Prepared for: Law Architects

Stormwater Management Strategy
Catholic Ladies College - Wild Centre
19 Diamond Street, Eltham

Author: James Tabban
Job No: 200413
Reference No: 200413-003-SWMS-CL-JT
Revision: A
Date: 25 July 2021

Contents

Appendices

1 Introduction

CREO Consultants (CREO) has been engaged by Law Architects to produce a Stormwater Management Strategy (SWMS) for the proposed new classroom building development at Catholic Ladies College, 19 Diamond Street Eltham. This report outlines the stormwater management plan for the proposed classroom development on the site.

This document will outline the proposed drainage strategy to ensure that 'best practice' guidelines for qualitative and quantitative treatment are met, in accordance with relevant authority requirements.

2 Existing Conditions

2.1 Site Characteristics And Catchments

The Wild Centre is a new classroom and learning facility consisting of a two-storey building. The upper level of the building connects into the eastern elevation of an existing building, and the lower level of the building adjoins and interfaces with the existing on-grade asphalt carpark.

The positioning of the new building and its interface with the carpark has resulted in the need for a minor reduction in the carpark pavement area. Beyond this localised realignment of the carpark along the building edge as well as provision of new kerbing and localised asphalt re-sheeting as part of general maintenance works, the carpark is considered to be existing infrastructure that is serviced by existing in-ground stormwater drainage. Subsequently, the drainage flows developed by the carpark, being an existing condition, have not been considered as part of the stormwater management strategy

In relation to the proposed new building, the site area associated with the works is 970m^2. The existing conditions provides a site fraction impervious of 67% while the proposed development has an increased site fraction impervious of 100%. As a result, the proposed development will generate a minor increase in stormwater runoff.

The existing drainage infrastructure that services this area is the existing in-ground drainage infrastructure that currently services the on-grade carpark.

Please refer to the architectural Town Planning documentation for the current and proposed site layout.

In accordance with Nillumbik Council's stormwater design guidelines as defined within the LPOD advice as well as what is considered to be industry best practice, the new development will utilise the existing site drainage infrastructure as its legal point of stormwater discharge and will be provided with stormwater on-site detention and stormwater water treatment measures.

2.2 Existing Catchment

The existing catchment of the site is approximately 0.1127ha and is located near the northern boundary of the broader school campus. The school property is surrounded to the north, east, and west by residential dwellings, and the Eltham Retirement Centre to the south.

The site has been considered as a standalone single parcel excludng neighbouring catchments from within the school property boundary. The site was analysed in its current developed state in order to ascertain the amount of flow that will be generated in its current condition using the Swinbourne Method. We have set a 10% AEP (i.e. 1 in 10 year ARI) storm event as the benchmark for the pre-developed flows based on the existing conditions and a 10% AEP (i.e. 1 in 10 year ARI) storm event as the benchmark for the developed flows. Hence, an increase in flow from the developed scenario will result in a requirement to attenuate back to its pre-developed state. Table 1 below outlines the estimated flows for the 10% AEP (1 in 10 year ARI) pre-devlopment flow and the 10% AEP (1 in 10 year ARI) post development flow for the site.

Table 1 Estimated Peak Flows for the Pre-Developed & Pos Developed Site

Parameter	Developed Flows	
	Pre-Development 10% AEP (10 year)	Post Development 10% AEP (10 Year)
Peak Flows	15.0 l/s	22.0 l/s

3 Stormwater Management Strategy

The stormwater management strategy proposed for the new Wild Centre classroom and learning building has been developed to integrate the management of catchment run-off and the quality of the run-off in accordance with Section 53.18 of the Nillumbik Council's Planning Scheme Provisions. The primary objectives of this section relevant to this development focus on:

- Provide flood protection treatments for public safety and to protect downstream environments by retarding peak developed flows back to existing conditions.
- Implementation of Water Sensitive Urban Design (WSUD) elements to treat post-developed pollutant-laden run-off to best practice guidelines.

