- Recycled water to residential development.
- Recycled water to non-residential development.
- Water sensitive urban design.

Further detailed investigations were then completed on the preferred option with the expectation that this option reduces the amount of potable water imported to service the new development by 62 per cent compared to that required for a conventional development (BASIX proxy measurement). It is important to note that agreement has been reached with Queanbeyan City Council on this option (letter from QCC Engineering Services to CIC, 8 September 2008).

The preferred integrated water cycle management option for Googong comprises the following key elements:

- Water recycling plant.
- Potable and recycled water distribution system.
- Wastewater collection system.
- Stormwater management system.
- Water pumping stations.
- Sewage pumping stations.
- Potable water and recycled water reservoirs.

High levels of water efficiency are achieved through mandated low flow showerheads, clothes washers, taps and commercial urinals. Further potable water savings are then achieved through water recycling, collection of rainwater and water sensitive urban design.

It is proposed that recycled water be directly employed for:

- Irrigation of sporting fields and public spaces.
- Toilet flushing and washing machines.

Rainwater tanks, in turn, are to be used for household irrigation and as a cold water source for washing machines. During periods of high water demand, the potable water supply will be used as a 'top-up' source for the recycled water supply system. Water sensitive urban design will provide further water demand reductions reducing irrigation water needs by retaining runoff within the development area. Water sensitive urban design stormwater control features such as drainage swales, porous paving and retention of natural drainage paths and streams will be employed.

Further investigation of overland stormwater capture will be conducted as part of the stormwater management plan.

Staging

Infrastructure for the integrated water cycle management strategy will be staged over time to meet the needs of the development as the development grows. Components of the infrastructure will be provided in stages to meet population growth within the development. Such infrastructure includes:

- Bulk potable water pumping station and rising main.
- Potable water distribution system.
- Potable water reservoirs (including potable water chlorination and pH adjustment chemical dosing equipment).

- Water recycling plant.
- Recycled water distribution system.
- Recycled water pumping station, odour control system and rising mains.
- Recycled water reservoirs.
- Wastewater collection system.
- Wastewater pumping stations and rising mains.

Part of project (NH1A)

The water cycle infrastructure that will be required to service the needs of the first lot release for NH1A (to be delivered prior to permitting occupation of the first homes (refer to figures 5 and 6) are listed in the table below (Table 2).

Table 2 Water cycle infrastructure

Water cycle infrastructure	Purpose
Potable water	• First stage bulk water pumping station and rising main. • First stage reservoir. • Reservoir outlet main to the first release area.
Wastewater	• First stage water recycling plant stage 1a (sewage treatment, wastewater recycling processes). • Wastewater pumping stations and odour control facility for the collection of wastewater and treatment of potential odours. • Trunk wastewater collection system for NH1A.
Recycled water	• First stage recycled water pumping station and rising main. • First stage reservoir. • Reservoir outlet main to the first release area.

When an understanding of the discharge standards for the recycling plant has been obtained from DECC, CIC will complete further detailed design of the water recycling plant and develop a plan of management specifically tailored for the management of recycled water and wastewater immediately following first lot release. This plan will confirm the preferred staging of wastewater treatment processes to service NH1A.

