Woolacotts.
CONSULTING ENGINEERS

School Infrastructure NSW

Centre of Excellence in Agricultural Education (CoE)

Civil Engineering Report

20-307 | 29th June 2021 | SSDA Submission

Contents

Document control

Rev	Date	Revision details	Approved	Verified	Prepared
A	28.04.21	SSDA Submission		JC	AP
B	03.05.21	Revised Section 3.1		JC	AP
C	20.05.21	Revised Section 5.1		JC	AP
D	29.06.21	Minor Amendments			AP

1.0 Introduction

Woolacotts Consulting Engineers have been engaged by the Department of Education (DoE) to prepare a Civil Engineering Report for the proposed Centre of Excellence in Agricultural Education (CoE).

The new proposed Centre of Excellence in Agricultural Education (CoE) is to be located within the Western Sydney University site off Vines Drive, Richmond ('The Site'). Londonderry Road is located to the west of The Site and Vines Drive is located to the north-east of The Site. The total lease area is approximately 11.37ha. Refer to Figure 1 below for the site location and extent.

The proposed high school includes a single-story complex of 6 buildings and ancillary structures located mainly over the eastern side of the site.

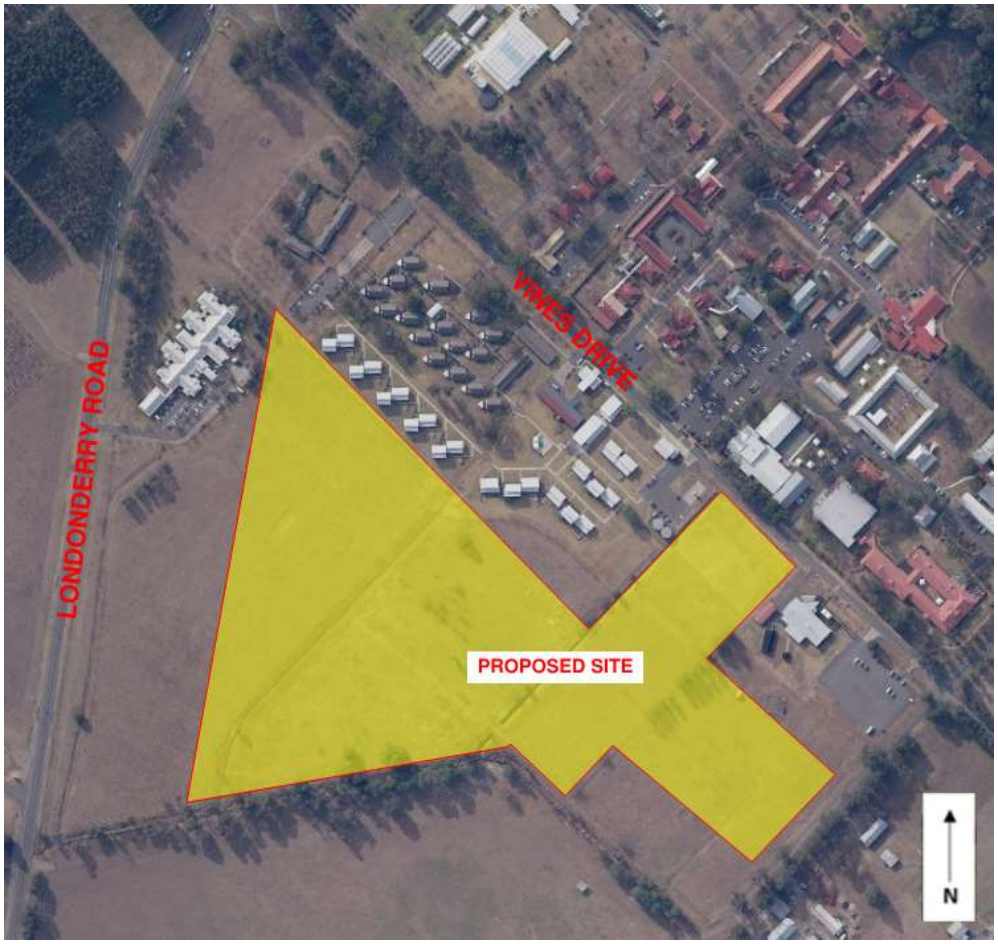

Figure 1 – Site location

The purpose of this report is to identify the civil engineering requirements for the proposed schematic design.

1.0 Existing Conditions

The proposed site is adjacent to the Western Sydney University Village at the north-east and Anglicare Carol Allen House at the north-west. The total lease area is approximately 11.37ha. The site is generally flat with a gentle slope that falls towards the southern boundary of the site.

The site is largely used for agricultural purposes and there are several swales that run across the site from the north-east boundary to an open channel watercourse along the south-west boundary.

3.0 Proposed Development

3.1 Project description

The proposed development involves the construction and operation of a new Centre of Excellence (CoE) in Agricultural Education on a leased land parcel within the Western Sydney University (Hawkesbury Campus) site, Richmond NSW.

The CoE will provide new agricultural / STEM teaching facilities with general learning and administration spaces to be utilised by rural, regional, metropolitan and international school students. The CoE will accommodate up to 325 students and up to 20 full-time employees consisting of farm assistants, administration staff and teachers and up to five (5) itinerant staff members. The CoE will also include short-term on-site accommodation facilities for up to 62 visiting students and teaching professionals from regional and rural NSW.

The CoE will include five science laboratories, ten general learning spaces, practical activity teaching areas, seminar, botany room, administration block and accommodation facilities. It will also include covered outdoor learning areas, dining / conference hall, canteen and kitchen, agricultural plots, significant landscaping spaces, car parking and provision of necessary infrastructure.

The proposed development has been designed to be well integrated into the Western Sydney University site, having due regard for scale, bulk and orientation of existing buildings. The educational facilities will display linear open building forms in single story design with open spaces and lightweight construction techniques. The site is benefitted by Blue Mountains views to the west and the building and landscape plans have incorporated viewing opportunities into the design.

Refer to Figure 2 below for the proposed Site Plan.

