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Epping Park - Stage 1 Residential Works Project Application

Stormwater Management Strategy, Servicing Strategy & Civil Works Report

301015-01035 – CI-REP02

11/05/2009

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STORMWATER MANAGEMENT STRATEGY, SERVICING STRATEGY & CIVIL WORKS REPORT

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PROJECT 301015-01035 - EPPING PARK - STAGE 1 RESIDENTIAL WORKS PROJECT APPLICATION							
REV	DESCRIPTION	ORIG	REVIEW	WORLEY- PARSONS APPROVAL	DATE	CLIENT APPROVAL	DATE
B	ISSUED FOR APPROVAL	SCP	CJM	MJS	30-04-2009	N/A	
C	ISSUED FOR CLIENT REVIEW	SCP	CJM	MJS	01-05-2009		
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1. EXECUTIVE SUMMARY

The Stage 1 Residential Project Application includes proposed buildings 3, 4, 5, and 7 of the Epping Park masterplan.

An Early Works Package Project Application has been submitted concurrently with the Stage 1 Residential development Project Application. The Early Works Package addresses flooding, stormwater management, servicing, and civil works associated with the entire Epping Park development masterplan, including the Stage 1 Residential development works.

The Stage 1 Residential development requires that necessary servicing arrangements, stormwater infrastructure, and the partial construction of Roads 2 and 3 as outlined in the Early Works Package Project Application be constructed prior to, or concurrently with the Stage 1 Residential development.

1.1 Assessment Requirements

The Epping Park development masterplan was approved by the Minister for Planning in August 2006. The following assessment documents apply to the Stage 1 Residential development:

- Concept Plan Approval modifications;
- Preferred Project Report; and
- Director General's Requirements.

The Stage 1 Residential works package has been prepared in accordance with the requirements set out in the above three documents. The responses to each of the assessment documents (*where one is required*) for the Stage 1 Residential development is discussed under the sub-headings below. Furthermore, where the Stage 1 Residential development necessitates partial construction of the Early Works Package, the nature and extent of this partial construction is discussed.

1.1.1 Concept Plan Approval

The Concept Plan Approval lists a series of requirements for the proposed stormwater management strategy in terms of modelling work, design requirements, and construction protocols. Conditions (*referred to as "Modifications"*) B13 and B14 have been included as **Appendix 1** - .

Responses to the Modifications for the Stage 1 Residential development have been summarised below in **Table 1—1**. Where the Stage 1 Residential development necessitates the partial construction of the Early Works Package, the nature and extent of this partial construction is nominated.



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Table 1—1 Responses to Conditions of Consent

Modification	Sub-number	Response
B13	n/a	Hydrological, hydraulic, and stormwater quality modelling has been undertaken for the Stage 1 Residential development and is documented within this report.
B14	1	The Stage 1 Residential development will not drain towards the existing open drainage channel. Thus, the Stage 1 Residential development will have no impact on the existing open drainage channel.
	2	The Stage 1 Residential development will have no impact on the drainage regime for upstream catchments discharging through the site.
	3	The Stage 1 Residential development will require the prior, or concurrent construction of the constructed wetland/detention basin nominated as part of the Early Works Package. The inclusion of the constructed wetland/detention basin will ensure that there is no increase in peak flow rates downstream of the site for the 2 year, 5 year, 20 year, and 100 year ARI storm events.
	4	The prior or concurrent construction of the constructed wetland/detention basin nominated as part of the Early Works Package will ensure that the Stage 1 Residential development will result in decreased peak flow rates downstream of the Epping Park site.
	5	Detailed hydraulic design will be completed at the construction certificate stage. Provision has been made for drainage infrastructure capable of conveying the 20 year ARI peak flows in pipes and constructed diversion channels. For events exceeding the 20 year ARI event stormwater runoff will be contained within designated overland flow paths.
	6	The Stage 1 Residential development will require prior or concurrent construction of some external drainage works nominated as part of the Early Works Package. Stormwater pipes and pit will be placed along the northern side of Mobbs Lane (<i>where required</i>). These stormwater pipes and pits will be designed to capture and convey the 20 year ARI peak flow rates and will discharge into Terrys Creek at the Mobbs Lane/Terrys Creek crossing.



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Modification	Sub-number	Response
	7	The Stage 1 Residential development will require concurrent or prior construction of a bio-retention swale and the constructed wetland/detention basin nominated in the Early Works Package. The inclusion of at source (<i>bio-retention swale</i>) and end-of-line (<i>constructed wetland/detention basin</i>) stormwater quality infrastructure will ensure stormwater pollutant loads are managed on site and to levels recommended by the Department of Environment and Climate Change.
	8(i) and (ii)	The Stage 1 Residential development will require the concurrent or prior construction of stormwater infrastructure nominated as part of the Early Works Package. The stormwater management strategy for the Early Works Package has been developed with input from Parramatta City Council and approaches adopted have been incorporated into the Stage 1 Residential development stormwater management strategy. The consultation with Parramatta City Council will continue for all detailed design associated with the Stage 1 Residential development.

1.1.2 Preferred Project Report

The Preferred Project Report included a Statement of Commitments that contained a series of commitments for the Project and specifically the proposed stormwater management strategy. The relevant Preferred Project Report sections are included as **Appendix 2** - .

Responses to the commitments raised in the Preferred Project Report are included below in **Table 1—2**. Where the Stage 1 Residential development necessitates the partial construction of the Early Works Package, the nature and extent of this partial construction is nominated.



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Table 1—2 Responses to Preferred Project Report

PPR Statement of Commitment Item Number	Paragraph Number	Response
9	1	The Stage 1 Residential development stormwater management strategy complies with current objectives set out by the relevant New South Wales Government Departments. Where the stormwater management strategy varies from Parramatta City Council's general requirements appropriate discussion/explanation is provided.
	2	In the preparation of the Early Works Package a required detention storage volume was determined for the ultimate Epping Park development. The derivation of this volume was subject to detailed hydraulic and hydrologic modelling. The Stage 1 Residential development will require the concurrent or prior construction of the constructed wetland/detention basin (<i>which incorporates the detention storage volume calculated in the Early Works Package</i>). The inclusion of the constructed wetland/detention basin will result in decreased peak flow rates being discharged from the site (<i>relative to existing conditions</i>) in the 2 year, 5 year, 20 year, and 100 year ARI storm events.
	3 (bullet point 1)	The constructed wetland/detention basin has undertaken preliminary design to accommodate the ultimate Epping Park development scenario. The construction of the constructed wetland/detention basin (<i>in its ultimate form</i>) prior to or concurrently with the Stage 1 Residential development will reduce peak discharge flow rates downstream of the site. This has the potential to reduce localised flooding in the vicinity of the site.
	3 (bullet point 2)	The stormwater detention strategy accounts for the constructed wetland. The calculated detention storage volume will be included as part of the constructed wetland.
	3 (bullet point 3)	The Stage 1 Residential development will require a constructed wetland/detention basin as outlined in the Early Works Package. Approval is being sought in Early Works Project Application for a wet detention basin (<i>i.e. the detention volume will be provided as part of the constructed wetland</i>). Upon approval being granted



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PPR Statement of Commitment Item Number	Paragraph Number	Response
		for the inclusion of a wet detention basin, appropriate documentation will be submitted during detailed design. Documentation would address; eutrophication prevention, odour minimisation, mosquito breeding, and any other related concerns.
	3 (bullet point 4)	During the detailed design phase of the Early Works Package, appropriate documentation would be submitted detailing the necessary frequency of flushing and extent for the wet detention basin (<i>i.e. the constructed wetland with an allocated volume of storage</i>).
	3 (bullet point 5)	The Early Works Package incorporates a suite of Water Sensitive Urban Design measures to ensure stormwater quality under the ultimate Epping Park development scenario is adequate. The nature and extent of the Water Sensitive Urban Design measures is documented in the Early Works Package Project Application. The Stage 1 Residential development will require the prior or concurrent construction of a bio-retention swale and constructed wetland/detention basin to ensure stormwater discharging from the Stage 1 Residential development meets pollutant reduction targets established by the Department of Environment and Climate Change.

1.1.3 Director General's Requirements

The Director General's Requirements have been prepared in response to Concept Plan MP 05_0086 approved by the Minister for Planning in August 2006.

The Early Works Package and Stage 1 Residential Project Applications both respond to the requirements set out in the Director General's Requirements (*refer Appendix 3 -*).

The Director General's Requirements stipulate that drainage and flooding issues should consider the impact of climate change, sea level rise, an increase in rainfall intensity, and that the Water Sensitive Urban Design measures be incorporated into the Stage 1 Residential development as per Concept Plan MP 05_0086.

Given the distance of the site from the coast and the relative height of the site, sea level rise was not considered relevant in the development of the stormwater management strategy.



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The New South Wales Department of Environment and Climate Change (DECC) have published a guideline entitled, '*Practical Consideration of the Impacts of Climate Change*', 2007. This document provides a high range estimate of a 30% increase in storm intensities as a result of Climate Change. Thus, for all proposed scenario hydrologic and hydraulic modelling, rainfall intensities have been increased by 30%¹.

1.2 Flooding

The proposed Stage 1 Residential development lies well outside the existing flood extents of Terrys Creek. Given the relative height of the site at large, in the context of Terrys Creek, the site will not experience inundation from Terrys Creek.

Flows entering and passing through the development site from external sources will be safely conveyed in an existing drainage channel².

Roadways and overland flow paths will convey internal 100 year ARI surface flows safely through the site.

The stormwater quantity management strategy for the Stage 1 Residential development will ensure that flood behaviour downstream of the proposed development is not adversely impacted.

1.3 Stormwater Quantity Management Strategy

The Stage 1 Residential development will require the prior or concurrent construction of the stormwater quantity management infrastructure (*i.e. the constructed wetland/detention basin*) as outlined in this report and nominated as part of the Early Works Package. The Stage 1 Residential development adopts the same assessment locations nominated in the Early Works Package Project Application documentation, namely:

- An existing open channel located to the west of Valley Road;
- Terrys Creek at the Mobbs Lane/Terrys Creek crossing;
- Mobbs Lane Reserve; and
- The Terrys Creek/Valley Road Drainage Channel Junction (*i.e. total of three above locations*)³.

¹ For more detail refer **Section 4**.

² It is proposed to rehabilitate this drainage channel as part of the Early Works Package. The rehabilitation of this drainage channel is not necessary as part of or prior to the Stage 1 Residential development phase as it is located outside of the Stage 1 Residential development footprint.

³ Only flows from the site and those affecting the proposed stormwater management strategy have been considered at this location.



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The Stage 1 Residential development requires that the constructed wetland/detention basin with an allocated storage volume of 850m³ (*nominated in the Early Works Package documentation*) be constructed concurrently or prior to the Stage 1 Residential development. This detention volume has been determined based on the overall masterplan for the Epping Park development. As such, the provision of 850m³ of storage is surplus to the Stage 1 Residential requirements.

Through the provision of 850m³ of detention storage with engineered discharges, the proposed peak flow rates at the four key locations have been shown to closely replicate, and in most cases result in reducing the existing peak flow rates for each location for the whole proposed development of 650 dwellings. Therefore, the proposed stormwater quantity management strategy can be considered as having no adverse impacts on flood levels or stormwater infrastructure downstream of the site for the first 230 of these dwellings. In fact, the proposed stormwater management strategy has the potential to reduce flood impacts downstream of the site, for the Stage 1 Residential Development.

1.4 Stormwater Quality Management Strategy

The Stage 1 Residential development will require the concurrent or prior construction of some stormwater quality management infrastructure nominated in the Early Works Package Project Application.

Through the inclusion of the constructed wetland/detention basin and a bio-retention swale nominated in the Early Works Package the Stage 1 Residential development complies with the DECC guidelines on stormwater pollutant reduction targets for urban development.

Bio-retention swales have been designed in preliminary nature to represent current industry best practices. The proposed constructed wetland will be designed in accordance with the NSW Department of Land and Water Conservation publication, *'The Constructed Wetlands Manual'*.

A preliminary water quality model has been developed for the development masterplan using the industry recognised MUSIC software. MUSIC modelling outputs indicate that the DECC stormwater pollutant reduction targets will be exceeded for total suspended solids, total Phosphorus, total Nitrogen, and gross pollutants.

1.5 Servicing Strategy

As part of the Early Works Package Project Application a preliminary servicing strategy was prepared for the Epping Park masterplan for potable water, sewer, electricity, gas, and telecommunications. Initial discussions with local service providers have indicated that the ultimate Epping Park development can be serviced by local service providers with some amplification works.

The Stage 1 Residential development will require the partial construction of the infrastructure outlined in the servicing strategy developed for the Epping Park masterplan and discussed in the Early Works Package Project Application. However, it is unlikely that the Stage 1 Residential development will require the amplification works on existing servicing networks to be undertaken given the existing services demands currently being met on the site.



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1.6 Civil Works

The civil works for the Stage 1 Residential development will incorporate some works identified within the Early Works Package scope of works. The extent of the Early Works Package civil works that is to be constructed concurrently or prior to the Stage 1 Residential development is included in the WorleyParsons '*Epping Park – Stage 1 Residential PA*' drawing package, April 2009.

The Stage 1 Residential development requires the following civil works scope as defined by the Early Works Package Project Application, viz:

- Internal roads;
- Internal earthworks;
- Internal and external stormwater drainage; and
- The constructed wetland/detention basin.

The civil works design process for the Early Works Package and the Stage 1 Residential development has been undertaken in accordance with relevant Australian Standards or negotiated agreements with relevant authorities.

Preliminary bulk earthworks calculations indicate that the Stage 1 Residential development works package could result in a balance of cut and fill volumes.



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2. INTRODUCTION

The Epping Park masterplan comprises a total of 650 residential dwellings in a number of buildings, a series of internal roads, resident facilities, a child care centre, and substantial areas of open space. A concept plan (MP_05_0086) for the Epping Park development was approved by the Minister for Planning in August 2006.

Given the extensive nature of the Epping Park development it is proposed to phase construction. A Project Application has been submitted concurrently to the Department of Planning for an Early Works Package that includes the following, viz:

- Subdivision of the site;
- Construction of all internal roads;
- Construction of all stormwater infrastructure;
- Placement of required servicing infrastructure;
- Construction of resident's facilities;
- Construction of a Child Care Centre;
- Road re-alignment works in Mobbs Lane; and
- Intersection upgrade works at Mobbs Lane/Marsden Road and Mobbs Lane/Midson Road.

In addition to the submission of the Early Works Package, Project Application documentation has also been prepared for a Stage 1 Residential development. The Stage 1 Residential development is defined by the construction of building numbers 3, 4, 5, and 7.

The Stage 1 Residential development requires that the necessary servicing arrangements, stormwater infrastructure, and roads outlined in the Early Works Package Project Application be constructed concurrently or prior to the Stage 1 Residential development.

WorleyParsons has been engaged by Sydney Broadcast Property to prepare and document the following items associated with the Stage 1 Residential development, viz:

- The stormwater management strategy (*i.e. flooding, stormwater quantity, and stormwater quality*);
- The servicing strategy; and
- Internal civil works.



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While much of the nominated scope of works associated with the Stage 1 Residential development is accounted for by the Early Works Package, the function of this report is to demonstrate how the Stage 1 Residential development would be an independent and permissible development⁴.

⁴ Under the development conditions set out in the Concept Plan Approval, Preferred Project Report, and Director General's Requirements for the Epping Park masterplan.



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3. FLOODING

Flooding issues have been considered on both catchment wide and local scales. The catchment wide scale identifies the flood levels in nearby Terrys Creek to establish if the site is at risk of inundation. The local scale considers overland flow paths that drain external catchments and internal catchments running through the site under existing and proposed conditions.

3.1 Terrys Creek

The western boundary of 61 Mobbs Lane, Epping is located in close proximity to Terrys Creek.

In 2005 Cardno Willing completed the '*Terrys Creek Subcatchment Management Plan*' report. This report established peak flood levels within Terrys Creek for various Average Recurrence Interval (ARI) events. Parramatta City Council has provided the flood extents and flood levels for the 20 year and 100 year ARI floods (refer **Appendix 4** -). The maximum 100 year ARI flood level adjacent to the site is 85.37m AHD⁵.

Review of the flood extent and the associated levels indicates that the site is located well outside the flood conveyance and flood storage areas of Terrys Creek. The minimum surface level of the site at large is approximately 85.50m AHD. The minimum level of the Stage 1 Residential development is 106m AHD. Hence, the site and the Stage 1 Residential development will not be impacted by existing flooding from Terrys Creek.

3.2 External Overland Flows

External flows entering the site via the TAFE School of Horticulture are currently conveyed through 61 Mobbs Lane via an existing open drainage channel. As part of the Early Works Package, it is proposed to rehabilitate the existing drainage channel. However, as the location of the existing drainage channel is a considerable distance from the Stage 1 Residential development extents, the existing drainage channel will remain unaffected as a result of Stage 1 Residential works.

3.3 Internal Overland Flows

As all the necessary infrastructure required for the Stage 1 Residential development, as outlined in this report, will be constructed prior to or concurrently the Stage 1 Residential Development, flows

⁵ This flood level has been taken at the upstream extent of the model. The existing surface level within the site adjacent to this location is approximately 89.00m AHD.



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generated internally by the Stage 1 Residential development for events greater than the 20 year ARI⁶ will be conveyed within the proposed road network, constructed channels and swales.

In the event where the Stage 1 Residential development is advanced ahead of the construction of the infrastructure outlined by this report and included in the Early Works Package, a series of temporary drainage channels will be incorporated into the development to safely convey stormwater runoff to the constructed wetland/detention basin (as shown on **Drawing 7587-PA-S1-11**).

The Stage 1 Residential development required road network will be integrated into the stormwater management strategy and measures will be incorporated to ensure that vehicles and pedestrians can safely access/egress the site for events up to the 100 year ARI storm.

⁶ The internal piped drainage network will have the capacity to convey stormwater runoff for events up to and including the 20 year ARI storm.



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4. STORMWATER QUANTITY MANAGEMENT STRATEGY

The Stage 1 Residential development requires the concurrent or prior construction of the stormwater quantity management infrastructure (*i.e. constructed wetland/detention basin*) associated with the Epping Park masterplan and detailed in the Early Works Package Project Application.

The Stage 1 Residential development will decrease the percentage imperviousness at 61 Mobbs Lane, Epping and will include the detention volume calculated to be required for the ultimate Epping Park development scenario. As such, the Stage 1 Residential development would be anticipated to significantly reduce peak flow rates being discharged off the site. However, to quantify the reduction in peak flow rates off the site from the Stage 1 Residential development a detailed hydraulic and hydrologic model has been completed.

