SKM

Sydney WATER

Metropolitan Water Plan

Western Sydney Recycled Water Initiative

Preferred Project Report for Replacement Flows Project

February 2007

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1 Introduction

This chapter introduces the Preferred Project Report for the Replacement Flows Project. It provides an outline of the purpose of the report, summarises changes to the project since exhibition of the Environmental Assessment and defines the structure of the report.

1.1 General

The *2006 Metropolitan Water Plan* sets out how the New South Wales (NSW) Government will achieve its objectives for securing Sydney's water needs over the next 25 years. Currently Sydney recycles around 21 billion litres of wastewater a year. Through implementation of initiatives outlined in the *2006 Metropolitan Water Plan* water recycling will increase to 70 billion litres a year by 2015. The Western Sydney Recycled Water Initiative is one of these initiatives that will save up to 27 billion litres a year, with the Replacement Flows Project (the Project) contributing a saving of up to 18 billion litres a year.

An Environmental Assessment (EA) for the project was prepared which responded to requirements from the Director-General of the Department of Planning issued on 1 September 2006. In November 2006, the NSW Department of Planning exhibited an EA of the Replacement Flows Project. During the exhibition period the community and government stakeholders were invited to make submissions on the Project as described in the EA.

This Preferred Project Report (PPR) responds to issues raised in submissions to the Department of Planning and Sydney Water. Responses to the submissions draw on the findings of the EA, new information gained since the preparation of the EA was completed and changes in response to public inputs.

This report will assist the Department of Planning to advise the Minister for Planning on whether the Project should proceed and the details of conditions of approval.

1.2 The Preferred Project Report and the approval process

The Project is being assessed under Part 3A of the *Environmental Planning & Assessment Act 1979* (EP&A Act), which provides the assessment and approvals process for major infrastructure projects. The Minister for Planning is the approval authority for all projects assessed under Part 3A.

On 23 October 2006 the Minister for Planning declared that the Replacement Flows Project will be assessed under Part 3A of the EP&A Act.

The EA was prepared and finalised following the Director-General's pre-exhibition evaluation of the document's adequacy. In accordance with EP&A Act, the EA for the Project was publicly exhibited from 2 November 2006 to 4 December 2006. During this time Sydney Water provided community information on the Project, in accordance with Department of Planning guidelines (refer to **Section 2.1**).

The Department of Planning received submissions in response to the EA and forwarded them to Sydney Water on 13 December 2006. The Director-General also advised Sydney Water that they are required to respond to issues raised in the submissions. If Sydney Water's response requires changes to the Project to minimise its environmental impact or affects the statement of commitments, the Director-General requires a PPR to be prepared and the statement of commitments to be revised.

Sydney Water advised the Director-General on 11 January 2007 that a PPR would be prepared due to changes to the Project following a technical review and in response to submissions received. The statement of commitments would also be revised. If the Director-General considers that the changes to the Project are significant, the PPR may be required to be made available to the public. Sydney Water would advertise and exhibit the PPR in the same manner as the EA. There would not be a formal invitation for further submissions.

Following Sydney Water's submission of the PPR, the Director-General will prepare an EA Report to the Minister for Planning. The Minister for Planning, after considering the EA Report, may issue an approval and set conditions for the construction and operation of the Project.

1.3 Summary of the original proposal

The Project is part of a water management system that would increase the amount of potable water available from Warragamba Dam. The Project would include treating tertiary effluent from the St Marys, Penrith and Quakers Hill Sewage Treatment Plants (STPs) in north western Sydney at an Advanced Water Treatment Plant (AWTP) located at the St Marys STP. The AWTP would produce up to 50 million litres a day (ML/day) of highly treated recycled water, which will be discharged to the Hawkesbury-Nepean River below Penrith Weir to replace water that is currently released from Warragamba Dam for riparian use and river health purposes. The volume of tertiary treated effluent discharged directly from Penrith STP would be minimised, and the volume of tertiary treated effluent discharged from St Marys and Quakers Hill STPs will be reduced but would be sufficient to provide for the downstream water users, including irrigators, in South Creek.

The original proposal consisted of:

- an AWTP at the St Marys STP site that would produce up to 50ML/day of highly treated recycled water for discharge to the Hawkesbury-Nepean River downstream of Penrith Weir, and about 8ML/day of a concentrate to be discharged to the Northern Suburbs Ocean Outfall Sewer (NSOOS)
- a pipeline for the transfer of tertiary treated effluent from Penrith STP to the AWTP
- a pipeline for the transfer of tertiary treated effluent from Quakers Hill STP to the AWTP

- a pipeline for the transfer of recycled water produced by the AWTP at St Marys STP to the Penrith STP
- discharge of the replacement flows to the Hawkesbury-Nepean River, via the Penrith STP discharge to Boundary Creek, immediately downstream of Penrith Weir
- a pipeline for the transfer of the concentrate from the AWTP to Quakers Hill STP
- a storage pond at Quakers Hill STP for the temporary storage of the concentrate, when the Northern Suburbs Ocean Outfall Sewer (NSOOS) may not be available for discharge (during periods of extended wet weather)
- transfer of the concentrate to the NSOOS via an existing pipeline from Quakers Hill STP to Seven Hills, and a new pipeline between Seven Hills and Vineyard Creek at Dundas. Some upgrade works may be required to the existing pipeline. A new pumping station may also be required at Seven Hills where the existing pipeline would join the new pipeline to Vineyard Creek.
- balance storages and pumping stations at Penrith, Quakers Hill and St Marys STPs.

The indicative location and layout of the AWTP at the St Marys STP site is shown in **Figures 1.1a and b**, and artist's impressions of the external and internal features of the AWTP are shown in **Figures 1.2a and b**. The proposed pipeline routes are shown in **Figures 1.3a and b** and **Figures 1.4a and b**. The discharge outlet and ancillary items at Penrith STP are shown in **Figure 1.5**.

1.4 Summary of changes since Environmental Assessment exhibition

The majority of the Project is unchanged from the original proposal that was considered in the EA. Two specific aspects of the proposal have changed:

- Part of the concentrate pipeline route between Seven Hills and Vineyard Creek at Dundas
- In the EA pilot testing of the AWTP was included as a measure to validate performance criteria as part of design validation. The details of this pilot facility were not provided in the EA and have been included in this Preferred Project Report.

1.4.1 Revised concentrate pipeline route

The concentrate pipeline route has been revised in response to a technical review of the route between Seven Hills and Vineyard Creek and one of the submissions received. The revised route will minimise impacts on infrastructure including railways and roads and reduce energy usage with one less pumping station required.

The original pipeline route may have required three pumping stations to transport the concentrate to the NSOOS at Vineyard Creek. The Project description above includes pumping stations at St Marys and Quakers Hill STPs to pump concentrate to Vineyard Creek, with the possibility of a third pumping station at Seven Hills. The revised route is more hydraulically efficient requiring only the two pumping stations at the STPs, eliminating the third pumping station at Seven Hills. This reduces energy usage.

The revised route will connect to the existing pipeline in the International Peace Park at Seven Hills, in accordance with the original proposal. From this point the route is located north of the original proposal, avoiding the rail corridor at Seven Hills and eliminating two rail line crossings in this location. This change, which was made initially following the technical review, also provides a suitable response to a submission from RailCorp objecting to the use of the rail corridor at Seven Hills and raising concerns about rail line crossings near Seven Hills Rail Station.

The revised pipeline continues north of the original pipeline and reduces impacts on the busy Old Windsor Road corridor. From the intersection of Hammers and Kleins Road, Northmead, to the connection to the NSOOS at Vineyard Creek, the original and revised routes are very similar.

The environmental implications of these changes are assessed in **Chapter 4**. **Figures 4.1a and b** in **Chapter 4** show the original and revised concentrate pipeline routes.

1.4.2 Pilot facility

A pilot facility will be established on the St Marys STP site to demonstrate the performance of the treatment technology. The pilot facility will be temporary and will be operated on the site for a minimum of four months.

The pilot facility will be located adjacent to existing infrastructure on the STP site. The recycled water will be returned to the effluent discharged at St Marys STP, while the wastes will be returned to St Marys STP. **Figure 4.2** shows the approximate location of the pilot facility on the St Marys STP site. An assessment of the environmental affects of the construction and operation of the pilot facility is included in **Chapter 4**.

1.5 Structure of this report

This report has been prepared in accordance with the NSW Department of Planning guidelines and the Director-General's advice dated 13 December 2006. A summary of the information contained within each chapter of this report is provided below.

Chapter 1:

- Introduces the PPR
- Summarises the approval process
- Summarises the project presented in the EA
- Details changes that have been made since the EA was completed.

Chapter 2:

- Summarises the consultation that was undertaken prior to, during and post exhibition of the EA
- Outlines the submissions process
- Summarises the types of submission received and describes how issues were identified from formal submissions.

Chapter 3:

- Provides a summary of information in the EA, noting any changes that have been made following exhibition of the EA

- Summarises concerns raised within submissions received from Government Agencies and Councils, other stakeholders, interest groups and potentially affected residents/home owners
- Provides responses to concerns raised.

Chapter 4:

- Provides details on the changes to the Project outlined in Chapter 1 and assesses the environmental impacts of the changes
- Defines the preferred project.

Chapters 5:

- This chapter concludes the PPR by:
- Providing an amended Statement of Commitments including modifications made since the EA was finalised.

Figure 1.1a St Marys AWTP site

Figure 1.1b Layout of St Marys AWTP site

Figure 1.2a Artists impression of AWTP

Figure 1.2b Artists impression of AWTP showing internal layout

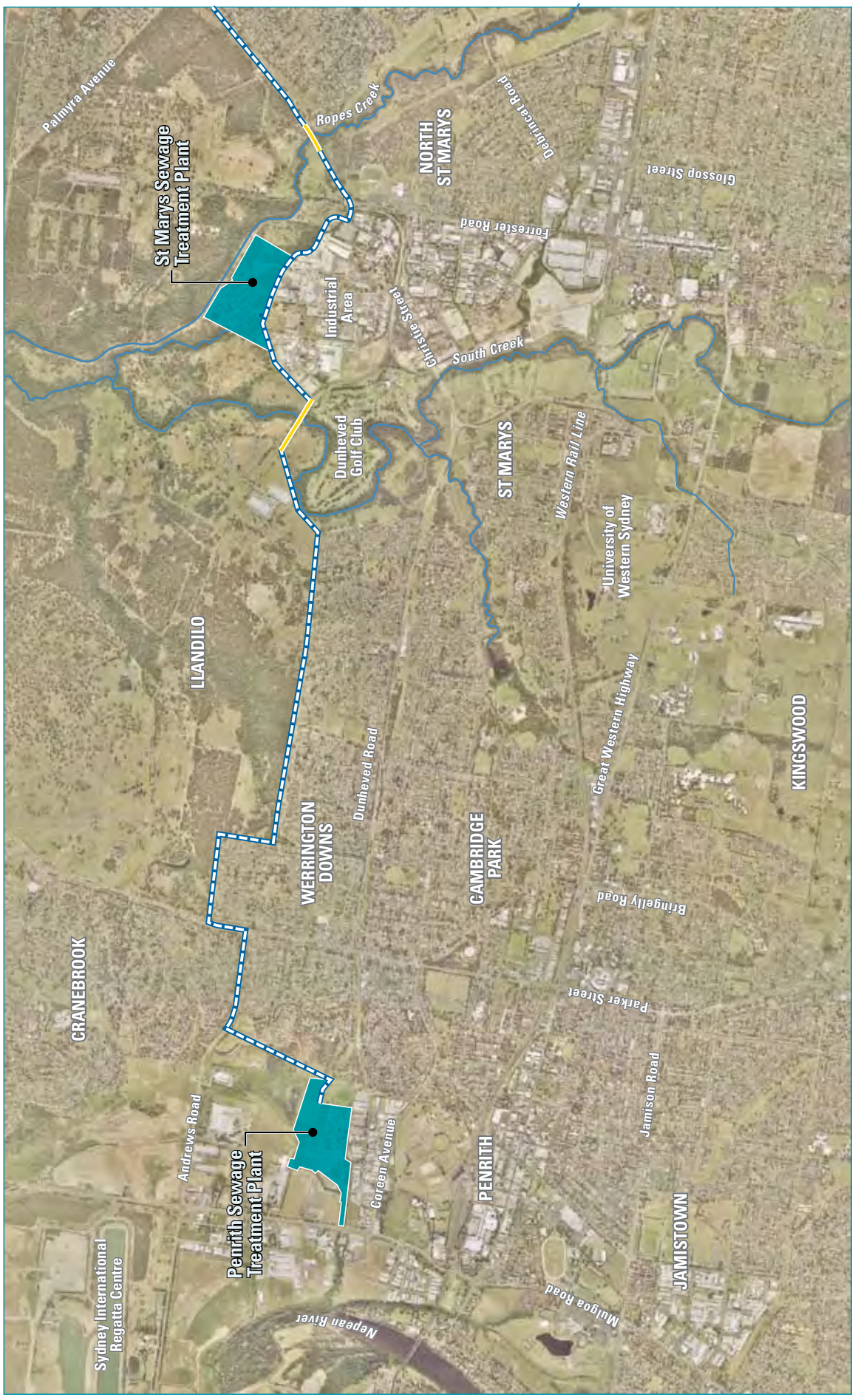
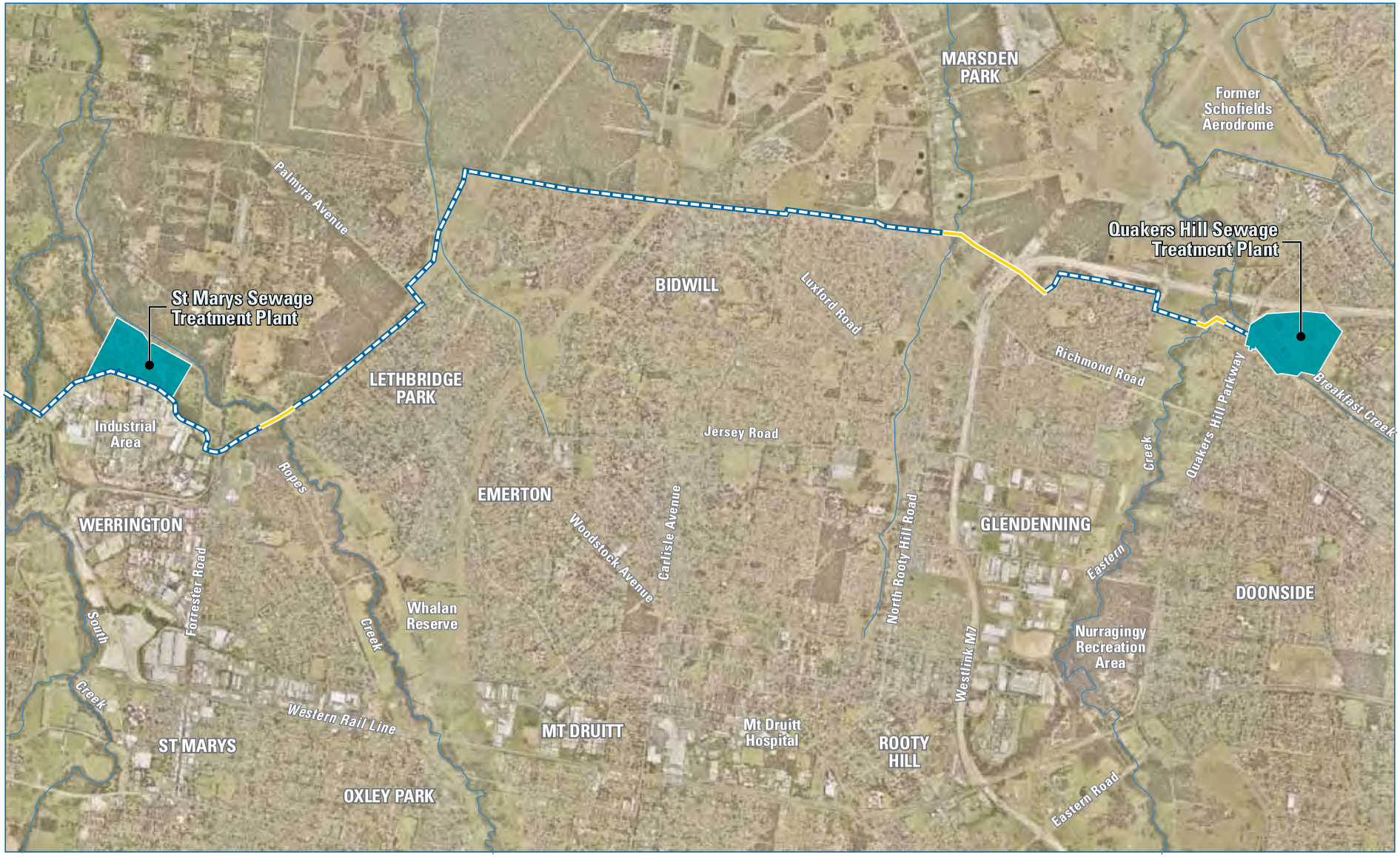


Figure 1.3a Pipeline route - Penrith to St Marys

Figure 1.3b Pipeline route - St Marys to Quakers Hill



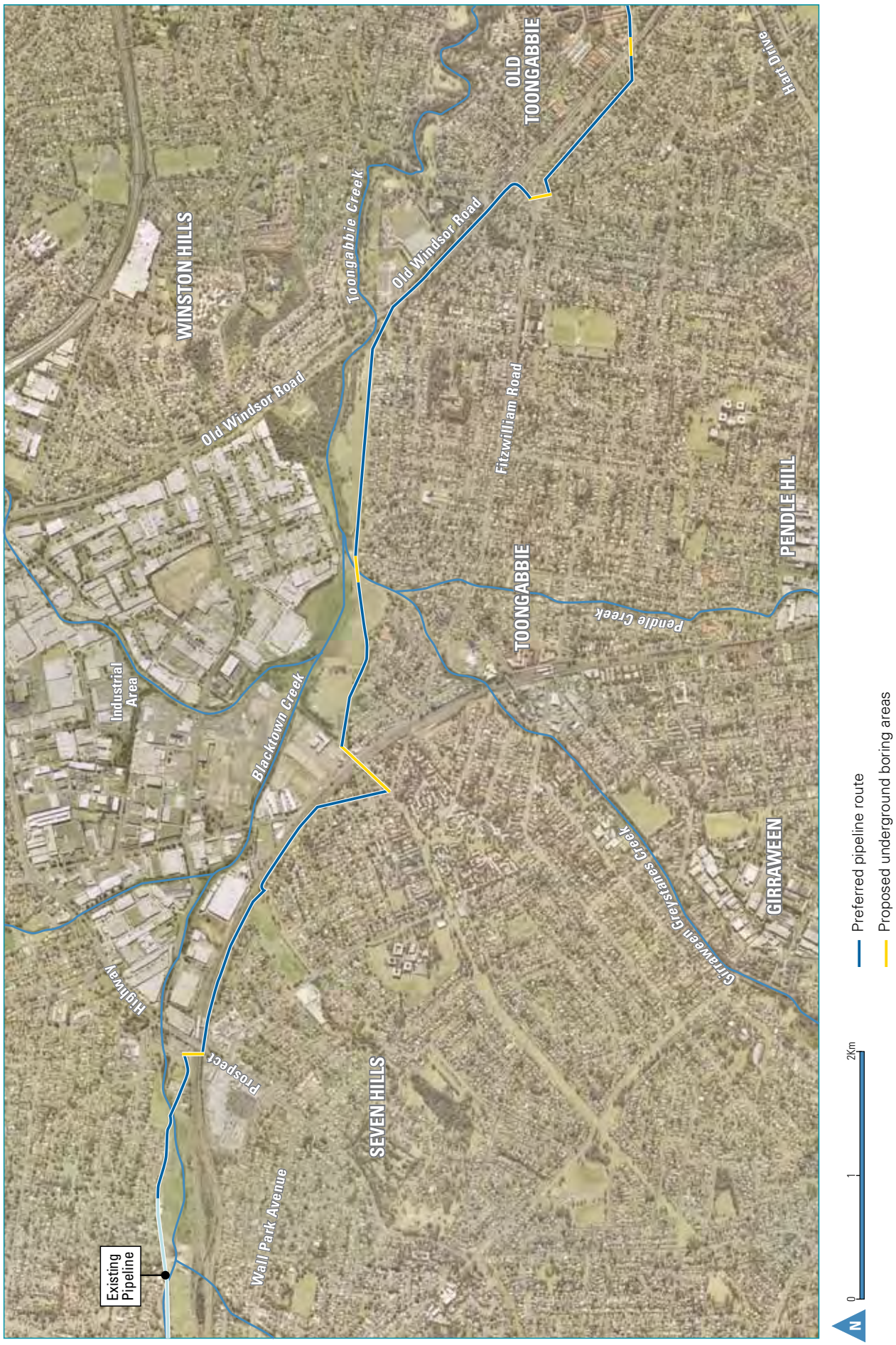


Figure 1.4a Concentrate pipeline route

Figure 1.4b Concentrate pipeline route

Figure 1.5 Penrith STP

The consultation process and submissions

This chapter provides details of the consultation Sydney Water undertook during the preparation, exhibition and post exhibition of the Environmental Assessment. Details are also provided on the submission process and types of submissions that were received.

2.1 Consultation

2.1.1 Overview of the consultation process

Sydney Water has engaged with a range of stakeholders during the preparation, exhibition and post exhibition of the EA. These stakeholders are shown below in **Table 2.1**.

Table 2.1 Stakeholder consultation and response to issues

Stakeholder	Date of meeting/s	Issues raised relevant to the Replacement Flows Project during consultation
Department of Environment and Conservation (DEC)*	27/7/06 (PFM) Draft copy of EA sent on 13/09/06 28/09/06	Comments received in writing on 21/09/06 Monitoring Statement of Commitments
Department of Primary Industries (DPI)	27/7/06 (PFM) Draft copy of EA sent on 13/09/06 22/09/06	Fish migration issues and fishways Statement of Commitments for additional study on fish migration
NSW Department of Health*	27/7/06 (PFM)	River health (water quantity and quality) and riparian zones Salinity impacts of recycled water used in gardens (WSRWI)
Hawkesbury-Nepean Catchment Management Authority (HNCMA)*	27/7/06 (PFM) 11/9/06	River health (water quantity and quality)
Sydney Catchment Authority (SCA)*	27/7/06 (PFM) Declined further meetings	River health (water quantity and quality)

Hawkesbury City Council*	21/7/06 27/7/06 (PFM)	River health (water quantity and quality) Supply of water for irrigation Use of high quality effluent for agriculture
Penrith City Council*	20/7/06 27/7/06 (PFM)	River health (water quantity and quality) Construction impacts
Parramatta City Council	25/8/06	Construction impacts, notification of construction works to communities Traffic management issues
Blacktown City Council	8/9/06 11/10/06	River health (water quantity and quality) South Creek volumes Construction impacts, notification of constructions works to communities. Community consultation WSRWI and other local projects
Baulkham Hills Shire Council	18/8/06	River health (water quantity and quality) Construction impacts Salinity impacts of recycled water used in outdoor areas
Western Sydney Regional Organisation of Councils* (WSROC)	28/8/06	River health (water quantity and quality)
RailCorp*	30/08/06	Preferred pipeline route (across rail corridor at Seven Hills Train Station) Sufficient time for investigation of rail crossings
Growth Centres Commission	25/8/06	Project timeframe Servicing strategy
Roads and Traffic Authority (RTA)*	13/9/06	Preferred pipeline route impact on RTA corridors, easements and roads Traffic management during construction
TransGrid	19/9/06	Preferred pipeline route impact on TransGrid corridors and easements Design considerations
Department of Energy, Utilities & Sustainability (DEUS)	15/8/06	Synergy with increased flows from the Nepean River Ensuring irrigators needs are met River health
Department of Housing	18/9/06	Preferred pipeline route Potential land use loss due to easements
Delfin Lend Lease*	28/8/06	Preferred pipeline route traversing the former ADI site Strategic context of WSRWI
ADI Residents Action Group	2/9/06	Flora and fauna impacts on the former ADI site Impacts on South Creek Strategic context of WSRWI Development of the ADI site
Darug Custodians Aboriginal Corporation	4/9/06 15/16 January 07 (Pipeline walkover)	Preferred pipeline route and potential impacts on indigenous heritage River health (water quantity and quality) Consultation methodology Future surveying works

Darug Aboriginal Cultural Heritage Assessments	30/8/06 15/16 January 07 (Pipeline walkover)	Preferred pipeline route and potential impacts on indigenous heritage River health (water quantity and quality)
Darug Tribal Aboriginal Corporation*	30/8/06 17/18 January 07 (Pipeline walkover	Preferred pipeline route and potential impacts on indigenous heritage River health (water quantity and quality)
NSW Aboriginal Land Council	26/9/06	Consultation requirements
Parramatta Council - Aboriginal and Torres Strait Islander local council network	26/10/06	Preferred pipeline route and potential impacts on indigenous heritage River health (water quantity and quality) Consultation methodology
Local Government and Shires Association	10/11/06	River health (water quantity and quality)
Commercial and Recreational Fishers*	20/11/06	Impact of project on fisheries
Corrective Services	24/01/07	Preferred pipeline route

* Indicates submission received. Concerns raised in submissions are addressed in Chapter 3 of this report.

(PFM) Planning Focus Meeting

2.1.2 Exhibition of the Environmental Assessment

The Department of Planning exhibited the EA, including Sydney Water's draft Statement of Commitments, from 2 November 2006 to 4 December 2006. During the exhibition period the public was able to review the document, attend public information stands and forward submissions to the Department of Planning to help in its assessment of the project.

During the exhibition period, Sydney Water consulted with specific stakeholders and provided information for the wider community. This supplemented the formal Department of Planning exhibition process.

The EA exhibition gave the community, Government agencies and stakeholder groups an opportunity to input ideas, raise issues and provide feedback. The project communications activities are described in detail below.

The communication activities and material prepared for the project included:

- Sydney Water website project information
- fact sheets
- a summary document of the EA
- sink strainers in promotional cards providing an overview of the project
- a series of three banners supporting public exhibitions
- a DVD including a 3D animation of the AWTP which is available on Sydney Water's website and used in public displays on large screen TVs.

Events and meetings were held during exhibition to supplement and highlight the written material, including:

- information displays at four regional shopping centres over three weekends
- information displays at Sculpture by the Sea over six days (three weekends)

- banner display and handout of information with sink-strainers during morning peak period at Seven Hills, Blacktown and Penrith train stations
- meetings with stakeholder groups
- meetings with Government agencies.

Other communication channels included:

- newspaper advertisements
- freecall 1800 telephone number
- email facilities: recycledwater@sydneywater.com.au

Information displays

The distribution of promotional information with sink strainers at Penrith, Blacktown and Seven Hills train stations was a successful method of informing the people most likely to be affected by the Project. Approximately 1000 sink strainers were distributed at each location. Less than three at each site were found to be discarded afterwards either in station bins or within the station property.

Printed fact sheets were distributed at public displays in shopping centres at Westfield Parramatta, Mt Druitt and Penrith, St Marys Shopping Village and Sculpture by the Sea at Bondi. Most visitors to the stands watched the DVD and collected a free sink strainer, and had the opportunity to ask members of the project team questions on the Project. Visitors to the displays could also register for free Water Saving Kits.

Static displays

The Department of Planning exhibited the EA document for public information and comment at Councils in the areas potentially impacted by the Project (Penrith, Blacktown, Parramatta, Baulkham Hills and Hawkesbury Councils). The EA was also available at the Department of Planning, Sydney Water and the Nature Conservation Council.

Meetings with key stakeholders

Over 50 letters were sent to stakeholder groups, inviting them to meet with representatives of the Project team at a time and venue of their convenience (35 meetings were held in total). At each meeting concerns raised were recorded into a contacts database and were considered in the development of the EA.

Phone, email and website facilities

Project information including the EA, Fact Sheets, the DVD and the Summary of the EA is available on the Sydney Water website at **www.sydneywater.com.au.** The community could comment on and obtain further information about the Project by contacting Sydney Water on **1800 685 833**, a freecall number, or sending an e-mail to **recycledwater@sydneywater.com.au.** The concerns raised by phone and e-mail were also recorded in a contacts database.

Advertisements

Newspaper advertisements were used to notify the community about the exhibition of the EA and the public displays by both Sydney Water and the Department of Planning.

Advertisements were placed in local and mainstream press in October and November 2006 as shown below. In accordance with DEC guidelines, separate advertisements were placed in local and mainstream press and the Koori Mail seeking interest from Aboriginal groups. Four groups registered their interest through this process.

Table 2.2 Project advertisement details

Publication	Dates advertised
Daily Telegraph	18 October 2006 1 and 8 November 2006
Sydney Morning Herald	18 & 31 October 2006 7 November 2006
Penrith City Star	17 October 2006 1 and 8 November 2006
Blacktown Advocate	18 October 2006 1 and 8 November 2006
Parramatta Advertiser	18 October 2006 1 and 8 November 2006
Mt Druitt St Marys Standard	18 October 2006 1 and 8 November 2006

2.2 Submissions

During the public exhibition of the EA submissions were invited from the community and other stakeholders.

This report addresses concerns raised in submissions to the Department of Planning and Sydney Water.

2.2.1 Types of submissions

Community input received by Sydney Water and Department of Planning about the project included:

- 20 formal written submissions to the Department of Planning and the online facility on the Sydney Water's website
- Informal submissions, including:
  - Comments and inquiries to Sydney Water via a freecall 1800 number, mail and email
  - Comments and inquiries received from members of the public, stakeholder groups and government agencies, at information displays, stakeholder meetings and government agency meetings.

2.2.2 Consultation post exhibition

Letters have been sent to Blacktown and Parramatta Councils and to the Roads and Traffic Authority (RTA) advising them of the changes to the concentrate pipeline route. These letters outlined the changes to the route and offered meetings and an opportunity to provide feedback regarding the changes.

Site walkovers have been conducted with interested Aboriginal groups. The groups concurred with preliminary cultural and heritage assessments of the sites and only minor amendments to the assessments is required.

A meeting with Corrective Services has been conducted to identify any potential impacts the changes in the concentrate pipeline route may cause

to the Parramatta Gaol. During this inspection it was identified that a parcel of land previously owned by Corrective Services is now owned by NSW Health, Health Support Unit. Correspondence has been sent to the appropriate division to seek a meeting to discuss construction impacts.

The RTA provided a written response on 2 February 2007. Issues of concern included:

- potential for impact on the Parramatta to Rouse Hill T-way
- disruption to the State Road network (Old Windsor Road) and impacts on future road widening of Old Windsor Road
- future road widening and construction impacts along Prospect Highway
- consultation with RTA prior to construction regarding pipeline location and traffic management.

These issues are addressed in **Section 4.2.9**.

Parramatta Council requested land use and tenure maps of the revised concentrate pipeline route. The maps (see **Appendix A**) were sent to Council.

2.2.3 Formal submissions

A total of 20 submissions were received as a result of the exhibition of the EA for the Project. Each submission was reviewed and specific concerns were identified and categorised based upon the chapters and key issues in the EA. Concerns have been addressed under general themes so that the same type of concern raised within different submissions can be documented and addressed in a single instance to minimise repetition and to provide clarity.

A summary of the concerns that were raised in submissions received and by whom are categorised in **Table 2.3**. Detailed responses to the concerns raised are provided in **Chapter 3**.