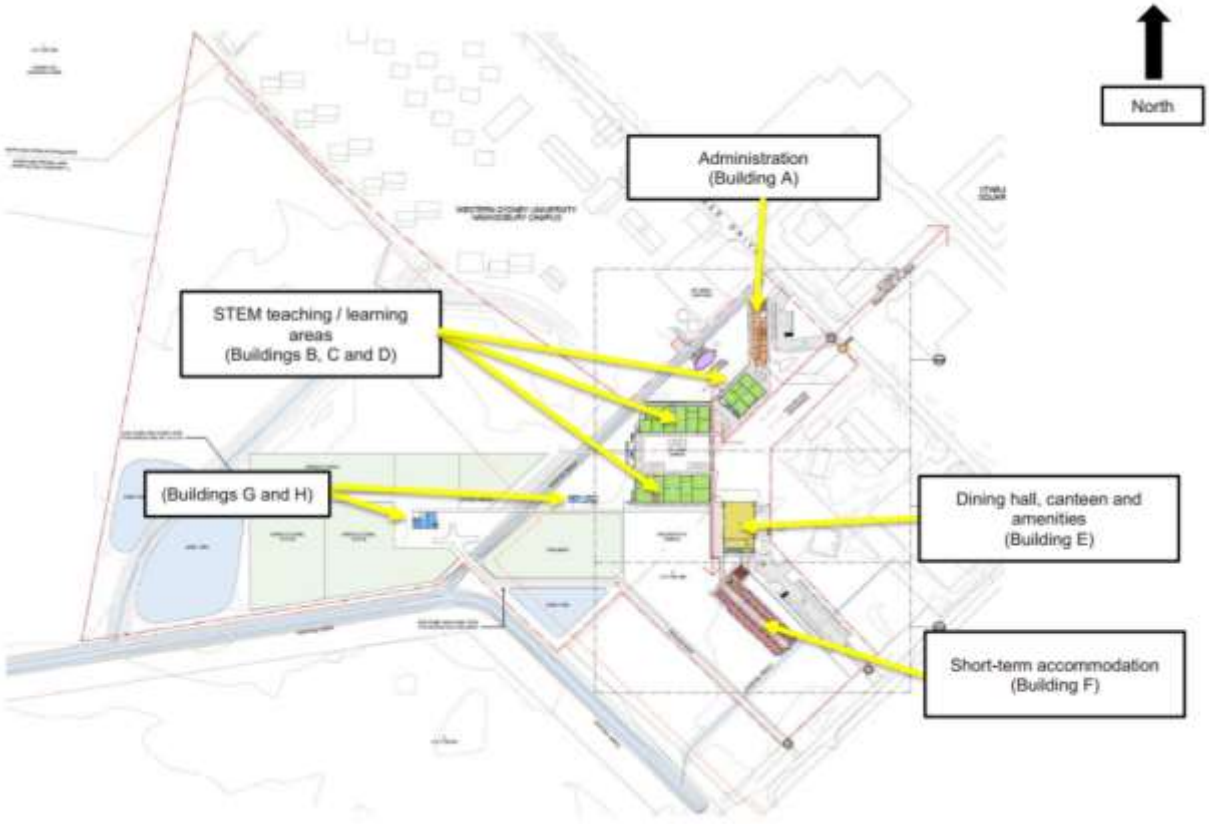

Figure 2 – Proposed Site Plan

3.2 Stormwater Drainage

A stormwater management system has been developed to accommodate the development works resulting in the increased impervious areas, as well as comply with Council's requirements.
The piped stormwater drainage system will be designed to carry runoff from storms up to and including the 5% AEP event, with pipes graded at a minimum fall of 1 in 100 where possible. For runoff from storms up to and including the 1% AEP event, overland flow paths will be provided. External surfaces will be graded at a minimum fall of 1 in 100 where possible to the stormwater collection and drainage system.

To ensure the future flow rate of the post-developed site does not exceed the existing pre-developed site, the total site runoff will be diverted to 3 new detention basins. These detention basins will have an appropriately sized outlet pipe to maintain a maximum discharge equivalent to the pre-development discharge rate during all storm events up to and including the 1% AEP storm event in accordance with Hawkesbury Council's Development Control Plan.

Water sensitive urban design principles have also been incorporated into the stormwater drainage design. The proposed stormwater drainage system has been designed to incorporate treatment devices that ensure the quality of discharged water meets the requirements. Refer to Section 3.4 for MUSIC modelling and results.

Ongoing management and maintenance of the stormwater system inclusive of the pits, pipes, and detention tank are required to form part of the school's maintenance schedule. The periodic cleaning

of the system to remove rubbish and debris is recommended to be undertaken at 6-month intervals and following any storm greater than the 10% AEP event.

Refer to Appendix A - for the concept stormwater management plan.

3.3 On-Site Detention System

Hawkesbury Council's Development Control Plan (HCDCP) requires on-site detention (OSD) system for all new developments. Therefore, an on-site stormwater detention system is proposed for the site.

As direct connections to the existing swales are proposed, On-Site Detention (OSD) storage and Permissible Site Discharge (PSD) need to comply with HCDCP, Appendix E – Civil Works Specification. HCDCP, Appendix E, Section 8.2 outlines OSD storage volume and PSD requirements for all developments as the table below.

Table 1 – On-Site Detention Design Values

	Land Use	
	Residential/ Medium Density/ Commercial	Industrial
Permissible Site Discharge (l/s/ha)	65	39
Site Storage Volume (cu.m/ha)	200	283

The proposed educational development has a total area of approximately 11.37ha. OSD storage and PSD requirements for the proposed development for the 1% AEP storm event based on the table are:

- Storage = 2320 m^3
- PSD = 754 L/s

Refer to Appendix B – Calculations, for further information.

Three OSD basins with a combined storage volume of 2320m^3 are proposed within The Site area. Each OSD basin has an outlet pipe that meets the PSD requirements. The outlet pipe of each OSD basin is connected to the existing swales for the stormwater discharge.

3.4 MUSIC Modelling

A Model for Urban Stormwater Improvement Conceptualisation (MUSIC) has been developed as a conceptual design tool for the purpose of estimating generated pollution within the catchment area. The model has been used to demonstrate the performance of implemented stormwater quality improvement systems.

The improvement systems implemented have been assessed to meet the stormwater treatment requirements set out in accordance with the NSW Office of Environment and Heritage. Annual pollutant loads targets are summarised as follows:

- 45% reduction in Total Nitrogen (TN)
- 65% reduction in Total Phosphorus (TP)
- 85% reduction in Total Suspended Solids (TSS)
- 90% reduction in Gross Pollutants

The 6min Sydney Observatory Hill rainfall station including monthly PET values, were utilised as part of the analysis.

