504	44.348	44.498	44.498	44.498 / 39.090
EXISTING SURFACE LEVEL	39.104	39.103	39.100	39.100	39.100	39.097	39.091	39.091	39.091	39.090
OFFSET	-7.887	-6.650	-3.150	-3.030	-3.000	0.000	5.200	5.230	5.350	5.850

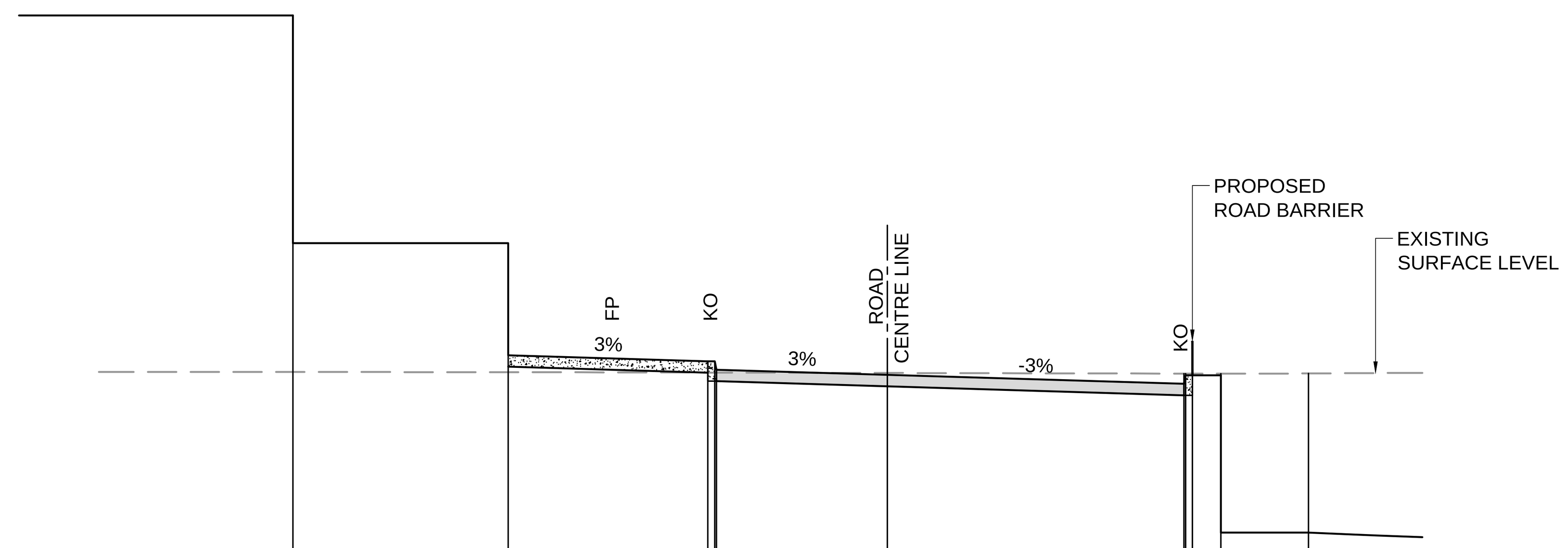
CHAINAGE 100



DATUM RL 34.500

DESIGN SURFACE LEVEL	44.800 / 40.800	40.800 / 38.756	38.394 / 35.802	35.697	35.697	35.547	35.457	35.301	35.451	35.451	35.451	35.629
EXISTING SURFACE LEVEL	39.147	38.756	38.394	38.234	38.229	38.228	38.164	38.080	38.080	38.078	38.069	38.051
OFFSET	-18.41	-13.41	-6.650	-3.150	-3.030	-3.000	0.000	5.200	5.230	5.350	5.850	6.918

CHAINAGE 500



DATUM RL 35.000

DESIGN SURFACE LEVEL	44.800 / 40.800	40.800 / 38.834	38.729	38.729	38.579	38.489	38.333	38.483	38.483	38.483 / 35.723	35.723
EXISTING SURFACE LEVEL	38.547	38.538	38.530	38.530	38.530	38.523	38.512	38.512	38.512	38.511	38.515
OFFSET	-10.932	-6.650	-3.150	-3.030	-3.000	0.000	5.200	5.230	5.350	5.850	7.385

CHAINAGE 400

NOT FOR CONSTRUCTION

Issue	Description	Date	Design	Manager
A	ISSUE FOR DEVELOPMENT APPLICATION	27/11/2020	M.M.	J.B.

Certification By:

Architect: mkd architects

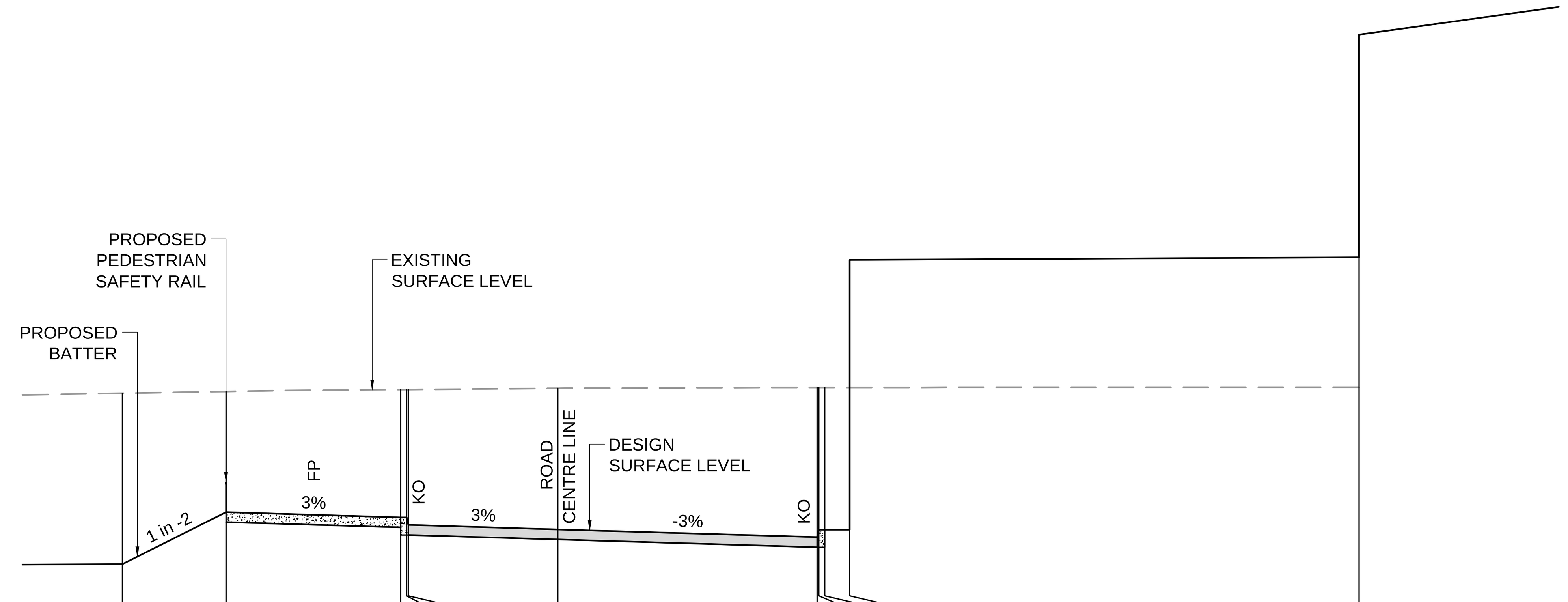
Scale: 0 2 4 6 m — SCALE 1:100 @ A1

AUSTRALIAN CONSULTING ENGINEERS.
PTY LTD - A.C.N. 084 059 941
LEVEL 4, 470 CHURCH STREET NORTH PARRAMATTA NSW 2150
PH: (02) 9763 1500 FX: (02) 9763 1515
EMAIL: info@aceeng.com.au

Project: 1290 GREENDALE ROAD, GREENPARK PUBLIC DOMAIN WORKS CIVIL ENGINEERING PLANS DEVELOPMENT APPLICATION

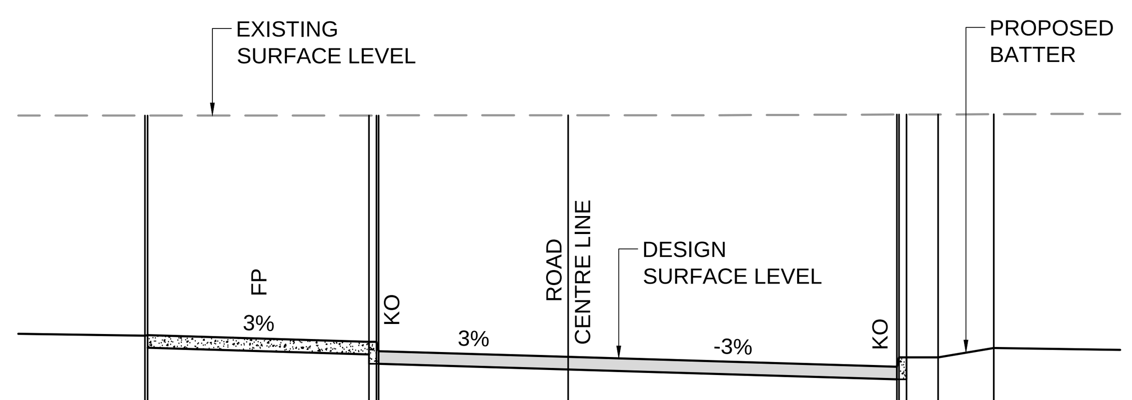
Drawing Title: ROAD 1 CROSS SECTIONS CROSS SECTIONS SHEET 1 OF 2

Scale	A1	Project No.	Dwg. No.	Issue
1:100		200597	320	A



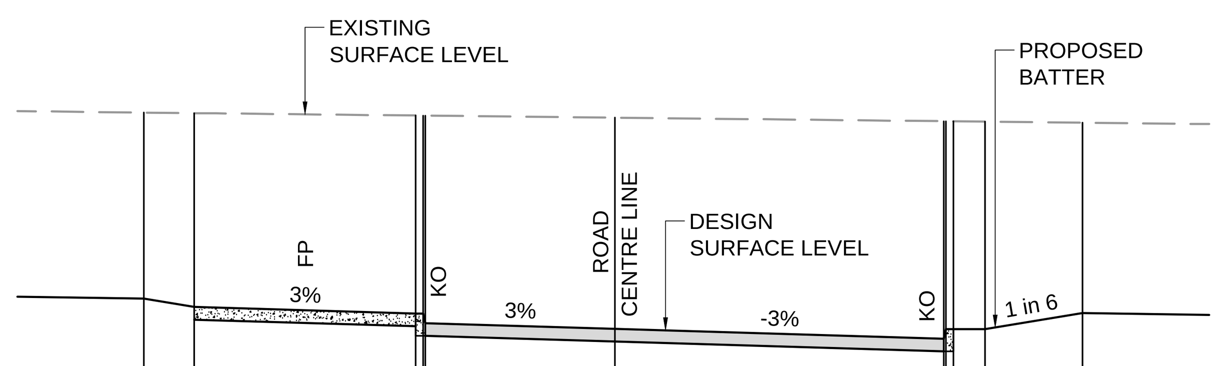
DESIGN SURFACE LEVEL	34.335	35.375	35.270	35.270	35.120	35.030	34.874	35.024	35.024	35.024	40.432	40.432	44.943
EXISTING SURFACE LEVEL	37.759	37.795	37.832	37.833	37.833	37.857	37.875	37.875	37.875	37.875		37.881	
OFFSET	-8.731	-6.650	-3.150	-3.030	-3.000	0.000	5.200	5.230	5.350	5.850		16.061	

CHAINAGE 800



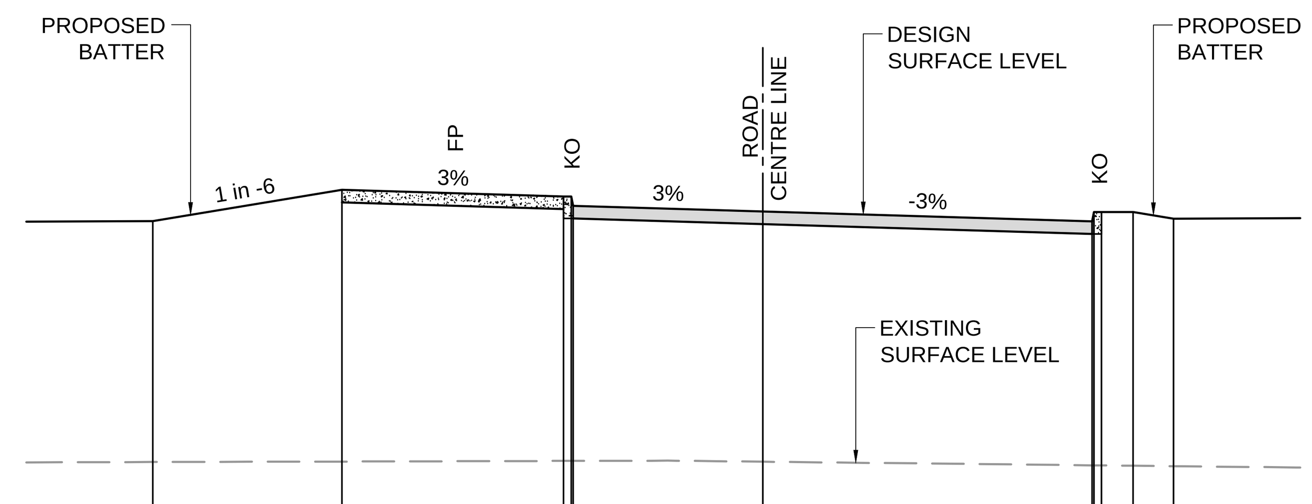
DESIGN SURFACE LEVEL	33.915	33.923	33.818	33.818	33.668	33.578	33.422	33.572	33.572	33.572	33.719		
EXISTING SURFACE LEVEL	37.394	37.394	37.395	37.395	37.395	37.397	37.408	37.409	37.409	37.411	37.414		
OFFSET	-6.696	-6.650	-3.150	-3.030	-3.000	0.000	5.200	5.230	5.350	5.850	6.730		

