Integrated Water Management Plan

Redevelopment of Channel 9 Site, Willoughby

NA50613013

Prepared for
Nine Network Australia Pty Ltd

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Executive Summary

Integrated Water Management (IWM) aims to manage water use and runoff to maximise benefits to the community and environment through sustainable water, wastewater and stormwater systems. In an urban context, IWM systems can be delivered in local applications through to larger regional applications. Depending on the scale of an individual development, opportunities arise for IWM measures to be incorporated with the overall development concept.

This report provides a recommendation on the nature of an IWM system which would be appropriate for the Channel 9 redevelopment, based on an assessment of:

> Stormwater Infrastructure, including:
  - Existing Catchments;
  - Stormwater Service Connection and Existing Capacity;
  - Overland Flows and Flooding; and
  - Proposed stormwater infrastructure.
> Water Sensitive Urban Design; including:
  - Reductions Potable water demand;
  - Rainwater harvesting for non-potable water supply;
  - Reductions in wastewater generation; and
  - Stormwater quality treatment.

The review also includes an analysis of economic viability of components of the IWM system, and recommendations have been formed with economic constraints in mind. This report found the Integrated Water Management initiatives for the Channel 9 development could consist of:

> Management measures to reduce potable water demand and waste water generation through water saving devices and fixtures included with the development.

> Management and re-use of stormwater through rainwater harvesting from roof areas for use in toilet flush and irrigation to landscaped areas. This in turn provides a reduction in potable water demand for the development and reduces stormwater discharge from the site.

> Stormwater Quality Treatment and On-Site Detention systems to manage stormwater discharge from site in line with Water Sensitive Urban Design requirements.

A Concept Plan indicating the Integrated Water Management initiatives recommended for the proposed development is included as Appendix C. The identified opportunities for an IWM System are discussed in subsequent sections of this report.

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1 Introduction

1.1 Background

Cardno has been engaged by the Nine Network Australia to prepare an Integrated Water Management Plan in support of a Part 3A Major Project application for development of land at 6-30 Artarmon Road, Willoughby (the site). The site has a total area of approximately 2.9 hectares and is bound by Artarmon Road, Richmond Avenue and Scott Street. The southern boundary of the site is shared with the TXA Transmission Tower, a Council reserve and a number of residential properties which front Walter Street. The site comprises a number of individual lot titles, which we understand to be Lot 1 in DP820327, Lot 1 in DP748215, Lot 13 in DP6849 and Lot 1 in DP327266.

The proposed development is for a mixed-use residential and retail development comprising of multiple buildings, ranging in height from two to fifteen storeys. The proposed development includes:

> Up to 60,000m^2 of floor area for residential and up to 600m^2 for retail;

> Development yield of up 600 dwellings;

> Car parking for residents and visitors; and

> Communal and public open space across approximately half the site.

As required by the Director General's requirements, this report investigates stormwater infrastructure characteristics, including opportunities for Integrated Water Management (IWM) and Water Sensitive Urban Design (WSUD) initiatives which could be implemented as part of the development.

1.2 Information Sources and Limitations

Our findings have therefore been based on the following:

> Review of "Dial Before You Dig" information, requested by Underground Services Search Pty Ltd, which include0 information supplied by Willoughby Council, dated 24 October 2012;

> Review of Sydney Water data available in Hydra;

> Review of Willoughby City Council Engineering Standards and Development Control Plans;

> Site inspection on 9 November 2012; and

> Correspondence with Scott Soutar - Station Manager Channel 9.

This report aims to faithfully convey the outcomes of investigations, meetings and discussions in order to accurately and adequately define infrastructure requirements for the site based on a desktop analysis.

The report has been prepared in the context of the proposed development and offers a balanced approach to address competing demands to represent a sustainable development outcome for the site.

1.3 Site Context

The subject site, shown in Figure 1-1 below is located on Artarmon Road Willoughby. The site is bound by Artarmon Road, Richmond Avenue and Scott Street. The southern boundary of the site is shared with the TXA Willoughby Site, a Council reserve and a number of residential properties which front Walter Street.

Figure 1-1 Site Context Plan (Imagery by Nearmap)

The site contains a number of existing buildings and infrastructure required for the Channel 9 operations, including;

> Office buildings;

> Television studios;

> Workshops and storage areas;

> Parking and hardstand facilities;

> Helicopter landing area;

> Telecommunications and broadcast facilities; and

> An electrical substation.

1.4 Existing Stormwater Catchment

A number of existing stormwater assets have been identified surrounding the site. Cardno have prepared an Existing Catchment Plan included with Appendix B, which indicates the approximate catchment areas, based on existing site topography and includes the location of known stormwater assets.