To ensure that the proposed Stage 1 Residential development has no adverse impact on downstream stormwater infrastructure or flooding, the stormwater quantity management strategy focuses on proposed peak flow rates at four locations within and around the development site. The locations are illustrated on **Drawing 7587-PA-S1-10** and are listed below, viz:

- An existing culvert located within Mobbs Lane that discharges stormwater into an open channel⁷;
- The Mobbs Lane/Terrys Creek crossing;
- Mobbs Lane Reserve; and
- The Terrys Creek/Valley Road drainage channel junction (*i.e. the total of the above three locations*⁸)

The following sections detail the development of hydrologic and hydraulic modelling undertaken to confirm that the Stage 1 Residential development will have no adverse impacts on downstream stormwater infrastructure or flood levels.

4.1 XP-RAFTS Modelling

XP-RAFTS is a non-linear rainfall/runoff program developed by WP Software and can be used to estimate peak flows for catchments using actual storm events, or design rainfall data derived from *Australian Rainfall and Runoff (AR&R) Volume 1*, Institute of Engineers, 1987. In addition to being capable of generating peak flows from catchments, XP-RAFTS is also capable of routing stormwater flows through stormwater detention devices such as a basin.

⁷ For the purpose of this report the open drainage channel will be identified as the "Valley Road drainage channel".

⁸ Only flows generated from within the site and those affecting stormwater management have been considered at this location.



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To model a catchment within XP-RAFTS, the catchment is divided into sub-catchments based on watershed boundaries. Data required for each sub-catchment includes; catchment area, catchment slope, proportion of impervious area, rainfall losses, and surface roughness factors.

The stormwater quantity management strategy for the Stage 1 Residential development will verify that under proposed conditions there will be no adverse downstream impacts (*i.e. no increase in existing downstream peak flow rates as a result of the Stage 1 Residential development*) for the 2 year, 5 year, 20 year, and 100 year ARI storm events.

4.1.1 XP-RAFTS Model Parameters

Intensity-frequency-duration (*IFD*) data was derived for the site based on Latitude and Longitude. The Latitude and Longitude of the site is 33.78°S and 151.07°E respectively.

The Bureau of Meteorology (*BoM*) website enables IFD data from the Latitudinal and Longitudinal coordinates of a location within Australia to be calculated. Based on the aforementioned latitudinal and longitudinal coordinates, the IFD data presented below in **Table 4—1** was derived using <http://www.bom.gov.au/hydro/has/cdirswebx/cdirswebx.shtml>.

Table 4—1 Intensity-Frequency-Duration Data

Intensity-Frequency-Duration Data		
	Rainfall Intensities (mm/hr)	
Duration	2 year ARI	50 year ARI
1 hour	35.1	69.0
12 hour	8.01	17.0
72 hour	2.52	5.63
Frequency Factors		
F2	4.30	
F50	15.84	
Location Skew		
G	0.00	

The IFD data listed in **Table 4—1** was used to calculate design storm intensities for the existing model scenario. Under proposed conditions, the impacts of Climate Change must be considered. The DECC publication, '*Practical Considerations of Climate Change*', 2007 nominates a 30% increase in storm intensities as an upper limit. Thus, direct intensities were calculated (*based on IFD data*) for various durations for the 2 year, 5 year, 20 year, and 100 year ARI storm events and nominally increased by 30%. The increased direct storm intensities have been included as **Appendix 5** - .



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XP-RAFTS has the capacity to account for ground infiltration via initial and continuing loss parameters. Runoff is not generated from a rainfall event until the value of the initial loss has been exceeded, once the initial loss is exceeded, the continuing loss is applied to all rainfall throughout the storm duration. The initial and continuing losses adopted for all XP-RAFTS model scenarios are included in **Table 4—2**.

Table 4—2 Rainfall Loss Parameters

	Pervious Surfaces	Impervious Surfaces
Initial Loss	20mm	2.5mm
Continuing Loss	5mm	0mm

XP-RAFTS is capable of lagging hydrographs generated from an upstream catchment across a downstream catchment. In estimating lag times a runoff velocity of 2m/s has been assumed in all instances.

Surface roughness factors (*i.e. Manning's "n" values*) for impervious and pervious areas were based upon WorleyParsons' expert assessment. All XP-RAFTS model scenarios (*i.e. existing and proposed*) adopted Manning's "n" values of 0.015 and 0.03 for impervious and pervious surfaces respectively.

4.1.2 Model Verification

In order to verify the IFD data the XP-RAFTS input parameters and the flows generated within the XP-RAFTS model were compared against flow estimates derived by the Rational Method, '*Australian Rainfall and Runoff, Volume 1*', Institute of Engineers, 1987. The Rational Method is often applied across natural catchments (*i.e. 100% pervious*) as a method of estimating peak flow rates.

The Rational Method for estimating peak flow rates is driven by three attributes; catchment area, frequency factor, and rainfall intensity (*based on a Time of Concentration calculation*) for a given ARI storm event. The parameters used in the Rational Method peak flow estimation are summarised in **Table 4—3**.

Table 4—3 Rational Method Parameters

Parameter	Value
Catchment Area (ha)	8.9
C10	0.9
F100	1.2
Frequency Factor (C10 x F100)	1.08
Time of Concentration (mins)	18
Intensity (mm/hr)	172



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The XP-RAFTS and rational method flow estimates for the 100 year ARI are shown below in **Table 4—4**.

Table 4—4 XP-RAFTS Verification Against The Rational Method

Peak Flow Estimation Method	100 Year Peak Flow Estimation (m ³ /s)
XP-RAFTS	4.6
The Rational Method	4.4

Table 4—4 indicates that the XP-RAFTS peak flow approximation is comparable to the peak flow estimate derived from the Rational Method calculation. The XP-RAFTS estimate must be considered more accurate than the Rational Method. XP-RAFTS considers catchment specific conditions and the verification against the Rational Method in this instance has been completed to verify the magnitude of peak flow estimates out of XP-RAFTS derived from location specific IFD data and adopted input parameters.

4.2 Existing Catchment Characteristics

The characteristics of existing catchments within and around the site must be investigated and modelled to quantify existing peak flow rates at key locations. The establishment of existing peak flow rates is the key driver in the development of a stormwater quantity management strategy.

4.2.1 Internal Catchments

Under existing conditions the site can be considered to comprise of four discrete internal catchments (refer **Drawing 7587-PA-S1-10**). A brief description of the four existing internal catchments is provided below and catchment properties are summarised in **Table 4—5**.

Existing Catchment 1 is located in the north-eastern corner of the site and is predominately impervious. Existing Catchment 1 contains extensive roof and hardstand areas. Stormwater runoff generated in this catchment is drained via a pit and pipe network. The existing drainage network discharges flow into an existing pit located in Mobbs Lane. Flows from this pit are directed into a culvert under Mobbs Lane and then discharge into the Valley Road drainage channel. Flows from Existing Catchment 1 exceeding the capacity of the existing drainage network have been assumed to travel overland into Existing Catchment 2. The Stage 1 Residential development is largely contained within this Existing Catchment 1.

Existing Catchment 2 is bound by Existing Catchment 1 to the north and east, Mobbs Lane to the south and Existing Catchment 3 to the west. Existing Catchment 2 is essentially a grassed embankment containing no drainage infrastructure. Under existing conditions, Existing Catchment 2 generally drains in a south-westerly direction into the Mobbs Lane road reserve which is drained into the culvert located under Mobbs Lane and then into the open channel. Flows exceeding the capacity



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of the existing culvert⁹ are conveyed within Mobbs Lane and discharged directly into Terrys Creek at the Mobbs Lane/Terrys Creek junction.

Existing Catchment 3 is bound by Existing Catchment 4 to the north, Existing Catchment 1 and 2 to the east, Mobbs Lane to the south, and Mobbs Lane Reserve to the west. Existing Catchment 3 comprises predominately of grassed surfaces and intermittent regions of road, carpark, and satellite dish footings. Existing Catchment 3 drains overland in a south-westerly direction through the western boundary of the site and into Mobbs Lane Reserve.

Existing Catchment 4 is bound by residential developments along Grimes Lane to the north, the TAFE School of Horticulture to the east, Existing Catchment 3 to the south, and Mobbs Reserve to the west. Existing Catchment 4 is approximately 95% pervious and flows into a drainage channel located within the site. This drainage channel manoeuvres runoff through the western boundary of the site before discharging into the upper extent of Terrys Creek.

Table 4—5 Existing Internal Catchment Characteristics

Catchment Name	Catchment Area (ha)	Impervious Percentage	Vectored Average Catchment Slope	Location of Discharge
Existing Catchment 1	4.05	82%	4.5%	Channel to the south of Mobbs Lane and west of Valley Road
Existing Catchment 2	0.93	4%	8%	Channel to the south of Mobbs Lane and west of Valley Road
Existing Catchment 3	2.53	18%	9%	Mobbs Lane Reserve
Existing Catchment 4	1.40	5%	7%	Upper extents of Terrys Creek

The Stage 1 Residential development accounts for approximately 2.15ha of the Epping Park site and is largely contained within Existing Catchment 1.

4.2.2 External Catchments

Whilst the site is located at the upper extents of the Terrys Creek catchment, there are two external catchments that require consideration, the TAFE School of Horticulture, and Mobbs Lane. The

⁹ Based on information supplied by Parramatta City Council and site inspection, the culvert under Mobbs Lane consists of three 450mm diameter pipes. The pipes under Mobbs Lane have been calculated to run at 2.5% grade. A flow capacity analysis of the culvert determined that the peak conveyance of this culvert is 1.03m³/s.



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external catchment properties are summarised in **Table 4—6**. The external catchments are shown on **Drawing 7587-PA-S1-10**.

The TAFE School of Horticulture has been considered as two catchments. The first sub-catchment (*Ext1*) is relatively steep and largely pervious. It contains substantial vegetation and an irrigation pond. The second sub-catchment (*Ext2*) is relatively flat and predominately pervious, despite containing small portions of roof and road area.

The TAFE School of Horticulture generally drains from the east to the west and into an irrigation pond. This pond has not been considered in modelling flows down the existing drainage line located in Existing Catchment 4. The assumption of the irrigation pond being ineffective results in larger peak flow estimates down the existing drainage channel. As such, peak flow estimates in the channel documented are conservative.

The Mobbs Lane External Catchment (*MLe_{xt}*) contains regions of Mobbs Lane, Valley Road and some residential lots bound by Mobbs Lane and Valley Road. This catchment is of interest to quantify existing peak flow rates arriving at the culvert under Mobbs Lane that ultimately discharges into the open channel located to the west of Valley Road for various ARI events.

Table 4—6 External Catchment Characteristics

Catchment Name	Catchment Area (ha)	Impervious Percentage	Vectored Average Catchment Slope	Location of Discharge
External Catchment 1	1.07	5%	10%	Existing Catchment 4
External Catchment 2	1.00	60%	2%	External Catchment 1
Mobbs Lane External	2.20	64%	4%	Open Channel

4.3 Existing Peak Flow Rates

The existing scenario model layout is represented below as **Diagram 4-1**.

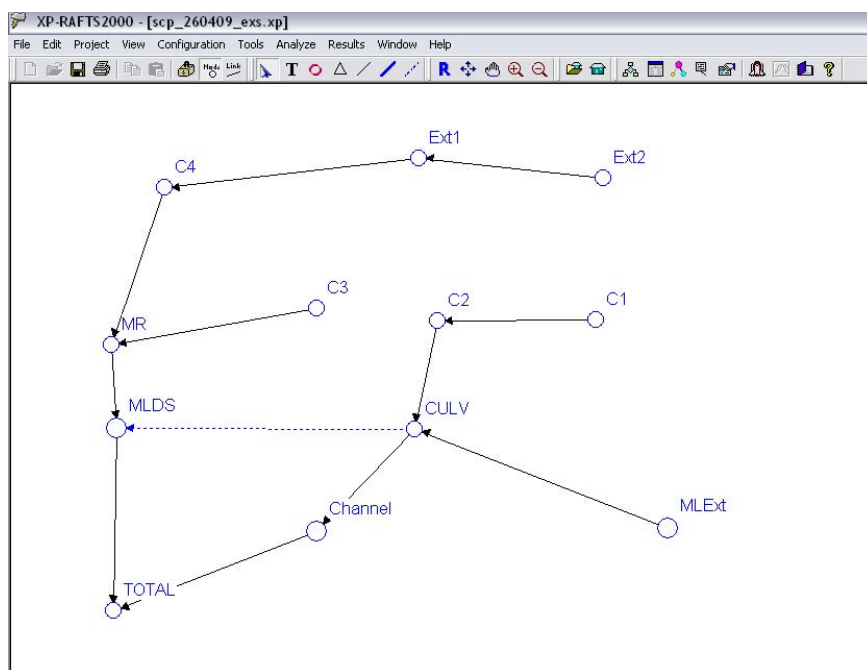


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Diagram 4-1 Existing Scenario Model Layout¹⁰



Peak flows rates for the 2 year, 5 year, 20 year and 100 year ARI storm events are provided below in **Table 4—7**.

Table 4—7 Existing Peak Flow Rates

		Peak Flow Rates (m ³ /s)			
Catchment Name/Location	Model Identification	2 Year ARI	5 Year ARI	20 Year ARI	100 Year ARI
Existing Catchment 1	C1	1.1	1.4	1.7	2.4
Existing Catchment 2	C2	1.1	1.6	2.2	2.8
Existing Catchment 3	C3	0.3	0.6	0.9	1.2
Existing Catchment 4	C4	0.4	0.8	1.3	1.7

¹⁰ The diversion link from CULV to MLDS is activated when flows arriving at CULV exceed the flow capacity of the culvert. For more detail refer **Sections 4.2 and 4.4.1**.



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		Peak Flow Rates (m ³ /s)			
Catchment Name/Location	Model Identification	2 Year ARI	5 Year ARI	20 Year ARI	100 Year ARI
External Catchment 1	Ext1	0.3	0.5	0.8	1.0
External Catchment 2	Ext2	0.2	0.3	0.4	0.5
Mobbs Lane External	MLExt	0.5	0.7	0.9	1.2
Mobbs Reserve	MR	0.7	1.3	2.0	2.8
Culvert at Mobbs Lane	CULV	1.5	2.2	3.1	3.9
Valley Road Drainage Channel	Channel	1.0	1.0	1.0	1.0
Terrys Creek/Mobbs Lane Junction	MLDS	1.0	2.3	4.1	5.7
Total	TOTAL	2.0	3.3	5.1	6.7

4.4 Proposed Conditions

The Stage 1 Residential development contains a smaller overall building footprint than the existing infrastructure that is located on the site, which will be demolished prior to the construction of the Stage 1 residential development. This demolition is outlined in the Early Works Project Application. As such, the proposed Stage 1 Residential development results in a minor decrease in the impervious area on the site (*from approximately 45% to 37%*). This reduction in impervious area would nominally decrease peak flow rates discharging from the site.

With the inclusion of the constructed wetland/detention basin and a decrease in impervious area – arising from the demolition of existing buildings, and the construction of the Stage 1 Residential development – it would be anticipated that peak flow rates off the site would be reduced. As a method of confirmation and to report the downstream impact of the Stage 1 Residential development, hydrologic and hydraulic modelling was completed for the proposed Stage 1 Residential development scenario.



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The proposed catchment plan for the Stage 1 Residential development is shown on **Drawing 7587-PA-S1-11**. The proposed model maintains the existing characteristics of the external catchments (refer **Section 4.2.2**).

The Early Works Package documentation demonstrated that the proposed 850m³ of detention volume was adequate to ensure that under the ultimate Epping Park development scenario there was no increase in peak flow rates downstream of the site. This analysis focussed on four key locations, viz:

- The Valley Road drainage channel;
- Mobbs Lane/Terrys Creek crossing;
- Mobbs Lane Reserve; and
- The Terrys Creek/Valley Road drainage channel junction (*i.e. total of above three locations*)¹¹.

The criteria for limiting the proposed peak flow rates at the four locations are described in the sections below.

4.4.1 Culvert Under Mobbs Lane

The existing culvert that runs under Mobbs Lane and discharges stormwater runoff into the Valley Road open drainage channel, is known to comprise of three 450mm diameter parallel pipes (refer **Appendix 6** -) with a grade of approximately 2.5%. Hydraulic modelling was undertaken to determine the peak capacity of this culvert which was calculated to be approximately 1.03m³/s.

XP-RAFTS modelling of the existing scenario estimated the peak flow arriving at this existing culvert would be 1.5m³/s for the 2 year ARI event. This implies that for minor rainfall events the existing culvert does not provide adequate capacity to direct stormwater runoff into the existing channel. Thus, when the peak flow rate arriving at this culvert exceeds 1.03m³/s stormwater runoff would bypass the culvert (*and subsequently the Valley Road drainage channel*) resulting in stormwater runoff discharging directly into Terrys Creek at the Mobbs Lane/Terrys Creek crossing.

As part of the proposed development works will be undertaken to upgrade the Mobbs Lane road reserve. The upgrade works will include drainage infrastructure in the form of kerb and gutter, stormwater pits, and stormwater pipes. The design capacity for the upgraded drainage infrastructure will be the 20 year ARI storm event.

Under proposed conditions, the Stage 1 Residential development site will not discharge (*excluding proposed catchments 2 and 18*) into the existing culvert running under Mobbs Lane. Rather, the development will drain directly into Terrys Creek at the Mobbs Lane/Terrys Creek crossing via appropriate drainage infrastructure designed and constructed as part of the Mobbs Lane external works outlined in the concurrent Early Works Project Application.

¹¹ Only flows generated from within the site and those affecting stormwater management have been considered at this location



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With the proposed development bypassing the existing culvert and open channel, the 20 year ARI peak flow from the Mobbs Lane External Catchment will be directed via the proposed pipe network into the open channel. This will also result in a reduced flow rate being discharged into the open channel (*which anecdotally experiences flooding issues*) for events up to and including the 20 year ARI event.

4.4.2 Mobbs Lane at Terrys Creek

The stormwater detention basin proposed in the concurrent Early Works Project Application will discharge stormwater directly into Terrys Creek at the Mobbs Lane/ Terrys Creek crossing via a pipe network and overland flow path in Mobbs Lane. Additionally, flows from the Mobbs Lane External catchment in excess of the 20 year ARI peak flow rate will bypass the Valley Road drainage channel and be conveyed within Mobbs Lane before discharging directly into Terrys Creek at the Mobbs Lane/Terrys Creek crossing.

Under proposed conditions the peak flow rate arriving at the Mobbs Lane/Terrys Creek junction will not exceed the existing peak flow rate for the 2 year, 5 year, 20 year and 100 year ARI events.