CHAINAGE 700



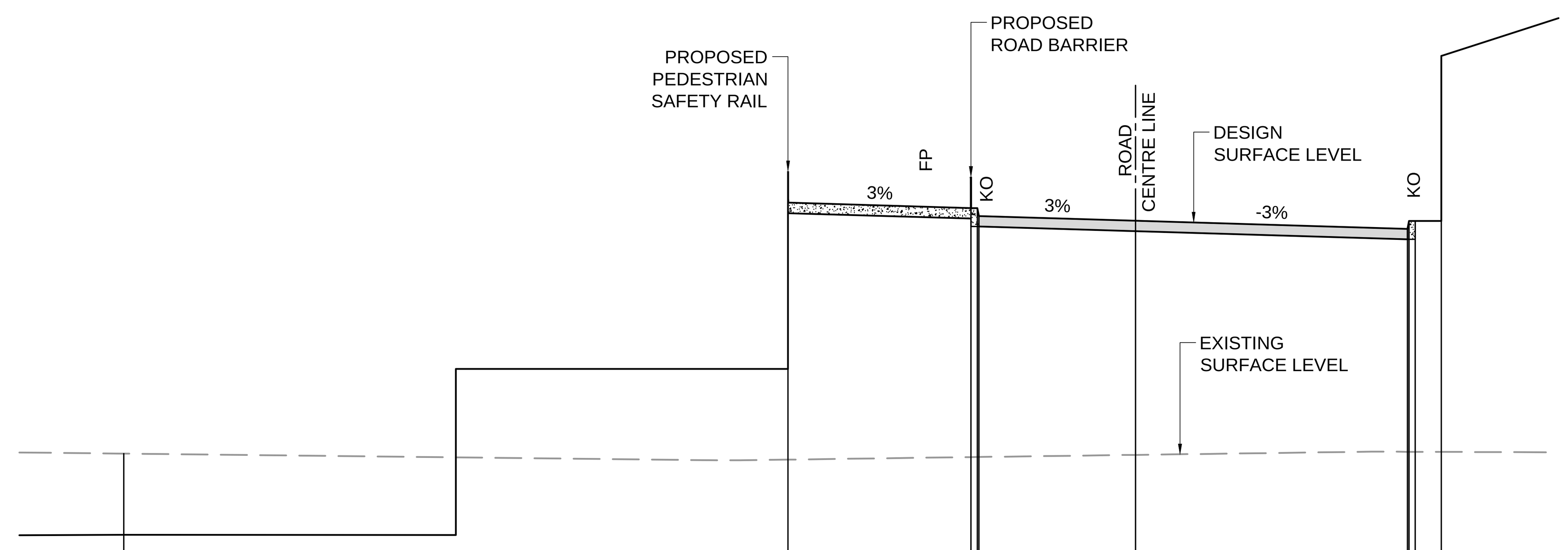
DESIGN SURFACE LEVEL	34.911	34.779	34.674	34.674	34.524	34.434	34.278	34.428	34.428	34.428	34.685
EXISTING SURFACE LEVEL	37.852	37.843	37.805	37.804	37.803	37.771	37.715	37.715	37.714	37.708	37.692
OFFSET	-7.447	-6.650	-3.150	-3.030	-3.000	0.000	5.200	5.230	5.350	5.850	7.392

CHAINAGE 600



DESIGN SURFACE LEVEL	44.853	45.352	45.247	45.247	45.097	45.007	44.851	45.001	45.001	45.001	44.894
EXISTING SURFACE LEVEL	41.044	41.052	41.061	41.061	41.061	41.049	40.992	40.992	40.991	40.985	40.978
OFFSET	-9.641	-6.650	-3.150	-3.030	-3.000	0.000	5.200	5.230	5.350	5.850	6.489

CHAINAGE 1000



DESIGN SURFACE LEVEL	35.638	35.638	38.812	38.812	41.993	41.888	41.888	41.738	41.648	41.492	41.642	41.642	41.642	44.800
EXISTING SURFACE LEVEL	37.191	37.120		37.076		37.124	37.125	37.126	37.167	37.226	37.226	37.225	37.224	
OFFSET	-19.360	13.005		-6.650		-3.150	-3.030	-3.000	0.000	5.200	5.230	5.350	5.850	

CHAINAGE 900

NOT FOR CONSTRUCTION

Issue	Description	Date	Design	Manager
A	ISSUE FOR DEVELOPMENT APPLICATION	27/11/2020	M.M.	J.B.

-1 0 1cm at full size 10cm 20cm

Certification By:

Architect
mkd architects

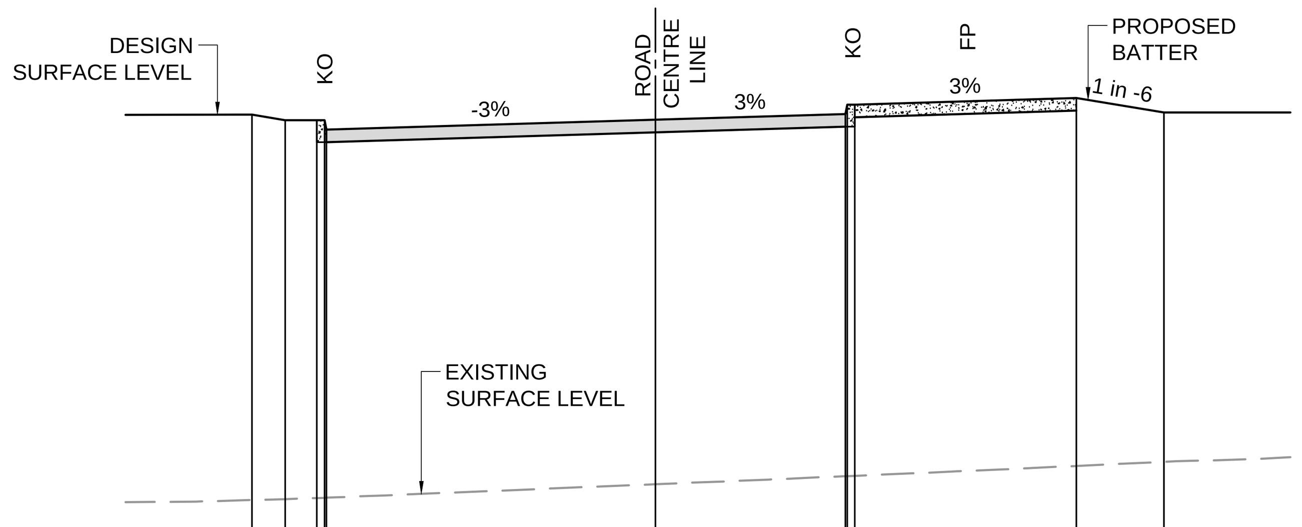
Scale
0 2 4 6 m
SCALE 1:100 @ A1

AUSTRALIAN CONSULTING ENGINEERS.
AUSTRALIAN
CONSULTING
ENGINEERS.
PTY LTD - A.C.N. 084 059 941
LEVEL 4, 470 CHURCH STREET NORTH PARRAMATTA NSW 2150
PH: (02) 9763 1500 FX: (02) 9763 1515
EMAIL: info@aceeng.com.au

Project
1290 GREENDALE ROAD, GREENPARK
PUBLIC DOMAIN WORKS
CIVIL ENGINEERING PLANS
DEVELOPMENT APPLICATION

Drawing Title
ROAD 1 CROSS SECTIONS
CROSS SECTIONS
SHEET 2 OF 2

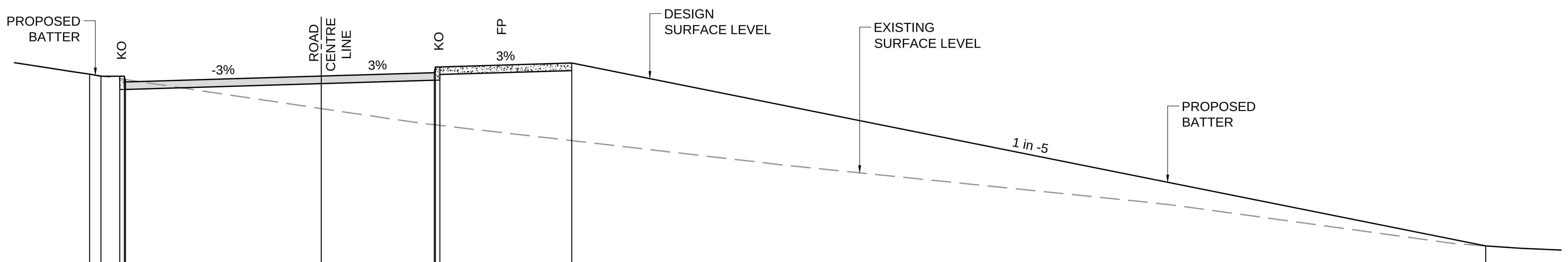
Scale	A1	Project No.	Dwg. No.	Issue
1:100		200597	321	A



DATUM RL 39.000

DESIGN SURFACE LEVEL	46.072	45.984	45.984	45.984	45.834	45.990	46.080	46.230	46.230	46.335	46.105
EXISTING SURFACE LEVEL	39.980	39.994	40.011	40.016	40.017	40.230	40.356	40.358	40.363	40.519	40.583
OFFSET	-6.376	-5.850	-5.350	-5.230	-5.200	0.000	3.000	3.030	3.150	6.650	8.032

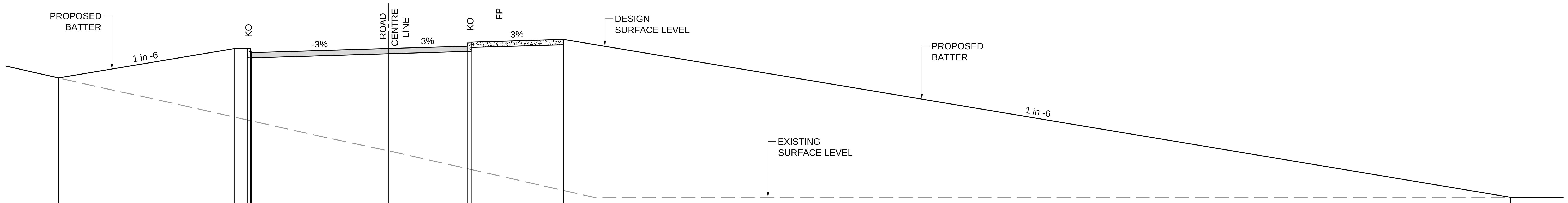
CHAINAGE 300



DATUM RL 45.000

DESIGN SURFACE LEVEL	50.345	50.290	50.290	50.290	50.140	50.296	50.386	50.536	50.536	50.641	45.787
EXISTING SURFACE LEVEL	50.345	50.300	50.226	50.208	50.204	49.432	49.002	48.999	48.985	48.582	45.787
OFFSET	-6.151	-5.850	-5.350	-5.230	-5.200	0.000	3.000	3.030	3.150	6.650	30.917

CHAINAGE 200



DATUM RL 51.000

DESIGN SURFACE LEVEL	56.123	57.235	57.235	57.235	57.085	57.241	57.331	57.481	57.481	57.586	51.592
EXISTING SURFACE LEVEL	56.123	54.640	54.528	54.502	54.495	53.356	52.680	52.674	52.647	51.854	51.592
OFFSET	-12.524	-5.850	-5.350	-5.230	-5.200	0.000	3.000	3.030	3.150	6.650	42.616

CHAINAGE 100

NOT FOR CONSTRUCTION

Issue	Description	Date	Design	Manager
A	ISSUE FOR DEVELOPMENT APPLICATION	27/11/2020	M.M.	J.B.

Certification By:

Architect: mkd architects

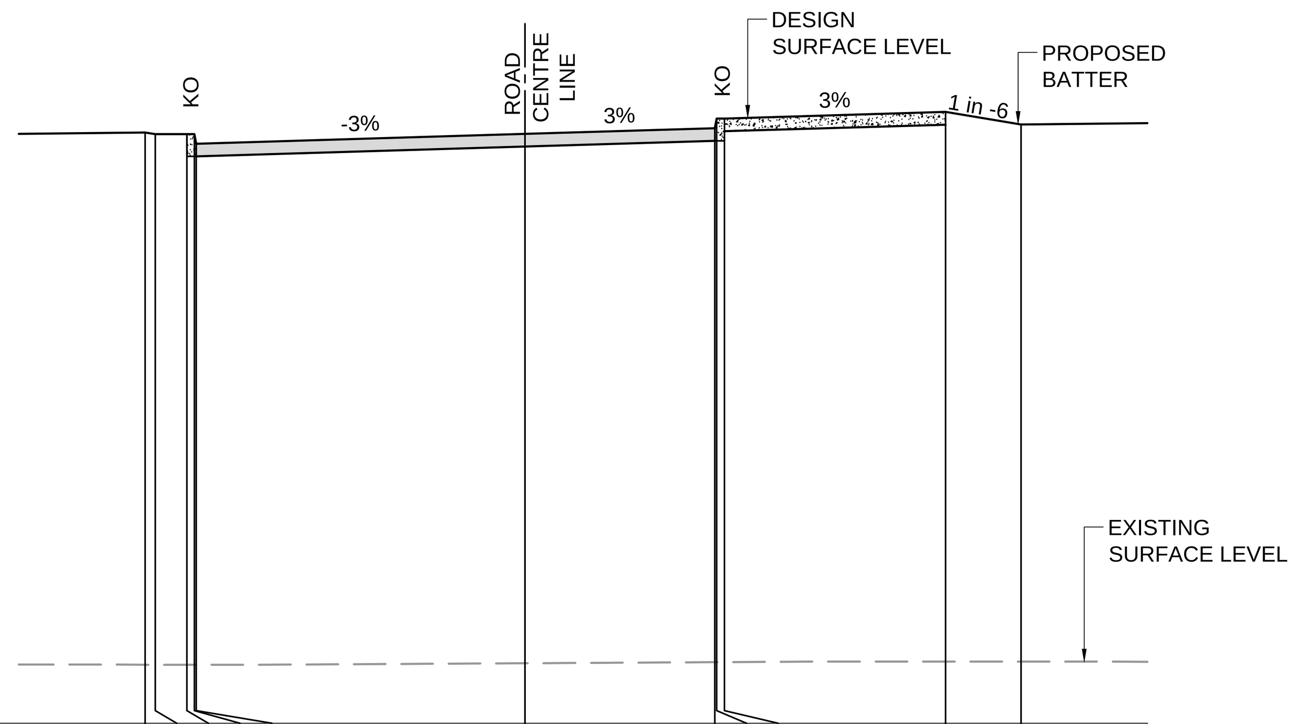
Scale: 0 2 4 6 m — SCALE 1:100 @ A1

AUSTRALIAN CONSULTING ENGINEERS.
PTY LTD - A.C.N. 084 059 941
LEVEL 4, 470 CHURCH STREET NORTH PARRAMATTA NSW 2150
PH: (02) 9763 1500 FX: (02) 9763 1515
EMAIL: info@aceeng.com.au