1.5 Proposed Development

The proposed development is for a mixed-use residential and retail development comprising of multiple buildings. This report is based on Concept Option 2C prepared by SJB Australia shown in Figure 1-2, which includes:

> Six building of various floor size;

> Approximately 60,000m^2 of total floor area;

> Town-house style development along Richmond Avenue;

> Development yield of approximately 600 dwellings;

> Car parking for residents and visitors; and

> Communal and public open space across approximately half the site.

Figure 1-2 Concept Development Plan (SJB Architects)

1.6 Assumptions and Clarifications

A plan indicating the current arrangements of the site is included with Appendix A. At the time of preparing this report it was unknown whether the site would be vacated by Channel 9 prior to development works or whether operations would continue in conjunction with the development. For planning purposes, this report has been prepared on the assumption the development will proceed in a single stage encompassing the whole site. Should the development proceed in multiple stages and should Channel 9 operations continue on the site, it is our opinion that sufficient water management arrangements can be incorporated with the development. Such arrangements can be further developed as part of the detailed design phase.

It is understood the existing TXA transmission tower to the south of the site is currently serviced via assets from within the Channel 9 site under a legacy agreement between TXA and the Nine Network. Correspondence received from the Station Manager confirms construction of a new TXA service building within the tower site will remove the need for existing connections within the Channel 9 site. These works are scheduled for completion in 2013; therefore, this report is formed on the basis the proposed development will not impact on any TXA assets.

2 Stormwater Infrastructure

2.1 Existing Catchments

The site is located near the top of the hill on Artarmon Road and is defined by four distinct catchment areas, as indicated on the Existing Catchment Plan in Appendix B. Our analysis determined no external catchments affect the site. The internal catchments are summarised as follows:

Table 2-1 Catchment Extents

Catchment Name	Catchment Extents	Catchment Size	Catchment Discharge Details
Catchment A	Western and central southern portion of site	1.34Ha	South towards council reserve and towards Walter Street via overland flow, ultimately to Flat Rock Creek.
Catchment B	Northern and Eastern extent of site	0.89Ha	Catchment is currently collected by internal drainage infrastructure which appears to discharge east within site (to Scott Street)
.Catchment C	South Eastern corner of site including South Scott St	0.55Ha	South into kerb inlet pit towards drainage easement towards Walter Street
Catchment D	Northern most portion of Scott St	0.21Ha	North into kerb inlet pit and lintel, draining to the east on Artarmon Rd

As noted above, the site is broadly defined by four internal catchments and three discharge locations from the site. Piped drainage and overland flow combine to provide conveyance capacity, however, the exact capacity of the piped drainage network within and external to the site is not known.

Existing stormwater drainage network within Scott Street lies within the proposed development footprint and therefore it is understood this infrastructure will be demolished and removed as part of the early site works.

2.2 Service Connection and Existing Capacity

It is intended the development's stormwater discharge locations will generally tie into the existing downstream stormwater infrastructure, in order to avoid costly infrastructure upgrades external to the site. The development will be required to limit discharge from the site, via On-site Detention (OSD), to ensure the existing drainage system performance is not reduced. At the time of preparing this report, it is not known whether the existing system is performing adequately or undersized for current conditions.

Willoughby City Council's Technical Guide for OSD indicates the use of On-site Detention (OSD) is required at a rate of 380 cubic metres per hectare of site, based on the 2.99Ha development area within Zone 3 as indicated in Council's Technical Guide for OSD. For the purposes of planning, an allowance should be made for minimum of approximately 1,100m^3 OSD capacity to service the development.

Willoughby City Council's technical guide permits reductions in part of the OSD storage capacity requirement for multiunit, commercial, retail and industrial developments which utilise rainwater harvesting facilities. The reduction would be determined by Council and would be based on a detailed assessment of stormwater discharge from the development. For example, the total roof area for the development is understood to be over 9,000m^2. This roof catchment area is likely to be connected to a stormwater harvest system. This harvesting system could therefore contribute to a reduction in the overall requirement for On Site Detention.

2.3 Overland Flows and Flooding

Based on the site's location on the plateau of Artarmon Road and the lack of external catchments contributing to overland flow on the site, it is understood this site is not affected by regional flooding.

The change in site use from commercial to residential will bring with it a net increase in pervious areas, as a result of the increase in landscaped and open space areas being created by the development. It is therefore likely the development may lead to a reduction in overland flows discharging from the site.

Furthermore, the proposed stormwater infrastructure for the site will seek to capture most stormwater runoff and convey through a pipe network to an appropriately sized on site detention system.

Hydraulic modelling and assessment of overland flows as a result of the development will be required to demonstrate the discharge from the development meets Council's requirements. It is understood this detailed assessment will be required as part of the detailed design process and therefore falls outside the scope of this report.