Table 2.3 Types of submissions

Concern raised	Submission author
Strategic and Regulatory Framework EA Chapters 2, 5 and 6, PPR Section 3.2	
Concern about inconsistency of the Project with the *NSW State Plan*	Recreational Fishing Alliance
Concern about the State Water Management Outcomes Plan	Hawkesbury Nepean Catchment Foundation
Concern about Water Industry Competition Bill	Hawkesbury City Council
Recommendation that a single river management authority should be established with the ultimate responsibility for managing the Hawkesbury Nepean River Concern that there is no overall policy or approach for improving river health and management. Assertion that Sydney Water should take sole responsibility for the Hawkesbury-Nepean River's health on behalf of the Government	Recreational Fishing Alliance Ocean Watch Australia
Concern about the Water Sharing Plan and Environmental Flows	Private Individual Nature Conservation Council of NSW Recreational Fishing Alliance Hawkesbury-Nepean Catchment Management Authority (CMA)

Concern about addressing the Statement of Joint Intent (SoJI) for the Hawkesbury-Nepean River regarding water quality and variable effluent discharge	Hawkesbury-Nepean CMA Hawkesbury Nepean Catchment Foundation Hawkesbury City Council
Concern about Sydney Water South Creek Water Servicing Strategy	Hawkesbury Nepean Catchment Foundation Nature Conservation Council of NSW Recreational Fishing Alliance
Concern about the Sydney Water's approach to the management of wastewater in Hawkesbury-Nepean River	Recreational Fishing Alliance
Recommendation that a Memorandum of Understanding be established between Sydney Water and the Department of Primary Industries for projects that will have the potential to impact on estuaries, dams, impoundments, lakes, streams, creeks, harbours and ocean waters	Recreational Fishing Alliance
Concern that the project does not comply with the precautionary principle requirement contained in Sydney Water's Ecological Sustainable Development Policy	Recreational Fishing Alliance
Assertion that all STPs discharging to the river should have advanced tertiary treatment	Ocean Watch Australia
Concern regarding the operation of the Replacement Flows Project without environmental flow releases from the Upper Nepean Dams	Recreational Fishing Alliance Hawkesbury-Nepean CMA Department of Primary Industries (DPI) Hawkesbury City Council
Recommended that Sydney Water not proceed with the project until the proposed alterations to the existing Upper Nepean weirs are completed, as water flows cannot be accurately predicted.	Recreational Fishing Alliance
Request for clarification that the West Camden STP upgrade has been factored into short and long-term effluent flows.	Recreational Fishing Alliance
Concern about licensing requirements for the Project	DEC
Concern about licensing requirements for the Penrith Lakes Scheme "Nepean Lakes System"	Hawkesbury Prawn Trawl Fishers
Description of the Project EA Chapter 3, PPR Section 3.3	
Concern over impact on ability to supply recycled water from St Marys STP to Ropes Crossing and other development sites in the vicinity	Delfin Lend Lease
Concern about establishing easements	DEC Delfin Lend Lease
Concern regarding the locations and maintenance of pipelines to minimise impacts on future developments	RTA RailCorp Delfin Lend Lease
Request that pipeline route minimise creek crossings and disturbance to riparian vegetation	Department of Natural Resources (DNR)
Concern about the removal of other pollutants apart from nutrients and dissolved solids	NSW Health
Request for details regarding concentrate storage at Quakers Hill STP	DNR

Alternatives EA Chapter 4, PPR Section 3.4	
Suggestions to supply highly treated recycled water directly to irrigators	Private Individual
Concern about lack of discussion regarding use of AWTP recycled water to load shed water extraction from Warragamba Dam to allow environmental discharge from the dam. The Project should allow 1:1 release from the dam each litre of water recycled from the AWTP	Private Individual
Suggestion to use more recycled water	Recreational Fishing Alliance
Concern regarding rationale for the preferred treatment process	NSW Health
Suggested use of water tanks for garden use in urban areas	Hawkesbury Prawn Trawl Fishers
Suggestion to add the reverse osmosis water to Sydney's drinking water supply (ie indirect potable reuse)	Hawkesbury Nepean Catchment Foundation
Part 3A Process EA Chapter 5, PPR Section 3.5	
Concern that Sydney Water has not adequately addressed the Director-General's EA requirements	Ocean Watch Australia
Regulatory requirements EA Chapter 6, PPR Section 3.6	
Requirements in relation to fish passage/fish migration (which includes crustaceans) under the Fisheries Management Act 1994 have been omitted	Ocean Watch Australia
Water quantity EA Section 7.3, PPR Section 3.7	
Concern about the reduction in flows in the Hawkesbury-Nepean River	Hawkesbury-Nepean CMA Hawkesbury Nepean Catchment Foundation Hawkesbury City Council Recreational Fishing Alliance Private Individual Ocean Watch Australia
Concern regarding the flows between Penrith Weir and North Richmond Water Filtration Plant.	Lower Nepean Hawkesbury Water Users Association
Concern regarding the impacts on the hydrology of South Creek	Recreational Fishing Alliance Hawkesbury Prawn Trawl Fishers Hawkesbury-Nepean CMA
Concern regarding impacts on Boundary Creek	Hawkesbury-Nepean CMA
Concern that environmental flow releases from the Upper Nepean Dams would not support the ecological health of the entire river	Hawkesbury Nepean Catchment Foundation
Concern about inadequate dilution of STP effluent in the study area	Hawkesbury Prawn Trawl Fishers
Concern about variability in flows to mimic natural flow regimes	Hawkesbury Prawn Trawl Fishers Hawkesbury Nepean Catchment Foundation DNR Private Individual
Concern about how the volume of the Warragamba River was determined	Hawkesbury-Nepean CMA

Water quantity EA Section 7.4, PPR Section 3.8	
Concern regarding the EA's conclusion that the project will provide long reaching environmental benefits providing significant broader river health improvements	Hawkesbury-Nepean CMA
Concern that the nutrient concentrations in the replacement flow will place further stress on the Hawkesbury-Nepean River's health	Lower Nepean Hawkesbury Water Users Association Nature Conservation Council of NSW
Concern about reduction in variations in minerals and micro-nutrients due to the substitution of Warragamba Dam releases with replacement flows and un-natural physico-chemical properties of replacement flow compared to dam water	Private Individual Ocean Watch Australia Department of Natural Resources
Concern regarding temperature difference between the replacement flow water and receiving waters	Recreational Fishing Alliance Private Individual Hawkesbury City Council Ocean Watch Australia
Request for sewage effluent quality and sediment monitoring and research	Recreational Fishing Alliance
Request for community information on the constituents of the replacement flow	Recreational Fishing Alliance
Concern regarding the proposed solution to maintain acceptable Warragamba River water quality	Sydney Catchment Authority Nature Conservation Council of NSW Hawkesbury-Nepean CMA Penrith City Council
Concern about options for improving the health of South Creek	Hawkesbury Nepean Catchment Foundation WSROC Penrith City Council Hawkesbury Prawn Trawl Fishers
Concern that the chemical contamination in South Creek has not been modelled	Hawkesbury Prawn Trawl Fishers
Concern regarding the salt wedge moving upstream in South Creek in very low flows	Private Individual Hawkesbury City Council
Concern that the change in flows in South Creek would lead to chemical contamination from exposed sediments	Department of Primary Industries
Concern about the area upstream from the South Creek confluence remaining a relatively degraded environment	Nature Conservation Council of NSW
Recommendation for a detailed assessment of the quality of the discharged "brine'	Hawkesbury Prawn Trawl Fishers
Recommendation for an investigation into the impacts of recycled effluent usage on colour fastness in washing machines	Hawkesbury City Council
Agriculture and Horticulture EA Section 7.8.1, PPR Section 3.9	
Concern regarding availability of water for riparian users and irrigators from the Hawkesbury-Nepean River	Lower Nepean Hawkesbury Water Users Association Private Individual Hawkesbury Nepean Catchment Foundation Hawkesbury-Nepean CMA Hawkesbury City Council

Concern about the availability of water in South Creek and the socio-economic impacts on primary producers due to a reduction in the availability of water	Lower Nepean Hawkesbury Water Users Association Private Individual
Fisheries EA Section 7.8.2, PPR 3.10	
Concern regarding socio-economic impacts on fisheries due to changes in volumes within the Hawkesbury-Nepean River	Hawkesbury Prawn Trawl Fishers Lower Nepean Hawkesbury Water Users Association
Concern regarding aquatic weeds, including their impact on commercial fisheries	Hawkesbury Nepean Catchment Foundation Hawkesbury Prawn Trawl Fishers Ocean Watch Australia
Recommendation that the project commence in winter, instead of summer	Hawkesbury Prawn Trawl Fishers
Concern regarding the impact of the proposed flow alterations on commercial fisheries	Hawkesbury-Nepean Catchment Foundation Hawkesbury Prawn Trawl Fishers Hawkesbury-Nepean CMA Ocean Watch Australia
Aquatic ecology EA Section 7.5, PPR Section 3.11	
Concern regarding the ecological health of Warragamba River with the absence of Warragamba Dam releases	Recreational Fishing Alliance Hawkesbury Nepean Catchment Foundation
Concern regarding growth of weeds and algae in South Creek	Ocean Watch Australia Hawkesbury Prawn Trawl Fishers Hawkesbury City Council
Recommendation regarding an aquatic weed harvester	WSROC Penrith City Council
Concern about the proposed fish migration studies	Penrith City Council Hawkesbury-Nepean CMA Sydney Catchment Authority
Concern about impacts on prawns/crustaceans	Hawkesbury Prawn Trawl Fishers Department of Primary Industries
Concern regarding the effects of chemicals such as endocrine disrupting compounds (EDCs) and other pharmaceuticals on aquatic fauna in all life stages	Ocean Watch Australia Hawkesbury Prawn Trawl Fishers Department of Primary Industries
Human Health EA Section 7.6, PPR Section 3.12	
Concern that the AWTP influent is from three combined plants and therefore providing a previously untested source of effluent (with regard to the Health Risk Assessment (HRA))	NSW Health
Concern that sampling regimes, analytical methods and the range of analytes were not necessarily optimum for the chemical risk assessment of treated effluents in the HRA	NSW Health
Concern that the most appropriate scenario to base chemical contaminants health risk estimates upon is the direct consumption of undiluted effluent from the AWTP as uncertainties in the HRA remain unresolved	NSW Health
Recommend that the water quality criteria for the effluent from the AWTP and the required plant efficacy in terms of removal of contaminants with health implications be specified	NSW Health

Recommendation for an annual baseline review of trade waste sources within the sewerage catchment areas to identify new industry and chemical contaminants with potential health effects	NSW Health
Recommendation to extensively measure pathogens and chemicals in St Marys, Penrith and Quakers Hill STP effluents (identified in the HRA and sewerage catchment review) for a substantial period prior to commissioning of the AWTP	NSW Health
Recommendation to continually review current knowledge and management strategies for emerging chemicals of concern including disinfection by-products and EDCs, and incorporate appropriate controls into the system where feasible	NSW Health
Recommend that the proponent demonstrates that a pilot facility can achieve output quality that complies with Australian Drinking Water Guidelines (2004) where a guideline value exists, or where a value does not exist that the plant can achieve a reduction in contaminant concentration to produce a margin of safety. For parameters that can't be measured directly challenge testing using safe surrogate microorganisms and chemicals should be done at a pilot facility	NSW Health
Recommend that an appropriate management strategy be put in place to prevent potential health impacts related to odour generated from the storage pond at Quakers Hill STP	NSW Health
Recommend that additional commitments be made to ensure adequate protection of public health associated with this project	NSW Health
Monitoring EA Section 7.9.3, PPR Section 3.13	
Recommendation to develop an ecotoxicology study with consideration of the Australian Guidelines for Water Quality Monitoring and Reporting (ANZECC & ARMCANZ, 2000) as part of the pilot testing program, in consultation with DEC, to assess the potential for impacts of the recycled water discharge on aquatic species including algae, macro-invertebrates and fish	DEC
Recommendation to develop a water quality and aquatic ecology monitoring program, in consultation with DEC and DPI, to be implemented prior to commissioning and continue for the life of the project with a review after three years (in consultation with DEC and DPI) for ongoing requirements. The program to be undertaken with, and provide a sub-set of data for, the Hawkesbury-Nepean Integrated Monitoring Framework	DEC
Recommended baseline monitoring to include at least two sampling events prior to commissioning for the following: flow regime phytoplankton (abundance and composition) submerged and floating aquatic vegetation (abundance and composition) macro-invertebrates (abundance and composition) fish (abundance and composition) water quality, with specific reference to key nutrients (nitrogen and phosphorus)	DEC

Recommendation to undertake post-commissioning monitoring in which sampling and data collection for parameters outlined in above would be undertaken to: determine the project's specific contribution to river health outcomes confirm the environmental impact predictions at appropriate temporal and spatial scales compare the post-commissioning river health conditions with the baseline conditions	DEC
Recommendation to undertake sampling and data collection at control and impact sites within Warragamba River, Nepean River, Hawkesbury River, South Creek and Eastern Creek	DEC
Recommendation to undertake sampling and data collection of the recycled water discharge and the immediate receiving environment	DEC
Concern regarding monitoring areas affected by river management changes for accurate status of the river's health	Recreational Fishing Alliance Ocean Watch Australia
Recommendation to develop a mechanism for the supply of data and results from the program, including comparison of baseline and post-commissioning data, both on request and at agreed milestones, to DEC, DPI and the Director-General	DEC
Recommend that the plant performance is monitored on a "real time" ongoing basis and its effluent prevented from discharging into Boundary Creek until plant performance is demonstrated to comply with agreed performance criteria	NSW Health
Management of other key issues EA Chapter 8, PPR Section 3.14	
Recommendation to prepare an Operational Environmental Management Plan addressing noise, odour control and liquid waste management and it should stipulate the requirements for plant monitoring, maintenance and the procedures for responding to failures	WSROC Penrith City Council Department of Natural Resources
Request for the opportunity to comment on the content of the Construction Environmental Management Plan to ensure appropriate practices will be in place to address noise, vibration and dust impacts on local residents and to ensure assets are not adversely impacted	Penrith City Council
Concern that two areas containing endangered ecological community (Freshwater Wetland and Cumberland Plain Woodland) near Penrith STP have not been avoided.	DEC
Concern regarding discharging waste into the ocean	Hawkesbury City Council
Concern regarding the construction of pipelines	Delfin Lend Lease Railcorp
Construction impacts on flora and fauna and water courses	DNR
Stakeholder engagement and consultation EA Chapter 9, PPR Section 3.15	
Concern regarding consultation with the fishing industry	Ocean Watch Australia DPI Hawkesbury Prawn Trawl Fishers
Requests to be kept informed of the progress of the Project	Darug Tribal Aboriginal Corporation

Statement of commitments EA Chapter 11, PPR Chapter 5	
Proposition for commitment 2 – The proponent shall manage the production and disposal of concentrate to ensure there is: • no discharge of concentrate into the Hawkesbury-Nepean River, including the South Creek Catchment • no increase in overflow frequencies from the NSOOS	DEC
Suggestion to enhance the existing modelling capacity to enable the predictions presented in the EA to be verified and to provide a tool which can assist with the adaptive management of the Hawkesbury Nepean River. The enhanced model should include the responses of pelagic algae (phytoplankton) and freshwater submerged aquatic plants Additional commitment related to Commitment 4 – The proponent shall liaise with DEC, DNR, DPI and SCA with the objective of developing a commonly accessible modelling framework to inform a range of future regulation and management decisions for the Hawkesbury-Nepean River	DEC
Suggestion for commitment 13 – Revegetation to be monitored for at least 6 months and further management undertaken if required	DEC

2.2.4 Informal submissions

Six informal submissions were received including three telephone calls and three emails. Issues raised in these informal submissions included the use of alternatives, such as rainwater tanks, support for the project and water quality sources for the North Richmond Water Filtration Plant. These concerns have been addressed within this report and information was provided to each of the people who commented on the Project.

3 Consideration of submissions

This chapter outlines the concerns that were raised in submissions in response to the exhibition of the EA. Each concern is then considered in detail.

Each submission received as a result of the exhibition of the EA for the Project was reviewed. Specific concerns were identified and categorised based upon the chapters and key issues in the EA.

For each concern raised in a submission a response is presented below. A number of the concerns were common across submissions, therefore a combined response to these concerns has been prepared.

All concerns in submissions relating to the statement of commitments are addressed in **Chapter 5**.

3.1 Support for the Project

A number of submissions from both private and public sector organisations have been received supporting the Project. Many of the submissions support the Project initiatives for maintaining the health of the Hawkesbury-Nepean River and for saving potable water supplies. Specific support has been given to measures to minimise impacts by directional boring under creeks, reducing nutrient loads in the Hawkesbury-Nepean River, and increasing water recycling activities in Western Sydney.

Sydney Water appreciates this support for the Project.

3.2 Strategic and regulatory framework

Concerns regarding the information provided in the strategic and regulatory framework section of the EA were raised by ten of the submissions received. A number of these submissions raise issues that are beyond the scope of the EA and the mandate of Sydney Water.

Concern about inconsistency of the Project with the NSW State Plan

The *NSW State Plan* has a goal to "Secure our supply of water and energy". One of the targets that have been set to achieve this goal, in Sydney, is to increase the volume of water recycled from 15 billion litres per year to 70 billion litres of water per year by 2015. This target is consistent with the target in the *2006 Metropolitan Water Plan*, of which

the Replacement Flows Project is a component. This demonstrates a consistency between the *NSW State Plan* and the Project.

The *NSW State Plan* makes a commitment to improving estuaries by 2015. Sydney Water will contribute to this commitment through providing input to the Hawkesbury-Nepean River Integrated Water Monitoring Program and other initiatives for the overall management of the river, as appropriate.

Concern about the State Water Management Outcomes Plan

Clause 6 of Division 2 Chapter 2 of the *Water Management Act 2000* allows the Governor to establish a *State Water Management Outcomes Plan* (SWMOP) for the development, conservation, management and control of the State's water resources. The SWMOP was gazetted on 20 December 2002.

The long term water outcomes of the plan include:

- protecting and restoring the diversity and abundance of native aquatic animals and plants by addressing the cumulative impacts of water management on their habitats and life cycles
- reducing the incidents of blue green algal blooms affecting essential water supplies and recreational values.

The EA considered the impacts of the project on aquatic ecology and concluded that there would be a neutral or positive impact for all reaches of the Hawkesbury-Nepean River. The impacts on aquatic ecology in Warragamba River are the exception due to the cessation of releases from Warragamba Dam. Sydney Water is, however, developing a strategy to reduce the impacts of the discharge of the recently commissioned Wallacia STP to levels identified by DEC. This would result in a reduced nutrient load into the river to offset the impact of the cessation of environmental flow releases from Warragamba Dam. Provided this is undertaken, excessive growth of exotic macrophytes and algae would be limited and the Project would have a neutral or potentially positive effect on macroinvertebrates, fish and other aquatic and riparian species. It is anticipated the Project would also reduce the potential for blue green algal blooms to occur in areas such as Sackville.

Through these measures the Project will contribute to the long term outcomes of the SWMOP.

Concern about Water Industry Competition Bill

One submission raised concerns that the new *Water Industry Competition Bill 2006* (which is now the *Water Industry Competition Act 2006*) could result in private operators obtaining rights over tertiary treated effluent currently discharged into the Hawkesbury-Nepean River and reuse the effluent for other uses. This would result in a further reduction in flows in the Hawkesbury-Nepean River and a reduction in the volume of water available to irrigators.

It is beyond the scope of the EA to predict future projects that may result in this occurring. However, Government regulations (through either the Water Sharing Plan (WSP) or Sydney Catchment Authority Water Management Licence) will require a minimum flow regime for environmental and riparian usage.

Recommendation that a single river management authority should be established with the ultimate responsibility for managing the Hawkesbury-Nepean River

Concerns that there is no overall policy or approach for improving river health and management.

Assertion that Sydney Water should take responsibility for the Hawkesbury-Nepean River's health on behalf of the Government

A number of submissions requested that a river management authority or similar organisation be created for the Hawkesbury-Nepean River. It is beyond the scope of the EA and outside Sydney Water's mandate to recommend management frameworks for the river.

Responsibility for the management of the health of the Hawkesbury-Nepean River is shared amongst a number of agencies, primarily DEC, DNR and DPI (Fisheries). Other agencies that have catchment management and development control responsibilities include the HNCMA, Department of Planning, local Councils and the SCA. The Growth Centres Commission (GCC) is responsible for managing the planning and infrastructure coordination for land releases in the North West and South West Growth Centres.

The *2006 Metropolitan Water Plan* (MWP) identified the development of an integrated monitoring program for the Hawkesbury-Nepean River that will provide information on the river health, the outcomes of environmental flows and recycling initiatives. In response to this initiative, a Hawkesbury-Nepean River Integrated Water Monitoring Framework (IWMF) has been established by DEC. The proposed framework will ensure that river health is comprehensively monitored in a manner that is acceptable and available to all Government agencies. The data from the integrated monitoring framework will inform future adaptive changes in river management. This provides an overall approach to improving river health and management. Sydney Water will provide input to this framework and other initiatives for the overall management of the river, as appropriate.

Concern about the Water Sharing Plan and Environmental Flows

Consultation was undertaken with DNR during the preparation of the EA, particularly in relation to the Water Sharing Plan assumptions upon which the assessment was based. These assumptions are related to river and water cycle management activities that will be implemented in addition to the Project in 2009. They include:

- increased environmental flow releases from the Upper Nepean Dams as described in the *2006 Metropolitan Water Plan*
- modification of the weirs in the Upper Nepean River to allow environmental flows to be passed downstream
- greater control over the volume and timing of agricultural water extraction from the Upper Nepean River to protect low flows

Based on advice provided by DNR, public consultation on the Water Sharing Plan is scheduled to commence mid 2007, with the plan to be operational by 2009. The *2006 Metropolitan Water Plan* commits to reviewing flow releases from Warragamba Dam in 2009 and establishing final flow rules by 2015. In developing both the Water Sharing Plan and final flow rules for Warragamba Dam, the discharge from the Project will be considered.

Modifications to the water management licences of the dams managed by SCA would be required to ensure that environmental flows occur and are correctly implemented. DNR will be responsible for regulating the environmental flow releases from the Upper Nepean dams through water management licences. SCA will be responsible for implementing the environmental flow releases from the Upper Nepean dams.

Concern about addressing the Statement of Joint Intent (SoJI) for the Hawkesbury-Nepean River regarding water quality and variable effluent discharge

The Statement of Joint Intent (SoJI) for the Hawkesbury-Nepean River was given general consideration within section 2.2.1 of the EA. The following provides more specific detail of how the SoJI has been applied.

The SoJI includes the following commitment:

FL6 - in the formulation of an integrated effluent management strategy, the following options for use of highly treated effluent are to be evaluated:

- *offset the potential impact of requiring additional releases from Warragamba Dam for environmental flow purposes.*
- *at other times, provide a water supply to water users along the Hawkesbury estuary (via a reticulated and/or river delivery system).*
- *establish a variable flow regime in South Creek and its tributaries.*
- *accommodate, in part, the water needs of the Penrith Lakes Scheme.*

The Project clearly meets the first commitment, and depending on how the replacement flows are allocated between the environment and irrigators, may meet the second commitment. The diversion of tertiary treated effluent from St Marys and Quakers Hill STP to the AWTP and the subsequent reduction in discharges to South Creek would result in a more variable flow regime in South Creek, however, dry weather flows would still be dominated by STP discharges.

Other relevant commitments in the SoJI include:

The Environment Protection Authority is to investigate, with other relevant agencies, opportunities to use the load-based licensing system to ensure an integrated approach to the management of water quality and river flows, as outlined in recommendation FL7 of the Report. This approach includes:

- *Incorporation of design features, in situations where effluent is to be discharged to rivers, which allow for variable patterns of effluent release, particularly during periods of low river flows; …..*

The Project would achieve the appropriate water quality objectives immediately downstream of its discharge location. However, the Project alone does not aim to provide variable flows. Other river management activities (including environmental flow releases from the Upper Nepean Dam) would contribute towards increased flow variability in 2009.

The impacts of the Project were assessed assuming a constant discharge. Following the assessment of water quality, quantity, aquatic ecology, recreation and primary industries impacts, the EA (Chapter 7) concluded that the objectives for each of these aspects would be achieved with a constant discharge.

The SoJI also outlines specific water quality objectives for the Hawkesbury-Nepean River system. These objectives were considered during the design and assessment of the Project. Table 7.1 page 7.17 in the EA outlines the water quality guidelines that were applied in the assessment, which includes the SoJI water quality objectives.

In accordance with the endorsed recommendations of the Healthy Rivers Commission (Appendix A to the SoJI), the water quality objectives for nutrients and chlorophyll-a were adopted for use as guidelines and ANZECC guidelines were used for all other water quality parameters.

Table 7.3 of the EA shows that a significant number of sites sampled within the study area currently do not comply with the relevant guidelines (SoJI

or ANZECC). The EA demonstrates that in 2009 improved water quality is predicted at all locations except for Warragamba River (with respect to all indicators) and South Creek (with respect to phosphorus), thus progressing towards achieving compliance with the SoJI objectives in the study area. Immediately downstream of Boundary Creek it is predicted that compliance with the SoJI objectives will be achieved for all relevant water quality indicators except for oxidised nitrogen. It is also predicted that there would be reductions in nitrogen concentrations throughout the lower Nepean River and Lower Hawkesbury River in 2009 due to the Project and other STP upgrades (eg West Camden STP). However it should be noted that these sections of the river are impacted by other sources of pollution (eg catchment runoff) and therefore the Project alone cannot be responsible for ensuring water quality objectives are achieved. Achieving water quality objectives is not a Project objective.

It is recognised that, apart from three locations (ie Warragamba River, downstream of Penrith Weir and downstream of the St Marys and Quakers Hill STPs), predicted water quality was not compared to SoJI water quality objectives along the whole length of the river, rather 2009 predicted water quality was compared to existing water quality to identify the trend in concentrations. This approach was adopted because the existing integrated model for the Hawkesbury-Nepean River (which must account for effluent discharges, extractions, dams, hydrology, rainfall, catchment runoff and biological interactions) does not have sufficient accuracy to predict actual concentrations. A new and improved model is proposed as part of the Hawkesbury Nepean integrated water monitoring framework.

Concern about the Sydney Water South Creek Water Servicing Strategy

Several submissions had concerns about Sydney Water's strategy for providing water related services to the growth centres.

In December 2004 the NSW Government announced a new land release plan for the South West and North West Growth Centres as part of the Metropolitan Strategy. Most of these growth centres are in the South Creek Catchment of the Hawkesbury-Nepean River.

The Growth Centres Commission (GCC) has been established to manage the planning and infrastructure coordination of the land releases in the growth centres. Sydney Water is supporting the GCC in planning to deliver water, wastewater and recycled water to the growth centres.

Urban development in the growth centres will have dual reticulation, supplying both potable and recycled water. Recycled water will be provided if there is a source available such as a STP. Recycled water will be used outdoors and for toilet flushing. Other uses such as washing machines are being investigated. The demands for recycled water from each of these growth centres will ensure the majority of the tertiary treated effluent produced by treating wastewater from these growth areas will be recycled.

Environmental impact assessment of proposals to provide water and wastewater services to South Creek new growth areas will be undertaken separately. The agency responsible for this assessment would consider cumulative impacts due to other initiatives in the catchment including the Project.

The EA used 2009 flow projections for the STPs, which included the increased volumes that will come from new development areas in the catchment. The resulting increase in effluent was considered as part of the total volume of effluent available for reuse and discharge to South Creek.

Concern about Sydney Water's approach to the management of wastewater in the Hawkesbury-Nepean River

Sydney Water developed a plan in 1997 for the management of Sydney Water's STPs that discharge to the Hawkesbury Nepean River. The plan (the Hawkesbury-Nepean Wastewater Strategy) identifies options for reducing the impact of wastewater discharges on river quality, while at the same time providing wastewater services to an increasing population in the catchment. Information on the strategy was included in section 2.2.2 of the EA.

Over the last 10 years the strategy has resulted in upgrades to nutrient removal processes at the Sydney Water STPs that discharge into the Hawkesbury-Nepean River. These upgrades have resulted in significant reductions in loads of total phosphorus and nitrogen being discharged, with Sydney Water's STPs upstream from Sackville having reduced these loads by 93 per cent and 54 per cent respectively (SWC 2005), which has resulted in a significant reduction in the occurrence of algal blooms. The current upgrade of Water Camden STP and the Project will further reduce nutrient loads discharged to the Hawkesbury-Nepean River.

Recommendation that a Memorandum of Understanding be established between Sydney Water and the Department of Primary Industries for projects that will have the potential to impact on estuaries, dams, impoundments, lakes, streams, creeks, harbours and ocean waters

Sydney Water regularly consults with the Department of Primary Industries during the planning, construction and operational phases of major projects and all maintenance activities that are undertaken within or in the vicinity of waterways. This consultation includes obtaining advice on the application of the Department's legislation/policies, threatened species, general impact assessment requirements and protection measures for aquatic habitats, species and commercial fisheries and has proved effective to ensure project outcomes are understood and implemented. The EA provides details of the consultation that occurred during the preparation of the assessment and outlines future consultation with the DPI (also refer to the revised statement of commitments in **Chapter 5** of this report).

A Memorandum of Understanding (MOU) would normally be established at a more strategic level for broadly based policy and strategic considerations and not project based issues. Sydney Water would consider the need for an MOU if approached by the Department.

Concern that the project does not comply with the precautionary principle requirement contained in Sydney Water's Ecological Sustainable Development Policy

Sydney Water is committed to ensuring the principles of Ecologically Sustainable Development (ESD) underpin its decision making processes. Chapter 4 of the EA outlined the criteria used to assess the key aspects of the Project where alternatives developed and considered including:

- treatment options for the AWTP
- recycled water discharge locations.

The major considerations when evaluating the options were:

- saving up to 18 billion litres a year of current Warragamba Dam discharges by providing high quality recycled water to the Hawkesbury-Nepean River as a replacement for existing Warragamba Dam releases

- reducing the discharge of nutrients from Penrith, Quakers Hill and St Marys STPs into the Hawkesbury-Nepean River and South Creek
- maintaining appropriate flows for irrigation
- ensuring environmental values are maintained, including aquatic ecosystems, primary industries, recreation and aesthetics and drinking water.

Sydney Water has adopted the following definition of the precautionary principle:

reduce the chance of serious environmental problems even if we are not sure that these problems will occur

By reducing the discharge of nutrients and other contaminants through AWTP and ensuring that environmental values are maintained the project will comply with the precautionary principle. In addition, a suite of mitigation measures for the management of the construction and operation of the project are contained in Chapter 8 of the EA. These measures have been devised to reduce impacts that may occur. There will not be any serious or irreversible impacts resulting from the project.

Assertion that all STPs discharging to the river should have advanced tertiary treatment

Sydney Water's strategy for managing STP discharges in the Hawkesbury-Nepean River was developed to reduce the impact of wastewater discharges on river water quality as discussed above. The strategy was endorsed in consultation with DEC. Most Sydney Water STPs discharging into the Hawkesbury-Nepean River have already been upgraded to world-class standards of tertiary treatment resulting in the 93 and 54% reduction in phosphorus and nitrogen stated earlier.

Section 7.2.2 of the EA shows that 91% of total phosphorus and 87% of total nitrogen originates from diffuse sources in the Hawkesbury-Nepean River catchment. Further capital intensive upgrades of STPs would deliver only marginal improvements in water quality. Sydney Water will however continue to consult with DEC and other agencies and adapt its strategy as necessary as new information becomes available.

Concern regarding the operation of the Replacement Flows Project without environmental flow releases from the Upper Nepean Dams

Changes to the environmental flow releases from the Upper Nepean dams will occur concurrently with the Project. The Project EA was based on the assumption that the Upper Nepean Dam releases would occur, as described in the NSW Government's *2006 Metropolitan Water Plan*. DNR is responsible for regulating environmental flow releases from the Upper Nepean dams through water management licences. The SCA will be responsible for implementing the environmental flow releases and modification of weirs.

Recommended that Sydney Water not proceed with the project until the proposed alterations to the existing Upper Nepean weirs are completed as water flows cannot be accurately predicted.

Section 7.1 of the EA assumed that modification of the weirs in the Upper Nepean River would be implemented by 2009 in addition to the Project. This modification will be the responsibility of the Sydney Catchment Authority. The impacts addressed in the EA are based on this and other water flow and quality conditions being implemented before the Project commences operation, as outlined in Section 7.1 of the EA.

Request for clarification that the West Camden STP upgrade has been factored into short and long-term effluent flows.

One submission requested clarification as to whether the West Camden STP Upgrade had been factored into the short and long term effluent flows.

The EA acknowledges a number of river and water cycle management activities that will be implemented in addition to the Project, one of which is the upgrade of West Camden STP to improve the quality of effluent discharged into the Upper Nepean River.

In undertaking the assessment of the impacts and benefits of the Project, it was assumed that upgrade of West Camden STP had occurred. The assessment of the Project's predicted impacts in 2009 included water quality conditions that would result from the upgrade of West Camden STP. These conditions were referred to as the '2009 flow' and 'water quality conditions' within the assessment.

The West Camden STP upgrade will be completed before the end of 2007, prior to the operation of the AWTP.

Concern about licensing requirements for the Project

Sydney Water notes that the Project will require a licence to operate under the *Protection of the Environment Operations Act 1997*. Sydney Water will lodge an application to DEC to operate the Project.

Concern about licensing requirements for the Penrith Lakes Scheme "Nepean Lakes System"

One submission raised concern that there is an unclear licensing arrangement to meet the needs of the Nepean Lakes system ("Penrith lakes"). The Penrith Lakes Scheme is not a Sydney Water responsibility and the licensing arrangements for the scheme are beyond the scope of this EA.

