Doran Drive Precinct
Deicorp
20-Apr-2022

Stormwater Management Plan

Doran Drive Precinct

Stormwater Management Plan

Client: Deicorp

ABN: 73 630 425 955

Prepared by

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Quality Information

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Prepared by Chris Roberts

Reviewed by Gijs Roeffen

Revision History

Rev	Revision Date	Details	Authorised	
			Name/Position	Signature
T1	1-June-2021	Issue for Review	Gijs Roeffen Principal Civil Engineer - Urban Development	
T2	1-July-2021	Issue for Development Application	Gijs Roeffen Principal Civil Engineer - Urban Development	
T3	14-October-2021	Amended and Reissued for Development Application	Gijs Roeffen Principal Civil Engineer - Urban Development	
T4	13-April-2022	Amended and Reissued for Development Application	Gijs Roeffen Principal Civil Engineer - Urban Development	
T5	20-April-2022	Amended and Reissued for Development Application	Gijs Roeffen Principal Civil Engineer - Urban Development	

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1.0 Introduction

AECOM has been engaged by Deicorp to prepare a Stormwater Management Plan to support the development application for the proposed mixed-use development at Doran Drive Precinct. The proposed scheme has been developed in accordance with Part D Section 19 – Showground Station Precinct of the Hills Shire Council Development Control Plan (DCP) - Control 4.5.3 and the Integrated Water Cycle Management Strategy (WSP, Rev 7).

2.0 Reference Information

The following reference information was used in compiling this report:

Drawing	Title	Revision (Date)	Originator
DA-110-007	GA Plans – Basement 01	25/06/2021	Turner Studios
DA-110-008	GA Plans – Ground Level	09/03/2022	Turner Studios
DA-110-009	GA Plans – Upper Level	25/06/2021	Turner Studios
DA-110-010 to DA 110-021	GA Plans – Level 01 to Level 21	25/06/2021	Turner Studios
DA-110-220	GA Plans – Roof Level	25/06/2021	Turner Studios
PS109693-WSP-REP-01 Rev 7	Hills Showground Station Precinct - Integrated Water Cycle Management Strategy	Rev 7, 09/06/2020	WSP
N/A	Part D Section 19 Showground Station Precinct	Hills DCP 2012	Hills Shire Council
N/A	Design Guidelines Subdivision/Developments	Hills DCP 2012 (Sep, 2011)	Hills Shire Council
5042-20 Detail Survey	Detail Survey @ 2 Mandala Parade, Castle Hill	Rev 3, 19/05/2021	Daw and Walton

3.0 Site Overview

3.1 Site Description

The development site, Lot 55 DP 1253217, 2 Mandala Parade Castle Hill, forms part of the Hills Showground Station Precinct. The site is approximately 7,969 m^2 and bounded by De Clambe Drive to the north, Andalusian Way to the east, Doran Drive to the West and Mandala Parade to the south. The abounding roads and drainage infrastructure were recently constructed as part of the Hills Showground Precinct as seen in Figures 1 and 2.

Figure 1 – De Clambe Drive looking south-east

Figure 2 – Doran Drive looking north-east

Deicorp is proposing a mixed-use development incorporating 6 levels of basement carparking, commercial tenancies, internal-communal podium area and residential floors between Levels 3-20. For more information on the architectural plans, refer to Turner Studios for documentation.

3.2 Existing Stormwater Behaviour

The site is currently undeveloped with slopes of up to 8 percent falling from east to west towards Doran Drive (Figure 3). The crossfall from north to south is relatively flat.

The existing landform features depressed swales along both northern and southern boundaries of the site, with inlet pits (Figure 4) situated within these swales to collect runoff. There are currently four pits in total which discharge to the drainage in the road. Two of these pits sit within the northern swale and the other two within the southern swale and connect into public drainage infrastructure (part of Hills Showground Station Precinct works) on De Clambe Drive and Mandala Parade respectively.

Figure 3 – Existing landform and depressed swale

Figure 4 – Inlet pit within swale

The remaining uncaptured catchment predominantly exhibits overland sheet flow to the western boundary and appears to be collected by inlet pits located within a dish drain on the western side of Doran Drive.

The downstream network from the south side of the site extends west from Mandala Parade and north along Doran Drive, then west on De Clambe Drive. The downstream network from the north side of the site extends one pipe segment west from De Clambe Drive before crossing to the trunkline under the northern side of road. Further downstream, a junction pit connects both the lines from Doran Drive and De Clambe Drive. The network continues west to daylight to a headwall outlet within a vegetated swale, behind the northern kerb treatment on De Clambe Drive. This swale connects into the regional basin which ultimately discharges to Cattai Creek, a tributary of the Hawkesbury River.

Refer to Figure 7 for an illustration of Council GIS drainage network and Figures 5 and 6 for site photos of the headwall outlet and downstream regional basin.

Figure 5 – Headwall Outlet to Swale upstream Basin

Figure 6 – Regional Detention Basin

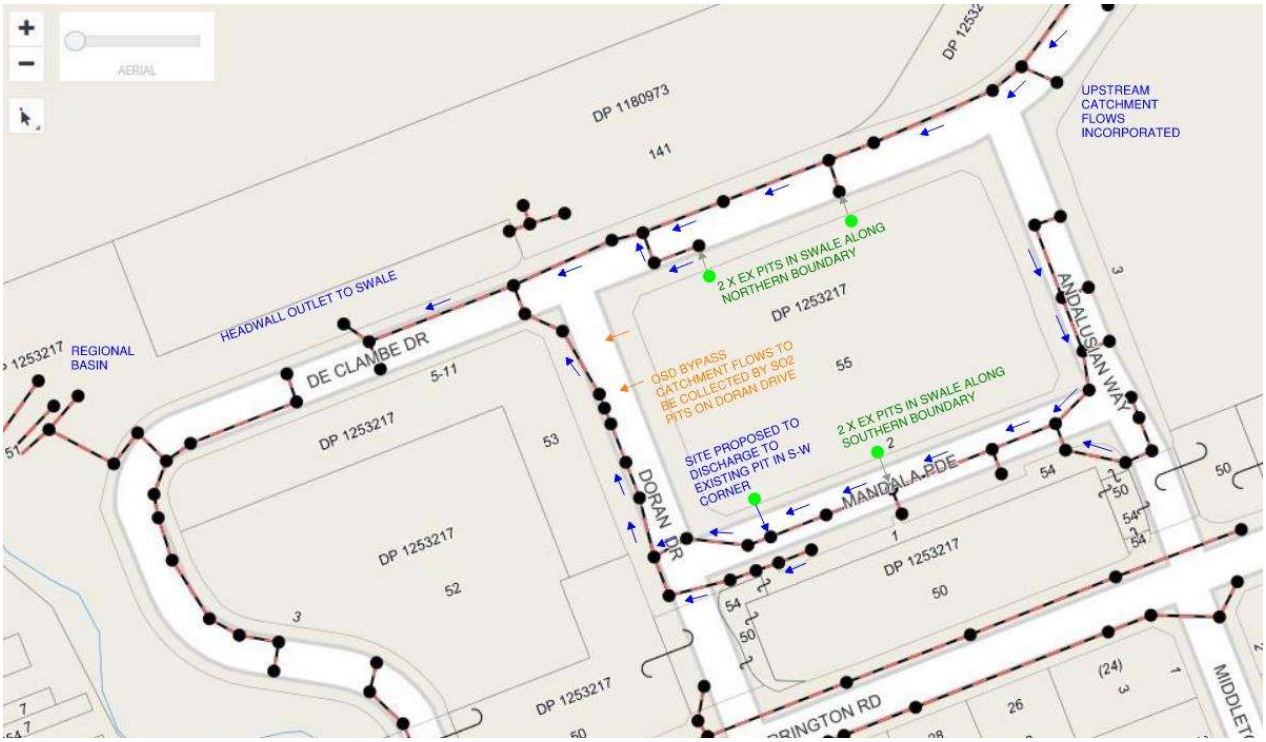

Figure 7 – Council GIS Network

4.0 Stormwater Management Plan

4.1 Proposed Stormwater Management

Roof water from Buildings A, B, C and D will be collected via the internal building drainage system to a proposed rainwater tank below ground level. The rainwater tank will provide re-use for irrigation and planting areas. Basement drainage and overflow from the rainwater tank will be directed to the OSD system before being conveyed to existing drainage infrastructure. The overflow system, internal/building reticulation, basement drainage and rainwater tank design has been coordinated by the hydraulic consultant.

The communal podium catchment area located in the Upper Level will bypass the rainwater tank collection and convey directly to the OSD facility. At the ground level, grated drains will capture perimeter runoff and direct surface flows into the OSD.

As the subject site is located within the Hills Showground Precinct which is serviced by an existing regional basin (depicted in Figure 8); additional on-site detention was confirmed to be not required by Hills Shire Council. Correspondence indicating the in-principle agreement is attached in Appendix A.

DRAINS hydraulic modelling was undertaken to substantiate the capacity of the existing drainage system and its ability to accommodate concentrated site flows at the nominated point of discharge to Mandala Parade.

Amplification works within the recently completed public roadworks was not preferred by the project team and as such, OSD has been proposed as part of the stormwater strategy to limit peak site discharge flows only to the level such that the downstream network can accommodate the discharge for events up to the 1% AEP storm.

4.2 Hydraulic Modelling

A DRAINS hydraulic model was prepared to estimate the capacity in the existing drainage network and incorporates detailed survey of pipe sizes and invert levels. The hydraulic assessment quantifies the developed site flows and ensure that these can be conveyed and accommodated by the existing system without pits surcharging in the major storm event. See Figure 8 for an illustration of the DRAINS model schematic. Flows from external upstream catchments in accordance with the IWCM (WSP, 2020) were also considered. An excerpt of the catchment plan from the IWCM is referenced in Figure 9.

Design Intensity-Frequency-Duration (IFD) Rainfall for the Hawkesbury catchment area in accordance with Table 4.5 of the Design Guidelines Subdivision/Developments (Hills Shire Council, September 2011) was adopted for the model hydrology.

The hydraulic model incorporated roughness coefficients for pipes and blockage provisions for pits in accordance with Table 4.11 and Table 4.10 respectively of Council's Design Guidelines. Pit loss coefficients were refined using QUDM charts within the hydraulic model package.

Table 1 – Recommended Pipe Roughness – Hills DCP

Pipe Material	Recommended K Value (mm)
UPVC	0.03
RCP	0.3

Table 2 – Provision for Blockage – Hills DCP

Condition	Pit Type	Theoretical Capacity Allowed
Continuous Grade	Kerb Inlet Pit	90%
Sag	Kerb Sag Pit	80%
Surface Inlet Pit Cover	Surface Inlet Pit	50%

Figure 8 – Doran Drive DRAINS Model Schematic

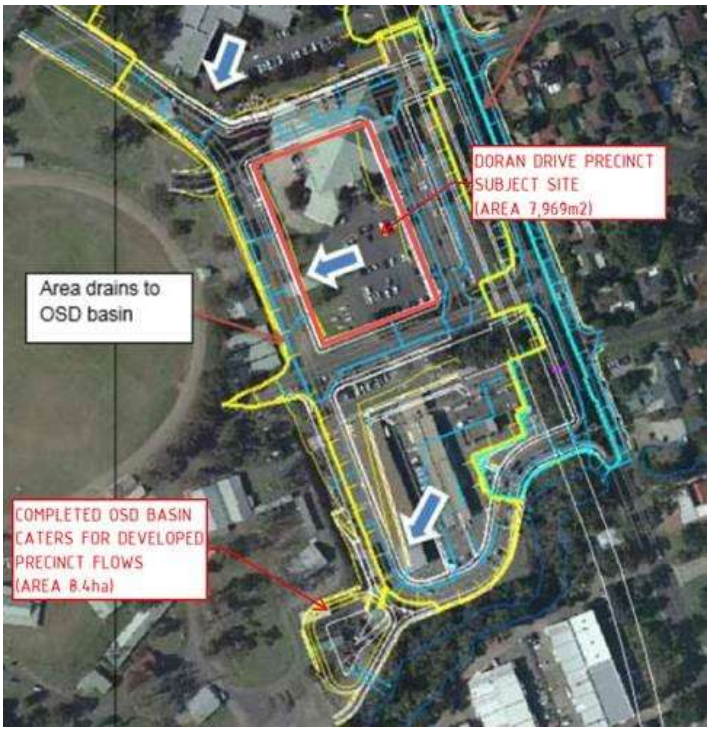

Figure 9 – Precinct Catchment Plan – (source: IWCM - WSP, 2020)

4.3 OSD Catchment and Bypass

The site area draining to the proposed On-Site Detention (OSD) system is approximately 7,905 m². The requirement to interface with existing footpath levels at Doran Drive will generate approximately 64 m² of bypass in the north-western portion which can be collected by a combination of subsoil drainage and surface inlet grates to discharge directly to the kerb subject to design development. A catchment plan of the site and bounding roads are depicted in Appendix D.

The external plaza to the west of the OSD is to grade to an informal dish drain formed from locally graded pavers to create a dish 2m wide and 40mm in total depth. This dish drain will follow the natural topography of the site and flow to the north and will include a series of surface inlet pits that connect to the OSD as shown in Figure 10. The dish drain is to be coordinated with the landscape design of the plaza during detailed design as well as coordinated with requirements for DDA compliance.

The dish drain is nominally sized to capture and contain overland flow across the plaza in the 1% AEP storm event, with the pit and pipe system designed to ensure no surcharge is directed to the street and is instead discharged into the OSD.