Council may request pre-development conditions to be reviewed as part of the detailed design process. This would therefore require the site to be analysed as if it was a 'greenfields' site. We note the site's current use involves a high proportion of impervious area which currently discharges to existing stormwater infrastructure. Therefore, opportunities may exist to demonstrate the proposed development can achieve better outcomes than current conditions. We therefore recommend opportunities to reduce OSD requirements are explored through the detailed design phase. It is understood reductions in OSD requirements would be determined on the basis of the existing downstream conditions and performance.

2.4 Proposed Stormwater Infrastructure

The concept stormwater drainage infrastructure layout for the development is provided with Appendix C. As indicated on the concept plan, stormwater from internal roads is anticipated to be collected and discharged to an existing overland flow path in the Council Reserve, which ultimately discharges to Flat Rock Creek.

The proposed stormwater infrastructure layout has been broadly split in to three systems, representing the different catchments which are likely to be encountered as a result of the development.

> North West Catchment:
  - Stormwater pits and pipework;
  - Low flow diversion pit;
  - Gross Pollutant Trap, and
  - Underground On Site Detention Tank.

> South and Central Catchment:
  - Stormwater pits and pipework;
  - Low flow diversion pit;
  - Gross Pollutant Trap;
  - Underground water quality treatment system; and
  - Underground on Site Detention Tank.

> Roof Catchment:
  - Guttering and downpipes;
  - Rainwater pipe network and associated pits;
  - Underground Storage Tank; and
  - Non-potable water supply system (pump and plumbing network).

Hydraulic modelling and analysis will be required as part of the detailed design process to sufficiently size and design the above-mentioned infrastructure. This will occur through the concept design stage and has not been undertaken as part of this report.

The proposed roof areas as indicated on the SJB Concept Plan represent approximately 9,000m2. This figure has been adopted for the purposes of preliminary sizing of the rainwater harvesting tank.

3 Water Sensitive Urban Design

3.1 Principles of Water Sensitive Urban Design

Water Sensitive Urban Design (WSUD) aims to provide environmentally sustainable water resource management for new developments, particularly urban developments. There are a number of key opportunities for WSUD as part of the Channel 9 development, with the four most critical being:

> Reducing potable water demand;

> Rainwater harvesting for non-potable water supply;

> Reductions in wastewater generation; and

> Treatment of stormwater prior to discharge into receiving waters.

These opportunities for WSUD are discussed in further detail in the following.

3.1.1 Reductions in Potable Water Demand

It is understood the proposed development will utilise Environmentally Sustainable Design (ESD) initiatives which will aim to reduce potable water demand through a Integrated Water Management (IWM) approach. The principles of IWM are to reduce both water demand and water discharge created by the development; therefore, a IWM approach will seek to reduce potable water demand to the development as well as reducing stormwater discharge and waste water discharge from the development, therefore aiming for an overall water balance.

In line with the IWM approach, the development has been assessed on the basis of a 5 STAR water demand rating as measured by the Green Star Building Council of Australia (GBCA). To achieve a 5 STAR rating, the following initiatives are required:

> Water smart fittings and fixtures utilised to achieve the minimum 2 points; and

> Non-potable water collection and re-use system to provide a maximum of 3 points.

Under the GBCA model, a maximum of 3 points maybe awarded for the collection and re-use of non-potable water within the development: 3 Points awarded where 100% of water demand for toilets clothes washer, laundry etc. is met; 2 points where 75% is met and 1 point where 50% of supply is met.

Table 3-1 below demonstrates the total potable water demand using the GBCA model to predict total potable water demand for the development:

Table 3-1 Water Demand (Using GBCA Model)

Fixture or Fitting	Water Demand	Assumed Usage	Potable Water Demand per dwelling (L/day)	Non-Potable Water Demand per dwelling (L/day)	Total Water Demand (L/day)	Total Non-Potable Water Demand (L/day)
Toilets	4 star - (2.5L/flush)	4 uses/person/day	30	30	18,000	18,000
Wash basins	6 star - (4.5L/min)	1.05 min/pers/day	14		8,505	
Kitchen taps	6 star - (4.5L/min)	2 min/pers/day	27		16,200	
Showers	3 star - (7.5L/min)	8 mins/pers/day	180	72	108,000	43,200
Clothes washers	3.5 stars (12L/Kg of wash)	2 washes/pers/week	11	11	6600	6600
Dish	3.5 stars -	1 wash /day/unit	16	16	9,600	9,600

Fixture or Fitting	Water Demand	Assumed Usage	Potable Water Demand per dwelling (L/day)	Non-Potable Water Demand per dwelling (L/day)	Total Water Demand (L/day)	Total Non-Potable Water Demand (L/day)
Washer	16L/wash					
Irrigation		Based on Water budget	27	27	27	27
TOTAL			**305**	**217**	**166,932**	**77,427**

It should be noted the figures noted above represents the maximum expected demand and is based on the premise of 3 occupants per unit of the 600 unit development in total. Under this scenario, a total of 166kL of water would be needed per day.