The proposed stormwater drainage system has been designed to incorporate treatment devices that ensure the quality of discharged water meets the requirements outlined above. The treatment devices include rainwater tanks with independent rainwater / roof collection pipes (refer to hydraulic engineers' drawings), grassed swales, bioretention pond, wetland with filtration system and enviropods inserted in all grated pits.

All roof water downpipes are connected via an independent pit and pipe system to two new 30m^3 rainwater tanks. Overflow from the rainwater tank will be directed to an OSD basin.

The onsite detention basins are implemented to manage excess runoff generated by the newly constructed impervious areas. The controlled outlets have been determined to restrict the outflow of large quantities of water whilst maintaining quality at outlined specifications in accordance with council policy.

Following discharge from the detention basins, stormwater is directed to the existing swales that run across the site.

The impervious fractions of the catchment have been determined from the proposed developed site plans. This method has allowed an improvement in accuracy of the input data as impervious mediums such as surface area of pavements and roofs are site specific.

The following MUSIC Model performance results have been obtained:

Total treatment system (% Reduction):

Total Nitrogen: 63%
Total Phosphorus: 70%
Total Suspended Solids: 85.5%
Gross Pollutants: 100%

Refer Figure 3 below for the MUSIC Model treatment train.

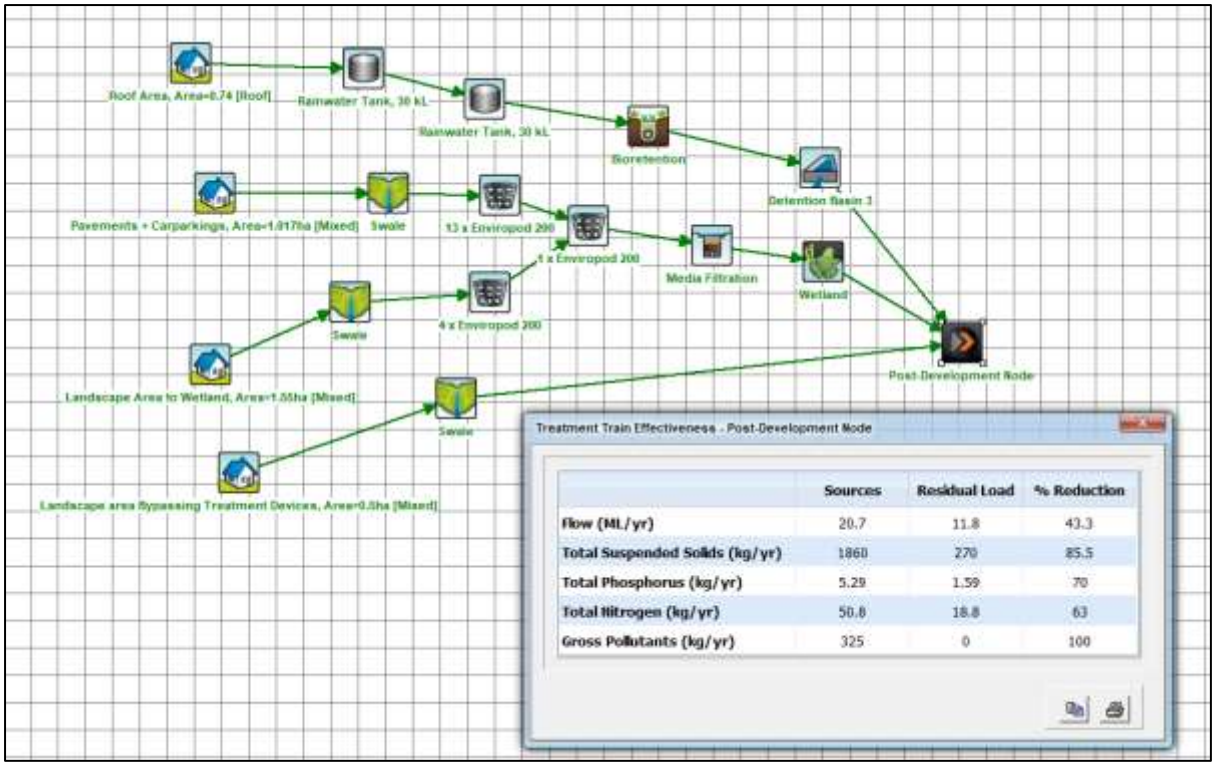

Figure 3 – MUSIC Model Treatment Train

3.5 Erosion and Sediment Control

During construction, erosion and sediment control measures will be provided in accordance with the requirements of “Managing Urban Stormwater Soils and Construction, 4th Edition (Blue Book)”. These measures will include silt fences on the low side of the site, silt traps at stormwater pits and a construction exit to remove silt from vehicles before they leave the site. Dust control measures will also be provided. Refer to drawing ES01 for the Erosion and Sediment Control Plan.

4.0 Road design

4.1 Vines Drive and Maintenance Lane

It is understood that additional vehicles will be utilising Vines Drive and Maintenance Lane as a result of the proposed development. To determine if these existing roads are suitable for the proposed additional traffic additional geotechnical investigation was undertaken involving bore holes along Vines Drive and Maintenance Lane.

The bore holes show that for the Vines Drive the pavement composition consist of

- 70mm thick asphaltic concrete
- 130mm basecourse material
- Sand subbase material (CBR of 35%)

For Maintenance Lane the pavement composition consist of

- 10 - 20mm sprayed seal
- 130 - 230mm basecourse material
- Sand subbase material (CBR of 30%)

Woolacotts have undertaken pavement design calculations based on the above pavement composition and the below assumptions:

- Flexible pavement
- 20 year design life
- Estimated 1 x 10^6 estimated standard axles (ESAs)
- Maximum Medium Rigid Vehicle (MRV)

The calculations show that Vines Drive and Maintenance Lane, within proximity of the proposed development, has sufficient structural capacity for the anticipated traffic volume generated by the proposed development.

Refer *Factual Report on Geotechnical Investigation – Centre of Excellence in Agricultural Education* by Douglas Partners dated May 2021 (Project 202196.00).