4.4 On-Site Detention System

An on-site detention tank is to be installed at the lower south-western portion of the site. It will comprise a total internal footprint area of 287 m^2, comprising of 262.5 m^2 for detention storage and 24.5 m^2 for a water quality chamber. The tank will be situated below ground level with the internal tank base invert level at RL 88.75. The tank will provide sufficient storage volume for attenuation to ensure developed site for events up to the 1% AEP event are piped without pits surcharging. A DRAINS schematic of the post-developed hydraulic grade line demonstrates available freeboard in the existing network and is illustrated in plan in Figure 10 and section in Figure 11.

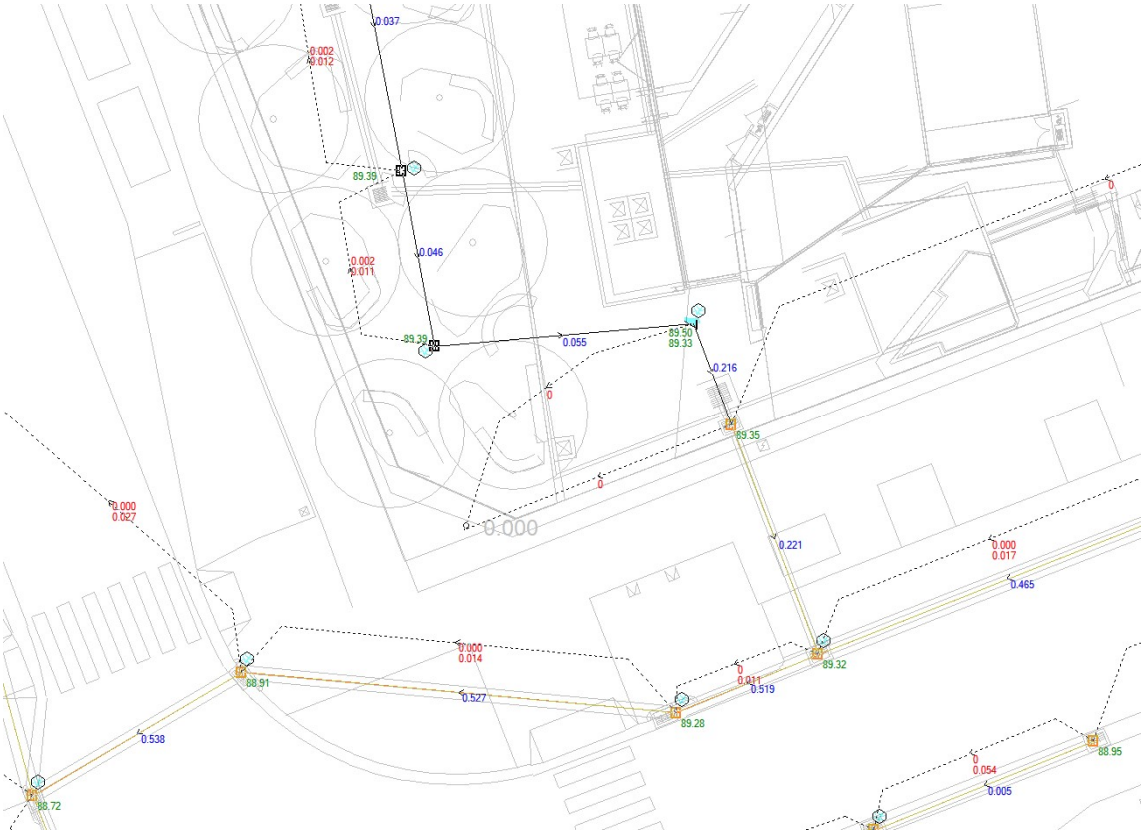

Figure 10 – OSD Outflow in the 1% AEP Event – DRAINS Model Plan

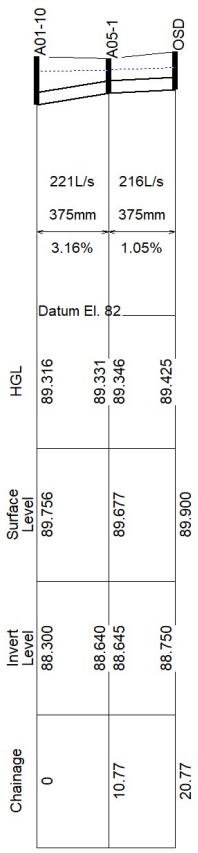

Figure 11 – OSD Outflow in the 1% AEP Event – DRAINS Model Long Section

An additional water quality treatment chamber is to be built within the OSD footprint. Details of the treatment chamber are discussed in Section 5.3.

The outlet configuration of the detention tank will incorporate a 375 mm outlet pipe for flow control. This outlet pipe will connect to an existing pit within the south-western low point of the site. This pit discharges to an existing 375 mm diameter pipe crossing under the Council verge which immediately continues into a 600 mm RCP trunkline within the road in Mandala Parade.

For rainfall events in excess of the major storm; emergency overflows will escape from the tank access hatches located and be conveyed over the verge to be collected by the Doran Drive drainage infrastructure and road network.

Refer to Appendix D for OSD, and stormwater plan drawings including nominated point of discharge.

5.0 Water Sensitive Urban Design Strategy

5.1 WSUD Strategy

A Water Sensitive Urban Design Strategy has been prepared to support the development application in accordance with Part D Section 19 – Showground Station Precinct of the Hills Shire Council Development Control Plan (DCP) – Controls 4.5.7 to 4.5.12. The strategy takes into the account prescribed water quality objectives and adopts modelling parameters as recommended by the guidance in the DCP.

The proposed stormwater treatment train will incorporate a combination of rainwater reuse, gross litter baskets, treatment chamber including filter cartridges, and tree pits. Stormwater runoff will be captured, reticulated, and treated within the development site before discharging to the public drainage system. Details of the treatment devices are discussed in Section 5.2.

Water quality modelling has been undertaken utilizing the MUSIC version 6.3 and in line with the Draft NSW MUSIC Modelling Guidelines, Sydney Metropolitan Catchment Management Authority, 2010. Modelling parameters have been adopted as per the *Hills DCP 2012 – Showground Precinct*, details of which are discussed in Section 5.3.

5.2 Pollutant Reduction Targets

The water quality performance objectives with reference to Table 3 of the Showground Station DCP are summarised in the table below:

Table 3 – Water Quality Performance Objective – Showground Station DCP

	Water Quality % Reduction in Pollution Loads			
	Gross Pollutants (>5mm)	Total Suspended Solids	Total Phosphorus	Total Nitrogen
Stormwater Management Objective	90	85	65	45

5.3 Proposed Treatment Train

A variety of treatment devices have been proposed to formulate the treatment train strategy and achieve the required pollutant reduction. These devices are discussed below:

- Water Quality Chamber and Stormfilter Cartridges

A water quality chamber with approximately 50 x OceanProtect filter cartridges will be situated within the OSD tank bounded by an internal weir of approximately 540 mm height and controlled by low-flow outlet. This chamber is intended to provide water treatment for the runoff captured from the hardstand and roof areas prior to discharging to the broader detention facility. The stormwater filter false floor is typically set at or above the immediate downstream 1 year ARI (equivalent 12EY) level. Advice has been provided by the proprietary supplier, OceanProtect, indicating that since the resultant 1 year ARI hydraulic grade line level (HGL) is low and the depth to ceiling is constrained; the false floor level can be set at the level of the OSD tank base.

- Rainwater Tanks and Re-use

Rainwater Re-use rates provided by the hydraulic consultant have been incorporated into the water quality model to conceptualize the rainwater tank sizing requirements from a water quality perspective. A typical estimate of 0.4 kL/year/m^2 for planting areas and 0.1 kL/year/m^2 for turf or watered landscape areas has been assumed.

- Pit Inserts and Trash rack

Trash racks and litter baskets will be installed where there is sufficient depth to invert at pits and within the OSD to provide pre-treatment of stormwater via enabling the filtering out of gross pollutants.

5.4 MUSIC Modelling

Water quality modelling has been undertaken using the latest model of MUSIC (version 6.3) and demonstrates that the proposed treatment train is able to achieve the pollutant reduction targets as identified in Table 3 of the Showground Station DCP.

The MUSIC model incorporates rainfall and potential evapotranspiration data from 1984-2010 (Sydney). Pollutant and catchment parameters have been adopted in accordance with those outlined in Tables 4 and 5 of the Showground Station DCP. Catchment delineations for types roof, hardstand and landscaped areas were refined and input into the model. Rainwater re-use rates for irrigation of landscape and planting areas provided by the hydraulic consultant were incorporated into the re-use demand parameters of the model. A sensitivity check of the rainwater tank with 10% less storage volume has also been included as part of the assessment.

Table 4 and 5 summarises the model parameters adopted for the water quality assessment. A schematic of MUSIC model is illustrated in Figure 12.

Table 4 – Soil/Groundwater parameters recommended for adoption in MUSIC Modelling – Showground Station DCP

	Units	Urban	Non-Urban
Impervious area parameters			
Rainfall threshold	Mm/day	1.4	1.4
Pervious area parameters			
Soil Storage capacity	mm	170	210
Initial Storage	% of capacity	30	30
Field Capacity		70	80
Infiltration capacity coefficient - a		210	175
Infiltration capacity coefficient - a		4.7	3.1
Groundwater properties			
Initial depth	mm	10	10
Daily recharge rate	%	50	35
Daily baseflow rate	%	4	20
Daily deep seepage rate	%	0	0

Table 5 – Recommended Stormwater Quality Parameters for MUSIC Modelling – Showground Station DCP

Land use	Storm Flow						Base Flow					
	TSS		TP		TN		TSS		TP		TN	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
General Urban	2.15	0.32	-0.60	0.25	0.30	0.19	1.20	0.17	-0.85	0.19	0.11	0.12
Residential												
Industrial												
Commercial												
Roads	2.43	0.32	-0.30	0.25	0.34	0.19	-	-	-	-	-	-
Roofs	1.30	0.32	-0.89	0.25	0.30	0.19	-	-	-	-	-	-
Forest/Natural	1.60	0.32	-1.10	0.25	-0.05	0.19	0.78	0.17	-1.52	0.19	-0.52	0.12

*All values in log_{10}mg/l

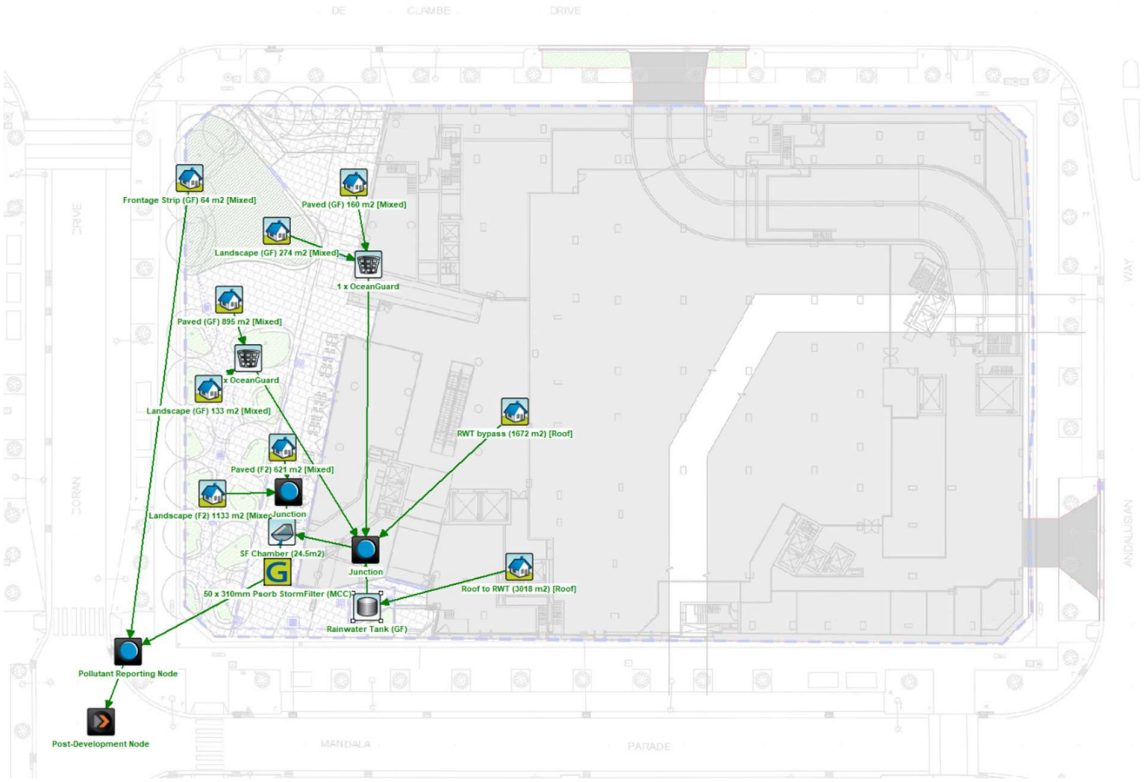

Figure 12 – MUSIC Model Schematic

The model results of the proposed treatment train pollutant reduction is summarised in Table 6.

Table 6 – Pollutant Reduction Model Results

Pollutant (kg/yr)	Source Load	Residual Load	Reduction in Pollutant Sources (%)	Reduction Target (%)	Reduction Target Achieved
Total Suspended Solids	353	52.5	85	85	Yes
Total Phosphorus	0.965	0.235	76	65	Yes
Total Nitrogen	10.8	5.02	54	45	Yes
Gross Pollutants	122	0	100	90	Yes

5.5 Erosion and Sediment Control Plan

An Erosion and Sediment Control Plan has been prepared in accordance with “Managing Urban Stormwater – Soils and Construction”, to minimise land disturbance and sediment pollution control of downstream waterways. Refer to Appendix D for the civil drawings.