The amount of potable water required would be reduced where non-potable water supply is met, in this model, a total of 77.4kL of non-potable water would be required, and would leave a net balance of 89.5kL to be sourced from the Potable Water supply each day.

3.1.2 Rainwater Harvesting for Non-Potable Water Supply

As discussed above, the total non-potable water demand equates to 77.4kL per day, which equates to 28.25ML per year. A typical and cost effective stormwater harvesting scenario for residential developments is to capture roof runoff only.

The Bureau of Meteorology rainfall data for the area shows the mean annual rainfall for the site is approximately 1,202mm. Based on this mean annual rainfall and an estimated roof catchment area of 9,000m^2 (based on concept Option 2c supplied by JBA), and a rain collection factor of 0.8, the annual supply of rain water is estimated to be 8.6ML per year. This represents a deficit of approximately 19.65ML per year in non-potable water supply to the development (or 53kL/day).

For the purposes of comparison, an analysis of the stormwater harvesting from the entire site area (2.9Ha), was undertaken. This analysis indicates the development could meet the required 75% supply target to achieve a 2 star rating. This would yield a rainwater harvest of 27.9ML per year, leaving a deficit of 0.36ML annually (or on average approximately 1 kL/day). However, extending the stormwater harvest catchment to include the whole site will require a significant increase in the water quality treatment measures to allow the harvested stormwater to be used for non-potable water supply to the development. Preliminary calculations to size a harvest tank required to capture stormwater from the entirety of the site would be of the order of 2,000m^3 (i.e. 2ML) in order to achieve an 80% operation efficiency (i.e., non-potable water could be sourced from the tank for 80% of the year). A tank of this magnitude is considered excessive for the scale of this development, representing approximately the size of an Olympic swimming pool.

For the scale of this development, and in order to achieve the objectives of IWM, a rainwater harvest system should be designed in consideration of the available roof catchment as this represents an efficient and cost effective system, appropriate for the scale of the proposed development. A schematic of a rainwater harvest system is demonstrated in Figure 3-1 below.

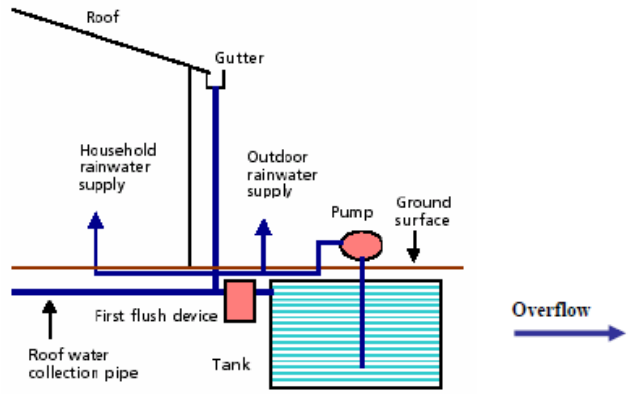

Figure 3-1 Stormwater Harvest Schematic

Based on the above analysis, it is our recommendation that a stormwater harvest system which captures roof water runoff only is provided as part of the development, with the view to reduce potable water demand for the site. A rainwater harvest tank of 200m^3 (i.e. 0.2ML) would be adequate to supply 22.5kL of non-potable water per day to the development and would be operational for 75% of the year. Potable water backup to the system would therefore be required for approximately 90 days per year. The graph shown in Figure 3-1 below indicates the cumulative stored volume of the tank over a two year period.