Project:
1290 GREENDALE ROAD, GREENPARK
PUBLIC DOMAIN WORKS
CIVIL ENGINEERING PLANS
DEVELOPMENT APPLICATION

Drawing Title:
ROAD 2 CROSS SECTIONS
CROSS SECTIONS
SHEET 1 OF 4

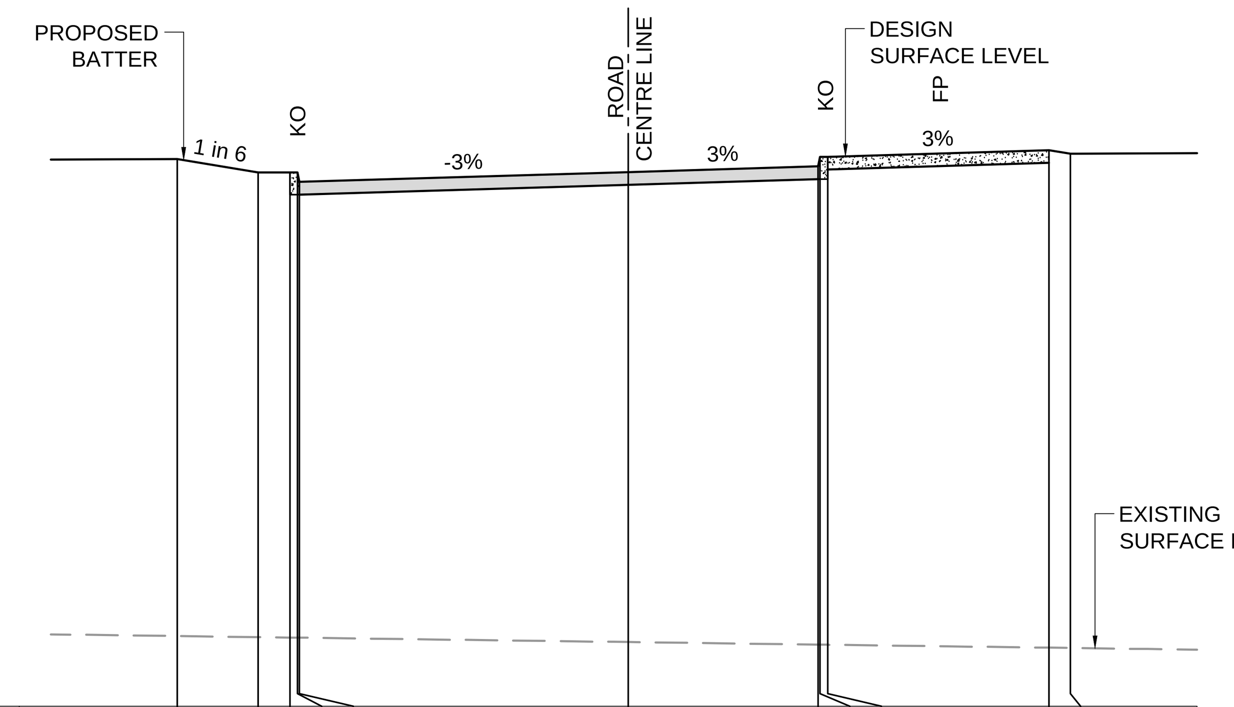
Scale	A1	Project No.	Dwg. No.	Issue
1:100		200597	322	A



DATUM RL 36.000

DESIGN SURFACE LEVEL	45.332	45.305	45.305	45.305	45.155	45.311	45.401	45.551	45.551	45.656	45.458
EXISTING SURFACE LEVEL	36.926	36.926	36.925	36.925	36.925	36.949	36.965	36.965	36.966	36.974	36.973
OFFSET	-6.008	-5.850	-5.350	-5.230	-5.200	0.000	3.000	3.030	3.150	6.650	7.842

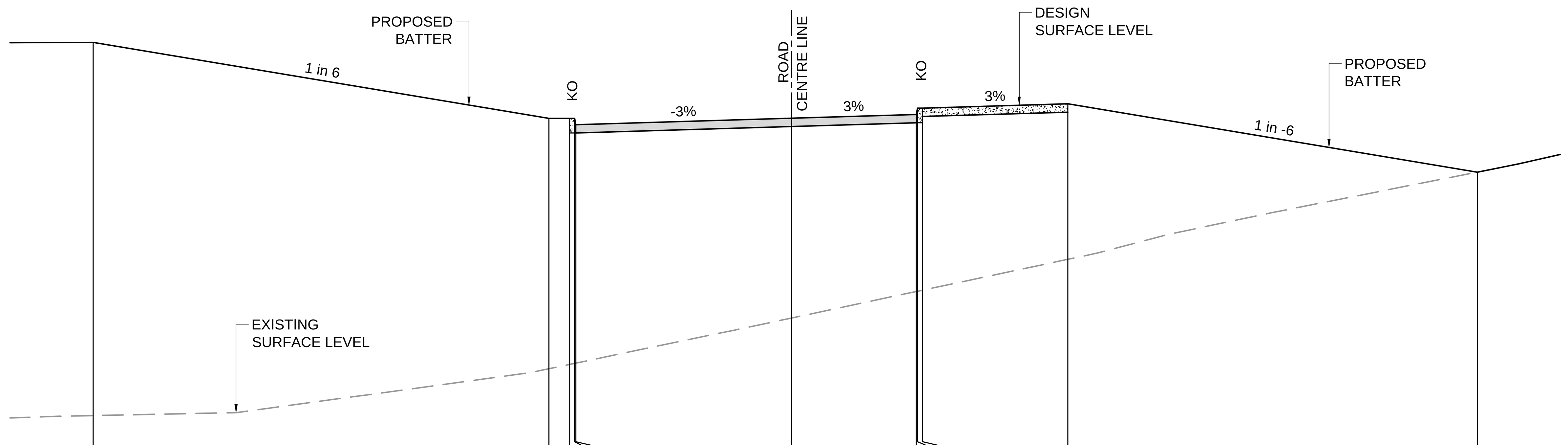
CHAINAGE 600



DATUM RL 36.500

DESIGN SURFACE LEVEL	45.152	44.938	44.938	44.938	44.788	44.944	45.034	45.184	45.184	45.289	45.233
EXISTING SURFACE LEVEL	37.610	37.593	37.587	37.585	37.585	37.515	37.475	37.475	37.473	37.426	37.422
OFFSET	-7.130	-5.850	-5.350	-5.230	-5.200	0.000	3.000	3.030	3.150	6.650	6.988

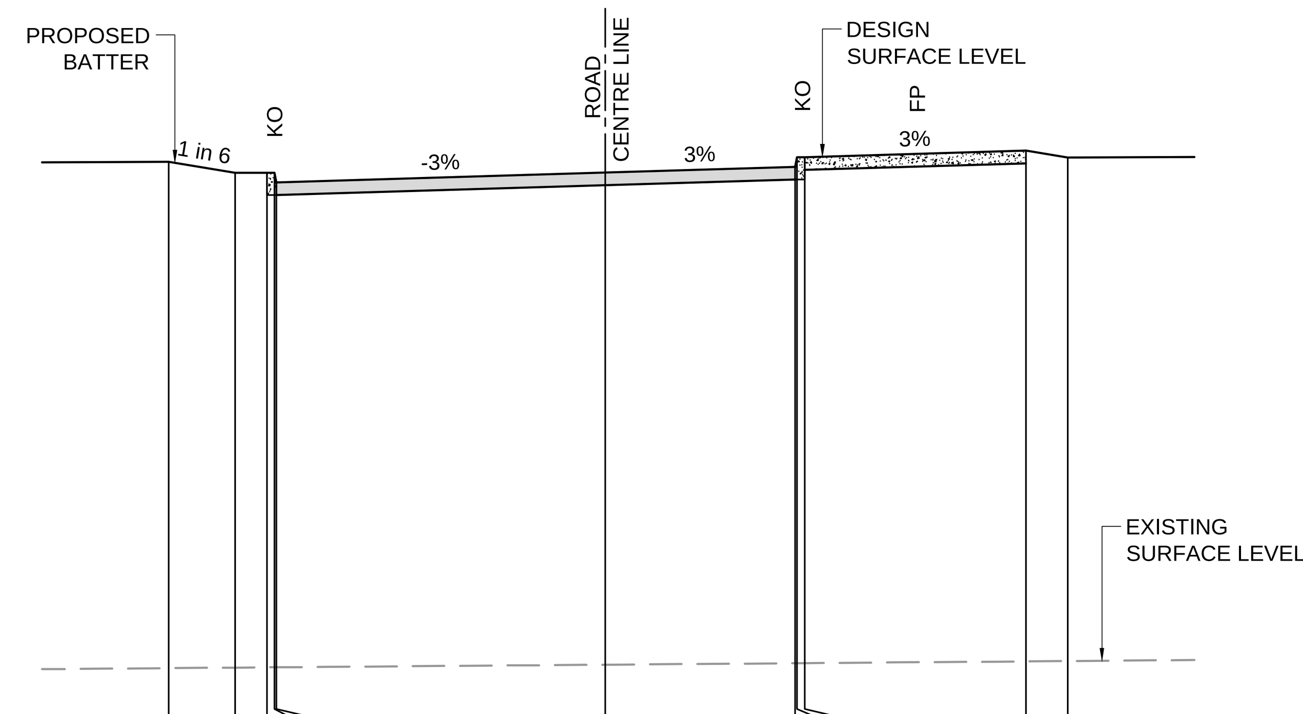
CHAINAGE 900



DATUM RL 37.000

DESIGN SURFACE LEVEL	46.809	44.980	44.980	44.980	44.830	44.986	45.076	45.226	45.226	45.331	43.688
EXISTING SURFACE LEVEL	37.829	38.957	39.061	39.086	39.092	40.178	40.815	40.821	40.847	41.589	43.688
OFFSET	-16.825	-5.850	-5.350	-5.230	-5.200	0.000	3.000	3.030	3.150	6.650	16.509

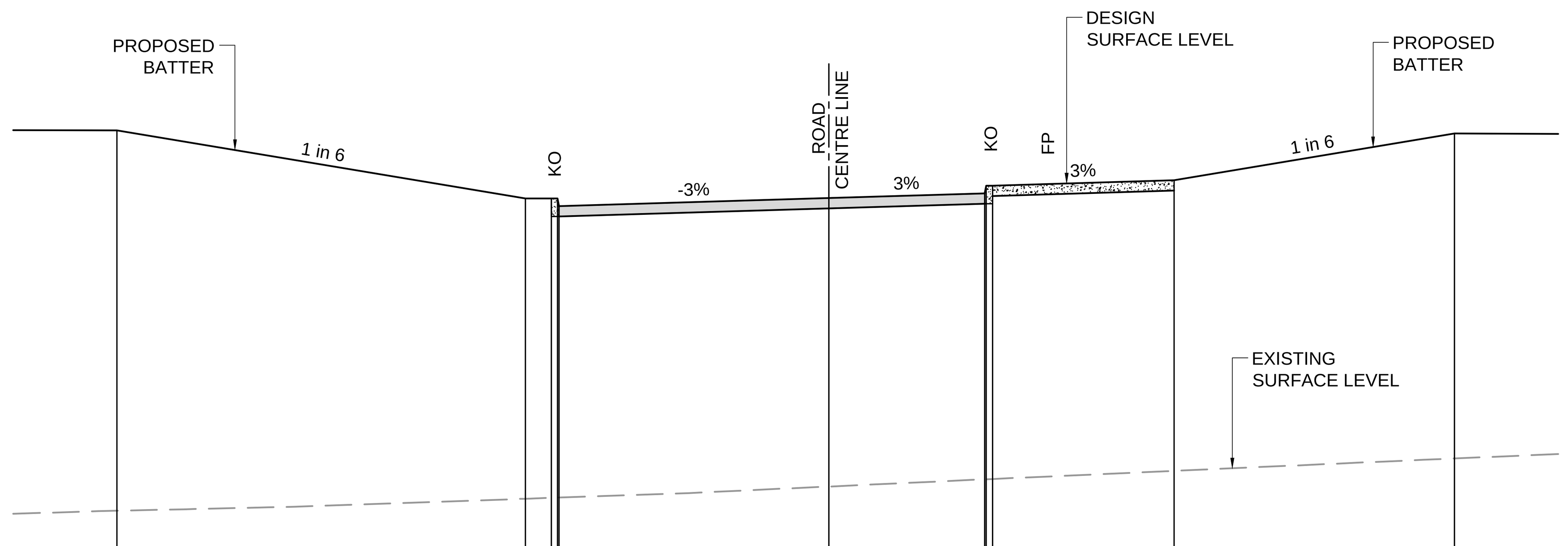
CHAINAGE 500



DATUM RL 36.500

DESIGN SURFACE LEVEL	45.350	45.174	45.174	45.174	45.024	45.180	45.270	45.420	45.420	45.525	45.415
EXISTING SURFACE LEVEL	37.346	37.354	37.358	37.359	37.359	37.400	37.424	37.424	37.425	37.453	37.458
OFFSET	-6.903	-5.850	-5.350	-5.230	-5.200	0.000	3.000	3.030	3.150	6.650	7.310