A separate EA for the Penrith Lakes Scheme to extract water from above Penrith Weir has been prepared by the Penrith Lakes Development Corporation. DNR will be responsible for ensuring that the operation of the Penrith Lakes scheme and the Project do not significantly impact on flows within the river.

3.3 Description of the Project

Concern over impact on ability to supply recycled water from St Marys STP to Ropes Crossing and other development sites in the vicinity

One submission required that the project should not impact on the delivery of recycled water to Ropes Crossing release area and other future precincts in the St Marys Development Site. Concerns were related to impacts on effluent quality, land required on the St Marys STP site for a recycled water facility and the approvals process.

Sydney Water is committed to providing recycled water to the St Marys Development site. The predicted recycled water demand for Ropes Crossing and future precincts was considered for when determining the amount of water available from St Mary's STP for use as replacement flows. The Project will not impact the quantity of tertiary treated effluent available for recycling opportunities at St Marys STP. It will therefore not impact on the quality and quantity of effluent available for the St Marys

Development. A suitable site on the St Marys STP site will be allocated for additional treatment facilities for the Ropes Crossing development site. The Ropes Crossing Recycled Water Scheme and future precinct developments and the Project are separate projects, with neither relying on each other to proceed. Therefore, the Project will not impact on the approval process for the supply of recycled water to the St Marys Development site.

Concern about establishing easements

Sydney Water intends to obtain easements for the pipelines, where appropriate. Sydney Water will continue to consult with relevant landholders regarding the establishment of easements following completion of the detailed design stage of the project.

Concern regarding the locations and maintenance of pipelines to minimise impacts on future developments.

There were a number of submissions regarding the pipeline routes and depths. Apart from one, these submissions did not object explicitly to the selected pipeline routes, however they wanted to ensure that the final design of the pipelines did not pose significant constraints to future development. Concern was also raised regarding future access requirements to maintain the pipelines. Appropriate consultation with the relevant organisations will be undertaken during the detailed design phase to ensure that these specific concerns are addressed.

One submission objected to part of the concentrate pipeline route adjacent to the rail corridor between Seven Hills Station and Abigail Street, Seven Hills. The submission also had concerns that the concentrate pipeline route in the EA crossed the rail corridor at two points near Seven Hills Train station. The concentrate pipeline route has been revised and now avoids the rail corridor at Seven Hills and the rail line crossings.

Request that pipeline routes minimise creek crossings and disturbance to riparian vegetation

One submission requested that impact to creeks and riparian vegetation be minimised. Impacts associated with creek crossings will be minimised by under boring to avoid creek vegetation and landscape features. Further, a number of safeguards have been identified to minimise disturbance within Table 8.1. of the EA.

Concern about the removal of other pollutants apart from nutrients and dissolved solids

The reverse osmosis process essentially removes all particles and dissolved chemicals that may be present in water (Binnie et al 2002). The EA focused on the ability of the treatment processes (which include reverse osmosis) to remove nutrients and total dissolved solids as these are the prevalent contamination issues in sewage effluent. These are also the contaminants that would have the greatest impacts on the overall health of the Hawkesbury-Nepean River.

Micro or ultra filtration pre-treatment combined with reverse osmosis treatment will generally reduce or remove chemicals of health concern that may be present in tertiary treated effluent such as those identified in the Health Risk Assessment discussed in the EA (aldrin, benzo(a)pyrene) and dibenzo(a,h)anthracene). For example, reverse osmosis treatment has been demonstrated to remove organic pollutants and pesticides (such as Aldrin) from contaminated water (USEPA 2001).

However size-exclusion is not the only mechanism of purification in the reverse osmosis process. Other important mechanisms that assist

in preventing molecules from passing through the membrane include hydrophobic adsorption and, in some cases, electrostatic repulsion.

The AWTP will be designed and constructed to provide reliable and practical automatic operation to achieve the required performance standards. Its reliability will be ensured by:

- installing proven and reputable equipment
- providing appropriate levels of equipment redundancy that provide for both equipment maintenance and failure without compromising the plants ability to meet the specified water quality objectives
- online monitoring and alarm systems
- skilled operators
- implementing asset management systems that provide for the proper maintenance and renewal of equipment.

A capacity and performance test will be undertaken annually to ensure that there is no deterioration of the plants performance from year to year that may impact on the key performance targets and compliance requirements.

Reliability of the AWTP will be governed by a large number of elements and factors some of which will be tested through the pilot facility, although it cannot replicate full scale plant operation.

Request for details regarding concentrate storage at Quakers Hill STP.

One submission requested details of the concentrate storage facility at Quakers Hill STP, including how many days storage could the pond hold, the contingency plan for AWTP shutdown and impacts on effluent discharge at Quakers Hill, St Marys and Penrith STPs.

A storage pond with a capacity up to 25ML would be constructed at Quakers Hill STP, which will be capable of storing up to three days of concentrate production from the AWTP operating at full capacity. During wet weather periods, if the concentrate cannot be discharged into the NSOOS, the AWTP could continue to operate, with the concentrate temporarily stored in the storage pond at Quakers Hill STP. Once the storage pond reaches a specified volume below its storage capacity, the AWTP operation would be reduced to a 'single train' or would temporarily cease. The temporary reduction or cessation of operations would reduce or eliminate production of the highly treated recycled water and the concentrate. Reduced volumes of recycled water would continue to be discharged into the Hawkesbury-Nepean River at Penrith during periods of reduced operations and would cease during periods of complete shutdown. During these periods of reduced production or shut-down, the STPs would resume their current operation of discharging tertiary treated effluent to the receiving waterways.

3.4 Alternatives

Suggestion to supply highly treated recycled water directly to irrigators

The objectives of the Project are outlined in section 1.3 of the EA and these are to:

- save up to 18 billion litres per year of current Warragamba Dam discharges by providing high quality recycled water to the Hawkesbury-Nepean River as a replacement for existing Warragamba Dam releases
- reduce the discharge of nutrients from Penrith, Quakers Hill and St Marys STPs into the Hawkesbury-Nepean River and South Creek
- maintain appropriate flows for irrigation
- ensure environmental values are maintained, including aquatic ecosystems, primary industries, recreation and aesthetics and drinking water.

The first objective of the Project would not be achieved if the irrigators were supplied directly with the highly treated recycled water from the AWTP.

The majority of extraction for irrigation in the region occurs directly from the freshwater tidal pool downstream of Yarramundi. If Sydney Water was to supply water from the AWTP directly to these irrigators and the irrigators were to surrender their extraction licences, the environmental benefit would only be realised downstream of Yarramundi. Upstream of Yarramundi there would be no change in flow from this scenario and flow releases from Warragamba Dam would have to continue to maintain river health downstream of Penrith Weir. Therefore Warragamba Dam releases would not be saved and the first objective of the Project not achieved, although it is recognised that there would be environmental benefits downstream of Yarramundi through a reduction in effluent discharge and irrigation extraction.

Another issue associated with supplying directly to irrigators is pricing. Under its operating licence Sydney Water is obliged to charge irrigators for the supply of its services including reuse water. Although the cost to irrigators has not yet been estimated it is likely that the costs would be substantially higher than the fees the irrigators currently pay for their river extraction licences. Although some irrigators may be prepared to pay for surety of supply, other irrigators may not want to pay increased costs associated with new infrastructure and the ongoing supply of reuse water.

The other main issue in regard to supplying irrigators is the varying demand across seasons. Generally in the Sydney Basin the highest demand for irrigation water is in spring and summer with demand decreasing in autumn and almost non-existent in winter. Therefore unless large storages are constructed, significant volumes of tertiary treated effluent would continue to be discharged into the Hawkesbury-Nepean River in winter and to a lesser extent in autumn. The construction and operation of large storages in the Sydney basin is not an attractive option due to scarcity of available land.

Recycled water suitable for irrigation does not need to be treated to the high standard proposed for the Project. Tertiary treated effluent from the three STPs is already suitable for irrigation use, conditional on the soil, groundwater and crop characteristics in the application area. Tertiary treated effluent from St Marys and Quakers Hill STPs is currently used for irrigation of golf courses. An expanded program of effluent reuse from St

Marys, Quakers Hill and Penrith STPs is also proposed as part of the *2006 Metropolitan Water Plan*.

Concern about lack of discussion regarding use of AWTP recycled water to load shed water extraction from Warragamba Dam to allow environmental discharge from the dam. The Project should allow 1:1 release from the dam for each litre of water recycled from the AWTP

This concern was interpreted as meaning that the highly treated recycled water from the AWTP should be used for recycling such as irrigation, or for residential non potable water uses. This would then allow for the continued release of water from Warragamba Dam for Environmental Flows on a pro rata basis for recycled water from the AWTP.

The use of the AWTP to directly supply recycled water as proposed by the submission would not achieve the Project objective of saving of 18 billion litres per annum of water released from Warragamba Dam. It should be noted that the Project forms only one part of the multiple strategies developed by the NSW State Government to manage water resources for the Sydney metropolitan area (refer to the *2006 Metropolitan Water Plan* for more detail).

Sydney Water is currently investigating local recycled water schemes within the study area, which would include the supply of treated effluent from Penrith, St Marys and Quakers Hill STPs. Recycled water will also be supplied to new residential growth areas, saving nine billion litres of water per annum. These schemes would include parkland and golf course irrigation. It should be noted that there would be adequate volumes of effluent available to produce recycled water for the local recycled water schemes and future residential growth in the region as well as the AWTP releases to the Hawkesbury-Nepean River.

The problems associated with the supply of recycled water from the AWTP to irrigators are discussed above.

Suggestion to use more recycled water

One submission recommended that Sydney Water review the Project to determine if more recycled water could be used by local government, state agencies, schools, golf courses and parks.

Sydney Water is currently investigating a number of local recycled water schemes, from Penrith, St Marys and Quakers Hill STPs, which will occur concurrently with the Project. These local schemes are proposed to provide recycled water for irrigation and industrial use within the vicinity of the STPs. The supply of recycled water to new developments (primarily the Growth Centres) is also proposed.

In addition to planned schemes, a number of irrigation customers already receive recycled water from the three treatment plants. For example, Quakers Hill supplies recycled water to Ashlar Golf Course, St Marys supplies Dunheved Golf Course and Penrith supplies Hickey's Reserve, Andrews Road Baseball Complex and Greygums Oval.

Concern regarding rationale for the preferred treatment process

One submission stated that the EA provided no rationale for the selection of the preferred treatment process (ie microfiltration or ultrafiltration, single pass reverse osmosis and breakpoint chlorination) and did not categorically define whether microfiltration or ultrafiltration would be part of the preferred option. It also requested justification for not selecting dual pass reverse osmosis and denitrification as the preferred treatment process.

Chapter 4 of the EA provides a detailed assessment of the options considered in determining the preferred main treatment process for the Project. Single pass osmosis was selected as the preferred treatment process as it would achieve the relevant water quality objectives at the discharge location at the least cost. Dual pass reverse osmosis would only result in a minor improvement in water quality downstream of the discharge location, the costs of this option (including energy use) are significantly higher, by approximately 20%, and do not warrant the relatively minor additional improvements in water quality. Energy required for dual pass would increase overall greenhouse gas production of the Project. Whilst dual phase reverse osmosis would provide a slightly higher quality of recycled water, this level of quality is beyond that required to meet the objectives of the Project.

The preferred pre-treatment process (ie microfiltration or ultrafiltration) would be determined during tendering and design phase of the Project. Pre-treatment would be required to remove any remaining solids in the tertiary treated effluent to prevent fouling of the reverse osmosis membranes. Either microfiltration or ultrafiltration would be suitable for pre-treatment and the choice of options would be based on the final design requirements. The final process design and the type of membranes would determine whether microfiltration or ultrafiltration is required.

Suggested use of water tanks for garden use in urban areas

The issue of the use of rainwater tanks for garden use in urban areas is beyond the scope of the Project.

The *2006 Metropolitan Water Plan* adopts a multi-faceted approach to ensure that water demand will be met through existing dam supplies and a combination of recycling, water saving measures (reducing demand), and the provision of additional supplies.

The plan includes a comprehensive range of water saving initiatives tailored to all major water usage sectors, from residential to industrial, agricultural and Government. The plan identifies the use of rainwater tanks as a water saving initiative. The use of rainwater tanks is an effective way to take the pressure off limited water resources and at the same time, help manage stormwater runoff. However, they are more expensive per litre of drinking water saved than many other measures to reduce demand and increase supply. For example, if one third of Sydney's existing detached dwellings (say 665,000 homes) were provided with a 5,000 litre rainwater tank for use in the laundry, toilet flushing and garden, the savings would be significant at 50 billion litres per year, however the cost would be around $2.3 billion. This is a much more expensive way to save water on a large scale than mass recycling schemes, such as dual reticulation in new suburbs.

Nevertheless, rainwater tanks do play a role in saving Sydney's precious drinking water, do save householders money through lower water bills, capturing stormwater at its source and help raise awareness of the importance of water conservation.

Sydney Water currently offers rebates to customers who install rainwater tanks.

Suggestion to add the reverse osmosis water to Sydney's drinking water supply (ie indirect potable reuse)

A number of submissions suggested that the highly treated recycled water should be discharged into Warragamba Dam and, once mixed with dam waters, used to supply drinking water for Sydney. As identified in the *2006*

Metropolitan Water Plan, introducing recycled water into Sydney's drinking water supply is not NSW Government policy and therefore this option has not been considered.

3.5 Part 3A process

Concern that Sydney Water has not adequately addressed the Director-General's EA Requirements

Table 5.1 in the EA listed each of the Director-General's EA requirements and identified where each was addressed in the document. All the requirements are addressed within the EA. This is supported by the Department of Planning's adequacy assessment of the draft EA. As required by S75h of the EP&A Act, the adequacy assessment was undertaken by the Department of Planning prior to acceptance of the EA for exhibition.

As part of the adequacy assessment of the draft EA, the Director-General sought advice from relevant agencies, councils and Department of Planning officers, to determine if the draft EA adequately addressed the matters in the Director-General's EA requirements and that the information was adequate prior to exhibition.

On 26 October 2006 the Department of Planning advised Sydney Water that the draft EA adequately addressed the Director-General's EA requirements, as issued on 1 September 2006.

3.6 Regulatory requirements

Requirements in relation to fish passage/fish migration (which includes crustaceans) under the Fisheries Management Act 1994 have been omitted

Table 6.4 in the EA assess the application of the *Fisheries Management Act 1994* to the Project. The consideration of fish passage/fish migration is also indicated in the table. Detailed consideration of the effects of the project on fish habitat and migration and the requirements of the Fisheries Management Act 1994 is included in section 7.5.5 of the EA.

3.7 Water Quantity

Concern about the reduction in flows in the Hawkesbury-Nepean River

There were a number of submissions which claimed that there would be significant reduction in flows in the river available for extraction due to the Project. When the Project is considered in conjunction with increased environmental flow releases from the Upper Nepean Dams as well as new flow rules for Warragamba Dam the total flows in the river will increase compared to existing conditions.

Viewed in isolation, the maximum potential reduction in overall inflows and/or water availability for extraction due to the Project alone would be 51.3ML/day, which would include the cessation of Warragamba Dam releases (43.3ML/day) and the transfer of concentrate to the ocean (8ML/day). The 43.3ML/day release from Warragamba is not made for licensed extractions, however, it is environmental water and for riparian users. The actual reduction in water availability will depend on how the replacement flows are licensed by DNR, namely what proportions are

allocated to the environment and for extraction. Also there is a new regime for compensatory flow releases from Warragamba Dam being developed which aims to ensure that there is sufficient water to meet irrigator demand especially in low flow periods.

The submissions which claimed that there would be significant reduction in flows in the river available for extraction due to the Project quoted various estimates of flow reduction to justify these claims. These are considered in detail below:

- one submission calculates a reduction in water availability of 63ML/day based upon excluding all environmental flows in the river. However, it does not consider that 33.3ML/day of flows from Warragamba Dam is currently released as an environmental flow (See SCA Water Management Licence). It also does not take into account that some of the reductions in flow are due to planned local reuse schemes and not due to the Project
- another submission also does not recognise environmental flows and calculates a *reduction* in flows in the river of 22ML/day downstream of Penrith and a 70% reduction in flows from South Creek. This assumes that all of the replacement flows would be available for irrigation. The 70% reduction in effluent discharged to South Creek due to the Project does not equate to a 70% reduction of flows in South Creek. Approximately 30% of tertiary treated effluent from St Marys and Quakers Hill STPs will continue to be discharged to South Creek. There are also existing flows in South Creek (especially in wet weather) from upstream and tributaries, as well as other STP discharges (Riverstone, South Windsor and McGraths Hill STPs discharge about 7 to 8ML/day). Some of the future reductions in flow will be due to the supply of recycled water from St Marys and Quakers Hill STPs to planned local reuse schemes and would not be a result of the Project
- a third submission claims that 60ML/day will be diverted from the Hawkesbury-Nepean River but provides no justification for this estimate
- a fourth submission claims a yearly net decrease of 18.2GL/year in flows and a halving of the current river flows. Neither of these assertions is correct based upon modelling data.

Another matter of relevance is how the current environmental flow releases from Warragamba Dam are protected as a requirement to maintain 50ML/day of flows over Penrith Weir to provide water for downstream users. Currently this environmental flow release does not appear to be protected from extraction. The tertiary treated effluent discharged into the river from the STPs is also not currently formally recognised as being available for extraction by irrigators and other water users. It should be noted that the draft Water Sharing Plan, which aims to protect environmental flows and regulate river extraction, currently does not recognise tertiary treated effluent discharge as a source of water.

Concerns about the availability of water for riparian users and irrigators is discussed in **Section 3.9**.

Concern regarding the flows between Penrith Weir and North Richmond Water Filtration Plant.

The EA makes reference to the '2009 flow' as the basis of the impact assessment for the project. Section 7.1 of the EA outlines a number of river and water cycle management activities that would have an influence on the 2009 flow conditions, which include the Project and increased flow releases from the Upper Nepean Dams, as described in the *2006 Metropolitan Water Plan*.

Figures 7.4 and 7.5 of the EA illustrate the 2009 flow conditions in the Hawkesbury-Nepean River. The figures show that, during both drought and non-drought conditions, in low and median flows the volume of water in the river would increase between Penrith Weir and North Richmond WFP.

However, the allocation of flows between the environment and water users has yet to be determined and this is further discussed in **Section 3.9**.

Concern regarding the impacts on the hydrology of South Creek

A number of submissions requested that an additional hydrological analysis of the impact of reducing effluent discharges on South Creek be undertaken. This is not considered necessary, as a further hydrological assessment would not provide any additional valuable information.

The South Creek system downstream of the St Marys and Quakers Hill STP consists of two sections, non-tidal and tidal fresh water. Between the STP discharge locations and the tidal extent, base flows in the South Creek system would decrease by the volume of tertiary treated effluent from St Marys and Quakers Hill STPs diverted to the AWTP. This would equate to dry weather flows in 2009 of approximately 24ML/day of effluent from St Marys and Quakers Hill STPs. There would also be discharges from other STPs of about 7 to 8 ML/day and base flows from upstream of St Marys and Quakers Hill STPs. These flows would be reduced by any extractions by irrigators or other water users. In some sections of the non-tidal reaches (mainly riffle areas) there may be a corresponding decrease in water levels, however, in most locations the creek system has become a series of ponds with the downstream outflow regulated by either a natural or man-made structure. The water levels in the ponds are unlikely to change significantly, however, the total water volume which flows through the pond would change. It should be noted that in effect the Project will result in more natural flows in South Creek than that exist currently.

In the tidal section of the South Creek system, there would be a negligible change in dry weather water levels as water levels in this section of the creek are dominated by freshwater tidal flows from of the Hawkesbury-Nepean River. There would be a reduction in flow, but flows in this section of the creek are predominantly influenced by the tide and therefore cannot be easily calculated.

There are no protected environmental flows in South Creek as base flows in dry weather are less than 1ML/day. It is also beyond the scope of the EA to recommend any environmental flow releases for this catchment.

Concern regarding impacts on Boundary Creek

Boundary Creek currently receives a flow of 22ML/day from Penrith STP. The discharge due to the Project will increase this volume to 50ML/day. The most likely impact on Boundary Creek due to the Project will be the potential for increased erosion of alluvial areas.

The EA included an assessment of the impacts of the project on erosion in Boundary Creek, which concluded that the main causes of the erosion appear to be high wet weather flows and receding floodwaters from the Nepean River.

The water quality in Boundary Creek will improve with the operation of the Project as the tertiary treated effluent that is currently discharged to the creek will be replaced with highly treated recycled water that has significantly lower levels of nutrients and dissolved solids.

Concern that environmental flow releases from the Upper Nepean Dams would not support the ecological health of the entire river

There was concern expressed in one submission that the environmental flow releases from the Upper Nepean Dams would not support the ecological health of the whole river. The submission recommended that flow releases from Warragamba Dam should not cease until the regulatory provisions, structural modifications and monitoring of the Upper Nepean Dam releases have been completed.

Environmental flow releases from the Upper Nepean Dam cannot alone ensure the ecological health of the river. A number of other measures such as the modifications to Upper Nepean weirs, cease to pump rules, implementation of the Water Sharing Plan and the final flows rules for Warragamba Dam are other important measures that will ensure that the ecological health of the river is improved and maintained in the long term.

The regulatory provisions and structural modifications for the environmental flow releases from the Upper Nepean dams are planned to be completed by the time the Project becomes operational in 2009. Monitoring of the effectiveness of the Upper Nepean Dam flow releases will occur as soon as they become operational as part of the Hawkesbury-Nepean River integrated monitoring program.

Concern about inadequate dilution of STP effluent in the study area

South Creek

The Project will divert up to 70% of the effluent discharged into South and Eastern Creeks from St Marys and Quakers Hill STPs to the AWTP to produce highly treated recycled water. The remaining STP discharges into South and Eastern Creeks would, however, still dominate low flow conditions. In 2009 it is predicted that St Marys STP would still discharge approximately 5ML/day and Quakers Hill STP would discharge approximately 19ML/day. In comparison to the upstream dry weather catchment flows of approximately 1ML/day, these discharge volumes are still significant.

Although the STP discharges would still dominate flows, the diversion of tertiary treated effluent to the AWTP would result in an approximate 70 per cent reduction in nutrient loads from the STPs contributed to the catchment with the exception of ammonia, which would reduce by approximately 57 percent.

Mass balance modelling results that were presented in the EA indicate that instream concentrations of all forms of nitrogen and total phosphorus in Eastern Creek in 2009 would decrease when compared to existing conditions, but concentrations would still exceed relevant guidelines for all nutrients.

A similar pattern would occur for South Creek as a result of the changes to discharges from St Marys STP. Concentration of all forms of nitrogen would decrease (while still being above relevant guidelines). Total phosphorus concentrations would, however, increase slightly due to the loss of the dilution effects of the STP discharges and the continuing high upstream total phosphorus contributions from catchment runoff. Therefore, due to the influence of other nutrients sources in the catchment, the STP effluent is currently providing dilution flows that are particularly influencing lower phosphorus concentrations in South Creek.

Wallacia Weir to Penrith Weir

In the Wallacia Weir to Penrith Weir section of the Hawkesbury-Nepean River, improvements to West Camden STP and the implementation of a recycled water scheme at West Camden will significantly reduce nutrient loads discharged upstream of this river reach. Also the increased flows from the Upper Nepean dam releases would further dilute discharges from Camden STP. The combination of these factors would result in a decrease in nitrogen concentrations at Wallacia Weir and Penrith Weir. Chlorophyll-a concentrations at Wallacia Weir are also likely to decrease.

Penrith Weir to Yarramundi

From Penrith Weir to Yarramundi, the Project would result in a reduction in nutrient loads to the Hawkesbury-Nepean River compared with the discharge of tertiary treated effluent from Penrith STP. There would be approximately 14 per cent reduction in total nitrogen loads and approximately 75 per cent reduction in total phosphorus loads discharged below Penrith Weir compared with 2009 Penrith STP discharge in the absence of the Project. There would also be no ammonia discharged in the replacement flows due to the incorporation of breakpoint chlorination, which converts it to nitrogen gas. Oxidised nitrogen loads discharged downstream of Penrith Weir would be reduced by approximately 2,665 kg/year, or 25 per cent, compared to those estimated for 2009 without the Project. This section of the river will also receive increased flow.

The Yarramundi to South Creek and South Creek to Sackville sections of the river will also experience decreases in total nitrogen concentrations as a result of the Project and a decrease in chlorophyll-a (an indicator of algal growth) is predicted.

Overall, the impacts of STP effluent on the Hawkesbury-Nepean River with regard to nutrient concentrations will be reduced by the Project and the Upper Nepean Dam releases. Whilst further dilution may be desirable, it is beyond the scope of the EA to recommend further environmental flow releases.

Concern about variability in flows to mimic natural flow regimes

A number of submissions highlighted the concern that the replacement flows would be discharged at a constant rate, which does not meet HRC and HNRMF objectives for re-instating variable "natural" flows regimes to improve and maintain river health.

The current flow regime in the lower Nepean River is characterised by low variation in flows. Currently there is no flow contribution from the Upper Nepean River over Wallacia Weir for 40% of the time (ie flows lower than the 60th percentile). Under this flow condition the only flow source would be from the Warragamba Dam releases (which are constant 43.3 ML/day), constant STP discharges (36 ML/day) and tributary inflows, which exhibit some natural variation depending on the influence of any water extractions and antecedent rainfall.

In 2009, there would be an increase in flow variability downstream of Wallacia Weir primarily due to the influence of increased Upper Nepean Dam releases. The increased releases which have been based upon recommendations from the Hawkesbury-Nepean River Expert Panel and Forum would have a transparent and translucent component which aim to mimic "natural" flow regimes by increasing flow variability. Also unlike the current flow regime there would be increased variability in flows lower than the 60th percentile.

While the replacement flows would be discharged at a constant rate and this does not mimic "natural" flow regimes, the Project is designed to replace the constant discharges from Warragamba Dam. To produce "pulsed" or natural flows from the AWTP would either require a large storage (which would be uneconomic and would have additional environmental impacts) or varying the volumes of discharges from AWTP. It is likely that, if the volume of replacement flows discharges were varied, compensatory flow releases from Warragamba Dam would be required on a 1:1 basis to make up for the shortfall in discharge and this would obviously not avoid the problem of constant discharges. Also if the production of replacement flows was decreased during certain time periods to mimic natural variability, there would be a corresponding increase in the discharges of tertiary treated effluent into South Creek from St Marys and/or Quakers Hill STP as there would be no longer any "use" for the tertiary treated effluent. This would decrease variability in flows and would increase nutrient loads discharged in South Creek and Hawkesbury-Nepean River system.

It should be noted that release rules for Warragamba Dam have yet to be determined and are scheduled for review in 2009 and final determination in 2015. If the flow rules are based upon the recommendations of Hawkesbury Nepean River Expert Panel and Forum, they are likely to have transparent and translucent components which would aim to mimic natural river flow regimes. The replacement flows discharge will be considered when developing the new flow rules for Warragamba Dam and the WSP for the system. It would be expected that in developing the new flows rules and WSP the replacement flows discharge would be considered and allocated appropriately to ensure the competing objectives of increasing flow variability and provision of water for downstream users are achieved.

It should also be noted that, below Yarramundi, the Hawkesbury-Nepean River is a tidal freshwater pool, therefore during low flow conditions, flow will be dominated by tidal movement rather than freshwater inflows. Only large wet weather inflows can affect flows in the freshwater tidal pool. During wet weather conditions the replacement flows would only make up a small proportion of total flows.

Concern about how the volume of the Warragamba River was determined

The section of Warragamba River assessed using the mass balance modelling was downstream of the new Wallacia STP discharge. For this purpose, the approximate dimensions of the Warragamba River were determined to be:

- length: 1.8 km
- an average depth of 2m obtained from DEC bathymetry data
- width: 30 m.

Based on these dimensions, the volume of the Warragamba River was estimated to be approximately 108ML with a surface area of approximately 54,000m^2.

3.8 Water quality

Concern regarding the EA conclusion that the project will provide long reaching environmental benefits providing significant broader river health improvements.

The Project will contribute to broader river health improvements, specifically with regards to nutrients and this improvement will have long reaching effects (ie as far down the Hawkesbury River as Sackville). This assessment is supported by the integrated modelling results presented in Figures 4-2 to 4-4 in Appendix C of the EA. It was never the intent of the EA conclusion to claim that the Project alone would significantly improve broader river health. The primary objective of the Project is to save up to 18 billion litres per year of current Warragamba Dam discharges by providing high quality recycled water to the Nepean River as a replacement for existing Warragamba Dam releases.

Concern that nutrient concentrations in the replacement flow will place further stress on the Hawkesbury Nepean River's health

Chapter 7 of the EA describes the effects of the Project on river health and water users. The potential impacts on water quality in the Hawkesbury-Nepean River were modelled (mass modelling and integrated modelling). The results of mass modelling downstream of Penrith Weir concluded that all forms of nitrogen, except for oxidised nitrogen, would be below ANZECC/ARMCANZ (2000) and HRC (1998) guidelines immediately downstream the replacement flows discharge. This is an improvement over existing conditions, where instream water quality does not meet guidelines for any nitrogen species.

The EA also concluded that there would be improvements in water quality further downstream from the discharge point, despite the influence from other catchment pollutant sources. Total nitrogen concentrations would decrease due to the operation of the Project and proposed Upper Nepean dam releases. The Project would also reduce nutrient loads downstream of Yarramundi to South Creek due to improved water quality from the replacement flows and the significant reduction in the volume of tertiary treated effluent discharged to South Creek. However, despite the changes in nitrogen concentrations, total phosphorus and chlorophyll-a concentrations are not expected to change significantly with the Project.

Table 7.10 of the EA provides a summary of the impacts on water quantity, water quality, macroinvertebrates and fish, all of which are good indicators of stresses on the river. The predicted impacts on these indicators for the Hawkesbury-Nepean River are neutral or beneficial, indicating that the river would not become more stressed due to the Project. With the increased flow and improved water quality, river health is expected to improve.

It is reiterated that the key objective of the Project is to save water that is currently released from Warragamba Dam by replacing it with high quality recycled water. In achieving this, the Project must also ensure that existing environmental values are maintained. The Project does not aim to achieve significant environmental benefits for the Hawkesbury-Nepean River system, however it is acknowledged that some environmental benefits would be achieved with the implementation of the Project and the proposed environmental flow increases from the Upper Nepean dams.

Concern about reduction in variations in minerals and micro-nutrients due the substitution of Warragamba Dam releases with replacement flows and un-natural physico-chemical properties of replacement flow compared to dam water

Three submissions were concerned with the chemical composition and physical qualities of the replacement flow compared to Warragamba Dam water.

Total dissolved solids in dam water are typically very low due to the nature of our catchments. The highly treated recycled water (replacement flow) will contain levels at the low end of this natural range with 25 to 35mg/L total dissolved solids. It should be noted however that the discharges from dams may not necessarily contain 'natural' concentrations and variations of micronutrients, minerals and other physico-chemical characteristics. The water quality of flow releases from the dam is primarily determined by the level of the dam offtake and impacts of stratification of the storage. Dams may become stratified when the top and bottom waters are poorly mixed. Concentrations of some substances, such as iron, manganese and phosphorus may increase in the leaching of substances from sediments under conditions of low dissolved oxygen. If this bottom water is released, higher concentrations and loads of micronutrients and minerals could affect receiving waters. Unless dams are well mixed (ie surface and bottom water are the same) or flow releases are from surface waters, the flow release from the dam could not be considered natural.

Ecotoxicological assessments on a variety of endemic aquatic species would be undertaken using highly treated recycled water generated by a pilot facility. The results from these studies would determine whether there are any chronic or acute impacts on aquatic species from the replacement flows and whether any additional post-treatment of the recycled water is required (such as re-mineralising the replacements flows, pH adjustment, etc).

The increased Upper Nepean dam releases would contain minerals, micronutrients and other chemicals which would exhibit some variation. These flows releases would make up a large portion of flows especially above the 80th percentile flows. However, as noted above releases from dams may not replicate "natural" water quality conditions and variations.

Concern regarding temperature difference between the replacement flow water and receiving waters

Concerns were raised regarding the temperature differences between the replacement flow waters and receiving waters. It was suggested that temperature differences may result from transport of the replacement flows through pipelines and the heating capabilities of the reverse osmosis process. Some submissions also suggested that additional studies should be undertaken to further investigate impacts of potential temperature differences between the replacement flows water and the receiving waters.

Chapter 7, Section 7.5.5 of the EA acknowledges that there is a potential for temperature differences between the replacement flow and receiving waters. However it is anticipated that the differences would be minimal compared to current discharge practices at Penrith STP and would not cause any significant impacts.