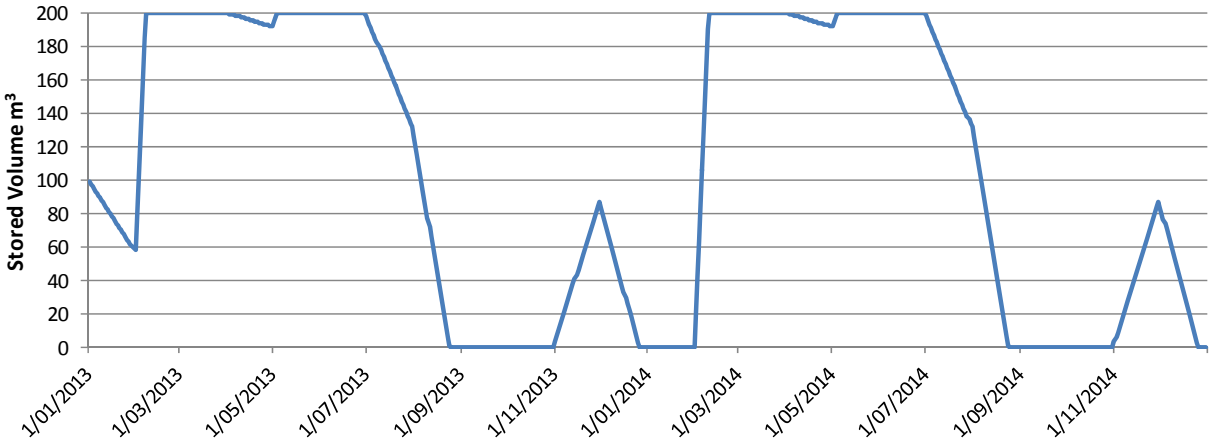

Figure 3-1 Stored non-potable water volume from roof water harvest

3.1.3 Reductions in Waste Water Generation

Sydney Water methods for calculation of sewage discharge are based on the waste water generation observed in existing multi storey residential buildings. Initiatives included with new Green Star rated developments, including water efficient fixtures and fittings, have typically lead to an overall reduction in waste water generation for new developments. This therefore suggests Sydney Water's rates generally over-estimate the actual waste water generation of new multi-storey residential developments. A detailed assessment of waste water generation at the detailed design stage may indicate that discharge from the site can be reduced to such an extent that sewer lead in works may not be required.

As part of this investigation, an analysis of opportunities for sewer mining and grey water use was undertaken as part of the IWM review. An on-site sewer treatment facility could have a two-fold effect on the IWM initiatives, being a direct reduction in waste water discharge from the site and a reduction in potable water use, through a grey water (non-potable) water supply system.

As discussed in section 3.1.2 above, the predicted shortfall in the rainwater harvest system could be alleviated by a waste water treatment system which supplies grey water to the development. To achieve 3 Stars under the GBCA, 100% of the non-potable water requirements must be available. Based on the calculations in Table 3-1, this equates to approximately 77kL per day (or 28ML per year).

Section 3.1.2 demonstrates above that collection of rainwater alone will not be sufficient, and leaves a deficit of 19.68ML annually. This deficit could be reduced further by collecting stormwater from the entire catchment area, and balanced entirely through sewer mining.

A detailed cost benefit assessment will be required to confirm the feasibility of incorporating a sewer mining and waste water treatment facility for the development. A Life Cycle Costing considers the total costs over the operational life span of a recycled water treatment system. The key components to a life cycle costing evaluation are:

> Capital expenditure;

> Ongoing maintenance and labour costs;

> Replacement costs and timing for significant expenditure;

> Life span; and

> Decommissioning costs.

For the purpose of this report, an order of magnitude estimate was prepared to predict the cost for treating sewerage by means of a small scale treatment plant. A rule of thumb estimate of $75,000 for every ML of treated water required. For 19.7ML the capital would be, simplistically, $1.47Million. This equates to a treatment cost of approximately $5 per kL, assuming 20 year maintenance free life of the plant, and fixed interest rate of 3% annually. This cost is substantially higher than the cost of water supply from Sydney Water, which is currently at $2.103/kL.

For the scale of this development, it is not considered economically viable to warrant the construction of a waste water treatment facility for the purposes of reductions in potable water demand and waste water discharge from the site.

3.1.4 Stormwater Quality Treatment

As previously discussed in Section 2.1, the Channel 9 site currently discharges directly into existing drainage infrastructure surrounding the site. Investigations of the site determined that stormwater discharged from the site does not undergo water quality treatment. Therefore, any water quality treatment measures installed as part of the development would represent in an improvement to the existing conditions.

The Stormwater Concept Plan included with Appendix C proposes a number of Stormwater Quality Treatment devices should be included with the development. The inclusion of Stormwater quality improvement devices with the development is proposed to meet the objectives of an IWM approach, as outlined in the Director General's requirements.

The general objectives of water quality treatment measures are to remove pollutants from stormwater being discharged from the site, including:

> Gross pollutants: trash, litter and vegetation larger than five millimetres;

> Coarse sediment: particles between 5 and 0.5 millimetres;

> Medium sediment: particles between 0.5 and 0.062 millimetres;

> Fine sediments: particles smaller than 0.062 millimetres;

> Attached pollutants: those that are attached to fine sediments - specifically, nutrients, heavy metals, toxicants and hydrocarbons; and/or

> Dissolved pollutants: typically nutrients, metals and salts.

The stormwater quality targets are typically established in consultation with the Local Government Authority, and other authorities responsible for the management of local catchments. In the instance of the Channel 9 site, it is understood Willoughby City Council will be the body responsible for establishing the water quality targets for the development.