The stormwater drainage systems will be designed to maximise benefits to the community based upon adequacy of design, the economy of construction and a high level of safety and amenity, including the provision to:

- Ensure hazardous situations do not arise on streets and footpaths.
- Ensure that all buildings in urban areas are protected against floodwaters to a similar standard to that applying in other areas of Eltham and the municipality of Nillumbik.
- Limit rubbish and pollutants entering the stormwater drainage system.
- Prevent erosion and sedimentation in estate development.
- Integrate drainage works into urban planning of estate development.
- Provide for multiple uses of land for drainage, recreation and transportation.

3.1 Requirements Of Clause 53.18-05 Of The Panning Scheme

Clause 53.18-05 of the Planning Scheme requires urban runoff from new building developments to meet best practice water quality and flow requirements. The objectives of Clause 53.18-05 are:

1. To encourage development that reduces the impact of stormwater on the drainage system and filters sediment and waste from stormwater prior to discharge from the site.
2. To encourage stormwater management that contributes to cooling, local habitat improvements and provision of attractive and enjoyable spaces.
3. To ensure that industrial and commercial chemical pollutants and other toxicants do not enter the stormwater system.

Standard W2 requires that urban stormwater management systems must be:

1. Designed to meet current best practice performance objectives for stormwater quality, as outlined in *Urban Stormwater – Best Practice Environmental Management Guidelines* (Victorian Stormwater Committee 1999), as amended. The current water quality objectives are:
    a. 80 per cent retention of typical urban annual suspended solids load;
    b. 45 per cent retention of typical urban annual total phosphorus load; and
    c. 45 per cent retention of typical urban annual total nitrogen load.
2. Minimise the impact of chemical pollutants and other toxicants.
3. Contribute to cooling, improving local habitat and providing attractive and enjoyable spaces.

3.2 Requirements Of Clause 53.18-06 Of The Panning Scheme

Clause 53.18-06 of the Planning Scheme requires urban runoff from new building developments to meet best practice water quality and flow requirements. The objectives of Clause 53.18-06 are:

1. To protect drainage infrastructure and receiving waters from sedimentation and contamination.
2. To protect the site and surrounding areas from environmental degradation prior to and during construction of subdivision works.

Standard W3 requires that urban stormwater management systems, specifically those implemented during construction must manage:

1. Erosion and sediment.
2. Stormwater.
3. Litter, concrete and other construction wastes.
4. Chemical contamination.

3.3 Proposed Concept

The new classroom and learning facility development will be served by an in-ground stormwater drainage system that will be designed for the 10% AEP storm event. This system will contain an in-ground detention system that will manage and limit the flow from the 10% AEP storm event to the pre-development flows as nominated in Section 2.2 of this report. The total detention system volume is to be 2.829m^3 noting that this will be stored in 'oversized' in-ground stormwater drainage pipework with flows restricted via the installation of a baffle pit.

The new in-ground stormwater system will be connected to the LPOD as directed and instructed by Nillumbik Council, for clarity, connection will be into the existing site drainage infrastructure. The in-ground stormwater system will be designed to service the planned development on the site. Due to site spatial constraints both the detention and proposed Water treatment system will be inline in-ground systems.

Details of stormwater detention system calculation output are provided in Appendix A.

4 Stormwater Quality

4.1 Release Criteria

The objectives for on-site treatment relating to urban stormwater quality identify the best practice as the removal of Total Suspended Solids (TSS), Total Phosphorus (TP), Total Nitrogen (TN) and Gross Pollutants (GP). The values are set out in the Victorian Stormwater Committee (1999) *Urban Stormwater Best Practice Environmental Management Guidelines* and have been reproduced in Table 2. These stormwater quality objectives reflect the level of stormwater management necessary to meet the SEPP (Waters of Victoria) (EPA Victoria, 2003) requirements and have been adopted as the design criteria for WSUD treatments.

