with compliments

Ku-ring-gai Council
Attn: Janice Buteux-Wheeler

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KU-RING-GAI COUNCIL

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ARCHITECTURE
INTERIORS
MASTERPLANNING

Re: PLC Carpark DA ref: DA0367/13
2 copies of OSD & Water Quality Strategy.

Note 3 copies sent ~~to~~ on friday
– Paul Freeman.

www.pmdl.com.au

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Pymble Ladies' College - Stage 2 of Master Plan - Carpark & Mollie Dive Field

On-site Detention and Water Quality Strategy

Issue | 27 February 2014

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This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

Job number 232297

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Document Verification

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Document title		On-site Detention and Water Quality Strategy		**File reference**
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		Name	Charmila Sathianandan	Louise Millward	Louise Millward
		Signature			
Issue	27 Feb 2014	**Filename**	OSD and WQ Strategy Report Final.docx	
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Issue Document Verification with Document ✓

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Schematic of conceptual OSD and Water Quality

1 Introduction

This report has been prepared to support the DA application DA0367/13 for Pymble Ladies' College - Stage 2 of Master Plan - Carpark & Mollie Dive Field submitted to Ku-ring-gai Council (Council). The report outlines the strategy for on-site detention (OSD) and water quality treatment. This includes an assessment of the catchment contributing to sizing the OSD requirements as well as the catchment breakdown for water quality treatment.

The wider site area for Pymble Ladies College (PLC) incorporates two stages of development; Stage 1 and Stage 2.

Stage 1 for Aquatic and Fitness Centre includes:

- Demolition of existing swimming pool
- Construction of an Aquatic and Fitness Centre - including main pool and grandstand, Learn To Swim pool, fitness at upper level, basement plant level
- Landscaping and utilities
- Relocation of Mollie Dive Field (remains on grade)
- Use of new Aquatic and Fitness Centre by school and community
- Minor upgrade of existing Jeanette Buckham PE Centre

Stage 2 for Carpark & Mollie Dive Field (covered by the current DA0367/13) includes:

- Redevelopment of the Mollie Dive Field to raise the finished level to provide car parking under
- Provision of a terrace to the Aquatic and Fitness Centre
- New Piazza and landscaping

2 On-Site Detention

2.1 Catchment sizing

The wider PLC site has an existing OSD tank located within the existing maintenance shed. The catchment draining to the existing shed has been assessed to be approximately 26852m^2 based on the 2-dimensional site survey and existing pipe network drawing. This catchment, of which the new works boundary forms a part, is shown in Figure 1 below.

Figure 1 OSD site catchment

As there is an existing detention facility, we have taken the approach of calculating the additional storage required for the total site catchment to meet the councils OSD requirements as per the current DCP 47, rather than reviewing the new works boundary in isolation. It is also noted that due to the type of development, application of the OSD criteria to this development is at the Council's discretion.

2.2 Site Storage and Permitted Site Discharge Requirements

In accordance with Council's on-site detention calculation sheet, a catchment factor (representing the average fraction impervious) of 60% has been applied on the total site catchment. A catchment storage rate of 0.0398 m^3/m^2 has been used as per Council's guidelines for catchment AC1 – Avondale Creek. This calculation results in a total storage of $642m^3$ required for the site draining to the existing maintenance shed.

As we are taking a total site catchment approach, there are no areas that bypass detention. The catchment discharge rate is set at 0.0102 $l/sec/m^2$ as per Council's guidelines for catchment AC1 – Avondale Creek. Consequently, the permitted site discharge for the catchment is 164 l/s. For a completed copy of Council's calculation sheet, refer to Appendix A.

As per the existing tank drawings (Appendix B), the storage available is approximately $505m^3$. Consequently $137m^3$ is required in addition to the existing tank volume.

Table 1 Summary of OSD Calculations

Total Catchment Area (m^2)	60% of Total Catchment Area (m^2)	Volume of OSD Required (m^3)	Existing OSD Tank Volume (m^3)	Additional OSD Storage Required (m^3)
26852	16111	642	505	137

2.3 New On-Site Detention

The additional $137m^3$ is proposed to be achieved through allowing surface ponding in two locations on the site: within the ground level of the proposed carpark located below the elevated playing field and the existing tennis court. The carpark is to retain a minimum of $100m^3$ of storage within Council's 150mm limit on ponded depth. The remaining $37m^3$ shall be stored within the confines of the tennis court. Appendix C provides a plan of ponded area within the carpark and a plan of the ponded area within the tennis court, showing peak ponded volumes, levels and depths. Surcharge into these areas and controlled discharge of detained stormwater will be achieved through appropriately sized orifice plates within discharge control pits.

Appendix D provides a schematic of the conceptual arrangements for the OSD and water quality treatment measures proposed in Section 3 of this report.

3 Water Quality

3.1 Treatment Targets

Council's Water Management Development Control Plan DCP 47 – Chapter 8 Water Quality (2005) outlines the standard of treatment that is typically required for new developments. Table 2 summarises treatment targets.

Table 2 Council's Water Quality Targets

Pollutants	Target (% reduction)
Gross Pollutants	70
Total Suspended Solids (TSS)	80
Total Phosphorus (TP)	45
Total Nitrogen (TN)	45

It is understood that direct application of these targets to the PLC site is at the discretion of Council, given that the project is within the planning controls of the Local Centres DCP (2013).

3.2 Method of Assessment

Water quality modelling of the site was undertaken using MUSIC version 5. MUSIC is a numerical modelling package capable of simulating pollutant loads for conceptually sizing treatment measures. MUSIC software effectively models the percentage reductions of gross pollutants, TSS, TN and TP from the given site.