Appendix A

On-Site Stormwater Detention Requirements & IFD Data

Ou, Benson

From: Rashad Abboud <rabboud@thehills.nsw.gov.au>
Sent: Tuesday, 18 May 2021 3:09 PM
To: Ou, Benson
Cc: Roeffen, Gijs; Cynthia Dugan
Subject: [EXTERNAL] Email to consultant - Doran Drive Precinct - Confirmation of Regional OSD and site requirements - 2 Mandala Parade CASTLE HILL

Importance: High

Hi Ben,

As we have discussed on the phone last week, in principle; I agree with the context of your email below. Where a regional basin has been designed/sized to cater for the entire contributing catchment including the subject site, then OSD is not required to be provided with the future development for this subject site. However, the capacity of the stormwater system into which stormwater from the development discharges into, must be checked/analysed. Please note that the check/analysis shall be carried out to the legal point of discharge to ensure that the street pits will not surcharged.

Please let me know if you need any further clarification.

Kind regards

Rashad Abboud
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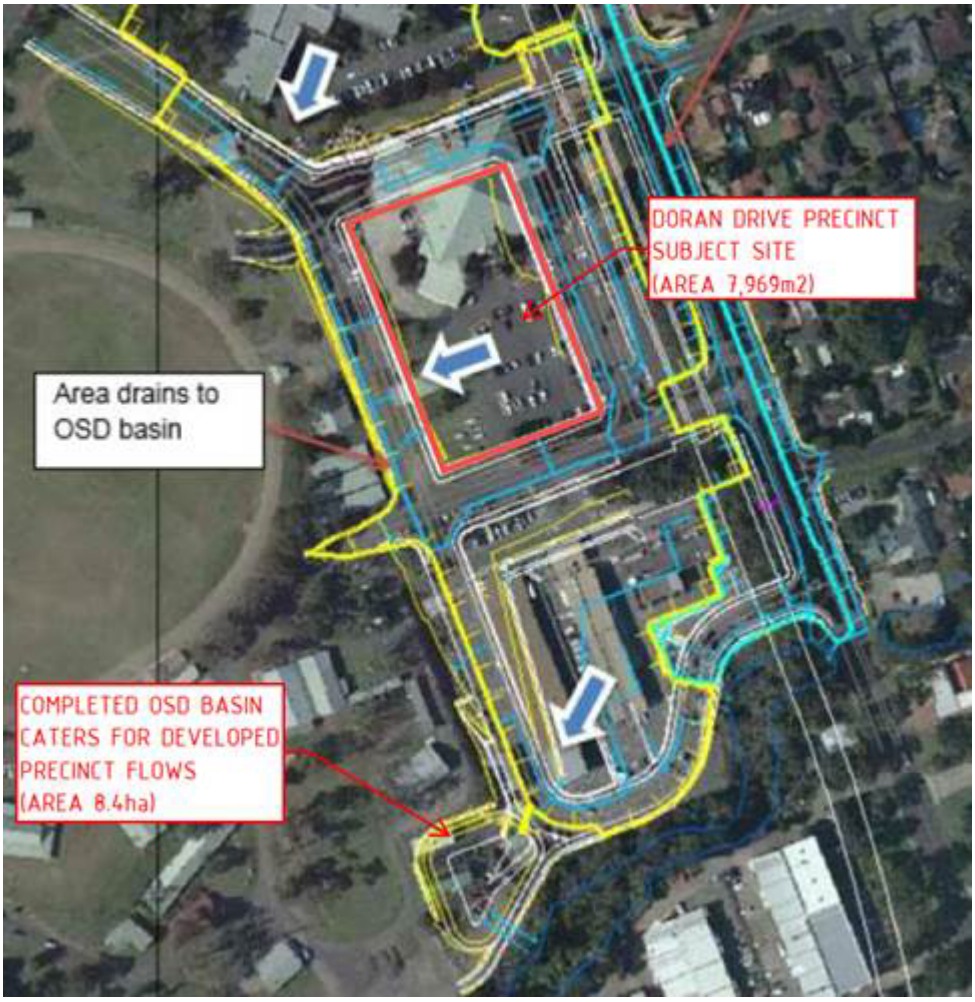
From: Ou, Benson [mailto:Benson.Ou@aecom.com]
Sent: Friday, 14 May 2021 1:56 PM
To: Rashad Abboud
Cc: Roeffen, Gijs; Cynthia Dugan
Subject: Doran Drive Precinct - Confirmation of Regional OSD and site requirements

Good afternoon Rashad,

Thanks for your time on the phone. Glad we are on the same page. As discussed; we are developing the stormwater management strategy for thew Doran Drive lot at the Showgrounds precinct and are hoping you can provide some information prior to finalisation of our submission. If we could get your confirmation in writing come Monday/Tuesday we can progress to an agreed approach and documentation.

Specifically we are hoping to confirm the OSD requirements for the site in accordance with the IWCM. As part of the Stage 1 DA documentation; we note that the Integrated Water Cycle Management Report as prepared by WSP for the site in 2020 (**link to report)** finds that the constructed regional basin for the precinct has been sized to cater for the entire Hills Showground Precinct site (8.4 ha) before discharging to Cattai Creek. (OSD called out in bottom left red below and also Figure 3.2 of the report)



Two excerpts of the IWCM report is snipped in below:
Section 4.2.1.

4.2.1 ON SITE DETENTION

Council's Design Guidelines Subdivision/Developments (September 2011) provide methods for calculating the permissible site discharge (PSD) and site storage volume (SSV) requirements for development sites. An OSD basin was designed and constructed on site as part of the NRT works (NRT, 2016). The NRT Design Report shows the basin has been designed to have a volume of 2135m^3 and sized to cater for the entire site (8.4ha) including the station (section 6.4.3.7 and 6.4.3.12, NRT design report, 2016). No further DA Areas would be connected to the private drainage channel and OSD basin.

Section 4.2 of the WSP Report informs that concentrated flows from the proposed buildings and hardstand surfaces to be collected by the piped stormwater drainage system.

A piped stormwater drainage system will be provided to collect all concentrated flows from the proposed buildings and hardstand surfaces. Most of the Site will drain to the existing OSD basin on the north western boundary before discharge to Cattai Creek, except for a section at the eastern most point of the Site which drains towards Showground Road and Carrington Road and will be captured by two proposed new OSD basins in this DA Area. Consideration will be given to the potential upgrades undertaken by RMS on the drainage system in consequence of the civil and any drainage upgrading works completed within Showground Road. Rock rip rap, gravel and vegetation are provided at the outlet of the drainage system to act as energy dissipators to reduce scour potential.

Furthermore, in the Hills DCP 2012 for the sites within the Hawkesbury River catchment (of which Doran Precinct lies within):

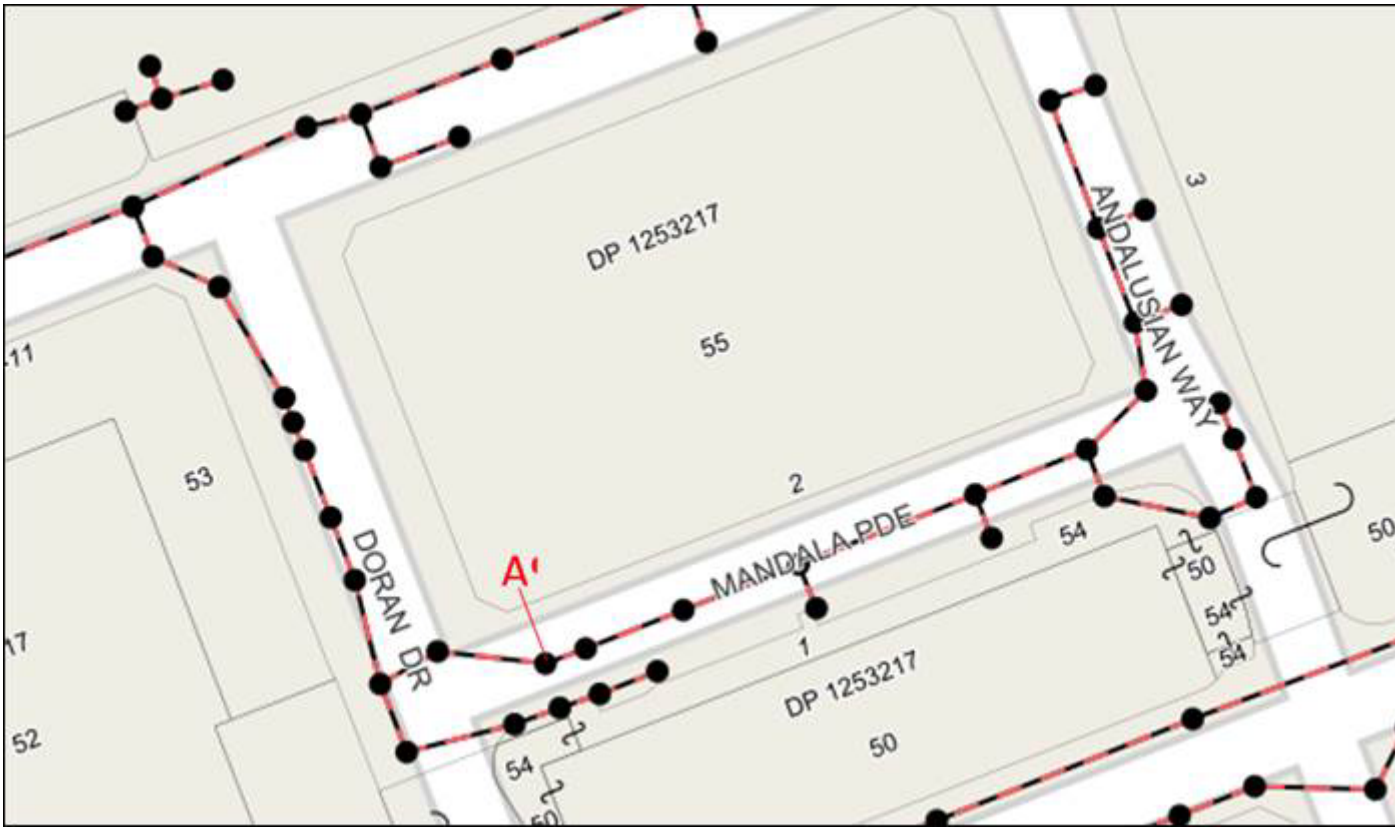
Table 4.14 - PSD and SSV Requirements for the Hawkesbury River Catchment

On-site stormwater detention shall not be provided in catchment areas that drain to an approved detention system. This generally includes new release areas. Council's Subdivision & Development Certification section can advise which catchment applies to the proposed development and the requirement for on-site detention.

Prior to finalising our OSD approach we want to confirm with Council whether the site:

1. **does not require OSD. Noting that the information in the Stage 1 DA is demonstrating that the regional basin will already cater for the developed flows of the subject site.**

We understand that discharging concentrated flows may require an assessment of the downstream drainage capacity to ensure that it has capacity for the design storm. For reference, we expect the overall site discharge to be in the southwestern corner. Likely through an existing pipe within the property boundary (marked up as 1 below). We will assess the flows and check if the D/S network needs to be amplified or alternative methods.