Table 4—8 below has been included to summarise the existing and proposed scenarios for stormwater flows discharging into the open channel, and directly into Terrys Creek via Mobbs Lane.

Table 4—8 Summary of Existing and Proposed Conditions at the Open Channel and at the Terrys Creek/Mobbs Lane Junction

Discharge Location	Existing Scenario	Stage 1 Residential Development Proposed Scenario
Valley Road Drainage Channel	Combined flows from Existing Catchment 1, Existing Catchment 2, and Mobbs Lane External up to a quantity of 1.03m ³ /s.	All flows from the Mobbs Lane External Catchment and Catchment 7-6 that do not exceed 1.03m ³ /s.
Terrys Creek at the Mobbs Lane/Terrys Creek crossing	Direct flows from Existing Catchment 3 and combined flows from Existing Catchment 1, Existing Catchment 2, and Mobbs Lane External that exceed 1.03m ³ /s.	All flows from the Epping Park development site (<i>except catchment Channel 7-6</i>) and flows arriving at the Valley Road drainage channel exceeding 1.03m ³ /s from the Mobbs Lane External Catchment and Channel 7-6.



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4.4.3 Mobbs Lane Reserve

Peak flow rates generated from the proposed development discharging into Mobbs Lane Reserve will not exceed the existing flow rates for the 2 year, 5 year, 20 year and 100 year ARI storm events.

4.4.4 Terrys Creek/Valley Road Drainage Channel (*i.e. total of three above locations*)¹²

The combined total peak flow rates generated by the proposed development site will not exceed the existing combined total peak flow rates being discharged off the site for the 2 year, 5 year, 20 year, and 100 year ARI storm events.

4.5 Proposed Catchment Characteristics

The catchment characteristics modelled for the proposed scenario are presented below as **Table 4—9**.

Table 4—9 Proposed Catchment Characteristics

Catchment Name	Catchment Area (ha)	Impervious Percentage	Vectored Average Catchment Slope
Channel 7-1	1.39	5%	7%
Channel 7-2	1.13	35%	9%
Channel 7-3	0.49	40%	8%
Channel 7-4	2.27	35%	8%
Channel 7-5	0.44	15%	4%
Channel 7-6	0.86	10%	4%
Stage 1	2.15	70%	1.5%
Basin	0.18	100%	0%
Total	8.91	37%	n/a

4.6 Epping Park Proposed Detention Basin

The Stage 1 Residential development requires the concurrent or prior construction of the constructed wetland/basin discussed in the concurrent Early Works Package Project Application documentation. Thus, for the Stage 1 Residential development, the constructed wetland/detention basin will have a

¹² Only flows from the site and to 0.64ha affecting stormwater management have been considered at this location.



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Table 4—10 Stage 1 Residential Proposed Scenario Peak Flow Rates

Catchment Name/Location	Model Identification	Peak Flow Rates (m ³ /s)			
		2 Year ARI	5 Year ARI	20 Year ARI	100 Year ARI
Channel 7-1	Ch 7-1	0.41	0.77	1.26	1.67
Channel 7-2	Ch 7-2	0.16	0.32	0.48	0.60
Channel 7-3	Ch 7-3	0.08	0.15	0.22	0.27
Channel 7-4	Ch 7-4	0.30	0.54	0.91	1.16
Channel 7-5	Ch 7-5	0.04	0.09	0.17	0.21
Channel 7-6	Ch 7-6	0.08	0.16	0.27	0.37
Stage 1	Stg 1	0.49	0.62	0.87	1.10
Basin	BASIN	0.55	0.93	1.53	2.20
External Catchment 1	Ext1	0.28	0.51	0.79	1.04
External Catchment 2	Ext2	0.19	0.26	0.38	0.51
Mobbs Lane External	MLext	0.53	0.88	1.36	1.75
Mobbs Lane Reserve	MR	0.54	0.98	1.56	2.12
Valley Road Drainage Channel	CULV	0.53	0.88	1.03	1.03
Mobbs Lane/Terrys Creek Crossing	MLDS	1.09	1.90	3.10	4.60
Terrys Creek/Valley Road Drainage Channel Junction	Total	1.50	2.55	4.11	5.63



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4.8 Comparison of Existing and Proposed Peak Flow Rates

The existing peak flow rates at the four strategic locations identified in **Section 4.4** are compared against the proposed peak flow rates arising as a result of the Stage 1 Residential Development.

Table 4—11 Stage 1 Residential Development Downstream Peak Flow Rate Comparison

Location	Model Identification	Scenario	Peak Flow Rates (m ³ /s)			
			2 Year ARI	5 Year ARI	20 Year ARI	100 Year ARI
Valley Road Drainage Channel	CULV	Existing	1.0	1.0	1.0	1.0
		Proposed ¹⁴	0.53	0.88	1.0	1.0
Terrys Creek/Mobbs Lane Crossing	MLDS	Existing	1.0	2.3	4.1	5.7
		Proposed ¹⁴	1.1	1.9	3.10	4.60
Mobbs Lane Reserve	MR	Existing	0.7	1.3	2.0	2.8
		Proposed ¹⁴	0.54	0.98	1.56	2.12
Terrys Creek/Valley Road Drainage Channel Junction	TOTAL	Existing	2.0	3.3	5.1	6.7
		Proposed ¹⁴	1.5	2.6	4.1	5.6

The results outlined in **Table 4—11** demonstrate that the proposed stormwater quantity management strategy achieves the objective of no significant increase in peak flow rates off the proposed Stage 1 Residential development site at four strategic locations. Additionally, the proposed stormwater quantity management strategy will result in significantly lower peak flow rates within the Valley Road drainage channel and at Terrys Creek/Valley Road drainage channel junction during frequent storm events.

The reductions indicated in **Table 4—11** indicate that the proposed stormwater quantity management strategy has the potential to reduce the frequency and severity of flooding downstream of the development site.

¹⁴ Stage 1 Residential development



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5. STORMWATER QUALITY MANAGEMENT STRATEGY

The Stage 1 Residential development will require a bio-retention swale and a constructed wetland/detention basin in order to fulfil the DECC stormwater pollutant reduction targets. As such, the Stage 1 Residential development will require concurrent or prior construction of some stormwater quality infrastructure documented in the Early Works Package Project Application.

Under the following sub-headings, the Stage 1 Residential development will be shown to meet the DECC stormwater pollutant reduction targets and to minimise pollutant export off the site relative to existing conditions.

5.1 Stormwater Quality Management Strategy (Construction Phase)

Construction can result in large amounts of sediment and other pollutants migrating downstream during storm events.

It is proposed to treat surface runoff (*occurring during the construction phase*) arising from the Stage 1 Residential development construction period in accordance with the NSW Department of Housing publication, 'Managing Urban Stormwater – Soils and Construction', 2004 (*commonly referred to as the "Blue Book"*). Runoff during construction phases will be managed through the implementation of a sediment and erosion control plan, refer **Drawing 7587-PA-S1-17** and **Drawing 7587-PA-S1-18**.

The proposed sediment and erosion control plan would comprise of the following measures:

- Temporary settling basin;
- Silt fencing;
- Straw bales;
- Pit inlet protection;
- Flow diversion channels; and
- Management of construction entry and exit locations.

5.2 Stormwater Quality Management Strategy (Post Construction Phase)

The NSW Department of Environment and Climate Change (DECC) has published a document entitled, 'Managing Urban Stormwater: Urban Design', October 2007, as a consultation draft. This document outlines water quality objectives for development within New South Wales. The DECC pollutant reduction targets are summarised below in **Table 5—1**.



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Table 5—1 DECC Stormwater Pollutant Reduction Targets

Pollutant	Ideal Pollutant Reduction Percentage	Pollutant Reduction Percentage Objective
Gross Pollutants	100	90
Total Suspended Solids	95	85
Total Phosphorus	95	65
Total Nitrogen	85	45

The pollutant reduction percentage objectives are required for stormwater runoff generated from within the Stage 1 Residential development site boundary (*i.e. there is no consideration of externally generated pollutant loads from the residual Channel 7 site or external catchments in the achievement of the above objectives*).

The Stage 1 Residential development will require the prior or concurrent construction of the constructed wetland/detention basin in the southern corner of the site and the bio-retention swale adjacent to proposed Road 3 as outlined in the Early Works Package Project Application documentation. It is proposed that these measures fulfil the DECC pollutant reduction percentage objectives independently for the Stage 1 Residential development.

The nature and location of the WSUD measures is shown on **Drawing 7587-PA-S1-11**.

5.2.1 MUSIC Stormwater Quality Modelling

The software package developed by the Cooperative Research Centre for Catchment Hydrology (CRCH) termed “MUSIC” (*Model for Urban Stormwater Improvement Conceptualisation*) was used to assess the effectiveness of the proposed WSUD mechanisms located throughout the proposed development.

MUSIC is a continual-run conceptual water quality assessment model that can be used to estimate the long-term annual average stormwater volume generated by a catchment as well as the expected mean annual pollutant loads. MUSIC is also able to conceptually simulate the performance of a group of WSUD measures to assess whether a proposed water quality management strategy is able to meet specified water quality objectives.

MUSIC has been used to ensure compliance with DECC’s stormwater pollutant reduction objectives because it has the following attributes:

- It can account for temporal variation in storm rainfall throughout a year;
- Modelling steps can be as low as 6 minutes to allow accurate modelling of treatment devices;
- It can model a range of treatment devices;



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- It can be used to estimate pollutant loads at any location within the catchment; and
- It is based on logical and accepted algorithms.

5.2.2 Climate Data

RAINFALL

MUSIC can model actual rainfall events on a 6 minute basis. To harness this capacity it is preferable to use 6 minute pluviograph data. Pluviograph data recorded at the Bureau of Meteorology station at Parramatta North (*Masons Drive – station number 66124*) between years 1988 and 1995 inclusive has been used.

The long term average annual rainfall at the Parramatta North rainfall station is 959mm per year (*based on data collected from 1984 to 2006*). The 8 years of rainfall data used for the MUSIC modelling had a mean annual rainfall of 958mm per year. Despite the close correlation between the long term average and the average across the 8 years of data used, an appropriate range of wet and dry years are present within the data set.

EVAPOTRANSPIRATION

Monthly aerial potential evapotranspiration values were obtained for the site from the '*Climate Atlas of Australia, Evapotranspiration*', Bureau of Meteorology, 2001. The adopted values are shown below in

Table 5—2 Monthly Aerial Potential Evapotranspiration

Month	Aerial Potential Evapotranspiration (mm)	Month	Aerial Potential Evapotranspiration (mm)
January	180	July	43
February	140	August	58
March	128	September	88
April	85	October	127
May	58	November	152
June	43	December	180



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5.2.3 Soil Data and Model Calibration

SOIL DATA

In the absence of the appropriate site specific geotechnical data required to calibrate soil parameters within MUSIC, the DECC's recommended soil parameters for MUSIC modelling in western Sydney have been adopted. The DECC's recommended soil parameters are included as .

Table 5—3 DECC's Recommended Soil Parameters

	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	mm	70	80
Infiltration capacity coefficient – a	n/a	210	175
Infiltration capacity coefficient – b	n/a	4.7	3.1
Groundwater properties			
Initial depth	mm	10	10
Daily recharge rate	%	50	35
Daily base flow rate	%	4	20
Daily deep seepage rate	%	0	0

MODEL CALIBRATION

The recommended soil parameters were evaluated for appropriateness through the consideration of the volumetric runoff coefficient. In order to establish the legitimacy of a set of soil parameters, the volumetric runoff coefficient has been evaluated for a 100% pervious non-urban scenario and a 60% impervious urban scenario. The adopted soil parameters were applied to 1.0ha urban and non-urban catchments. The rainfall volume, runoff volume, and runoff coefficient values for the urban and non-urban scenario are summarised below in **Table 5—4**.



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Table 5—4 Volumetric Runoff Coefficients

	1.0ha 100% Pervious Non-Urban Catchment	1.0ha 60% Pervious Urban Catchment
Rainfall Volume	9,590m ³	9,590m ³
Runoff Volume	3,120m ³	6,230m ³
Runoff Coefficient (C _v)	0.3	0.6

Based on the former NSW Government Department for Environment and Conservation publication, '*Managing Urban Stormwater: Strategy Framework*', 1997, the runoff coefficients calculated in **Table 5—4** lie within an acceptable range. Thus, the DECC's recommended soil parameters can be considered as appropriate and relevant for use on the site.

5.2.4 Event Mean Concentrations

DECC has recommended that the Event Mean Concentration (EMC) values presented in **Table 5—5** be adopted for MUSIC models for catchments throughout New South Wales. The recommended EMC values were determined by the CRCCH following an extensive literature review, '*Urban Stormwater Quality: A Statistical Overview*', H Duncan et al (CRCCH), 1999, which drew on data collected throughout Australia, but focussed more specifically on studies within New South Wales.



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Table 5—5 DECC Recommended Event Mean Concentration Values

Land use	Base Flow						Storm Flow					
	Total Suspended Solids		Total Phosphorus		Total Nitrogen		Total Suspended Solids		Total Phosphorus		Total Nitrogen	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
	<i>(all values expressed as log₁₀ mg/l)</i>											
General urban	1.20	0.17	-0.85	0.19	0.11	0.12	2.15	0.32	-0.60	0.25	0.30	0.19
Residential												
Industrial												
Commercial												
Rural	1.15	-	-1.22	-	-0.05	-	1.95	-	-0.66	-	0.30	-
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	0.78	0.17	-1.52	0.19	0.52	0.12	1.60	0.32	-1.10	0.25	-0.05	0.19

5.3 Existing Site Conditions

Under existing conditions, the proposed development site contains three land use types, viz:

- Roof area;
- Road area; and
- General area.

Table 5—6 below shows the approximate area break down for the existing land uses.



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Table 5—6 Existing Catchment Areas and Land Uses¹⁵

Land Use	Total Area (ha)	Percentage Impervious	Soil Parameters
Roof	1.18	100%	Urban
Road	3.00	85% ¹⁶	Urban
General ¹⁷	4.73	5%	Urban
Total	8.91	45%	

The areas nominated above in **Table 5—6** were modelled in MUSIC to provide an approximation of existing stormwater annual pollutant loads generated within the proposed development site.

5.3.1 Existing Stormwater Pollutant Concentrations

The MUSIC outputs for the existing catchment conditions are included below in **Table 5—7**.

Table 5—7 Existing Stormwater Pollutant Loads

Stormwater Pollutant	Mean Annual Load (kg/yr)
Total Suspended Solids	6,480
Total Phosphorus	14
Total Nitrogen	99
Gross Pollutants	896

¹⁵ For the entire 61 Mobbs Lane site.

¹⁶ For the purpose of the MUSIC model, the existing road area has been assumed to be 85% impervious. This accounts for the areas of planting within the road footprint and the road pavements lack of condition (*i.e. wear, potholes, cracks, etc*).

¹⁷ Under existing conditions, the General Urban Area has been modelled with the forest/natural Event Mean Concentration Values.



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5.4 Stage 1 Residential Development Proposed Catchment Characteristics

The Stage 1 Residential development has been separated into eight sub-catchments (*refer Drawing 7587-PA-S1-11*). The catchment splitting process was primarily driven by watershed boundaries and regions draining to WSUD measures. The proposed catchment characteristics that are integral in the preparation of the water quality modelling are included in **Table 5—8** below.

Table 5—8 Stage 1 Residential Development Proposed Catchment Characteristics

Catchment Name	Total Area (ha)	% Impervious
Stage 1 Road	0.15	100%
Stage 1 General	2.00	70%
Channel 7-1	1.39	5%
Channel 7-2	1.13	35%
Channel 7-3	0.49	40%
Channel 7-4	2.27	35%
Channel 7-5	0.44	15%
Channel 7-6	0.86	10%
Basin	0.18	100%
Total	8.91	n/a

The MUSIC model representing the Stage 1 Residential development applied the EMC values presented in **Table 5—5** to the roof, road and general urban catchment areas listed in **Table 5—8**. Roof and road areas were modelled as 100% impervious catchments whereas general urban areas were modelled with varying percentages of imperviousness based on the proposed composition of the open space areas.

5.5 Proposed Water Sensitive Urban Design Measures

In order to meet the recommended stormwater pollution reduction targets, the Stage 1 Residential development integrates some Water Sensitive Urban Design (*WSUD*) measures throughout the entire Epping Park site as proposed in the Early Works Package Project Application. These measures include:

- A bio-retention swale; and
- A constructed wetland.



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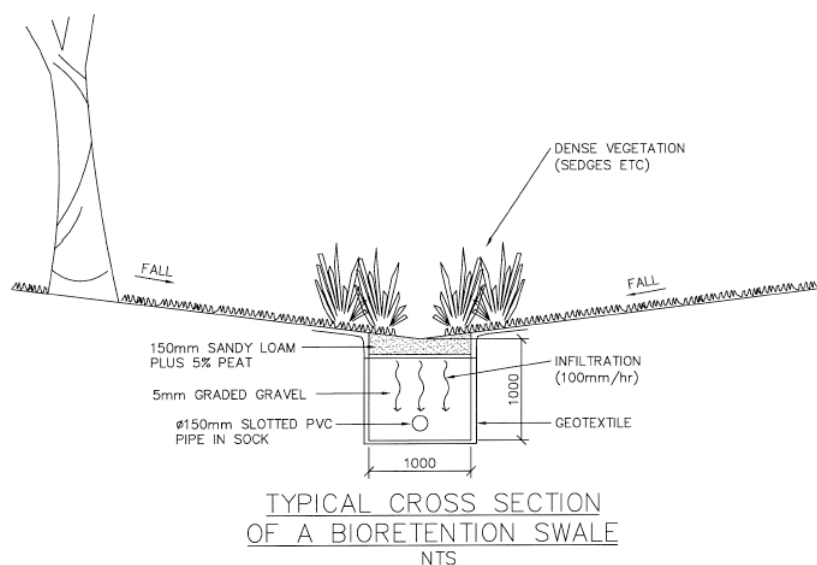
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5.5.1 Bio-retention Swale

Bio-retention swales consist of a planted region containing native grasses, shrubs and trees underlain by an infiltration area. The swales are proposed to be gravel filled and approximately 700mm deep with 200mm of sandy loam topsoil and a perforated pipe at the base. A typical bio-retention swale cross-section, with indicative dimensions, is included below as **Diagram 5-1**.

Diagram 5-1 Typical Bio-retention Swale



Bio-retention swales remove stormwater pollutants via detention and an extended filtration process. Further treatment would be achieved by filtering through the gravel trench and biological action due to growth on the gravel.