3.3 Assumptions

The following assumptions have been made in the preparation of the water quality modelling:

- Catchments for the site have been based on the plans provided by pmdl. Following discussions with pmdl, it has been agreed that the playing field and the terrace areas both drain to the treatment device. Due to existing services and site constraints, the landscaped area in Stage 2 will bypass any form of treatment. A segment of the aquatic centre roof will be diverted through the device as a result of the drainage arrangements by the project civil engineer. Figure 2 provides a schematic of the catchments.

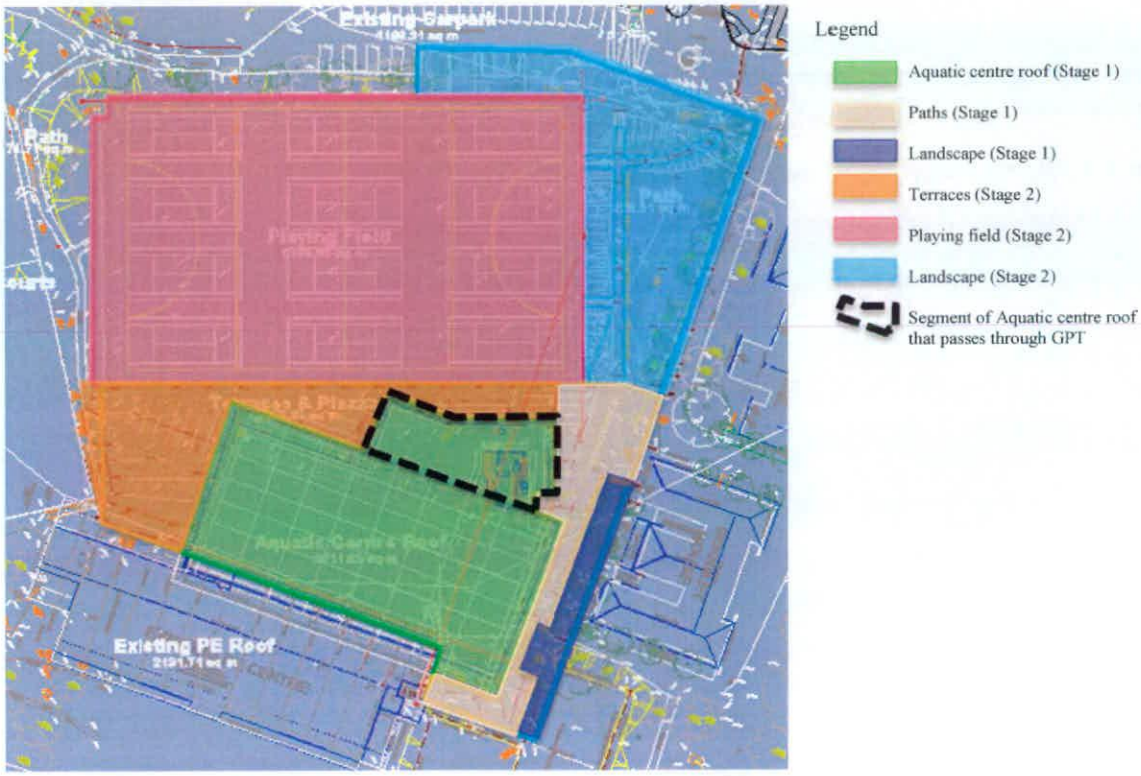


Figure 2 Catchments

- MUSIC modelling has been undertaken in accordance with guidelines provided in the "*Draft MUSIC Modelling Guidelines for NSW*" (2010). Rainfall data for Sydney Observatory Hill has been used for the time period 5/1/1962 – 31/12/1966 (as specified by the Draft guidelines). Evapotranspiration data has been adopted for Sydney Monthly Areal PET in the MUSIC model database. Table 3.9 and Table 3.10 of the guidelines were used to input the base flow and storm flow concentrations for each of the

catchments. Table 3 indicates which category was used for each catchment, the catchment size and the percentage impervious applied to each.

Table 3 Source Node Parameters

Catchment	Base flow	Storm flow	Catchment Area (ha)	% impervious
Landscape (Stage 2)	Commercial	Commercial	0.204	30
Terraces (Stage 2)	Commercial	Commercial	0.125	100
Playing Field (Stage 2)	Roof	Commercial	0.617	100
Aquatic Centre roof (Stage 1)	Roof	Roof	0.057	100

- The device used for the modelling is a Rocla CDS 0708. This device is indicative and is used for preliminary modelling. Equivalent alternative devices may also be proposed. The intent is to provide a reasonable level of treatment given the nature and scale of the development.

3.4 MUSIC modelling results

Figure 3 indicates the MUSIC model configuration that was used to assess the treatment for the site.

