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Potts Hill SWC Surplus Land

Services, Civil Engineering and Water Management Report

6242.05 – rp6242.05fmc_dk080318 - water civil services sustain v2.doc

26-May-08

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SYNOPSIS

This report was prepared for the lands surplus to Sydney Water Corporation requirements at Potts Hill. It details the civil engineering, water management, servicing and sustainability aspects of the proposed development.

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PROJECT 6242.05 - POTTS HILL SWC SURPLUS LAND

REV	DESCRIPTION	ORIG	REVIEW	WORLEY-PARSONS APPROVAL	DATE	CLIENT APPROVAL	DATE
A	DRAFT	FMC	MST	MST		N/A	
B	First Issue	FMC	MST	MST	1/5/08		
C	Second Issue	FMC	MST	MST	21/5/08		

CONTENTS

1. INTRODUCTION

This report was prepared to present the results of investigations for the proposed development of land at Potts Hill that is surplus to the requirements of Sydney Water Corporation. It is proposed to redevelop areas of the site as follows:

- Around 25 ha adjacent to the western boundary for residential development (including open spaces); and
- Over 15 ha in the south-western quarter of the site for commercial development.

The report covers several aspects of the proposed works including water management, civil engineering, services and sustainability.

The subject site is located on the top of a crest in the suburb of Potts Hill and in the Local Government Area of Bankstown. The site contains existing potable water reservoirs, known as Reservoir 1 and Reservoir 2, ancillary buildings and supply infrastructure, such as pipelines. Currently, Reservoir 2 is used for water supply purposes and is roofed.

The site is bordered by residential development fronting Cooper Road in the west and Brunker Road in the south. In the north, a rail corridor runs in a generally east-west direction and borders part of the site. The site is also bordered in the north by residential development fronting Lewis Street. Rookwood Road generally defines the eastern site boundary, except towards the south, where Potts Park and existing residential development are adjacent to the site.

Birrong Boys and Girls High Schools and Birrong railway station lie in close proximity to the west of the site.

The western portion of site drains toward the northwest, while the eastern portion drains to the east and south east.

It will be necessary for the proposed development at Potts Hill to not preclude the opportunity in the future of being able to readily adopt more sustainable management actions which at present are not approved. It may be appropriate, in some instances, to include the infrastructure which in the future could be used as a more sustainable outcome but which could not be readily retrofitted at some future time. All those issues need to be considered in the selection of the most appropriate option for Potts Hill.

2. SERVICES

2.1 Water

For potable water the proposed site is serviced by the Bankstown Water System. According to the Sydney Water Development Servicing Plan (DSP) (2001), no future works have been identified for this system.

Preliminary service investigations show that the site is bounded by water reticulation services. Trunk mains exist on both the southern side of Brunker Road between Cooper Road and Rookwood Road and in Rookwood Road adjacent the eastern boundary of the site. A 150mm diameter reticulation main exists on the eastern side of Cooper Road adjacent the western border of the site and 100mm diameter reticulation mains exist in Graf Avenue and Boardman Street adjacent to the south-eastern corner of the site.

Initial correspondence with Sydney Water indicates that the proposed residential and employment development are in agreement with projected demand projections for the system and, as such, would be able to be adequately serviced by the Bankstown Water System via the Bankstown Elevated Reservoir. The proposed residential development will be able to connect into the 150 mm main in Cooper Road. The proposed employment development will be able to connect to the mains located in Graf Avenue and Boardman Street, however these systems will require some augmentation to account for the increased demand.

A more detailed potable water servicing strategy for the proposed developable areas will be able to be prepared after a suitable Masterplan for the site has been developed and all pertinent information relating to SWC assets in and around the site has been received.

2.2 Recycled Water

The Liverpool – Ashfield Pipeline (LAP) for recycled water has recently been constructed. This pipeline could supply recycled water to the site. The recycled water has undergone only secondary treatment and would therefore require tertiary treatment, including disinfection, prior to use on the site. This would require the construction of a treatment plant.

2.3 Sewer

Due to the surrounding topography, development on the site is capable of delivering to two sewerage systems: the Northern Suburbs Ocean Outfall System (NSOOS) Sections 7 – 8 and the Southern and Western Suburbs Ocean Outfall Sewerage System (SWSOOS). The NSOOS discharges to North Head Sewage Treatment Plant while the SWSOOS discharges to the sewage treatment plant located at Malabar. The employment development would deliver to the SWSOOS and residential development would deliver to the NSOOS.