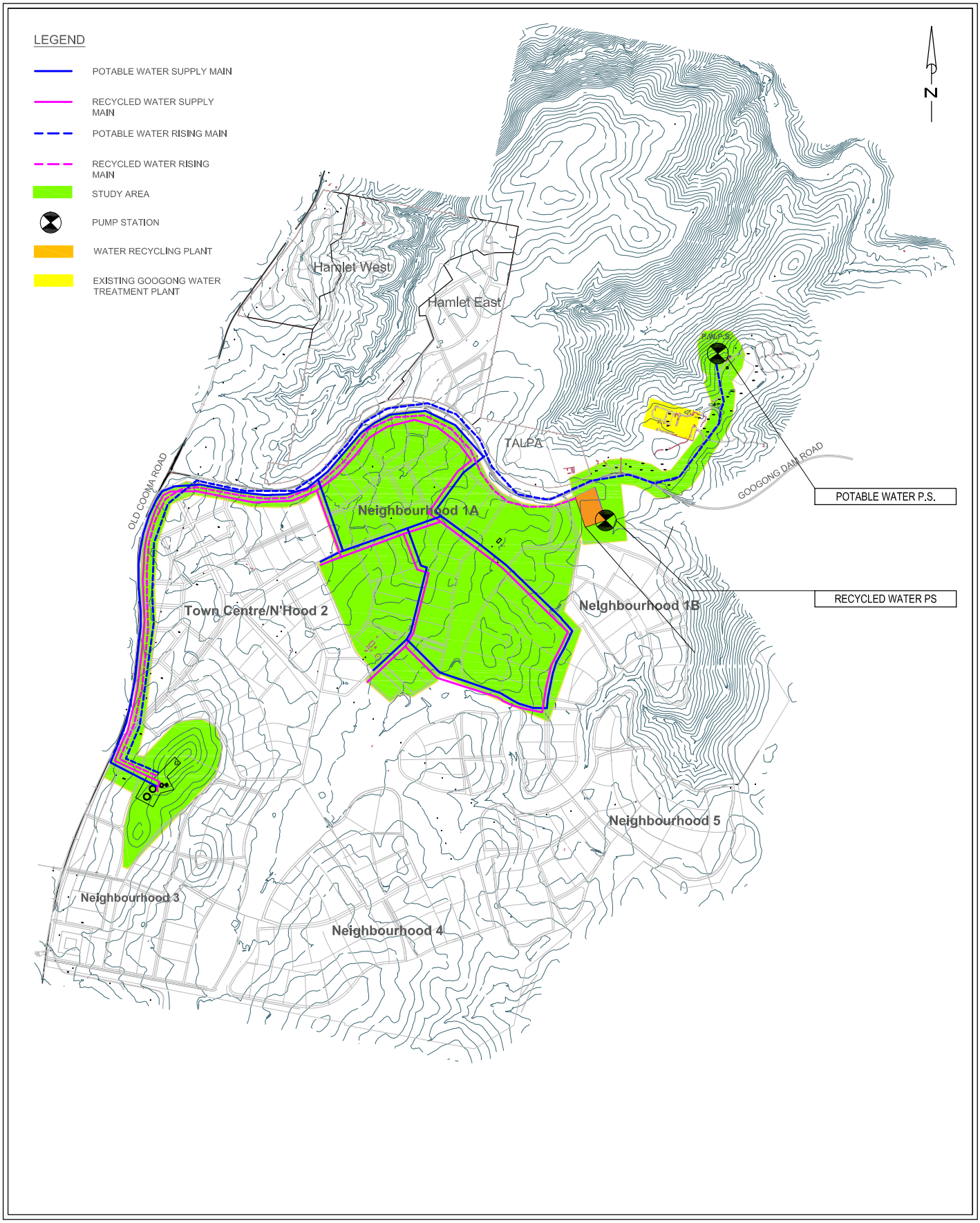
Staging will need to take into account several factors including:

- Initial low flows unable to support biological treatment processes.
- The anticipated population growth rate.

For the life of NH1A (this may be up to 10 years depending on lot sales rate), and depending on effluent discharge standards, the water recycling plant bioreactor may take the form of either:

- An intermittent process design.
- A continuous process design.