4.2 Service Bays and Car parks

Service / Turn bays and crossovers are to be hardstand concrete pavement as per EFSG requirements. Preliminary calculations show this to be 180mm thick concrete on a 150mm thick basecourse material.

Assuming a 1 x 10^5 ESA and a CBR of 7%, Carparks are to be minimum 250 mm thick asphalt consists of 40mm thick asphaltic concrete, 100mm basecourse material and 110mm subbase material.

Appendix A
Civil Works Plan

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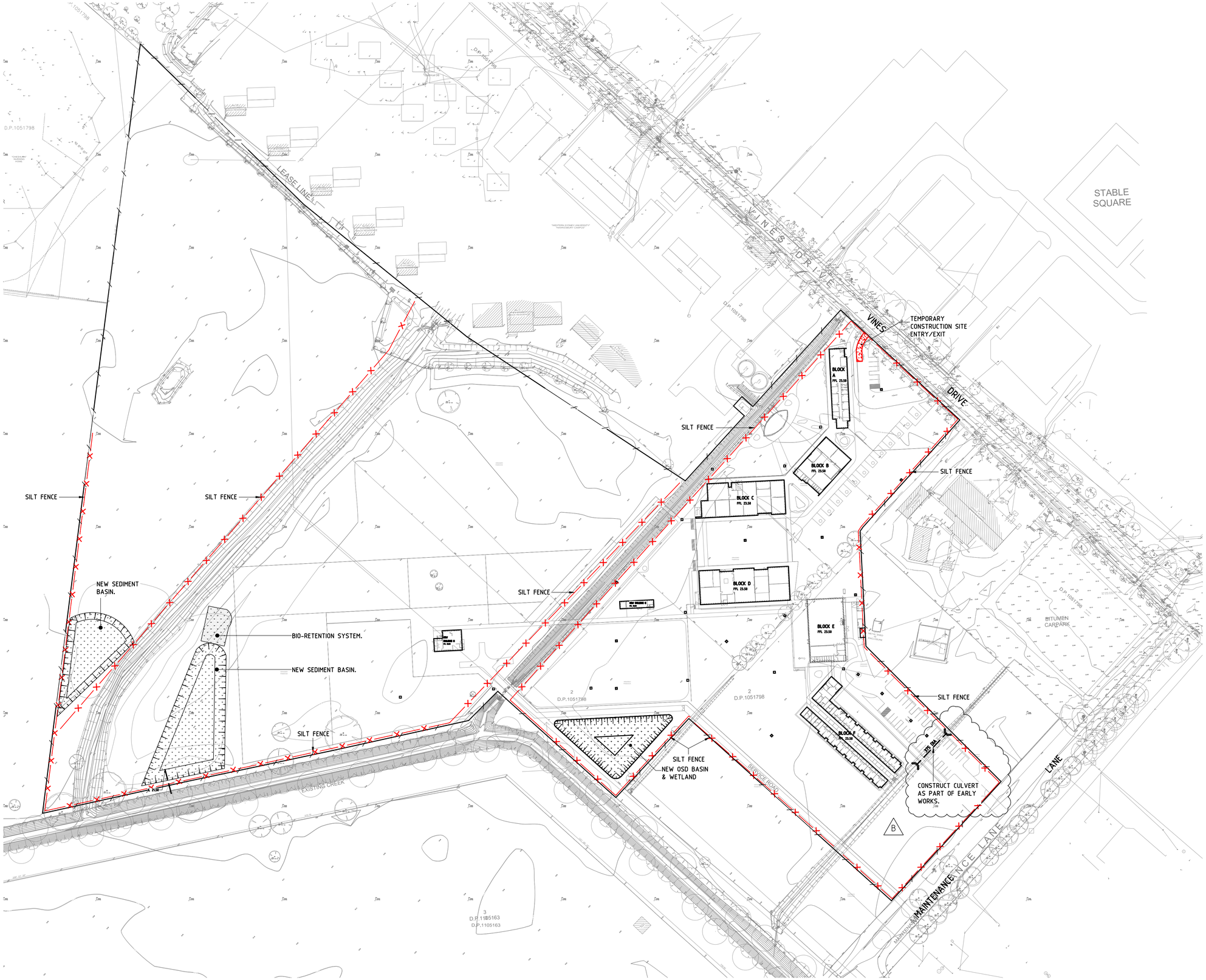

LEGEND

- TEMPORARY CONSTRUCTION SITE ENTRY/EXIT. REFER DETAIL.
- NEW SEDIMENT BASIN
- SILT FENCE. REFER DETAIL.
- SITE BOUNDARY
- NEW STORMWATER PIT
- BATTER

PROVIDE SILT FENCE TO LOW SIDE OF AREA OF WORKS (TYP). LOCATION TO BE ADAPTED ONSITE TO SUIT CONSTRUCTION STAGING AS REQUIRED.
REFER TO DETAIL.

PROVIDE SEDIMENT TRAP AROUND ALL EXISTING STORMWATER PITS AND NEW STORMWATER PITS FOR ENTIRE DURATION OF WORKS.

Issue

No.	Date	Description	Chkd
A	28.04.21	SSDA SUBMISSION.	
B	29.06.21	TEMPORARY ACCESS AMENDED.	

Architect

NBRSARCHITECTURE.

Sydney
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Nominated Architect:
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Project

Centre of Excellence in Agricultural Education

at
HAWKESBURY

for
DEPARTMENT OF EDUCATION

Drawing Title

EROSION AND SEDIMENT CONTROL PLAN

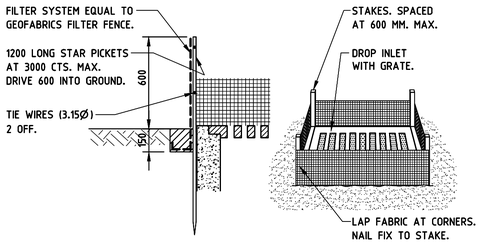
Date APRIL 2021
Scale 1:1000

Drawing Reference
20-307_ES01

Revision
B

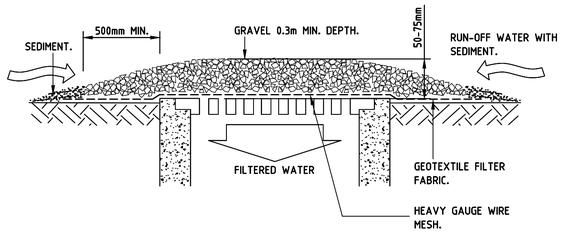
0 10 20 30 40 50 60 70 80 90 100

SCHEMATIC CIVIL WORKS DESIGN



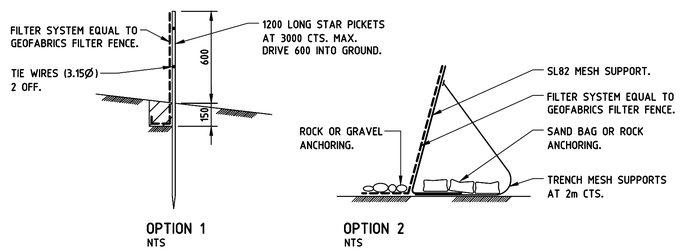
GEOTEXTILE FILTER FABRIC DROP INLET SEDIMENT TRAP.