Bio-retention swales are typically designed to allow stormwater runoff to pond upon their surface (*the maximum depth of ponding for swales located within the proposed development is 0.3m*). Over time, the ponded water filters through vegetation and a layer of gravel. Flows maintained on the surface enable sunlight exposure and introduce small degrees of turbulence as flows travel along the vegetated base. Turbulence is beneficial to improving stormwater quality by enabling oxygen to enter flow volumes.

5.5.2 Constructed Wetland

The constructed wetland will be designed for a dual purpose encompassing stormwater quality improvement, and stormwater detention. A typical cross-section through the constructed wetland is included below as **Diagram 5-2**.

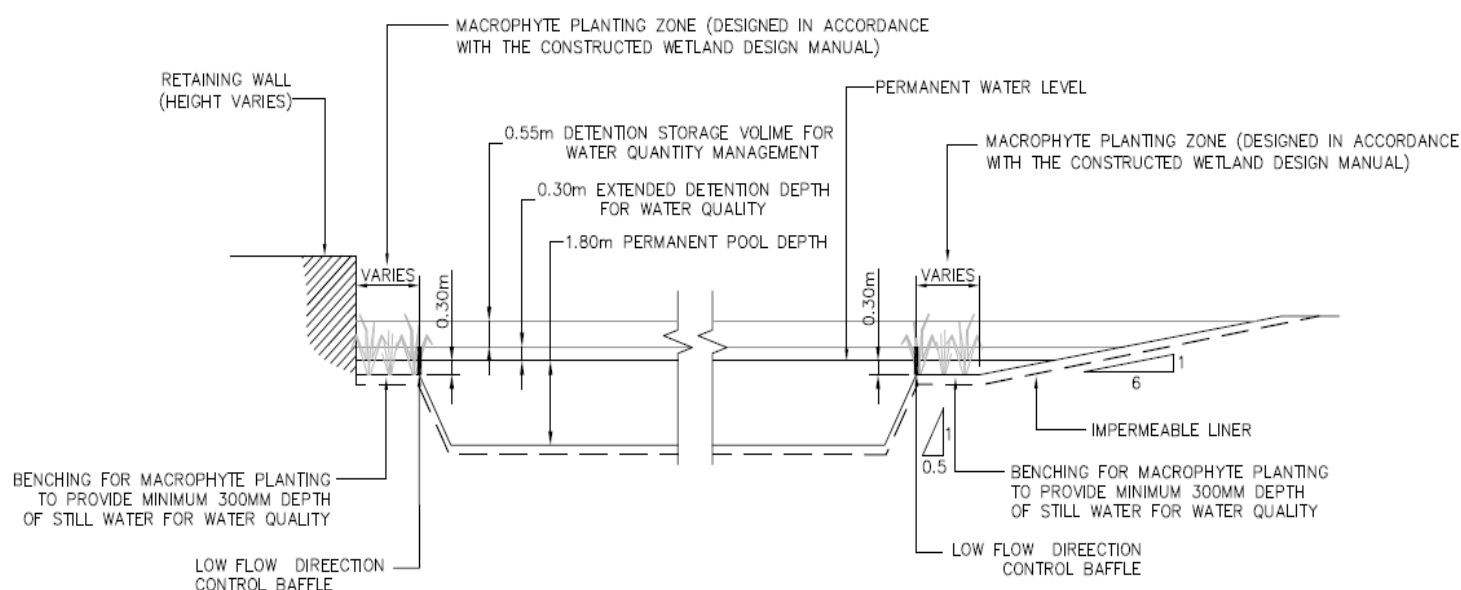


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Diagram 5-2 Typical Constructed Wetland Cross Section



TYPICAL BASIN CROSS-SECTION

NTS

Constructed wetlands are typically installed as end-of-line stormwater quality improvement devices. Through a combination of sedimentation, filtration and other pollutant uptake processes, constructed wetlands reduce stormwater pollutant loadings. The constructed wetland is proposed to consist of a 1.8m permanent pool depth an additional 0.3m of extended detention depth¹⁸. A macrophyte zone will be established around the perimeter of the basin and will be sized in accordance with 'The Constructed Wetlands Manual', NSW Department of Land and Water Conservation, 1998.

In addition to the water quality improvement capability, the constructed wetland will also contain an allocated volume of detention storage to attenuate peak flow rates off the site in accordance with the stormwater quantity management strategy (refer **Section 4**). The allocated volume of storage will be provided directly above the water quality depths.

¹⁸ The 0.3m extended detention depth extends 1.5m inwards from the basin perimeter. This depth of water is generally recommended as adequate for water related safety concerns.



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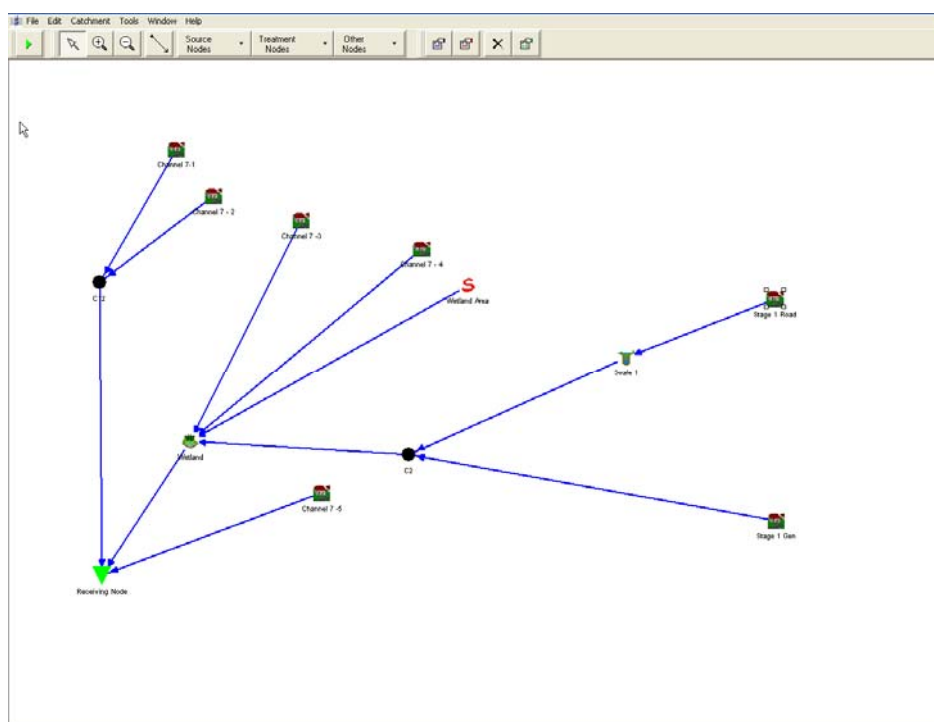
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5.6 MUSIC Model Layout

A schematic of the MUSIC model for the Stage 1 Residential development is included below as **Diagram 5-3**.

Diagram 5-3 Proposed Development MUSIC Model Layout



5.7 MUSIC Modelling Results

The MUSIC modelling results can be considered in two parts, viz:

- Responding to the DECC stormwater pollutant reduction objectives; and
- The levels of stormwater pollutants being exported off the development site after construction relative to the existing scenario.

5.7.1 Stormwater Pollutant Reduction Targets

The objectives set out by the DECC for stormwater quality are driven by percentage reductions targets for four pollutants; total suspended solids, total phosphorus, total nitrogen, and gross pollutants. The effectiveness of the proposed WSUD measures in removing stormwater pollutants from the Stage 1 Residential development site is summarised below in **Table 5—9**.



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Table 5—9 Stage 1 Residential Development MUSIC Modelling Results

	Mean Annual Loads (% Reduction)	
	Treatment Train Efficiency	DECC Target
Flow (ML/year)	10%	n/a
Total Suspended Solids (kg/year)	85%	85%
Total Phosphorus (kg/year)	73%	65%
Total Nitrogen (kg/year)	59%	45%
Gross Pollutants (kg/year)	100%	90%

The results presented in **Table 5—9** demonstrate that the proposed stormwater quality management strategy achieves the objectives set out by the DECC.

Furthermore, the proposed stormwater quality strategy results in a significant improvement in annual pollutants discharged off-site in comparison with existing conditions (*refer Table 5—10*)

Table 5—10 Comparison Between Existing and Stage 1 Residential Development Annual Pollutant Loads Discharged Off-Site

	Mean Annual Loads (kg/yr)	
	Existing	Proposed
Total Suspended Solids	6,480	2,180
Total Phosphorus	14	5.8
Total Nitrogen	99	51
Gross Pollutants	896	215

5.8 Volumetric Runoff Coefficients

The volumetric runoff coefficient represents the proportion of rainfall across a catchment that does not infiltrate into the ground or is not lost by other means. Typically, volumetric runoff coefficients are



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dependent upon soil characteristics and the impervious percentage of the catchment. The soil properties and the percentage impervious are discussed in **Section 5.2.3** and **Section 5.4** respectively.

The affect of Water Sensitive Urban Design measures on the volumetric run off coefficient within the proposed development are summarised in **Table 5—11**.

Table 5—11 Stage 1 Residential Development Volumetric Runoff Coefficient Summary

Modelled Scenario	Volumetric Runoff Coefficient
Existing	0.56
Proposed without WSUD measures	0.54
Proposed with WSUD measures	0.50

Based on WorleyParsons' experience a volumetric runoff coefficient of 0.50 represents a typical outcome for an urban catchment containing WSUD measures.

5.9 Maintenance of Water Sensitive Urban Design Measures

The proposed maintenance program for the water sensitive urban design measures outlined below has been based upon '*Managing Urban Stormwater: Treatment Techniques*', New South Wales Environment Protection Agency, 1997, and would consist of the following:

- Inspection of bio-retention swales should be undertaken quarterly and following large storm events. The following items should be inspected and, if required remedial action taken;
 - o Channelisation and erosion;
 - o Vigour and density of vegetation;
 - o Weed inundation;
 - o Access and wear;
 - o Sediment build up behind check dams and in subsoil drainage; and
 - o Litter/debris.
- The constructed wetland should be inspected quarterly and following large storm events. The following should be inspected and, if required remedial action taken;
 - o Performance of outlet structures;
 - o Integrity of embankments/retaining walls;



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- o Weed infestation;
- o Mosquito breeding;
- o Litter and sediment levels; and
- o Health and diversity of macrophytes.



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6. SERVICING STRATEGY

A preliminary servicing strategy has been prepared for the Epping Park masterplan as part of the Early Works Package Project Application documentation. The Stage 1 Residential development will require the concurrent or prior construction for sections of the proposed servicing network (*with some modifications*) to ensure that all buildings associated with the Stage 1 Residential development can be adequately serviced for, viz:

- Potable water;
- Sewer;
- Electricity;
- Gas; and
- Telecommunications.

The Stage 1 Residential development servicing strategy nominates a proposed servicing plan (*refer Drawing 7587-PA-S1-19¹⁹*), potential connection points into existing servicing infrastructure, and discusses existing network availability to meet anticipated load demands for the Stage 1 Residential development for each of the above listed services.

The Stage 1 Residential development servicing strategy will require the inclusion of temporary servicing networks. These temporary servicing networks will enable amplification works of existing servicing infrastructure to be delayed to a later development phase of the overall Epping Park development. In time, the temporary servicing networks will be removed and replaced with the servicing network configuration detailed as part of the Early Works Package Project Application submission.

6.1 Potable Water

A Sydney Water Service Coordinator (*Qalchek*) has been engaged to complete a preliminary design of a potable water network for the proposed development including, viz:

- Internal network design;
- Existing network capacity; and
- Establishment of connection points.

The proposed potable water network has been developed to ensure all proposed buildings nominated as part of the Stage 1 Residential development can have appropriate access to potable water. The

¹⁹ For sewer and water only.



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proposed network will largely follow the internal road network and where possible has been designed to run in a looped fashion as preferred by Sydney water.

A Pre-Feasibility Study completed by Sydney Water Corporation (*refer Appendix 7 -*) was undertaken for the Epping Park masterplan. The Pre-Feasibility Study concluded that existing potable water infrastructure had sufficient capacity to meet the demands of the Epping Park development. As such, the Stage 1 Residential development can be adequately serviced by existing potable water infrastructure.

To incorporate a looped network, the Stage 1 Residential development will utilise the two connection points nominated in the Early Works Package Project Application, namely:

- The intersection of proposed Road 1²⁰ and Mobbs Lane; and
- The intersection of proposed Road 2 and Mobbs Lane.

Once the Project Application is approved by the Department of Planning the proposed connection points will be submitted to, and reviewed by Sydney Water Corporation through the Section 73 Application process.

6.2 Sewer

A Sydney Water Service Coordinator (*Qalchek*) has been engaged to complete a preliminary design of a sewer network associated with the Stage 1 Residential development which includes, viz:

- Internal network design;
- Existing network capacity; and
- Nomination of a connection point.

The proposed sewer network has been developed to ensure all proposed buildings nominated as part of the Stage 1 Residential development can have appropriate sewer access. The proposed sewer network will largely follow the internal road network and will drain via gravity towards the southern boundary of the site in close proximity to proposed building 17²².

Under existing conditions 61 Mobbs Lane, Epping is utilised by Channel Seven network. It is estimated that approximately 700 employees are based at this site. Presently, the site is connected into local sewer infrastructure located within the Mobbs Lane road reserve.

A Pre-Feasibility Study completed by Sydney Water Corporation for the Epping Park development (*refer Appendix 7 -*) indicated that local sewer infrastructure had insufficient capacity to service the

²⁰ Not part of this scope of works.

²² Not part of this scope of works



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proposed 650 dwellings²³. Thus, sewer lead in works are required to connection point nominated by Sydney Water Corporation (*approximately 850m south of the development in Holway Street, Eastwood*) for the Epping Park development.

The Stage 1 Residential development will only include 230 dwellings so it is proposed to connect into existing sewer infrastructure located in Mobbs Lane enabling the sewer lead in works to be delayed beyond the Stage 1 Residential development phase.

The capacity of the existing network to accommodate the 230 dwellings will be subject to extensive modelling and review from Sydney Water Corporation and will be undertaken via the lodgement of a Section 73 once the Stage 1 Residential development Project Application has been approved. At this stage we consider that based on existing loads (*i.e. from the Seven Network occupation*) that the Stage 1 Residential development is likely to be sustained without external upgrades.

In the anticipation of the existing sewer network being able to accommodate the 230 Stage 1 Residential dwellings, a temporary sewer connection point has been nominated approximately 70 west of the Mobbs Lane/Valley Road intersection.

6.3 Electricity

A proposed electricity network has been prepared by Lincolne Scott for the Stage 1 Residential development.

The proposed electricity network has been developed to ensure all proposed buildings nominated as part of the Stage 1 Residential development can have appropriate access to electricity. The proposed electricity network will largely follow the proposed road network with high voltage cabling.

The Epping Park masterplan servicing strategy nominates two connection points to existing power infrastructure in the Early Works Package Project Application, namely:

- The intersection of Road 1 and Mobbs Lane; and
- The intersection of Road 2 and Mobbs Lane.

Given the proposed phased construction of the Epping Park masterplan it is likely that the electricity network would involve temporary connections and conduits. The nature and location of temporary conduits and connections would take into account the future electricity servicing strategy for the Epping Park masterplan and detailed design will be undertaken upon approval being granted of the Stage 1 Residential Project Application.

²³ The proposed residential yield of the Epping Park development.



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6.4 Gas

A proposed gas network has been prepared by Lincolne Scott for the Stage 1 Residential development.

The proposed gas network has been developed to ensure that all proposed buildings nominated as part of the Stage 1 Residential development can have appropriate access to gas. The proposed network will largely follow the proposed road network.

Initial discussions with local gas infrastructure owner, Jemena Gas Networks, has established that existing gas infrastructure has adequate capacity to service the Epping Park development for standard gas service (*natural gas, hot water, cooking and heating*).

It is proposed to connect into existing gas infrastructure at the intersection of Road 2 and Mobbs Lane. Once the Stage 1 Residential development Project Application is approved by the Department of Planning negotiations with Jemena will be undertaken to confirm the adequacy of the proposed connection point.

6.5 Telecommunications

A proposed telecommunications network for the Stage 1 Residential development has been prepared by Lincolne Scott.

The proposed telecommunications network has been developed to ensure that all proposed buildings nominated as part of the Stage 1 Residential development have adequate access to telecommunication services.

Discussions are currently ongoing with various telecommunication providers to supply services and manage network infrastructure within the proposed development. While the discussions are ongoing with providers, initial discussions with Telstra have indicated that the local exchange has adequate capacity to service the requirements of the Epping Park development and thus the Stage 1 Residential development .



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7. CIVIL WORKS

The civil works for the Stage 1 Residential development will incorporate some works identified within the Early Works Package scope of works. The extent of the Early Works Package civil works that is to be constructed concurrently or prior to the Stage 1 Residential development is included in the WorleyParsons '*Epping Park – Stage 1 Residential PA*' drawing package, April 2009.

The Stage 1 Residential development civil works scope is defined by the following, viz:

- Internal earthworks;
- Internal roads (*as established in the Early Works Package Project Application*); and
- Internal and external stormwater drainage (*as established in the Early Works Package Project Application*).

Each of these elements is discussed independently over the following sections. For more detail on the nature and extent of the civil works package the WorleyParsons drawing set entitled '*Epping Park Stage 1 Residential PA*' should be referenced.

7.1 Internal Earthworks

Under existing conditions the site contains considerable changes in elevation. While the proposed surface generally maintains the existing topography of the land, significant changes in elevation between buildings, roads, and open space areas is unavoidable. Thus, it is proposed that a series of earth batters, future building basements and structural retaining walls be incorporated into the proposed development to provide suitable transitions across changes in elevation.

The conceptual regrading of the site for the Stage 1 Residential development has been designed to minimise any requirement to export excess cut off site or import a short fall of fill onto the site. A preliminary earthworks volume calculation based on the proposed Stage 1 Residential development designs of buildings and basements has been undertaken. The preliminary calculation estimates that cut and fill volumes can be balanced.

7.2 Internal Road Design

The Early Works Package documentation included the internal road network associated with the Epping Park masterplan. The Stage 1 Residential development will require concurrent or prior construction of Roads 2 and 3.

Roads within the Stage 1 Residential development generally consist of a 6m wide carriageway and either one-way or two-way cross fall (*depending on the location of drainage infrastructure*). All roads associated with the Epping Park development have been designed in accordance with the AUS-SPEC Joint Venture publication, '*Aus-Spec #1*', 2002, and will be maintained as private roads throughout the life cycle of the development.



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7.3 Stormwater Drainage

The Stage 1 Residential development will require the concurrent or prior construction of stormwater drainage infrastructure associated with the Early Works Package.