A preliminary investigation of the local sewerage network has revealed the presence of sewerage mains in Cooper Road ranging from 150mm to 225mm in diameter. Conversations with Sydney Water have revealed that residential development in the north-western corner of the site should be able to connect to the NSOOS via the Jensen's Park Carrier leading to pump station SPS 98 within the NSOOS. It has been advised that the proposed level of development is within the population growth projections detailed in the NSOOS Development Servicing Plan (DSP) and that the development will not impact on current hydraulic capacity issues located elsewhere within the NSOOS (Sections 7 – 8) system (refer SWC NSOOS DSP). In order to connect to the Jensen's Park Carrier, some augmentation of the local sewerage network will be required to accommodate the development. Current 150mm and 225mm diameter local sewerage mains in Cooper Road and surrounding streets near the north-western corner of the site will be required to be amplified to 300mm diameter systems prior to connection to the existing 300mm diameter system in Morris Street, Regents Park (approximately 1km of pipe augmentation external to the site).

There appears to be limited sewerage services in both Brunker Road and Rookwood Road adjacent the respective southern and eastern boundaries of the site. Local sewerage services exist in and adjacent to Graf Avenue and Boardman Street in the south-eastern corner of the site and the 400mm diameter Potts Hill Carrier main crosses Brunker Road near the Rookwood Road intersection. Preliminary correspondence with SWC has indicated that the employment development will be able to discharge to the SWSOOS via the Potts Hill Carrier main. Some minor augmentation of the local sewerage services in Graf Avenue and Boardman Street is required to allow for the increased loading. It is estimated that the increased demand upon the SWSOOS is in accordance with demand projections detailed in the SWSOOS DSP.

A more detailed assessment of the potential impacts of development within the site on both the NSOOS and SWSOOS will be made possible with the provision of information relating to SWC-owned infrastructure surrounding the site and the development of a final lot layout for the site.

2.4 Electricity

There currently exists significant Energy Australia (EA) distribution assets within the road reserves surrounding the site (Cooper Road, Brunker Road and Rookwood Road). Additionally, EA high-voltage (11kV) transmission assets exist in the abovementioned roads bordering the site as well as a high-voltage feeder line to the SWC site connected from the north-eastern corner of the site. Preliminary discussions with Energy Australia (EA) have indicated that if the proposed development were to be divested from Sydney Water ownership, any development must be connected to EA assets residing in the public domain and not the high voltage line servicing the remaining SWC land.

Very preliminary advice from EA suggests that enough capacity exists in the high-voltage networks bordering the site to supply a high-voltage feeder to the proposed residential and commercial development without major augmentation or amplification. In addition, development within the SWC site will require the provision of substations ("kiosks") at pertinent locations. Each kiosk is approximately capable of servicing a total of 160 residential lots via up to 4 distribution lines. The

actual number of kiosks required will be dependent on final dwelling densities, projected land use and the proposed lot layout.

2.5 Gas

Agility has advised of existing infrastructure in Brunker Road and Rookwood Road and some limited infrastructure in Cooper Road. Based on a very preliminary assessment of the site, they have advised that the provision of gas to the site is feasible. They have advised that they will provide a more detailed assessment of the requirements for servicing the site subject to the provision of a site plan/lot layout.

Alinta has advised that capacity is currently available to supply the site, subject to:

- the interconnection of two existing 110 mm gas mains via Cooper Road, one stemming from Farnell Road, which meets Cooper Road south of Brunker Road and the other stemming from Rodd Street, which meets Cooper Road around the north-south midpoint of the site; and
- the site being connected to the new 110 mm Cooper Road main, south of Rodd Street and north of Brunker Road.

2.6 Telecommunications

Servicing plans and information provided by Telstra have indicated that there is a main cable (optical fibre) adjacent the southern and eastern boundaries of the site in Brunker Road and Rookwood Road, respectively. In addition, there is an extensive local cable network in Cooper Road. Initial advice provided by Telstra indicates that any development of the site will be able to be adequately serviced by telecommunications.