Figure 5: Part of project (NH1A) trunk water and recycled water system



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GOOGONG
TRUNK WATER & RECYCLED WATER SYSTEM - STUDY AREA

DOCUMENT No. A1154700-G003
DATE: 12/11/2008
REV: D
COMPILED: OB

SCALE: 1 : 7,500 (A1)
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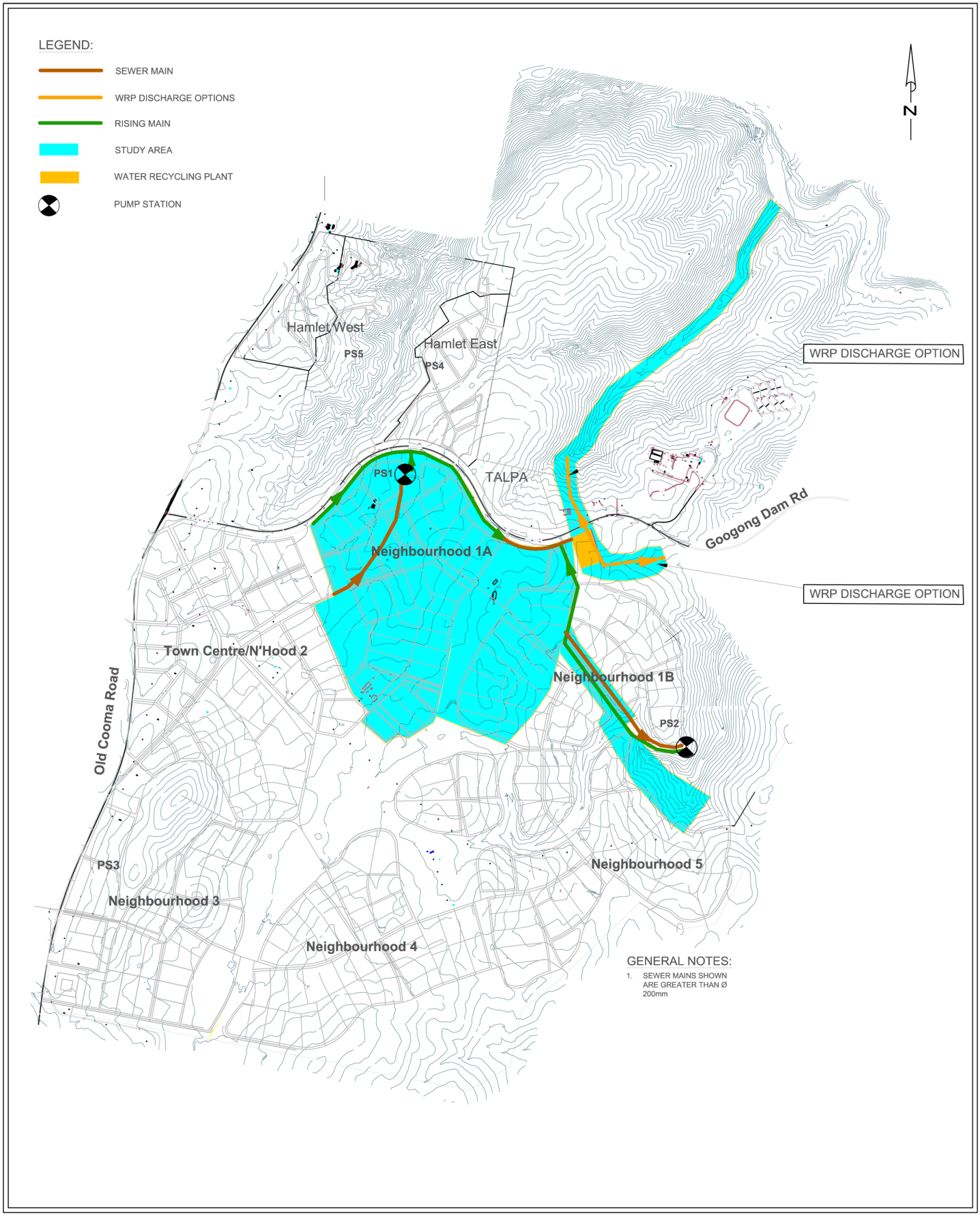
Figure 6: Part of project (NH1A) wastewater system



Where economically advantageous and where capable of meeting the effluent discharge standards, proprietary package systems may be employed for either process design. Where proprietary package systems cannot securely produce the effluent discharge quality required under the water recycling plant's discharge licence, or where not financially viable, stage 1 of the ultimate plant's bioreactor design will be constructed.

Similarly, for the initial years of the development and depending on effluent discharge standards, the plant's filter system may take the form of either:

- A proprietary package system.
- Stage 1 of the plant's ultimate filtration system.

Once the biological processes at the water recycling plant have been in operation for a number of months after connection of properties to the plant, sufficient biosolids will be developed to require the start up of the plant's biosolids stabilisation and dewatering process units. The biosolids processing facility will be designed to stabilise waste activated sludge and then dewater it for beneficial reuse.

Following stage 1 delivery of integrated water cycle management strategy infrastructure, further augmentation of this infrastructure will occur as required to meet:

- Development.
- Potable water demands.
- Recycled water demands.
- Wastewater collection system licence requirements.
- Water reclamation discharge licence requirements.