The Stage 1 Residential development will incorporate a drainage network (*comprising of stormwater pits, pipes*) capable of conveying events up to the 20 year ARI. For events beyond the 20 year ARI, designed swales and channels will convey stormwater runoff safely (*i.e. velocity depth product less than four*) on the surface.

In the event where the Stage 1 Residential development precedes the Early Works Package, a series of temporary drainage solutions will be introduced. These temporary drainage solutions will convey stormwater runoff safely towards the constructed wetland/detention basin and would be designed during the detailed design phase (*refer **Drawing 7587-S1-PA-11***).



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8. CONCLUSION

This report has outlined how the Stage 1 Residential development at Epping Park requires the construction of specific items associated with the Early Works Package. Additionally, this report has detailed how the Stage 1 Residential development (*incorporating required items of the Early Works Package*) can be considered a permissible development as set out by the assessment requirements discussed in **Section 1**. The specific conclusions that can be drawn from this report are summarised under sub-headings below.

8.1 Flooding

The Stage 1 Residential development is situated outside the existing flood extent of Terrys Creek. The Stage 1 Residential development is situated approximately 20m above the flood extent of Terrys Creek. Therefore, the Stage 1 Residential development will not be inundated by Terrys Creek.

The implementation of stormwater detention measures not only mitigates any impact of the Stage 1 Residential development but has the potential to minimise flows downstream of the site and thus, potentially reduce the severity of local any flooding issues.

8.2 Stormwater Quantity

Despite the fact that the Stage 1 Residential development reduces the existing impervious area at 61 Mobbs Lane, Epping, the stormwater quantity management strategy developed for the ultimate Epping Park development scenario has been adopted. As such, the stormwater quantity management strategy nominated for the Stage 1 Residential development reduces peak flow rates downstream of the site at the following locations, viz:

- An existing open channel located to the west of Valley Road;
- Mobbs Reserve;
- Terrys Creek at the Mobbs Lane/Terrys Creek junction; and
- The Terrys Creek/Valley Road Drainage Channel junction (*i.e. the combination of the three above locations*)²⁴.

8.3 Stormwater Quality

A stormwater quality strategy has been developed for the Stage 1 Residential development that ensures current guidelines set out by the Department of Environment and Climate Change (DECC) are satisfied.

²⁴ Only flows from the site and those affecting stormwater management have been considered at this location.



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In order for the proposed development to achieve the pollutant reduction percentage objectives put forward by DECC, the construction of a bio-retention swale and a constructed wetland/detention basin as outlined in the Early Works Project Application is proposed prior to or concurrent with the construction of the Stage 1 Residential development.

The proposed development incorporating the WSUD exceeds the minimum and presents a benefit to the downstream receiving water bodies in comparison with existing conditions.

8.4 Servicing

The Stage 1 Residential development can be serviced adequately for potable water, sewer, electricity, gas, and telecommunications. It is unlikely that any amplification (*associated with the full extent of the Epping Park development*) will be required to service the buildings nominated in the Stage 1 Residential development.

8.5 Civil Works

The civil works incorporates internal road design, internal earthworks, internal and external stormwater drainage design from the concurrent Early Works Package Project Application. The civil design has been conducted in accordance with relevant Australian standards or negotiated agreements with relevant authorities. For more detail the WorleyParsons '*Epping Park Project Application Stage 1 Residential*' drawing package should be referenced.

Preliminary bulk earthworks calculations indicate that the Stage 1 Residential development works package could result in a balance of cut and fill volumes.



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9. REFERENCES

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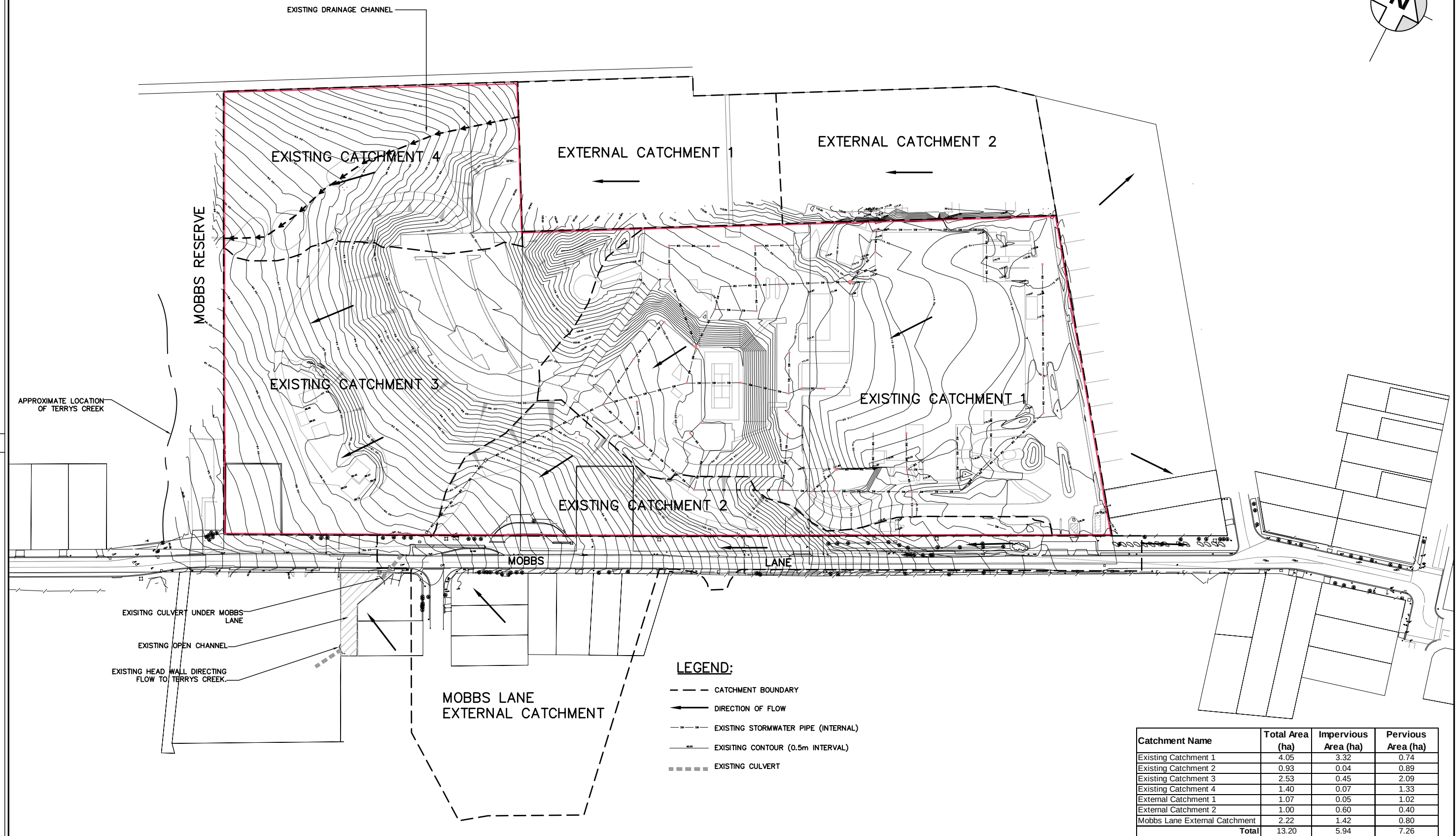
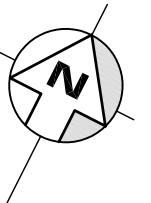
EcoNomics

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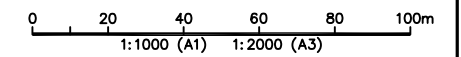
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Drawings



Catchment Name	Total Area (ha)	Impervious Area (ha)	Pervious Area (ha)
Existing Catchment 1	4.05	3.32	0.74
Existing Catchment 2	0.93	0.04	0.89
Existing Catchment 3	2.53	0.45	2.09
Existing Catchment 4	1.40	0.07	1.33
External Catchment 1	1.07	0.05	1.02
External Catchment 2	1.00	0.60	0.40
Mobbs Lane External Catchment	2.22	1.42	0.80
Total	13.20	5.94	7.26



DRG STATUS : NOT FOR CONSTRUCTION

Issue	Details of Issue	Des'd	Drn	Chk'd	Approved	Date
B	ISSUED FOR APPROVAL	PBC	GI	CM	M.SHAW	12.05.09
A	ISSUED FOR REVIEW	PBC	PMT	CM	M.SHAW	28.04.09

INITIALS SHOWN IN THE ADJACENT ISSUE RECORDS INDICATE THE STAGES UNDERTAKEN IN THE DRAWING APPROVAL PROCESS. DRAWINGS ARE ONLY TO BE USED WHEN APPROVED BY WORLEYPARSONS AND THEN ONLY AS NOTED FOR DRG STATUS. THE ORIGINAL SIGNATURES CAN BE FOUND ON THE REVERSE SIDE OF THE ORIGINAL OF THE DRG REGISTER/TRANSMITTAL FORM No.5.2.2. HELD BY WORLEYPARSONS

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resources & energy

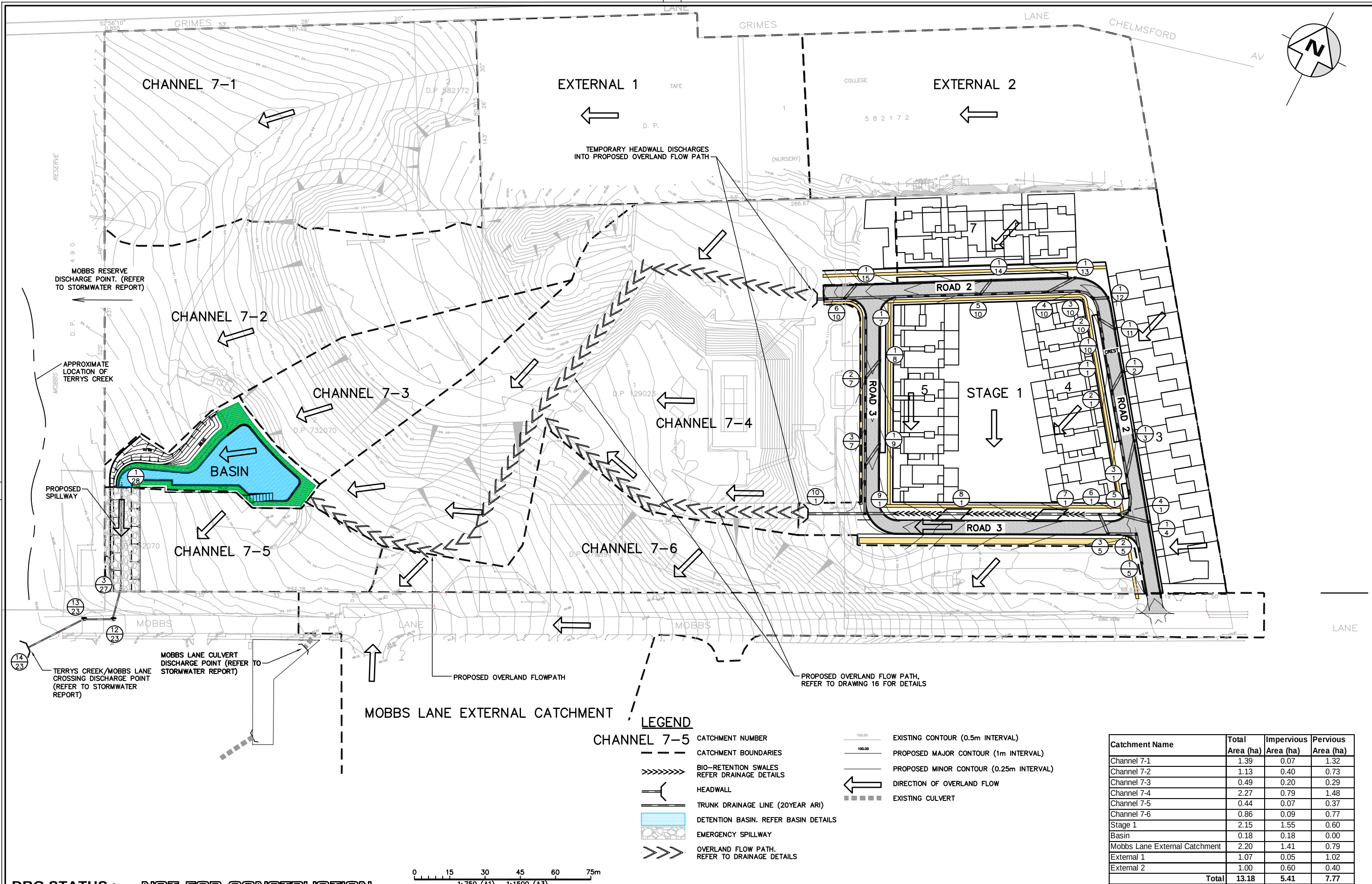
Infrastructure & Environment
Level 11
141 Walker Street
North Sydney 2060

telephone (02) 8456 7200
facsimile (02) 8923 6877
www.worleyparsons.com
A.B.N. 61 001 279 812

Client	SYDNEY BROADCAST PROPERTY PTY LTD
Project	EPHING PARK, STAGE 1 - RESIDENTIAL

Title	EXISTING CATCHMENT PLAN	Drawing No.	7587-PA-S1-10
		Issue	B
		Cad File No.	7587-PS-S1-10
		Xref.(s)	

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Issue	Details of Issue	Des'd	Drn	Chk'd	Approved	Date
C	LOT & DP INFORMATION UPDATED					
B	ISSUED FOR APPROVAL	PBC	GI	CM	M.SHAW	12.05.09
A	ISSUED FOR REVIEW	PBC	PMT	CM	M.SHAW	28.04.09

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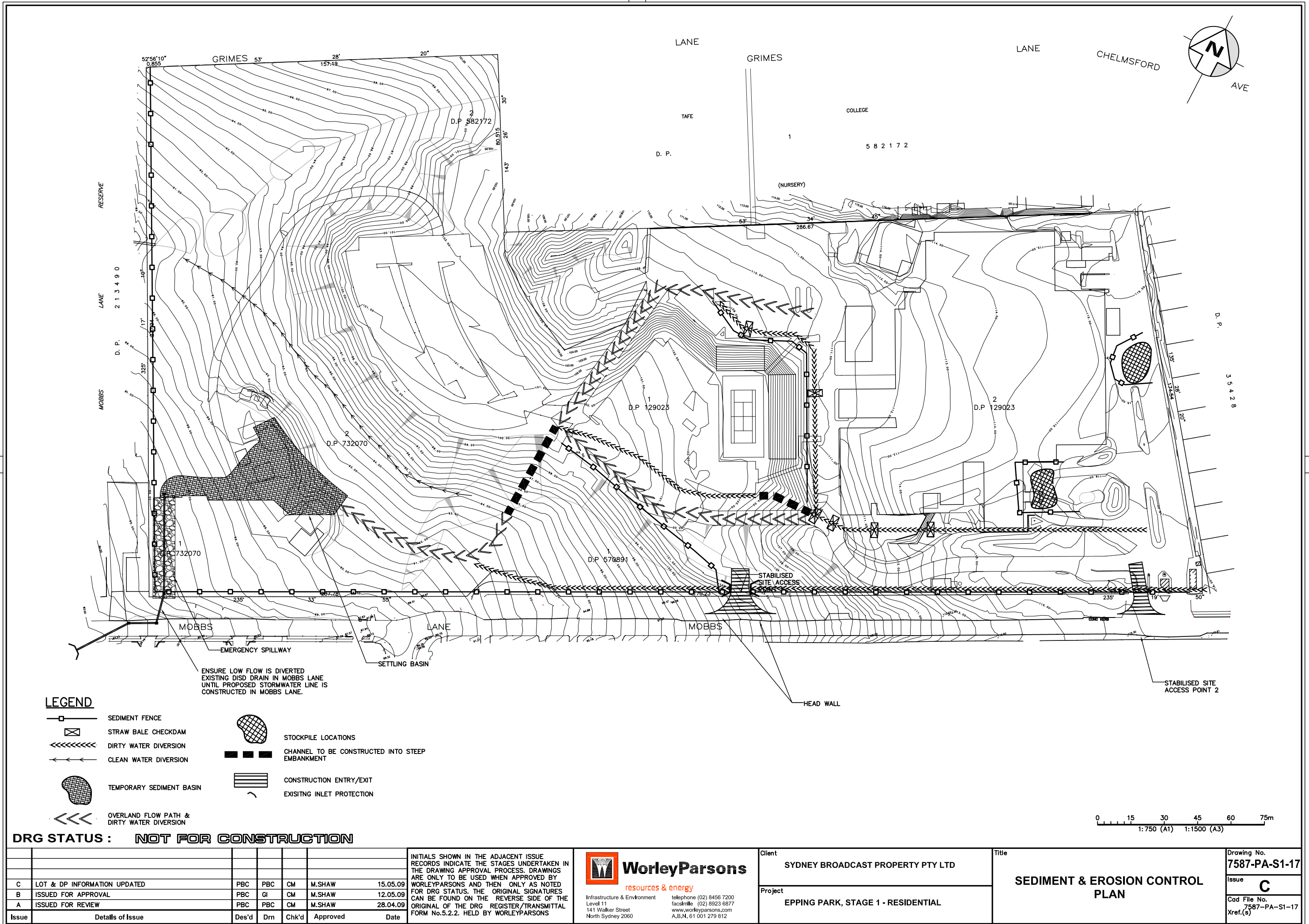