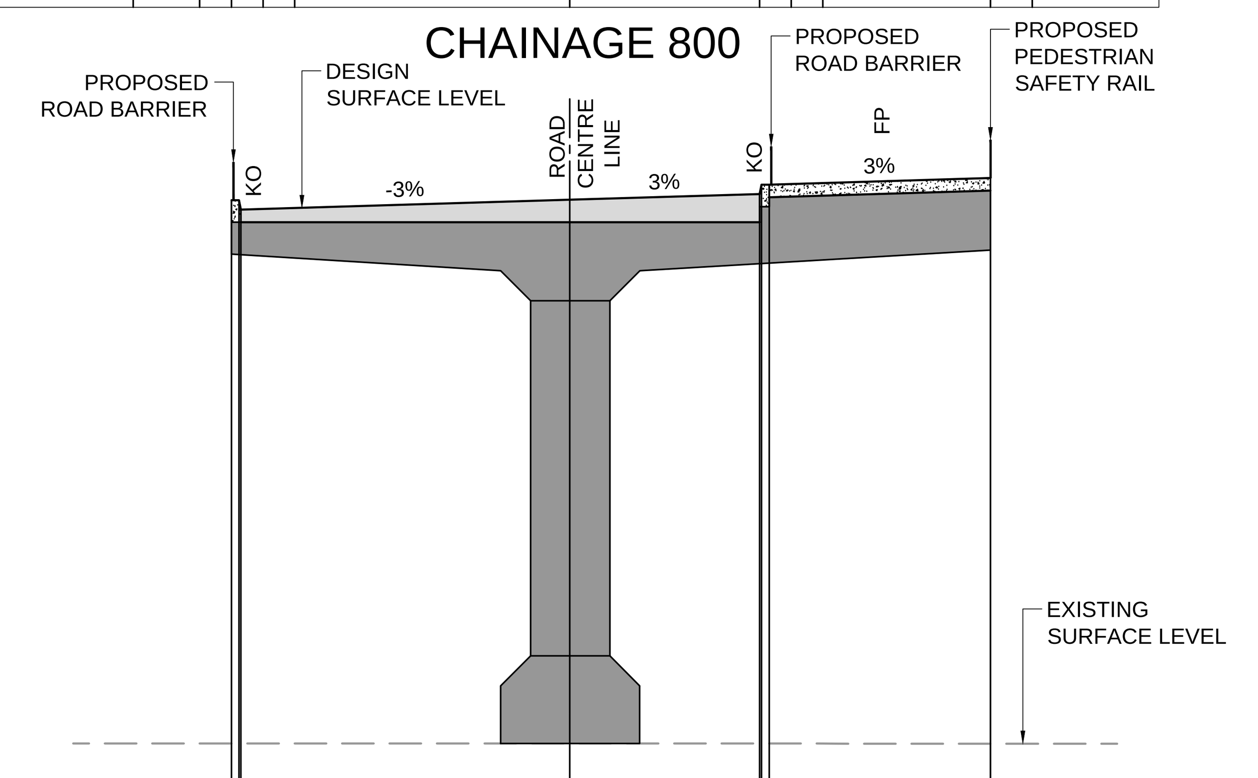
CHAINAGE 800



DATUM RL 38.500

DESIGN SURFACE LEVEL	46.733	45.422	45.422	45.422	45.272	45.428	45.518	45.668	45.668	45.773	46.673
EXISTING SURFACE LEVEL	39.401	39.631	39.649	39.653	39.654	39.867	40.006	40.007	40.013	40.169	40.408
OFFSET	-13.717	-5.850	-5.350	-5.230	-5.200	0.000	3.000	3.030	3.150	6.650	12.048

CHAINAGE 400



DATUM RL 36.500

DESIGN SURFACE LEVEL	45.848	45.848	45.698	45.854	45.944	46.094	46.094	46.199
EXISTING SURFACE LEVEL	37.265	37.265	37.265	37.264	37.264	37.264	37.264	37.263
OFFSET	-5.350	-5.230	-5.200	0.000	3.000	3.030	3.150	6.650

CHAINAGE 700 - BRIDGE

NOT FOR CONSTRUCTION

Issue	Description	Date	Design	Manager
A	ISSUE FOR DEVELOPMENT APPLICATION	27/11/2020	M.M.	J.B.

Certification By:

Architect: mkd architects

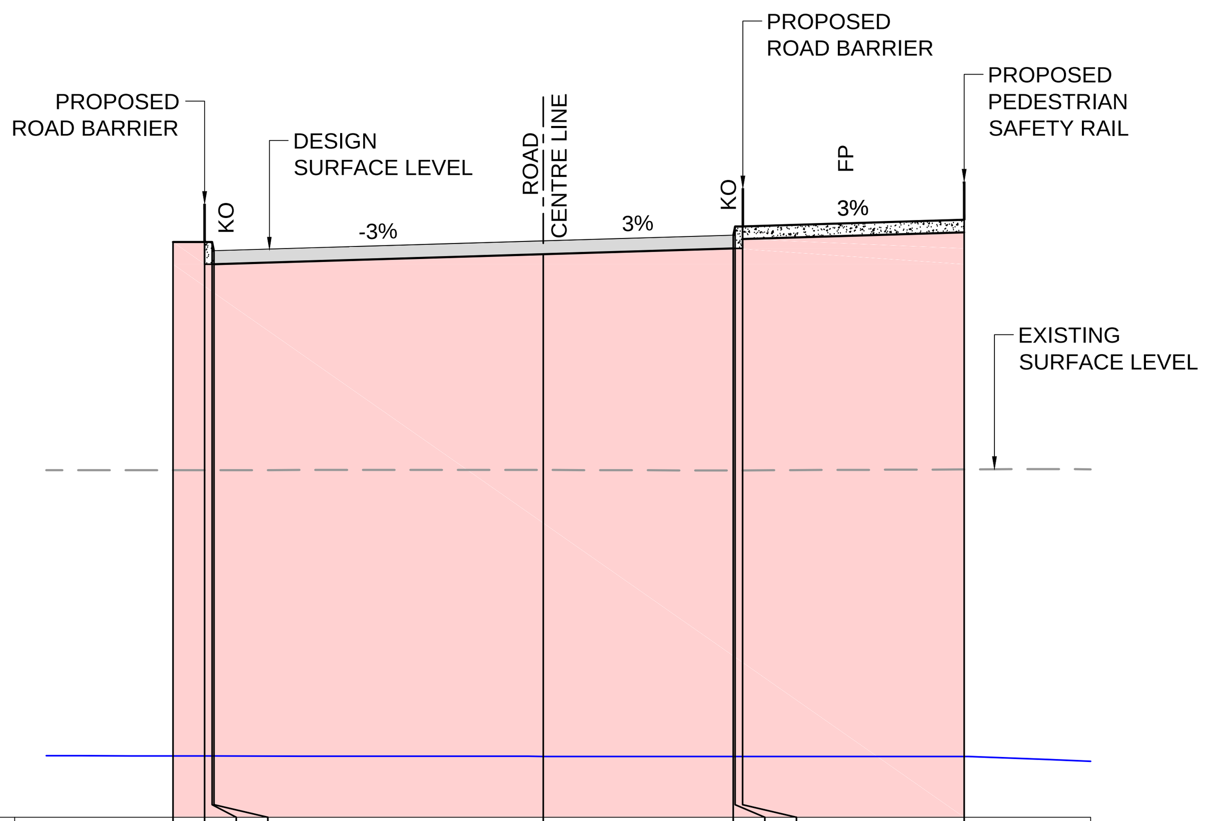
Scale: 0 2 4 6 m — SCALE 1:100 @ A1

AUSTRALIAN CONSULTING ENGINEERS.
PTY LTD - A.C.N. 084 059 941
LEVEL 4, 470 CHURCH STREET NORTH PARRAMATTA NSW 2150
PH: (02) 9763 1500 FX: (02) 9763 1515
EMAIL: info@aceeng.com.au

Project: 1290 GREENDALE ROAD, GREENPARK
PUBLIC DOMAIN WORKS
CIVIL ENGINEERING PLANS
DEVELOPMENT APPLICATION

Drawing Title: ROAD 2 CROSS SECTIONS
CROSS SECTIONS
SHEET 2 OF 4

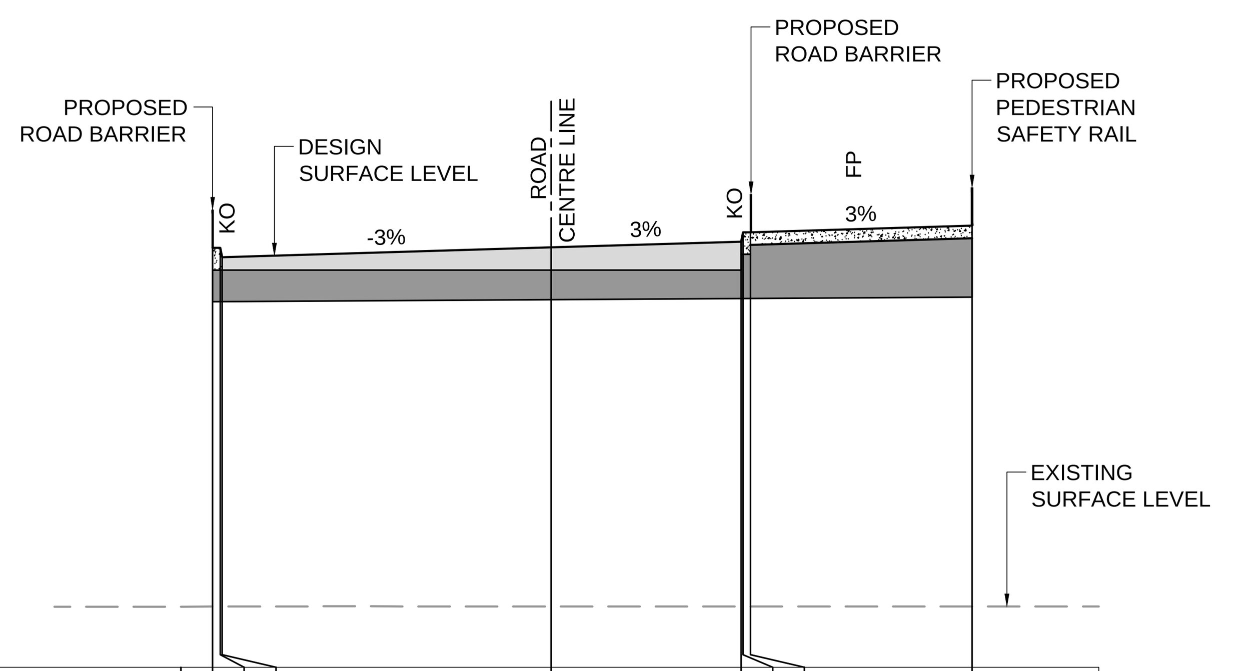
Scale	A1	Project No.	Dwg. No.	Issue
1:100		200597	323	A



DATUM RL 35.000

DESIGN SURFACE LEVEL	44.093	44.093	44.093	43.943	44.099	44.189	44.339	44.339	44.444
EXISTING SURFACE LEVEL	40.486	40.487	40.487	40.487	40.489	40.483	40.483	40.483	40.498
OFFSET	-5.850	-5.350	-5.230	-5.200	0.000	3.000	3.030	3.150	6.650

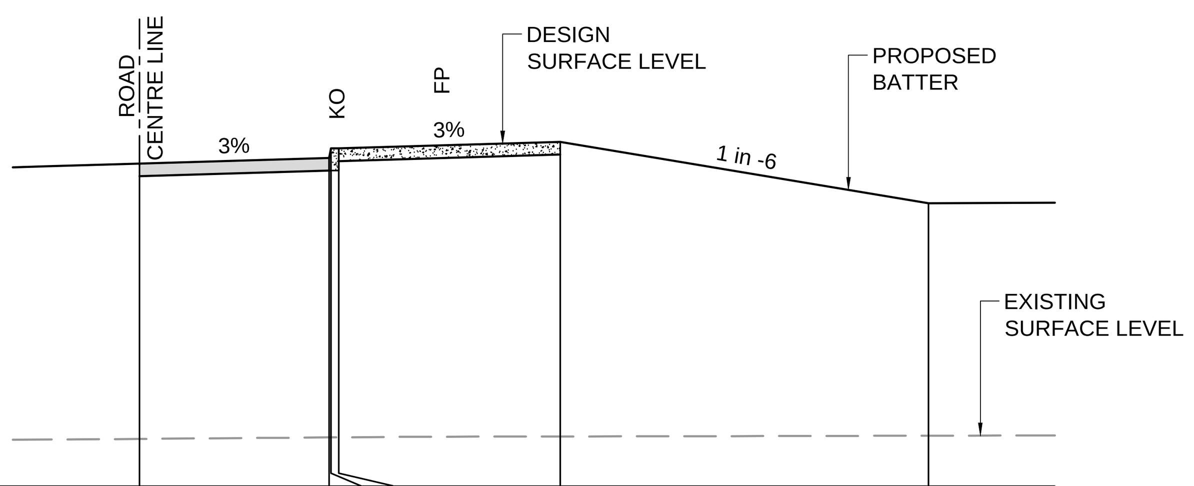
CHAINAGE 1200



DATUM RL 39.000

DESIGN SURFACE LEVEL	45.629	45.629	45.629	45.479	45.635	45.725	45.875	45.875	45.980
EXISTING SURFACE LEVEL	39.958	39.959	39.959	39.959	39.959	39.959	39.959	39.959	39.960
OFFSET	-5.850	-5.350	-5.230	-5.200	0.000	3.000	3.030	3.150	6.650