Cheers,

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Appendix B

DRAINS Modelling Data

PIT / NODE DETAILS Version 15

Name	Type	Family	Size	Ponding Volume (cu.m)	Pressure Change Coeff. Ku	Surface Elev (m)	Max Pond Depth (m)	Base Inflow (cu.m/s)	Blocking Factor	x	y	Bolt-down lid	id	Part Full Shock Los	Inflow Hydrograph	Pit is	Internal Width (mm)	Inflow is Misaligned	Minor Safe Pond Dept (m)	Major Safe Pond Depth (m)
A01-1	OnGrade	NSW RTA	Single SO1 Pit		5.9	97.116		0	0.1	313567.8	6266312	No	46343995	1 x Ku	No	Existing		No		
A01-2	OnGrade	NSW RTA	Single SO1 Pit		0.5	97.101		0	0.1	313559.8	6266309	No	46343996	1 x Ku	No	Existing		Yes		
A01-3	OnGrade	NSW RTA	Single SO1 Pit		2.1	96.393		0	0.1	313568.6	6266288	No	46343997	1 x Ku	No	Existing		No		
Pit243512	OnGrade	NSW RTA	Single SO1 Pit		2.1	96.025		0	0.1	313572.7	6266277	No	93687333	1 x Ku	No	New				
A01-4	OnGrade	Dished Cro	DCG96D		1.2	95.841		0	0.1	313574.7	6266272	No	46343998	1 x Ku	No	New		No		
A01-5	OnGrade	NSW RTA	SA1		0.9	95.446		0	0.1	313576.7	6266260	No	46343999	1 x Ku	No	Existing		No		
A01-6	OnGrade	NSW RTA	SA2		2	94.844		0	0.1	313566.7	6266250	No	46344000	1 x Ku	No	Existing				
A01-7	OnGrade	NSW RTA	Single SO1 Pit		0.2	93.959		0	0.1	313547.4	6266242	No	46344001	1 x Ku	No	Existing		No		
A01-8	OnGrade	NSW RTA	Single SO1 Pit		0.8	92.095		0	0.1	313517.3	6266231	No	46344002	1 x Ku	No	Existing		No		
A01-9	OnGrade	NSW RTA	Single SO1 Pit		0.3	90.683		0	0.1	313497.5	6266223	No	46344003	1 x Ku	No	Existing		No		
A01-10	OnGrade	NSW RTA	Single SO1 Pit		0	89.756		0	0.1	313480.9	6266216	No	46344004	1 x Ku	No	Existing		No		
A01-11	OnGrade	NSW RTA	SA2		1.6	89.563		0	0.1	313474.6	6266214	No	46344005	1 x Ku	No	Existing		Yes		
A01-12	OnGrade	NSW RTA	SA1		0.8	89.282		0	0.1	313455.4	6266216	No	46344006	1 x Ku	No	Existing		No		
A01-13	OnGrade	NSW RTA	SA2		2.6	89.047		0	0.1	313446.2	6266210	No	46344007	1 x Ku	No	Existing				
A01-14	OnGrade	NSW RTA	Single SO1 Pit		0	88.958		0	0.1	313441.5	6266228	No	46344008	1 x Ku	No	Existing		No		
A01-15	OnGrade	NSW RTA	Single SO1 Pit		0.3	88.863		0	0.1	313437.3	6266239	No	46344009	1 x Ku	No	Existing		No		
A01-16	OnGrade	NSW RTA	Single SO1 Pit		0.3	88.781		0	0.1	313433	6266250	No	46344010	1 x Ku	No	Existing		No		
A01-17	OnGrade	NSW RTA	Single SO1 Pit		0.3	88.749		0	0.1	313431.2	6266255	No	46344011	1 x Ku	No	Existing		No		
A01-18	Sag	NSW RTA	Double SO	0.3	0.3	88.715	0.1	0	0.2	313429.6	6266259	No	46344012	1 x Ku	No	Existing		No	0.2	0.15
A01-19	OnGrade	NSW RTA	Single SO1 Pit		1	88.971		0	0.1	313418.6	6266278	No	46344013	1 x Ku	No	Existing		No		
A01-20	OnGrade	NSW RTA	SA1		0.7	88.775		0	0.1	313407.2	6266283	No	46344014	1 x Ku	No	Existing		No		
A01-21	OnGrade	NSW RTA	SA2		1	88.725		0	0.1	313404	6266291	No	46344015	1 x Ku	No	Existing		No		
A01-22	Node					88.307		0		313393	6266287		46344016		No					
A02-1	OnGrade	Unlimited	Unlimited		2.1	97.939		0	0.1	313564.8	6266349	No	46344017	1 x Ku	No	Existing		No		
A02-2	OnGrade	NSW RTA	SA2		1.5	97.6		0	0.1	313556.3	6266357	No	46344018	1 x Ku	No	Existing		Yes		
A02-3	OnGrade	NSW RTA	SA2		1.4	97.306		0	0.1	313547.7	6266350	No	46344019	1 x Ku	No	Existing		No		
A02-4	OnGrade	NSW RTA	SA2		1.1	95.35		0	0.1	313512	6266334	No	46344020	1 x Ku	No	Existing		No		
A02-5	OnGrade	NSW RTA	SA2		1.6	94.299		0	0.1	313498	6266328	No	46344021	1 x Ku	No	Existing		No		
A02-6	OnGrade	NSW RTA	SA2		1	91.869		0	0.1	313466.4	6266316	No	46344022	1 x Ku	No	Existing		No		
A02-7	OnGrade	NSW RTA	SA2		0	90.091		0	0.1	313442.7	6266307	No	46344023	1 x Ku	No	Existing		No		
A02-8	OnGrade	NSW RTA	SA2		1.6	89.517		0	0.1	313433.2	6266305	No	46344024	1 x Ku	No	Existing		Yes		
A03-1	OnGrade	NSW RTA	SA2		5.8	95.626		0	0.1	313589.1	6266258	No	46344025	1 x Ku	No	Existing		No		
A03-2	Sag	NSW RTA	SA2	0.3	5.9	95.52	0.09	0	0.2	313591.6	6266252	No	46344026	1 x Ku	No	Existing		No	0.2	0.15
A03-3	OnGrade	NSW RTA	SA2		2	95.635		0	0.1	313595.3	6266242	No	46344027	1 x Ku	No	Existing		Yes		
A03-4	OnGrade	NSW RTA	SA2		1.1	95.589		0	0.1	313587.6	6266238	No	46344028	1 x Ku	No	Existing		No		
A03-5	OnGrade	NSW RTA	SA2		1.7	94.82		0	0.1	313569.3	6266242	No	46344029	1 x Ku	No	Existing		No		
A04-1	OnGrade	NSW RTA	Single SO1 Pit		5.5	90.146		0	0.1	313493	6266212	No	46344030	1 x Ku	No	Existing		No		
A04-2	OnGrade	NSW RTA	Single SO1 Pit		5.9	89.699		0	0.1	313483.4	6266209	No	46344031	1 x Ku	No	Existing		No		
A04-3	OnGrade	NSW RTA	SA2		0.8	89.529		0	0.1	313476.5	6266206	No	46344032	1 x Ku	No	Existing		No		
A04-4	OnGrade	NSW RTA	SA2		1.7	89.46		0	0.1	313468.9	6266203	No	46344033	1 x Ku	No	Existing		No		
A04-5	OnGrade	NSW RTA	SA2		1.8	89.111		0	0.1	313451	6266198	No	46344034	1 x Ku	No	Existing		Yes		
A06-1	OnGrade	NSW RTA	Single SO1 Pit		3.3	91.98		0	0.5	313513.1	6266240	No	46344036	1 x Ku	No	Existing		No		
A07-1	OnGrade	NSW RTA	Single SO1 Pit		5.7	92.154		0	0.1	313520.3	6266223	No	46344037	1 x Ku	No	Existing		No		
A08-1	OnGrade	NSW RTA	Single SO1 Pit		5.9	93.964		0	0.1	313550.3	6266235	No	46344038	1 x Ku	No	Existing		No		
A09-1	OnGrade	NSW RTA	Single SO1 Pit		5.9	91.505		0	0.5	313464.6	6266296	No	46344039	1 x Ku	No	Existing		No		
A09-2	OnGrade	NSW RTA	Single SO1 Pit		5.9	91.338		0	0.1	313459.3	6266303	No	46344040	1 x Ku	No	Existing		No		
A09-3	OnGrade	NSW RTA	SA2		0.5	90.324		0	0.1	313446	6266298	No	46344041	1 x Ku	No	Existing		Yes		
A10-1	OnGrade	NSW RTA	Single SO1 Pit		3.3	94.595		0	0.5	313504.7	6266312	No	46344042	1 x Ku	No	Existing		No		
A10-2	OnGrade	NSW RTA	Single SO1 Pit		2.7	94.573		0	0.1	313501.4	6266320	No	46344043	1 x Ku	No	Existing		No		
A011-1	OnGrade	NSW RTA	Single SO1 Pit		5.9	96.38		0	0.1	313576.2	6266291	No	46344044	1 x Ku	No	Existing		No		
A012-1	OnGrade	NSW RTA	Single SO1 Pit		5.9	95.823		0	0.1	313582.5	6266275	No	46344045	1 x Ku	No	Existing		No		
O A01-20	Node					88.775		0		313396.2	6266279		46344046		No					
O A02-8	Node					89.517		0		313418.2	6266313		46344048		No					
N159188	Node							0		313589.4	6266348		46671224		No					
N185505	Node					89.5		0		313465.4	6266222		53371042		No					
Bypass	Node					89.9		0		313443.1	6266271		76451740		No					
Pit264018	OnGrade	Hinged Pit	HPG6060		1.5	89.35		0	0.1	313455.5	6266259	No	1.13E+08	1 x Ku	No	New				
Pit264019	OnGrade	Hinged Pit	HPG4545		1.5	89.5		0	0.1	313460.1	6266250	No	1.13E+08	1 x Ku	No	New				
Pit264020	OnGrade	Hinged Pit	HPG4545		1.5	89.55		0	0.1	313462.5	6266238	No	1.13E+08	1 x Ku	No	New				
Pit264021	OnGrade	Hinged Pit	HPG4545		1.5	89.6		0	0.1	313464	6266230	No	1.13E+08	1 x Ku	No	New				
A05-1	OnGrade	Unlimited	Unlimited		0.6	89.677		0	0.5	313477.1	6266226	No	46344035	1 x Ku	No	Existing		No		
N298647	Node					80		0		313446.9	6266257		1.13E+08		No					

DETENTION BASIN DETAILS

Name	Elev	Surf. Area	Not Used	Outlet Type	K	Dia(mm)	Centre RL	Pit Family	Pit Type	x	y	HED	Crest RL	Crest Leng	id
OSD	88.75	257.5		Culvert	0.5					313475.4	6266231	No			51418931
	89.75	257.5													
	89.751	3													
	89.9	3													

SUB-CATCHMENT DETAILS

Name	Pit or Node	Total Area (ha)	Paved Area %	Grass Area %	Supp Area %	Paved Time (min)	Grass Time (min)	Supp Time (min)	Paved Length (m)	Grass Length (m)	Supp Length (m)	Paved Slope(%) %	Grass Slope %	Supp Slope %	Paved Rough	Grass Rough	Supp Rough	Lag Time or Factor	Gutter Length (m)	Gutter Slope %	Gutter FlowFactor	Rainfall Multiplier
C A01-1	A01-1	0.0409	100	0	0	5	10	0														1
C A01-2	A01-2	0.0202	100	0	0	5	10	0														1
C A01-3	A01-3	0.028	100	0	0	5	10	0														1
C A01-4	Pit243512	0.023	100	0	0	5	10	0														1
C A01-5	A01-5	0.0171	100	0	0	5	10	0														1
C A01-6	A01-6	0.0221	100	0	0	5	10	0														1
C A01-7	A01-7	0.0212	100	0	0	5	10	0														1
C A01-8	A01-8	0.0408	100	0	0	5	10	0														1
C A01-9	A01-9	0.0219	100	0	0	5	10	0														1
C A01-10	A01-10	0.0276	100	0	0	5	10	0														1
C A01-11	A01-11	0.0168	100	0	0	5	10	0														1
C A01-12	A01-12	0.0218	100	0	0	5	10	0														1
C A01-13	A01-13	0.0828	100	0	0	5	10	0														1
C A01-14	A01-14	0.043	100	0	0	5	10	0														1
C A01-15	A01-15	0.0291	100	0	0	5	10	0														1
C A01-16	A01-16	0.0323	100	0	0	5	10	0														1
C A01-17	A01-17	0.0143	100	0	0	5	10	0														1
C A01-18	A01-18	0.0156	100	0	0	5	10	0														1
C A01-19	A01-19	0.1018	100	0	0	5	10	0														1
C A01-20	A01-20	0.0165	100	0	0	5	10	0														1
C A01-21	A01-21	0.0208	100	0	0	5	10	0														1
C A02-1	A02-1	0.1062	100	0	0	5	10	0														1
C A02-3	A02-3	0.0179	100	0	0	5	10	0														1
C A02-4	A02-4	0.0609	100	0	0	5	10	0														1
C A02-5	A02-5	0.0152	100	0	0	5	10	0														1
C A02-6	A02-6	0.0421	100	0	0	5	10	0														1
C A02-7	A02-7	0.0364	100	0	0	5	10	0														1
C A02-8	A02-8	0.0168	100	0	0	5	10	0														1
C A03-1	A03-1	0.1001	100	0	0	5	10	0														1
C A03-2	A03-2	0.0648	100	0	0	5	10	0														1
C A03-3	A03-3	0.1047	100	0	0	5	10	0														1
C A03-4	A03-4	0.0286	100	0	0	5	10	0														1
C A03-5	A03-5	0.0255	100	0	0	5	10	0														1
C A04-2	A04-2	0.0854	100	0	0	5	10	0														1
C A04-3	A04-3	0.0094	100	0	0	5	10	0														1
C A04-4	A04-4	0.0668	100	0	0	5	10	0														1
C A04-5	A04-5	0.0231	100	0	0	5	10	0														1
C A07-1	A07-1	0.0951	100	0	0	5	10	0														1
C A08-1	A08-1	0.0154	100	0	0	5	10	0														1
C A09-2	A09-2	0.0348	100	0	0	5	10	0														1
C A09-3	A09-3	0.0072	100	0	0	5	10	0														1
C A10-2	A10-2	0.0329	100	0	0	5	10	0														1
C A11-1	A011-1	0.0882	100	0	0	5	10	0														1
C A12-1	A012-1	0.054	100	0	0	5	10	0														1
Cat101892	N159188	1.08	100	0	0	8.5	10	0														1
C Bypass	Bypass	0.006	100	0	0	5	5	2										0				1
Cat218326	Pit264018	0.0548	100	0	0	5	5	2										0				1
Cat218330	Pit264019	0.0168	100	0	0	5	5	2										0				1
Cat218331	Pit264020	0.0151	100	0	0	5	5	2										0				1
Cat218332	Pit264021	0.0195	100	0	0	5	5	2										0				1
C A05-1	OSD	0.69	100	0	0	5	10	0														1