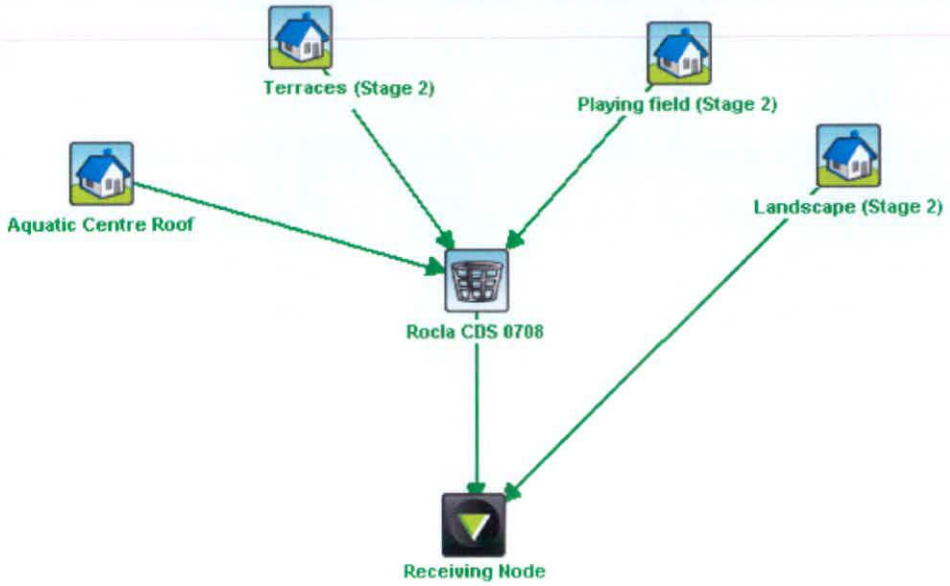


Figure 3 MUSIC Model configuration

Table 4 MUSIC Modelling Results

Pollutant	% Reduction achieved
Gross Pollutants	86.9
Total Suspended Solids (TSS)	57.9
Total Phosphorus (TP)	24.7
Total Nitrogen (TN)	0.00

3.5 Summary of MUSIC modelling

The results indicate that the current design only complies with the reduction targets for gross pollutants. As previously discussed in our meeting with Council on 13th February, due to the nature of the site there is minimal amount of nitrogen and phosphorus generated over and above that contained in the direct rainfall only. Hence the target reduction for nutrients will be extremely difficult without bioretention. As the site is predominately roof and impervious areas there is no scope for adopting bioretention.

The device itself has the capacity to remove 70% total suspended solids (according to the manufacturer's testing) which is not reached due to minimal total suspended solids generated from the site. Consequently there would be no benefit achieved from increasing the size of the device.

It is important to note that there is no standard test method available or standards required for manufacturers to verify the performance and pollution reduction efficiencies of their stormwater quality improvement devices. The reductions used in the MUSIC model are as per the manufacturers' specifications. A copy of the model can be provided on request.

Appendix A

On-site Detention Calculation Sheet

Appendix 3
On-Site Detention Calculation Sheet

Address Pymble Ladies College, Sydney

Catchment Detail				
1.	Catchment Name ACI - Avondale Creek			
2.	Catchment Discharge Rate	0.0102	l/sec/m^2	A
3.	Catchment Storage Rate	0.0398	m^3/m^2	B
Site Details				
4.	Site Area 26852 m^2 ^ 60% of site area	16111	m^2	C
5.	Area(s) not draining to the detention system 0 m^2			
6.	Total impervious area (roofs, driveways, paving, etc.)	NA	m^2	D
7.	Impervious area bypassing detention system	0	m^2	E
Permitted Site Discharge				
8.	**C** [16111 m^2] x **A** [0.0102 l/sec/m^2] =	164	l/sec	**Flow 1**
9.	Adjustment for any uncontrolled impervious flow **E / D** =	0	(<0.25)	F
10.	**Flow 1** [164 l/sec] x **F** [0] =	0	l/sec	**Flow 2**
11.	**Flow 1** [164] – **Flow 2** [0] =	164	**l/sec**	**PSD**
Site Storage Requirement				
12.	**C** [16111 m^2] x **B** [0.0398 m^3/m^2] =	642	m^3	**SSR1**
13.	If the storage is in a landscaped basin, **SSR1** x 1.2 =	NA	m^3	**SSR2**
Outlet Control				
14.	Height difference between top water surface level and the centre of the orifice	TBA	m	G
15.	Orifice Diameter $21.8 \times \sqrt{\frac{PSD}{\sqrt{G}}}$	TBA	mm	OD