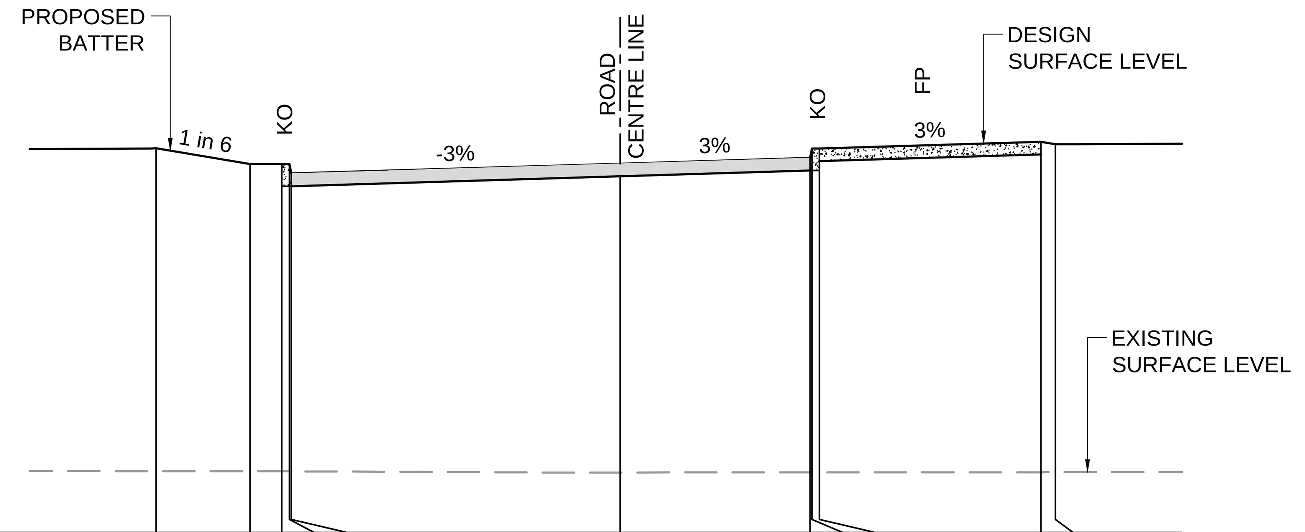
CHAINAGE 1500 - SUSPENDED BRIDGE



DATUM RL 40.500

DESIGN SURFACE LEVEL	45.594	45.684	45.834	45.834	45.939	44.969
EXISTING SURFACE LEVEL	41.243	41.266	41.267	41.267	41.281	41.293
OFFSET	0.000	3.000	3.030	3.150	6.650	12.472

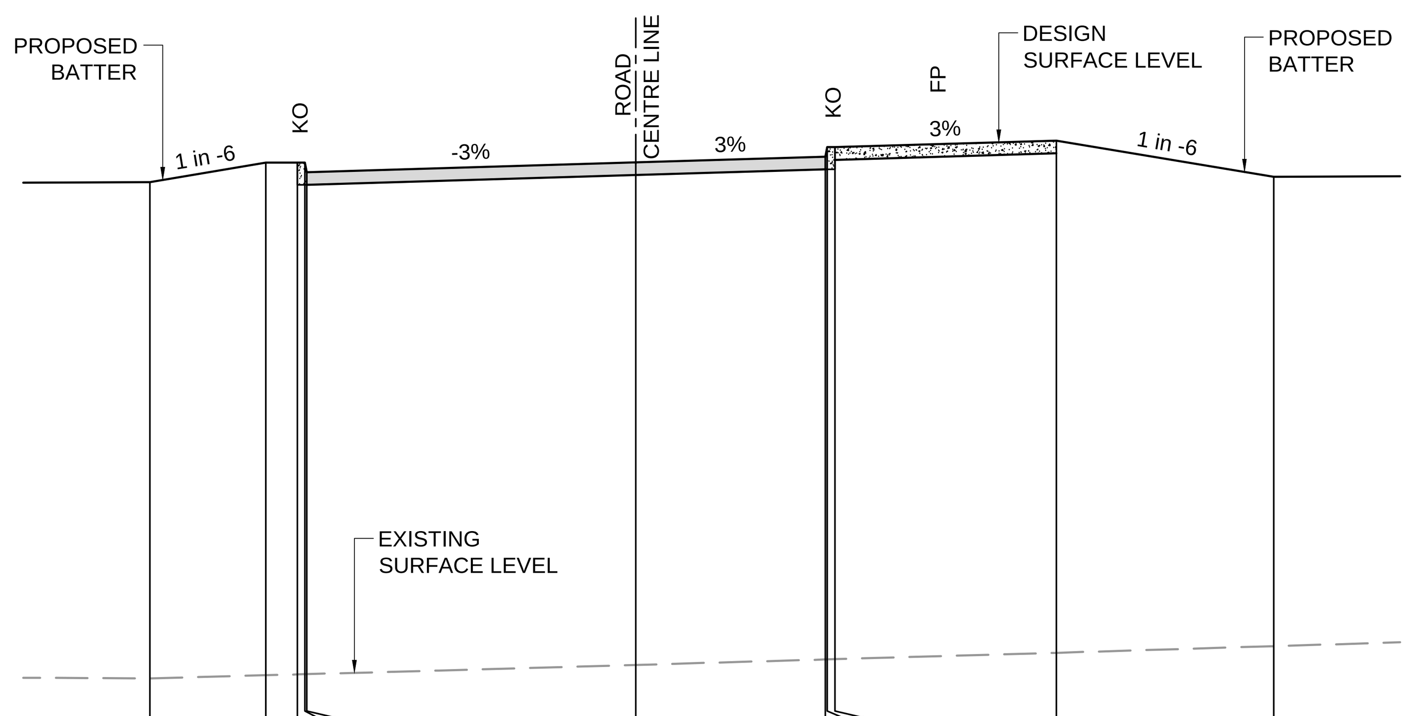
CHAINAGE 1100



DATUM RL 39.000

DESIGN SURFACE LEVEL	45.066	44.819	44.819	44.819	44.669	44.825	44.915	45.065	45.065	45.170	45.132
EXISTING SURFACE LEVEL	39.964	39.962	39.961	39.961	39.961	39.943	39.945	39.945	39.946	39.948	39.948
OFFSET	-7.335	-5.850	-5.350	-5.230	-5.200	0.000	3.000	3.030	3.150	6.650	6.879

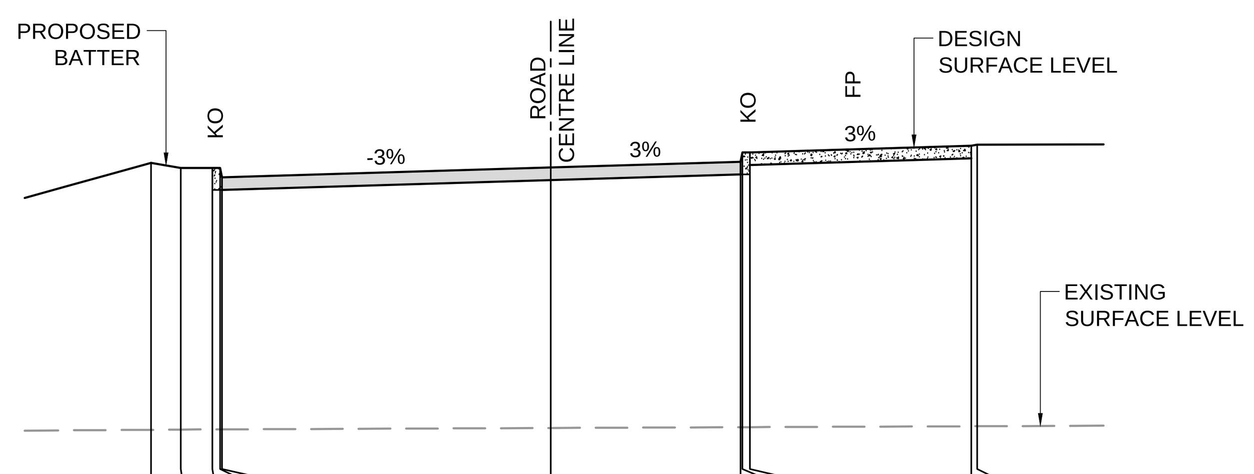
CHAINAGE 1400



DATUM RL 36.500

DESIGN SURFACE LEVEL	45.066	45.371	45.371	45.371	45.221	45.377	45.467	45.617	45.617	45.722	45.149
EXISTING SURFACE LEVEL	37.216	37.265	37.278	37.281	37.282	37.428	37.514	37.515	37.519	37.620	37.725
OFFSET	-7.682	-5.850	-5.350	-5.230	-5.200	0.000	3.000	3.030	3.150	6.650	10.087

CHAINAGE 1000



DATUM RL 39.500

DESIGN SURFACE LEVEL	44.537	44.459	44.459	44.459	44.309	44.465	44.555	44.705	44.705	44.810	44.825
EXISTING SURFACE LEVEL	40.319	40.322	40.325	40.325	40.325	40.347	40.360	40.360	40.360	40.375	40.375
OFFSET	-6.320	-5.850	-5.350	-5.230	-5.200	0.000	3.000	3.030	3.150	6.650	6.742

CHAINAGE 1300

NOT FOR CONSTRUCTION

Issue	Description	Date	Design	Manager
A	ISSUE FOR DEVELOPMENT APPLICATION	27/11/2020	M.M.	J.B.

Certification By:

Architect: mkd architects

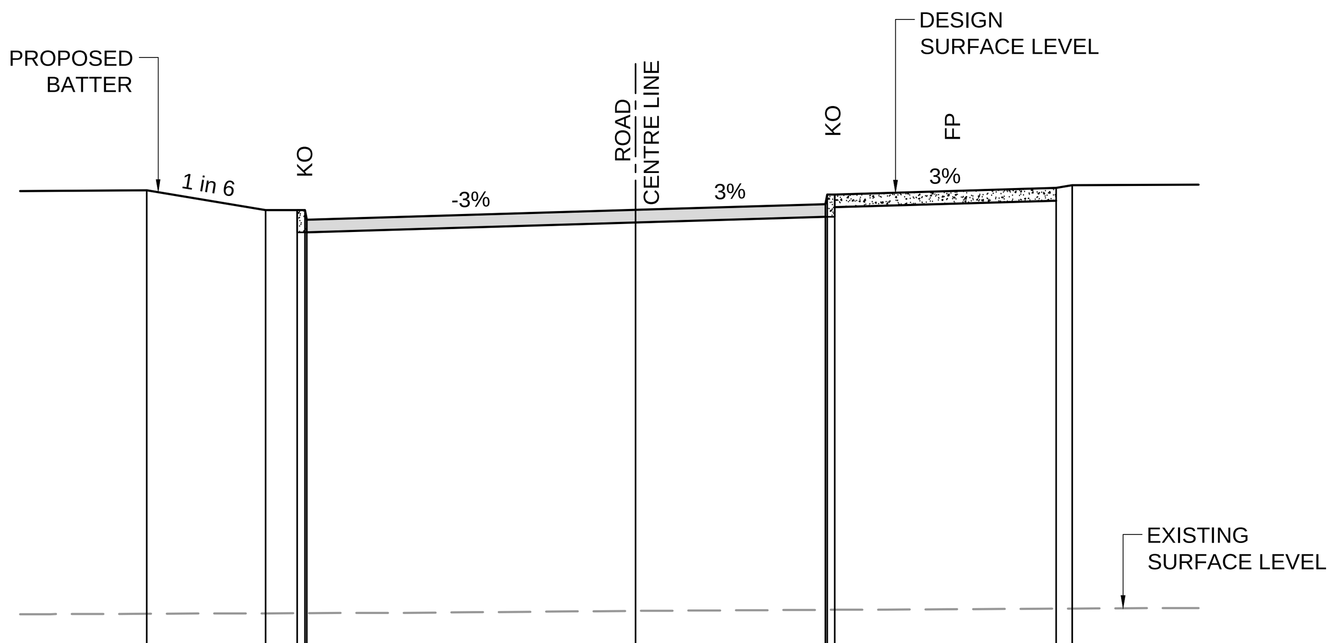
Scale: 0 2 4 6 m — SCALE 1:100 @ A1

AUSTRALIAN CONSULTING ENGINEERS.
PTY LTD - A.C.N. 084 059 941
LEVEL 4, 470 CHURCH STREET NORTH PARRAMATTA NSW 2150
PH: (02) 9763 1500 FAX: (02) 9763 1515
EMAIL: info@aceeng.com.au

Project: 1290 GREENDALE ROAD, GREENPARK
PUBLIC DOMAIN WORKS
CIVIL ENGINEERING PLANS
DEVELOPMENT APPLICATION

Drawing Title: ROAD 2 CROSS SECTIONS
CROSS SECTIONS
SHEET 3 OF 4

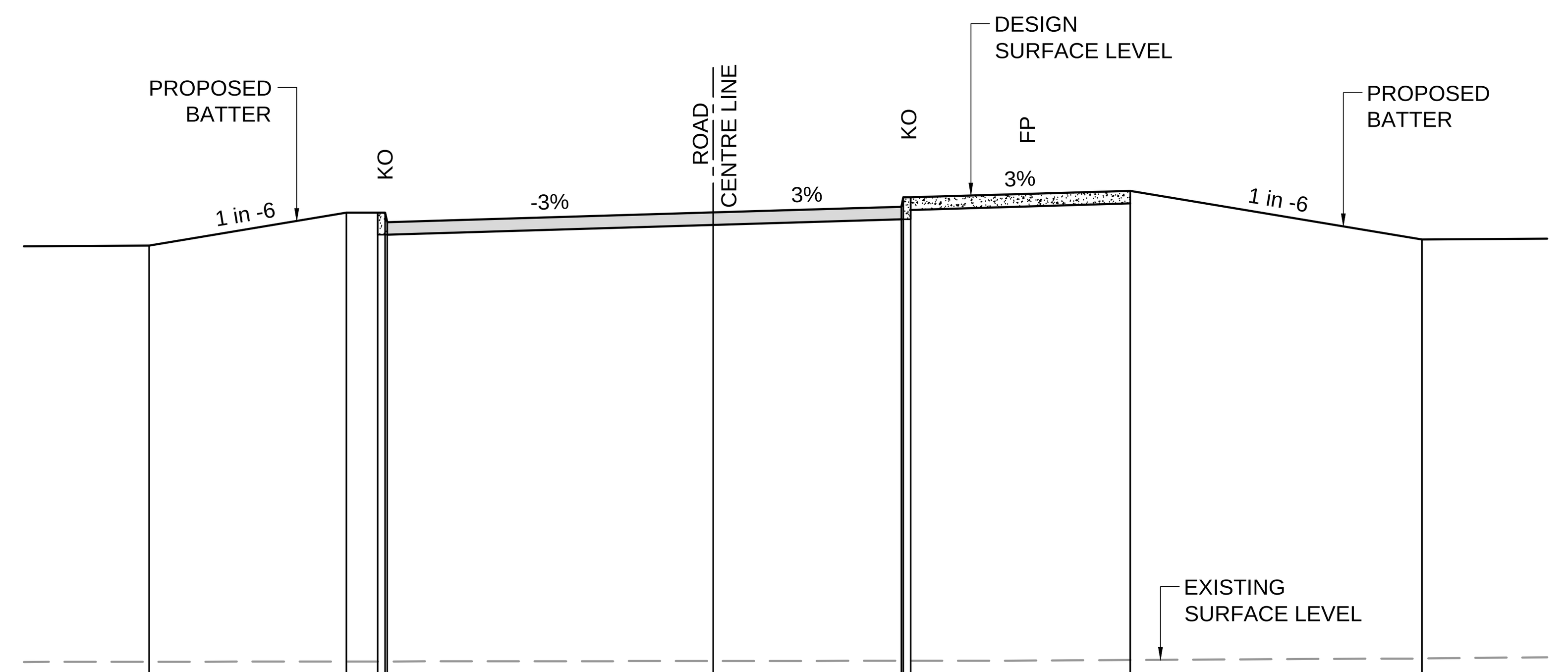
Scale	A1	Project No.	Dwg. No.	Issue
1:100		200597	324	A