The EA acknowledges the need to undertake further investigations regarding potential temperature impacts associated with the release of replacement flows (refer to Section 7.5.5 and the draft statement of commitments with regards to water quality monitoring and specific

studies, i.e. fish migration). Temperature control measures would be adopted to mitigate against significant thermal impacts associated with the release of the replacement flow water.

Request for sewage effluent quality and sediment monitoring and research

Sydney Water currently monitors the effluent that is discharged from all its STPs in accordance with the Environment Protection Licence (EPL) for each STP issued by DEC. The monitoring data is currently available on Sydney Water's website and will continue to be available in the future. The need for sediment monitoring would be reviewed as part of the planned integrated monitoring program for the Project and the Hawkesbury-Nepean River system.

Request for community information on the constituents of the replacement flow

One submission requested that the community be informed of the level of filtering provided by the AWTP and details of what will remain in the replacement flow.

The tertiary treated effluent will undergo pre treatment, reverse osmosis and post treatment. Reverse osmosis is capable of removing all dissolved solids and organic molecules with molecular weight greater than approximately 100, which is typically 95-99 per cent of all dissolved ionic chemicals. Reverse osmosis also provides an effective barrier to pathogens and would remove chemicals such as pesticides, herbicides and pharmaceuticals.

Table 3.2 of the EA provided details of the likely water quality of the highly treated recycled water. Under normal circumstances highly treated recycled water would contain approximately 0.45 milligrams per litre (mg/L) of readily available nitrogen, approximately 0.8mg/L of total nitrogen and approximately 0.01mg/L for total phosphorus. The total dissolved solids concentration would be approximately 25 to 35mg/L.

Monitoring of the replacement flow is discussed in detail in various responses below.

Concern regarding the proposed solution to maintain acceptable Warragamba River water quality

The EA acknowledges that the Project would impact on water quality (section 7.4.1, pg 7.21) and aquatic ecology (section 7.5.1, pg 7.32) of Warragamba River. The EA also outlines that options will be investigated to maintain acceptable water quality levels to minimise aquatic weed and algal growth within this river (section 7.4.1, pg 7.21) and the Draft Statement of Commitment, Number 5, stated that *"Sydney Water would continue to investigate to establish suitable solutions to maintain acceptable water quality in the Warragamba River"* (pg 11.2). This commitment has been revised in response to submissions to include consultation with appropriate Government agencies regarding water quality objectives (and is now Commitment Number 7, within **Chapter 5**).

Sydney Water will implement an appropriate solution to maintain acceptable water quality in the Warragamba River prior to the operation of the Project. A short list of options is currently being assessed to determine the preferred wastewater management option for Wallacia STP which is subject to assessment and approval requirements of the EP&A Act and the *Protection of the Environment Operations Act 1997*.

Concern about options for improving the health of South Creek

The Project will remove significant loads of nutrients from South Creek downstream of St Marys and Quakers Hill STPs. Nonetheless, other catchment impacts would continue to influence water quality conditions. Sydney Water would support opportunities to further improve the health of South Creek, where appropriate. However, the responsibility for the management of the South Creek catchment is with local government, DNR and DEC.

Concern that the chemical contamination in South Creek has not been modelled.

Compared to the current situation, the Project will significantly reduce the quantity of nutrients discharged to South Creek. Other chemicals that can be found in effluent will be proportionally reduced but due to their relatively low concentrations the effect would not be significant. As a result, only mass balance modelling of nutrients in the South Creek catchment was undertaken as part of the EA.

The toxicity of effluent is monitored and publicly reported in Sydney Water's Annual Report.

Concern regarding the salt wedge moving upstream in South Creek in very low flows.

Modelling was undertaken for the EA to predict the impacts on the freshwater and saline water interface in the Hawkesbury River. The EA included there would be virtually no change in salinity profile of the estuary due to the operation of the Project and other river management changes in 2009. Therefore there would be no impact on aquatic ecology and irrigators due to changes in salinity in the freshwater tidal pool. The modelling results provided in Appendix C to the EA clearly show that the Project will have virtually no effect on the location of the freshwater/saline interface (refer to Figure 4-5 in Appendix C).

Concern that the change in flows in South Creek would lead to chemical contamination from exposed sediments.

A number of submissions identified concerns with changes in water levels in South Creek which may lead to contaminated sediments being exposed resulting in the release of contaminants. As noted in previous sections, water levels in South Creek are only likely to change in free-flowing non-tidal sections of the creek system. In most locations the creek system has become a series of ponds with the downstream outflow regulated by either a natural or man-made structure and therefore the water levels in the ponds are unlikely to change significantly. Given that water levels are unlikely to change significantly in most sections of the creek, the area of sediments exposed to the air would be small.

Generally leaching of contaminants from sediments occurs when the sediments become anaerobic and subsequently more acidic. As the sediments would be exposed to air and become aerobic, contaminants would tend to oxidise and generally become more harmless, though it is noted that this is not always the case.

The discharges from the STPs will continued to be subject to Sydney Water environment protection licence requirements, hence the South Creek monitoring program will continue to be undertaken. This program comprises physico-chemical water quality and toxicity testing. The latter is aimed at identifying any potential long-term impacts in the creek.

Concern about the area upstream from the South Creek confluence remaining a relatively degraded environment

Even though a large portion of nutrients would be removed from the South Creek catchment below St Marys and Quakers Hill STPs, as a result of implementing the Project, other catchment impacts would continue to influence water quality conditions above the STP discharge points. Sydney Water has no control over other catchment activities that contribute to the waterway health conditions within the South Creek Catchment.

Recommendation for a detailed assessment of the quality of the discharged "brine"

The EA concluded that the concentration of most pollutants in the concentrate (brine) discharged to North Head deep water ocean outfall would actually decrease by a small amount, as the concentrate from the AWTP has lower pollutant concentrations compared to the Northern and Southern Suburbs Ocean Outfall Sewer (NSOOS) wastewater and therefore mixing of the two wastes would result in a dilution of pollutants within the NSOOS wastewater. Given the dilution effect of the concentrate discharge, it was determined that this activity would have minimal affect on the marine environment and commercial fisheries, therefore no additional assessment was deemed necessary.

Monitoring of the North Head STP effluent will continue under its environment protection licence issued by DEC, which includes toxicity testing. The monitoring results will continue to be publicly reported through Sydney Water's Annual Report.

Recommendation for an investigation into the impacts of recycled effluent usage on colour fastness in washing machines.

It should be noted that the replacement flow water generated by the AWTP is of a superior quality (with regard to nutrients, dissolved solids and other contaminants which influence colour fastness). The replacement flow water mixed with Hawkesbury-Nepean River water is not likely to affect clothing colours when used for clothes washing.

Sydney Water is currently studying the use of recycled water in washing machines. The impacts of recycled water on colour fastness will be investigated as part of this study.

In addition, on-going refinement of the risk assessment will be undertaken, based on long-term performance of the full-scale AWTP, combined with detailed studies of river water users.

No other investigations are planned in relation to the riparian use of Hawkesbury River water.

3.9 Agriculture and horticulture

Concern regarding availability of water for riparian users and irrigators from the Hawkesbury-Nepean River

As noted in **Section 3.7** flows in the river downstream of Penrith Weir in 2009 would increase compared to the current situation. Although flows in this section of the river will increase, it is recognised that the volume of water accessible to irrigators may change as more of the flow volume may be allocated to the environment and therefore protected from extraction.

The sustainable allocation of water for the environment, irrigators and riparian users is determined by DNR through its water management licensing system and development and implementation of Water Sharing

Plans (WSP). DNR would determine how the replacement flows would be licensed and allocated. It is likely that a portion would be allocated for the environment, and the remainder allocated to riparian users or irrigators. The allocation of the replacement flows would be undertaken in consideration of the licensed water extractions, environmental flows releases, catchment inflows and other relevant activities that impact river flows. The mechanisms and details of the allocation and protection of flows in the Hawkesbury-Nepean River system (including replacement flows) would be contained in the WSP – which is planned for public exhibition and consultation in 2007. The EA for the Project is not the appropriate mechanism to allocate flows for the environment and irrigators and cannot pre-determine the final outcomes of the WSP.

Minimal extraction occurs between the Wallacia and Penrith Weirs, as there are very few irrigators within this reach of the river. Flow estimates indicate that there would be sufficient flow in the river between Penrith Weir and North Richmond to meet environmental and water user requirements.

Downstream of Yarramundi, water is extracted from the freshwater tidal pool, which depends on high flows for replenishment, rather than dry weather flows. North Richmond Water Filtration Plant extracts water from the tidal pool and is downstream of the Grose River inflow, which delivers substantial volumes of water into the Hawkesbury River. In addition, modelling of the saline intrusion in 2009 low flows indicates there will be no change in the location. Consequently the Project will not affect the irrigators who extract from this section of the river.

Concern about the availability of water in South Creek and the socio-economic impacts on primary producers due to a reduction in the availability of water.

In 2009 it is predicted that the volume of tertiary treated effluent discharged in the South Creek system by St Marys and Quakers Hill STPs would decrease by approximately 70% to about 24ML/day. The reduction in discharge is due to the diversion of tertiary treated effluent to the AWTP as well as predicted increased demand for the effluent for local reuse schemes (primarily irrigation of golf courses and municipal areas such as sporting fields). Although the discharge from these two STPs dominates flows in the South Creek system downstream of their discharge locations, there are other sources of water in the system including Riverstone STP (2ML/day), South Windsor and McGraths Hill STPs (combined volume about 5.5ML/day) and base flows in the creek system. In dry weather base flows in the creek are minimal (less than 1ML/day), however after rainfall catchment flows increase substantially and dominate flow volumes.

Section 7.8 of the EA considers the impacts of the predicted changes in flow in 2009 in the South Creek system including the effect of the Project and other local recycling schemes on primary industries. In developing the Project, the water requirements of water users downstream of the STPs was considered and a sufficient volume of effluent will be retained and discharged into South and Eastern Creeks for downstream irrigation.

Based on flow gauging information, it is estimated that approximately 5ML/day (on average) and average summer demand of 9.3ML/day is extracted from the creeks downstream of St Marys and Quakers Hill STPs. The estimated volume of tertiary treated effluent discharged from St Marys

and Quakers Hills STPs, as well as other sources of water in the creek system, would provide sufficient flow in the creek to meet water user peak and average demands. It should be reiterated that it is not Sydney Water's role to allocate flows for the environment or for irrigator, though this will be covered by the WSP.

It should also be noted that the STP discharges would increase over time with a growth in urban development. Although most of the increase in the volume of tertiary treated effluent produced would be reused in dual reticulation and local recycling schemes, not all would be reused and would require discharge, increasing the flow in South and Eastern Creeks. It is estimated that, by about 2030, up to an additional 10ML/day of tertiary treated effluent would be discharged into South Creek.

3.10 Fisheries

Concern regarding socio-economic impacts on fisheries due to changes in volumes within the Hawkesbury-Nepean River

The major commercial fisheries in the Hawkesbury-Nepean River system are located in the estuarine and marine areas downstream of the study area. These downstream areas would not be affected by the Project and so commercial fisheries would not be directly impacted.

Some of the species targeted by the commercial fisheries may spend part of their lifecycle in the freshwater reaches of the Hawkesbury-Nepean River. The impact of the Project on these reaches is described in detail in the EA for water flow (Section 7.3), water quality (Section 7.4) and aquatic ecology (Section 7.5). These impacts have been assessed to have a neutral impact on flows and a neutral to potentially beneficial effect on the water quality of receiving waterways, except for Warragamba River.

As there would be no significant adverse impacts on water quality, flows and aquatic ecosystems in the freshwater reaches of the Hawkesbury-Nepean River, commercial fish and crustaceans which spend part of their lifecycle in freshwater would also be unaffected. Consequently there would be no indirect impacts on commercial fisheries from the Project.

Concern regarding aquatic weeds, including their impact on commercial fisheries

A Ministerial taskforce, the Hawkesbury-Nepean Aquatic Weeds Scientific Committee, was formed in May 2006 to provide advice on long term management of aquatic weeds in the Hawkesbury-Nepean River and strategies to ensure the health of the river. The weeds considered include Egeria, Salvinia, Alligator Weed, Water Hyacinth, Senegal Tea, Primrose Willow and Cabomba. The recommendations from this taskforce will deal with aquatic weed issues in the Hawkesbury-Nepean including those that may impact commercial fisheries.

Section 7.5 of the EA assessed the affects of the Project on aquatic ecology. The EA concluded that the combination of increased flow and improved water quality within the vicinity of Penrith Weir may favour native macrophytes over exotic species, such as Egeria. The improved flow and water quality conditions are not likely to be the cause for an increase in Elodea within the Hawkesbury-Nepean River system.

Concern was raised regarding the transport of Egeria downstream, which would become a nuisance to downstream prawn trawling activities. The Project would result in an increase in flow volume at Boundary Creek from approximately 22ML/day, from current Penrith STP operations, to

the proposed increase to 50ML/day with the operation of the AWTP. The proposed Upper Nepean Dam releases would also result in an increase in flow volume within the Nepean River. The Project would only affect less than 3% of the dry weather (fresh water) flow volume within the Hawkesbury-Nepean River system, which would only have a minor effect on the current flow regime. Therefore the Project is not likely to result in a significant increase in dry weather flow velocity within the river and subsequent transport of Egeria. The effects of the Project on the Hawkesbury-Nepean River flow regime were addressed in Chapter 7 of the EA, and diagrammatically presented in EA Figures 7.4 and 7.5.

The greatest risk of movement of Egeria from upstream to downstream areas occurs during significant wet weather events when high flows may dislodge large mats of weed. The Project will not impact upon wet weather flows. With the reduction in nitrogen concentrations, associated with the Project, there is potential for a reduction in the biomass of Egeria.

The key objective of the Project is to replace water currently released from Warragamba Dam with highly treated recycled water (replacement flow) from the AWTP enabling a significant saving of potable water supply, which would be made available to Sydney Water's customers. The Project does not aim to contribute to achieving flow variability within the Hawkesbury-Nepean River System.

The Project would only affect a small component of the entire flow regime of the Hawkesbury-Nepean River system and is unlikely significantly alter existing flow conditions or the distribution of weed species.

Recommendation that the project commence in winter, instead of summer

The Project is scheduled to commence operation in mid to late 2009 to coincide with the implementation of the Upper Nepean Dam releases under the Water Sharing Plan for the Metropolitan Region. The AWTP will operate continuously from that point onwards.

As discussed within the EA and further clarified within this report, the construction and operation of the Project is not likely to create a significant impact on the viability of commercial fisheries. The affects of the project would not be magnified by activities undertaken during the summer period when commercially important fish and fish harvesting is most active within the Hawkesbury River.

Sydney Water will develop a monitoring program and undertake specific studies to address concerns that have been raised regarding issues such as river health, water quality and fish migration, as outlined in more detail in responses below.

Concern regarding the impact of the proposed flow alterations on commercial fisheries

The average daily flow of the Hawkesbury-Nepean River system is approximately 2,000ML/day under dry weather conditions and the marine tidal movement is estimated to be approximately 14,000ML/day estimated at Brooklyn (AWT 2000). The Project would only affect the distribution of a small portion (58ML/day) of the total water flowing into the Hawkesbury-Nepean River system, being less than 3%. This would involve a reduction in STP discharge to South Creek and an increased discharge to Boundary Creek. The Project will also result in reduced flows within Warragamba River. It is unlikely that the alterations to the overall flow regime of the Hawkesbury-Nepean River would have a significant impact on the ecology of the river system, including breeding areas and the migration patterns

of commercially important fish and crustacean species. The EA concluded that the proposed changes in flow and improvements in water quality would be beneficial to fish species and would create less favourable conditions for noxious weeds and algal blooms.

The anticipated benefits of the Project and other targets and initiatives outlined within the *2006 Metropolitan Water Plan* would contribute to improvements to water quality and ecological health of the Hawkesbury-Nepean River system. It is also anticipated that there would be benefits to the commercial fishing industry due to the predicted changes to the river system following commissioning of the Project.

Concern was also raised regarding inadequacy of the EA with regard to the impact on the ecology of species that are triggered by freshes (flooding periods) within the Hawkesbury-Nepean River. The effects of the project were considered for both dry and wet weather conditions (refer to Chapter 7 of the EA). It is highly unlikely that the project would impact on the occurrence or hydrological characteristics of flooding events that are linked to ecological process.

3.11 Aquatic ecology

Concern regarding the ecological health of Warragamba River with the absence of Warragamba Dam releases

The ecology of Warragamba River has been impacted in the past by the various water management activities that have occurred. This includes the construction of barriers such as Warragamba Dam and the downstream weir (Warragamba Weir), discharge of effluent from Warragamba STP and the release of environmental flows from Warragamba Dam.

Section 7.4 of the EA identified that the cessation of Warragamba Dam releases without any further mitigation measures would result in an increase in nitrogen and phosphorus levels in Warragamba River. This predicted change in water quality would create favourable conditions for the growth of exotic macrophytes and algae which in turn could impact on the health of aquatic native species.

Although the objective of releasing water from Warragamba Dam is to achieve environmental benefits downstream of the dam within the Hawkesbury-Nepean River system, this release would have an impact on aquatic ecology within the immediate vicinity of the release point, impacting on fish breeding and other aquatic life cycle activities (due to impacts such as thermal shock, low flow variability and high water velocities). The benefits from dam environmental releases are achieved downstream of the initial release point.

Sydney Water is investigating options to maintain acceptable water quality within Warragamba River with the operation of the new Wallacia STP when flow releases from Warragamba Dam cease (see also **Section 3.8** of this report)). Implementation of an appropriate strategy would result in a reduced nutrient load into the river to offset the impact of the cessation of environmental flow releases from Warragamba Dam. Provided this is undertaken, excessive growth of exotic macrophytes and algae would be limited.

It is acknowledged that the operation of the Project would create different flow conditions within Warragamba River that would also impact on the ecology of Warragamba River. The extent and comparative impacts associated with the existing and proposed changes in flow conditions within Warragamba River would be considered when flow releases are

reviewed in 2009 and final rules are established in 2015 as part of the WSP. This may result in increased discharges to Warragamba River as a measure to maintain acceptable ecological health. The DNR is responsible for the establishment of the flow regulations.

Concern regarding growth of weeds and algae in South Creek

The influence of the Project on the growth of weeds and algae in South Creek is assessed in Chapter 7 of the EA. The implications of the major reduction in flow and nutrient load that would occur downstream of the STPs in South Creek were addressed in the EA. The EA concluded that, concentrations of phosphorus would increase slightly and nitrogen concentrations would decrease and overall water quality would be relatively unchanged, therefore the Project would have a neutral effect on riparian, native fish, macroinvertebrate and macrophyte species within South and Eastern Creeks.

It is acknowledged that the reduction in effluent discharged to the South Creek catchment would reduce flow velocity. However, due to the turbid nature of both South and Eastern Creeks, and the reduction in nutrient loads, it is unlikely that algal blooms will be induced.

Recommendation regarding an aquatic weed harvester

The impacts of the Project upon aquatic weed growth are assessed in Section 7.5 of the EA. The EA does not anticipate there will be any increased growth of aquatic weeds as a result of the Project and potentially there will be a reduction due to decreased nutrient loads discharges to the river.

It is beyond the scope of the EA to commit to purchase and operate a weed harvester.

Concern about the proposed fish migration studies

Commitment number 10 of the Statement of Commitments states that the Department of Primary Industries (Fisheries) would be consulted regarding the proposed fish migration studies. This study will be undertaken prior to finalising the design phase of the project. Mitigation measures identified by this study will be considered during the design, construction and operation stages of the Project. The fish migration study will include consideration of the proposed changes to Penrith Weir and how the new flow regime will interact with the increased discharges from Boundary Creek.

Concern about impacts on prawns/crustaceans

As outlined in Chapter 7 of the EA, water quality in the Hawkesbury-Nepean River is anticipated to improve as a result of the Project. It is also anticipated that there would be no significant impacts on fish species.The Project would be consistent with *Fish Habitat Protection Plan No.1 General and Fish Habitat Protection Plan No. 3 Hawkesbury-Nepean River System*, which aim to protect fish habitats. The Project considers the conservation of fish habitats at the planning, design, construction and operation phases.

Concern regarding the effects of chemicals such as endocrine disrupting chemicals (EDCs) and other pharmaceuticals on aquatic fauna in all life stages

Sydney Water has been supporting University of Technology, Sydney (UTS) projects assessing the impacts of EDCs in the Hawkesbury-Nepean River catchment since 2001. Sampling for chemical and biological analysis has occured over the past three summer periods. This includes the most

active EDCs, estradiol and ethinylestradiol, known to be found regularly in wastewater. The UTS project has been assessing any changes to fish (in this case mosquito fish) morphology and behaviours. It has also been collecting data on important protein markers in the fish themselves. These specialist biological experiments are then correlated with 'standard' biological and chemical tests that are used internationally. The results over the past three summers show that the EDCs and estrogenic activity of effluents discharged from St Marys and Quakers is at very low levels and has shown minor and intermittent demonstrable effects on fish behaviour and morphology. The results are in line with other similar published studies where highly treated wastewater is shown to effectively remove EDCs to levels below concern. Sydney Water has not undertaken monitoring of pharmaceuticals or personal care products primarily due to the undetermined effects on aquatic life which are expected to be very low (Derksen, 2002). Relevant regulatory agencies will be consulted as more certainty in published and peer reviewed literature becomes available.

3.12 Human Health

Concern that the AWTP influent is from three combined plants and therefore providing a previously untested source of effluent (with regard to the Health Risk Assessment (HRA)

The HRA combined the effluent data for Penrith, St Marys and Quakers Hill STPs providing a representative combined effluent quality which is considered to reflect the composition of the combined effluent that will feed the AWTP. Whilst each sewerage catchment may have chemicals or levels of chemicals that are specific to that area, management of the source (through Sydney Water's trade waste program) and effective tertiary treatment ensures the major effluent components are similar between the STPs.

Concern that sampling regimes, analytical methods and the range of analytes were not necessarily optimum for the chemical risk assessment of treated effluents in the HRA

* Schedule 10 substances are substances listed in Schedule 10 of the Sydney Water Act 1994. Sydney Water is required to monitor Schedule 10 substances by its environmental protection licences.

The scope of the study was limited to quantitatively estimating the risks likely to arise from the Project using only existing local historical and literature data. Existing Schedule 10* monitoring data is extensive and provided a comprehensive data set for numerous classes of chemicals that have been associated with human health concerns. This was the principal available relevant data and it provided adequate information to assist in determining chemicals of potential concern.

Concern that the most appropriate scenario to base chemical contaminants health risk estimates upon is the direct consumption of undiluted effluent from the AWTP as uncertainties in the HRA remain unresolved

The uncertainties in the HRA were considered when determining the appropriate scale of risk assessment required, the risks to be assessed and the style of risk assessment. The final study design was consistent with the advice and principles outlined in a number of guidelines including *EnHealth Environmental Health Risk Assessment Guidelines (2002) and Health Impact Assessment Guidelines (2001)*. The direct consumption of undiluted replacement flow from the AWTP was not considered to be a likely exposure pathway and therefore not considered in the risk assessment.

Recommend that the water quality criteria for the effluent from the AWTP and the required plant efficacy in terms of removal of contaminants with health implications be specified

Sydney Water will negotiate with NSW Health and DEC to determine the most appropriate water quality criteria to meet the objectives of the Project. It is expected that national water quality guidelines would be assessed as part of this process.

Recommendation for an annual baseline review of trade waste sources within the sewerage catchment areas to identify new industry and chemical contaminants with potential health effects

Through its trade waste agreements and sewage monitoring, Sydney Water has a detailed understanding of the range of chemicals being discharged by industry in the catchment areas. Extensive trade waste information is collected and publicly reported within Sydney Water's annual reports. Trade waste agreements are reviewed annually depending on the level of contaminant risk. Sydney Water is already actively involved with trade waste customers to reduce contaminant levels, particularly those that present a potential health risk.

In line with a risk management framework approach outlined in the *National Recycled Water Guidelines*, Sydney Water will undertake a survey of industries in the sewage catchment areas to provide a comprehensive understanding of potentially hazardous sources. This will include the identification of the types of chemicals being discharged beyond those already known. The selection of chemicals of potential concern will be based on their potential health risks and will be undertaken in accordance with recognized State and Federal agency frameworks (eg National Industrial Chemicals Notification and Assessment Scheme).

The sewage catchments will be reviewed as required to identify any new industries or chemicals being discharged.

It should be noted, that the survey will not be capable of identifying every industrial source of chemical (particularly in relation to illegal discharges) and will not account for chemicals being discharged in domestic sewage.

Recommendation to extensively measure pathogens and chemicals in St Marys, Penrith and Quakers Hill STP effluents (identified in the HRA and sewerage catchment review) for a substantial period prior to commissioning of the AWTP

No specific pathogens were identified in the HRA as presenting a risk to public health from the proposed scheme. The risk assessment used three model microorganisms representing the three main classes of pathogens for which there was available dose-response information and which were critical in terms of infectivity ie *Campylobacter, Cryptosporidium*, and rotavirus. This allowed for a highly conservative estimate of risk. The three chemicals identified in the health risk assessment has presenting a potential risk are currently subject to a monitoring program at St Marys, Quakers Hill and Penrith STPs. Initial results demonstrate these chemicals have not yet been found at concentrations above that which may present a human health risk. Confirmation of these findings will occur once the program has been completed in February 2007.

Sydney Water will undertake a monitoring program of the feed water to the AWTP to demonstrate contaminant reduction over the treatment process and identify significant changes in the composition of potential contaminants. This will involve monitoring the effluents from St Marys, Quakers Hill and Penrith STPs prior to and following commissioning of

the AWTP. The parameters to be measured in the monitoring program will draw upon the potential chemicals of concern identified in the HRA, chemicals that may contribute to a loss in efficiency in the AWTP, other chemicals documented by NSW Health as having a potential impact on public health, chemicals of potential risk identified during sewerage catchment surveys, and a range of water quality parameters typically used to monitor treatment performance. In addition, the indicator bacterium *E. coli* and bacteriophages (in this case MS 2 phage) would also be assessed. The bacteriophages were selected as these are accepted surrogates for viruses, the smallest microorganisms, and hence will provide an opportunity to identify any potential break through.

The monitoring program will be reviewed on a regular basis to ensure only relevant analytes are monitored.

Recommendation to continually review current knowledge and management strategies for emerging chemicals of concern including disinfection by-products and EDCs, and incorporate appropriate controls into the system where feasible

Sydney Water already undertakes an active and continual review of emerging chemicals of concern, including disinfection by-products and EDCs. This is achieved through its associations with Water Environment Research Foundation (WERF), American Water Works Association Research Foundation (AWWARF), the Global Water Research Coalition (GWRC), and the CRC for Water Quality and Treatment. In addition, Sydney Water is actively involved in collaborative research projects investigating the health impacts of disinfection by-products and EDCs within its sphere of operations. Outcomes from the continual review process as well as the collaborative research will be taken into consideration and incorporated where feasible into the Project.

Recommend that the proponent demonstrates that a pilot facility can achieve output quality that complies with Australian Drinking Water Guidelines (2004) where a guideline value exists, or where a value does not exist that the plant can achieve a reduction in contaminant concentration to produce a margin of safety. For parameters that can't be measured directly challenge testing using safe surrogate microorganisms and chemicals should be done at a pilot facility

* Challenge testing is the simulation of conditions or scenarios to prove the ability or effectiveness of a process

The desired and defined outcomes of the Project do not require the AWTP to produce water to the ADWG (2004). Furthermore it is unclear at this stage what an acceptable margin of safety would be and what it would be based on. This will be assessed following review of the monitoring outcomes.

A pilot facility has been proposed to ensure that the proprietary membranes selected for the AWTP meet the specified performance objectives prior to significant investment in full scale facilities.

Challenge testing* will be undertaken to prove that the AWTP effectively removes biological contaminants from the feedwater. The specified performance values are: (*E. coli* less than 1 in 100mL (90%ile), viruses less than 1 in 50L (90%ile), parasites less than 1 in 50L (90%ile). In this regard the AWTP will produce water that has a higher degree of compliance than required by the ADWG, which only sets guideline values for *E. coli*. Challenge testing will be undertaken as part of the testing during the commissioning and plant proving periods to prove the virus log reduction performance of the each treatment stage of the AWTP. The proving of the virus log reduction performance will be part of the final acceptance tests

for the AWTP and will be based on the removal of the MS2 phage. This will be supported in the longer term by bacteriophage monitoring.

Given the wide range of chemicals Sydney Water has both historically and currently measures in both raw and treated effluent, and in the absence of any chemicals of concern identified in the human health risk assessment, Sydney Water will develop a list of surrogate chemicals for challenge testing purposes to match the range of substances and the associated physico-chemical properties.

It is also proposed that a test facility will be set up in the AWTP to be a permanent feature within the AWTP. The test facility can then be used for a number of purposes including challenge tests to confirm removal efficiency for various potential contaminants.

Sydney Water will design and undertake a challenge testing and ecotoxicity testing program that will be integrated with the catchment assessment and monitoring (see response above) to demonstrate contaminant reduction over the treatment process and identify significant changes in the composition of potential contaminants. It is proposed that the program be developed in consultation with NSW Health and endorsed by NSW Health prior to implementation. The program will be implemented following commissioning of the AWTP.

Recommend that an appropriate management strategy be put in place to prevent potential health impacts related to odour generated from the storage pond at Quakers Hill STP

The storage pond at Quakers Hill STP is not intended for long term storage of concentrate but only to hold concentrate for a few days during wet weather events. The concentrate will then be disposed of via the Northern Suburbs Outfall Sewer (NSOOS).

It is not anticipated that odour will be an issue. It is unlikely that health impacts will arise from any possible odours produced in the storage pond given that the concentrate will be primarily salt. The issues will primarily be aesthetic. If an odour issue arises causing customer complaint, management strategies will be established to mitigate the issue.

Recommend that additional commitments be made to ensure adequate protection of public health associated with this project

Additional commitments, including those addressing public health issues, have been made in response to submissions and they can be found in **Chapter 5** in **bold** text. The commitments are also discussed in responses above.

3.13 Monitoring

Recommendation to develop an ecotoxicology study with consideration of the Australian Guidelines for Water Quality Monitoring and Reporting (ANZECC & ARMCANZ, 2000) as part of the pilot testing program, in consultation with DEC, to assess the potential for impacts of the recycled water discharge on aquatic species including algae, macro-invertebrates and fish

The pilot testing program objective is to confirm the primary design assumptions in membrane selection prior to construction of the full scale AWTP. Once this activity is completed the pilot facilities will be relocated permanently to the AWTP. Toxicological testing would occur following the initial pilot facility phase of the Project, in order to assess the impacts of

replacement flows on aquatic species. The study will be undertaken in accord with current SWC environmental monitoring program and meet appropriate guidelines such ANZECC/ARMCANZ (2000). These monitoring programs are also reported publicly through Sydney Water's annual reports.

Recommendation to develop a Water Quality and Aquatic Ecology Monitoring Program, in consultation with DEC and DPI, to be implemented prior to commissioning and continue for the life of the project with a review after three years (in consultation with DEC and DPI) for ongoing requirements. The program shall be undertaken with, and provide a sub-set of data for the Hawkesbury Nepean Integrated Monitoring Framework

Monitoring of recycled water discharge impacts will be carried out in two phases: a baseline phase to quantify the existing water quality and structure of the aquatic environment; and a post commissioning phase in which the results will be compared with data from the baseline phase.

Whilst no formal review of the Program is detailed, review will be ongoing. Following the commissioning of the Project, the extent of all operational aspects of the Project on the river system will be monitored and incorporated as part of the multi-agency Hawkesbury-Nepean River Integrated Water Monitoring Program under its adaptive management framework. Current baseline data is in the process of being incorporated under the integrated program.

Recommended baseline monitoring to include at least two sampling events prior to commissioning for the following:

- **flow regime**
- **phytoplankton (abundance and composition)**
- **submerged and floating aquatic vegetation (abundance and composition)**
- **macro-invertebrates (abundance and composition)**
- **fish (abundance and composition)**
- **water quality, with specific reference to key nutrients (nitrogen and phosphorus).**

A single baseline monitoring phase is proposed. Details of the monitoring will be determined in consultation with DEC.

Recommendation to undertake post-commissioning monitoring in which sampling and data collection for the parameters outlined in above would be undertaken to:

- **determine the project's specific contribution to river health outcomes**
- **confirm the environmental impact predictions at a temporal and spatial scale**
- **compare the post-commissioning river health conditions with the baseline conditions.**

The monitoring program will focus on potential impacts relating to:

- river ecological health (as assessed through receiving water quality, aquatic ecology and toxicity monitoring)
- human health impacts (as assessed through the measurement of pathogens and chemicals)
- construction related impacts, including noise and fauna disturbance.