PIPE DETAILS

Name	From	To	Length (m)	U/S IL (m)	D/S IL (m)	Slope (%)	Type	Dia (mm)	I.D. (mm)	Rough	Pipe Is	No. Pipes	Chg From	At Chg	Chg (m)	Rl (m)	Chg (m)	RL (m)	etc (m)
P A01-1	A01-1	A01-2	8.499	95.86	95.73	1.53	Concrete,	375	375	0.3	Existing	1	A01-2	0					
P A01-2	A01-2	A01-3	23.387	95.73	94.97	3.25	Concrete,	375	375	0.3	Existing	1	A01-3	0					
P A01-3	A01-3	Pit243512	10.947	94.97	94.667	2.77	Concrete,	375	375	0.3	Existing	1	Pit243512	0					
P249763	Pit243512	A01-4	6	94.66	94.5	2.67	Concrete,	375	375	0.3	Existing	1	A01-4	0					
P A01-4	A01-4	A01-5	12.197	94.5	94.06	3.61	Concrete,	375	375	0.3	Existing	1	A01-5	0					
P A01-5	A01-5	A01-6	14.184	94.06	93.32	5.22	Concrete,	375	375	0.3	Existing	1	A01-6	0					
P A01-6	A01-6	A01-7	20.769	93.32	92.33	4.77	Concrete,	375	375	0.3	Existing	1	A01-7	0					
P A01-7	A01-7	A01-8	32.298	92.33	90.48	5.73	Concrete,	375	375	0.3	Existing	1	A01-8	0					
P A01-8	A01-8	A01-9	21.169	90.48	89.15	6.28	Concrete,	375	375	0.3	Existing	1	A01-9	0					
P A01-9	A01-9	A01-10	17.901	89.15	88.3	4.75	Concrete,	375	375	0.3	Existing	1	A01-10	0					
P A01-10	A01-10	A01-11	6.791	88.3	88.14	2.36	Concrete,	600	600	0.3	Existing	1	A01-11	0					
P A01-11	A01-11	A01-12	19.249	88.14	87.77	1.92	Concrete,	600	600	0.3	Existing	1	A01-12	0					
P A01-12	A01-12	A01-13	10.699	87.77	87.48	2.71	Concrete,	600	600	0.3	Existing	1	A01-13	0					
P A01-13	A01-13	A01-14	18.075	87.48	87.31	0.94	Concrete,	600	600	0.3	Existing	1	A01-14	0					
P A01-14	A01-14	A01-15	11.834	87.31	87.13	1.52	Concrete,	750	750	0.3	Existing	1	A01-15	0					
P A01-15	A01-15	A01-16	11.938	87.13	87.02	0.92	Concrete,	750	750	0.3	Existing	1	A01-16	0					
P A01-16	A01-16	A01-17	5.116	87.02	86.94	1.56	Concrete,	750	750	0.3	Existing	1	A01-17	0					
P A01-17	A01-17	A01-18	4.46	86.94	86.87	1.57	Concrete,	750	750	0.3	Existing	1	A01-18	0					
P A01-18	A01-18	A01-19	22.421	86.87	86.69	0.8	Concrete,	750	750	0.3	Existing	1	A01-19	0					
P A01-19	A01-19	A01-20	12.319	86.69	86.5	1.54	Concrete,	750	750	0.3	Existing	1	A01-20	0					
P A01-20	A01-20	A01-21	8.889	86.5	86.39	1.24	Concrete,	750	750	0.3	Existing	1	A01-21	0					
P A01-21	A01-21	A01-22	11.825	86.39	86	3.3	Concrete,	750	750	0.3	Existing	1	A01-22	0					
P A02-1	A02-1	A02-2	11.477	96.464	95.95	4.48	Concrete,	375	375	0.3	Existing	1	A02-2	0					
P A02-2	A02-2	A02-3	11.129	95.95	95.73	1.98	Concrete,	375	375	0.3	Existing	1	A02-3	0					
P A02-3	A02-3	A02-4	39.237	95.73	93.57	5.51	Concrete,	375	375	0.3	Existing	1	A02-4	0					
P A02-4	A02-4	A02-5	14.996	93.57	92.57	6.67	Concrete,	375	375	0.3	Existing	1	A02-5	0					
P A02-5	A02-5	A02-6	33.903	92.57	90.28	6.75	Concrete,	375	375	0.3	Existing	1	A02-6	0					
P A02-6	A02-6	A02-7	25.327	90.28	88.28	7.9	Concrete,	375	375	0.3	Existing	1	A02-7	0					
P A02-7	A02-7	A02-8	9.827	88.28	87.73	5.6	Concrete,	600	600	0.3	Existing	1	A02-8	0					
P A02-8	A02-8	A01-21	32.144	87.73	86.39	4.17	Concrete,	600	600	0.3	Existing	1	A01-21	0					
P A03-1	A03-1	A03-2	6.812	94.148	94.08	1	Concrete,	375	375	0.3	Existing	1	A03-2	0					
P A03-2	A03-2	A03-3	10.299	94.06	93.957	1	Concrete,	375	375	0.3	Existing	1	A03-3	0					
P A03-3	A03-3	A03-4	8.534	93.937	93.852	1	Concrete,	375	375	0.3	Existing	1	A03-4	0					
P A03-4	A03-4	A03-5	18.662	93.832	93.44	2.1	Concrete,	375	375	0.3	Existing	1	A03-5	0					
P A03-5	A03-5	A01-6	8.09	93.44	93.32	1.48	Concrete,	375	375	0.3	Existing	1	A01-6	0					
P A04-1	A04-1	A04-2	10.43	88.74	88.41	3.16	Concrete,	375	375	0.3	Existing	1	A04-2	0					
P A04-2	A04-2	A04-3	7.333	88.41	88.1	4.23	Concrete,	375	375	0.3	Existing	1	A04-3	0					
P A04-3	A04-3	A04-4	8.133	88.1	87.85	3.07	Concrete,	375	375	0.3	Existing	1	A04-4	0					
P A04-4	A04-4	A04-5	18.602	87.85	87.636	1.15	Concrete,	375	375	0.3	Existing	1	A04-5	0					
P A04-5	A04-5	A01-13	12.954	87.616	87.48	1.05	Concrete,	375	375	0.3	Existing	1	A01-13	0					
P A06-1	A06-1	A01-8	10.657	90.9	90.48	3.94	Concrete,	375	375	0.3	Existing	1	A01-8	0					
P A07-1	A07-1	A01-8	8.018	90.63	90.48	1.87	Concrete,	375	375	0.3	Existing	1	A01-8	0					
P A08-1	A08-1	A01-7	7.982	92.57	92.33	3.01	Concrete,	375	375	0.3	Existing	1	A01-7	0					
P A09-1	A09-1	A09-2	9.062	90.28	90.01	2.98	Concrete,	375	375	0.3	Existing	1	A09-2	0					
P A09-2	A09-2	A09-3	14.298	90.01	88.89	7.83	Concrete,	375	375	0.3	Existing	1	A09-3	0					
P A09-3	A09-3	A02-7	9.644	88.89	88.28	6.33	Concrete,	375	375	0.3	Existing	1	A02-7	0					
P A10-1	A10-1	A10-2	8.749	93.33	93.09	2.74	Concrete,	375	375	0.3	Existing	1	A10-2	0					
P A10-2	A10-2	A02-5	9.432	93.09	92.57	5.51	Concrete,	375	375	0.3	Existing	1	A02-5	0					
P A11-1	A011-1	A01-3	8.231	95.052	94.97	1	Concrete,	375	375	0.3	Existing	1	A01-3	0					
P A12-1	A012-1	A01-4	8.246	94.582	94.5	0.99	Concrete,	375	375	0.3	Existing	1	A01-4	0					
Pipe27069	Pit264018	Pit264019	12	89.03	88.97	0.5	uPVC, not	225	242	0.03	New	2	Pit264019	0					
Pipe27069	Pit264019	Pit264020	10	88.97	88.92	0.5	uPVC, not	225	242	0.03	New	2	Pit264020	0					
Pipe27069	Pit264020	Pit264021	9	88.92	88.875	0.5	uPVC, not	225	242	0.03	New	2	Pit264021	0					
Pipe27069	Pit264021	OSD	9	88.875	88.83	0.5	uPVC, not	225	242	0.03	NewFixed	2	OSD	0					
Pipe16451	OSD	A05-1	10	88.75	88.645	1.05	Concrete,	375	375	0.3	NewFixed	1	A05-1	0					
P A05-1	A05-1	A01-10	10.768	88.64	88.3	3.16	Concrete,	375	375	0.3	Existing	1	A01-10	0					

DETAILS of SERVICES CROSSING PIPES

Pipe	Chg (m)	Bottom Elev (m)	Height of S (m)	Chg (m)	Bottom Elev (m)	Height of S (m)	Chg (m)	Bottom Elev (m)	Height of S (m)	etc

CHANNEL DETAILS

Name	From	To	Type	Length (m)	U/S IL (m)	D/S IL (m)	Slope (%)	Base Width (m)	L.B. Slope (1:?)	R.B. Slope (1:?)	Manning n	Depth (m)	Roofed

OVERFLOW ROUTE DETAILS

Name	From	To	Travel Time (min)	Spill Level (m)	Crest Length (m)	Weir Coeff. C	Cross Section	Safe Depth Major (m)	Safe Depth Minor (m)	Safe DxV (sq.m/sec)	Bed Slope (%)	D/S Area Contributing %	id	
F A01-1x	A01-1	A011-1		1			7.5 m road	0.3	0.15	0.4	3.21	100	46344147	22.957
F A01-2x	A01-2	A01-3		1			7.5 m road	0.3	0.15	0.4	3.03	100	46344148	23.387
F A01-3x	A01-3	Pit243512		1			7.5 m road	0.3	0.15	0.4	3.26	100	46344149	16.947
OF236497	Pit243512	A01-4		1			7.5 m road	0.3	0.15	0.4	3.26	100	93687364	16.947
F A01-4x	A01-4	A01-5		1			7.5 m road	0.3	0.15	0.4	3.15	100	46344150	12.549
F A01-5x	A01-5	A01-6		1			7.5 m road	0.3	0.15	0.4	3.96	100	46344151	15.212
F A01-6	A01-6	A01-7		1			7.5 m road	0.3	0.15	0.4	4.26	100	46344152	20.768
F A01-7	A01-7	A01-8		1			7.5 m road	0.3	0.15	0.4	5.77	100	46344153	32.298
F A01-8	A01-8	A01-9		1			7.5 m road	0.3	0.15	0.4	6.67	100	46344154	21.169
F A01-9	A01-9	A01-10		1			7.5 m road	0.3	0.15	0.4	5.18	100	46344155	17.901
F A01-10	A01-10	A01-11		1			7.5 m road	0.3	0.15	0.4	2.84	100	46344156	6.79
F A01-11	A01-11	A01-12		1			7.5 m road	0.3	0.15	0.4	1.31	100	46344157	21.494
F A01-12	A01-12	A01-14		1			4 m wide p	0.3	0.15	0.4	1.49	100	46344158	21.739
F A01-13	A01-13	A01-14		1			7.5 m road	0.3	0.15	0.4	0.49	100	46344159	18.076
F A01-14	A01-14	A01-15		1			7.5 m road	0.3	0.15	0.4	0.8	100	46344160	11.834
F A01-15	A01-15	A01-16		1			7.5 m road	0.3	0.15	0.4	0.69	100	46344161	11.938
F A01-16	A01-16	A01-17		1			7.5 m road	0.3	0.15	0.4	0.63	100	46344162	5.115
F A01-17	A01-17	A01-18		1			7.5 m road	0.3	0.15	0.4	0.76	100	46344163	4.46
F A01-18	A01-18	A01-20		1			7.5 m road	0.3	0.15	0.4	1	100	46344164	22.775
F A01-19	A01-19	A01-20		1			7.5 m road	0.3	0.15	0.4	1.48	100	46344165	13.21
F A01-20	A01-20	O A01-20		1			7.5 m road	0.3	0.15	0.4	4	100	46344166	13.6
F A01-21	A01-21	A01-22		1			7.5 m road	0.3	0.15	0.4	4	100	46344167	10
F A02-1x	A02-1	A02-3		1			Overflow a	0.05	0	0.6	3.78	100	46344168	16.75
F A02-2x	A02-2	A02-3		1			7.5 m road	0.3	0.15	0.4	2.64	100	46344169	11.128
F A02-3x	A02-3	A02-4		1			7.5 m road	0.3	0.15	0.4	4.97	100	46344170	39.322
F A02-4x	A02-4	A02-5		1			7.5 m road	0.3	0.15	0.4	7.01	100	46344171	14.996
F A02-5x	A02-5	A02-6		1			7.5 m road	0.3	0.15	0.4	7.17	100	46344172	33.903
F A01-19x	A02-6	A02-7		1			7.5 m road	0.3	0.15	0.4	7.02	100	46344173	25.327
F A01-20x	A02-7	A02-8		1			7.5 m road	0.3	0.15	0.4	5.84	100	46344174	9.821
F A01-21x	A02-8	O A02-8		1			7.5 m road	0.3	0.15	0.4	1	100	46344175	10
F A03-1	A03-1	A03-2		1			7.5 m road	0.3	0.15	0.4	0.13	100	46344176	6.811
OF169744	A03-2	A03-5		0.1			4 m wide p	0.3	0.15	0.4	3.72	100	60940239	24.1
F A03-3	A03-3	A03-2		1			7.5 m road	0.3	0.15	0.4	0.17	100	46344177	10.299
F A03-4x	A03-4	A03-5		1			7.5 m road	0.3	0.15	0.4	3.62	100	46344178	21.236
F A03-5	A03-5	A08-1		1			7.5 m road	0.3	0.15	0.4	4.19	100	46344179	20.435
F A04-1x	A04-1	A04-2		1			7.5 m road	0.3	0.15	0.4	4.29	100	46344180	10.429
F A04-2	A04-2	A04-3		1			7.5 m road	0.3	0.15	0.4	2.32	100	46344181	7.333
F A04-3	A04-3	A04-4		1			7.5 m road	0.3	0.15	0.4	0.85	100	46344182	8.132
F A04-4	A04-4	A04-5		1			4 m wide p	0.3	0.15	0.4	1.88	100	46344183	18.598
F A04-5	A04-5	A01-13		1			7.5 m road	0.3	0.15	0.4	0.49	100	46344184	12.954
F A03-4	A06-1	A05-1		1			Swale with	0.45	0.3	1	5.96	100	46344186	38.669
F A07-1x	A07-1	A04-1		1			7.5 m road	0.3	0.15	0.4	6.87	100	46344187	29.244
F A08-1	A08-1	A07-1		1			7.5 m road	0.3	0.15	0.4	5.62	100	46344188	32.204
F A09-1	A09-1	A01-19		1			7.5 m road	0.3	0.15	0.4	5.15	100	46344189	49.235
F A09-2	A09-2	A09-3		1			7.5 m road	0.3	0.15	0.4	7.09	100	46344190	14.298
F A09-3	A09-3	A01-19		1			7.5 m road	0.3	0.15	0.4	3.69	100	46344199	36.7
F A10-1	A10-1	A09-1		1			7.5 m road	0.3	0.15	0.4	7.18	100	46344192	43.041
F A010-2	A10-2	A09-2		1			7.5 m road	0.3	0.15	0.4	7.15	100	46344193	45.22
F A11-1	A011-1	A012-1		1			7.5 m road	0.3	0.15	0.4	3.18	100	46344202	17.5
F A012-1	A012-1	A03-1		1			7.5 m road	0.3	0.15	0.4	1.1	100	46344195	17.9
OF130487	N159188	A02-1		0.2			7.5 m road	0.3	0.15	0.4	1	100	46671226	25.8
F Bypass	Bypass	A01-18		0.2			Overflow a	0.05	0	0.6	2	0	76451743	10
OF258220	Pit264018	N298647		0.2			Overflow a	0.05	0	0.6	1	0	1.13E+08	9.1
OF258229	Pit264019	Pit264018		0.4			Informal pa	0.04	0.04	0.6	1	90	1.13E+08	9.4
OF258228	Pit264020	Pit264019		0.4			Informal pa	0.04	0.04	0.6	1	90	1.13E+08	9.4
OF258212	Pit264021	Pit264020		0.4			Informal pa	0.04	0.04	0.6	1	90	1.13E+08	9.4