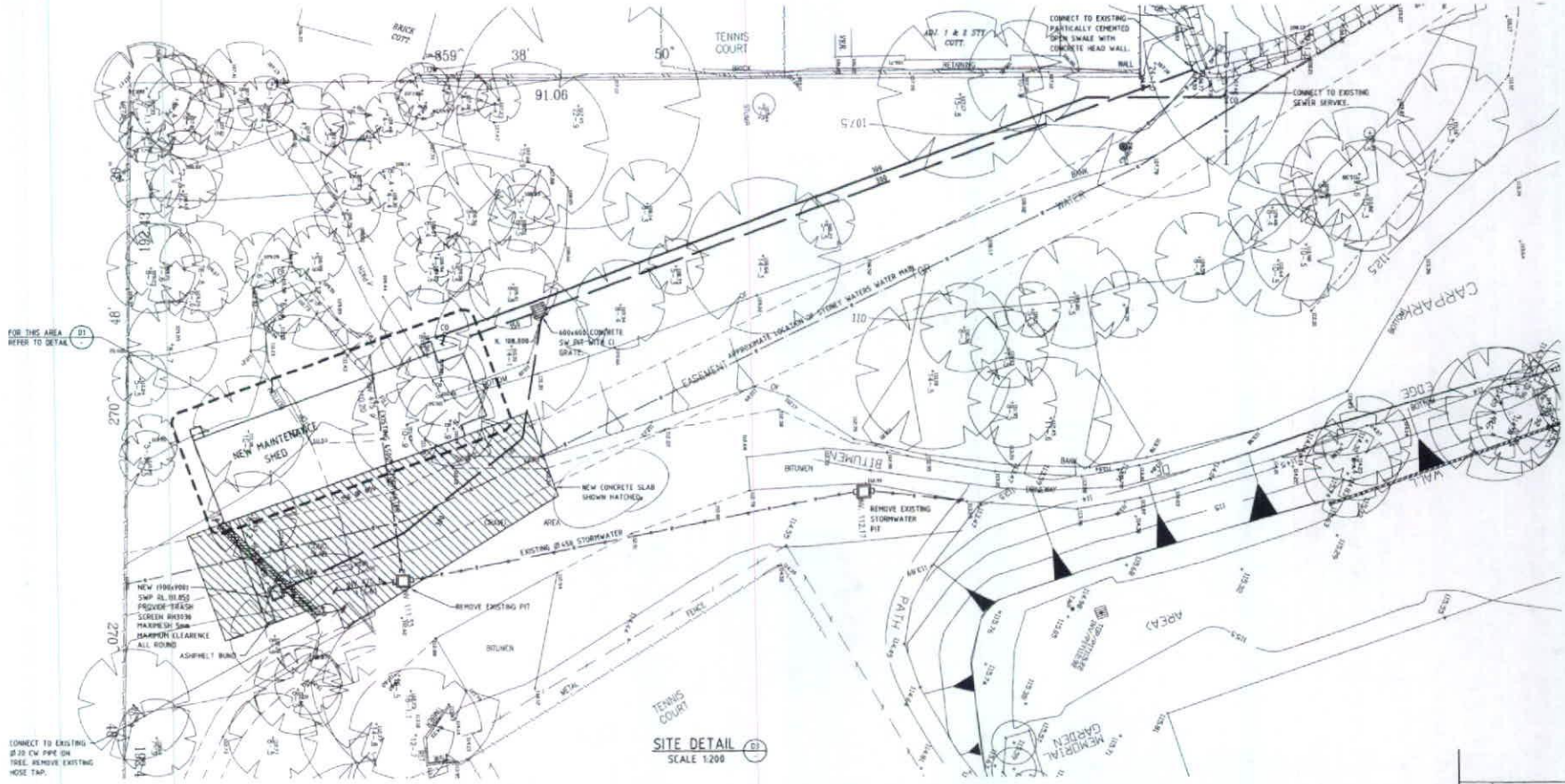
PSD = Permitted Site Discharge
SSR1 = Site Storage Requirement (except for landscaped basins)
SSR2 = Site Storage Requirement (landscaped basins) **(Note: Use only SSR1 or SSR2)**
OD = Orifice Diameter

Signature ..... **Name** LOUISE MILLWARD

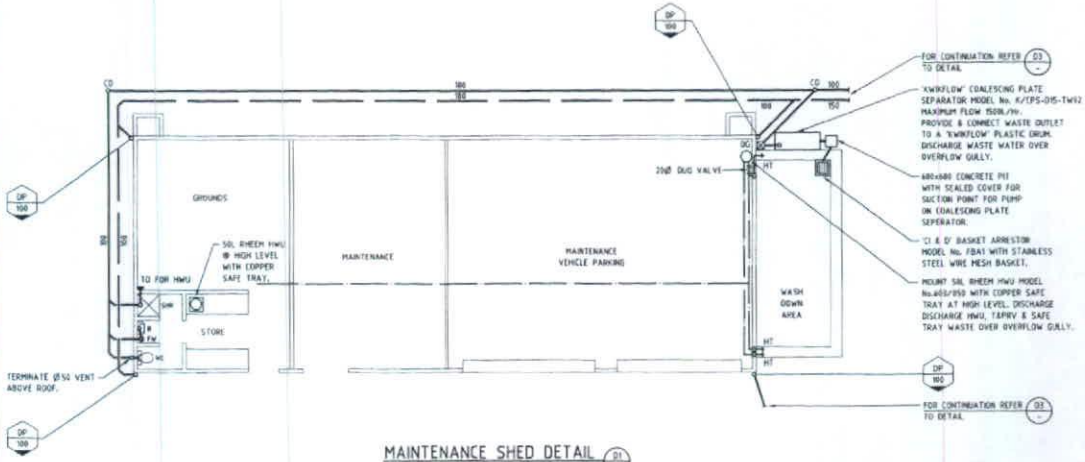
Qualifications BEng, MIEAust CPEng **Date** 27/2/14

Appendix B

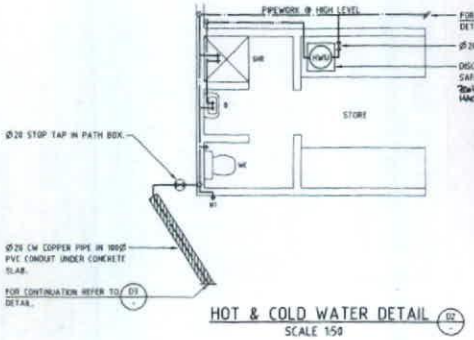
Existing Tank Drawings



SITE DETAIL D3
SCALE 1:200



MAINTENANCE SHED DETAIL D1
SCALE 1:100



HOT & COLD WATER DETAIL D2
SCALE 1:50

no.	amendment	date
2	FOR APPROVAL	13.11.97
1	ISSUE FOR COMMENT	27.10.97

notes
- dimensions not shown to be checked on site.
- do not scale off this drawing.
- this drawing to be read in conjunction with specification, and architectural documentation.
- levels are indicative only and are to be checked prior to commencement of any works.
- authorities mains and/or existing services are to be located and checked prior to commencement of any works.
- the information on this drawing is to be used for site hydraulic and/or fire protection services only.

dch hydraulics and fire protection consultants
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ph (02)9906 5676 fax (02)9906 3551