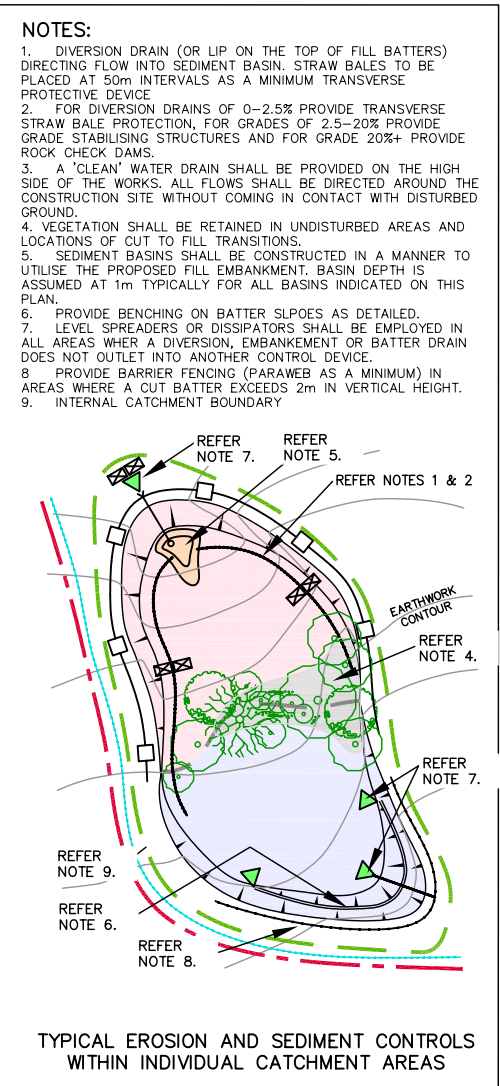
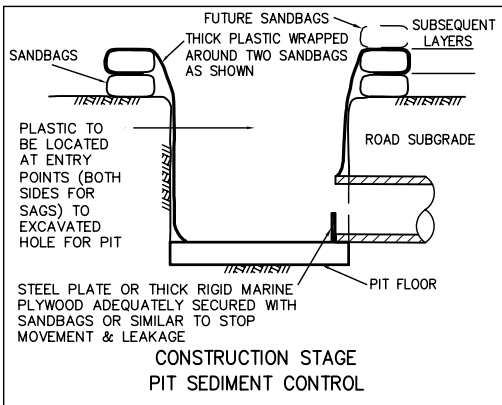
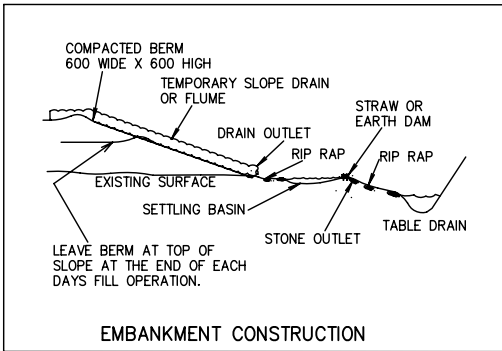
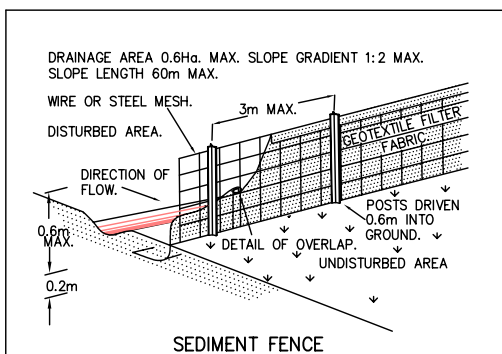
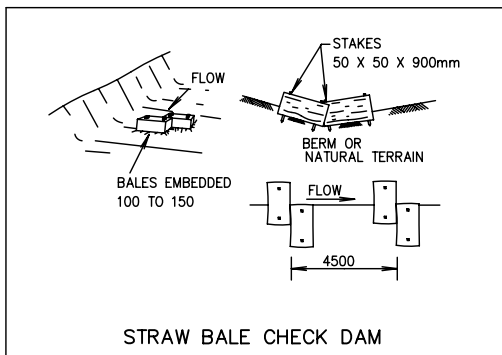
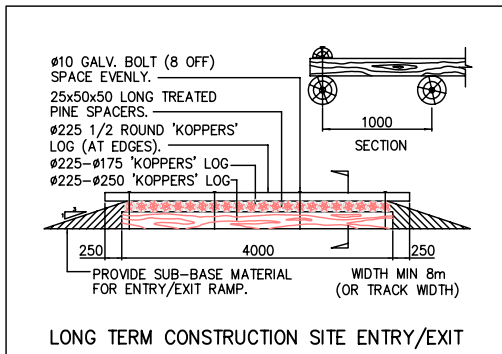
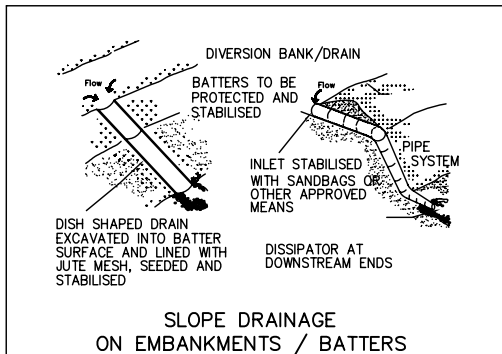
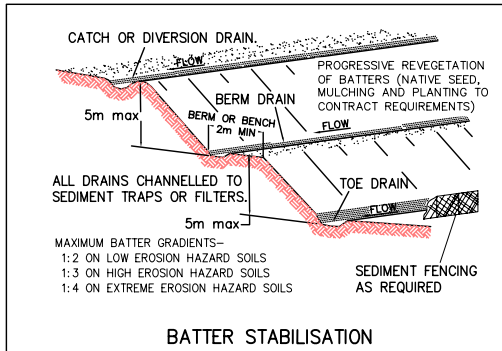
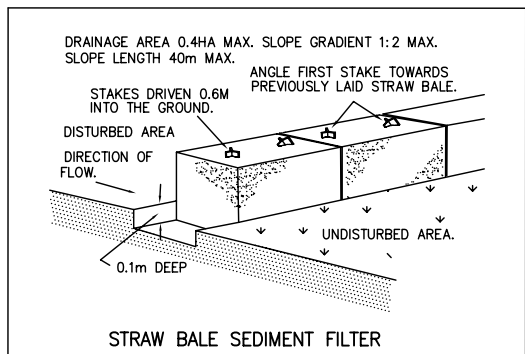
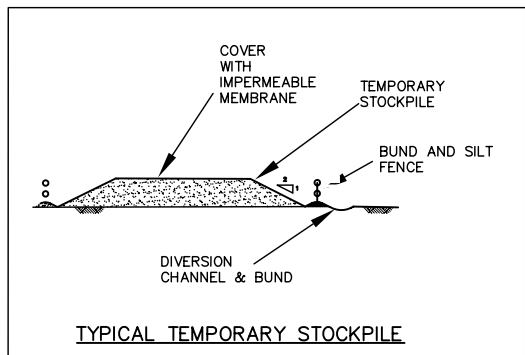
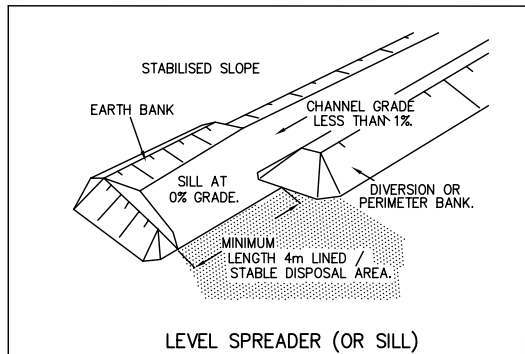
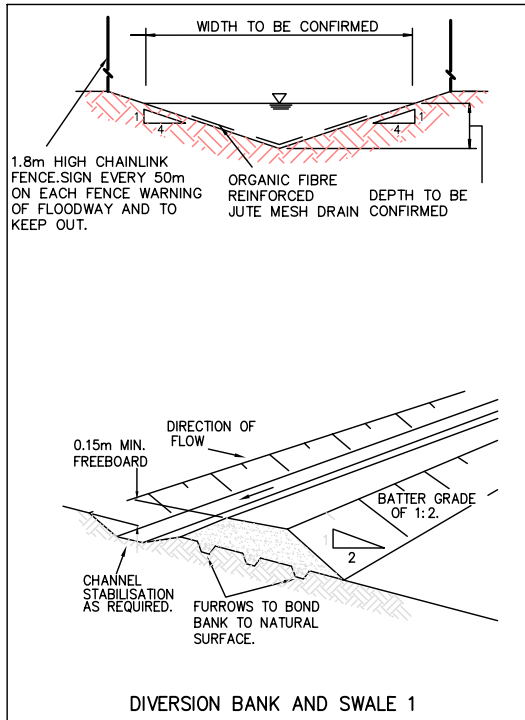
Client	SYDNEY BROADCAST PROPERTY PTY LTD
Project	EPPIING PARK, STAGE 1 - RESIDENTIAL

Title	OVERALL STORMWATER CONCEPT PLAN	Drawing No.	7587-PA-S1-11
		Issue	C
		Cad File No.	7587-PA-S1-11
		Xref(s)	

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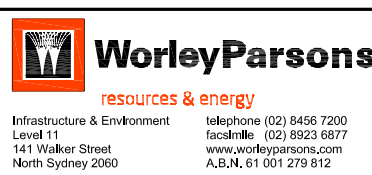


- NOTES:**
- ALL EROSION AND SEDIMENT CONTROL MEASURES TO BE INSTALLED IN ACCORDANCE WITH THE DEPARTMENT OF HOUSINGS "BLUE BOOK".
- GEOFABRIC LINED SEDIMENT FENCE**
- FOR SEDIMENT FENCE, JOIN SECTIONS OF FABRIC AT A STAR PICKET WITH 150mm OVERLAP.
 - DRIVE 1.5m LONG STAR PICKETS INTO GROUND, 3m APART.
 - DIG A 150mm DEEP TRENCH ALONG THE UPSLOPE LINE OF THE FENCE FOR THE BOTTOM OF THE FABRIC TO BE ENTRENCHED.
 - BACKFILL TRENCH OVER BASE OF FABRIC
 - FIX SELF-SUPPORTING GEOTEXTILE TO UPSLOPE SIDE OF POSTS WITH WIRE TIES OR AS RECOMMENDED BY GEOTEXTILE MANUFACTURER.
- TEMPORARY DIVERSION BANKS**
- DRAINS TO BE OF PARABOLIC OR TRAPEZOIDAL CROSS SECTION NOT V-SHAPED.
 - EARTH BANKS TO BE ADEQUATELY COMPACTED IN ORDER TO PREVENT FAILURE.
 - CONSTRUCTION IS OF A TEMPORARY NATURE AND SHALL BE REMOVED AT COMPLETION OF WORKS.
 - DIRECT DISCHARGE TO LEVEL SPREADER.
 - COMPACT WITH A SUITABLE IMPLEMENT IN SITUATIONS WHERE THEY ARE REQUIRED TO FUNCTION FOR MORE THAN FIVE DAYS.
 - EARTH BANKS TO BE FREE OF PROJECTIONS OR OTHER IRREGULARITIES THAT WILL IMPEDE NORMAL FLOW.
 - ALL OPEN DRAINS TO BE TURFED AS A MINIMUM. PROVIDE JUTE MESH LINING ON ANY DRAIN WITH A LONGITUDINAL GRADE EXCEEDING 5%.
- TURF BUFFER STRIP**
- PROVIDE 300mm TURF STRIP BEHIND KERB AND GUTTER AND SURROUNDING ALL INLET PITS NOT SURROUNDED BY PAVEMENT.
- STABILISED SITE ACCESS**
- STRIP TOPSOIL AND LEVEL SITE.
 - COMPACT SUBGRADE
 - COVER AREA WITH NEEDLE-PUNCHED GEOTEXTILE
 - CONSTRUCT 200mm THICK PAD OVER GEOTEXTILE USING 40mm AGGREGATE. MINIMUM LENGTH 15 METRES OR TO BUILDING ALIGNMENT. MINIMUM WIDTH 3 METRES.
 - CONSTRUCT HUMPS IMMEDIATELY WITHIN BOUNDARY TO DIVERT WATER TO A SEDIMENT FENCE OR OTHER SEDIMENT TRAP.

DRG STATUS : NOT FOR CONSTRUCTION

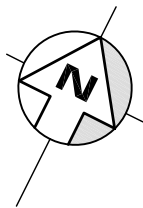
Issue	Details of Issue	Des'd	Drn	Chk'd	Approved	Date
B	ISSUED FOR APPROVAL	PBC	GI	CM	M.SHAW	12.05.09
A	ISSUED FOR REVIEW	PBC	PBC	CM	M.SHAW	28.04.09

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Client	SYDNEY BROADCAST PROPERTY PTY LTD
Project	EPPIING PARK, STAGE 1 - RESIDENTIAL

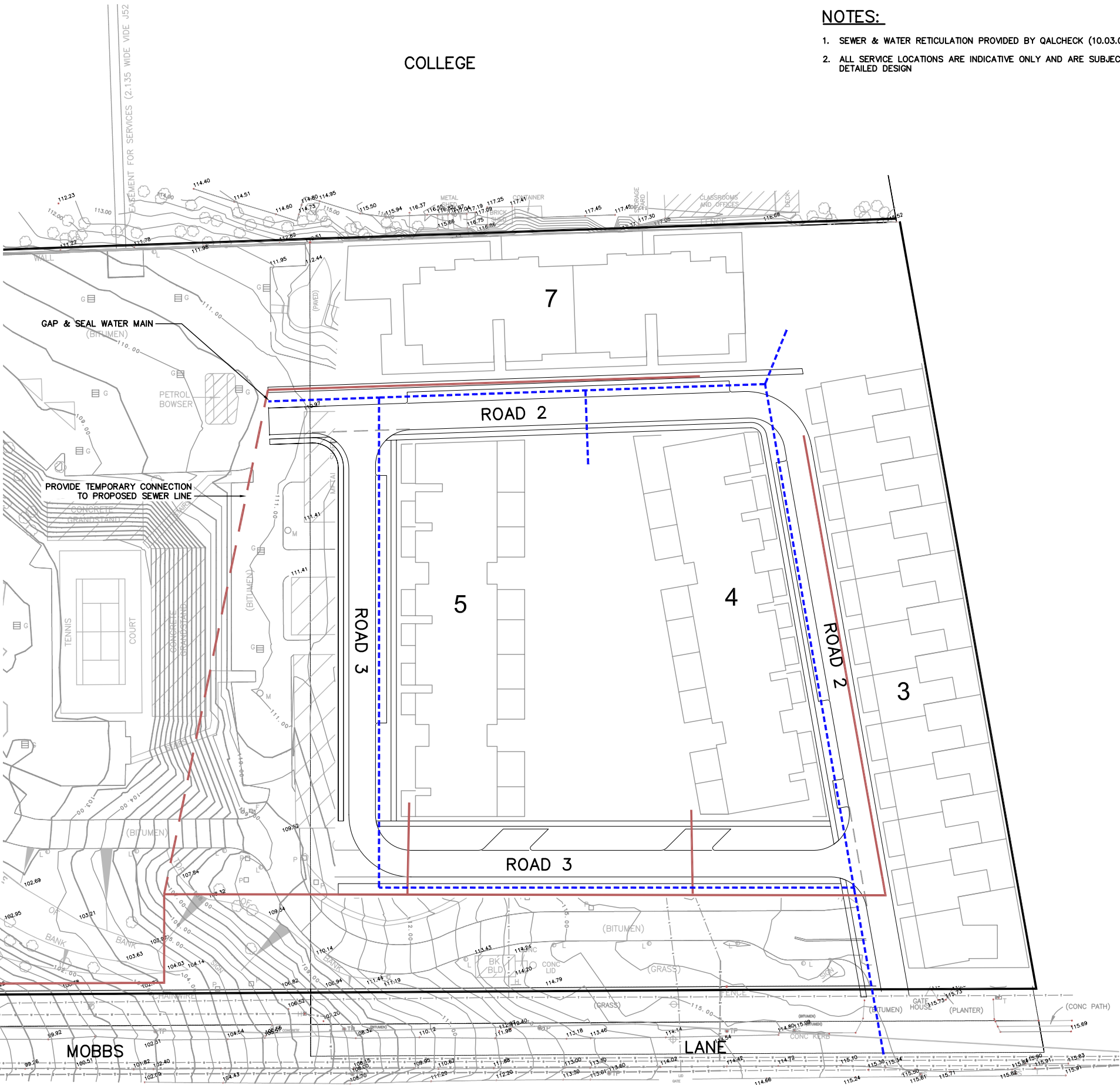
Title	SEDIMENT & EROSION CONTROL DETAILS
Drawing No.	7587-PA-S1-18
Issue	B
Cad File No.	7587-PA-S1-17
Xref(s)	



COLLEGE

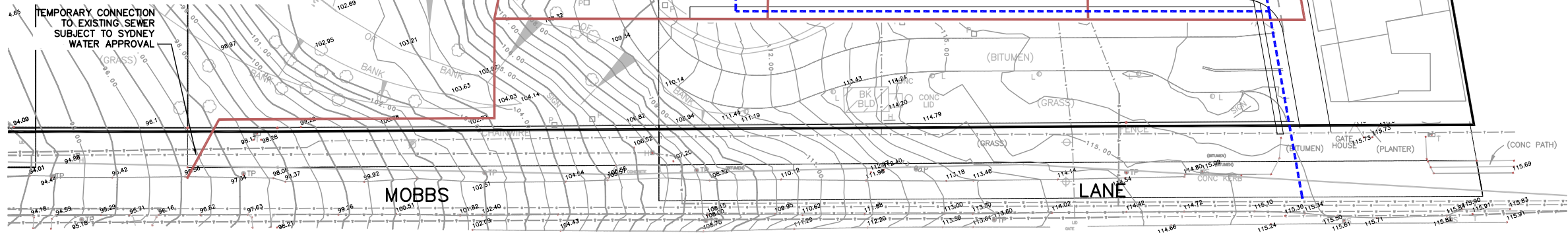
NOTES:

- SEWER & WATER RETICULATION PROVIDED BY QALCHECK (10.03.09)
- ALL SERVICE LOCATIONS ARE INDICATIVE ONLY AND ARE SUBJECT TO DETAILED DESIGN



LEGEND

- PROPOSED POTABLE WATER RETICULATION
- PROPOSED SEWER RETICULATION
- PROPOSED BUILDING NUMBER
- EXISTING TELSTRA LINE
- EXISTING WATER LINE
- EXISTING GAS LINE



DRG STATUS : NOT FOR CONSTRUCTION

Issue	Details of Issue	Des'd	Drn	Chk'd	Approved	Date
B	ISSUED FOR APPROVAL	PBC	GI	CM	M.SHAW	12.05.09
A	ISSUED FOR REVIEW	PBC	PBC	CM	M.SHAW	28.04.09

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Client	SYDNEY BROADCAST PROPERTY PTY LTD
Project	EPPIING PARK, STAGE 1 - RESIDENTIAL

Title	SERVICING CONCEPT PLAN
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Drawing No.	7587-PA-S1-19
Issue	B
Cad File No.	7587-PA-S1-19
Xref(s)	



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EPPING PARK - STAGE 1 RESIDENTIAL WORKS PROJECT APPLICATION

STORMWATER MANAGEMENT STRATEGY, SERVICING STRATEGY & CIVIL WORKS REPORT

Appendix 1 - Concept Plan Approval – Relevant Items to The Stormwater Management Strategy

- 1) A safe pedestrian environment that seeks to minimise contacts and conflicts with the road network, by providing green linkages/corridors to/from the main open space areas.
- 2) Open space that is perceived unequivocally by members of the public, by its proper site planning and design, to be welcoming, accessible and inclusive.
- 3) Well designed engineering functions that do not dominate or alienate the use and enjoyment of open space.
- 4) Facilities that will attract users to the park, including facilities that normally associates with successful design of open space.
- 5) Retention of significant vegetation that will enhance the amenity of the development, helping to place the development within its local context.