To achieve stormwater quality treatment targets in urban developments, a combination of primary, secondary and tertiary devices is typically used.

Primary treatment is typically achieved through use of a Gross Pollutant Trap (GPT) which physically filters the stormwater for the removal of gross pollutants and coarse sediment.

Secondary Treatment aims to remove fine sediment and attached pollutants, typically through the use of Swales, Infiltration Trenches, Porous Paving, Bio-Retention Systems, and Rain Gardens.

Tertiary Treatment aims to remove nutrients and heavy metal contaminants through filtration and biological uptake, typically through use of bio-retention systems wetlands or engineered in-grounds solutions.

The Channel 9 development site's limited open space area and the constraints of existing downstream drainage infrastructure restricts the ability to locate a bio-retention basin, swale or other above ground devices within the development footprint. It is therefore proposed that an underground stormwater quality treatment system is implemented, where stormwater is treated by a GPT then by an underground tertiary water quality filtration system such as a Humes Jellyfish (R) underground water quality treatment system.

Water quality modelling, such as MUSIC modelling to appropriately size GPTs and water quality treatment devices would be undertaken as part of the detailed design process, in consultation with Willoughby City Council. Such analysis and modelling falls outside the scope of this report.

4 Conclusion

This report has been prepared to describe the Integrated Water Management Plan for the proposed development of the Channel 9 site in Willoughby, to accompany the Part 3A Major Project Application. The strategy developed as part of this report indicates opportunities for Integrated Water Management, which aims to:

> Reduce potable water demand;

> Reduce wastewater discharge;

> Reduce stormwater discharge;

> Improve stormwater quality prior to discharge from site;

This report recommends a typical water supply and sewerage service system, with rainwater harvesting, as the most appropriate Integrated Water Management system for this development. Our review concludes:

> Water efficient fixtures and fittings should be used throughout the development in order to maximise the potential for reductions in potable water use.

> For the scale of this development, it is not considered economically viable to warrant the construction of a waste water treatment facility for the purposes of reductions in potable water demand and waste water discharge from the site. However, this report demonstrates that wastewater generation can be reduced through water smart fixtures and fittings installed as part of the development.

> Reductions in potable water demand could be achieved through a rainwater harvest system, designed in consideration of the available roof catchment. This system can in turn reduce the stormwater discharge from the development. It was not considered economically viable to extend the stormwater harvest system to include the entire site area, given the difficult topography and the vast tank size required for such a system.

> On Site Detention and on site water quality treatment devices should be incorporated within the stormwater system to effectively manage stormwater discharge from the development, in line with Water Sensitive Urban Design requirements.

A Concept Plan indicating the Integrated Water Management initiatives recommended for the proposed development is included as Appendix C.

Redevelopment of Channel 9 Site,
Willoughby

APPENDIX A
EXISTING SITE PLAN

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Rev	Date	Description	Drawn	Appr.
04	25.01.13	ISSUED FOR INTEGRATED WATER MANAGEMENT REPORT	DB	CW
03	30.11.12	ISSUED FOR REVIEW	DB	CW
02	30.11.12	ISSUED FOR STORMWATER MANAGEMENT STRATEGY REPORT	AG	CW
01	23.11.12	ISSUE FOR REVIEW	AG	DC

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		Date
Drawn	AG	NOV'12
Checked	CW	NOV'12
Designed	AG	NOV'12
Verified	DC	NOV'12
Approved	DC	NOV'12

Client: NINE NETWORK AUSTRALIA PTY LTD

CHANNEL 9 SITE REDEVELOPMENT

EXISTING SITE PLAN
INDICATIVE FOR PLANNING ONLY

Status: ISSUED FOR NA50613013-R-002

Date	Datum	Scale	Size
NOV'12	AHD	1:500	A1

Drawing Number: NA50613013-SK001
Revision: 04

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Redevelopment of Channel 9 Site,
Willoughby