Table 2 Objectives for Environmental Management of Stormwater

Pollutant	Receiving Water Objective	Current Best Practice Performance Objective
Total Suspended Solids (TSS)	Comply with SEPP (e.g. not to exceed the 90th percentile of 80mg/L)	80% retention of the typical urban annual load
Total Phosphorus (TP)	Comply with SEPP (e.g. base flow concentration not to exceed 0.08mg/L)	45% retention of the typical urban annual load
Total Nitrogen (TN)	Comply with SEPP (e.g. base flow concentration to not exceed 0.09 mg/L)	45% retention of the typical urban annual load
Gross Pollutants (GP)	Comply with SEPP (e.g. no litter in waterways)	70% retention of the typical urban annual load

4.2 Stormwater Quality Strategy

To achieve the best practice objectives shown in the above table, an in-ground water treatment system will be installed on the outlet discharge pipe from the site.

4.3 Modelling Results

For the proposed design of the in-ground water treatment system, a MUSIC model has been designed which incorporates the entire catchment. The overall results from the model are shown in Table 3.

Table 3 Source, Residual and Removal Loads for Catchment

Pollutant	Source Load (kg/yr)	Residual Load (kg/yr)	Load Removed (kg/yr)	% Reduction
Total Suspended Solids (TSS)	62.3	6.67	55.63	89.30
Total Phosphorus (TP)	0.14	0.0461	0.0939	66.90
Total Nitrogen (TN)	1.17	0.61	0.5600	47.70
Gross Pollutants (GP)	18.4	0.398	18.0020	97.80

5 Conclusions and Recommendations

This document provides a holistic approach to managing the stormwater infrastructure to be implemented as part of the classroom and learning facility development located at Catholic Ladies College, 19 Diamond Street, Eltham.

The report addresses the following key aspects:

- Retardation of 10% AEP storm events exiting the site to match the existing pre-developed conditions.
- Compliance with best practice stormwater quality treatment requirements for discharge to the existing drainage.
- For the catchment, it is recommended that the following infrastructure is implemented:
  - Installation of an underground detention systems totalling 2.829m^3.
  - Installation of SPEL Stormsacks into all grated and side entry pits.
  - Installation of a SPEL Hydrosystem HS.400 (Model SHS.400.H.01.100.PVC) or similar approved system.

6 References

IEAust (2003), Australian Rainfall and Runoff Volume 2. Institute of Engineers Australia

Melbourne Water Corporation (2010), MUSIC Guidelines: Recommended Input Parameters and modelling approaches for MUSIC Users.

Victorian Stormwater Committee (1999) Urban Stormwater Best Practice Environmental Management Guidelines

Appendix A Detention Calculations

STORMWATER DETENTION CALCULATOR

CREO CONSULTANTS PTY LTD

Client:	Law Architects
Project:	CLC Eltham - Wild Centre

Engineer:	J.Tabban
Job Number:	200413
Date:	25/07/2021
Revision:	A

Predeveloped Conditions:

Catchment Area (ha)	0.097
Time of Concentration (min)	7
Fraction Impervious	0.65

Fraction Impervious Calculator	
Impervious Area (m²)	630
Pervious Area (m²)	340
Total Area (m²)	970
Fraction Impervious	65%

	1 year	2 year	5 year	10 year	20 year	50 year	100 year
Intensity (mm/hr)	41.89	55.68	75.75	89.39	107.60	133.73	155.35
Coefficient of Runoff	0.507	0.539	0.602	0.634	0.666	0.729	0.761
Q (m3/s)	0.006	0.008	0.012	0.015	0.019	0.026	0.032

Developed Conditions:

Catchment Area (ha)	0.097
Time of Concentration (min)	7
Fraction Impervious	100%

Fraction Impervious Calculator	
Impervious Area (m²)	970
Pervious Area (m²)	0
Total Area (m²)	970
Fraction Impervious	100%

	1 year	2 year	5 year	10 year	20 year	50 year	100 year
Intensity (mm/hr)	41.89	55.68	75.75	89.39	107.60	133.73	155.35
Coefficient of Runoff	0.720	0.765	0.855	0.900	0.945	1.035	1.080
Q (m3/s)	0.008	0.011	0.017	0.022	0.027	0.037	0.045

STORAGE CALCULATION

Retard Flows up to:	10 Year Storm Event
Predeveloped Flow:	0.015 m^3/s
OR Restrict flows to:	m^3/s