3. CIVIL ENGINEERING

3.1 Subsurface Conditions

According to the geotechnical investigation completed by Coffey Geotechnics, the surplus land is primarily underlain by uncontrolled fill. The sites would be classified “P”, unless the existing fill is excavated and replaced with proper compaction. The P classification requires engineering design of foundations. Ground improvements are recommended using impact rolling. This would require bulk earthworks on sloping ground to form level strips able to be compacted.

The site geology is otherwise generally made up of silty clay soils derived from shale to interbedded shale and sandstone parent material.

The site material has been identified as unsuitable for pavement subgrade without further treatment with lime.

Soils were tested as part of the investigation and salinity was not considered significant for the site, however a moderate to slight dispersibilty was encountered. The dispersibility could be addressed with adequate soil and erosion control measures during the construction phase.

Coffey Geotechnics has identified that the embankment on the eastern and southern sides of the employment area is unstable and requires work to provide stability. This is likely to require bulk earthworks on this embankment along with installation of retaining walls.

3.2 Landform Design

The geotechnical investigation recommended that permanent fill batters do not exceed 1V in 3H in fill material or crushed rock, while 1V:2H is permissible in residual soils.

The site is generally located on the crest of a hill, however a number of steep slopes are present across the site. The geotechnical investigation made recommendations for the maximum slopes for these slopes, generally consistent with the slopes recommended above. An easement free of surcharge loading is to be provided at the crest of the slopes, otherwise a slope stability analysis and possibly stabilisation would be required.

The landform for the residential area would closely follow the existing ground levels. In the steeper areas, it is proposed that the houses would have a split level design to accommodate the grade. Elsewhere, the lots would be graded by house builders for a slab on ground foundation.

The landform for the western portion of the employment area is relatively flat and would not require extensive works to form building platforms. The road access from Rookwood Road is likely to require cut and fill with retaining walls on both sides of the road, along its entire length. The need for the

retaining wall on the northern side of the road may be reviewed if a final landform was available for the proposed Transgrid site.

3.3 Road Design

A preliminary road grading has been carried out to confirm the feasibility of the landform design.

4. SUSTAINABLE WATER SYSTEMS

The options for water management for the surplus lands at Potts Hill range from a base case which is conforming with the State government BASIX requirements to the site being a net potable water producer.

Achievement of some options may require changes to present NSW Health policies and community acceptance of drinking water out of rainwater tanks. The attitude to these issues can be expected to change in the near future as the security of our water resources is better understood. These practices are adopted elsewhere (e.g. Queensland) and are found to be safe and governments are gradually adopting sustainability as a necessity for government policy. It will be necessary for the proposed development at Potts Hill to not preclude the opportunity in the future of being able to readily adopt more sustainable management actions which at present are not approved. It may be appropriate, in some instances, to include the infrastructure which in the future could be used as a more sustainable outcome but which could not be readily retrofitted at some future time. All those issues need to be considered in the selection of the most appropriate option for Potts Hill.

4.1 40% Reduction in SWC potable water use

BASIX legislation requires that all new residential developments provide a 40% reduction in potable water use compared to an average existing dwelling. While there is no comparable legislation for commercial developments, it is considered to be the minimum provision for this development.

The 40% reduction would be achieved through the use of water saving devices and rainwater tanks for both commercial and residential areas.

The average potable water use in a traditional house is approximately 260 L/p/day with about 183 L/p/d for internal uses and about 77 L/p/d for external uses. With water saving taps, showerheads, toilets and dishwasher the internal use can be reduced to approximately 141 L/p/d representing an overall reduction in potable water use (141 + 77) of approximately 16%.

With the use of a reasonable size rainwater tank (4 kL for each residential lot), an overall reduction in potable water use of 40% can be achieved saving 104 L/p/d or approximately 290 L/dwelling/day for an average of 2.8 persons per household. This equates to a saving of nearly 106,000L in a year per dwelling.

The rain water tank sizes for the commercial development would need to be sized at a later date.

For the purpose of illustrating potential savings, an example of a residential yield of 230 lots and 400 apartments and 5,000 m^2 of commercial gross lettable area were taken and presented in **Table 4-1**.