OF222707	OSD	N185505	0.1	89.9	3.6	1.67	4 m wide p	0.3	0.15	0.4	1	0	87158701	15
OF154692	A05-1	N185505	0.1				4 m wide p	0.3	0.15	0.4	1.39	100	53371041	12.7

PIPE COVER DETAILS

Name	Type	Dia (mm)	Safe Cover	Cover (m)	
P A01-1	Concrete, r	375	0.6	0.85	
P A01-2	Concrete, r	375	0.6	0.96	
P A01-3	Concrete, r	375	0.6	0.95	
P249763	Concrete, r	375	0.6	0.93	
P A01-4	Concrete, r	375	0.6	0.93	
P A01-5	Concrete, r	375	0.6	0.98	
P A01-6	Concrete, r	375	0.6	1.11	
P A01-7	Concrete, r	375	0.6	1.2	
P A01-8	Concrete, r	375	0.6	1.12	
P A01-9	Concrete, r	375	0.6	1.05	
P A01-10	Concrete, r	600	0.6	0.78	
P A01-11	Concrete, r	600	0.6	0.78	
P A01-12	Concrete, r	600	0.6	0.87	
P A01-13	Concrete, r	600	0.6	0.92	
P A01-14	Concrete, r	750	0.6	0.84	
P A01-15	Concrete, r	750	0.6	0.92	
P A01-16	Concrete, r	750	0.6	0.95	
P A01-17	Concrete, r	750	0.6	1	
P A01-18	Concrete, r	750	0.6	1.03	
P A01-19	Concrete, r	750	0.6	1.47	
P A01-20	Concrete, r	750	0.6	1.47	
P A01-21	Concrete, r	750	0.6	1.5	
P A02-1	Concrete, r	375	0.6	1.06	
P A02-2	Concrete, r	375	0.6	1.17	
P A02-3	Concrete, r	375	0.6	1.17	
P A02-4	Concrete, r	375	0.6	1.32	
P A02-5	Concrete, r	375	0.6	1.18	
P A02-6	Concrete, r	375	0.6	1.18	
P A02-7	Concrete, r	600	0.6	1.14	
P A02-8	Concrete, r	600	0.6	1.14	
P A03-1	Concrete, r	375	0.6	1.03	
P A03-2	Concrete, r	375	0.6	1.05	
P A03-3	Concrete, r	375	0.6	1.29	
P A03-4	Concrete, r	375	0.6	0.97	
P A03-5	Concrete, r	375	0.6	0.97	
P A04-1	Concrete, r	375	0.6	0.88	
P A04-2	Concrete, r	375	0.6	0.88	
P A04-3	Concrete, r	375	0.6	1.02	
P A04-4	Concrete, r	375	0.6	1.06	
P A04-5	Concrete, r	375	0.6	1.08	
P A06-1	Concrete, r	375	0.6	0.67	
P A07-1	Concrete, r	375	0.6	1.11	
P A08-1	Concrete, r	375	0.6	0.98	
P A09-1	Concrete, r	375	0.6	0.81	
P A09-2	Concrete, r	375	0.6	0.92	
P A09-3	Concrete, r	375	0.6	1.02	
P A10-1	Concrete, r	375	0.6	0.85	
P A10-2	Concrete, r	375	0.6	1.07	
P A11-1	Concrete, r	375	0.6	0.92	
P A12-1	Concrete, r	375	0.6	0.83	
Pipe27069	uPVC, not	242	0.3	0.07	Unsafe
Pipe27069	uPVC, not	242	0.3	0.28	Unsafe
Pipe27069	uPVC, not	242	0.3	0.38	
Pipe27069	uPVC, not	242	0.3	-0.33	Unsafe
Pipe16451	Concrete, r	375	0.6	-0.41	Unsafe
P A05-1	Concrete, r	375	0.6	0.63	

These pipes have non-return valves: Pipe270690

Appendix C

DRAINS Modelling Results

PIT / NODE DETAILS Version 15

Name	Type	Family	Size	Ponding Volume (cu.m)	Pressure Change Coeff. Ku	Surface Elev (m)	Max Pond Depth (m)	Base Inflow (cu.m/s)	Blocking Factor	x	y	Bolt-down lid	id	Part Full Shock Los	Inflow Hydrograph	Pit is	Internal Width (mm)	Inflow is Misaligned	Minor Safe Pond Dept (m)	Major Safe Pond Depth (m)
A01-1	OnGrade	NSW RTA	Single SO1 Pit		5.9	97.116		0	0.1	313567.8	6266312	No	46343995	1 x Ku	No	Existing		No		
A01-2	OnGrade	NSW RTA	Single SO1 Pit		0.5	97.101		0	0.1	313559.8	6266309	No	46343996	1 x Ku	No	Existing		Yes		
A01-3	OnGrade	NSW RTA	Single SO1 Pit		2.1	96.393		0	0.1	313568.6	6266288	No	46343997	1 x Ku	No	Existing		No		
Pit243512	OnGrade	NSW RTA	Single SO1 Pit		2.1	96.025		0	0.1	313572.7	6266277	No	93687333	1 x Ku	No	New				
A01-4	OnGrade	Dished Cro	DCG96D		1.2	95.841		0	0.1	313574.7	6266272	No	46343998	1 x Ku	No	New		No		
A01-5	OnGrade	NSW RTA	SA1		0.9	95.446		0	0.1	313576.7	6266260	No	46343999	1 x Ku	No	Existing		No		
A01-6	OnGrade	NSW RTA	SA2		2	94.844		0	0.1	313566.7	6266250	No	46344000	1 x Ku	No	Existing				
A01-7	OnGrade	NSW RTA	Single SO1 Pit		0.2	93.959		0	0.1	313547.4	6266242	No	46344001	1 x Ku	No	Existing		No		
A01-8	OnGrade	NSW RTA	Single SO1 Pit		0.8	92.095		0	0.1	313517.3	6266231	No	46344002	1 x Ku	No	Existing		No		
A01-9	OnGrade	NSW RTA	Single SO1 Pit		0.3	90.683		0	0.1	313497.5	6266223	No	46344003	1 x Ku	No	Existing		No		
A01-10	OnGrade	NSW RTA	Single SO1 Pit		0	89.756		0	0.1	313480.9	6266216	No	46344004	1 x Ku	No	Existing		No		
A01-11	OnGrade	NSW RTA	SA2		1.6	89.563		0	0.1	313474.6	6266214	No	46344005	1 x Ku	No	Existing		Yes		
A01-12	OnGrade	NSW RTA	SA1		0.8	89.282		0	0.1	313455.4	6266216	No	46344006	1 x Ku	No	Existing		No		
A01-13	OnGrade	NSW RTA	SA2		2.6	89.047		0	0.1	313446.2	6266210	No	46344007	1 x Ku	No	Existing				
A01-14	OnGrade	NSW RTA	Single SO1 Pit		0	88.958		0	0.1	313441.5	6266228	No	46344008	1 x Ku	No	Existing		No		
A01-15	OnGrade	NSW RTA	Single SO1 Pit		0.3	88.863		0	0.1	313437.3	6266239	No	46344009	1 x Ku	No	Existing		No		
A01-16	OnGrade	NSW RTA	Single SO1 Pit		0.3	88.781		0	0.1	313433	6266250	No	46344010	1 x Ku	No	Existing		No		
A01-17	OnGrade	NSW RTA	Single SO1 Pit		0.3	88.749		0	0.1	313431.2	6266255	No	46344011	1 x Ku	No	Existing		No		
A01-18	Sag	NSW RTA	Double SO	0.3	0.3	88.715	0.1	0	0.2	313429.6	6266259	No	46344012	1 x Ku	No	Existing		No	0.2	0.15
A01-19	OnGrade	NSW RTA	Single SO1 Pit		1	88.971		0	0.1	313418.6	6266278	No	46344013	1 x Ku	No	Existing		No		
A01-20	OnGrade	NSW RTA	SA1		0.7	88.775		0	0.1	313407.2	6266283	No	46344014	1 x Ku	No	Existing		No		
A01-21	OnGrade	NSW RTA	SA2		1	88.725		0	0.1	313404	6266291	No	46344015	1 x Ku	No	Existing		No		
A01-22	Node					88.307		0		313393	6266287		46344016		No					
A02-1	OnGrade	Unlimited	Unlimited		2.1	97.939		0	0.1	313564.8	6266349	No	46344017	1 x Ku	No	Existing		No		
A02-2	OnGrade	NSW RTA	SA2		1.5	97.6		0	0.1	313556.3	6266357	No	46344018	1 x Ku	No	Existing		Yes		
A02-3	OnGrade	NSW RTA	SA2		1.4	97.306		0	0.1	313547.7	6266350	No	46344019	1 x Ku	No	Existing		No		
A02-4	OnGrade	NSW RTA	SA2		1.1	95.35		0	0.1	313512	6266334	No	46344020	1 x Ku	No	Existing		No		
A02-5	OnGrade	NSW RTA	SA2		1.6	94.299		0	0.1	313498	6266328	No	46344021	1 x Ku	No	Existing		No		
A02-6	OnGrade	NSW RTA	SA2		1	91.869		0	0.1	313466.4	6266316	No	46344022	1 x Ku	No	Existing		No		
A02-7	OnGrade	NSW RTA	SA2		0	90.091		0	0.1	313442.7	6266307	No	46344023	1 x Ku	No	Existing		No		
A02-8	OnGrade	NSW RTA	SA2		1.6	89.517		0	0.1	313433.2	6266305	No	46344024	1 x Ku	No	Existing		Yes		
A03-1	OnGrade	NSW RTA	SA2		5.8	95.626		0	0.1	313589.1	6266258	No	46344025	1 x Ku	No	Existing		No		
A03-2	Sag	NSW RTA	SA2	0.3	5.9	95.52	0.09	0	0.2	313591.6	6266252	No	46344026	1 x Ku	No	Existing		No	0.2	0.15
A03-3	OnGrade	NSW RTA	SA2		2	95.635		0	0.1	313595.3	6266242	No	46344027	1 x Ku	No	Existing		Yes		
A03-4	OnGrade	NSW RTA	SA2		1.1	95.589		0	0.1	313587.6	6266238	No	46344028	1 x Ku	No	Existing		No		
A03-5	OnGrade	NSW RTA	SA2		1.7	94.82		0	0.1	313569.3	6266242	No	46344029	1 x Ku	No	Existing		No		
A04-1	OnGrade	NSW RTA	Single SO1 Pit		5.5	90.146		0	0.1	313493	6266212	No	46344030	1 x Ku	No	Existing		No		
A04-2	OnGrade	NSW RTA	Single SO1 Pit		5.9	89.699		0	0.1	313483.4	6266209	No	46344031	1 x Ku	No	Existing		No		
A04-3	OnGrade	NSW RTA	SA2		0.8	89.529		0	0.1	313476.5	6266206	No	46344032	1 x Ku	No	Existing		No		
A04-4	OnGrade	NSW RTA	SA2		1.7	89.46		0	0.1	313468.9	6266203	No	46344033	1 x Ku	No	Existing		No		
A04-5	OnGrade	NSW RTA	SA2		1.8	89.111		0	0.1	313451	6266198	No	46344034	1 x Ku	No	Existing		Yes		
A06-1	OnGrade	NSW RTA	Single SO1 Pit		3.3	91.98		0	0.5	313513.1	6266240	No	46344036	1 x Ku	No	Existing		No		
A07-1	OnGrade	NSW RTA	Single SO1 Pit		5.7	92.154		0	0.1	313520.3	6266223	No	46344037	1 x Ku	No	Existing		No		
A08-1	OnGrade	NSW RTA	Single SO1 Pit		5.9	93.964		0	0.1	313550.3	6266235	No	46344038	1 x Ku	No	Existing		No		
A09-1	OnGrade	NSW RTA	Single SO1 Pit		5.9	91.505		0	0.5	313464.6	6266296	No	46344039	1 x Ku	No	Existing		No		
A09-2	OnGrade	NSW RTA	Single SO1 Pit		5.9	91.338		0	0.1	313459.3	6266303	No	46344040	1 x Ku	No	Existing		No		
A09-3	OnGrade	NSW RTA	SA2		0.5	90.324		0	0.1	313446	6266298	No	46344041	1 x Ku	No	Existing		Yes		
A10-1	OnGrade	NSW RTA	Single SO1 Pit		3.3	94.595		0	0.5	313504.7	6266312	No	46344042	1 x Ku	No	Existing		No		
A10-2	OnGrade	NSW RTA	Single SO1 Pit		2.7	94.573		0	0.1	313501.4	6266320	No	46344043	1 x Ku	No	Existing		No		
A011-1	OnGrade	NSW RTA	Single SO1 Pit		5.9	96.38		0	0.1	313576.2	6266291	No	46344044	1 x Ku	No	Existing		No		
A012-1	OnGrade	NSW RTA	Single SO1 Pit		5.9	95.823		0	0.1	313582.5	6266275	No	46344045	1 x Ku	No	Existing		No		
O A01-20	Node					88.775		0		313396.2	6266279		46344046		No					
O A02-8	Node					89.517		0		313418.2	6266313		46344048		No					
N159188	Node							0		313589.4	6266348		46671224		No					
N185505	Node					89.5		0		313465.4	6266222		53371042		No					
Bypass	Node					89.9		0		313443.1	6266271		76451740		No					
Pit264018	OnGrade	Hinged Pit	HPG6060		1.5	89.35		0	0.1	313455.5	6266259	No	1.13E+08	1 x Ku	No	New				
Pit264019	OnGrade	Hinged Pit	HPG4545		1.5	89.5		0	0.1	313460.1	6266250	No	1.13E+08	1 x Ku	No	New				
Pit264020	OnGrade	Hinged Pit	HPG4545		1.5	89.55		0	0.1	313462.5	6266238	No	1.13E+08	1 x Ku	No	New				
Pit264021	OnGrade	Hinged Pit	HPG4545		1.5	89.6		0	0.1	313464	6266230	No	1.13E+08	1 x Ku	No	New				
A05-1	OnGrade	Unlimited	Unlimited		0.6	89.677		0	0.5	313477.1	6266226	No	46344035	1 x Ku	No	Existing		No		
N298647	Node					80		0		313446.9	6266257		1.13E+08		No					