APPENDIX B
EXISTING CATCHMENT PLAN

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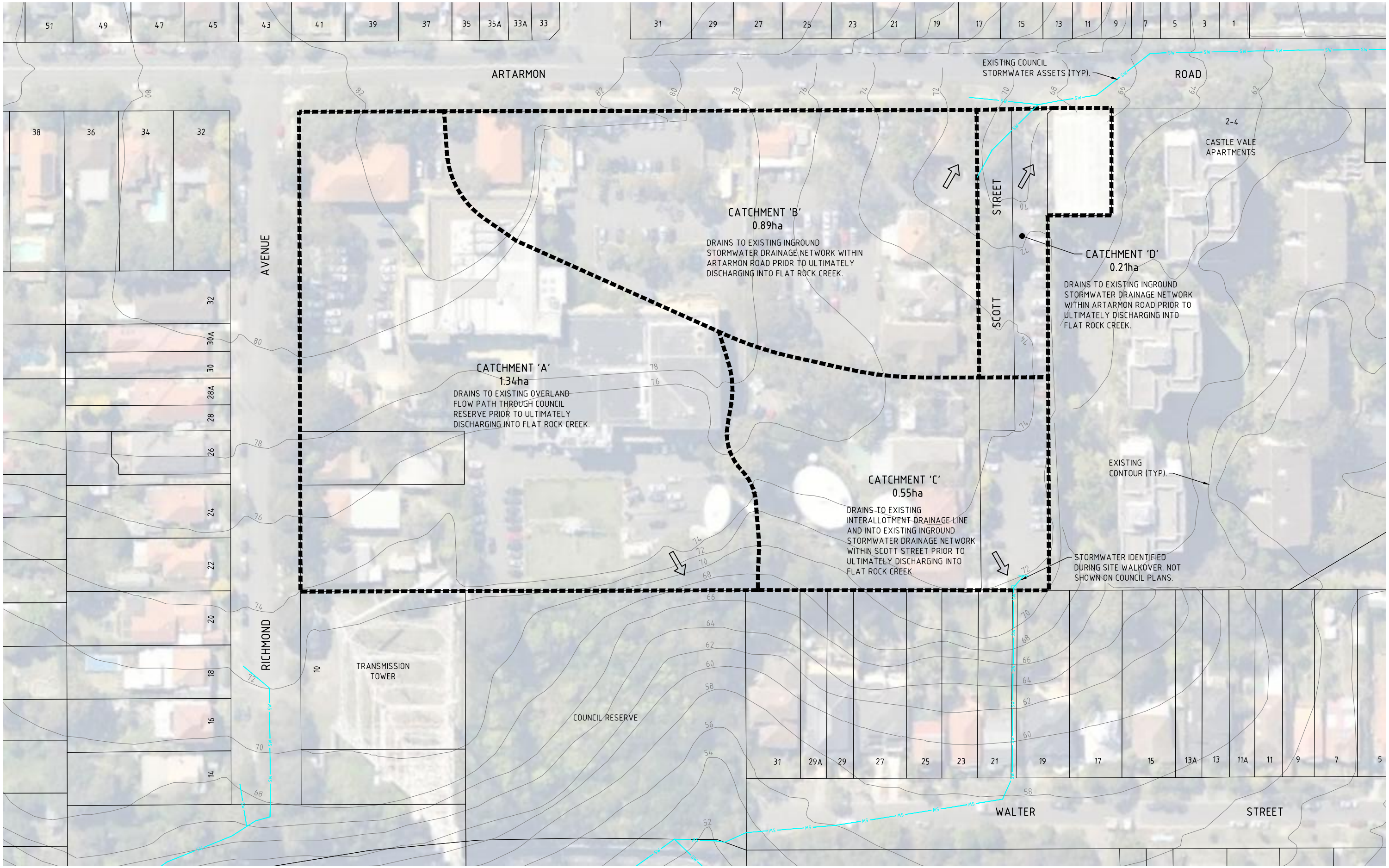

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03	30.11.12	ISSUED FOR REVIEW	DB	CW
02	28.11.12	REVISED CATCHMENT D	DB	CW
01	23.11.12	ISSUE FOR REVIEW	AG	DC

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Approved	DC	Date NOV'12

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CHANNEL 9 SITE REDEVELOPMENT

EXISTING CATCHMENT PLAN
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Status			
ISSUED FOR NA50613013-R-002			
Date	Datum	Scale	Size
NOV'12	AHD	1:500	A1
Drawing Number			Revision
NA50613013-SK002			04

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Redevelopment of Channel 9 Site,
Willoughby