These later augmentations will be based on population growth and will form the basis of separate 'part of project' planning approval applications.

2.3 Key elements of the project

Googong water recycling plant

Location

The water recycling plant will be located within the northeast corner of the development area (Figure 6) This location is higher than some parts of the development area and is on the eastern side of ridge line within the development, therefore a number of pumping stations and rising mains will be required to transport and lift sewage to the recycling plant.

The location of the plant has been selected to minimise the potential impact on residents and optimise the use of Googong Dam Road as a maintenance and service vehicle corridor, consolidating maintenance and service vehicle movements for the development with similar movements for the existing Googong Water Treatment Plant.

Processes

The water recycling plant will be designed to meet the requirements of the Australian Guidelines for Water Recycling (NRMMC, 2008) and its proposed effluent discharge licencing conditions. It may incorporate unit process for:

- Flow balancing.
- Screenings and grit removal and handling.
- Biological treatment.
- Filtration.
- Chemical dosing.
- Disinfection.
- Recycled effluent storage and pumping.
- Odour control.
- Sludge stabilisation and handling.
- First flush containment.

It is proposed that parts of the plant be located within 200m of the proposed residential development. A number of issues will need to be carefully considered during the detail design to minimise the impact of the plant on future nearby residents and achieve an environmentally viable 200m buffer. These issues include impacts associated with lighting, noise, odour, vehicle movements and visual amenity.

To minimise the impact of these issues it is anticipated that relevant management strategies and controls may need to be developed.

Discharge standards

The specific design of the water recycling plant is under consideration, pending the requirements and criteria for release into the receiving environment. Final concept design will occur concurrently with environmental assessments to ensure that environmental constraints are correctly specified.

The ANZECC Water Quality Guidelines for aquatic ecosystems (ANZECC, 2000) will be considered in design of the water recycling plant with respect to any necessary discharges of recycled water during times of low recycled water demand. Indicative trigger values for some parameters are shown in Table 3. If discharges to receiving environments are considered necessary, water recycling plant design requirements will also consider the known ambient receiving water quality.

Table 3 ANZECC water quality guidelines for aquatic ecosystems (for upland rivers in the South East of Australia)

Parameter	Aquatic ecosystems trigger value
Chl a (μg/L)	N/a
TP (μg/l)	20
FRP (μg/l)	15
TN (μg/l)	250
NOx (μg/L)	15
NH4 (μg/L)	13
DO (% saturation)	90–110
PH	6.5–7.5

Source: Australian and New Zealand Guidelines for Fresh and Marine Water Quality, (ANZECC, 2000)

Potable and recycled water distribution system

The design of the potable and recycled water systems will be based primarily on the guidelines published by the Water Services Association (WSA) of Australia with due consideration of the water consumption minimisation measures to be adopted in the development control plans created for the development.

Potable and recycled water infrastructure will be delivered on an as needs basis to support potable and recycled water demands. The distribution of potable and recycled water throughout NH1A will require the provision of the following infrastructure (to be in place before any dwellings are occupied):

- Trunk mains (typically larger than 200mm in diameter) – typically following road alignments.
- Reticulation network (typically 200mm in diameter or smaller) – typically following road alignments.
- Disinfection facilities.
- Storage reservoirs (the exact location, number and size of storage reservoirs will be confirmed during final concept design, however preliminary design work has anticipated the provision of:
  - Two recycled water reservoirs holding around 10ML each and approximately 12m in height. One of these reservoirs will be required for the release of land in NH1A and the other staged in the future to meet recycled water demand needs and water recycling targets.
  - Two potable water reservoirs holding around 5ML each and approximately 12m in height. One of these reservoirs will be required for the release of land in NH1A and should be sufficiently large for ultimate development, however space will be allocated for the provision of an additional potable water reservoir should potable water demands exceed expectations.
- Small pump control reservoirs – to supply sufficient water pressure to properties in elevated areas within the development. The size of these reservoirs will be confirmed during detailed design, however preliminary design anticipated the provision of:
  - One recycled water reservoir holding around 10kL and approximately 5m in height. This reservoir will not be required to service NH1A but will be constructed at a later stage to service areas that are of higher elevations.