DATUM RL 37.500

DESIGN SURFACE LEVEL	45.135	44.821	44.821	44.821	44.671	44.827	44.917	45.067	45.067	45.172	45.215
EXISTING SURFACE LEVEL	38.442	38.449	38.451	38.451	38.451	38.487	38.504	38.504	38.505	38.523	38.525
OFFSET	-7.732	-5.850	-5.350	-5.230	-5.200	0.000	3.000	3.030	3.150	6.650	6.903

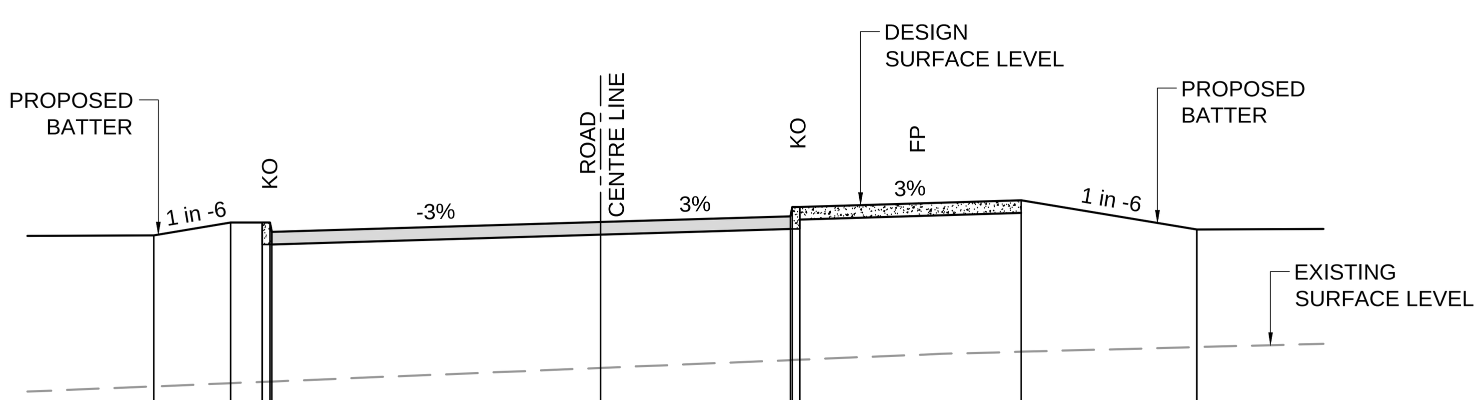
CHAINAGE 1700



DATUM RL 37.500

DESIGN SURFACE LEVEL	44.961	45.485	45.485	45.485	45.335	45.491	45.581	45.731	45.731	45.836	45.061
EXISTING SURFACE LEVEL	38.325	38.329	38.330	38.330	38.330	38.337	38.341	38.341	38.341	38.353	38.378
OFFSET	-8.995	-5.850	-5.350	-5.230	-5.200	0.000	3.000	3.030	3.150	6.650	11.301

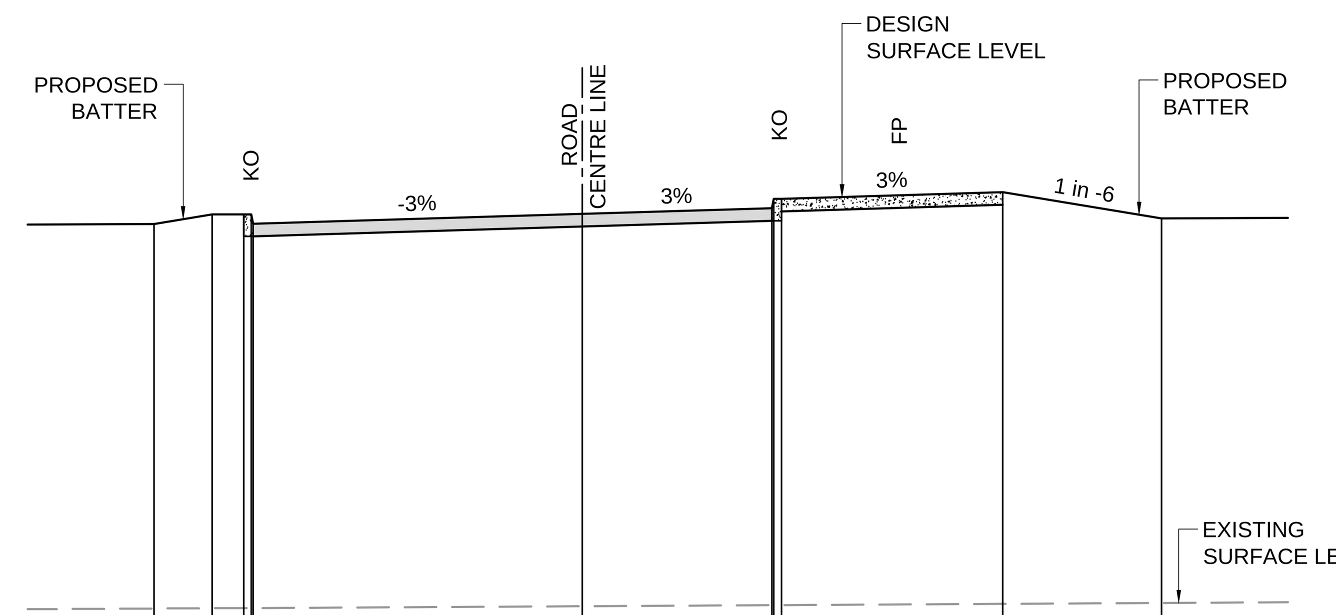
CHAINAGE 1900



DATUM RL 42.000

DESIGN SURFACE LEVEL	45.130	45.332	45.332	45.332	45.182	45.338	45.428	45.578	45.578	45.683	45.221
EXISTING SURFACE LEVEL	42.741	42.791	42.812	42.817	42.818	43.033	43.157	43.158	43.163	43.289	43.362
OFFSET	-7.065	-5.850	-5.350	-5.230	-5.200	0.000	3.000	3.030	3.150	6.650	9.427

CHAINAGE 1600



DATUM RL 38.500

DESIGN SURFACE LEVEL	45.097	45.249	45.249	45.249	45.099	45.255	45.345	45.495	45.495	45.600	45.182
EXISTING SURFACE LEVEL	39.017	39.022	39.025	39.026	39.026	39.055	39.072	39.072	39.073	39.092	39.107
OFFSET	-6.765	-5.850	-5.350	-5.230	-5.200	0.000	3.000	3.030	3.150	6.650	9.157

CHAINAGE 1800

NOT FOR CONSTRUCTION

Issue	Description	Date	Design	Manager
A	ISSUE FOR DEVELOPMENT APPLICATION	27/11/2020	M.M.	J.B.

Certification By:

Architect
mkd architects

Scale
0 2 4 6 m
SCALE 1:100 @ A1

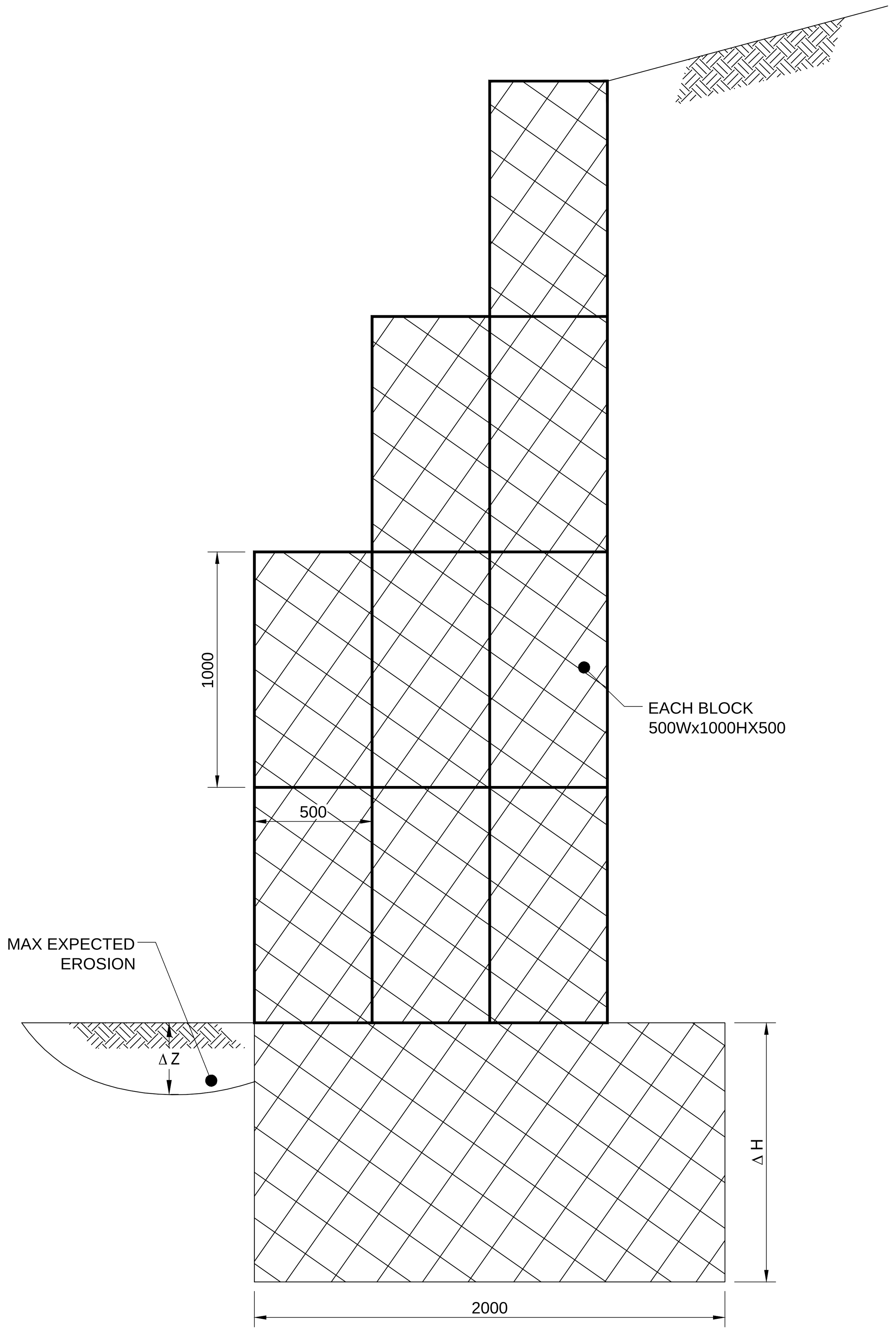
AUSTRALIAN CONSULTING ENGINEERS.
PTY LTD - A.C.N. 084 059 941
LEVEL 4, 470 CHURCH STREET NORTH PARRAMATTA NSW 2150
PH: (02) 9763 1500 FX: (02) 9763 1515
EMAIL: info@aceeng.com.au

Project
1290 GREENDALE ROAD, GREENPARK
PUBLIC DOMAIN WORKS
CIVIL ENGINEERING PLANS
DEVELOPMENT APPLICATION

Drawing Title
ROAD 2 CROSS SECTIONS
CROSS SECTIONS
SHEET 4 OF 4

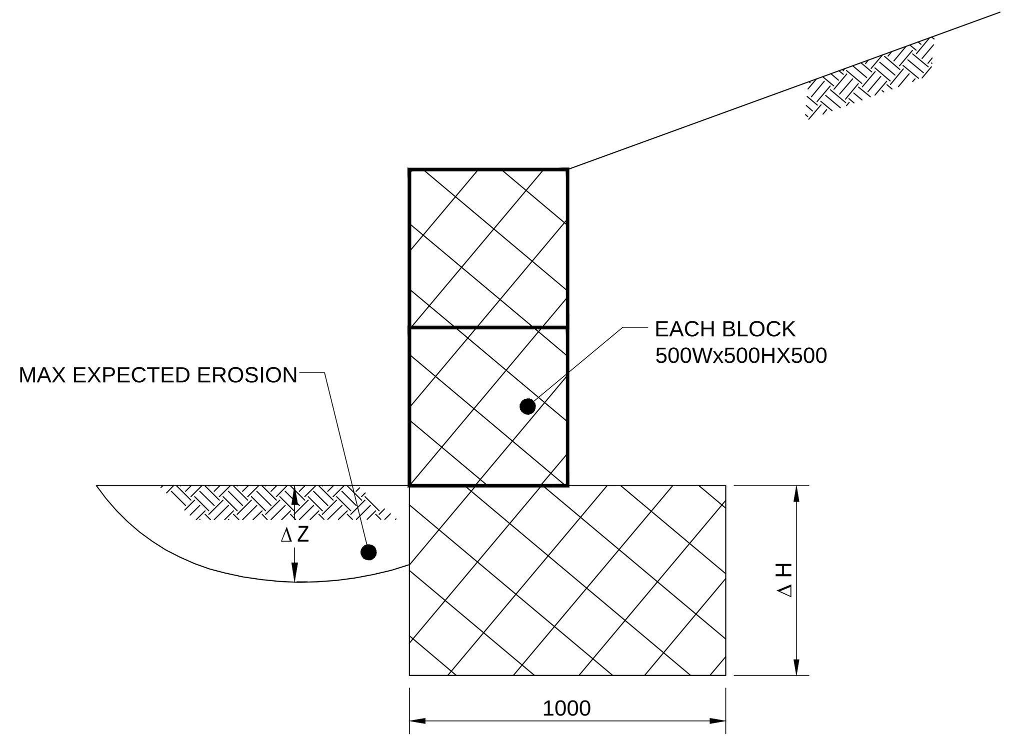
Scale	A1	Project No.	Dwg. No.	Issue
1:100		200597	325	A

GABION RETAINING WALL
(FOR ILLUSTRATION PURPOSES ONLY)
SCALE N.T.S.