Table 4-1 – Water Management Infrastructure Options

Stage/ Target	Description	Benefits
40% reduction in SWC potable water use	• Water saving devices and appliances; • 4kL rainwater tank on each residential lot • Rainwater tanks for commercial development	• Meets government requirements; • Saves over 70 million litres of SWC potable water per year
65% reduction	• Water saving devices and appliances; • Recycled water from LAP for use in irrigation, toilets, washing machines	• Exceeds government requirements and meets present best practice; • Saves over 120 million litres per year
80% reduction	• 60% option; • Rainwater harvesting for use in hot water	• Represents future industry best practice; • Saves over 140 million litres per year
95-99% reduction	• 80% option with roof runoff used for potable uses; • Larger rainwater tank to provide potable water (15kL)	• Represents world best practice; • Saves over 170 million litres potable water per year
Up to 100% reduction	• 95-99% option; • Supply roof runoff from Reservoir 2 and excess from proposed commercial buildings for potable uses in residences	• Water neutral – use no SWC potable water; • Sustainable water solution; • Saving SWC infrastructure for other development; • Saves 180 million litres per year
Site is a water producer	• Up to 100% reduction option; • Excess supply from roofs of Reservoir 2/commercial buildings to LAP and SWC use e.g. jet cleaning of pipes	• Water producer; • Saves over 220 million litres per year; • Provides up to 255 million litres of water per year; • Sustainable water solution; • Saving SWC infrastructure for other development

4.2 65% Reduction

This option involves replacing the rainwater harvesting with use of recycled water for irrigation, car washing, toilet flushing and washing machines.

The potable water use would reduce to 92L/p/d or approximately 9400L/year for each dwelling. This would be a saving of approximately 172,000 L/year of potable water per dwelling.

The recycled water would be sourced from the proposed Liverpool to Ashfield Recycled Water Pipeline (LAP) which is planned to have a storage on the SWC portion of the site. The quality of this water would not be sufficient for use as recycled water and would require filtering and disinfection. The average and peak demand rates would be approximately 306 L/d/dwelling and 1120L/d/dwelling respectively.

4.3 80% Reduction

This option involves the 65% reduction option with the addition of a 4kL rainwater tank on each dwelling to supply water to the hot water system. The use of recycled water and rainwater (for hot water) has the potential to reduce potable water use in a household to approximately 51 L/p/d or 142 L/day. This would represent an 80% reduction in potable water use.

This would save approximately 200,000 L/year of potable water from the SWC system for each household.

4.4 95-99% Reduction

With the increasing scarcity of potable water resources, increasing water demand from population increases, objection to the construction of further dam storages, it is likely in the near future that use of roof runoff from residences will be approved for potable purposes. It is imperative that the infrastructure designed for the Potts Hill development does not preclude this use of roof runoff in the future.

Long term water balance assessments suggest that the following rainwater tank sizes would be required to achieve the following security of supply of potable water to detached dwellings (apartments would require a site-specific analysis):

- 7.5 kL 95% security of supply
- 20 kL 97.5% security of supply
- 30 kL 99.3% security of supply

The relatively small rainwater tank size is able to achieve high security of supply rates because the demand has increased (compared to the 80% reduction option) when both the hot water and potable water demand are combined. As such, this higher demand keeps the tank at a lower level for longer increasing its ability to meet the household water demand by capturing more roof runoff.

The inclusion of these large tank sizes on the typical lot would not be practical with an above ground tank. The design of the dwellings need to consider the feasibility of including a tank under the garage as part of the house foundations.

4.5 No Potable Water Use

The development could achieve no demand on the SWC potable water system by using recycled water and rainwater from the Reservoir 2 roof and the roofs of the proposed employment development adjacent to Reservoir 2.

The rainwater harvesting from the proposed dwellings would be limited by the available roof area and the tank size. This can be augmented by a supply from the roofs of Reservoir 2 and the proposed employment buildings. The proposed employment buildings would be unable to use all the roof runoff. This excess roof runoff could be piped to the Reservoir 2 storage to complement the supply of potable water to the proposed dwellings. Each detached dwelling would collect roof runoff into a slimline 4 kL tank and this would be topped up from a storage adjacent to Reservoir 2.