TO BE PROVIDED AT GRATED PITS WITHIN PERVIOUS AREAS.



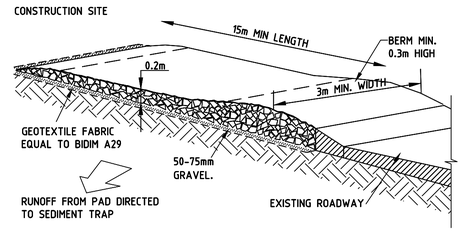
WIRE MESH AND GRAVEL DROP INLET SEDIMENT TRAP.

TO BE PROVIDED AT GRATED PITS WITHIN IMPERVIOUS AREAS.



SILT FENCE DETAILS

TO BE PLACED AROUND LOW SIDE OF PROPERTY BOUNDARY AND AROUND STORMWATER INLET STRUCTURES TO PREVENT SOIL WASHING OFF SITE.



TEMPORARY CONSTRUCTION ENTRY/EXIT

TO BE LOCATED AT VEHICLE EXIT FROM SITE

NBRSARCHITECTURE.

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Issue

No.	Date	Description	Chkd
A	28.04.21	SSDA SUBMISSION	

Architect

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Centre of Excellence in Agricultural Education

at

HAWKESBURY

for

DEPARTMENT OF EDUCATION

Drawing Title

EROSION AND SEDIMENT CONTROL DETAILS

Date APRIL 2021

Scale 1:20

Drawing Reference

20-307_ES02

Revision

A

0 10 20 30 40 50 60 70 80 90 100

CENTRE OF EXCELLENCE
IN AGRICULTURAL EDUCATION (CoE)

DRAWING LIST

20-307_SC00	KEY PLAN, DRAWING LIST & LEGEND
20-307_SC01	STORMWATER MANAGEMENT PLAN - SHEET 1
20-307_SC02	STORMWATER MANAGEMENT PLAN - SHEET 2
20-307_SC03	STORMWATER MANAGEMENT PLAN - SHEET 3
20-307_SC04	STORMWATER MANAGEMENT PLAN - SHEET 4
20-307_SC05	OSD BASIN SECTION AND DETAILS
20-307_ES01	EROSION AND SEDIMENT CONTROL PLAN
20-307_ES02	EROSION AND SEDIMENT CONTROL DETAILS

LEGEND

CONCRETE PAVEMENT TYPE 1:
125 THICK N32 CONCRETE SLAB
REINFORCED WITH SL72 FABRIC (40 TOP COVER)
ON 100mm COMPACTED DGB20 BASECOURSE MATERIAL.
ON COMPACTED SUBGRADE.
CONCRETE FINISH TO ARCHITECT'S DETAIL.

VEHICULAR ASPHALTIC CONCRETE PAVEMENT:
40mm AC10 ON
100mm DGB20 BASECOURSE MATERIAL ON
110mm DGS40 SUB-BASECOURSE MATERIAL ON
COMPACTED SUBGRADE.

VEHICULAR CONCRETE PAVEMENT:
180mm THICK N40 CONCRETE SLAB
REINFORCED WITH SL92 FABRIC (40 TOP COVER)
ON 100mm COMPACTED BASECOURSE MATERIAL
ON COMPACTED SUBGRADE.
CONCRETE FINISH TO ARCHITECT'S DETAIL.

SERVICE ROAD PAVEMENT:
100mm DGB20 BASECOURSE MATERIAL ON
COMPACTED SUBGRADE.

ABOVE GROUND ON SITE DETENTION BASIN.

BIO-RETENTION SYSTEM / FILTER MEDIA

NEW STORMWATER PIPE

RW — NEW RAINWATER COLLECTION PIPE

NEW SWALE

NEW OVERLAND FLOW PATH.

CHILD-PROOF FENCE TO
ARCHITECT'S SPECIFICATION.

NEW STORMWATER PIT

RWT — NEW RAINWATER TANK

RW — NEW RETAINING WALL

DP — NEW DOWN PIPE.