Condition B10 is DELETED and replaced with the following:
(modified by Section 75W modification MOD 1 approved on 23 December 2008)

B10. Aboriginal Archaeological and Archaeological Investigation

Future applications for development (other than the erection of a temporary marketing suite as detailed in Project No. 208.044.11, dated December 2008, MSA000, MSA100 - 101, MSA110, MSA200 - 203, MSA400, MSA306 - MSA309) on the subject site will be accompanied by an Aboriginal heritage and archaeological investigation to be formalised by the proponent and agreed by the Department, in consultation with Council where appropriate and implemented by the proponent to the satisfaction of the Department, in consultation with Council, and other agencies where appropriate. The Aboriginal archaeological and archaeological investigation will be prepared and undertaken by a suitably qualified person(s).

Condition B11 is DELETED and replaced with the following:
(modified by Section 75W modification MOD 1 approved on 23 December 2008)

B11. Geotechnical Investigation

Future applications for development (other than the erection of a temporary marketing suite as detailed in Project No. 208.044.11, dated December 2008, MSA000, MSA100 - 101, MSA110, MSA200 - 203, MSA400, MSA306 - MSA309) on the subject site will be accompanied by a geotechnical investigation to be formalised by the proponent and agreed by the Department, in consultation with Council where appropriate and implemented by the proponent to the satisfaction of the Department, in consultation with Council, and other agencies where appropriate. The geotechnical investigation will be prepared and undertaken by a suitably qualified person(s).

B12. Sub Consultant Reports

The proponent will implement all the recommendations set out within "The Parklands, 61 Mobbs Lane, Epping – Preferred Project Report – Appendices" produced by Architectus (May 2006) in any future applications for development on the subject site to the satisfaction of the Department, in consultation with Council, and other agencies where appropriate. Each report may require updating as determined by the Department or Council.

(Note: Under Modification A3, in the event of any inconsistency between the recommendations of any sub-consultant report, and the requirement of these modifications, then the modifications shall prevail).

B13. Stormwater Modelling

Prior to the issuance of certificates of occupancy for any building on the site, the proponent will provide detailed hydrological, hydraulic, water balance and water quality modelling in accordance with the NSW

Department of Conservation Guidelines – “*Managing Urban Streams and Urban Stormwater: Treatment Techniques*” to the satisfaction of the Department, in consultation with Council, and other agencies where appropriate.

B14. Stormwater Management

Prior to the issuance of certificates of construction, the proponent shall prepare and submit plans and relevant documentation to the Department for approval demonstrating compliance with, or evidence of the following matters:

- (1) The open drainage channel through the site (north-western side) from Grimes Lane is required to be preserved in order to maintain stormwater drainage discharge from upstream catchments (e.g: First Avenue, Second Avenue, etc);
- (2) The upstream catchment run off can be safely managed and conveyed through the site from the north and north-eastern side of the Channel Seven site;
- (3) Any proposed detention storage strategy will demonstrate zero increase in flooding or stormwater flows;
- (4) Any proposed detention storage strategy will result in significantly reduced frequencies of inundation;
- (5) All piped drainage infrastructure located on the site is designed to convey 20 year ARI flows generated on the site;
- (6) Provision of stormwater pipes under mobs lane to discharge site run off (off the site) to nearby Terry's Creek;
- (7) Installation of Pollution Control Devices (PCD's) along various drainage outlets discharging runoff from the developed site; and
- (8) Rehabilitation of existing drainage outlets and the open drainage channel.

In undertaking the above the proponent shall take into consideration the following:

- (1) Any relocation or adjustment of existing stormwater infrastructure is to be undertaken at the proponent's expense and subject to the requirements of Council.
- (2) The proponent is to enter into a suitable Deed of Agreement with the Council relating to stormwater infrastructure which provides Council with rights of access and protects Council's interests.

B15. State Environmental Planning Policy (Building Sustainability Index: BASIX) 2004

Future applications for development on the subject site shall be in accordance with State Environmental Planning Policy (Building Sustainability Index: BASIX) 2004 to be formalised by the proponent and agreed by the Department, in consultation with Council where appropriate and implemented by the proponent to the satisfaction of the Department, in consultation with Council.



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EPPING PARK - EARLY WORKS PACKAGE PROJECT APPLICATION

STORMWATER MANAGEMENT STRATEGY, SERVICING STRATEGY & CIVIL WORKS REPORT

Appendix 2 - Preferred Project Report – Relevant Items to The Stormwater Management Strategy

- Design of the internal road network in accordance with the road hierarchy, to provide a sense of place in different locations and to improve safety for pedestrians and cyclists.
- Provision of parking and storage in accordance with Parramatta City Council's codes and/or RTA guidelines.
- Provision of pathways accessible for people with disabilities within the site and linking to Mobbs Lane Reserve and a footpath along the Mobbs Lane frontage to the site.
- Public access for the community to the common open space and roads on the site.

The Proponent commits to working with Parramatta City Council and the RTA in implementing the two recommendations set out in the Sydney Regional Advisory Committee's letter to the Department of Planning, dated 24 January 2006 and resolve the issues set out in Councils submission.

9. Stormwater Management

The Proponent commits to working with Parramatta City Council to develop the design for the stormwater management system, which will operate effectively to the standards for infrastructure, safety and public health set down Parramatta City Council, and to the satisfaction of the Department of Planning.

Layout and design of the detention basin is yet to be finalised, and will be subject to a detailed hydrologic and hydraulic analysis. The developer will work with Parramatta City Council to achieve a design that resolves the issues noted in Parramatta City Council's submission.

The Proponent commits to:

- Providing sufficient stormwater storage on-site, for Council's flood Mitigation Strategy, including increased provision in storage to detain run-off generated by development on-site.
- In the event that Parramatta City Council approves irrigation storage, wetland or water features on-site, increasing the stormwater detention volume to accommodate this retention.
- In the event that approval is given for a wet detention basin with a lake and/or other water features, providing consultancy confirmation, including hydrogeological analysis or equivalent that the proposed lake system and wetland will survive and operate effectively in the manner proposed and the mitigation measure to prevent potential for eutrophication, odours, mosquito breeding and related concerns.
- Providing consultancy confirmation on the required level of flushing of the system
- Installing suitable stormwater quality improvement devices and measures such as GPT's screen/baskets, swales and wetlands to form part of the overall stormwater management scheme.



SYDNEY BROADCAST PROPERTY

EPPING PARK - EARLY WORKS PACKAGE PROJECT APPLICATION

STORMWATER MANAGEMENT STRATEGY, SERVICING STRATEGY & CIVIL WORKS REPORT

Appendix 3 - Director General's Requirements – Relevant Items to The Stormwater Management Strategy



NSW GOVERNMENT
Department of Planning

Contact: Anthony Witherdin
Phone: 02 9228 6173
Fax: 02 9228 6488
Email: anthony.witherdin@planning.nsw.gov.au

Mr Allen Linz
Sydney Broadcast Property Pty Ltd
Suite 1101, Level 11
14 Martin Place
SYDNEY NSW 2000

Our ref: MP 08_0258
File: S09/00057-1

Dear Mr Linz,

Director General's Requirements for Early Works Package associated with Concept Plan MP 05_0086 (MP 08_0258)

Thankyou for your request for Director-General's environmental assessment requirements (DGRs) for the above project.

The DGRs were prepared from the information provided within your application and in consultation with relevant Government agencies, including Council (attached).

Under section 75F(3) of the Act, the Director-General may alter or supplement these requirements if necessary and in light of any additional information that may be provided prior to the proponent seeking approval for the project.

Prior to exhibiting the Environmental Assessment, the Department will review the document to determine if it adequately addresses the DGR's. If the Director-General considers that the Environmental Assessment does not adequately address the DGR's, the Director-General may require the proponent to revise the Environmental Assessment to address the matters notified to the proponent.

Following this review period the Environmental Assessment will be made publicly available for a minimum period of 30 days. Please contact the Department at least two weeks before you propose to submit the Environmental Assessment to determine the fees applicable to the application.

Please also find attached with this letter, copies of submissions from other agencies addressing their key issues for the proposal. Please note that these responses have been provided to you for information only and do not form part of the DGRs for the Environmental Assessment.

If you have any enquiries about these requirements, please contact Anthony Witherdin on 02 9228 6173 or via e-mail at anthony.witherdin@planning.nsw.gov.au.

Yours sincerely

Jason Perica
Executive Director
(as delegate for the Director General)

11/2109

Director-General's Requirements

Section 75F of the *Environmental Planning and Assessment Act 1979*

Application number	MP 08_0258
Project	Early works package including demolition of existing structures; construction of final landform; internal and external roads; reticulation of services; landscaping of the public and private domain; child care facility; private communal facilities and subdivision.
Location	61 Mobbs Lane, Epping
Proponent	Sydney Broadcast Property Pty Ltd
Date issued	11/2/09
Expiry date	If the environmental assessment is not exhibited within 2 years after this date, the applicant must consult further with the Director-General in relation to the preparation of the environmental assessment.
Key Issues	The Environmental Assessment (EA) must address the following key issues: 1. Relevant EPI's policies and Guidelines to be Addressed Planning provisions applying to the site, including permissibility and the provisions of all plans and policies including: • Objects of the EP&A Act • SEPP (Major Projects) 2005 • SEPP (Infrastructure) 2007 • SEPP 55 – Remediation of Land • Draft West Central Subregional Strategy • Nature and extent of any non-compliance with relevant environmental planning instruments, plans and guidelines and justification for any non-compliance 2. Concept Plan The EA shall demonstrate consistency with the terms of approval of Concept Plan MP 05_0086 as described in Part A of Schedule 1 and subject to the modifications of approval as set out in Parts A and B of Schedule 2 of MP 05_0086, dated 22 August 2006 (including relevant modifications) and justification for any areas of inconsistency. 3. Built Form The EA shall address the height, bulk and scale of the proposed development within the context of the Concept Plan MP 05_0086 and the locality and mitigate potential impacts relating to loss of solar access, acoustic privacy, visual privacy, view loss and wind impacts. The development is to achieve a high level of environmental and residential amenity. 4. Urban Design The EA shall address the design quality with specific consideration of the façade, massing, setbacks, building articulation, use of appropriate colours, materials/finishes, landscaping, safety by design and public domain as per Concept Plan MP 05_0086. 5. Landscaping and Public Domain Management The EA shall provide details on the interface between the proposed uses and public domain, and the relationship to and impact upon the existing public domain and address the provision of linkages with and between other public domain spaces. Any landscaping is to be provided in accordance with Concept Plan MP 05_0086.

	6. Transport and Accessibility (Construction and Operational) The EA shall provide a Transport and Accessibility Impact Study prepared in accordance with the RTA's <i>Guide to Traffic Generating Developments</i>, considering transport and accessibility generation, any required road / intersection upgrades, access, loading dock(s), car parking arrangements, pedestrian and bicycle linkages associated with the early works package as per Concept Plan MP 05_0086. 7. Ecologically Sustainable Development (ESD) The EA shall detail how the development will incorporate ESD principles in the design, construction and ongoing operation phases of the development. 8. Flora and Fauna The EA shall address impacts on flora and fauna, including threatened species, populations and endangered ecological communities and their habitats and steps taken to mitigate any identified impacts to protect the environment as per Concept Plan MP 05_0086. 9. Drainage The EA shall address drainage/flooding issues associated with the development/site, including: stormwater, the potential effects of climate change, sea level rise and an increase in rainfall intensity, drainage infrastructure and incorporation of Water Sensitive Urban Design measures as per Concept Plan MP 05_0086. 10. Contributions The EA shall address Council's Section 94 Contribution Plan, details of any Voluntary Planning Agreement and compliance with the terms of approval of Concept Plan MP 05_0086, dated 22 August 2006. 11. Heritage The EA shall provide an assessment of any potential archaeology and aboriginal cultural heritage significance as per Concept Plan MP 05_0086. 12. Contamination The EA is to demonstrate compliance that the site is suitable for the proposed use in accordance with SEPP 55 and Concept Plan MP 05_0086. 13. Utilities In consultation with relevant agencies, the EA shall address the existing capacity and requirements of the development for the provision of utilities including staging of infrastructure works as per Concept Plan MP 05_0086. 14. Environmental and Construction Management Plan The EA shall provide an Environmental and Construction Management Overview for the proposed works and address the impact of the proposal upon: • Noise and vibration impacts on and off site • Air quality impacts on the neighbourhood • Water quality management for the site • Waste and chemical management 15. Consultation Undertake an appropriate and justified level of consultation in accordance with the Department's <i>Major Project Community Consultation Guidelines October 2007</i>. The EA is also to provide a demand analysis to determine the appropriateness of the childcare centre.
Deemed refusal period	60 days

Plans and Documents to accompany the Application

<u>General</u>	The Environmental Assessment (EA) must include: 1. An executive summary; 2. A thorough site analysis including site plans, areal photographs and a description of the existing and surrounding environment; 3. A thorough description of the proposed development; 4. An assessment of the key issues specified above and a table outlining how these key issues have been addressed; 5. An assessment of the potential impacts of the project and a draft Statement of Commitments, outlining environmental management, mitigation and monitoring measures to be implemented to minimise any potential impacts of the project; 6. The plans and documents outlined below; 7. A signed statement from the author of the Environmental Assessment certifying that the information contained in the report is neither false nor misleading; 8. A Quantity Surveyor's Certificate of Cost to verify the capital investment value of the project (in accordance with the definition contained in the Major Projects SEPP; and 9. A conclusion justifying the project, taking into consideration the environmental impacts of the proposal, the suitability of the site, and whether or not the project is in the public interest.
<u>Plans and Documents</u>	The following plans, architectural drawings, diagrams and relevant documentation shall be submitted; 1. An existing site survey plan drawn at an appropriate scale illustrating: • the location of the land, boundary measurements, area (sq.m) and north point; • the existing levels of the land in relation to buildings and roads; • location and height of existing structures on the site; and • location and height of adjacent buildings and private open space. • all levels to be to Australian Height Datum. 2. A Site Analysis Plan must be provided which identifies existing natural elements of the site (including all hazards and constraints), existing vegetation, footpath crossing levels and alignments, existing pedestrian and vehicular access points and other facilities, slope and topography, utility services, boundaries, orientation, view corridors and all structures on neighbouring properties where relevant to the application (including windows, driveways, private open space etc). 3. A locality/context plan drawn at an appropriate scale should be submitted indicating: • significant local features such as parks, community facilities and open space and heritage items; • the location and uses of existing buildings, shopping and employment areas; • traffic and road patterns, pedestrian routes and public transport nodes. 4. Architectural drawings at an appropriate scale illustrating: • the location of any existing building envelopes or structures on the land in relation to the boundaries of the land and any development on adjoining land; • detailed floor plans, sections and elevations of the proposed buildings; • elevation plans providing details of external building materials and colours proposed; • fenestrations, balconies and other features; • accessibility requirements of the Building Code of Australia and the Disability Discrimination Act; • the height (AHD) of the proposed development in relation to the land; • the level of the lowest floor, the level of any unbuilt area and the level of the ground;

	- any changes that will be made to the level of the land by excavation, filling or otherwise; 5. Other plans (to be required where relevant): Stormwater Concept Plan - illustrating the concept for stormwater management; Erosion and Sediment Control Plan – plan or drawing that shows the nature and location of all erosion and sedimentation control measures to be utilised on the site; Geotechnical Report – prepared by a recognised professional which assesses the risk of Geotechnical failure on the site and identifies design solutions and works to be carried out to ensure the stability of the land and structures and safety of persons; View Analysis - Visual aids such as a photomontage must be used to demonstrate visual impacts of the proposed building envelopes in particular having regard to the siting, bulk and scale relationships from key areas; Landscape plan - illustrating treatment of open space areas on the site, screen planting along common boundaries and tree protection measures both on and off the site. Shadow diagrams showing solar access to the site and adjacent properties at summer solstice (Dec 21), winter solstice (June 21) and the equinox (March 21 and September 21) at 9.00 am, 12.00 midday and 3.00 pm.
<u>Documents to be submitted</u>	1 copy of the EA, plans and documentation for the Test of Adequacy; 12 hard copies of the EA (once the EA has been determined adequate); 12 sets of architectural and landscape plans to scale, including one (1) set at A3 size (to scale); and 1 copy of the Environmental Assessment and plans on CD-ROM (PDF format), not exceeding 5Mb in size.