FROM TABLE BELOW: **STORAGE REQUIRED (m^3): 2.829**

Storm Duration (min)	Volume In (m^3)	Volume Out (m^3)	Storage Required (m^3)
5	7.410	4.581	2.829
6	8.306	5.497	2.809
7	9.105	6.413	2.691
8	9.827	7.329	2.497
9	10.487	8.246	2.242
10	11.096	9.162	1.935
11	11.663	10.078	1.585
12	12.193	10.994	1.199
13	12.691	11.910	0.781
14	13.162	12.826	0.335
15	13.608	13.743	-0.134
16	14.033	14.659	-0.626
17	14.439	15.575	-1.136
18	14.827	16.491	-1.664
19	15.199	17.407	-2.208
20	15.557	18.323	-2.766
22	16.235	20.156	-3.921
24	16.869	21.988	-5.119
26	17.464	23.820	-6.356
28	18.026	25.653	-7.627
30	18.559	27.485	-8.926
35	19.786	32.066	-12.279
40	20.891	36.647	-15.756
45	21.899	41.228	-19.329
50	22.829	45.808	-22.979
55	23.695	50.389	-26.694
60	24.507	54.970	-30.463

ORIFICE CALCULATION

$Q = 0.6 \times A \times (2gH)^{0.5}$

Height (above CL) (m)	0.5
Qpd (m^3/s)	0.015
Orifice Area (m^2)	0.008
Orifice Diameter (mm)	**101.7**

PIPE STORAGE CALCULATOR

Diameter (m)	0.3
Length (m)	45
Storage Volume (m^3)	3.181
OK	

CULVERT STORAGE CALCULATOR

Width (m)	
Height (m)	
Length (m)	
Storage Volume (m^3)	

Appendix B Proposed Water Treatment Device

spelstormwater
joy in water

SPEL Stormsack®

At Source Gross Pollutant Trap (GPT)

OVERVIEW

The SPEL StormSack® is specifically designed for the capture of gross pollutants: sediment, litter, and oil and grease. Ideally suited for municipal storm drain retrofits, the SPEL StormSack's unique design allows maintenance to be performed using conventional vacuum suction equipment.

BENEFITS

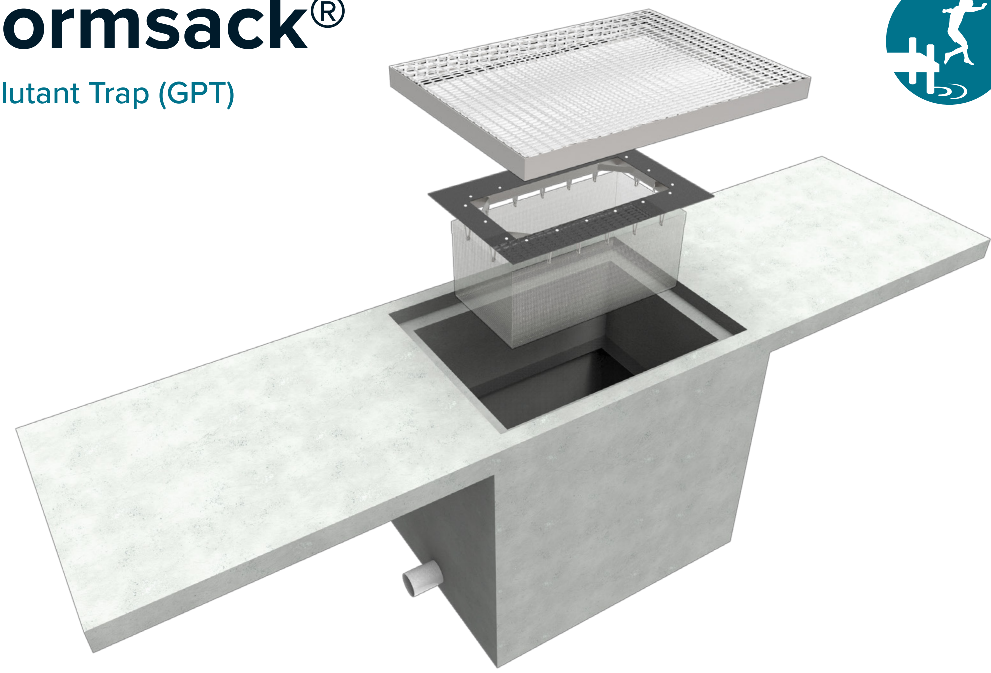
- Quick and easy installation.
- Cost efficient gross pollutant capture.
- Adjusts to custom pit sizes.
- Can be modelled in MUSIC in conjunction with bio-retention.
- Adjusts to custom pit sizes.