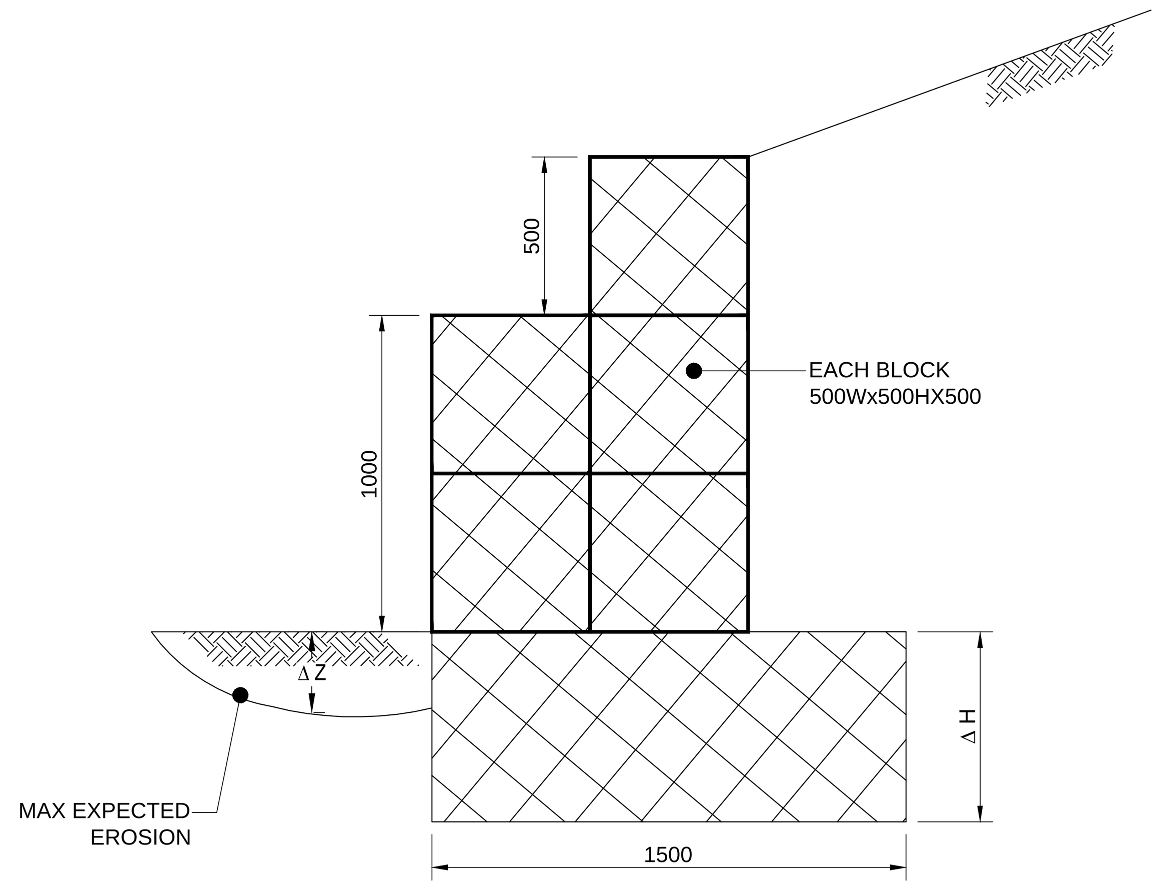


TYP. GB4, MAX 4.0m HIGH

NOTE:
MAXIMUM SLOPE FOR MATTRESS LINING IS 3 (H) 2 (V)
Δ H : FOUNDATION LEVEL OF THE GABION WALL HAS TO BE LOCATED 1m BELOW MAXIMUM EROSION DEPTH
Δ Z : TOE WIDTH MUST BE GREATER THAN 1.50 - 2 TIMES MAXIMUM EROSION (Δ Z)

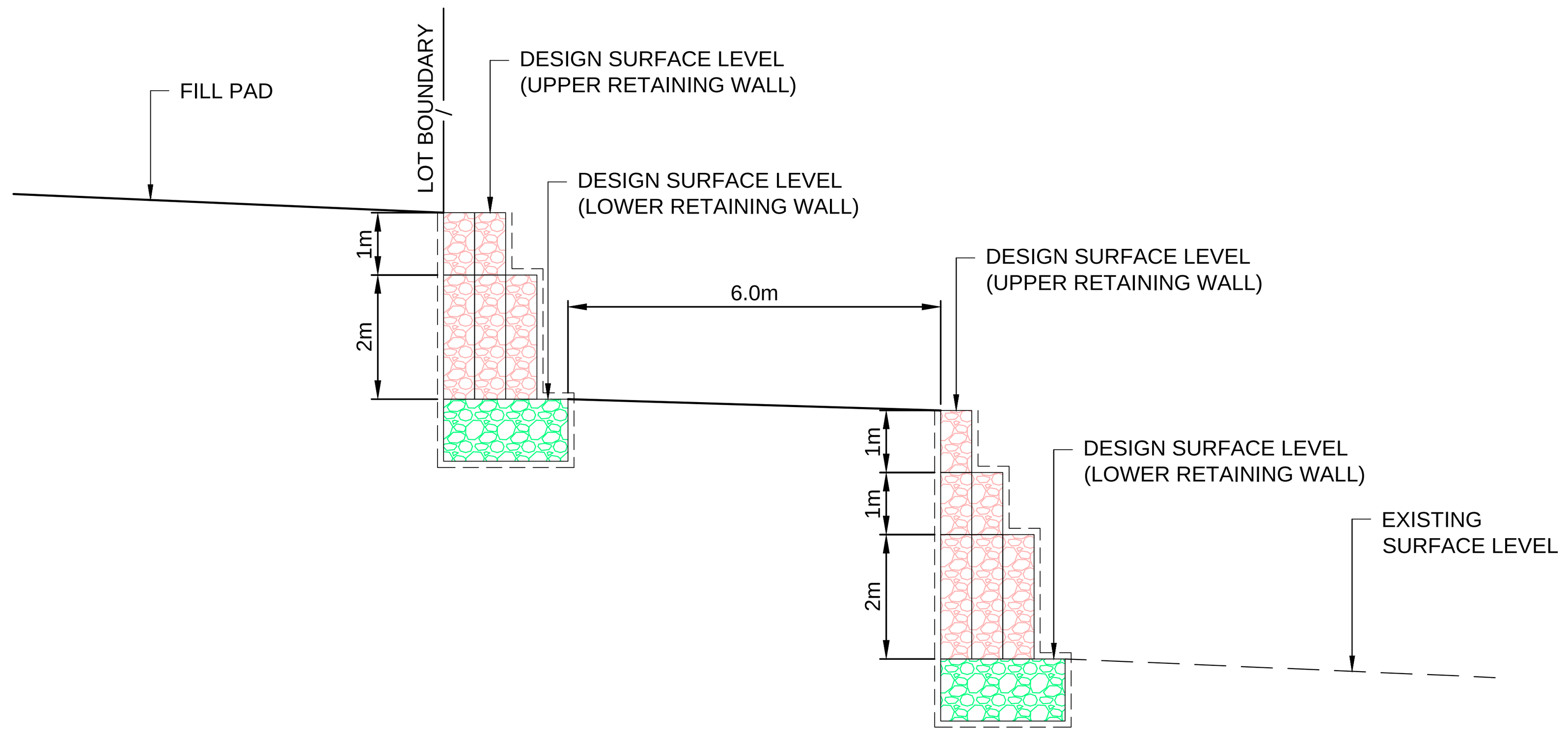


TYP. GB1, MAX 1m HIGH



TYP. GB2, MAX 1.5m HIGH

GABION FOOTINGS DETAILS
N.T.S.



SECTION A
RETAINING WALL - TYPICAL SECTION
SCALE 1:100

NOT FOR CONSTRUCTION

Issue	Description	Date	Design	Manager
A	ISSUE FOR DEVELOPMENT APPLICATION	27/11/2020	M.M.	J.B.

Certification By:

Architect
mkd architects

Scale
0 2 4 6 m
SCALE 1:100 @ A1

AUSTRALIAN CONSULTING ENGINEERS.
PTY LTD - A.C.N. 084 059 941
LEVEL 4, 470 CHURCH STREET NORTH PARRAMATTA NSW 2150
PH: (02) 9763 1500 FX: (02) 9763 1515
EMAIL: info@aceeng.com.au

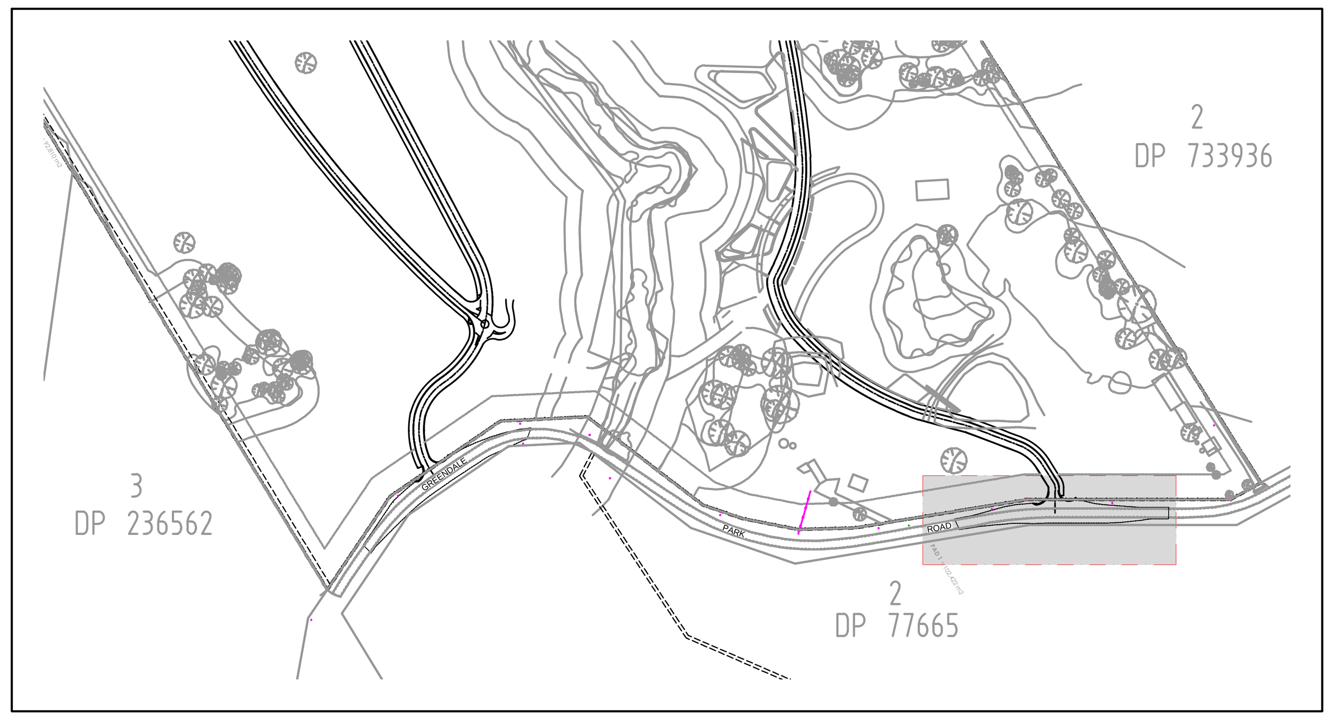
Project
1290 GREENDALE ROAD, GREENPARK
PUBLIC DOMAIN WORKS
CIVIL ENGINEERING PLANS
DEVELOPMENT APPLICATION