Information collected as part of the monitoring program will be provided to update the existing Hawkesbury-Nepean River model. Monitoring required by the Sydney Water operating licence is also reported publicly through the annual report.

Recommendation to undertake sampling and data collection at control and impact sites within Warragamba River, Nepean River, Hawkesbury River, South Creek and Eastern Creek

Samples would be collected from sites at which changes are expected ('impact' sites) and from some sites at which changes are not expected after commissioning ('control' or 'reference' sites). Comparisons of water quality and ecological parameters would then be made before and after commissioning of the AWTP. The specific locations of the control and impact sites will be in accord with the Hawkesbury-Nepean Integrated Water Monitoring Program and include other relevant sites as or if deemed necessary.

Recommendation to undertake sampling and data collection of the recycled water discharge and the immediate receiving environment to:

- **monitor the volume and temperature of the recycled water**
- **characterise and quantify the type, concentration and load of constituents being discharged to the Hawkesbury-Nepean River**
- **determine the area of impact for the recycled water discharge, including hydrological changes**
- **quantify changes in the quality (including toxicity) of the receiving waters at the discharge point, with specific reference to phytoplankton, aquatic vegetation (floating and submerged), macroinvertebrates, fish, nutrients, other physico-chemical parameters and pathogens**

A discharge monitoring component will be developed and implemented to characterise and quantify the types, concentrations and loads of constituents being discharged to the environment; determine the area of impact for the discharge, including hydrological changes and quantify changes in quality (including toxicity) of waters surrounding the discharge location. This would involve monitoring potential changes in phytoplankton, aquatic vegetation, macroinvertebrates, fish, nutrients, other physico-chemical parameters and pathogens.

Concern regarding monitoring areas affected by river management changes for accurate status of the river's health

A monitoring program to assess the impacts of this and other projects included in the *2006 Metropolitan Water Plan* on river health (including water quality, fish, macrophytes, macroinvertebrate communities and flow) will be undertaken in conjunction with a number of NSW State Government agencies including DEC, DNR, DPI, SCA, the Cabinet Office and Sydney Water. This program is referred to as the Hawkesbury-Nepean Integrated Monitoring Program and has been agreed by the joint agencies.

It is not proposed to re-instate the former Recreational Water Assessment and Monitoring Program.

The results of all monitoring programs including the Hawkesbury-Nepean Integrated Monitoring Program will be used to inform the operations of the recycle water facility under an adaptive management framework.

Recommendation to develop a mechanism for the supply of data and results from the program, including comparison of baseline and post-commissioning data, both on request and at agreed milestones, to DEC, DPI and the Director-General

A data sharing agreement with DEC has been developed for the release of Sydney Water monitoring data under the Hawkesbury-Nepean Integrated Monitoring Program. Data release for existing baseline data will commence in January 2007. Provision for regular updates will be included in this agreement.

Recommend that the plant performance is monitored on a "real time" ongoing basis and its effluent prevented from discharging into Boundary creek until plant performance is demonstrated to comply with agreed performance criteria

It is proposed that the plant be monitored on a real time basis. Monitoring will include temperature, turbidity, total and free chlorine residual, oxidation reduction potential (ORP), particle counts, pH, total organic carbon and flow. Other parameters such as on-line pressure testing of the membranes will also be evaluated for real time monitoring purposes.

3.14 Management of other key issues

Project Environmental Management

Recommendation to prepare an Operational Environmental Management Plan addressing noise, odour control and liquid waste management and it should stipulate the requirements for plant monitoring, maintenance and the procedures for responding to failures

The construction of the AWTP and all pipelines will be the responsibility of the contractor awarded the work following consideration of competitive tenders. The operation of the AWTP will also be the responsibility of the contractor, but Sydney Water will manage all pipelines constructed for the Project. Sydney Water will also continue to manage St Marys, Penrith and Quakers Hill STPs under the existing waste water integrated management system (WWIMS).

The contractors responsibility for managing the AWTP will include establishing an EMS certified to ISO14000 (2004 standard series) and quality systems certified to ISO9000. These systems will include operation and maintenance procedures to manage aspects such as noise, odour control and waste management. The contractor will also be required to manage the AWTP according to operating protocols for plant monitoring, maintenance and for responses to failures. Conditions of approval for the Project, related to the operation and maintenance of the AWTP, will be fully integrated into the EMS.

Sydney Water also has an Integrated Management System (Networks) (IMS) which integrates environment, safety and quality for the management of pipes and pumps. The IMS is certified to ISO14000. Standard operating and administrative procedures are in place to manage aspects such as environmental impacts. Management of the operation and maintenance of the Project pipelines and other aspects of the Project not included in the contractors operation and maintenance of the AWTP, will be integrated into the IMS. This will include full integration of the relevant conditions of approval.

Request for the opportunity to comment on the content of the Construction Environmental Management Plan to ensure appropriate practices will be in place to address noise, vibration and dust impacts on local residents and to ensure assets are not adversely impacted

The contractor will be required to develop a certified EMS to ISO14000 for the construction and operation of the AWTP and the construction of pipelines for the Project. The EMS would include appropriate procedures to manage noise, vibration and dust impacts on local residents as well as ensuring services are not adversely impacted. Sydney Water will consult with affected stakeholders, including Councils, on specific issues regarding construction impact management.

Flora and fauna

Concern that the two areas containing endangered ecological community (Freshwater wetland and Cumberland Plain Woodland) near Penrith STP have not been avoided.

There are existing cleared corridors and sealed pathways that run through the areas near Penrith STP containing freshwater wetland and Cumberland Plain Woodland. Construction impacts and the construction corridor will be restricted to these already cleared and disturbed areas avoiding direct impacts on the communities. All feasible and reasonable measures would be taken to avoid indirect impacts.

Waste

Concern regarding discharge of waste into the ocean.

The concentrate produced by the AWTP will be transferred to the NSOOS for treatment at North Head STP prior to its discharge. The direct reuse potential for the concentrate is limited due to salinity.

Concern regarding the construction of pipelines

One submission highlighted potential construction scheduling issues with a section of the pipeline near St Marys STP. The Construction Contractor would be responsible for consultation with affected stakeholders to ensure that these issues are considered during the construction of the pipelines in this area.

Construction impacts on flora and fauna and water courses

One submission identified a number of measures to minimise impact to flora and fauna and water courses during construction of the project. These included:

- the establishment of temporary site compounds along the pipeline route are to avoid remnant vegetation and not result in clearing of native vegetation
- wherever possible, the underground boring commences from the outer edge of the riparian buffer and that it is bored for the full width of the watercourse, core riparian zone and riparian buffer
- trenching and excavation including stockpiling of spoil materials are to be located away from watercourses
- restoration of affected areas using a diversity of local native species
- any riparian areas disturbed by under boring should be rehabilitated with a diversity of local native plant species for a 10 metre wide radius.

All measures were identified within the EA in Table 8.1 and will be implemented during construction.

3.15 Stakeholder engagement and consultation

Concern regarding consultation with the fishing industry

Sydney Water consulted with a wide variety of stakeholders in the development of the EA, including the DPI (Fisheries). In addition to the Department of Planning's exhibition activities during November 2006, Sydney Water displayed the EA at major shopping centres in Western Sydney, Sculpture by the Sea (attended by 300,000 people) and handed out information at three Western Sydney train stations. During the exhibition period, Sydney Water specifically met with commercial and recreational fishers at a meeting on the 20 November 2006. At this meeting an overview of the Project was given and the groups/representatives had an opportunity to raise issues with Sydney Water representatives.

Requests to be kept informed of the progress of the Project

Sydney Water and its contractors will continue to keep key stakeholders and affected landholders informed of the progress of the Project.

During construction, Sydney Water will be in regular contact with affected communities and information will be available on the project pages of the Sydney Water website. A community information line has been set up to provide direct access to the project team and information on how to contact the construction team during the construction phase of the project will also be provided. Communities will be consulted prior to the start of any works in their area and will be notified at regular intervals throughout the construction process.

4 The preferred project and assessment of changes

This chapter provides details on the changes to the Replacement Flows Project outlined in Chapter 1 and assesses the environmental impacts of these changes. It also describes the preferred project.

4.1 Description of changes

The proposed changes to the Project include a realignment of the concentrate pipeline route between Seven Hills and Vineyard Creek at Dundas and the construction and temporary operation of a pilot facility at St Marys STP. These changes are described below. This description will include identification of land uses and tenure for the change to the concentrate pipeline route.

4.1.1 Concentrate pipeline route

A pipeline will transfer concentrate from the AWTP at St Marys STP to the Northern Suburbs Ocean Outfall Sewer (NSOOS) at Vineyard Creek, Dundas. The route of most of this pipeline between St Marys STP as far as Seven Hills is unchanged. Between St Marys and Quakers Hill STPs it will consist of a 375mm diameter pipeline, adjacent to the effluent transfer pipeline. A new pump station at Quakers Hill STP would then pump the concentrate about seven kilometres to Seven Hills via an existing 300mm diameter pipeline. Some upgrade works may also be required to the existing pipeline.

The proposed changes to the concentrate pipeline route are for part of the route between Seven Hills and Vineyard Creek at Dundas. This involves the construction of a new section of 375 mm diameter sub-surface pipeline approximately 12km long.

Figures 4.1a and **b** show the original and revised pipeline route from the existing pipeline at Seven Hills to the NSOOS at Vineyard Creek. The land uses along the revised route are similar to the original route passing through parklands, in road reserves and through suburban areas. Unlike the original route, however, the revised route does not pass beside or through railway land. Land tenure along the revised route is summarised in **Appendix A**.

The changes to the proposal are discussed in detail below.

International Peace Park, Seven Hills to Kleins Road, Northmead

This section of the revised pipeline route is located generally north of the original proposal and north of the train line at Seven Hills. The pipeline route initially traverses eastwards through Peace Park, then follows the Prospect Highway, Station Street and Powers Road to Old Windsor Road. This route avoids the rail corridor and removes the potential for impact on planned future upgrades of the rail infrastructure, existing rail operations and train commuters.

The pipeline would then be bored under the North West Transitway and Old Windsor Road and follow residential streets in Winston Hills. This avoids constructing the pipeline adjacent to the transitway where there is potential to impact on the transitway operation and any future widening, together with the likelihood that construction will be difficult as the original corridor is heavily congested with services, such as a high pressure gas pipeline.

The revised pipeline would be bored under Quarry Branch Creek, whereas the original proposal was attached to a bridge across Toongabbie Creek.

Kleins Road, Northmead to Barton Park, North Parramatta

There are minor changes to this section of the route, but it is mainly the same route that is described in the EA. The revised route crosses Darling Mills Creek using a shorter length bore than the proposal described in the EA. It follows the edge of the Parramatta Gaol property and unlike the original proposal it is not bored beneath it, avoiding heritage impacts. The route avoids private properties by traversing along O'Connell and Barney Streets. The route is then unchanged as far as Barton Park.

Barton Park, North Parramatta to Vineyard Creek

The revised pipeline route utilises open space on the southern side of James Ruse Drive and avoids traversing through residential streets. The pipeline would be bored under James Ruse Drive as it would have been in the original proposal. At this point it would run beside Kissing Point Road to Vineyard Creek, again avoiding construction in residential streets.

4.1.2 Pilot facility

A temporary pilot facility will be established on the St Marys STP site to demonstrate the performance of the treatment technology. The plant will be located adjacent to existing St Marys STP treatment infrastructure allowing easy access to tertiary treated effluent. **Figure 4.2** shows the approximate location of the pilot facility on the St Marys STP site.

Installation works will include providing separate amenities for staff operating the pilot facility and all the cables, pits, conduits, and other accessories required to provide power to the pilot facility.

The pilot facility will replicate the main process components of the proposed full-scale AWTP in its entirety and would be suitable for operation 24 hours per day 7 days a week. The pilot facility will process 0.8% of the flow that would be treated by the full scale plant, which equates to 0.55ML per day. Approximately 0.07ML of concentrate will be produced per day. Small quantities of chemicals would be stored on site. The stored volumes would be below the screening thresholds set out in *'Applying SEPP 33: Hazardous and Offensive Development Application Guidelines - DUAP1994'*. **Table 4.1** shows the approximate chemical requirements of the pilot facility.

Figure 4.1a Comparison of the original and revised concentrate routes

Figure 4.1b Comparison of the original and revised concentrate routes

Figure 4.2 Approximate location of the pilot facility at St Marys STP

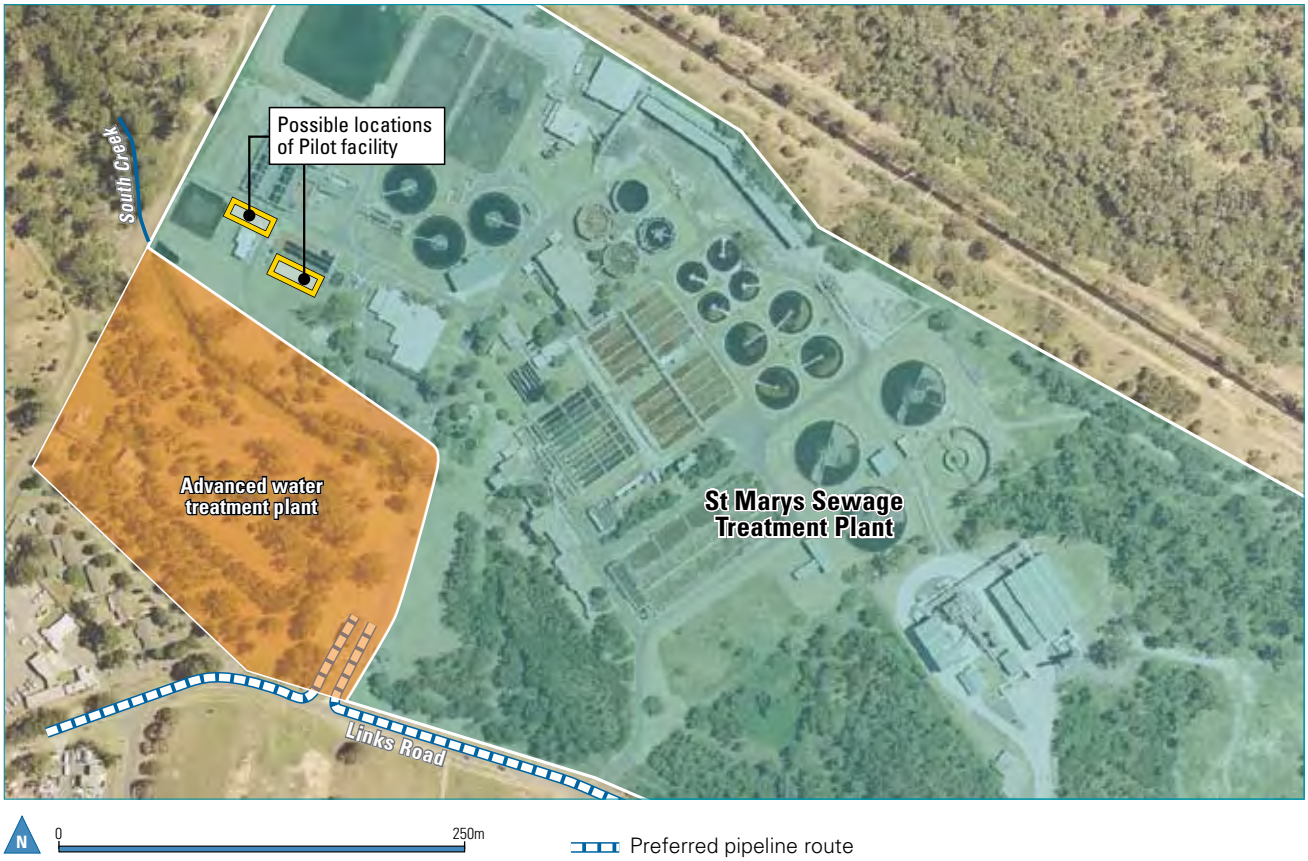


Table 4.1 Chemical requirements for pilot facility

Chemical	Required amount (tonnes)*
Sodium hypochlorite	0.96
Ammonia	0.2
**Antiscalent	0.2
Sodium bicarbonate	0.96
Sodium metabisulphite	0.2
Sodium hydroxide	2
Hydrochloric Acid	2

* The required amount is based on 120 days operating time. It is anticipated that the volumes of each chemical stored onsite will be similar to the required amount.

** Antiscalents could be chemicals such as sodium hexametophosphate, organophosphonate or polyacrylates.

It is anticipated that the pilot facility will use 825kW hours per day of electricity. The facility would be operated for a minimum of 4 months or for 1 month after the first cleaning cycle of the reverse osmosis membrane, whichever occurs last. The testing will be completed prior to finalising the concept design for the AWTP. At the completion of testing the pilot facility will be relocated to the AWTP site and the area rehabilitated to existing condition or better.

The impacts of the pilot facility are considered minor and a summary of the impacts and safeguards for construction and operation of the pilot facility are included in **Table 4.4**.

4.2 Concentrate pipeline environmental assessment

The environmental impacts of the changes to the concentrate pipeline are assessed below. The assessment of these impacts is restricted to construction impacts, as operational impacts will not change.

A table showing where applicable issues identified in the Director-General's EA requirements have been addressed is included in **Appendix B**. New safeguards have been identified where the safeguards proposed in the EA will not adequately mitigate the identified impacts for the changed concentrate pipeline route.

4.2.1 Land use zones

The local planning zones through which the revised concentrate pipeline passes are indicated in **Table 4.2** and shown in **Appendix A**. Land use zoning also applies in certain regional environmental plans. The plans that apply to the revised concentrate route are the same as those described in Table 6.2 of the EA.

Table 4.2 Applicable zones under local environmental plans for the revised route

Local Government Area	Land use zones
Parramatta	Residential 2 (a) & (b)
	Public Open Space 6(a)
	Environmental Protection - Bushland
	Special uses
	Mixed Use
	Employment
Blacktown	General Industrial
	Residential A
	Special Uses – General 5(a)
	Special Uses – Local road and local road widening 5(c)
	Public Recreation 6 (a)
Baulkham Hills	Residential 2(a2) & 2(a3)

Comparison of impact

The proposed works are generally consistent with the objectives of the local and regional environmental plans that are applicable to the study area. The construction and operation of the pipeline is permissible in all zones indicated in **Table 4.2**.

The impacts of the revised and original pipeline would be very similar. Access to private properties would be maintained during construction and as construction activities would be undertaken progressively, the duration of potential land use impacts would be minimised. Once installation of the pipelines has been completed, the land would be returned to its former use.

Services and utilities in the area may be affected if they occur along the alignment of the proposed pipeline.

Mitigation measures

Land use impacts due to the construction of the revised pipeline route can be mitigated through Sydney Water's standard practices and the safeguards identified in the EA. No additional safeguards are required.

4.2.2 Terrestrial ecology

Existing conditions

A terrestrial flora and fauna study was undertaken for the revised concentrate pipeline route. Site assessments were conducted on 19 January 2007. **Figures 4.3a and b** show the general vegetation types recorded for the revised pipeline route during the assessments. The following sections identify areas that were not affected by the original pipeline route but are along the alignment of the revised route.

Flora

The revised concentrate pipeline traverses through a highly modified landscape consisting of a predominantly urban streetscape with planted and landscaped vegetation. Remnant vegetation comprising disturbed moist forest surrounds the Quarry Branch Creek, which the pipeline crosses by boring under. The moist forest is dominated by a mix of native and exotic trees including Sweet Pittosporum *Pittosporum undulatum*, Christmas Bush Ceratopetalum gummiferum, Privets *Ligustrum* species and Camphor Laurel *Cinnamonum camphora*. Exotic trees are dominant along the creek line whilst native trees dominate the surrounding slopes. There is a diversity of native and exotic species in the understorey including Coffee Bush *Breynia oblongifolia*, Mat-rush, Straw Treefern *Cyathea cooperi, Lantana camara*, Morning Glory *Tradescantia fluminensis* and Paspalum *Paspalum dilatatum.* Turpentine *Syncarpia glomulifera* is present to the north of the proposed pipeline alignment on the eastern side of Quarry Branch Creek near Otto Losco Reserve, although generally sclerophyll (eucalypt) species are absent in the canopy. This vegetation has some affinities to River-flat Eucalypt Forest on Coastal Floodplains.

The area of Barton Park adjacent to James Ruse Drive supports planted and remnant native vegetation including a row of planted Port Jackson Figs *Ficus rubiginosa* and *Eucalyptus* species, and clusters of larger trees including Spotted Gum. On the eastern side of James Ruse Drive near Larnook Place parkland supports mature plantings of Tallowwood and Spotted Gum.

In general, small fragments of remnant vegetation are present at scattered locations throughout the landscape, although no such areas were found to be characteristic of their former habitat quality. Indeed most areas of remnant vegetation have been highly modified with areas of native understorey restricted to narrow, disturbed patches along creek lines. Such vegetation has affinities to the endangered ecological community River-flat Eucalypt Forest and disturbed remnant stands of trees occurring on the adjacent slopes comprise Cumberland Plain Woodland.

No listed flora species were recorded within close proximity to proposed pipeline route during the field inspections. Areas of remnant vegetation are generally highly disturbed and do not provide optimal habitat for threatened flora species of the local area.

Fauna

Habitat for fauna along the works corridor mainly comprises cleared and modified habitats such as open grass, road verges, and planted shrubs and small trees in landscaped urban areas. Such habitats are characterised by a lack of natural vegetation cover from trees, shrubs and groundcovers, and hence have no significant fauna habitat value. These habitats are frequented by a range of common fauna species adapted to modified landscapes.

Figure 4.3a High value conservation areas

Figure 4.3b High value conservation areas

Disturbed remnant vegetation in Otto Losco Reserve provides the best habitat attributes for fauna in this area comprising dense areas of shrubs and grasses, rotting logs, rock outcrops, creek banks and aquatic environments. No hollow bearing trees were recorded in this area. A range of common fauna species are likely to utilise this area including Eastern Water Dragons which were recorded during field surveys.

Low quality habitat for the Cumberland Land Snail was recorded in isolated portions of the proposed pipeline route including areas of remnant vegetation along creek lines such as the Quarry Branch Creek. Most habitats along the proposed pipeline route are characterised by isolated trees and small isolated stands of trees and shrubs with a general lack of understorey vegetation cover, providing limited value for threatened fauna species.

Comparison of impact

The impact on flora and fauna will be very similar for the revised and original pipeline routes. The revised and original routes were designed with the same principal of utilising roads and disturbed areas where possible to avoid impacting sensitive areas.

Areas where remnant vegetation and potential fauna habitat were identified along the revised route, such as Quarry Branch Creek and Otto Losco Reserve, would be avoided by boring under the areas. The revised route, similar to the original route, would also be bored beneath Darling Mills Creek (Parramatta River) to avoid direct impacts.

Mitigation measures

Flora and fauna impacts due to the revised pipeline route can be mitigated through Sydney Water's standard practices and the safeguards identified in the EA. No additional safeguards are required.

4.2.3 Noise and vibration

Construction noise was assessed according to Construction Site Noise Guidelines issued by DEC.

The noise goals adopted for construction are those contained in the construction guidelines *Construction Site Noise* (previously Chapter 171 of the *Environmental Noise Control Manual* (ENCM) (NSW DEC 1994).

The noise assessment for the construction phase was based on the equipment likely to be used and the proximity of sensitive receivers. The construction equipment that has potential to contribute to the acoustic environment includes:

- excavator operations and earthmoving equipment
- boring rigs
- general construction noise
- truck movements.

Night-work may be required for construction of the pipelines such as where they cross major roads or intersections, or in industrial areas, to minimise disruption of local and through traffic.

Existing conditions

The revised pipeline route is located in a similar acoustic environment to the original pipeline route. The areas include residential, industrial and open parklands. Sensitive receivers along the revised route include churches and a hospital.

Comparison of impact

Similar to the original proposal, construction of the changed concentrate pipeline would impact on the local acoustic environment and would present a short-term nuisance to adjoining residents and users of public reserves. The construction activities would be continually moving, advancing at a rate of about 16m per day, and are unlikely to be adjacent to any residence for a period of more than a few weeks at a time.

The revised route will be bored in a number of locations including under two creeks and major roads. There will be no boring under residential properties although vibration may impact on properties alongside the pipeline route, particularly within the densely populated areas along the pipeline. The effects of vibration in buildings can be divided into three main categories:

- where occupants or users of the building are disturbed or inconvenienced
- those in which the building contents may be affected
- circumstances in which the integrity of the building or the structure itself may be jeopardised.

A boring machine may be located on vacant land between two residences in order to bore beneath Quarry Branch Creek. There may be some localised noise and vibration impacts on these residents.

Mitigation measures

Noise and vibration impacts due to the revised pipeline route can be mitigated through Sydney Water's standard practices and the safeguards identified in the EA. No additional safeguards are required.

4.2.4 Waste generation and management

Existing conditions

During construction water may enter excavations after rainfall or through groundwater infiltration. When this occurs, trenches and other excavations would need to be dewatered to allow work to continue. The condition (quality) of the water would need to be considered before discharge.

Bentonite slurry would be used to lubricate cutting heads and drilling equipment during boring beneath sensitive environmental areas, creeks or roads. The bentonite slurry would be reused in the drilling process, although small quantities of this liquid waste may be produced and would require disposal.

No significant volumes of liquid wastes, including oils or fuels, would be generated on site during construction.

Solid waste generated by the construction of the revised pipeline route would predominantly be spoil from excavation. The estimated volume of spoil that will be generated is 24000m^3 and the number of trucks required to remove the spoil is approximately 1090. This is about the same amount of spoil and truck movements as the proposal described in the EA.

Spoil would be reused on site, wherever possible. Unused spoil would be disposed of at landfill sites or on other projects requiring clean fill.

Other wastes produced during construction would include:

- packaging waste
- off-cuts and disused construction materials
- general waste from construction workers.

Comparison of impact

Construction of the revised and original pipelines involves trenching and boring so the impacts on construction waste management are the same for both routes, which are approximately the same length (12km). These include possible impacts on surface water from dewatering activities due to high levels of suspended solids that could impact surface water quality if discharged without treatment. Bentonite slurry wastes, although non-toxic, could also impact on surface water quality if inappropriately managed.

Inappropriate material handling or poor management of solid wastes are to be avoided so as not to result in excessive waste production, overuse of natural resources and premature filling of local landfill sites.

Mitigation measures

Waste management impacts due to the revised pipeline route can be mitigated through standard practices and the safeguards identified in the EA. No additional safeguards are required.

4.2.5 Geology, soils and construction water management

Existing conditions

The revised pipeline route is located within the same geology and soil landscapes as the original pipeline route. The geology of the area consists primarily of the Middle Triassic Wianamatta Group shales and sandstones. The Blacktown and South Creek soil landscapes predominate, along with Gymea and Luddenham erosional soil landscapes.

With reference to *Map of Salinity Potential in Western Sydney* (DIPNR 2003), the salinity potential in the study area is considered to be moderate, with high salinity potential generally confined to areas along the creeks and drainage lines.

The soils around Vineyard Creek generally have low erodability. The Blacktown soils to the west have moderate erodability and the soils associated with the South Creek landscape around Pendle, Greystanes and Toongabbie Creeks are highly erodable.

There are several creeks in the study area that would either be crossed, or are located in close proximity to the revised pipeline route. These are:

- Quarry Branch Creek
- Darling Mills Creek
- Blacktown Creek
- Greystanes Creek
- Toongabbie Creek
- Parramatta River

Quarry Branch Creek and Darling Mills Creek would both be crossed by boring, avoiding any direct impact. Indirect impacts from potential erosion and sedimentation on these creeks and any other water courses would be managed by standard control measures.

Comparison of impact

The potential impacts of the original and revised pipeline routes are very similar. The construction phase has the potential to contaminate soil, ground and surface water through the spillage of liquids such as oils or other materials required for construction, and through erosion of soils, particularly where vegetation has been cleared or where stockpiling occurs.

Depending on the groundwater levels within the study area and rainfall during the construction phase, dewatering of pipeline trenches and other excavations may be required. Inappropriate disposal of this material has the potential to impact on soils or surface waters.

Topsoil and subsoil material would be stripped and temporarily stockpiled immediately adjacent to the construction area for backfilling and compaction of the trench.

Mitigation measures

Impacts on geology, soils and construction water management due to the revised pipeline route can be mitigated through Sydney Water's standard practices and the safeguards identified in the EA. No additional safeguards are required.

4.2.6 Heritage

Existing conditions

The EA included figures showing the location of Aboriginal and historical heritage listings within 500m of the study area. A printing error occurred and Figure 8.2d in the EA was incorrect. The correct figure is shown in **Figure 4.4**.

Aboriginal heritage

A preliminary assessment of indigenous heritage items was undertaken for the revised pipeline route, which included a search of the Department of Environment and Conservation's (DEC) *Aboriginal Heritage Information Management System*. The search identified two previously recorded Aboriginal sites within 100m of the new pipeline route which were not within this range of the original route.

An archaeological field investigation of the revised route was undertaken and no new items or sites were identified.

European Heritage

The potential impact of the revised pipeline on non indigenous or European heritage was also assessed. Initially the following heritage registers and schedules were searched:

- the National Heritage List (Australian Heritage Council)
- the Commonwealth Heritage List (Australian Heritage Council)
- the Register of National Estate (Australian Heritage Council)
- the State Heritage Register (NSW Heritage Office)
- the State Heritage Inventory (NSW Heritage Office)
- Heritage Schedule(s) from Blacktown, Parramatta, Baulkham Hills

Local Environmental Plans

- Parramatta Local Environmental Plan 1996 (Heritage and Conservation).

All European heritage items identified within 500 m of the revised pipeline corridor were within 500m of the original pipeline route. All of the Indigenous and European items that have been identified in the vicinity of the revised pipeline route are shown on **Figures 4.5a and b**. The numbered items on **Figures 4.5a and b** are identified in **Table 4.3**.