- One potable water reservoir holding around 2kL and approximately 5m in height. This reservoir will not be required to service NH1A but will be constructed at a later stage to service areas that are of higher elevations.

- Pumping facilities and their associated rising mains. Rising mains typically following road alignments and pumping stations connected to the reservoirs.

The bulk potable water pump station will be located at the existing Googong water treatment plant and deliver bulk potable water from this plant to the bulk storage reservoirs (potable water). The recycled water pumping station will be located at the proposed new water recycling plant and will deliver recycled water from the plant to the bulk storage reservoirs (recycled water). The exact alignment of the mains has not yet been confirmed and will be constructed on an as needs basis throughout the life of the project.

Wastewater trunk mains

Wastewater infrastructure sizing will be primarily based on guidelines published by WSA, and the collection system operating licence conditions for wastewater containment. The wastewater collection system will be a modified gravity sewerage system, which will be modified to reduce infiltration. This type of system is a recent development in the delivery of wastewater collection services in Queensland (any new area in the Gold Coast) and NSW (Mulgoa, Wallacia, Silverdale, Upper Blue Mountains) and are commonly termed: smart sewers, reduced infiltration gravity sewers (RIGS), reduced infiltration sewerage systems (RISS) or modified gravity sewerage systems.

Like conventional gravity sewerage systems, the pipework in a RISS is designed to operate under gravity and will incorporate ventilation shafts at regular intervals to ensure adequate ventilation of the sewer to minimise the potential for sewage septicity and gas attack of pipework. However, key differences are:

- Employment of solvent welded or fusion bonded plastic pipes to reduce the potential for infiltration at pipe joints.
- Employment of prefabricated manholes with rubber ring joints.
- Reduction in the number of manholes to realise the benefits available from modern wastewater maintenance equipment such as jet rodders and close circuit television systems.

RISS aims to minimise the potential for rain and ground water infiltration, and the potential for sewage exfiltration, and therefore has a number of sustainability and environmental benefits. These include:

- Reduction in the size of wastewater treatment processes.
- Reduction in the amount of energy required to lift raw sewage from low-lying areas into the wastewater treatment system.
- Reduction in the amount of energy required to treat wastewater to a given effluent quality standard.
- Reduced potential for sewage exfiltration and dry weather pollution of waterways.

It is anticipated that these trunk mains (typically 300mm diameter and above) and collection mains (typically less than 300mm diameter) will be constructed on an as needs basis over an extended time frame of approximately 25 years.

Trunk sewers will typically run along valley floors and along side watercourses within the development. To optimise the use of gravity and minimise energy consumption for the collection of wastewater this may necessitate the traversal of privately owned land. Wherever possible, the smaller collector sewers will be run along streets, however, to optimise the use of gravity and minimise energy consumption, traversal of privately owned land may be required in some instances.

As noted earlier, the water recycling plant is located above some low-lying areas within the development and to the eastern side of a ridge line within the development. This will therefore require a small volume of sewage collected within the development to be lifted, via sewage pumping stations, into the water recycling plant. However, a major proportion of the sewage will not require pumping.

Subject to final design, up to two sewage pumping stations will be required to service the release of land in NH1A. The large part of these pumping stations will be below ground with the roof slab, access lids, vent shaft, odour control facility and switchboard being visible above ground. At each sewage pumping station, telemetry facilities will be provided to alert system operators of any potential breakdowns to minimise the opportunity of sewage overflow. Further, each pumping station will be provided with 4hrs of emergency storage (measured across the day's peak inflow period) in the event of a breakdown.

Stormwater management system

A stormwater management strategy utilising the principles of water sensitive urban design, will be developed that mitigates the potential impacts of the development such as:

- Stormwater quality.
- Riparian zones.
- Water balance and stream forming flows.
- Stormwater peak flows and flood risk.
- Construction phase impacts.

The key objectives of the strategy will be developed to achieve the following performance:

- A reduction of 1-in-3 month stormwater peak runoff flow to pre-development levels with release of captured flow over a period of 1–3 days.
- A reduction of five year ARI and 100 year ARI stormwater peak run off flows to predevelopment levels.
- To ensure that residential land is flood free for the 100 year ARI storm event and provide safe evacuation routes.
- Maintaining the existing hydrological regime for stream forming flows, with respect to peak flows and duration of flow.
- Compared to predevelopment, a reduction in average annual stormwater pollutant export load of:
    - Gross pollutants (>5mm) by 90 per cent
    - Suspended solids by 85 per cent
    - Total phosphorus by 65 per cent
    - Total nitrogen by 45 per cent
- To maximise the efficient use of land by integrating stormwater management strategies into public open space and roadways.