3.80 — PROPOSED SPOT LEVEL

EX3.80 — EXISTING SPOT LEVEL

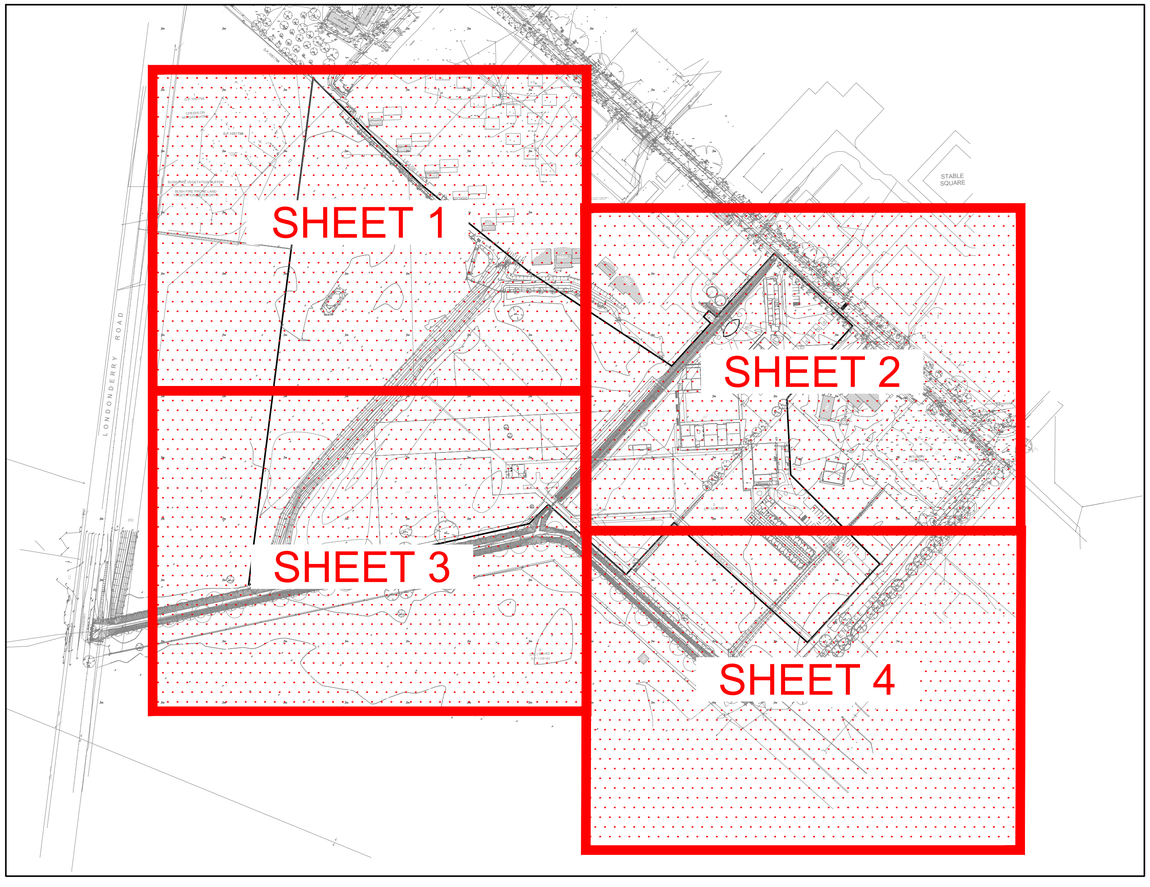
NEW PRECAST HEADWALL.

BATTER

SITE INFORMATION SUMMARY:

TOTAL SITE AREA = 11.6ha (APPROXIMATE)
OSD COUNCIL REQUIREMENT = 200m³/ha
OSD REQUIRED = 2320m³
OSD VOLUME PROVIDED = 2320m³
PSD COUNCIL REQUIREMENT = 65 L/S/ha
PSD MAXIMUM ALLOWED FOR THE SITE = 754 L/S

NOTE::
ENVIROPOD INSERTS TO BE INSTALLED IN
ALL GRATED INLET PITS.



KEY PLAN

Issue

No.	Date	Description	Chkd
A	28.04.21	SSDA SUBMISSION	

Architect

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Centre of Excellence in Agricultural Education

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HAWKESBURY

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Drawing Title
KEY PLAN, DRAWING LIST AND LEGEND

Date APRIL 2021
Scale -

Drawing Reference
20-307_SC00

Revision
A

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FOR CONTINUATION REFER TO DRAWING SC02

FOR CONTINUATION REFER TO DRAWING SC03

Issue

No.	Date	Description	Chkd
A	28.04.21	SSDA SUBMISSION	

Architect

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Project

Centre of Excellence in Agricultural Education

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HAWKESBURY

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Drawing Title

SCHEMATIC CIVIL WORKS DESIGN - SHEET 1

Date APRIL 2021
Scale 1:500

Drawing Reference
20-307_SC01

Revision
A

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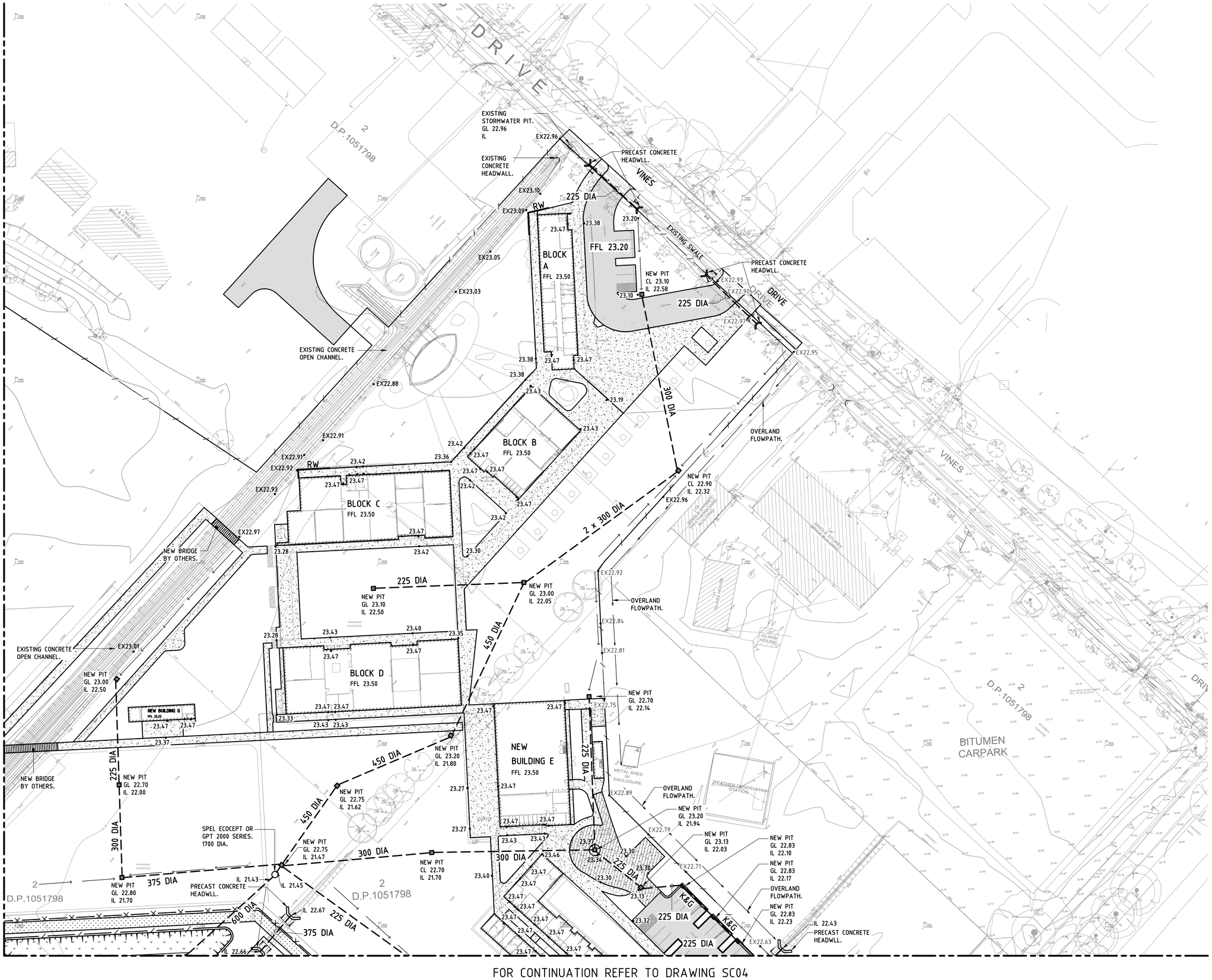
RICHARD CROOKES CONSTRUCTIONS