APPLICATIONS

Council Storm Drain Retrofits
Commercial/Retail/Residential
Litter Prone Urban Areas
Scrap Metal/Solid Waste/Oil Storage/Etc
Part of Treatment Train
Construction Sediment
<200 micron capture

SPEL Stormsack®

At Source Gross Pollutant Trap (GPT)



Sizes

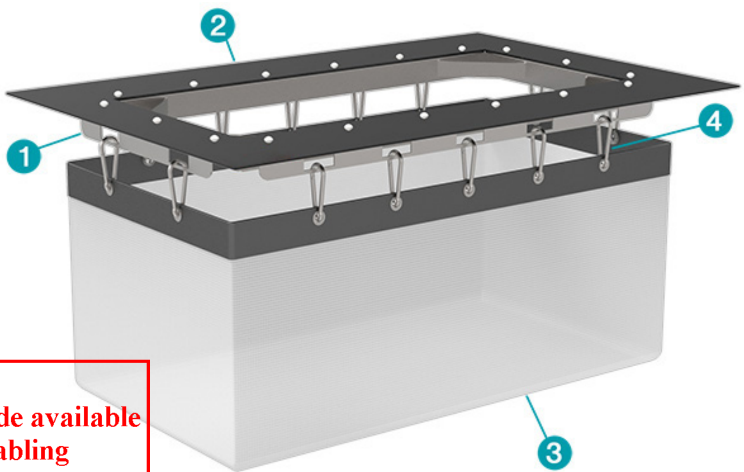
Dimensions (mm)*
450x450
600x600
600x900
900x900

Custom sizes (i.e. 1200x900mm) can be manufactured on short lead times.

Application	Regulatory Issue	Target Pollutants
Council Storm Drain Retrofits	At-source litter capture	Sediment, Litter, O&G
Commercial/Retail/Residential	Stormwater Compliance	Sediment, Litter, O&G
Litter Prone Urban Areas	Cost effective litter control	Litter ≥ 5 mm
Scrap Metal/Solid Waste/ Oil Storage/Etc	Industrial Multi-Sector General Permit	Gross Pollutants, O&G
Part of Treatment Train	Council Stormwater Quality Improvement Targets	Sediment, Litter, O&G
Construction Sediment/Erosion	Sediment Control Plan	Sediment/Erosion Control

Features

1. Ultra-Durable Aluminium Frame
   - Custom pit arrangements upon request
2. Black Poly Surround riveted to Frame
   - Can be cut to suit on site
3. Reinforced Stormsack Bag
   - Bag has sewed eyelets
   - Square bottom design for even distribution
4. Karabiners attach Bag to Frame for easy service & replacement