DETENTION BASIN DETAILS

Name	Elev	Surf. Area	Not Used	Outlet Type	K	Dia(mm)	Centre RL	Pit Family	Pit Type	x	y	HED	Crest RL	Crest Leng	id
OSD	88.75	257.5		Culvert	0.5					313475.4	6266231	No			51418931
	89.75	257.5													
	89.751	3													
	89.9	3													

SUB-CATCHMENT DETAILS

Name	Pit or Node	Total Area (ha)	Paved Area %	Grass Area %	Supp Area %	Paved Time (min)	Grass Time (min)	Supp Time (min)	Paved Length (m)	Grass Length (m)	Supp Length (m)	Paved Slope(%) %	Grass Slope %	Supp Slope %	Paved Rough	Grass Rough	Supp Rough	Lag Time or Factor	Gutter Length (m)	Gutter Slope %	Gutter FlowFactor	Rainfall Multiplier
C A01-1	A01-1	0.0409	100	0	0	5	10	0														1
C A01-2	A01-2	0.0202	100	0	0	5	10	0														1
C A01-3	A01-3	0.028	100	0	0	5	10	0														1
C A01-4	Pit243512	0.023	100	0	0	5	10	0														1
C A01-5	A01-5	0.0171	100	0	0	5	10	0														1
C A01-6	A01-6	0.0221	100	0	0	5	10	0														1
C A01-7	A01-7	0.0212	100	0	0	5	10	0														1
C A01-8	A01-8	0.0408	100	0	0	5	10	0														1
C A01-9	A01-9	0.0219	100	0	0	5	10	0														1
C A01-10	A01-10	0.0276	100	0	0	5	10	0														1
C A01-11	A01-11	0.0168	100	0	0	5	10	0														1
C A01-12	A01-12	0.0218	100	0	0	5	10	0														1
C A01-13	A01-13	0.0828	100	0	0	5	10	0														1
C A01-14	A01-14	0.043	100	0	0	5	10	0														1
C A01-15	A01-15	0.0291	100	0	0	5	10	0														1
C A01-16	A01-16	0.0323	100	0	0	5	10	0														1
C A01-17	A01-17	0.0143	100	0	0	5	10	0														1
C A01-18	A01-18	0.0156	100	0	0	5	10	0														1
C A01-19	A01-19	0.1018	100	0	0	5	10	0														1
C A01-20	A01-20	0.0165	100	0	0	5	10	0														1
C A01-21	A01-21	0.0208	100	0	0	5	10	0														1
C A02-1	A02-1	0.1062	100	0	0	5	10	0														1
C A02-3	A02-3	0.0179	100	0	0	5	10	0														1
C A02-4	A02-4	0.0609	100	0	0	5	10	0														1
C A02-5	A02-5	0.0152	100	0	0	5	10	0														1
C A02-6	A02-6	0.0421	100	0	0	5	10	0														1
C A02-7	A02-7	0.0364	100	0	0	5	10	0														1
C A02-8	A02-8	0.0168	100	0	0	5	10	0														1
C A03-1	A03-1	0.1001	100	0	0	5	10	0														1
C A03-2	A03-2	0.0648	100	0	0	5	10	0														1
C A03-3	A03-3	0.1047	100	0	0	5	10	0														1
C A03-4	A03-4	0.0286	100	0	0	5	10	0														1
C A03-5	A03-5	0.0255	100	0	0	5	10	0														1
C A04-2	A04-2	0.0854	100	0	0	5	10	0														1
C A04-3	A04-3	0.0094	100	0	0	5	10	0														1
C A04-4	A04-4	0.0668	100	0	0	5	10	0														1
C A04-5	A04-5	0.0231	100	0	0	5	10	0														1
C A07-1	A07-1	0.0951	100	0	0	5	10	0														1
C A08-1	A08-1	0.0154	100	0	0	5	10	0														1
C A09-2	A09-2	0.0348	100	0	0	5	10	0														1
C A09-3	A09-3	0.0072	100	0	0	5	10	0														1
C A10-2	A10-2	0.0329	100	0	0	5	10	0														1
C A11-1	A011-1	0.0882	100	0	0	5	10	0														1
C A12-1	A012-1	0.054	100	0	0	5	10	0														1
Cat101892	N159188	1.08	100	0	0	8.5	10	0														1
C Bypass	Bypass	0.006	100	0	0	5	5	2										0				1
Cat218326	Pit264018	0.0548	100	0	0	5	5	2										0				1
Cat218330	Pit264019	0.0168	100	0	0	5	5	2										0				1
Cat218331	Pit264020	0.0151	100	0	0	5	5	2										0				1
Cat218332	Pit264021	0.0195	100	0	0	5	5	2										0				1
C A05-1	OSD	0.69	100	0	0	5	10	0														1

PIPE DETAILS

Name	From	To	Length (m)	U/S IL (m)	D/S IL (m)	Slope (%)	Type	Dia (mm)	I.D. (mm)	Rough	Pipe Is	No. Pipes	Chg From	At Chg	Chg (m)	Rl (m)	Chg (m)	RL (m)	etc (m)
P A01-1	A01-1	A01-2	8.499	95.86	95.73	1.53	Concrete,	375	375	0.3	Existing	1	A01-2	0					
P A01-2	A01-2	A01-3	23.387	95.73	94.97	3.25	Concrete,	375	375	0.3	Existing	1	A01-3	0					
P A01-3	A01-3	Pit243512	10.947	94.97	94.667	2.77	Concrete,	375	375	0.3	Existing	1	Pit243512	0					
P249763	Pit243512	A01-4	6	94.66	94.5	2.67	Concrete,	375	375	0.3	Existing	1	A01-4	0					
P A01-4	A01-4	A01-5	12.197	94.5	94.06	3.61	Concrete,	375	375	0.3	Existing	1	A01-5	0					
P A01-5	A01-5	A01-6	14.184	94.06	93.32	5.22	Concrete,	375	375	0.3	Existing	1	A01-6	0					
P A01-6	A01-6	A01-7	20.769	93.32	92.33	4.77	Concrete,	375	375	0.3	Existing	1	A01-7	0					
P A01-7	A01-7	A01-8	32.298	92.33	90.48	5.73	Concrete,	375	375	0.3	Existing	1	A01-8	0					
P A01-8	A01-8	A01-9	21.169	90.48	89.15	6.28	Concrete,	375	375	0.3	Existing	1	A01-9	0					
P A01-9	A01-9	A01-10	17.901	89.15	88.3	4.75	Concrete,	375	375	0.3	Existing	1	A01-10	0					
P A01-10	A01-10	A01-11	6.791	88.3	88.14	2.36	Concrete,	600	600	0.3	Existing	1	A01-11	0					
P A01-11	A01-11	A01-12	19.249	88.14	87.77	1.92	Concrete,	600	600	0.3	Existing	1	A01-12	0					
P A01-12	A01-12	A01-13	10.699	87.77	87.48	2.71	Concrete,	600	600	0.3	Existing	1	A01-13	0					
P A01-13	A01-13	A01-14	18.075	87.48	87.31	0.94	Concrete,	600	600	0.3	Existing	1	A01-14	0					
P A01-14	A01-14	A01-15	11.834	87.31	87.13	1.52	Concrete,	750	750	0.3	Existing	1	A01-15	0					
P A01-15	A01-15	A01-16	11.938	87.13	87.02	0.92	Concrete,	750	750	0.3	Existing	1	A01-16	0					
P A01-16	A01-16	A01-17	5.116	87.02	86.94	1.56	Concrete,	750	750	0.3	Existing	1	A01-17	0					
P A01-17	A01-17	A01-18	4.46	86.94	86.87	1.57	Concrete,	750	750	0.3	Existing	1	A01-18	0					
P A01-18	A01-18	A01-19	22.421	86.87	86.69	0.8	Concrete,	750	750	0.3	Existing	1	A01-19	0					
P A01-19	A01-19	A01-20	12.319	86.69	86.5	1.54	Concrete,	750	750	0.3	Existing	1	A01-20	0					
P A01-20	A01-20	A01-21	8.889	86.5	86.39	1.24	Concrete,	750	750	0.3	Existing	1	A01-21	0					
P A01-21	A01-21	A01-22	11.825	86.39	86	3.3	Concrete,	750	750	0.3	Existing	1	A01-22	0					
P A02-1	A02-1	A02-2	11.477	96.464	95.95	4.48	Concrete,	375	375	0.3	Existing	1	A02-2	0					
P A02-2	A02-2	A02-3	11.129	95.95	95.73	1.98	Concrete,	375	375	0.3	Existing	1	A02-3	0					
P A02-3	A02-3	A02-4	39.237	95.73	93.57	5.51	Concrete,	375	375	0.3	Existing	1	A02-4	0					
P A02-4	A02-4	A02-5	14.996	93.57	92.57	6.67	Concrete,	375	375	0.3	Existing	1	A02-5	0					
P A02-5	A02-5	A02-6	33.903	92.57	90.28	6.75	Concrete,	375	375	0.3	Existing	1	A02-6	0					
P A02-6	A02-6	A02-7	25.327	90.28	88.28	7.9	Concrete,	375	375	0.3	Existing	1	A02-7	0					
P A02-7	A02-7	A02-8	9.827	88.28	87.73	5.6	Concrete,	600	600	0.3	Existing	1	A02-8	0					
P A02-8	A02-8	A01-21	32.144	87.73	86.39	4.17	Concrete,	600	600	0.3	Existing	1	A01-21	0					
P A03-1	A03-1	A03-2	6.812	94.148	94.08	1	Concrete,	375	375	0.3	Existing	1	A03-2	0					
P A03-2	A03-2	A03-3	10.299	94.06	93.957	1	Concrete,	375	375	0.3	Existing	1	A03-3	0					
P A03-3	A03-3	A03-4	8.534	93.937	93.852	1	Concrete,	375	375	0.3	Existing	1	A03-4	0					
P A03-4	A03-4	A03-5	18.662	93.832	93.44	2.1	Concrete,	375	375	0.3	Existing	1	A03-5	0					
P A03-5	A03-5	A01-6	8.09	93.44	93.32	1.48	Concrete,	375	375	0.3	Existing	1	A01-6	0					
P A04-1	A04-1	A04-2	10.43	88.74	88.41	3.16	Concrete,	375	375	0.3	Existing	1	A04-2	0					
P A04-2	A04-2	A04-3	7.333	88.41	88.1	4.23	Concrete,	375	375	0.3	Existing	1	A04-3	0					
P A04-3	A04-3	A04-4	8.133	88.1	87.85	3.07	Concrete,	375	375	0.3	Existing	1	A04-4	0					
P A04-4	A04-4	A04-5	18.602	87.85	87.636	1.15	Concrete,	375	375	0.3	Existing	1	A04-5	0					
P A04-5	A04-5	A01-13	12.954	87.616	87.48	1.05	Concrete,	375	375	0.3	Existing	1	A01-13	0					
P A06-1	A06-1	A01-8	10.657	90.9	90.48	3.94	Concrete,	375	375	0.3	Existing	1	A01-8	0					
P A07-1	A07-1	A01-8	8.018	90.63	90.48	1.87	Concrete,	375	375	0.3	Existing	1	A01-8	0					
P A08-1	A08-1	A01-7	7.982	92.57	92.33	3.01	Concrete,	375	375	0.3	Existing	1	A01-7	0					
P A09-1	A09-1	A09-2	9.062	90.28	90.01	2.98	Concrete,	375	375	0.3	Existing	1	A09-2	0					
P A09-2	A09-2	A09-3	14.298	90.01	88.89	7.83	Concrete,	375	375	0.3	Existing	1	A09-3	0					
P A09-3	A09-3	A02-7	9.644	88.89	88.28	6.33	Concrete,	375	375	0.3	Existing	1	A02-7	0					
P A10-1	A10-1	A10-2	8.749	93.33	93.09	2.74	Concrete,	375	375	0.3	Existing	1	A10-2	0					
P A10-2	A10-2	A02-5	9.432	93.09	92.57	5.51	Concrete,	375	375	0.3	Existing	1	A02-5	0					
P A11-1	A011-1	A01-3	8.231	95.052	94.97	1	Concrete,	375	375	0.3	Existing	1	A01-3	0					
P A12-1	A012-1	A01-4	8.246	94.582	94.5	0.99	Concrete,	375	375	0.3	Existing	1	A01-4	0					
Pipe27069	Pit264018	Pit264019	12	89.03	88.97	0.5	uPVC, not	225	242	0.03	New	2	Pit264019	0					
Pipe27069	Pit264019	Pit264020	10	88.97	88.92	0.5	uPVC, not	225	242	0.03	New	2	Pit264020	0					
Pipe27069	Pit264020	Pit264021	9	88.92	88.875	0.5	uPVC, not	225	242	0.03	New	2	Pit264021	0					
Pipe27069	Pit264021	OSD	9	88.875	88.83	0.5	uPVC, not	225	242	0.03	NewFixed	2	OSD	0					
Pipe16451	OSD	A05-1	10	88.75	88.645	1.05	Concrete,	375	375	0.3	NewFixed	1	A05-1	0					
P A05-1	A05-1	A01-10	10.768	88.64	88.3	3.16	Concrete,	375	375	0.3	Existing	1	A01-10	0					