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SYDNEY BROADCAST PROPERTY

EPPING PARK - EARLY WORKS PACKAGE PROJECT APPLICATION

STORMWATER MANAGEMENT STRATEGY, SERVICING STRATEGY & CIVIL WORKS REPORT

Appendix 4 - Flood Levels in Terrys Creek – Provided By Parramatta City Council



ST

AVE

AVE

SECOND

AVE

ST

PL

LN

85.37
85.28

1:100
1:20

83.59
83.44
83.49
83.33

MOBBS

81.87
81.63

80.70
80.46



SYDNEY BROADCAST PROPERTY

EPPING PARK - STAGE 1 RESIDENTIAL WORKS PROJECT APPLICATION

STORMWATER MANAGEMENT STRATEGY, SERVICING STRATEGY & CIVIL WORKS REPORT

Appendix 5 - Proposed Conditions Direct Rainfall Intensities (*Considering Climate Change*)

Calculation of Intensities based on IFD coefficients and applying a 30% increase for Climate Change

Location:-61 Mobbs Lane Epping-----

Latitude:-33° 46' 56"-----

Longitude:-151° 04' 12"-----

IFD Coefficients-----

ARI in years	Coefficient A	Coefficient B	Coefficient C	Coefficient D	Coefficient E	Coefficient F	Coefficient G
2	3.56E+00	-5.71E-01	-2.44E-02	7.99E-03	-1.84E-04	-2.63E-04	1.13E-05
5	3.81E+00	-5.61E-01	-2.23E-02	7.43E-03	-2.77E-04	-2.05E-04	5.00E-06
20	4.07E+00	-5.52E-01	-2.05E-02	7.37E-03	-4.11E-04	-2.02E-04	8.84E-06
100	4.34E+00	-5.44E-01	-1.87E-02	7.30E-03	-5.51E-04	-1.99E-04	1.33E-05

2 Year Storm Intensities

Duration (min)	Duration (hr)	Log(e) Intensity	Intensity (mm/hr)	Intensity (post climate change) (mm/hr)
10	0.17	4.46	86.47	112.41
15	0.25	4.28	72.38	94.09
30	0.5	3.94	51.38	66.79
60	1	3.56	35.08	45.61
90	1.5	3.32	27.74	36.06
120	2	3.15	23.40	30.42
180	3	2.91	18.37	23.88
270	4.5	2.67	14.41	18.73
360	6	2.50	12.13	15.77
540	9	2.25	9.52	12.38

5 Year Storm Intensities

Duration (min)	Duration (hr)	Log(e) Intensity	Intensity (mm/hr)	Intensity (post climate change) (mm/hr)
10	0.17	4.70	110.23	143.30
15	0.25	4.53	92.38	120.09
30	0.5	4.19	65.80	85.54
60	1	3.81	45.20	58.76
90	1.5	3.58	35.89	46.66
120	2	3.41	30.39	39.51
180	3	3.18	23.98	31.17
270	4.5	2.94	18.91	24.58
360	6	2.77	15.97	20.76
540	9	2.53	12.60	16.38

20 Year Storm Intensities

Duration (min)	Duration (hr)	Log(e) Intensity	Intensity (mm/hr)	Intensity (post climate change) (mm/hr)
10	0.17	4.96	141.89	184.45
15	0.25	4.78	119.13	154.87
30	0.5	4.44	85.18	110.73
60	1	4.07	58.82	76.47
90	1.5	3.85	46.89	60.96
120	2	3.68	39.83	51.77
180	3	3.45	31.58	41.05
270	4.5	3.22	25.02	32.53
360	6	3.05	21.22	27.58
540	9	2.82	16.82	21.86

100 Year Storm Intensities

Duration (min)	Duration (hr)	Log(e) Intensity	Intensity (mm/hr)	Intensity (post climate change) (mm/hr)
10	0.17	5.21	183.20	238.15
15	0.25	5.04	154.04	200.26
30	0.5	4.70	110.49	143.63
60	1	4.34	76.65	99.64
90	1.5	4.12	61.31	79.70
120	2	3.96	52.21	67.87
180	3	3.73	41.57	54.04
270	4.5	3.50	33.08	43.01
360	6	3.34	28.14	36.58
540	9	3.11	22.40	29.12



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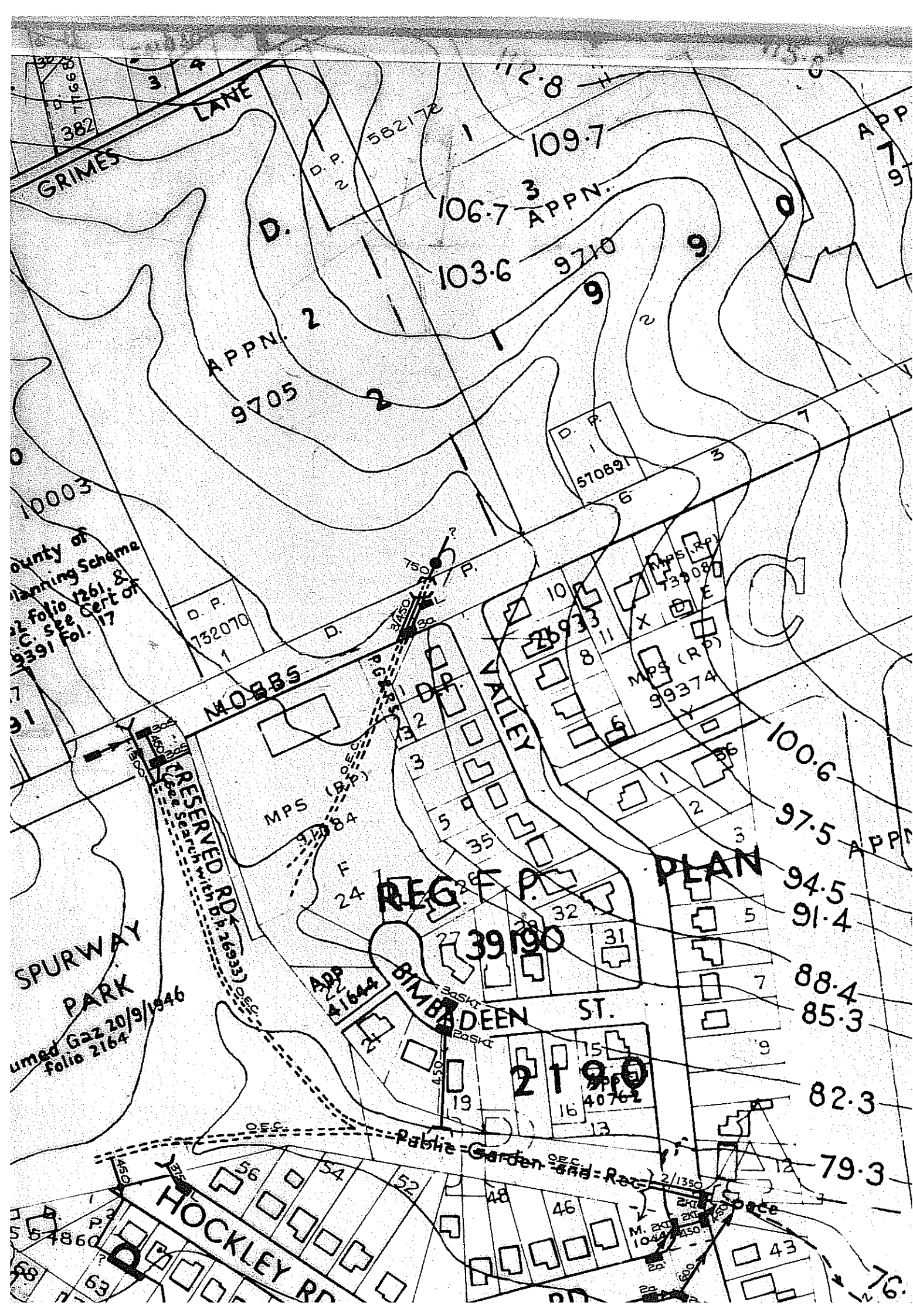
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SYDNEY BROADCAST PROPERTY

EPPING PARK - STAGE 1 RESIDENTIAL WORKS PROJECT APPLICATION

STORMWATER MANAGEMENT STRATEGY, SERVICING STRATEGY & CIVIL WORKS REPORT

Appendix 6 - Drainage Infrastructure Nearby 61 Mobbs Lane Epping – Provided by Parramatta City Council





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EPPING PARK - STAGE 1 RESIDENTIAL WORKS PROJECT APPLICATION

STORMWATER MANAGEMENT STRATEGY, SERVICING STRATEGY & CIVIL WORKS REPORT

Appendix 7 - Sydney Water Pre-Feasibility Study



10 September 2007

Case Number: 108814
V 1

Patterson Britton & Partners Pty Ltd
c/- Qalcheck Pty Ltd

Dear Applicant

FEASIBILITY LETTER

Developer: **Patterson Britton & Partners Pty Ltd**
Development: **Redevelopment of Channel 7 Studios, Mobbs Lane Epping.**

Your attention is drawn to the requirements in this letter that may apply should you proceed to obtain development consent and then are required to apply to Sydney Water for a Section 73 Subdivider/ Developer Compliance Certificate (the Certificate) for your proposed development.

Because of the tentative nature of this application, after you receive that consent, you would need to make **a fresh application to Sydney Water for that Certificate by engaging your current or another authorised Water Servicing Coordinator (the Coordinator).**

The advice provided in this letter is valid for today's date only.

Since you have not yet obtained development consent, this letter contains Sydney Water's anticipated requirements. It is not an approval to execute any work.

You must engage your current or another authorised Coordinator to manage the design and construction of the sewer works that you must provide, at your cost, to service your development.

For a list of authorised Coordinators, see www.sydneywater.com.au and refer to *e-Developer* under *Your Business*, or call **13 20 92**. Coordinators may provide you with **a quote or advice regarding costs for their and other supplier's services/ works as well as** other Sydney Water costs.

The Coordinator generally will be the single point of contact between you and Sydney Water and can answer any questions in the first instance you may have on Sydney Water's developer process and developer charges.

SUMMARY OF REQUIREMENTS TO OBTAIN A CERTIFICATE:

You must:

- 1. Engage a Coordinator prior to signing an Agreement.**
- 2. Sign both copies of the Agreement and lodge with the Coordinator.**
- 3. Consequent to signing the Agreement, build Sewer works at your cost, pay associated charges and note advice on existing service availability.**
- 4. Pay a total of \$11,307 in charges identified in Section 4.**

DETAILED REQUIREMENTS

1. Water Servicing Coordinator.

You must engage an authorised Coordinator to manage the design and construction of works that you must provide, at your cost, to service your development.

2. Major Works Agreement.

After you engage a Coordinator, you will need to sign and lodge **both copies** of the enclosed Major Works Agreement with your nominated Coordinator. The agreement identifies the responsibilities of Sydney Water, the Coordinator and you (the Developer) for your development's water/sewer construction. After execution by Sydney Water, one copy will be returned to your authorised Coordinator.

Note: The authorisation of the Coordinator must be current at all times throughout the project.

3. Water and Sewer works.

Further investigation into specific requirements may occur if Parramatta Council approves rezoning of the site.

Water:

The proposed development of 650 dwellings would be adequately served by the 375mm CICL watermain in Mobbs Lane.

Assessment of any firefighting capability of Sydney Water main is not part of the Section 73 Certificate system capability assessment which is for predicted normal domestic supply only. Firefighting capability assessment is the responsibility of the applicant. Sydney Water can assist only by indicating modelled pressures at flows nominated by the applicant (provided that such flows do not exceed water supply capability) on a standard pressure enquiry form submitted with the scheduled fee.

It is expected that demand management initiatives would be undertaken that are in line with Planning NSW BASIX directives.

Sewer:

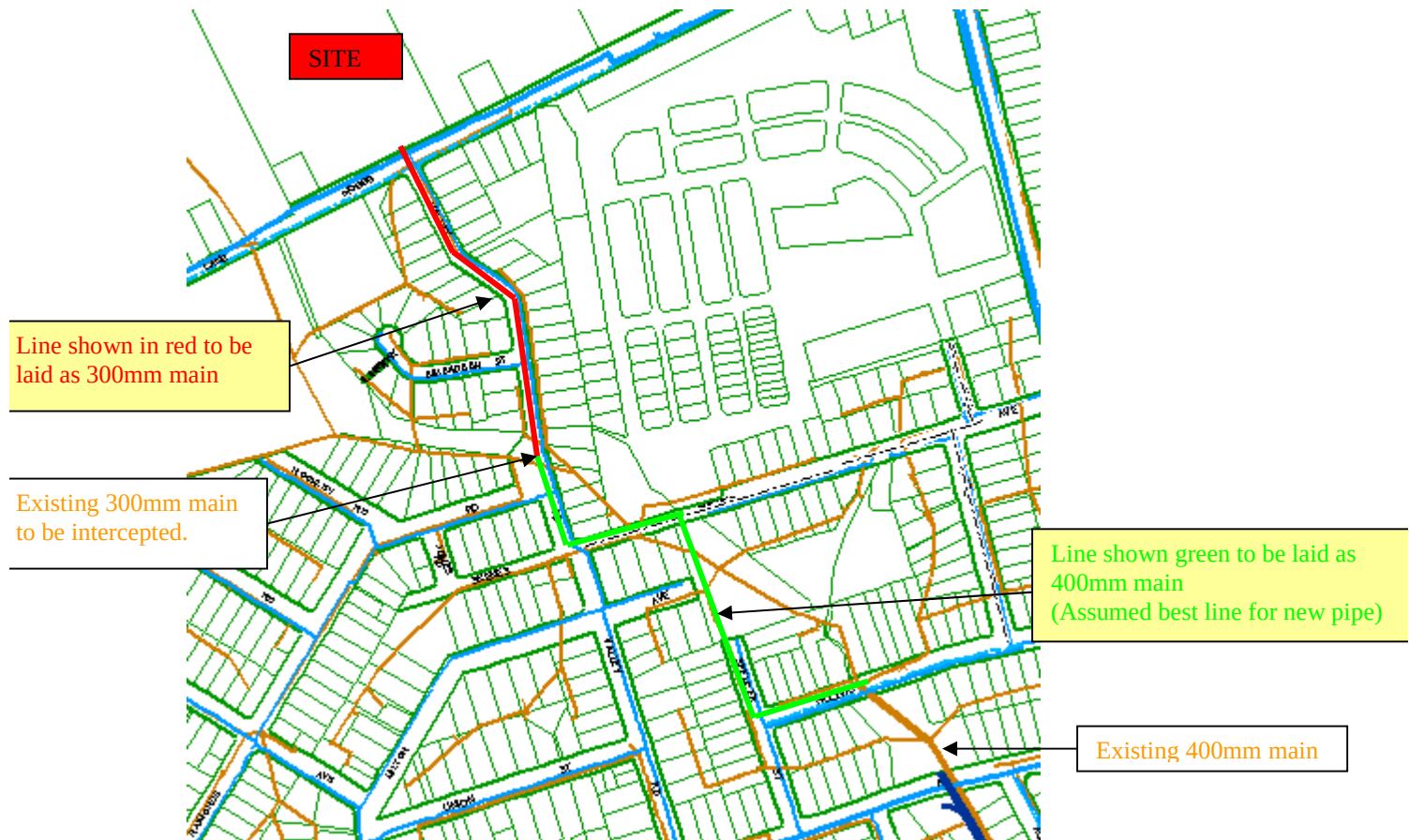
The development is located within the West Lane Cove catchment. **Analysis of the catchment sewers indicates that there would still be insufficient capacity for the planned 650 lot development.** (When compared with the previous application for 900 dwellings. – CN 62912) The original design of the sewers would have allocated a small nominal demand for the 11 ha site.

The effect of the development if connected to the nearest sewer would result in Sydney Water Corporation breaching its Operating Licence.

Accordingly, the requirements would be:

- **The proposed 650 dwelling development will be required to connect to a new 400mm/300mm sewer main amplification as per the attached figure.**
- The downstream end of the new 400mm main will intersect the existing 400mm sewer in Holway Street. The upstream end of the new 400mm main will intersect the existing 300mm sewer in Valley Road. Flow in the existing 300mm sewer west of Valley Road will be diverted into the new 400mm main.

- A new 300mm sewer will be required from the new access chamber in Valley Road, up Valley Road to the proposed development in Mobbs Lane.
- Where possible, dwellings in the new subdivision must connect to this 300mm amplification.



At the Developer's own risk the Works may be carried out prior to the granting of Development Consent. In such cases you will be responsible for any adjustments to Sydney Water assets and the associated costs thereof necessitated by variation to the Consent.

*Note: If construction must take place on neighbouring properties, written consent on Sydney Water's **Permission to Enter** form must be obtained from the relevant property owners. Your Coordinator has copies of the form (also available on the Internet at the address as above) and can negotiate on your behalf.*

In providing these works to Sydney Water you will need to pay project management, survey, design and construction costs **directly to your suppliers**. These costs may include Sydney Water charges for:

- Water main shutdown and disinfection
- Connection of new mains to Sydney Water system(s)
- Design and construction audit fees
- **Contract administration on project finalisation**
- Creation or modification of Sydney Water interests in land (eg. easements)
- Further application fees for staged developments.

Your Coordinator can advise you about these costs and how these costs may be quoted.

4. Developer charges.

Development Servicing Plan (DSP)	Basis of Calculation	Charge (\$) for Applicable period (10/09/07-10/09/07)	Charge (\$) for Applicable Period - (*CPI adjusted)
Mobbs Hill Water DSP Area	Residential Development Density 66-81 dwellings per ha band; 650 dwellings @ \$25 = \$16,250 Less Credit of \$4,943 for previous payment/ use	\$11,307	
Lane Cove Sewer DSP Area	Residential No charges apply to this zone at present.	\$Nil	
Reticulation Recovery	Nil	\$Nil	
DEVELOPER CHARGES TOTAL: <i>[OFFICE USE- Invoice Charges total - Developer \$11,307]</i>		\$11,307	

Notes:

- If you do not pay the charges identified in column 3 of the above table by 30 June, the total will be adjusted for inflation (based on the weighted average of the capital cities CPI for the 12 months to the end of the previous March) from 1 July for the balance of the 12-month period. The charge from 1 July is shown in column 4 when the inflation figure is known.
- **DSP charges** are a contribution towards the cost of systems (eg treatment plants), which serve your development. They have been calculated using base developer charges that cannot be changed or waived by Sydney Water having been established in Plan(s), available on request, and registered with the Independent Pricing and Regulatory Tribunal (IPART) under its relevant Determination. For further details, and a copy of the IPART Act 1992 including section 31 that refers to arbitration rights, see the IPART web site **www.IPART.nsw.gov.au**. Costs of arbitration, if appropriate, are borne equally by you and Sydney Water irrespective of outcome.
- These charges are directly payable to Sydney Water. CASH or BANK CHEQUE payments ONLY at any Sydney Water Customer Service Centre.
- **You must pay any DSP charge before you will be given permission to connect your development to Sydney Water's water/sewer systems.**
- **Reticulation Recovery Charges** recover part of the cost of works that have been provided by Sydney Water or other developers that benefit your development. This charge has been calculated before your detailed designs are completed. If later design investigation shows your development will be connected to other main/s, the Reticulation Recovery charge may be varied and/or you may need to construct other works.

Stamping and approval of your engineering and building plans.

You are reminded that all building plans must be stamped and approved at:

- a Quick Check agency (for an agency list see www.sydneywater.com.au, refer to *Your Business* then see *Building & Renovating* under the heading *Building & Developing* or call 13 20 92); or
- a Sydney Water Customer Service Centre.

Approval is required as construction/building works (eg earthworks, roadworks, drainage, landscaping, excavation, foundation works) may impact on existing Sydney Water assets (eg water and sewer mains). Approval of the plans may take up to 21 days and the results may affect these activities.

Note: If any work on our assets is carried out without that approval, then Sydney Water will take action to have work on the site cease and apply the provisions of Section 44 of the Sydney Water Act 1994.

POSSIBLE FUTURE COSTS

Requirements in this Notice relate to your Certificate application and may not cover all aspects of Sydney Water's involvement with your development. During design and construction of your development other Sydney Water fees/requirements may be necessary, including:

- construction/building plan stamping fees including fees to ensure the protection of Sydney Water assets
- plumbing and drainage inspection costs for private service lines (including property service connection and inspection fees)
- install backflow prevention devices for certain commercial/industrial connections
- trade waste requirements when constructing a building
- council fire fighting requirements (if not catered for by your current Sydney Water main). You should investigate fire fighting facility requirements for your development as soon as possible, including a standard pressure inquiry to Sydney Water if needed.

END OF NOTICE