Figure 4.4 Location of Aboriginal sites within 500m of the study area and Historical listings (replacing Figure 8.2d in the Environmental Assessment)

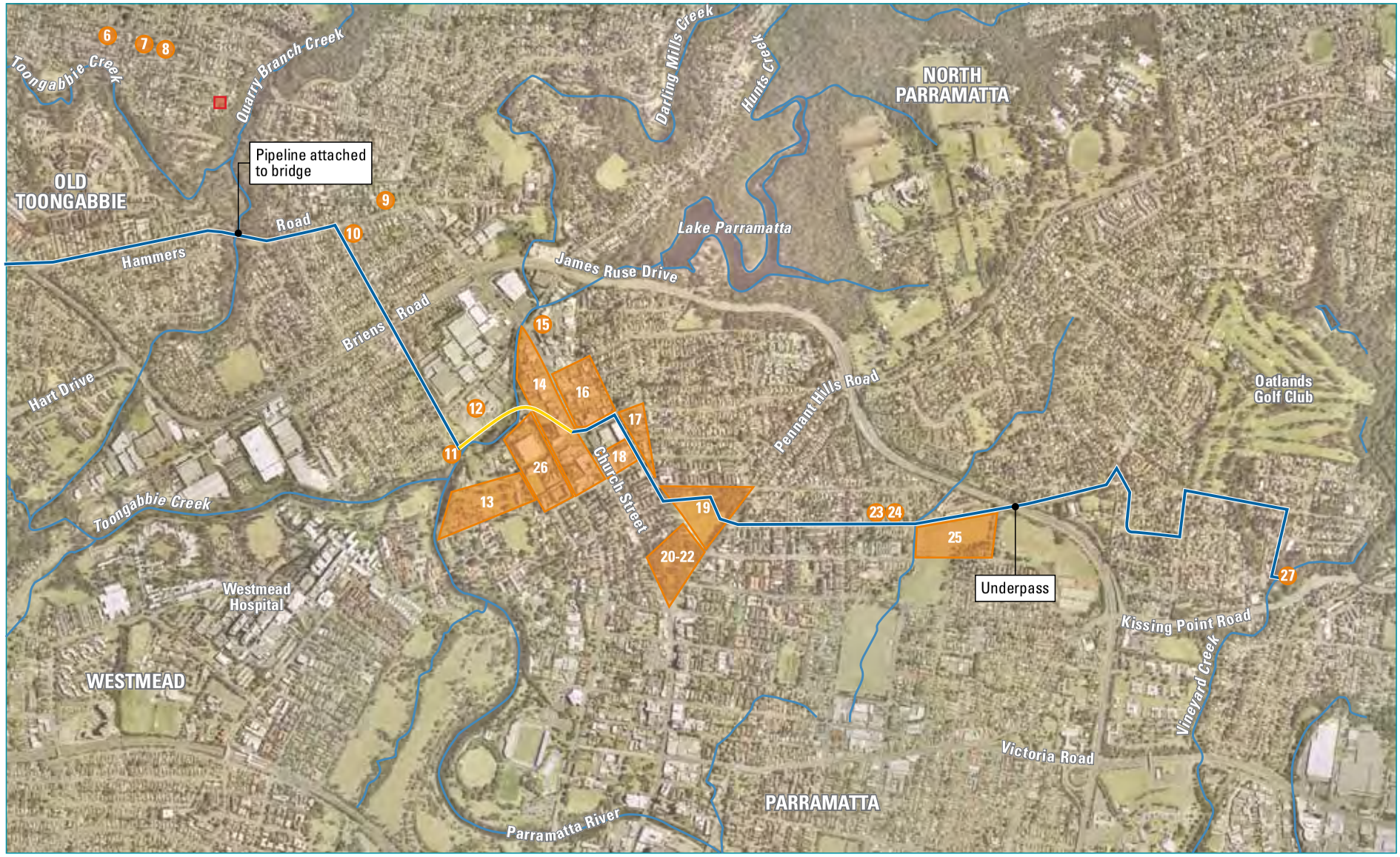


Figure 4.5a Location of Aboriginal sites within 500m of the study area and Historical Heritage listings

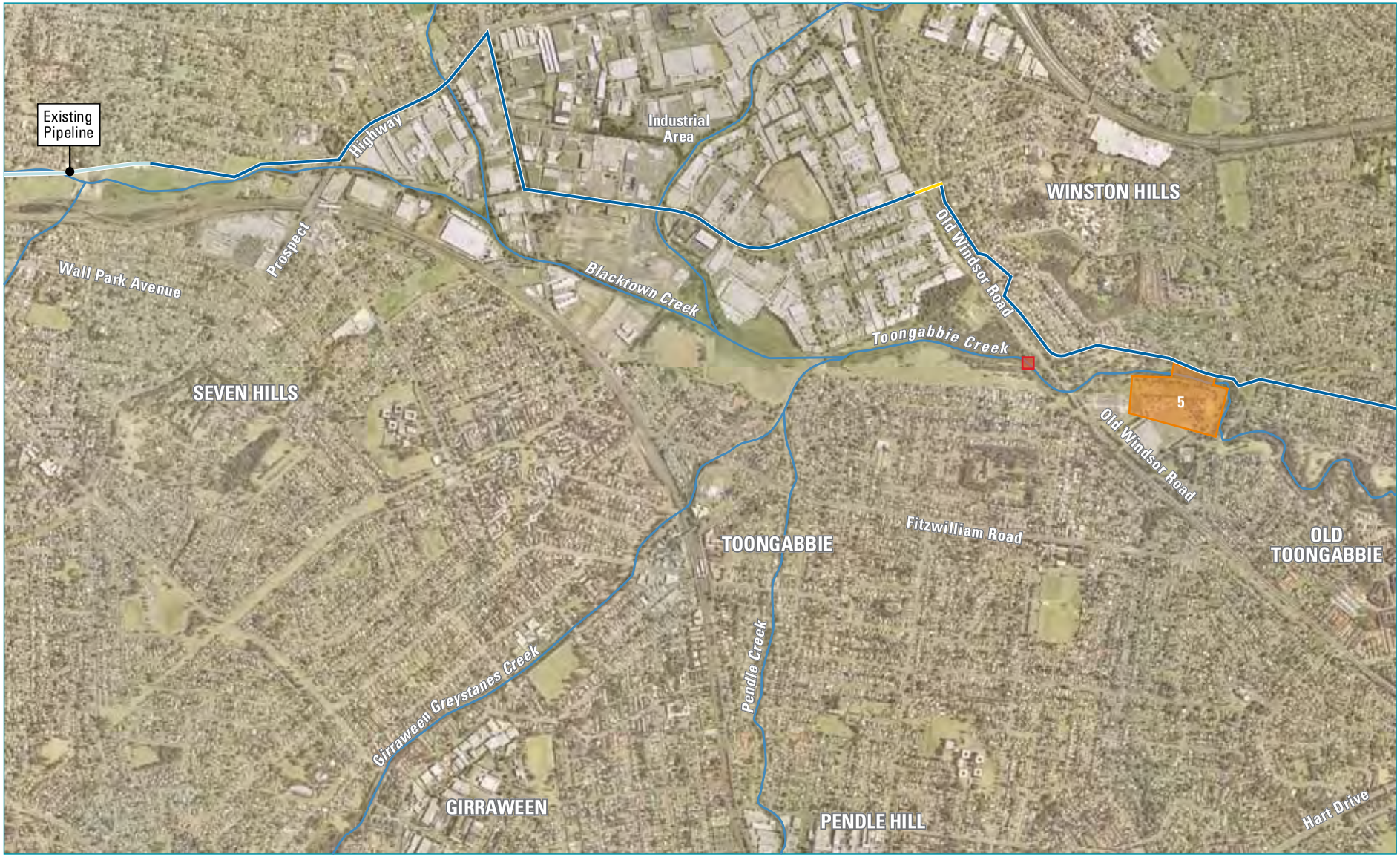


Figure 4.5b Location of Aboriginal sites within 500m of the study area and Historical Heritage listings

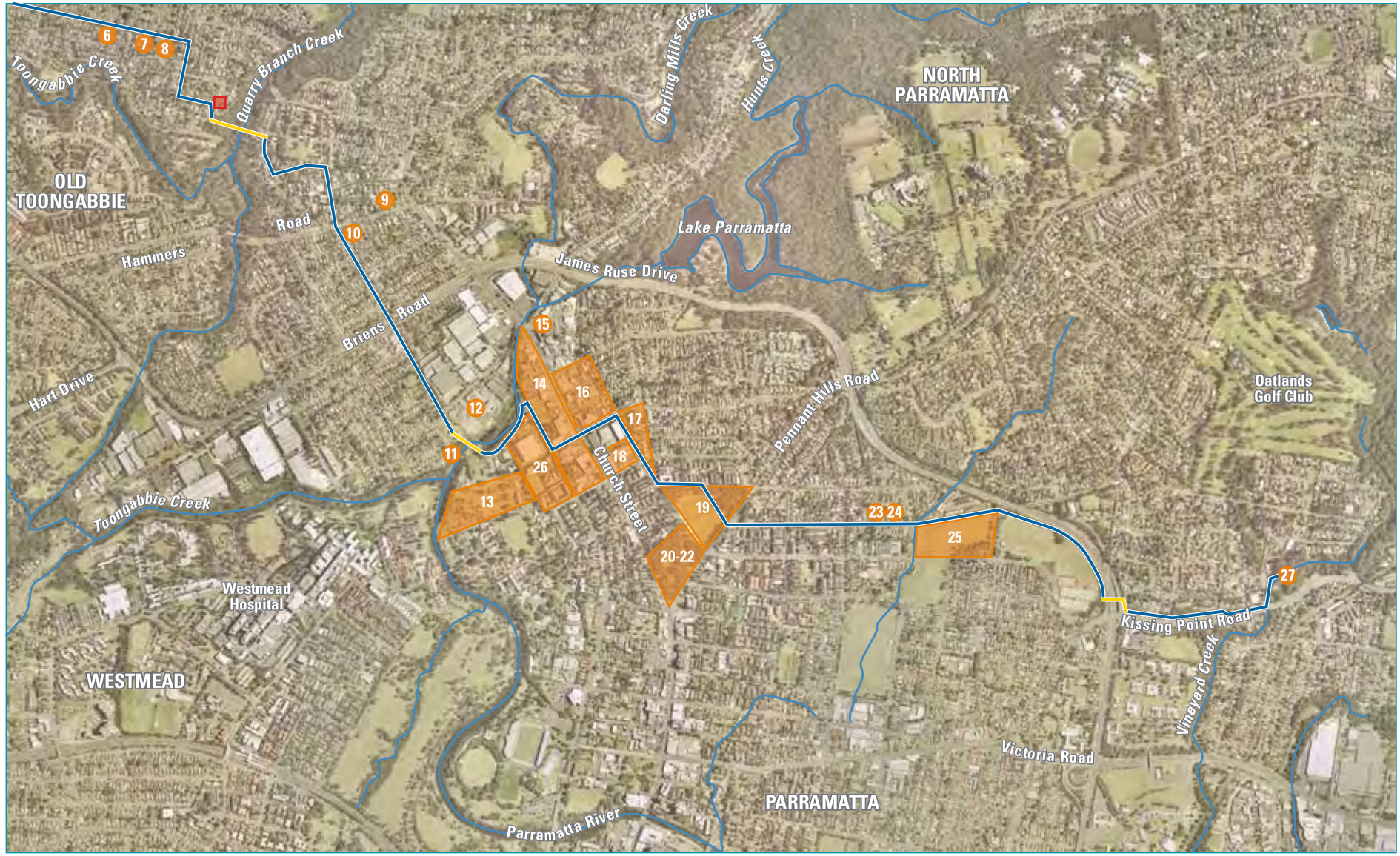


Table 4.3 European heritage items within 500 metres of the revised concentrate pipeline

Item No.	Item
5	Toongabbie convict settlement archaeological site
6	Byrock
7	House
8	Bridge Farm
9	Cottages
10	Cottage
11	Parramatta Archaeological Management Unit 2921
12	Parramatta Archaeological Management Unit 2919
13	Parramatta Psychiatric Centre Precinct
14	Parramatta Archaeological Management Unit 3138
15	Parramatta Archaeological Management Unit 2979
16	Parramatta Archaeological Management Unit 3137
17	Parramatta Archaeological Management Unit 3136
18	Parramatta Archaeological Management Unit 3134
19	Parramatta Archaeological Management Unit 2898
20	Catholic Cemetery
21	Single story residence and potential archaeological site
22	Norfolk House and potential archaeological site
23	Brick Cottage
24	Stone Cottage
25	Parramatta Archaeological Management Unit 3167
26	Parramatta Gaol
27	4570286 – Northern Suburbs Ocean Outfall Sewer

Table 4.4 identifies the items located in the alignment of the revised concentrate pipeline route and they are also shown on **Figures 4.6a and b**. No Aboriginal heritage items are in the alignment of the revised route. The new directly affected European heritage item is identified in **bold** text.

* relates to heritage item identification number on Figures 4.5a and b

Table 4.4 Heritage items in the alignment of the revised concentrate pipeline

* item in bold is newly identified in this assessment

Item No.	Item
Parramatta Archaeological Management Unit (AMU) 2898	The AMU includes a sports field (Ritchie Benaud Oval), a single-storey amenities building and surrounding open space and trees. This AMU was reserved for recreation in the 1870s and has remained a reserve and sports ground since that time. This is categorised as a reserve and is considered to have high archaeological potential.
Parramatta Archaeological Management Unit 3167	This AMU includes the Old Salesyards Reserve. A stock salesyard was well established in this area by the 1950s. Since then the salesyards and house have been demolished and the area is now the Old Salesyards Reserve. It is considered to have little archaeological potential.
Toongabbie convict settlement archaeological site	**Site of the former Toongabbie convict settlement which has been little affected by disturbance although there is no evidence visible above ground. A Government Farm was established at Toongabbie c.1791 operating until c.1803 growing barley maize and wheat with grazing until 1807. Two settlements occurred on the farm one at Johnston's Creek comprising 13 wattle and daub convict huts, stockyards and outbuildings, and one 2 miles north along Old Windsor Road where the brick threshing barn was located. This early convict site is considered to have high archaeological potential.**

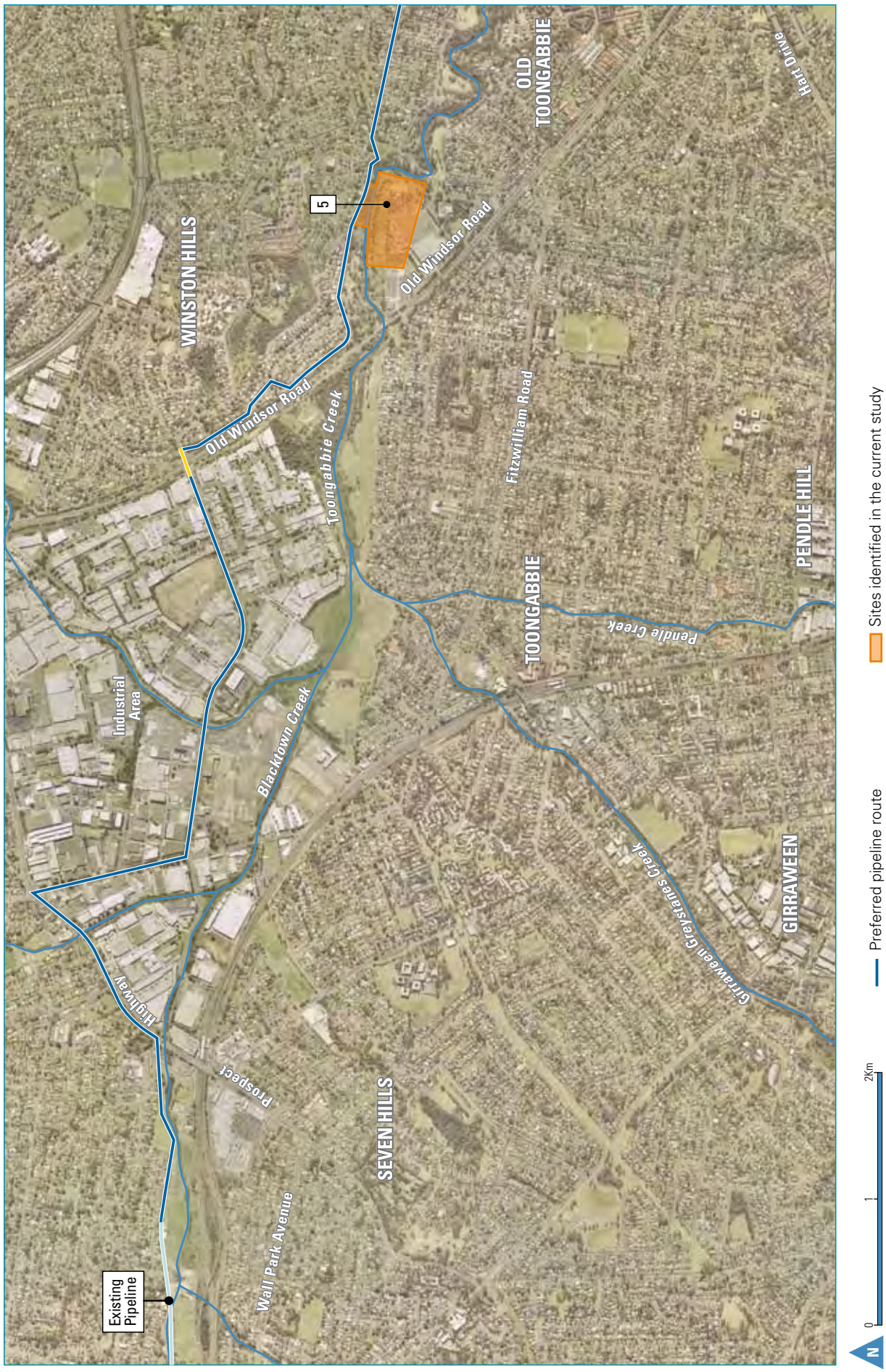


Figure 4.6a Location of sites that would be directly impacted by the project

Figure 4.6b Location of sites that would be directly impacted by the project

Comparison of impact

Indigenous heritage - The original route impacted directly on a potential archaeological deposit (WSPAD5). The revised concentrate pipeline route does not directly impact on any items, sites or PADs, representing a reduced impact on indigenous heritage compared to the original route.

European heritage – Construction of the original pipeline may have disturbed two archaeological management units (AMUs) and passed beneath the Parramatta Gaol. The two AMUs may still be disturbed during construction of the revised route but the gaol will be avoided. The revised route passes through parts of the Toongabbie convict settlement archaeological site but it is confined to the road which is a previously disturbed environment.

The overall impact on heritage due to the revised pipeline route is reduced compared to the original route. Indigenous impacts are eliminated and the route will no longer pass beneath Parramatta Gaol but the construction may impact on the convict archaeological site at Toongabbie.

Mitigation measures

The safeguards identified in the EA, which includes monitoring by an appropriately qualified archaeologist during construction, would mitigate the identified heritage impacts on the AMUs. Monitoring by an appropriately qualified archaeologist would also be required for construction in the Toongabbie convict settlement archaeological site to mitigate impacts.

4.2.7 Air quality

Existing conditions

The existing air quality around the project area is influenced by surrounding commercial, industrial and residential land uses, vehicular traffic movements and emissions, surface disturbance and exposure of soil associated with construction works.

Comparison of impact

The EA indicated that construction of the original pipeline route would require only minimal surface disturbance at any one time, as the excavation works and site rehabilitation works would be completed progressively. The revised route would have the same impacts.

Mitigation measures

Air quality impacts due to the revised pipeline route can be mitigated through Sydney Water's standard practices and the safeguards identified in the EA. No additional safeguards are required.

4.2.8 Visual amenity

Existing conditions

The revised concentrate pipeline, similar to the original pipeline route, passes through residential, commercial and industrial areas, with the pipeline positioned for the most part within existing road corridors.

Comparison of impact

The impact of the revised concentrate pipeline route on the visual environment is very similar to the original route. During construction of

the pipelines, trenches would be dug and the pipelines laid in sections along the proposed routes. Construction equipment would be visible to residences where construction work is proposed on roadways. In other areas, visibility would vary depending on the extent of distance, residential vegetation and fences.

Some reserves exist along the revised pipeline route. The presence and operation of construction equipment in these areas would affect the visual amenity, although use of these areas by the public is generally limited to weekends and outside of work hours, when construction work would be limited. Additionally, the construction period in the vicinity of any one house or reserve would be short and as such, the anticipated visual impacts would be temporary and minimal.

Mitigation measures

The impacts on the visual environment due to the revised pipeline route can be mitigated through standard practices and the safeguards identified in the EA. No additional safeguards are required.

4.2.9 Traffic, transport and access

Existing conditions

The revised concentrate pipeline route would be located in the road or road reserves of the following roads:

- Prospect Highway
- Kissing Point Road, Dundas
- Station Street, Seven Hills
- Powers Road, Seven Hills

The pipeline will cross these roads:

- Old Windsor Road
- Pennant Hills Road
- James Ruse Drive
- Church Street, Parramatta

The Prospect Highway / Station Street and Kissing Point Road / James Ruse Drive intersections carry high volumes of traffic, as does Old Windsor Road. The point where the pipeline will cross Pennant Hills Road is close to North Parramatta and is in one of the quieter stretches of the road.

Comparison of impact

The majority of the revised concentrate pipeline would be located in or adjacent to roads. The original route was also close to roads.

Construction of the pipeline has the potential to cause localised traffic delays and diversions, due to:

- short-term closure of sections of road reserve and traffic lanes, to allow the safe installation of pipelines within existing road easements
- restricted or modified access to adjacent properties.

The road verge and one lane of traffic would be closed during trenching and installation of the pipelines in or adjacent to roads for the minimum section necessary at any one time, to allow safe access and operation of construction equipment. This will be required for the revised route along Prospect Highway, Station Street, Powers Road and Kissing Point Road.

The original route would have required closing of the road verge and one lane of traffic along Hammers Road and may have impacted on the bus transit way along Old Windsor Road. The revised route will be bored under Old Windsor Road and the transitway, avoiding disruption to this busy transport corridor. Required road crossings for the revised route are similar to the original route.

It is anticipated that road works in or adjacent to roads would be undertaken progressively over a period of 4 months, with any one area being disturbed for approximately 3 weeks, although bore sites would require longer construction periods.

The original route had similar traffic impacts to the revised route but it impacted significantly on the rail corridor in the vicinity of Seven Hills, restricting the ability of RailCorp to amplify the railway system. The pipeline also crossed the railway line at two points and would have impacted on commuters in the vicinity of Seven Hills station. The revised route does not impact on the rail corridor, does not cross the railway line and will not impact on commuters.

The increased traffic due to the revised pipeline route would be similar to the original route and limited to truck movements for the removal of spoil from the sites. The original and revised routes are about the same length, and require approximately the same number of truck movements.

Proposed future road widening of Old Windsor Road will be taken into account during the detailed design of the concentrate route. The pipeline route will be located appropriately so as not to interfere with future road widening works.

Mitigation measures

The impacts on traffic and roads that are anticipated due to the revised concentrate route can be mitigated through Sydney Water's standard practices and the safeguards identified in the EA. No additional safeguards are required.

4.3 Pilot facility environmental assessment

It is anticipated that there will be minimal impacts from the pilot facility, as it will be a temporary feature, confined to the St Marys STP site. A general assessment of the pilot facility has been undertaken and is summarised in **Table 4.5**.

4.4 Conclusion

The changes to the concentrate route will minimise the pipeline's impact on road and transport corridors, on indigenous heritage and the heritage values of Parramatta Gaol and reduce energy usage. The inclusion of a pilot facility in the Project provides the opportunity to demonstrate the performance of the treatment technology with minimal impacts.

The revised concentrate route and the inclusion of the pilot facility are not significant changes to the nature of the project. The types of activities and the impacts that will occur during the construction and operation of the Project with the proposed changes will be substantially the same as the proposal considered in the EA.

Table 4.5 Assessment of impacts for the pilot facility at St Marys STP

Aspect	Impact	Mitigation measures
Water quality	Pollution of creek that runs through St Marys STP due to discharge of concentrate or other operational wastes	Concentrate and other liquid wastes from the pilot facility operation would be sent back to the STP head of works
	Pollution of creek that runs through St Marys STP due to chemical spills	All chemicals will be stored in bunded areas in compliance with Australian Standard 1940 A spill kit will be maintained on the pilot facility site
	No impact on the ability of the St Marys STP to meet its Environment Protection Licence (EPL) due to the small volumes that will be returned to head of works from the pilot facility	The filtrate will be discharged upstream of the EPL sampling point and the St Marys STP will continue monitoring as per the licence. Monitoring to assess the performance of the pilot facility will be undertaken
Soils, sedimentation and erosion	Small potential for erosion impacts due to excavation for services installation	All excavations and surfaces disturbed for installation of the pilot facility will be covered or rehabilitated as soon as possible
	Soil contamination due to spills of process chemicals such as antiscalent and acid	All chemicals will be stored in bunded areas in compliance with Australian Standard 1940
Noise	The small increase in background noise levels at the STP due to operation of the pilot facility will not be significant	No safeguards required
Traffic	A few large trucks will be required to deliver the pilot facility and will have little or no impact on traffic in the industrial area. Additional traffic generated by staff operating the pilot facility will also only be minor in the context of the current industrial area	No safeguards required
Flora and fauna	Loss of a small area of vegetation due to installation of pilot facility	Pilot facility would be located in a non vegetated (hardstand or grassed) area on the STP site, adjacent to existing infrastructure. Ancillary facilities will also be located in non vegetated areas
Air quality	Some minor dust may be generated if excavation for services and other minor items is required during construction and decommissioning of the pilot facility There would be no impact on air quality due to the pilot facility operation	Dust controls such as watering down exposed areas, will be used if required during installation of the pilot facility and facilities

4.5 The Preferred Project

4.5.1 Overview

The preferred project is the same as that described in the EA with the addition of the pilot facility at St Marys STP and some changes to sections of the concentrate pipeline route between Seven Hills and Vineyard Creek, Dundas. The addition of the pilot facility is essential to demonstrate the performance of the treatment technology. The changes to the original concentrate pipeline route have been made in response to submissions and a technical review of the project. The changes will minimise the pipeline's impact on road and transport corridors, on indigenous heritage and the heritage values of Parramatta Gaol and reduce energy usage.

The description of the preferred project that follows should be read in conjunction with the EA as the project details remain substantially unchanged, except for the concentrate pipeline route.

4.5.2 Description of the preferred project

The preferred project is comprised of the AWTP and its associated pipelines, pumping stations and storage for the transport of tertiary treated effluent to the plant, the transport of concentrate to the NSOOS and the transport of replacement flow to its discharge point at Boundary Creek – this is the major portion of the project. A temporary pilot facility will be located on the St Marys STP site.

The preferred project is described in detail below:

- an AWTP at the St Marys STP site for the treatment of the tertiary treated effluent from Quakers Hill, Penrith and St Marys STP. An artist's impression of the AWTP is shown in **Figures 4.7a and b**. The AWTP would produce up to 50ML/day of highly treated recycled water for discharge to the Hawkesbury-Nepean River downstream of Penrith Weir, and about 8ML/day of a concentrate for discharge to the Northern Suburbs Ocean Outfall Sewer (NSOOS)
- a pipeline for the transfer of tertiary treated effluent from Penrith STP to the AWTP at the St Marys STP site **(Figure 4.8a)**
- a pipeline for the transfer of tertiary treated effluent from Quakers Hill STP to the AWTP at the St Marys STP site **(Figure 4.8b)**
- a pipeline for the transfer of recycled water produced by the AWTP at St Marys STP to the Penrith STP (same route as **Figure 4.8a**)
- discharge of the replacement flows to the Hawkesbury-Nepean River, via the Penrith STP discharge to Boundary Creek, immediately downstream of Penrith Weir **(Figure 4.9)**
- a pipeline for the transfer of the concentrate from the AWTP to Quakers Hill STP (same route as **Figure 4.8b**)
- a storage pond at Quakers Hill STP for the temporary storage of the concentrate, when the NSOOS may not be available for discharge (during periods of extended wet weather) **(Figure 4.10)**
- transfer of the concentrate to the NSOOS via an existing pipeline from Quakers Hill STP to Seven Hills and a new pipeline between Seven Hills and Vineyard Creek at Dundas **(Figures 4.11a and b)**
- balance storages and pumping stations at Penrith, Quakers Hill and St Marys STPs
- temporary pilot facility at St Marys STP **(Figure 4.12)**