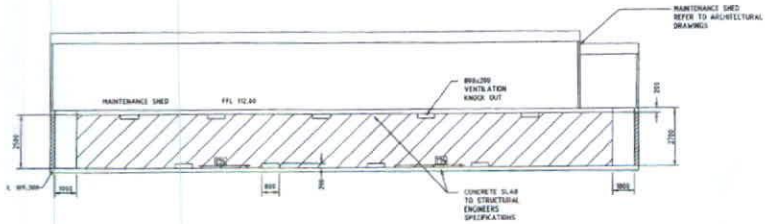
architect
P M D L
59-61 WILLOUGHBY ROAD, CROWS NEST
PH (02) 9906 7655 FAX (02) 9906 7925

project
PYMBLE LADIES COLLEGE
MAINTENANCE SHED

drawing
HYDRAULIC SERVICES

SITE PLAN & DETAILS

date	no. in set		project no.	
OCT 97	2	AHBCA	7074	
drawn	checked	scale	drawing no.	revision
C.H. E.H./P.K.		AS SHOWN	H1	2



SECTION 1 - 1

MAINTENANCE SHED DETENTION TANK

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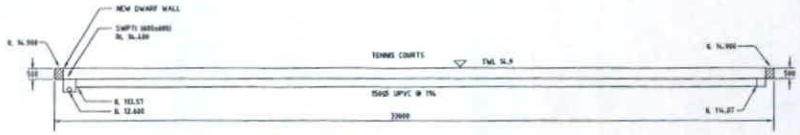
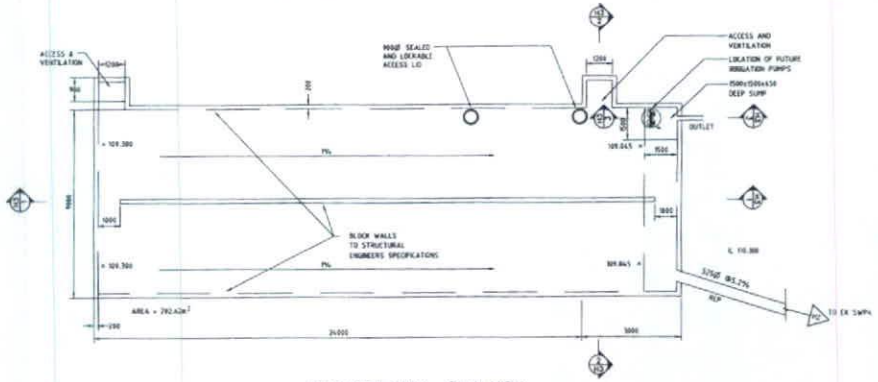


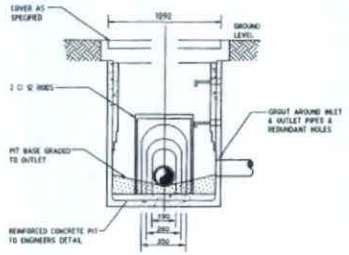
SECTION 4 - 4

SCALE 1:100



DETENTION TANK - PLAN VIEW

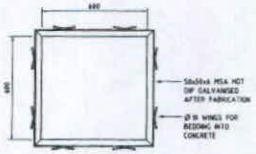
SCALE 1:100



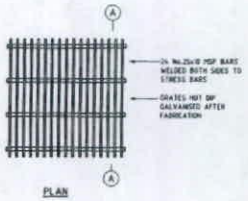
SECTION A

NOTE:

ALL DIMENSIONS ARE IN mm.
DEPTH OF PIT TO BE DETERMINED BY THE INVERT OF THE PIPES



PLAN WITHOUT COVER



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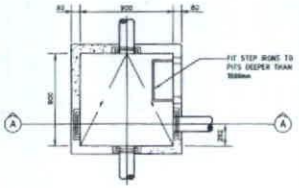
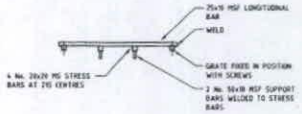


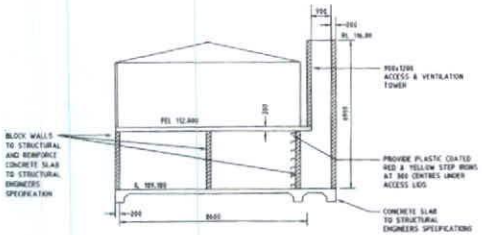
PLAN

PRECAST STORMWATER PIT NTS



SECTION A

GRATE & DRAIN NTS



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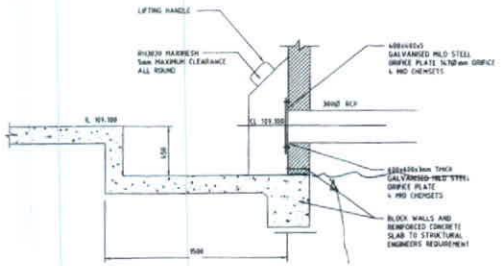
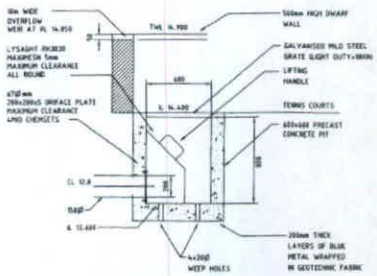


SECTION 3 - 3

SCALE 1:20

Provide weepholes and blue metal along outlet pipe trench to drain sump



SECTION 5 - 5

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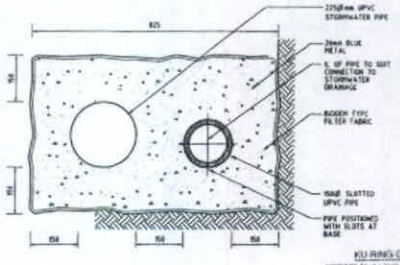