DETAILS of SERVICES CROSSING PIPES

Pipe	Chg (m)	Bottom Elev (m)	Height of S (m)	Chg (m)	Bottom Elev (m)	Height of S (m)	Chg (m)	Bottom Elev (m)	Height of S (m)	etc

CHANNEL DETAILS

Name	From	To	Type	Length (m)	U/S IL (m)	D/S IL (m)	Slope (%)	Base Width (m)	L.B. Slope (1:?)	R.B. Slope (1:?)	Manning n	Depth (m)	Roofed

OVERFLOW ROUTE DETAILS

Name	From	To	Travel Time (min)	Spill Level (m)	Crest Length (m)	Weir Coeff. C	Cross Section	Safe Depth Major (m)	Safe Depth Minor (m)	Safe DxV (sq.m/sec)	Bed Slope (%)	D/S Area Contributing %	id	
F A01-1x	A01-1	A011-1		1			7.5 m road	0.3	0.15	0.4	3.21	100	46344147	22.957
F A01-2x	A01-2	A01-3		1			7.5 m road	0.3	0.15	0.4	3.03	100	46344148	23.387
F A01-3x	A01-3	Pit243512		1			7.5 m road	0.3	0.15	0.4	3.26	100	46344149	16.947
OF236497	Pit243512	A01-4		1			7.5 m road	0.3	0.15	0.4	3.26	100	93687364	16.947
F A01-4x	A01-4	A01-5		1			7.5 m road	0.3	0.15	0.4	3.15	100	46344150	12.549
F A01-5x	A01-5	A01-6		1			7.5 m road	0.3	0.15	0.4	3.96	100	46344151	15.212
F A01-6	A01-6	A01-7		1			7.5 m road	0.3	0.15	0.4	4.26	100	46344152	20.768
F A01-7	A01-7	A01-8		1			7.5 m road	0.3	0.15	0.4	5.77	100	46344153	32.298
F A01-8	A01-8	A01-9		1			7.5 m road	0.3	0.15	0.4	6.67	100	46344154	21.169
F A01-9	A01-9	A01-10		1			7.5 m road	0.3	0.15	0.4	5.18	100	46344155	17.901
F A01-10	A01-10	A01-11		1			7.5 m road	0.3	0.15	0.4	2.84	100	46344156	6.79
F A01-11	A01-11	A01-12		1			7.5 m road	0.3	0.15	0.4	1.31	100	46344157	21.494
F A01-12	A01-12	A01-14		1			4 m wide p	0.3	0.15	0.4	1.49	100	46344158	21.739
F A01-13	A01-13	A01-14		1			7.5 m road	0.3	0.15	0.4	0.49	100	46344159	18.076
F A01-14	A01-14	A01-15		1			7.5 m road	0.3	0.15	0.4	0.8	100	46344160	11.834
F A01-15	A01-15	A01-16		1			7.5 m road	0.3	0.15	0.4	0.69	100	46344161	11.938
F A01-16	A01-16	A01-17		1			7.5 m road	0.3	0.15	0.4	0.63	100	46344162	5.115
F A01-17	A01-17	A01-18		1			7.5 m road	0.3	0.15	0.4	0.76	100	46344163	4.46
F A01-18	A01-18	A01-20		1			7.5 m road	0.3	0.15	0.4	1	100	46344164	22.775
F A01-19	A01-19	A01-20		1			7.5 m road	0.3	0.15	0.4	1.48	100	46344165	13.21
F A01-20	A01-20	O A01-20		1			7.5 m road	0.3	0.15	0.4	4	100	46344166	13.6
F A01-21	A01-21	A01-22		1			7.5 m road	0.3	0.15	0.4	4	100	46344167	10
F A02-1x	A02-1	A02-3		1			Overflow a	0.05	0	0.6	3.78	100	46344168	16.75
F A02-2x	A02-2	A02-3		1			7.5 m road	0.3	0.15	0.4	2.64	100	46344169	11.128
F A02-3x	A02-3	A02-4		1			7.5 m road	0.3	0.15	0.4	4.97	100	46344170	39.322
F A02-4x	A02-4	A02-5		1			7.5 m road	0.3	0.15	0.4	7.01	100	46344171	14.996
F A02-5x	A02-5	A02-6		1			7.5 m road	0.3	0.15	0.4	7.17	100	46344172	33.903
F A01-19x	A02-6	A02-7		1			7.5 m road	0.3	0.15	0.4	7.02	100	46344173	25.327
F A01-20x	A02-7	A02-8		1			7.5 m road	0.3	0.15	0.4	5.84	100	46344174	9.821
F A01-21x	A02-8	O A02-8		1			7.5 m road	0.3	0.15	0.4	1	100	46344175	10
F A03-1	A03-1	A03-2		1			7.5 m road	0.3	0.15	0.4	0.13	100	46344176	6.811
OF169744	A03-2	A03-5		0.1			4 m wide p	0.3	0.15	0.4	3.72	100	60940239	24.1
F A03-3	A03-3	A03-2		1			7.5 m road	0.3	0.15	0.4	0.17	100	46344177	10.299
F A03-4x	A03-4	A03-5		1			7.5 m road	0.3	0.15	0.4	3.62	100	46344178	21.236
F A03-5	A03-5	A08-1		1			7.5 m road	0.3	0.15	0.4	4.19	100	46344179	20.435
F A04-1x	A04-1	A04-2		1			7.5 m road	0.3	0.15	0.4	4.29	100	46344180	10.429
F A04-2	A04-2	A04-3		1			7.5 m road	0.3	0.15	0.4	2.32	100	46344181	7.333
F A04-3	A04-3	A04-4		1			7.5 m road	0.3	0.15	0.4	0.85	100	46344182	8.132
F A04-4	A04-4	A04-5		1			4 m wide p	0.3	0.15	0.4	1.88	100	46344183	18.598
F A04-5	A04-5	A01-13		1			7.5 m road	0.3	0.15	0.4	0.49	100	46344184	12.954
F A03-4	A06-1	A05-1		1			Swale with	0.45	0.3	1	5.96	100	46344186	38.669
F A07-1x	A07-1	A04-1		1			7.5 m road	0.3	0.15	0.4	6.87	100	46344187	29.244
F A08-1	A08-1	A07-1		1			7.5 m road	0.3	0.15	0.4	5.62	100	46344188	32.204
F A09-1	A09-1	A01-19		1			7.5 m road	0.3	0.15	0.4	5.15	100	46344189	49.235
F A09-2	A09-2	A09-3		1			7.5 m road	0.3	0.15	0.4	7.09	100	46344190	14.298
F A09-3	A09-3	A01-19		1			7.5 m road	0.3	0.15	0.4	3.69	100	46344199	36.7
F A10-1	A10-1	A09-1		1			7.5 m road	0.3	0.15	0.4	7.18	100	46344192	43.041
F A010-2	A10-2	A09-2		1			7.5 m road	0.3	0.15	0.4	7.15	100	46344193	45.22
F A11-1	A011-1	A012-1		1			7.5 m road	0.3	0.15	0.4	3.18	100	46344202	17.5
F A012-1	A012-1	A03-1		1			7.5 m road	0.3	0.15	0.4	1.1	100	46344195	17.9
OF130487	N159188	A02-1		0.2			7.5 m road	0.3	0.15	0.4	1	100	46671226	25.8
F Bypass	Bypass	A01-18		0.2			Overflow a	0.05	0	0.6	2	0	76451743	10
OF258220	Pit264018	N298647		0.2			Overflow a	0.05	0	0.6	1	0	1.13E+08	9.1
OF258229	Pit264019	Pit264018		0.4			Informal pa	0.04	0.04	0.6	1	90	1.13E+08	9.4
OF258228	Pit264020	Pit264019		0.4			Informal pa	0.04	0.04	0.6	1	90	1.13E+08	9.4
OF258212	Pit264021	Pit264020		0.4			Informal pa	0.04	0.04	0.6	1	90	1.13E+08	9.4

OF222707	OSD	N185505	0.1	89.9	3.6	1.67	4 m wide p	0.3	0.15	0.4	1	0	87158701	15
OF154692	A05-1	N185505	0.1				4 m wide p	0.3	0.15	0.4	1.39	100	53371041	12.7

PIPE COVER DETAILS

Name	Type	Dia (mm)	Safe Cover	Cover (m)	
P A01-1	Concrete, r	375	0.6	0.85	
P A01-2	Concrete, r	375	0.6	0.96	
P A01-3	Concrete, r	375	0.6	0.95	
P249763	Concrete, r	375	0.6	0.93	
P A01-4	Concrete, r	375	0.6	0.93	
P A01-5	Concrete, r	375	0.6	0.98	
P A01-6	Concrete, r	375	0.6	1.11	
P A01-7	Concrete, r	375	0.6	1.2	
P A01-8	Concrete, r	375	0.6	1.12	
P A01-9	Concrete, r	375	0.6	1.05	
P A01-10	Concrete, r	600	0.6	0.78	
P A01-11	Concrete, r	600	0.6	0.78	
P A01-12	Concrete, r	600	0.6	0.87	
P A01-13	Concrete, r	600	0.6	0.92	
P A01-14	Concrete, r	750	0.6	0.84	
P A01-15	Concrete, r	750	0.6	0.92	
P A01-16	Concrete, r	750	0.6	0.95	
P A01-17	Concrete, r	750	0.6	1	
P A01-18	Concrete, r	750	0.6	1.03	
P A01-19	Concrete, r	750	0.6	1.47	
P A01-20	Concrete, r	750	0.6	1.47	
P A01-21	Concrete, r	750	0.6	1.5	
P A02-1	Concrete, r	375	0.6	1.06	
P A02-2	Concrete, r	375	0.6	1.17	
P A02-3	Concrete, r	375	0.6	1.17	
P A02-4	Concrete, r	375	0.6	1.32	
P A02-5	Concrete, r	375	0.6	1.18	
P A02-6	Concrete, r	375	0.6	1.18	
P A02-7	Concrete, r	600	0.6	1.14	
P A02-8	Concrete, r	600	0.6	1.14	
P A03-1	Concrete, r	375	0.6	1.03	
P A03-2	Concrete, r	375	0.6	1.05	
P A03-3	Concrete, r	375	0.6	1.29	
P A03-4	Concrete, r	375	0.6	0.97	
P A03-5	Concrete, r	375	0.6	0.97	
P A04-1	Concrete, r	375	0.6	0.88	
P A04-2	Concrete, r	375	0.6	0.88	
P A04-3	Concrete, r	375	0.6	1.02	
P A04-4	Concrete, r	375	0.6	1.06	
P A04-5	Concrete, r	375	0.6	1.08	
P A06-1	Concrete, r	375	0.6	0.67	
P A07-1	Concrete, r	375	0.6	1.11	
P A08-1	Concrete, r	375	0.6	0.98	
P A09-1	Concrete, r	375	0.6	0.81	
P A09-2	Concrete, r	375	0.6	0.92	
P A09-3	Concrete, r	375	0.6	1.02	
P A10-1	Concrete, r	375	0.6	0.85	
P A10-2	Concrete, r	375	0.6	1.07	
P A11-1	Concrete, r	375	0.6	0.92	
P A12-1	Concrete, r	375	0.6	0.83	
Pipe27069	uPVC, not	242	0.3	0.07	Unsafe
Pipe27069	uPVC, not	242	0.3	0.28	Unsafe
Pipe27069	uPVC, not	242	0.3	0.38	
Pipe27069	uPVC, not	242	0.3	-0.33	Unsafe
Pipe16451	Concrete, r	375	0.6	-0.41	Unsafe
P A05-1	Concrete, r	375	0.6	0.63	

These pipes have non-return valves: Pipe270690

Appendix D

Drawings