APPENDIX C
CONCEPT INTEGRATED WATER MANAGEMENT PLAN

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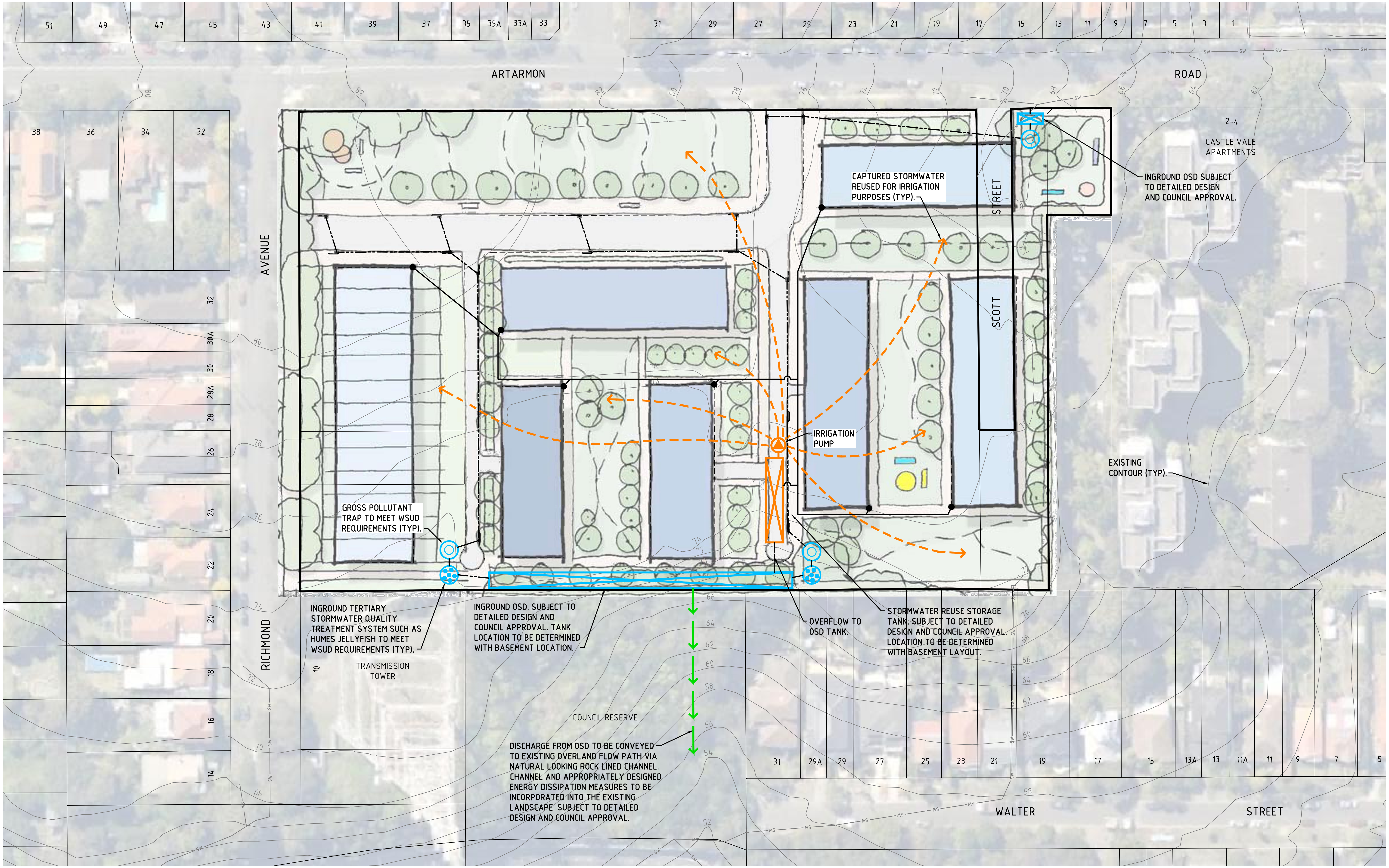

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04	25.01.13	ISSUED FOR INTEGRATED WATER MANAGEMANT REPORT	DB	CW
03	30.11.12	ISSUED FOR REVIEW	DB	CW
02	28.11.12	REVISED ARCHITECTURAL LAYOUT	DB	CW
01	23.11.12	ISSUE FOR REVIEW	AG	DC

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Checked	CW	NOV'12
Designed	AG	NOV'12
Verified	DC	NOV'12
Approved	DC	NOV'12

Client: NINE NETWORK AUSTRALIA PTY LTD

CHANNEL 9 SITE REDEVELOPMENT

CONCEPT INTEGRATED WATER MANAGEMENT PLAN
INDICATIVE FOR PLANNING ONLY

Status: ISSUED FOR NA50613013-R-002

Date	Datum	Scale	Size
NOV'12	AHD	1:500	A1

Drawing Number: NA50613013-SK004
Revision: 04

0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150mm ON A1 ORIGINAL

DATE PLOTTED: 25 January 2013 12:17 PM BY: DAVID BALL (SYDNEY)

XREF's: X-NA50613013-TITLE_SHEET; X-BHL-A1-Logo; X-CHANNEL 9-EXISTING CONTOURS; X-CHANNEL 9-CADASTRE; X-CHANNEL 9-SITEWORKS; X-CHANNEL 9-EXISTING SERVICES
CAD FILE: \\cardno.corp\global\AU\NSW\DIRECT~1\Projects\506\FY13\NA6045~1\01-CHA~1\011-MA~1\5363E~1\DRA\1E3F7~1\BUI\CDPM~1\Sketches\NA50613013-SK004(04)CONCEPT INTEGRATED WATER MANAGEMENT PLAN.dwg