The proposed stormwater management strategy incorporates the following measures to manage and mitigate the impacts of the proposed development:

- Stormwater treatment facilities such as GPT's, bio-retention swales and basins.
- Stormwater detention systems.
- Roof water run-off collection and re-use for non-potable water uses.
- Flood risk management using flood planning levels.
- Construction phase management provisions, which include implementation of erosion and sediment control strategies.
- Possible inclusion of overland stormwater storage and reuse.

Hydrological, hydraulic and water quality modelling was undertaken to support this proposed stormwater management strategy. The results of the simulations show that this strategy would effectively mitigate the impacts of development at the site, protect the downstream riparian environment and allow for stormwater quality and quantity targets to be met.

Within NH1A and other development areas within the same broad catchment, it is proposed to provide four large detention basins to control the flows from the development site. There will be two basins in NH1A to be located within open space areas. These basins would be connected via a series of open channels and swales at the development site, and would be adopted in conjunction with tree pits.

3 Planning and assessment process

The Googong water cycle project environmental planning and assessment framework involves three levels of government:

- Commonwealth.
- State (NSW).
- NSW local government.

This section outlines the approach taken to obtaining concept plan approval for the project, and approval for part of the project (NH1A) for the Googong water cycle project under the EP&A Act. Details of the broader statutory planning framework are also discussed, including Commonwealth legislative planning considerations.

3.1 NSW planning legislation

The EP&A Act, the associated *Environmental Planning and Assessment Regulation 2000* (the regulation), and environmental planning instruments made under the EP&A Act provide the framework for the assessment of environmental impacts and planning approval of development proposals in NSW. Part 3A of the EP&A Act establishes an assessment and approval regime for major infrastructure projects. Part 3A applies to development that is declared to be a Part 3A project by either a State Environmental Planning Policy or Ministerial Order.

Broadly, the Googong water cycle project is defined as a major project under Schedule 1 of the *State Environmental Planning Policy (Major Projects) 2005* and as such should be assessed under Part 3A of the EP&A Act. The development that is the subject of this concept plan application will cater for the treatment of wastewater and delivery of treated (recycled) water to about 17,500 EP, at a total cost of about $50 million, in total qualifying the development to be assessed on this basis.

The implications of this planning approvals pathway, and details associated with the assessment of this project under Part 3A of the EP&A Act, are outlined in this section.

Concept plan and part of project approval under the EP&A Act

Section 75B of the EP&A Act specifies the types of projects to which Part 3A of the Act may apply. Section 75B(1) provides that Part 3A applies to:

> *'The carrying out of development that is declared under this section to be a project to which this Part applies:*
>
> *(a) by a State environmental planning policy, or*
>
> *(b) by order of the Minister published in the Gazette (including by an order that amends such a policy).'*

Declared major projects

Clause 6 and schedule 1 of the State Environmental Planning Policy (Major Projects) 2005 identifies development to which Part 3A of the EP&A Act applies. Clause 6 provides:

> *'Development that, in the opinion of the Minister, is development of a kind:*
>
> *(a) that is described in Schedule 1 or 2…*
>
> *is declared to be a project to which Part 3A of the Act applies.'*

Schedule 1, item 26 prescribes such development to be:

> *'(1) Development for the purpose of sewage and related waste water treatment plants for the treatment, storage or disposal of sewage effluent or other waste water, or for the reticulation of treated water, that:*
>
> *(a) handles more than 10,000 EP (equivalent population), or*
>
> *(b) has a capital investment value of more than $30 million, or*
>
> *(c) is located in an environmentally sensitive area of State significance.*
>
> *(2) This clause does not apply to development if the proponent is a public authority.'*

Associated water and wastewater headworks at Googong are anticipated to service greater than 10,000 equivalent population (EP) and cost more than $30,000,000. The project is therefore considered a major project in accordance with clause 6 and schedule 1 of the *State Environmental Planning Policy (Major Projects) 2005* and section 75(B)(1)(a) of the Act.