Figure 4.7a Artists impression of AWTP

Figure 4.7b Artists impression of AWTP showing internal layout

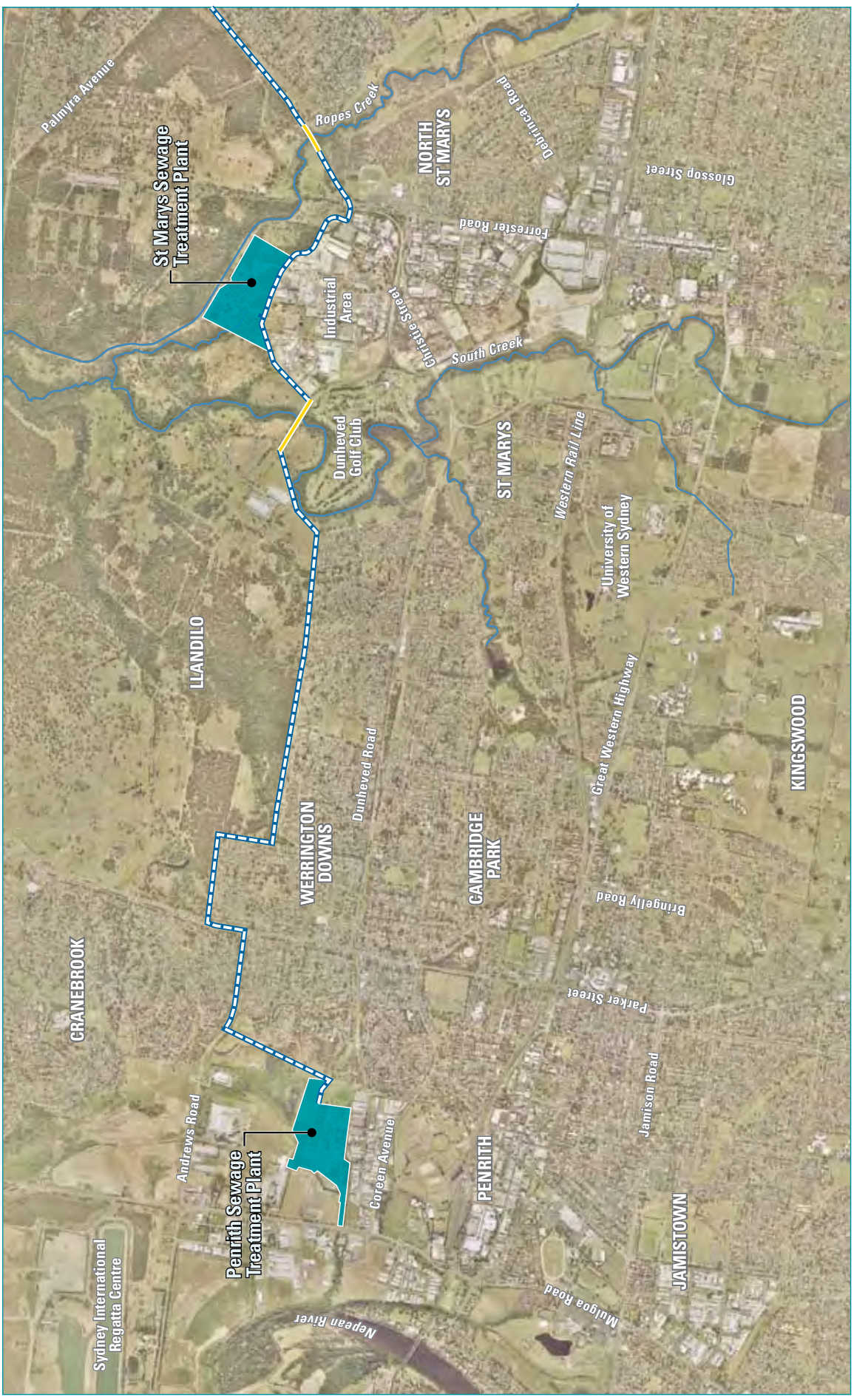


Figure 4.8a Pipeline route - Penrith to St Marys

Figure 4.8b Pipeline route - Penrith to St Marys

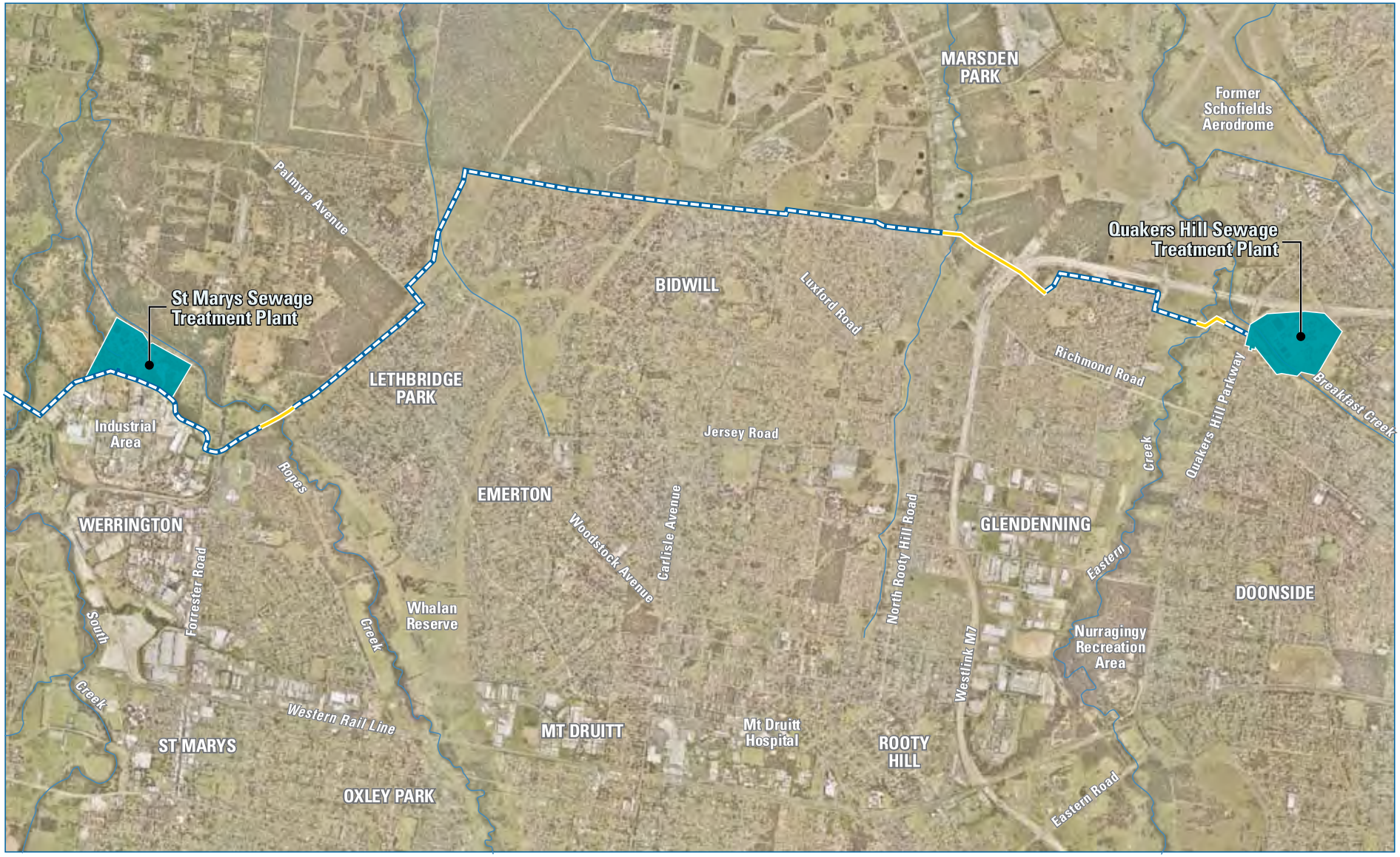


Figure 4.9 Penrith STP

Figure 4.10 Quakers Hill STP

Figure 4.11a Concentrate pipeline route

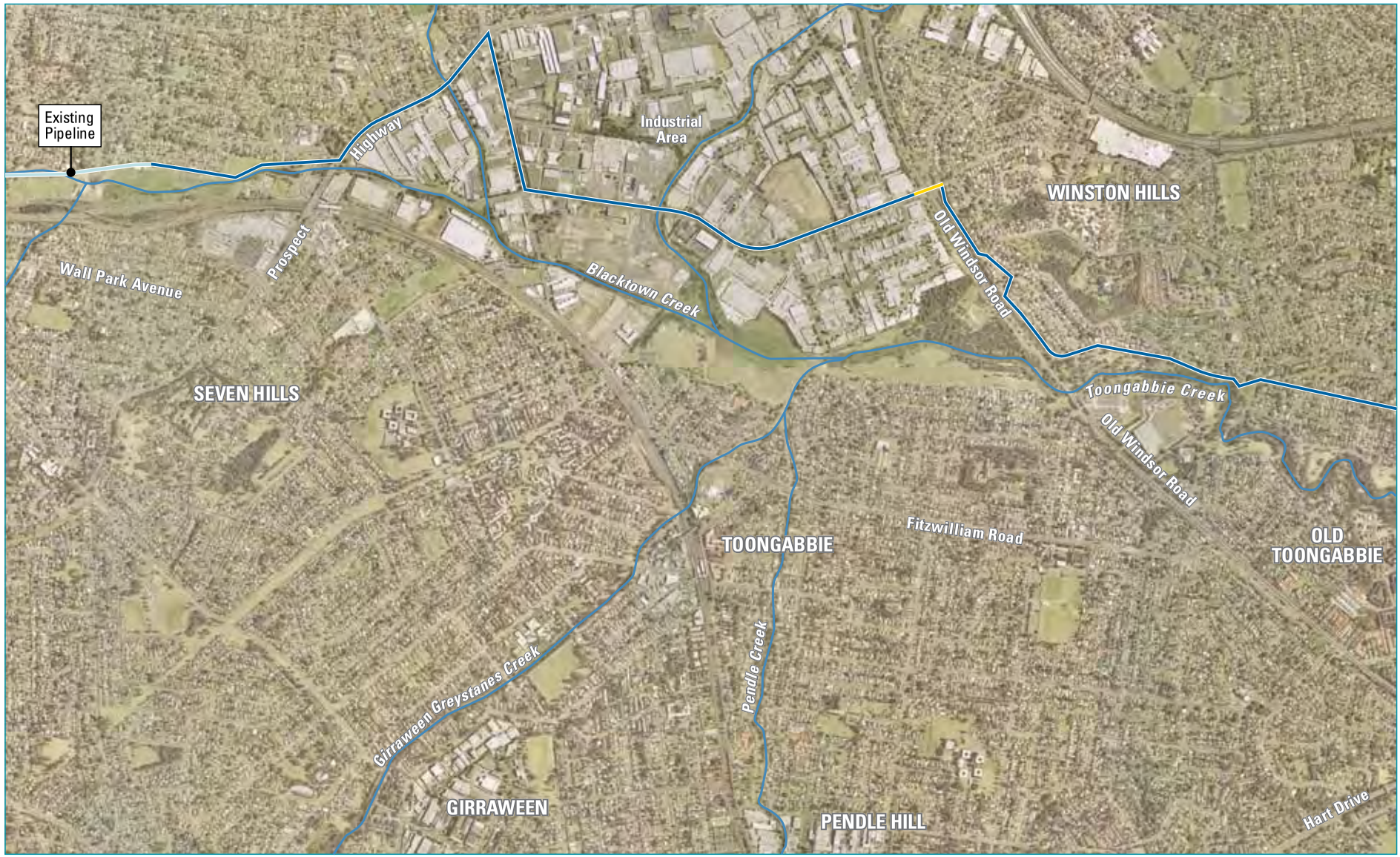
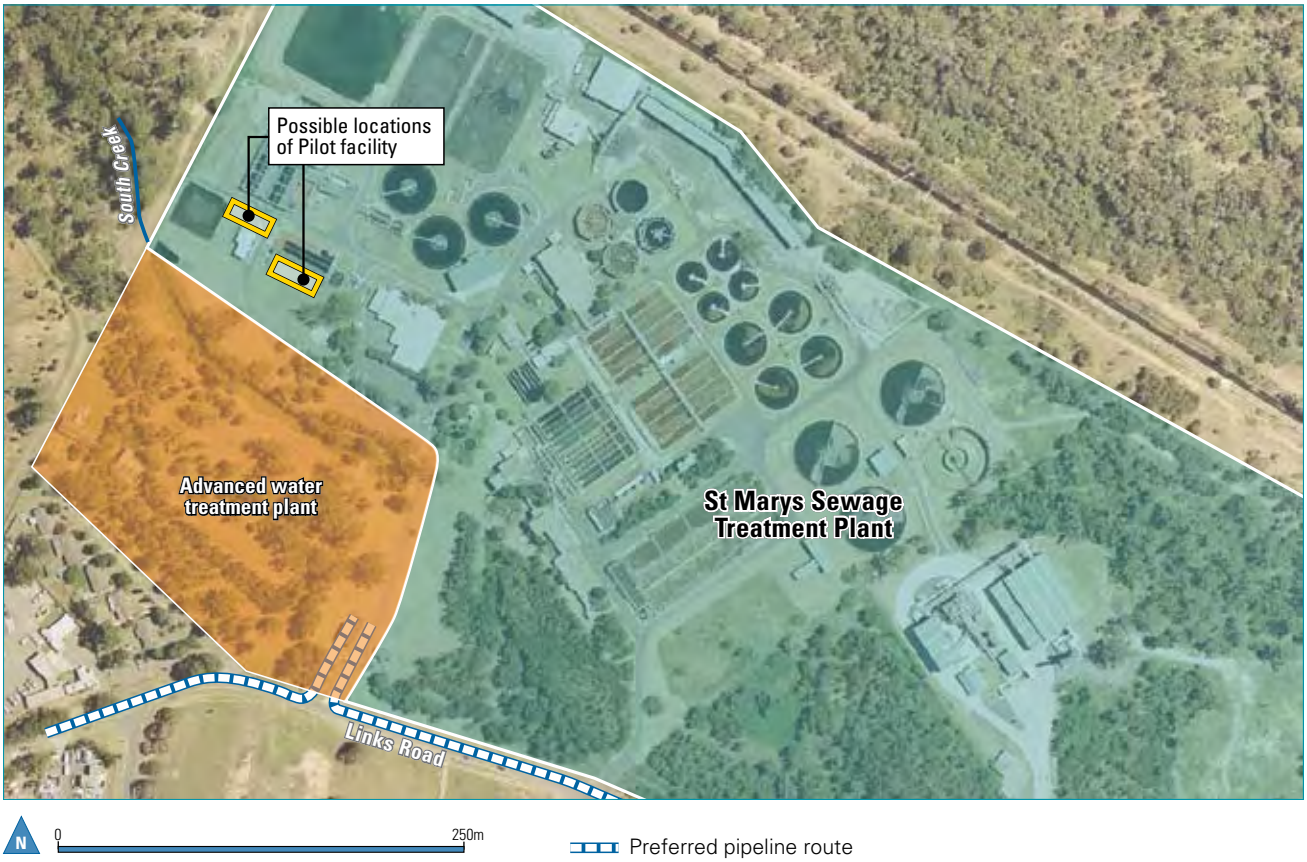


Figure 4.11b Concentrate pipeline route

Figure 4.12 Approximate location of the pilot facility at St Marys STP



Statement of Commitments

This chapter provides details of the revised Statement of Commitments for the Replacement Flows Project. Amendments to the draft Statement of Commitments are shown in **bold** text. The revised changes to the Statement of Commitments have been made in response to submissions in Chapter 3 and proposed changes to the Project presented within Chapter 4. The reasoning as to why suggested changes to the Statement of Commitments were not included within the statement is also provided.

5.1 Overview

The Statement of Commitments for the Project has been revised in response to submissions and a technical review of the Project. Submissions that proposed changes to the Statement of Commitments that have not been adopted are discussed in **Section 5.2**.

5.2 Summary of the Issues related to the draft Statement of Commitments

A number of submissions suggested revisions to the draft Statement of Commitments. The majority of these suggestions have been adopted and are identified in **bold** text in the revised Statement of Commitments in **Section 5.3.**

The following identify suggestions that haven't been adopted, or required minimal change. The reasons for not including these suggestions in the revised Statement of Commitments are provided.

Proposition for commitment 2 – The proponent shall manage the production and disposal of concentrate to ensure there is:

- **no discharge of concentrate into the Hawkesbury-Nepean River, including the South Creek Catchment, and**
- **no increase in overflow frequencies from the NSOOS**

The draft Statement of Commitments included this commitment with the provision that there will be no discharge of concentrate into the Hawkesbury Nepean River including the South Creek Catchment unless there is a significant incident or emergency or as otherwise agreed with

DEC. This commitment will remain unchanged, except for the addition of a commitment to manage backwash water at St Marys STP.

Prior to commencement of commissioning of the project, the Proponent shall enhance the existing modelling capacity to enable the predictions presented in the EA to be verified and to provide a tool which can assist with the adaptive management of the HN River. The enhanced model should include the responses of pelagic algae (phytoplankton) and freshwater submerged aquatic plants.

Additional commitment related to Commitment 4 – The proponent shall liaise with DEC, DNR, DPI and SCA with the objective of developing a commonly accessible modelling framework to inform a range of future regulation and management decisions for the Hawkesbury-Nepean River.

The draft Statement of Commitments includes a commitment that captures the enhancement of the modelling of impacts associated with the Project to assist in the adaptive management of the river. The details and capability of the model will be determined by the relevant Government agencies responsible for enhancing the predictive model and this requirement has been added to the draft commitment.

Commitment 13 – Revegetation to be monitored for at least 6 months and further management undertaken if required.

Commitment 12 outlines some of the mitigation measures that will be implemented to prevent impacts on ecology. Specific requirements on the monitoring of revegetation will be included in appropriate management procedures and details regarding revegetation are included in Commitment 14.

5.3 Revised Statement of Commitments

Table 5.1 and 5.2 lists the revised (final) Statement of Commitments for the Project. Alterations to existing commitments and any new commitments are identified in **bold** text.

Table 5.1 Statement of commitments: key issues

Water quality and water cycle management		Project phase
1	**The AWTP will be designed and constructed to provide reliable and practical automatic operation to achieve required performance standards. Its reliability will be ensured by:** • **installing proven and reputable equipment** • **providing appropriate levels of equipment redundancy that provide for both equipment maintenance and failure without compromising the plants ability to meet the specified water quality objectives** • **online monitoring and alarm systems** • **skilled operators** • **implementing asset management systems that provide for the proper maintenance and renewal of equipment.** **A capacity and performance test will be undertaken annually to ensure that there is no deterioration of the plant's performance from year to year that may impact on the key performance targets and compliance requirements.**	**Design & operation**
2	**A monitoring program to assess the impacts of the Project on river health (including water quality, flow, fish migration, macrophytes, macroinvertebtrates communities and ecotoxicity testing) would be undertaken in conjunction with NSW State Government agencies under an Integrated Water Monitoring Framework for the Hawkesbury-Nepean River. Information collected as part of the monitoring program will be provided to the relevant Government agency responsible for enhancing the existing Hawkesbury-Nepean River hydraulic and water quality models.** **Details of the monitoring program will be determined in consultation with relevant government authorities/ stakeholders (including the DNR, DPI, DEC, SCA and the Cabinet Office).** **A single baseline monitoring phase will be undertaken as part of the monitoring program for the Project. Details of the monitoring, including appropriate parameters and timing, will be determined in consultation with DEC.** **Samples would be collected at sites at which changes may occur (impact sites) and at which changes are not expected after commissioning (control sites). The specific locations of the control and impact sites will feed into the Hawkesbury-Nepean River Integrated Water Monitoring Program. Comparisons of water quality and ecological parameters would be made before and after commissioning of the AWTP.** **A discharge monitoring component will be developed to determine the area of impact, including hydrological changes and quantify changes in quality (including toxicity) of waters surrounding the discharge location. This would involve monitoring potential changes in phytoplankton, aquatic vegetation, macroinvertebrates, fish, nutrients, other physico-chemical parameters and pathogens.** **A post monitoring program will focus on potential impacts relating to:** • **river ecology health (as assessed through receiving water quality, aquatic ecology and toxicity monitoring)** • **human health impacts (as assessed through the measurement of pathogens and chemicals)** • **construction related impacts, including noise and fauna disturbance for parameters as agreed with DEC.** **Sydney Water does not propose to undertake any monitoring beyond that required by the sewage treatment system licence for South Creek catchment**	**Pre-construction, construction & operation**

3	**A discharge monitoring program will be developed and implemented to characterise and quantify the types, concentrations and loads of constituents discharged to the environment. The AWTP will be monitored on a real time basis. Monitoring will include temperature, turbidity, total & free chlorine residual, oxidation reduction potential (ORP), particle counts, pH, total organic carbon and flow. Other parameters such as on-line pressure testing of the membranes will also be evaluated for real time monitoring purposes.** **The results of all monitoring programs including the Hawkesbury-Nepean Integrated Monitoring Program will be used to inform the operations of the AWTP under an adaptive management framework. .**	**Operation**
4	**Management of the concentrate, including the AWTP and storages, would ensure there is no discharge of concentrate to the Hawkesbury-Nepean River including South Creek catchment, unless there is a significant incident or emergency or as otherwise agreed with DEC and to ensure that there is no increase in overflow frequencies from the NSOOS.** **The return of backwash water to St Marys STP will be managed so that it will not exceed the hydraulic processing capacity of the STP.**	**Operation**
5	Existing monitoring programs at North Head STP, as part of licence requirements, would continue over the life of the Project. Any changes in pollutant levels attributable to the AWTP concentrate would be detected and appropriately addressed.	Operation
6	**Sydney Water would provide data and results to assist the relevant Government agency responsible for enhancing the predictive model to assist in the adaptive management of the river. The model will then be used to verify the impacts associated with the Project. The capabilities of the model will be determined by the responsible Government agency.**	**Operation**
7	**Sydney Water would continue investigations to establish a suitable operating strategy for Wallacia STP with an objective of maintaining acceptable water quality in the Warragamba River. DEC, DNR, DPI and SCA will be consulted during the process of determining acceptable water quality objectives.**	**Operation**
8	A suitable volume of effluent would continue to be released from the St Marys and Quakers Hill STPs to ensure that current irrigation users downstream of these plants are not disadvantaged by the operation of the Project.	Operation
Ecology		Project phase
9	An ecotoxicological study will be undertaken as part of the pilot testing program, to assess the impacts of replacement flows on aquatic species.	Design
10	**A study would be undertaken in consultation with Department of Primary Industries (Fisheries) to determine whether the discharge of the Project would result in changes to the natural fish migration through the Penrith Weir fish passage. Based on outcomes of this study appropriate design and other mitigation measures would be developed.**	**Pre-design**
11	No degradation of bed or bank stability would occur within Boundary Creek downstream of Penrith STP as a result of the Project.	Design, construction & operation
12	All feasible and reasonable measures would be undertaken to minimise the impact of construction on vegetation. Vegetation clearance would be kept to a minimum. Infrastructure would be designed to avoid significant flora species and communities.	Construction

13	All feasible and reasonable measures would be undertaken to minimise the impact of construction on fauna. Disturbance to native fauna would be kept to a minimum. Infrastructure would be designed to avoid significant fauna habitat areas.	Construction
14	**A range of mitigation measures would be implemented, including:** • **construction compounds, access tracks, stockpiles and storage areas to be located on previously cleared areas, away from watercourses** • **management procedures to be implemented to prevent the spread of noxious and environmental weeds** • **the construction area to be minimised and areas of vegetation fenced off to avoid incidental disturbance** • **all revegetation works to be undertaken with locally native species and actively managed during establishment period.**	**Construction & operation**
Human health		Project phase
15	**Sydney Water will negotiate with NSW Health to determine the most appropriate water quality criteria to meet the objectives of the Project. The national water quality guidelines would be assessed as part of this process.**	**Design**
16	**The reverse osmosis membranes would be monitored at the pilot testing facility to demonstrate the specified performance objectives of the proposed treatment process.** **Specific safeguards for the establishment and operation of the pilot facilities include:** • **concentrate and other wastes from the pilot facility operation would be sent back to the St Marys STP head of works** • **all chemicals will be stored in bunded areas in compliance with Australian Standard 1940** • **a spill kit will be maintained on the pilot facility site** • **the filtrate will be discharged upstream of the environment protection licence sampling point and the St Marys STP will continue monitoring as per the licence. Monitoring to assess the performance of the pilot facility will be undertaken** • **all excavations and surfaces disturbed for installation of the pilot facility will be covered or rehabilitated as soon as possible.**	**Design & site establishment**

17	**Sydney Water will undertake (in consultation and endorsed by NSW Health) a monitoring program of the feed water to the AWTP to demonstrate contaminant reduction over the treatment process and identify significant changes in the composition of potential contaminants prior to and following commissioning of the AWTP. The parameters to be measured will include:** • **potential chemicals of concern identified in the HRA** • **chemicals that may contribute to a loss of efficiency in the AWTP** • **other chemicals having a potential impact on public health** • **chemicals of potential risk identified during sewerage catchment surveys** • **a range of water quality parameters** • **indicator bacterium E.coli and bacteriophages** **The monitoring program will be reviewed on a regular basis to ensure only relevant analytes are monitored.**	**Operation**
18	**A survey of industries in the sewerage catchment areas of Penrith, St Marys and Quakers Hill STPs will be undertaken to understand potentially hazardous sources and to identify types of chemicals being discharged to sewers (based on potential health risk of the chemicals). The survey will be reviewed as required.** **Sydney Water will continue to:** • **review emerging chemicals of concern, including disinfection by-products and EDCs** • **undertake collaborative research projects investigating the health impacts of disinfection by-products and EDCs.** **Outcomes of the above will be taken into consideration and incorporated where feasible into the AWTP process.**	**Construction & operation**
19	**Challenge testing will be undertaken to prove that the AWTP effectively removes biological contaminants from the feedwater. The specified performance values are:** • **E.coli less than 1 in 100mL (90%ile)** • **Viruses less than 1 in 50L (90%ile)** • **Parasites less than 1 in 50L (90%ile)** **Challenge testing would be implemented following commissioning of the AWTP.** **A testing facility will be set up in the AWTP for the challenge testing and other analytical requirements.**	**Operation**
20	Sydney Water's existing monitoring program would continue to assess the quality of drinking water against the National Health and Medical Research Council guidelines at North Richmond water filtration plant.	Operation
21	On-going refinement of the risk assessment would be undertaken, based on long-term performance data of the full-scale plant, combined with detailed studies of river water users.	Operation
22	Further studies arising from the Health Risk Assessment would be implemented in consultation with NSW Health.	Operation

Noise and vibration		Project phase
23	All feasible and reasonable measures would be undertaken to minimise the impact of construction noise on sensitive receivers.	Construction
24	All feasible and reasonable measures would be undertaken to minimise the impact of vibration on sensitive receivers.	Construction
25	Mitigation measures would be implemented, including: • generally limiting construction works where noise is audible at residential premises to between 7am to 6pm Monday to Friday and 8am to 1pm on Saturday unless otherwise approved by DEC. Night-work may also be required for construction of the pipelines, where they cross major roads or intersections, to minimise disruption of local and through traffic • minimising the noise generated by construction activities through construction planning and plant selection, use of mufflers, shrouds and appropriate maintenance • notification of adjacent residents prior to commencement of construction works • implementation of complaints management system so issues associated with excessive noise generation can be identified and resolved • designing the AWTP building to ensure the operation of the plant meets the noise criteria outlined in the NSW INP (NSW EPA 2000) • enclosing the pumping stations to aid in noise attenuation.	Construction & operation
Waste generation		**Project phase**
26	Wastes would be minimised. Reuse and recycling would be optimised. Wastes would be disposed of in accordance with appropriate guidelines.	Construction & operation
27	A range of mitigation measures would be implemented including: • waste to be managed in accordance with the *Waste Avoidance and Resource Recovery Act 2001* and EPA 1999 guidelines • spoil reuse opportunities to be investigated • vegetation clearing to be kept to a minimum. Composting or mulching options to be investigated • preferential purchase of materials with minimal packaging/ higher recycled content • accurate ordering and careful handling to minimise breakage/ wastage • asbestos containing materials to be handled and removed by a suitably licensed contractor and disposed of in accordance with DEC guidelines.	Construction & operation

Table 5.2 Statement of commitments: other issues

Soils and surface water		Project phase
28	Appropriate sediment and erosion control measures would be developed, implemented and maintained so the exposure of soils is not expected to have a significant effect on downstream water quality or the aquatic environment.	Construction
29	Boring techniques would be used, where practicable, to cross under creeks.	Construction
30	Any areas identified as affected by soil salinity would be appropriately managed and potential impacts mitigated. .	Construction
31	Soils would be appropriately classified and disposed of in accordance with appropriate DEC guidelines.	Construction
32	A range of mitigation measures would be implemented including: • contaminated soil identified on site to be classified and managed in accordance with the DEC Environmental Guidelines • contaminated waste and asbestos to be transported in accordance with POEO (Waste) Regulation • maintenance of spill kit on site • dewatering, installation and maintenance of erosion and sedimentation controls to be undertaken in accordance with Managing Urban Stormwater Guidelines (Landcom 2005) • containment and treatment of liquids resulting from dewatering in line with provisions of the POEO Act • contaminated water to be removed and disposed of to appropriate waste management facility.	Construction
Hazards		**Project phase**
33	Chemicals would be used and stored in accordance with appropriate guidelines.	Construction and Operation
34	A range of mitigation measures would be implemented including: • vehicles and equipment to be refuelled off site where possible. Where unavoidable mini-tanks to be used for refuelling • workforce trained in appropriate handling procedures • unloading of Class 8 substances only within designated bunded areas • spill kit maintained adjacent to unloading facilities • storage in accordance with AS1940.	Construction and Operation
Heritage		Project phase
35	Indigenous and non-indigenous cultural heritage values would be protected along infrastructure routes and at temporary construction sites. Known significant sites will be avoided where appropriate.	Construction
36	**A range of mitigation measures to be implemented including:** • **ongoing consultation with Aboriginal groups to determine management options for artefacts** • **boring beneath the PADs. If this is not feasible an archaeological investigation may be undertaken by an appropriately qualified archaeologist prior to works commencing** • **for the two AMUs and Toongabbie convict settlement archaeological site, monitoring by appropriately qualified archaeologist during construction**	**Construction and Operation**

Land use and property		Project phase
37	All feasible and reasonable measures would be undertaken to minimise impacts on land use, services and utilities and private property.	Construction
38	A range of mitigation measures to be implemented including: • consultation with affected property owners prior to works commencing • all services to be located prior to commencement of works. Notification of service providers of proposed works • rehabilitation of the land to former use on completion	Construction & operation
Visual amenity		**Project phase**
39	Construction work sites would be rehabilitated progressively	Construction
40	A range of mitigation measures would be implemented including: • maintenance of existing vegetation screening along STP boundaries • progressive rehabilitation of pipeline route • construction works limited on weekends and outside of normal work hours • storage of major construction equipment away from open areas	Construction & operation
Air quality		**Project phase**
41	All feasible and reasonable measures would be undertaken to minimise the impact of dust on sensitive receivers.	Construction
42	Concentrate odour generation potential would be evaluated as part of the pilot testing program, in relation to the potential for odour impacts from the concentrate storage pond at Quakers Hill STP.	Design
43	A range of mitigation measures to be implemented including: • appropriate dust control measures comprising: - limiting area of cleared land - revegetation on completion - damping down exposed surfaces - limiting height of stockpiles - covering spoil truck loads. • demolition of buildings containing asbestos sheeting to be undertaken by a suitably licensed contractor • maintenance of vehicles and construction equipment	Construction & operation

Traffic		Project phase
44	Disturbances to traffic and access would be minimised whenever and wherever practical.	Construction
45	A range of mitigation measures would be implemented including: • consultation with RTA, local government and public transport service providers regarding works that may impact roads or traffic • consultation with impacted property owners to maintain access during construction and notification of activities prior to commencement • construction activities to be restricted to 7am to 6pm Monday to Friday and 8am to 1pm on Saturday, unless otherwise approved by DEC • night-work may be undertaken for construction of the pipelines, where they cross major roads or intersections, to minimise traffic impacts • construction traffic management for the Project to include: - limiting area of cleared land - trucks avoiding residential streets where possible - timing of truck movements to avoid peak periods to minimise local traffic congestion where possible - routes to disposal/reuse facilities to be clearly defined with consideration of road capacity and current traffic volumes - road diversions and traffic management activities would be undertaken by qualified traffic controllers.	Construction
Environmental Management System (EMS)		**Project phase**
46	**The contractor will be required to develop a certified EMS to ISO14000 for the construction and operation of the AWTP and the construction of pipelines for the Project. The EMS would include procedures to manage noise, vibration and dust impact on local residents as well as ensuring services are not adversely impacted.**	**Construction & operation**
Community consultation		**Project phase**
47	**During construction, Sydney Water will be in regular contact with affected communities and information will be available on the project pages of the Sydney Water website.** **Communities will be informed prior to the start of any works in their area and will be notified at regular intervals throughout the construction process.**	**Construction**

References

AMBS (2000) *Final Report Environmental Flow Strategy*. Prepared on Behalf of Sydney Catchment Authority by the Australian Museum Business Services, East Sydney.

ANZECC & ARMCANZ (2000) *Australian Guidelines for Water Quality Monitoring*

AWT (2000) *Impact of discharges to the Hawkesbury River from a Proposed Sewage Treatment Plant for Brooklyn and Dangar Island.* Prepared by Australian Water Technologies for the Sydney Water Corporation.

Binnie, C, Kimber, M, & Smethurst, G. (2002). *Basic water treatment* (3rd ed.). London: Thomas Telford Ltd

Derksen, J, van Eunatten, G. M., Lahr, J., van der Linde, P., Kroon, A.(2002) *Environmental effects of human pharmaceuticals – the presence of risks* RIWA/RIZA, Amsterdam, The Netherlands

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NHMRC/ARMCANZ (2004) 2004 *Australian Drinking Water Guidelines (ADWG)*

Sydney Water Corporation (2005) *Environmental Indicators Compliance Report, Annual Report 2005, Volume 1 and 2.* Sydney Water Corporation, Sydney.

USEPA (2001) *The Incorporation of Water Treatment Effects on Pesticide Removal and Transformations in Food Quality Protection Act (FQPA)*

Appendix A

Schedule of affected land

Appendix A Schedule of affected land

Property ID number	Lot	DP	Parish	County	Owner	Local Government Areas
1	D	36666	Prospect	Cumberland	The Council of the Municipality of Blacktown	Blacktown
2a	1	634841	Prospect	Cumberland	The Council of the City of Blacktown	Blacktown
2b	3	634841	Prospect	Cumberland	The Council of the City of Blacktown	Blacktown
3	222	234686	St. John	Cumberland	The Council of the City of Parramatta	Parramatta
4	221	234686	St. John	Cumberland	Private owner	Parramatta
5	Y	31031	St. John	Cumberland	The Council of the City of Parramatta	Parramatta
6	Y	31032	St. John	Cumberland	The Council of the City of Parramatta	Parramatta
7	Parcels; Lot 1, Lot 5b	86836 752058	St. John	Cumberland	Hills Bus Co Pty Ltd	Parramatta
8	1	724342	Field of Mars	Cumberland	The Municipal Council of Parramatta	Parramatta
9	3	251334	Field of Mars	Cumberland	City of Parramatta	Parramatta
10	3	771858	Field of Mars	Cumberland	City of Parramatta	Parramatta
11	1B	402117	Field of Mars	Cumberland	City of Parramatta	Parramatta
12	1	868487	Field of Mars	Cumberland	Private owner	Baulkham Hills
13	1	709431	Field of Mars	Cumberland	The State of NSW	Parramatta