Runoff from the Reservoir 2 roof presently discharges to a concrete detention basin on the eastern side of the reservoir. Storage tanks could be provided in the northern section of this basin to collect a portion of the roof runoff. A storage of 6,100kL with a roof would provide sufficient supply to meet all the potable water demand. This storage could be formed with an additional concrete wall in the basin and a roof over this area. Water would be pumped from this storage to the potable water reticulation (not SWC's reticulation) which would top up the rainwater tanks on each dwelling. Allowance has been made for interim treatment of this water until monitoring establishes that it is suitable for potable uses without treatment.

It is assumed that the potable water reticulation would be substituted for this water supply from roof runoff.

4.6 Water Producer

The proposed development could become a producer of water based on the option of harvesting roof runoff from Reservoir 2 and the proposed employment area. The average annual roof runoff from these areas would be approximately 283 ML/year of which only about 10% would be used to supply the residential and employment areas in the No Potable Water Use option. This leaves up to 255 million litres to be available to supply other uses i.e. availability as a water producer. The effective volume of water available would depend on the storage capacity provided but nonetheless it is a significant quantity of water.

A storage could be provided so that the site was a water producer servicing:

- SWC uses for jet clearing of mains, etc.;
- Export to the Liverpool to Ashfield Recycled Water system on Reservoir 1; and
- Supply to the community, eg irrigation of Council playing fields, sale to industrial users.

5. SURFACE WATER MANAGEMENT

A water sensitive urban design (WSUD) approach should be adopted to mitigate impacts on existing waters. The principles for application of these best management practices include:

- At-source runoff control, such as rainwater reuse and bio-retention systems, and
- Integration of water quality control measures with the urban design and ecological features.

The proposed development would include a range of best practice measures to meet the following Water Sensitive Urban Design (WSUD) objectives:

- Reduction in potable water consumption;
- Utilisation of available rainwater;
- Minimisation of impacts on downstream receiving waters;
- Safe conveyance of stormwater;
- Integration of water management measures with landscape design into the proposed development, and
- Sustainable use of available water resource (refer to **Section 4**).

The elements of the WSUD approach focus on a treatment train, which begins at each lot. These elements include:

- rainwater tanks to reuse runoff, which reduces the runoff volume and pollutant loads and slows down the flow,
- bio-retention swales along the roads to treat and slow runoff from lots and roads and to promote subsurface flows,
- gross pollutant traps to remove sediment, debris, organic matter and litter, and
- bio-retention basins at focal points in the catchment to treat and slow runoff, to promote subsurface flows and provide visual and recreational amenity.

The NSW Department of Environment and Climate Change (*DECC*) recommends reduction targets in annual runoff pollutant loads for developments of:

- 80% for total suspended solids (TSS),
- 45% for total phosphorous (TP), and
- 45% for total nitrogen (TN).

Bankstown City Council's Development Control Plan (DCP) No. 30 is consistent with these requirements.

Generally, the stormwater treatment flow path for runoff in the residential area would consist of the following:

- runoff from roof areas would be collected and retained in rainwater re-use tanks and then into the minor drainage system,
- runoff from many roads and lots would be directed into bio-retention swales where it would be filtered and treated biologically,
- stormwater collected from impervious areas, such as roads, paths and driveways would be piped towards gross pollutant traps (GPT's) to remove coarse sediment, litter, debris, oils and greases, and
- runoff would be treated in bio-retention basins at catchment focal points.

It may not be feasible to create artificial wetlands or ponds, given the site topography.

In the employment area, it is likely that most of the runoff control features would be located on the lots, with GPTs located on the Council road drainage system at the outlets to the site.

The principles for application of these best management practices are to maintain the post developed flows to meet pre-developed levels to reduce stress of receiving waters and flooding impacts. Detention would be provided through a combination of active storage above the extended detention in bioretention basins, storage in dry basins and underground storage eg. below roadways. This would be compliant with DCP 30, which requires detention to pre-development levels for events greater than the 5 year average recurrence interval storm.

Drainage infrastructure is present in the surrounding streets of Brunker Road, Cooper Road and Rookwood Road.

The site itself is located on a crest and, as such, is not subjected to flooding from any watercourses.

The proposed layout of water management measures in the residential area is shown on **Figure 1**.

6. CONCLUSION

The Potts Hill surplus land is to be redeveloped for residential and employment use in line with the principles of ecologically sustainable development.