Drawing Title
RETAINING WALL
TYPICAL SECTIONS

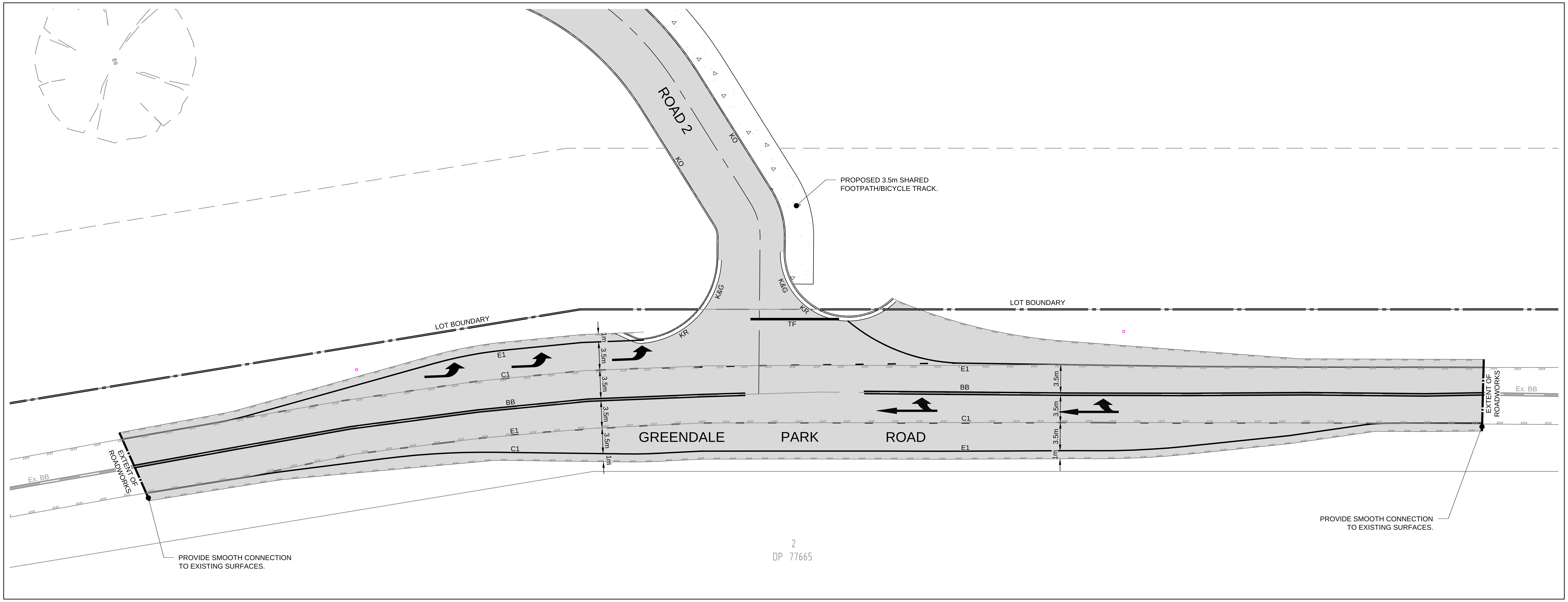
Scale A1	Project No.	Dwg. No.	Issue
AS SHOWN	200597	400	A

LEGEND

	LOT BOUNDARY
KO	PROPOSED KERB ONLY
K&G	PROPOSED KERB AND GUTTER
	PROPOSED ROAD CENTERLINE
	PROPOSED EDGE OF BITUMEN
	PROPOSED ROAD PAVEMENT
	PROPOSED CONCRETE FOOTPATH
E1	LONGITUDINAL LINES EDGE LINES
C1	CONTINUITY LINE
TF	STOP/ HOLD LINE
BB	BB LINEMARKING
Ex. BB	EXISTING BB LINEMARKING
	EXISTING EDGE OF BITUMEN
	EXISTING ROAD CENTRELINE



KEY PLAN
N.T.S.



NOTE:
FOR GENERAL NOTES REFER TO DRG No. ACE171359.CIV.DA.000

NOTE:
ALL WORKS SHOWN ON THIS PLAN ARE SUBJECT TO SEPARATE APPROVAL BY LIVERPOOL COUNCIL.

NOT FOR CONSTRUCTION

Issue	Description	Date	Design	Manager
A	ISSUE FOR DEVELOPMENT APPLICATION	27/11/2020	M.M.	J.B.

Certification By:

Architect: mkd architects

Scale: 0 2 4 6 8 10 12 m — SCALE 1:250 @ A1

AUSTRALIAN CONSULTING ENGINEERS. PTY LTD - A.C.N. 084 059 941
LEVEL 4, 470 CHURCH STREET NORTH PARRAMATTA NSW 2150
PH: (02) 9763 1500 FX: (02) 9763 1515
EMAIL: info@aceeng.com.au

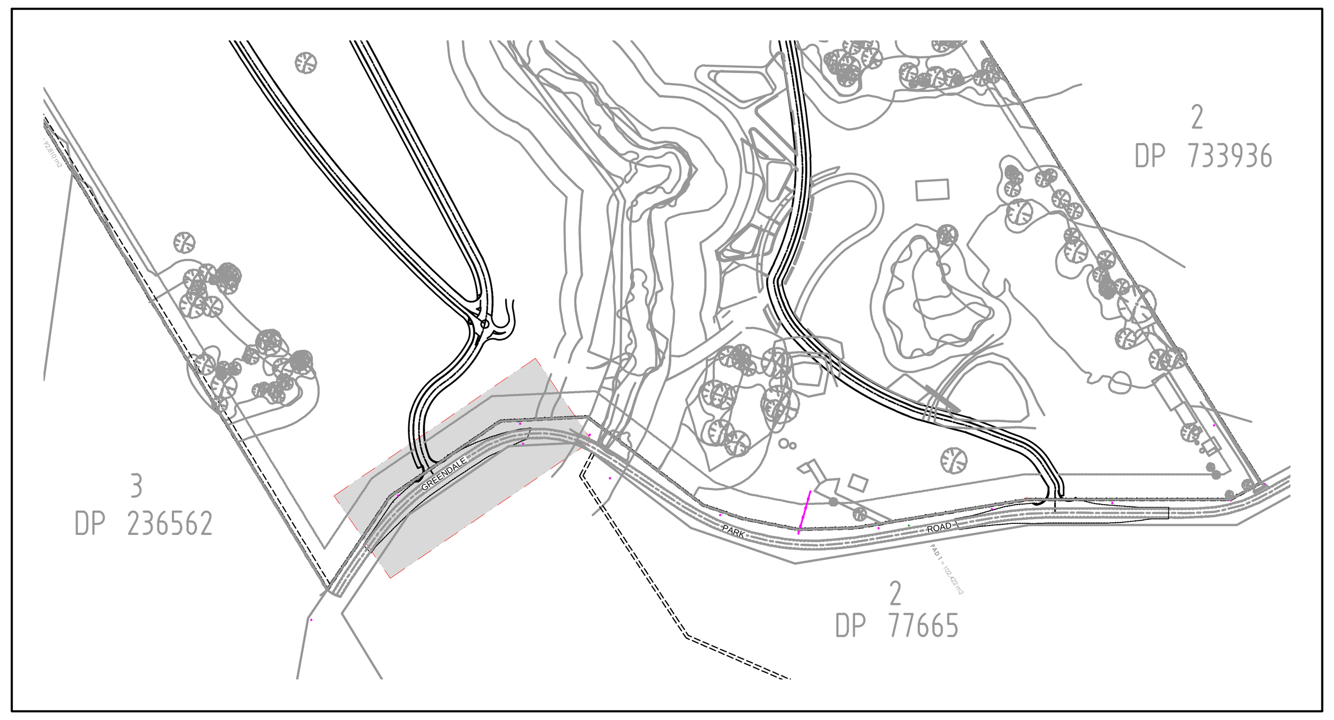
Project: 1290 GREENDALE ROAD, GREENPARK
PUBLIC DOMAIN WORKS
CIVIL ENGINEERING PLANS
DEVELOPMENT APPLICATION

Drawing Title: GREENDALE ROAD INTERSECTION
LAYOUT PLAN SHEET 1 OF 2

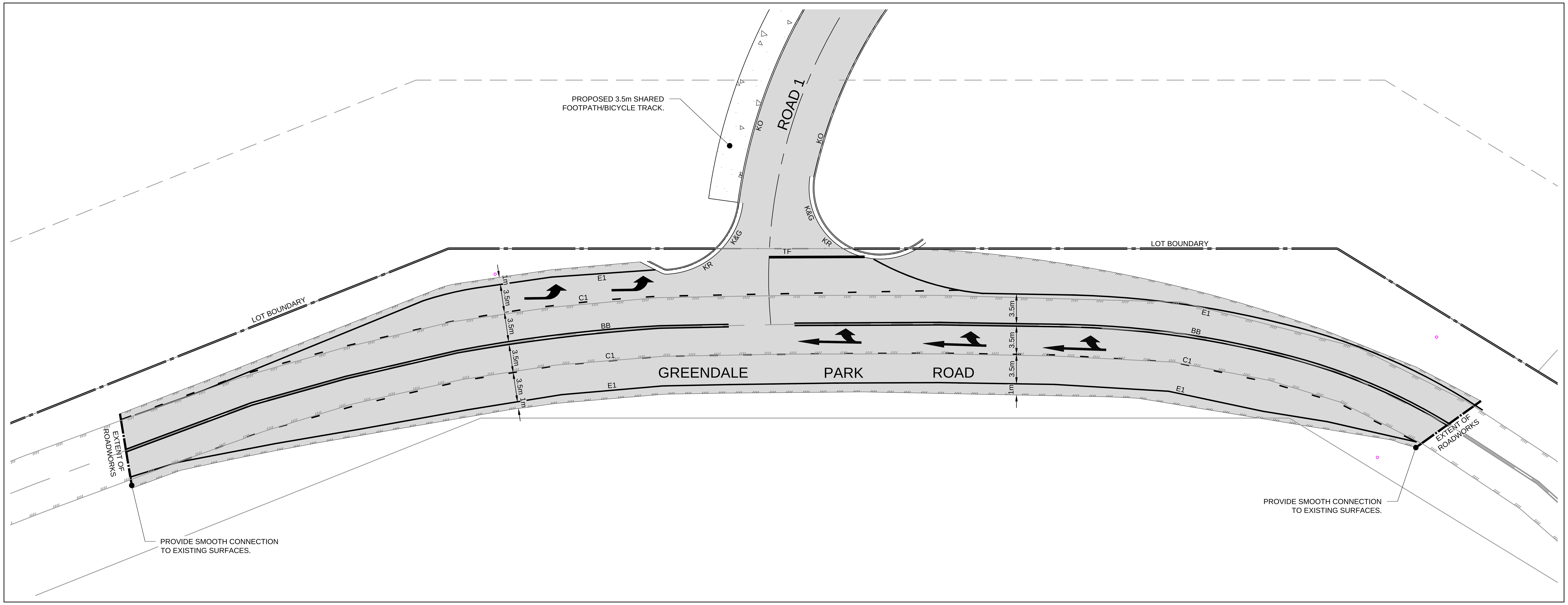
Scale	A1	Project No.	Dwg. No.	Issue
1:250		200597	700	A

LEGEND

LOT BOUNDARY	
KO	PROPOSED KERB ONLY
K&G	PROPOSED KERB AND GUTTER
	PROPOSED ROAD CENTERLINE
	PROPOSED EDGE OF BITUMEN
	PROPOSED ROAD PAVEMENT
	PROPOSED CONCRETE FOOTPATH
E1	LONGITUDINAL LINES EDGE LINES
C1	CONTINUITY LINE
TF	STOP/ HOLD LINE
BB	BB LINEMARKING
Ex. BB	EXISTING BB LINEMARKING
	EXISTING EDGE OF BITUMEN
	EXISTING ROAD CENTRELINE



KEY PLAN
N.T.S.



NOTE:
FOR GENERAL NOTES REFER TO DRG No. ACE171359.CIV.DA.000

NOTE:
ALL WORKS SHOWN ON THIS PLAN ARE SUBJECT TO SEPARATE APPROVAL BY LIVERPOOL COUNCIL.

NOT FOR CONSTRUCTION

Issue	Description	Date	Design	Manager
A	ISSUE FOR DEVELOPMENT APPLICATION	27/11/2020	M.M.	J.B.

Certification By:

Architect
mkd architects

Scale
0 2 4 6 8 10 12 m
SCALE 1:250 @ A1

AUSTRALIAN CONSULTING ENGINEERS.

PTY LTD - A.C.N. 084 059 941
LEVEL 4, 470 CHURCH STREET NORTH PARRAMATTA NSW 2150
PH: (02) 9763 1500 FX: (02) 9763 1515
EMAIL: info@aceeng.com.au

Project
1290 GREENDALE ROAD, GREENPARK
PUBLIC DOMAIN WORKS
CIVIL ENGINEERING PLANS
DEVELOPMENT APPLICATION

Drawing Title
GREENDALE ROAD INTERSECTION LAYOUT PLAN SHEET 2 OF 2

Scale	A1	Project No.	Dwg. No.	Issue
1:250		200597	701	A

Appendix B - Stormwater Drainage Concept Plan (SDCP)

LEGEND

LOT BOUNDARY		PROPOSED ROAD PAVEMENT	
KO PROPOSED KERB ONLY		PROPOSED ROAD OVER MOSELEUM	
PROPOSED ROAD CENTERLINE		PROPOSED BRIDGE	
32.0 FINISHED CONTOURS		PROPOSED CONCRETE FOOTPATH	
SW PROPOSED STORMWATER PIPE		PROPOSED PRAM RAMP	
PROPOSED GULLY PIT		PROPOSED GABION RETAINING WALL	
		EXISTING ROAD CENTRELINE	

NOTE:
FOR GENERAL NOTES REFER TO DRG No. ACE200597.CIV.DA.000

NOT FOR CONSTRUCTION

Issue	Description	Date	Design	Manager
A	ISSUE FOR DEVELOPMENT APPLICATION	27/11/2020	M.M.	J.B.

Certification By:

Architect: mkd architects

Scale: 0 40 80 120 m — SCALE 1:2000 @ A1

AUSTRALIAN CONSULTING ENGINEERS.
PTY LTD - A.C.N. 084 059 941
LEVEL 4, 470 CHURCH STREET NORTH PARRAMATTA NSW 2150
PH: (02) 9763 1500 FAX: (02) 9763 1515
EMAIL: info@aceeng.com.au

Project: 1290 GREENDALE ROAD, GREENPARK PUBLIC DOMAIN WORKS CIVIL ENGINEERING PLANS DEVELOPMENT APPLICATION

Drawing Title: OVERALL ROADWORKS AND DRAINAGE LAYOUT PLAN

Scale	A1	Project No.	Dwg. No.	Issue
1:2000		200597	300	A

GHD

Level 6
20 Smith Street
T: 61 2 8898 8800   F: 61 2 8898 8810   E: ptamail@ghd.com

12517741-96568-32/https://projectsportal.ghd.com/sites/pp15_04/1290greedaleroad/ProjectDocs/12517741-REP_1290 Greendale Road Water Sensitive Urban Design Assessment.docx

Document Status

Revision	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
Draft	R Berg	A Priory	iConnect	N Bailey	iConnect	29/10/2020
Rev 1	R Berg	A Priory	iConnect	N Bailey		30/11/2020

www.ghd.com