TYPICAL SUB-SOIL DRAINAGE TRENCH NTS

SECTION 6-6

KU-RING-GAI COUNCIL

APPROVED TO BUILD OVER EASEMENT

Date 5/12/99

RECEIVED

rev	amendment	date
3	FOR COUNCIL APPROVAL	29.3.99
2	FOR COUNCIL APPROVAL	7.1.99
1	FOR COUNCIL APPROVAL	6.11.97

notes
- dimensions are shown to be checked on site
- do not scale off this drawing
- this drawing is to be read in conjunction with specification, other drawings and all other relevant documents
- items are indicative only and are to be checked prior to commencement of any works
- authorities sewer and/or working services are to be located and checked prior to commencement of any works
- the information on this drawing is to be used for sew hydraulic and/or fire protection services only

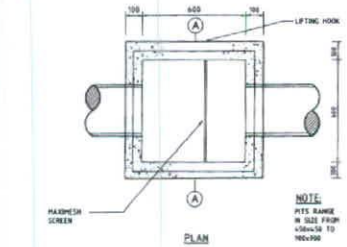
dch hydraulics and fire protection consultants
level 3, 1 chandos street st leonards nsw 2065
ph 02 9906 5655 fax 02 9906 7925

architect
P M D L
59-61 WILLOUGHBY ROAD, CROWS NEST
PH (02) 9906 7655 FAX (02) 9906 7925

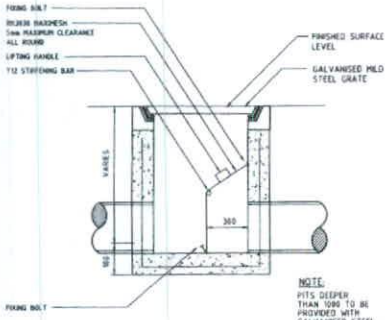
project
PYMBLE LADIES COLLEGE
STORMWATER UPGRADE
& REVIEW

drawing
HYDRAULIC SERVICES
SECTIONS & DETAILS
SHEET 1

date	no. in set		project no.
6.11.97	3	AHSCA	7081
drawn CH/PK	checked	scale AS SHOWN	drawing no. H3	revision 3

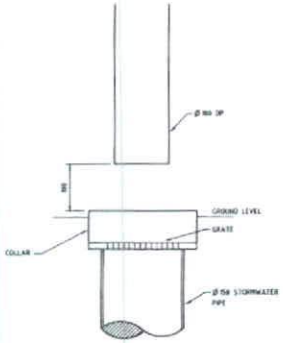


PLAN



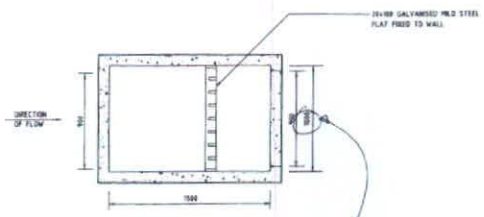
DETAIL 2

STORMWATER PIT
WITH MAXIMESH SCREEN NTS

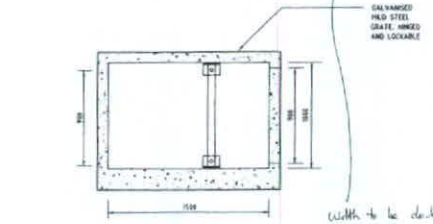


DETAIL 1

DOWNPIPE DISCHARGE TO
STORMWATER DRAINAGE NTS

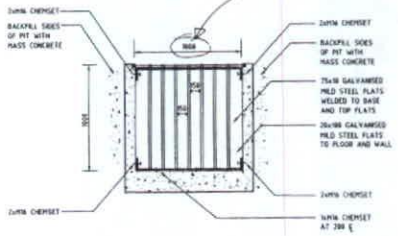


PLAN VIEW



ELEVATION

Width to be doubled to 2000 to allow for blockage. Adjust watercourse locally and provide stabilisation as directed

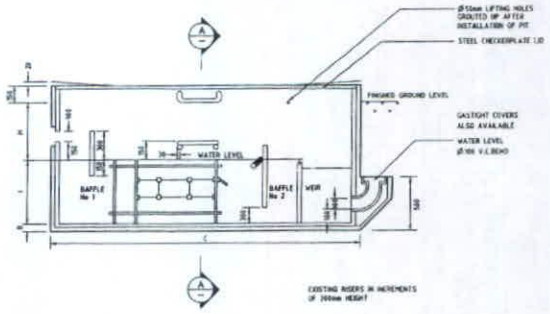


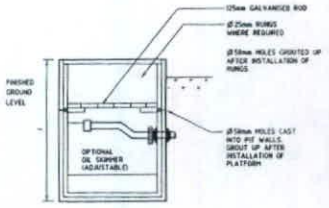
FRONT VIEW

GROSS POLLUTANT TRAP
DETAIL 4 NTS

CI & D GENERAL PURPOSE PITS & OIL SEPERATOR

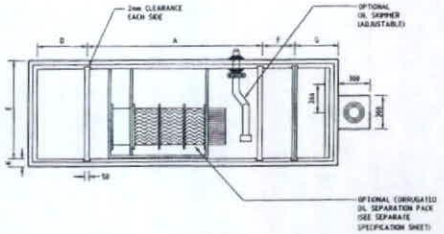
DETAIL 3





SECTION A-A

SECTIONAL ELEVATION



SECTIONAL PLAN AT WATER LEVEL NTS

MODEL	CAPACITY	DIMENSIONS											
		A	B	C	D	E	F	G	H	I	J	K	L
OP 6/1517	5KL	2550	1500	1500	1000	1000	1000	1000	1000	1000	1000	1000	1000