FOR CONTINUATION REFER TO DRAWING SC01 & SC03

FOR CONTINUATION REFER TO DRAWING SC04

Issue

No.	Date	Description	Chkd
A	28.04.21	SSDA SUBMISSION	

Architect

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Centre of Excellence in Agricultural Education

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Drawing Title

SCHEMATIC CIVIL WORKS DESIGN - SHEET 2

Date APRIL 2021

Scale 1:500

Drawing Reference

20-307_SC02

Revision

A

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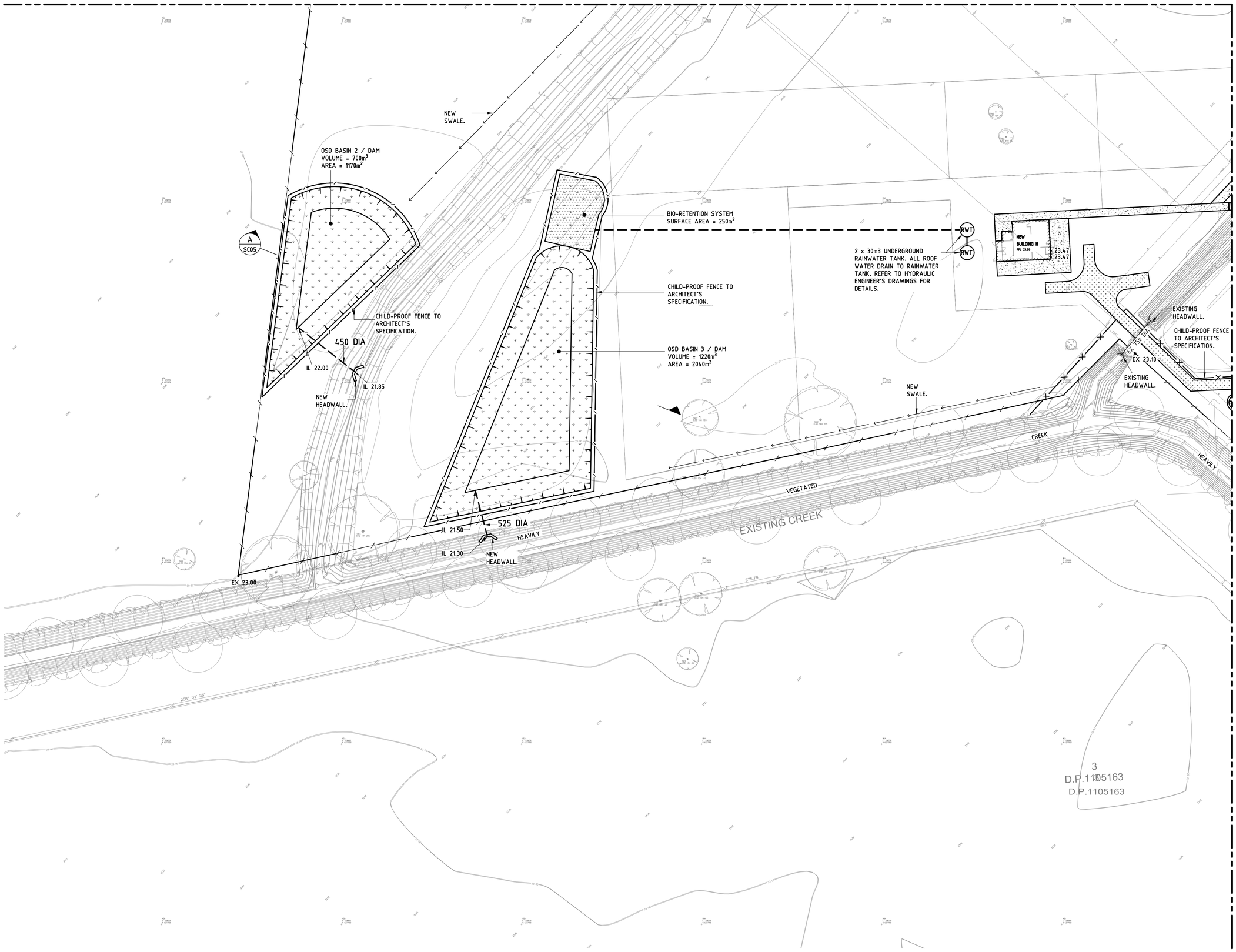
FOR CONTINUATION REFER TO DRAWING SC01