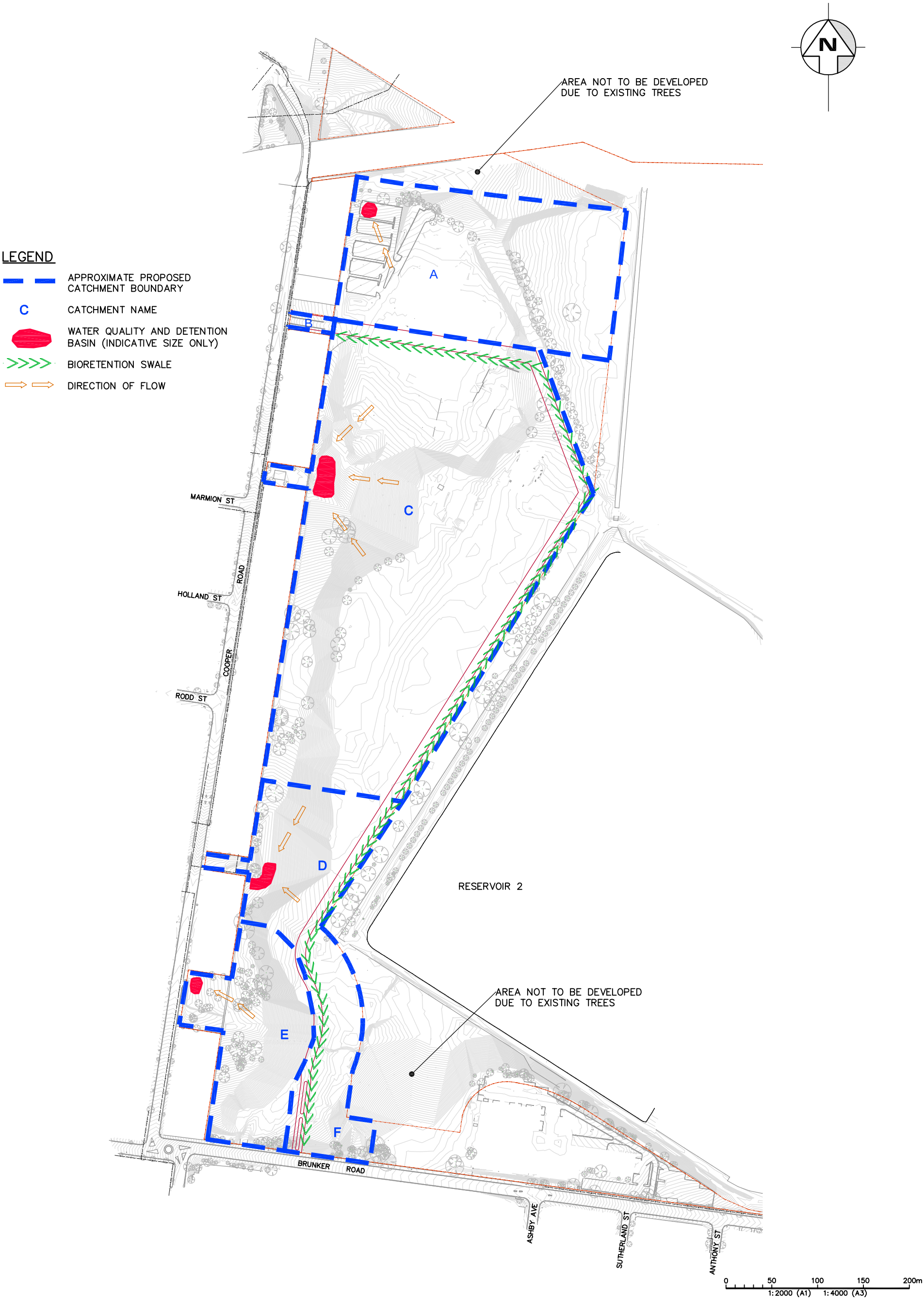
The water management measures proposed ensure that the treatment targets of DECC and Council are achieved.

Servicing investigations indicate that the site is not constrained by the provision of services to new development.

7. REFERENCES

1. Coffey Geotechnics, *Project 50363 - Potts Hill Geotechnical Investigation Report*, January 2008

FIGURE 1



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