KU-RING-GAI COUNCIL
APPROVED TO ISSUE DEVELOPMENT CONSENT
Date 5/3/99

no	amendment	date
3	FOR COUNCIL APPROVAL	26.3.98
2	FOR COUNCIL APPROVAL	7.1.98
1	FOR COUNCIL APPROVAL	6.11.97

NOTES
- DIMENSIONS NOT SHOWN TO BE CHECKED ON SITE.
- DO NOT SCALE OFF THIS DRAWING.
- THIS DRAWING TO BE READ IN CONJUNCTION WITH SPECIFICATION AND ARCHITECTURAL DOCUMENTATION.
- LEVELS ARE INDICATIVE ONLY AND ARE TO BE CHECKED PRIOR TO COMMENCEMENT OF ANY WORKS.
- AUTHORITIES HAVING RIGHT OF ACCESS TO EXISTING SERVICES ARE TO BE NOTIFIED AND CONSULTED PRIOR TO COMMENCEMENT OF ANY WORKS.
- THIS DRAWING IS THE PROPERTY OF DCH AND MAY BE USED FOR SITE HYDRAULIC AND/OR FIRE PROTECTION PURPOSES ONLY.

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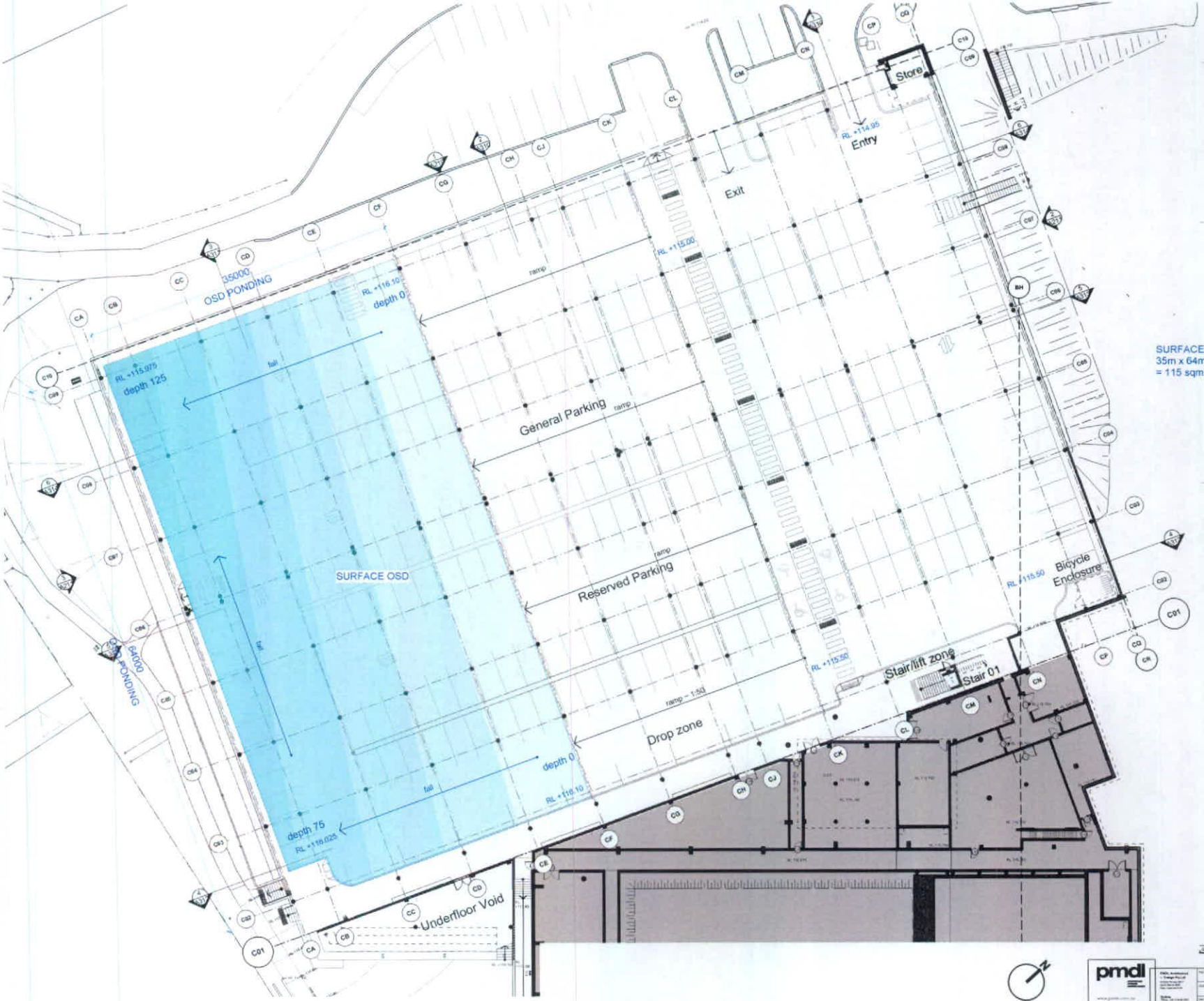
project
PYMBLE LADIES COLLEGE
STORMWATER UPGRADE
& REVIEW

drawing
HYDRAULIC SERVICES
SECTIONS & DETAILS
SHEET 2

date	no. in set		project no.	
6.11.97	3	AHBCA	7081	
drawn	checked	scale	drawing no.	revision
CH/MC		AS SHOWN	H4	3