ISSUE FOR APPROVAL
NOT FOR CONSTRUCTION

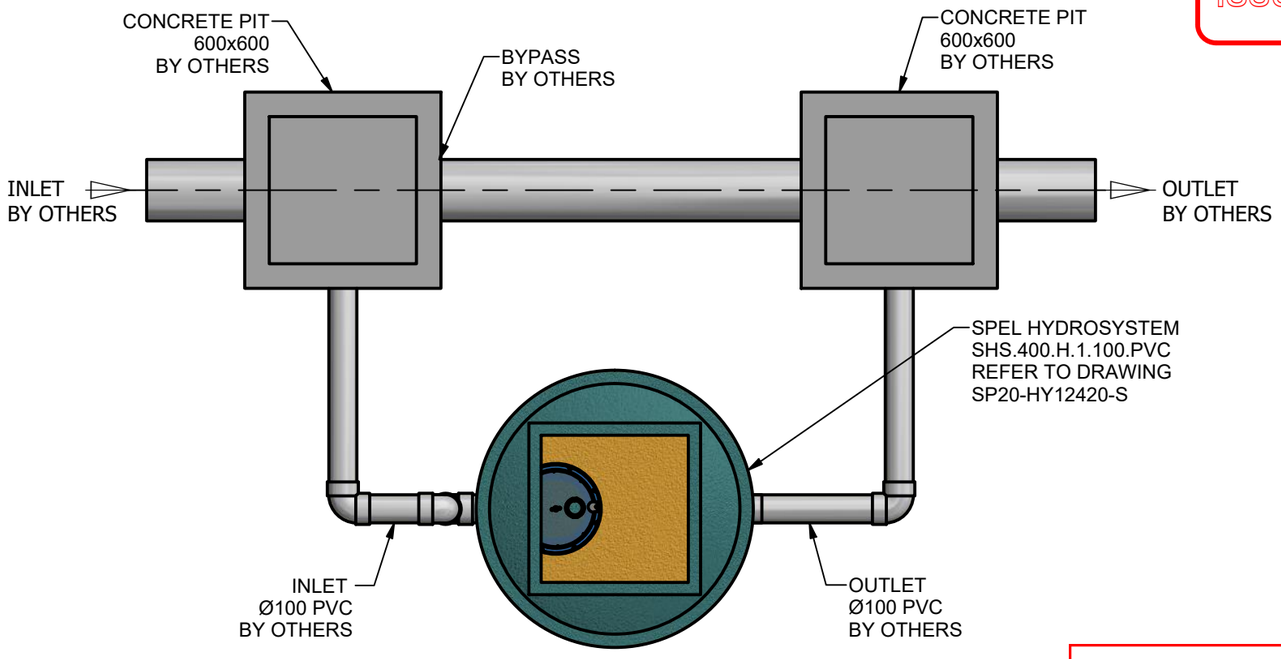
REVISION HISTORY				
REV	DESCRIPTION	DESIGNER	CREATION DATE	CHECKED BY
1	INITIAL RELEASE	R.R.	06/07/2020	P.Z.

APPROVED.....

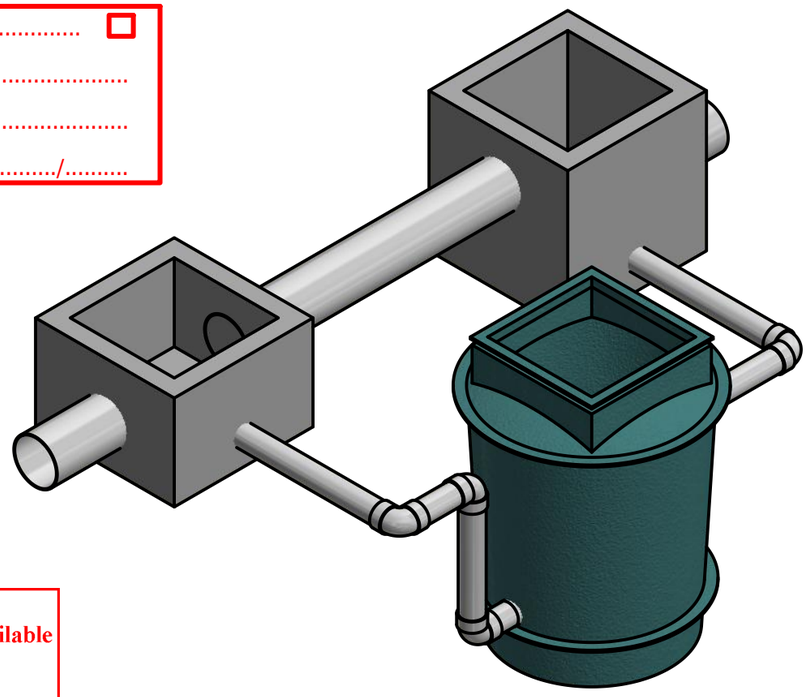
NAME.....

SIGNED.....

DATE...../...../.....