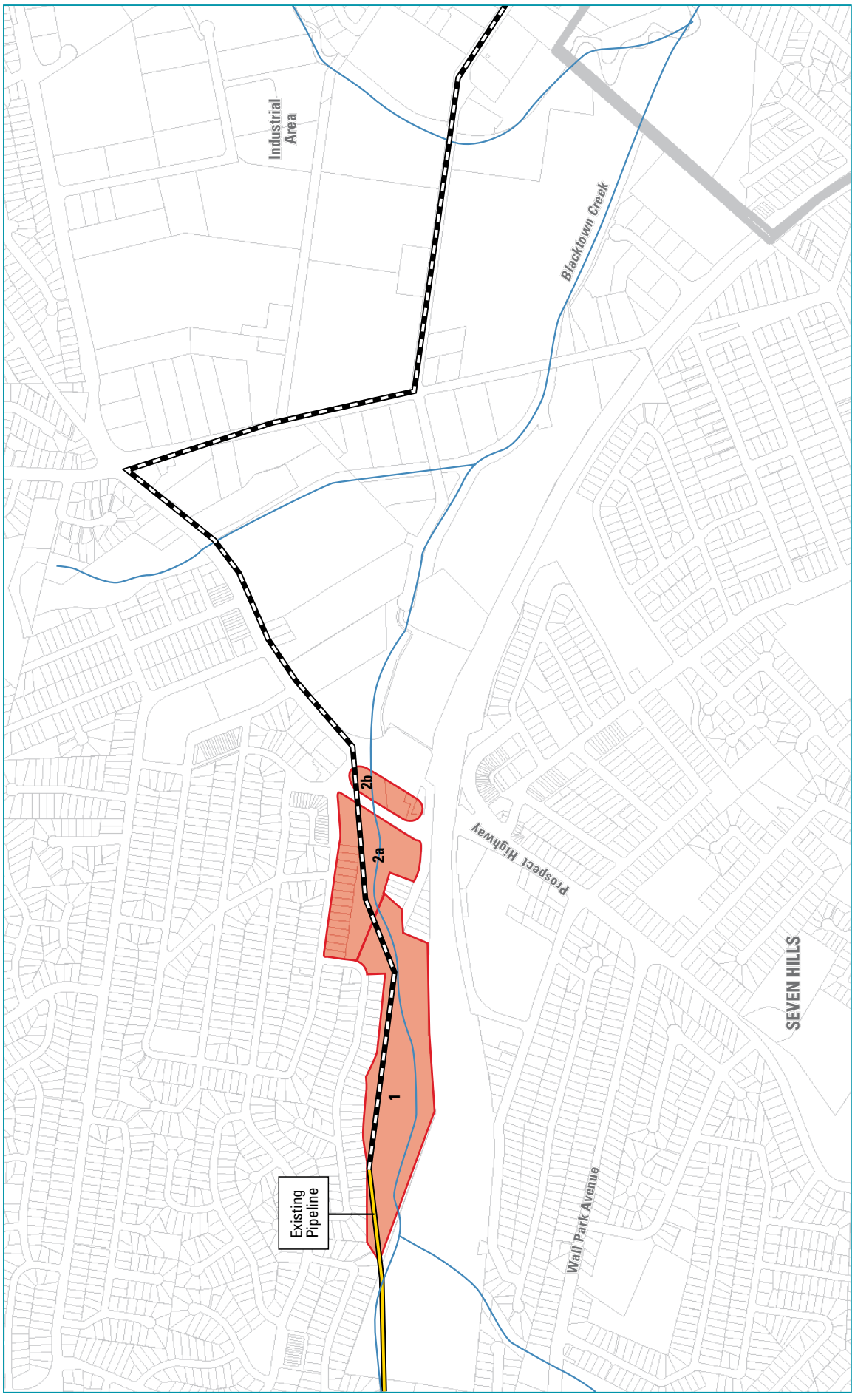
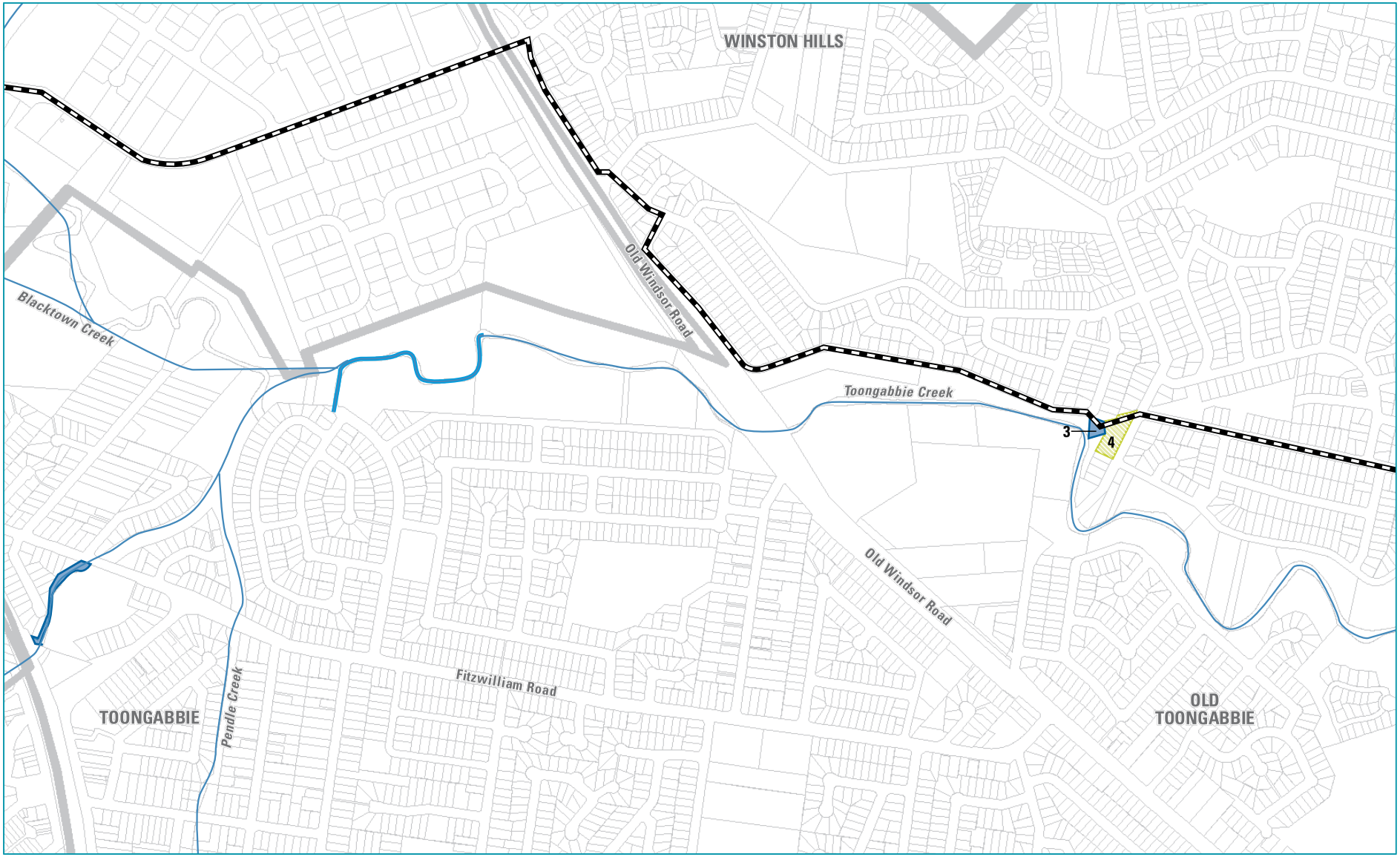


Figure Ap 1a Affected land and property details

Figure Ap 1b Affected land and property details



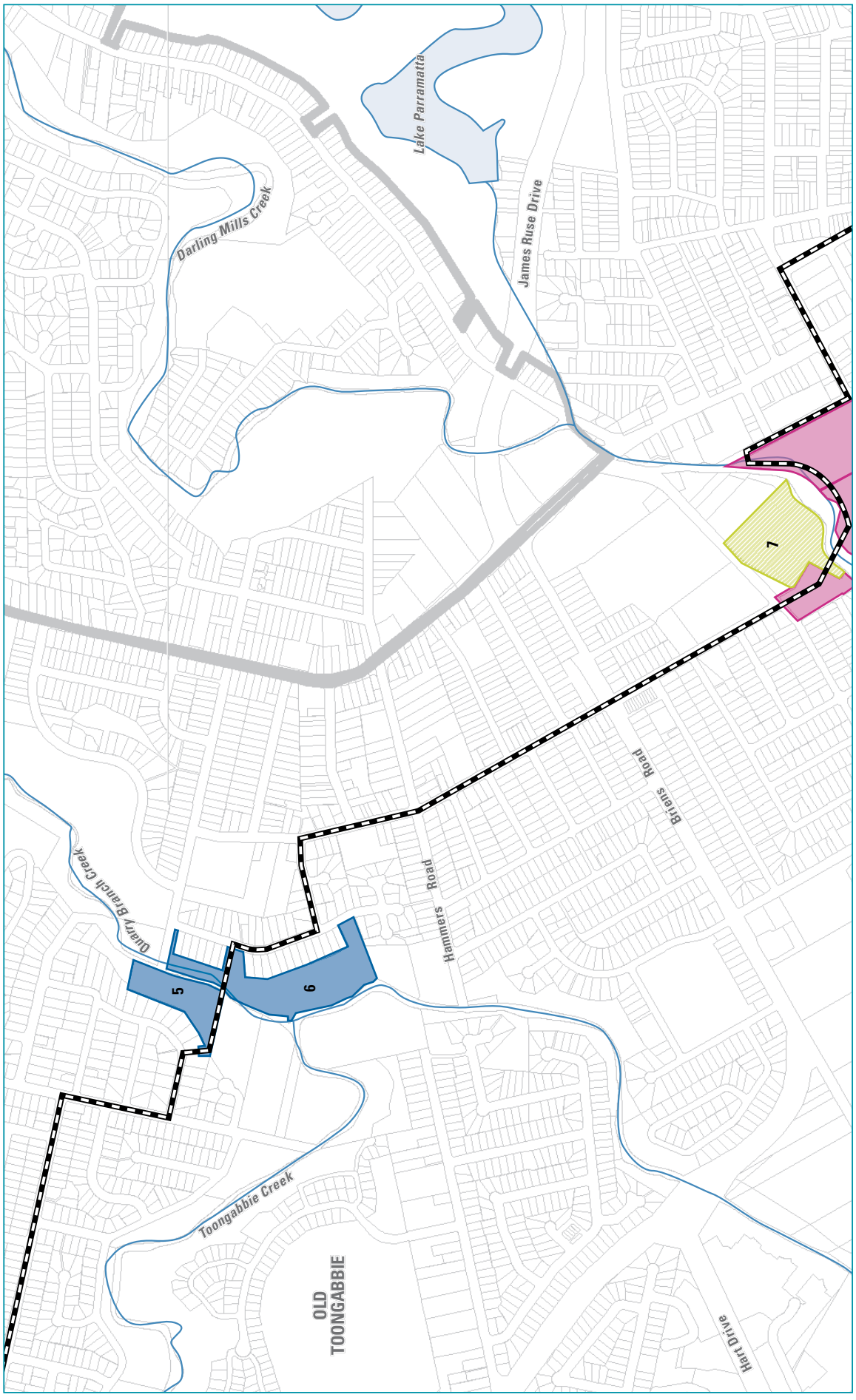


Figure Ap 1c Affected land and property details

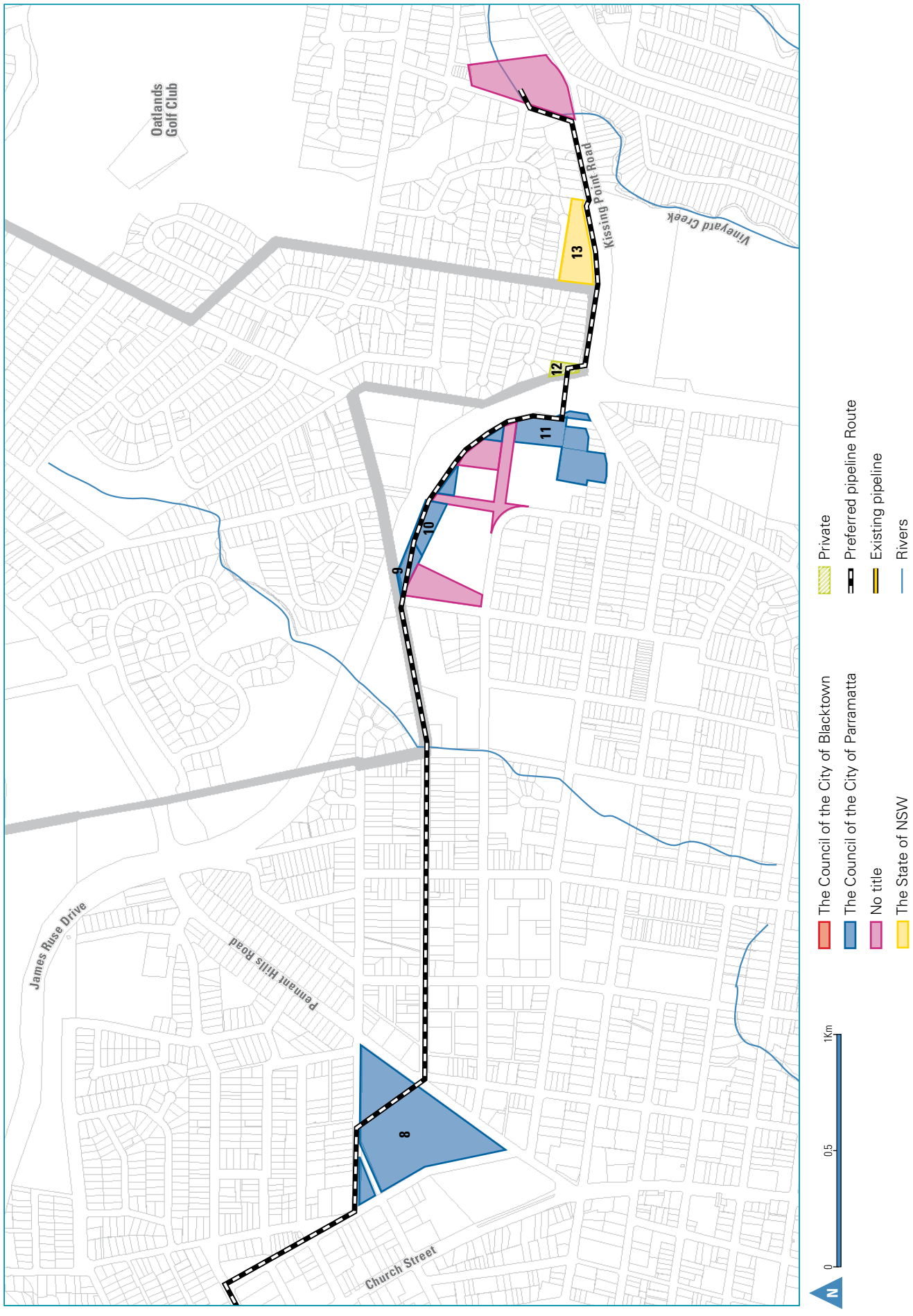


Figure Ap 1d Affected land and property details

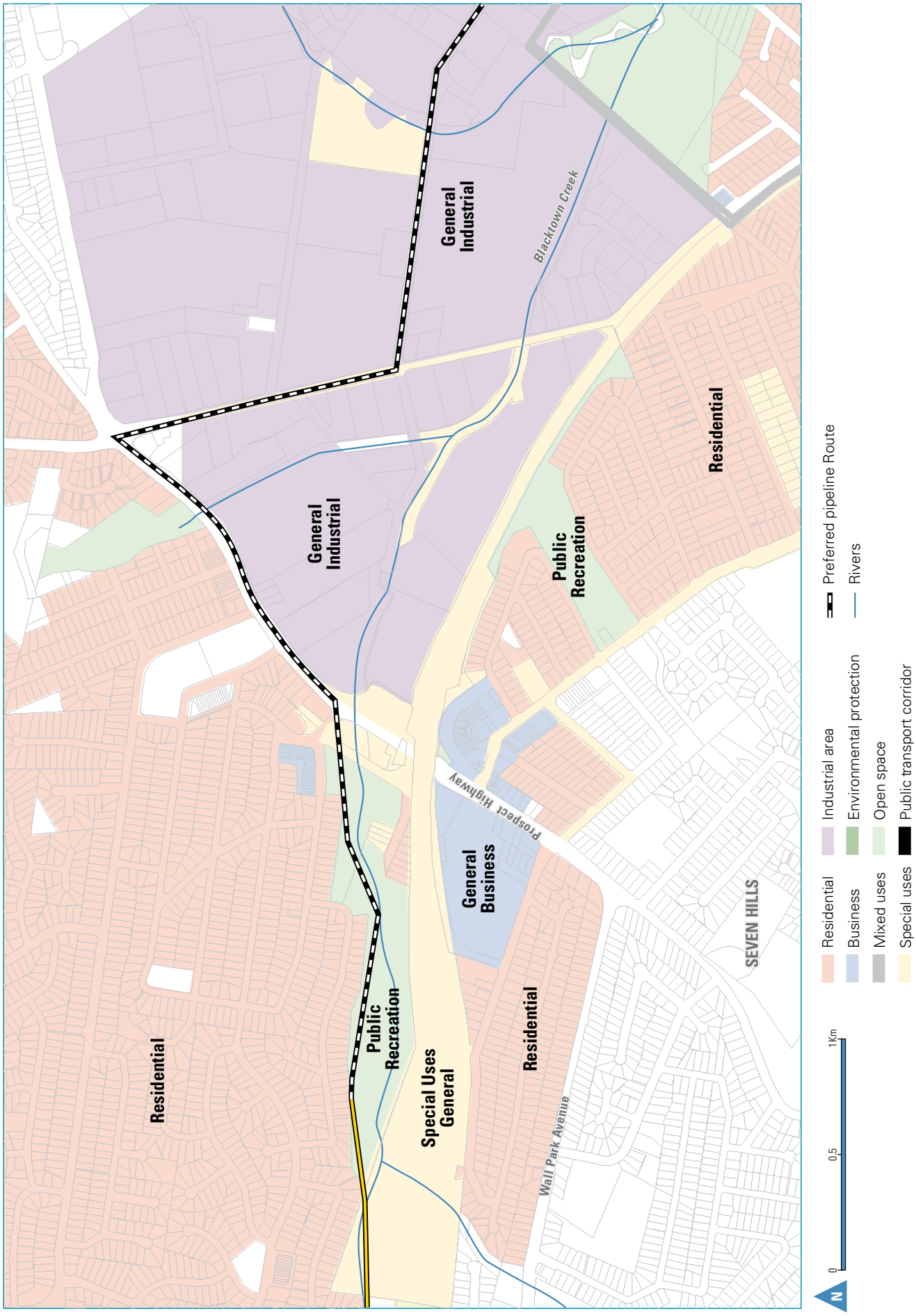
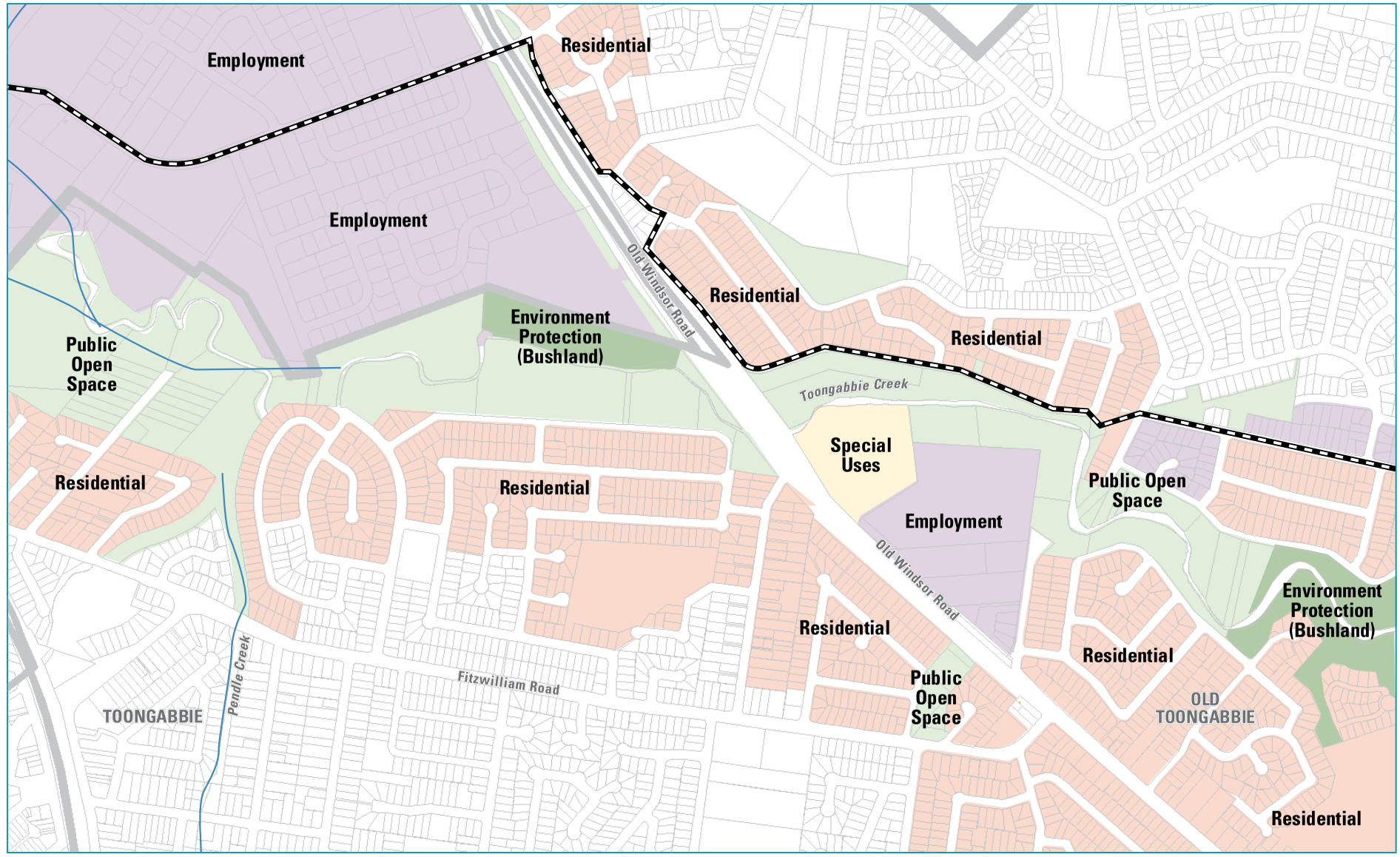


Figure Ap 2a Affected land and property details

Figure Ap 2b Affected land and property details



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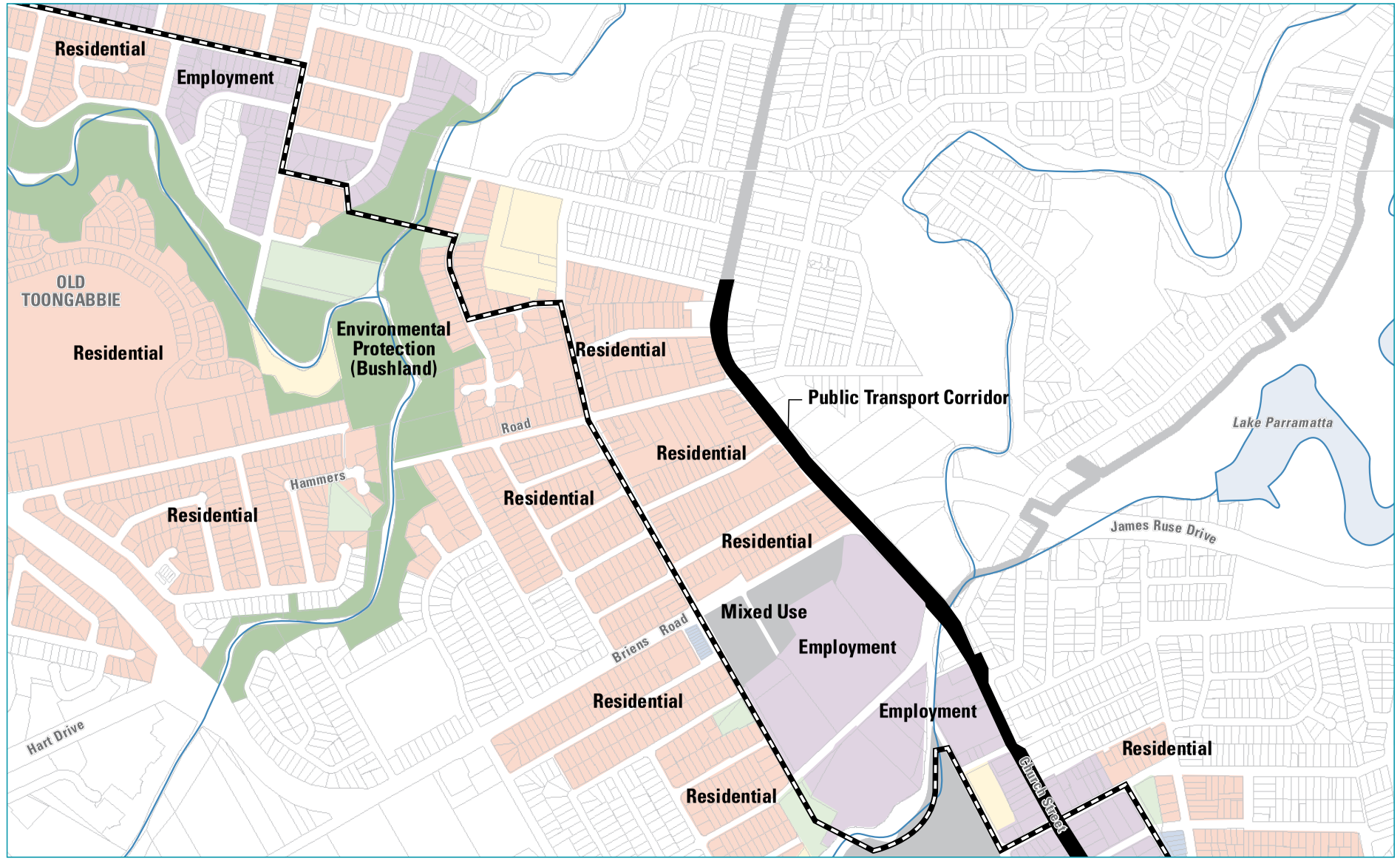

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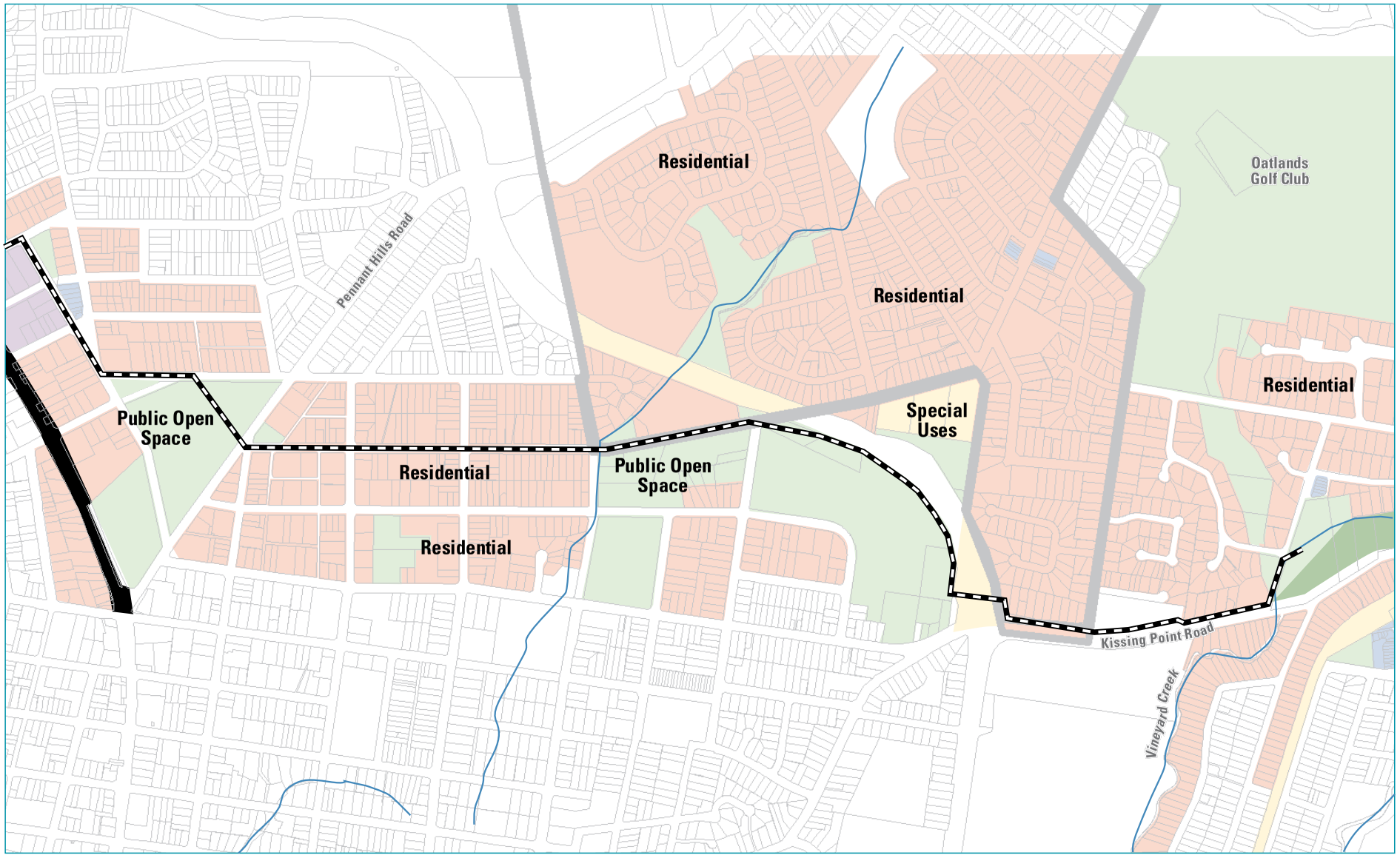

Appendix B

Director-General requirements

Appendix B Director-General Requirements

Item to be addressed	Requirement	Chapter of Environment Assessment	Section of PPR
General Requirements	Executive summary	Summary of Environmental Assessment	Provided in EA
	Description of the proposal including construction operation and staging	Chapter 3	Chapter 4
	Assessment of environmental impacts with a focus on key issues	Chapters 7 and 8	Chapter 4
	Justification for undertaking the proposal with consideration of benefits and impacts	Chapter 10	Chapter 4
	Draft Statement of Commitments	Chapter 11	Chapter 5
	Certification by the author	Front of Environmental Assessment	Provided in EA
Project Scope, Technology and Operation	Detailed description of the Project, its components and technology, any staging and interfaces with existing sewage treatment plants and infrastructure	Chapter 3	Provided in EA
	Consideration of wastewater technologies for removal of key water quality constituents. Particular consideration must be given to readily bioavailable forms of nutrients	Chapters 4 and 7	Provided in EA
	Details of proposed wastewater treatment process, evaluation of alternative processes	Chapters 3 and 4	Provided in EA
	Details of brine management, including measures to ensure overflows in exceptional circumstances only. Considerations to include options for storage capacity at St Marys STP, or elsewhere, increased sewer capacity or reduced wet weather infiltration, reduction of throughput of AWTP	Chapters 3 and 7	Provided in EA
	Details of current NSOOS condition, capacity and future capacity to accept brine waste	Chapter 7	Provided in EA

Project Scope, Technology and Operation (Contd.)	Details of the expected composition of brine	Chapters 3, 4 and 7	Provided in EA
	Likely frequency and volume of overflows and loads discharged during these events	Chapters 3, 4 and 7	Provided in EA
	Capacity of St Marys STP to receive backwash waste and any impacts on the STP	Chapter 3	Provided in EA
	Pipeline routes, construction methods and construction environmental management	Chapters 3 and 8	Chapter 4
	Maps of Project components including pipelines and showing an indication of land tenure and zoning	Chapter 3	Chapter 1 & 4 Appendix 1
Strategic Planning and Project Context	Strategic content of the Project, with regard to *2006 Metropolitan Water Plan*. Context of the Project within suite of other relevant water supply, recycling and demand management projects	Chapter 2	Provided in EA
Water Quality and Water Cycle Management	Position of the Project within Hawkesbury-Nepean system, alteration of flows due to the Project. Effect on flow rates and water balance across the system during wet and dry weather	Chapter 7	Provided in EA
	Design and operation of the Project to meet ANZECC guidelines (STP and AWTP)	Chapter 7	Provided in EA
	Likely water quality impacts of replacement flows in wet and dry weather with reference to total nitrogen, phosphorus, ammonia and total dissolved solids	Chapter 7	Provided in EA
	Likely water quality impacts from reduced St Marys and Quakers Hill STP discharges	Chapter 7	Provided in EA
	Likely impacts from cessation / alteration of Warragamba flow releases from dam wall to Penrith Weir	Chapter 7	Provided in EA
	Protection or not compromise water quality and river flow objectives and contribution to the achievement of these objectives	Chapter 7	Provided in EA
	Monitoring framework for impacts on water quality and aquatic ecology	Chapter 7	Provided in EA

Impacts on ecology	Terrestrial and aquatic ecological impact assessment (direct and indirect impacts)	Chapters 7 and 8	Terrestrial Chapter 4 Aquatic provided in EA
	Consistency with *NSW State Rivers and Estuaries Policy*	Chapters 2 and 7	Provided in EA
	Focus on Warragamba Dam to Penrith Weir and downstream of the three STPs addressing: • fish movement (past Boundary Creek and Penrith Weir) • migratory fish species • aquatic weed growth • flow regime changes in South, Eastern, Breakfast and Ropes Creeks and ecological impacts • stability of Boundary Creek, measures to rehabilitate banks and beds	Chapter 7	Provided in EA
	Demonstrate design philosophy of avoiding and minimising impacts. Identify any impacts on terrestrial endangered ecological communities and, where relevant, detail mitigation, management and off-set measures	Chapter 8	Chapter 4
Human Health impacts	Detailed assessment of impacts on current users of the Hawkesbury-Nepean River system, including microbiological and chemical hazards (including cumulative effects) including: • consumers of drinking water drawn from the river with and without further treatment • recreational users including swimming, water skiing, use of water craft • irrigators and potential implications from use of water on produce • residents using water for non potable private use • irrigation of public open spaces • any other significant use that may impact on human health	Chapter 7	Provided in EA
Noise and vibration impacts	Consider noise and vibration impacts during construction and operation and in a cumulative context through: • assessment of noise impacts in accordance with *NSW Industrial Noise Policy (EPA 2000)* and noise control guidelines *Construction Site Noise* • assessment of vibration in accordance with DEC's *Environmental Noise Management - Assessing Vibration: a Technical Guideline*	Chapter 8	Chapter 4
Waste generation and management	Detail the likely quantities and qualities generated during construction and operation. Focus on sludges, solids and aqueous wastes during operation, including details of appropriate waste management and disposal options	Chapter 8	Chapter 4

General environmental risk analysis	Include an environmental risk analysis to identify potential impacts (construction and operation), proposed mitigation measures and potentially significant residual environmental impacts after the application of proposed measures Any additional key environmental impacts identified through the risk analysis as significant, to undergo appropriately detailed impact assessment	Chapter 8	Provided in EA
Consultation Requirements	Appropriate and justified consultation with: • Department of Environment and Conservation • NSW Department of Primary Industries • NSW Department of Health • NSW Department of Natural Resources • Hawkesbury-Nepean Catchment Management Authority • Sydney Catchment Authority • relevant local Councils Appropriate consultation with the local community should be undertaken Indicate issues raised by stakeholders during consultation and how they have been addressed in the EA	Chapter 9	Provided in EA