Appendix C

Plan of Carpark and Existing Tennis Court OSD - Ponding Extents and Depths



SURFACE OSD VOLUME:
35m x 64m x average (0.125m, 0.075m) x .5
= 115 sqm

1	03/14	First Issue

pmdl

PLC Aquatic Centre	2362
Pymble Ladies' College	
Carpark Surface OSD Plan	SK342
Avon Road, Pymble	1

SURFACE OSD VOLUME:
1/3 x base x perpendicular height
=1/3 x 33m x average (6m, 26m) x 0.3m
= 52 cu.m

1	05/2/14	First issue

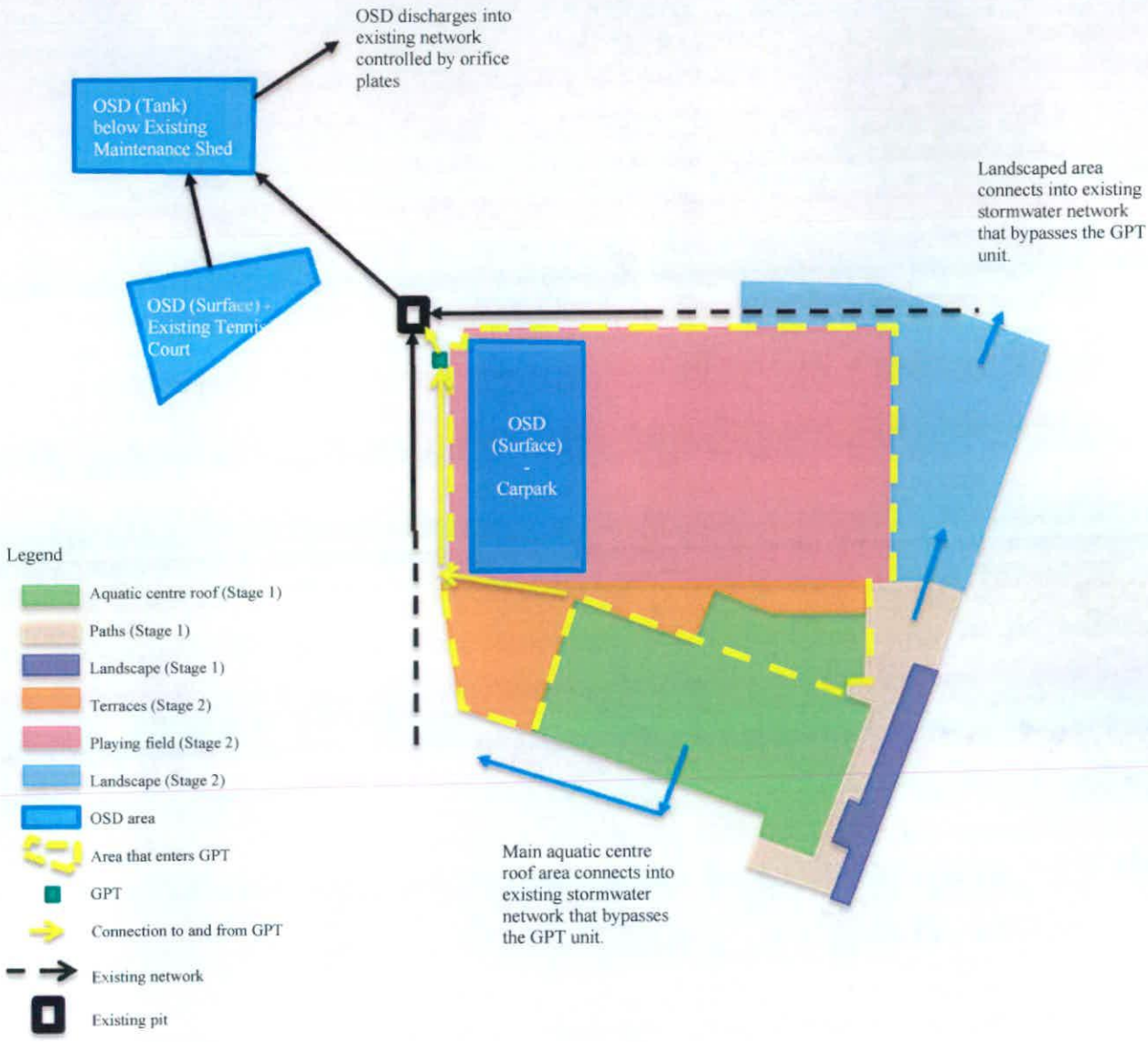
pmdl

PLC Aquatic Centre		2382
Pymble Ladies' College		
Tennis Court OSD Plan		SK343
Avale Road, Pymble		1

Appendix D

Schematic of conceptual OSD and Water Quality

D1


OSD discharges into existing network controlled by orifice plates
OSD (Tank) below Existing Maintenance Shed
OSD (Surface) - Existing Tennis Court
Landscaped area connects into existing stormwater network that bypasses the GPT unit.
OSD (Surface) - Carpark
Main aquatic centre roof area connects into existing stormwater network that bypasses the GPT unit.
Legend
Aquatic centre roof (Stage 1)
Paths (Stage 1)
Landscape (Stage 1)
Terraces (Stage 2)
Playing field (Stage 2)
Landscape (Stage 2)
OSD area
Area that enters GPT
GPT
Connection to and from GPT
Existing network
Existing pit