FOR CONTINUATION REFER TO DRAWING SC02 & SC04

Issue

No.	Date	Description	Chkd
A	28.04.21	SSDA SUBMISSION	

Architect

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Project

Centre of Excellence in Agricultural Education

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HAWKESBURY

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DEPARTMENT OF EDUCATION

Drawing Title

SCHEMATIC CIVIL WORKS DESIGN - SHEET 3

Date APRIL 2021

Scale 1:500

Drawing Reference

20-307_SC03

Revision

A

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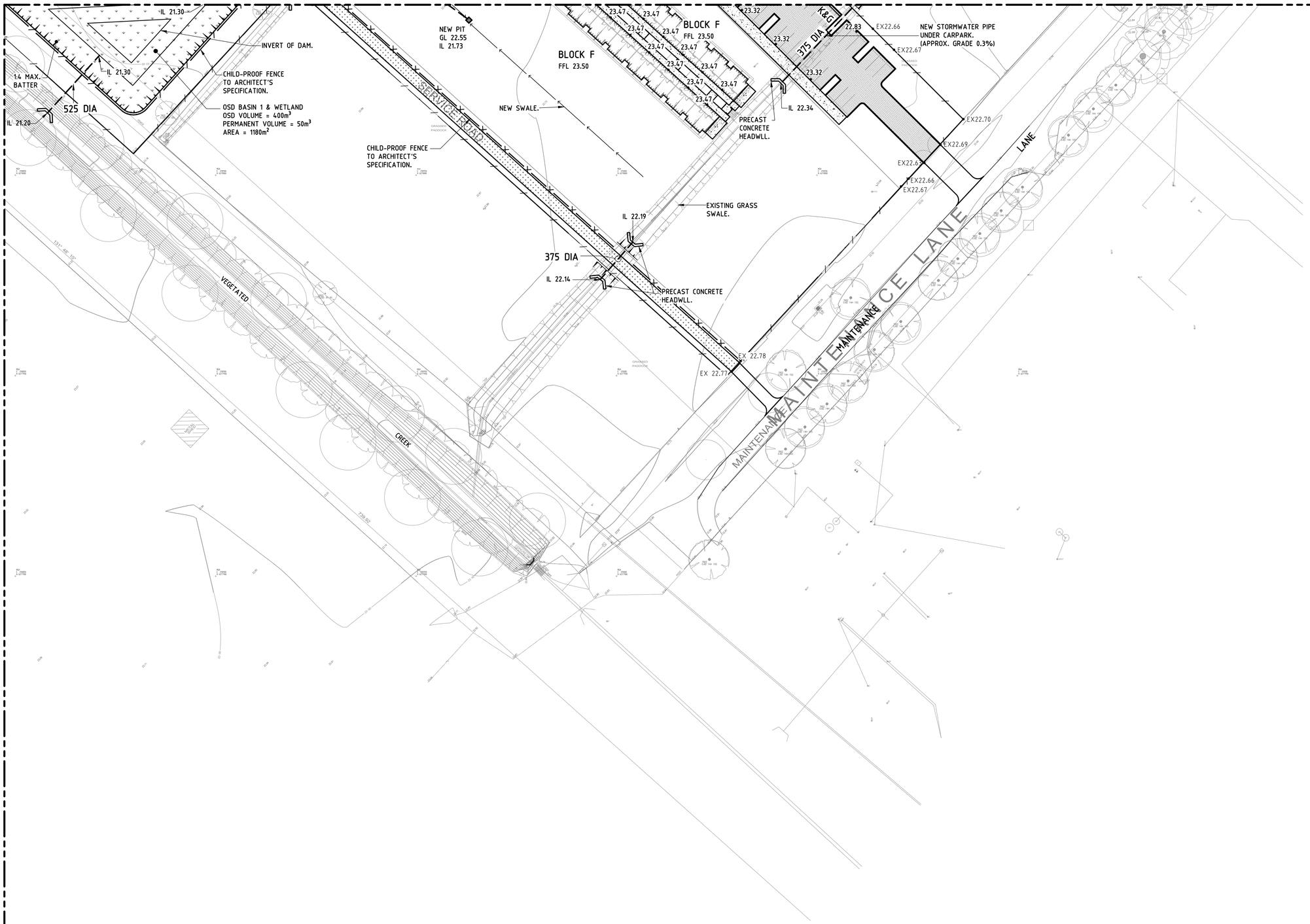
FOR CONTINUATION REFER TO DRAWING SC02



FOR CONTINUATION REFER TO DRAWING SC03

Issue

No.	Date	Description	Chkd
A	28.04.21	SSDA SUBMISSION	

Architect

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Drawing Title

SCHEMATIC CIVIL WORKS DESIGN - SHEET 4

Date APRIL 2021

Scale 1:500

Drawing Reference

20-307_SC04

Revision

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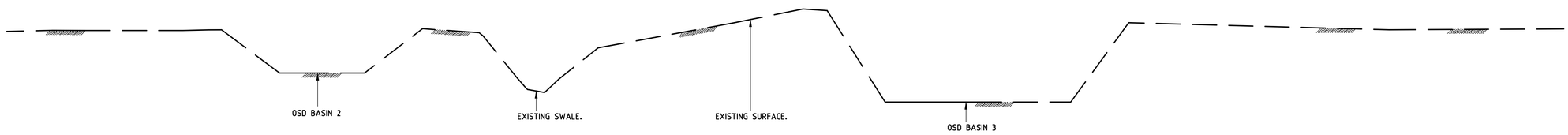

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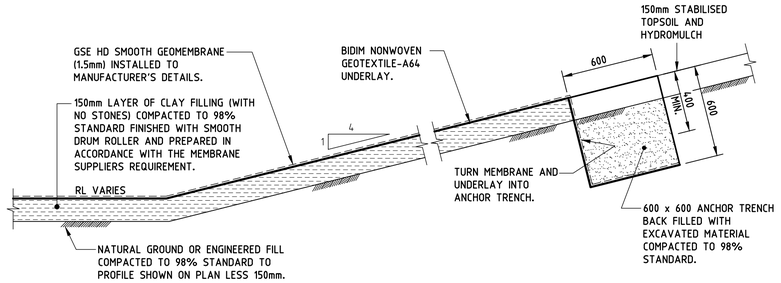

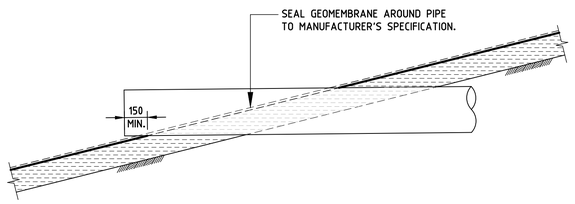

TYPICAL BASIN DETAIL

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RICHARD CROOKES CONSTRUCTIONS

Issue

No.	Date	Description	Chkd
A	28.04.21	SSDA SUBMISSION	

Architect
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Project
Centre of Excellence in Agricultural Education
at
HAWKESBURY

for
DEPARTMENT OF EDUCATION

Drawing Title
OSD BASIN SECTION AND DETAILS

Date APRIL 2021
Scale 1:250 1:20

Drawing Reference
20-307_SC05

Revision
A

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