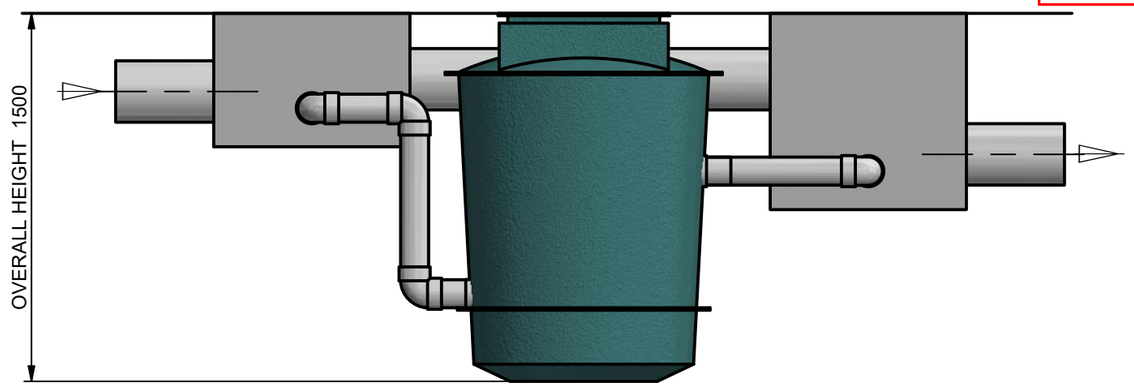


PLAN VIEW

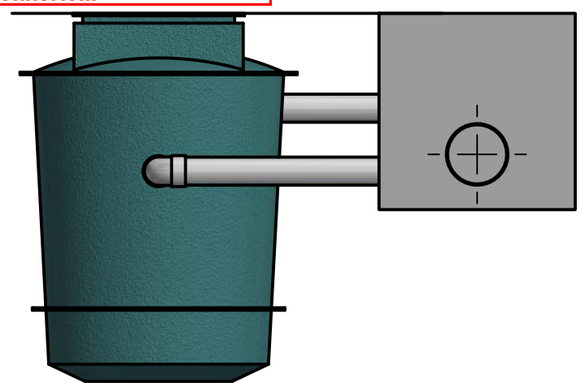


ISOMETRIC VIEW

ADVERTISED PLAN



ELEVATION VIEW



SIDE VIEW

Site Level Confirmation	
Finished Surface Level (FSL)	RL:
Access Cover Thickness	mm
Inlet Invert Level	RL:
Outlet Invert Level	RL:
Company:	
Name:	
Date:	

NOTES:
1: THE COMBINED HEIGHT OF AN EXTENSION-RISER & LID EXCEEDING 1000mm WILL REQUIRE THE TANK TO BE OF HEAVY DUTY CONSTRUCTION

2: SYSTEM PIPEWORK MUST HAVE AT LEAST 250 MM OF FALL TO OPERATE CORRECTLY

TOLERANCE: ALL DIMENSIONS TO CLOSEST 10mm +/- 30mm UNLESS OTHERWISE STATED.

CLIENT:

DISTRIBUTOR :

Drawn	R.R.	Date 06/07/2020
Check	P.Z.	Date 07/07/2020
Verified		Date
Approved		Date
Request No.	RN4497	

SPEL ENVIRONMENTAL
INTEGRATED WATER SOLUTIONS
100 Silverwater Road Silverwater NSW 2128
PH: 1300 773 500 | E: sales@spel.com.au
www.spel.com.au

PROJECT : SHS.400.H.01.100.PVC

TITLE SPEL HYDROSYSTEM WITH BYPASS
SHS.400.H.1.100.PVC
GENERAL ARRANGEMENT

SCALE	SIZE	SHEET	REV
N.T.S	A3	1	1

CUSTOMER CODE :

DWG No. SP20-HY15290-S

C:\Users\robin\Documents\Vault Designs\SPEL\PRODUCTS\HYDROSYSTEM\400 SERIES\STANDARD\SHS.400.HM FILTER ELEMENT\TAPERED TANKS\1460H TANK\1 HYDRO\SP20-HY15290-S.idw