CIC is the proponent for the proposal and now seeks concept plan approval for the project, as well as concomitant approval for the first stage of the project. The specific developments to which these applications relate are:

- Water cycle management for the whole Googong new town development.
- Water cycle infrastructure associated with the first stage of the Googong development (being NH1A).

This approach is in accordance with the direction provided by the DoP as to the appropriate planning approvals pathway for this project. This PEA supports both applications made to that department.

If the Minister for Planning is satisfied the project is within the scope of item 26 referred to above, it becomes a project to which Part 3A applies. CIC seeks the Minister's confirmation that a concept plan application can be made for this project, along with a project plan for the first stage of the project.

Land owner's consent

Section 8F of the *Environmental Planning and Assessment Regulation 2000* (the regulation) outlines the requirements for the consent and/or notification of the owner of land on which a project is to be carried out. Consent of the owner is not required where the application relates to a linear infrastructure project (clause 1(d)) or where the application relates to 'a project on land with multiple owners designated by the Director-General for the purposes of this clause' (clause 1(e)). For the purpose of section 8F of the regulation, 'linear infrastructure project' is defined as development for the purposes of linear transport or public utility infrastructure. The Googong water cycle project is in pursuance of the capture of wastewater and supply of water and treated water to the new town residents of Googong, NSW, and is therefore considered a linear infrastructure project due to the nature of these activities. Equally, the study area for the Googong water cycle project involves multiple land owners. As such, there is an obligation under clause 3(a) (section 8F of the regulation) for the proponent to:

Give notice of the application… to the public by advertisement published in a newspaper circulating in the area of the project before the start of the public consultation period for the project.

CIC seeks confirmation from the DoP about the specific application of clause 8F to the project.

CIC commenced stakeholder engagement and community consultation for the broader project that is the development of the Googong new town in 2003. This included a round of initial meetings with stakeholders to identify key concerns and opportunities, and workshopping of various water sustainability options developed for the Googong new town development. As the project progresses into the detailed concept design stage, it is expected that regular stakeholder involvement will continue to add significant value to the project. Further details of the community engagement and stakeholder consultation for this project are contained in Section 1.4 of this document.

NSW environmental planning instruments

Part 3 of the EP&A Act establishes requirements for three main types of environmental planning instruments (EPIs), which are designed to account for regulation of competing land uses. These include:

- Local environmental plans (LEPs).
- Regional environmental plans (REPs).
- State environmental planning policies (SEPPs).

The relevance of environmental planning instruments to the Part 3A concept plan assessment and approval process is dictated by 75O(3) of the EP&A Act, which states:

> *(3) In deciding whether or not to give approval for the concept plan for a project, the Minister may (but is not required to) take into account the provisions of any environmental planning instrument that would not (because of section 75R) apply to the project if approved. However, the regulations may preclude approval for a concept plan for the carrying out of a class of project (other than a critical infrastructure project) that such an instrument would otherwise prohibit.*

Similarly, section 75J(3) stipulates the relevance of EPIs to approval for carrying out a class of project.

In recognition of the Minister's discretion to consider the provisions of EPIs, this document contains a preliminary review of those that may be potentially relevant.

A summary of the development control provisions related to the broad site development and potentially to the Googong water cycle project are documented in the local environment study (Willana, 2007). This includes a number of SEPPs that have particular relevance to the whole development of the Googong new town, and that will be considered in the planning and assessment pathway adopted for that project (under Part 4 of the EP&A Act). The SEPPs that are relevant to the concept and part of project applications that are the subject of this document will be explored in detail in the environmental assessments for each. The *State Environmental Planning Policy (Major Projects) 2005* applies to the project specifically in establishing it as one that may be assessed under Part 3A.

There are no REPs that apply to the land encompassing the project corridor.

Draft local environmental plans

A local environmental study has been prepared to support separate resolutions made by the former Queanbeyan city and Yarrolumla shire councils to prepare draft LEPs to rezone and within the study area known as 'the Googong Urban Investigation Area'. With the creation of the Greater Queanbeyan

City Council in February 2004, portions of the former Yarrolumla LGA were incorporated in the new LGA for this council. The study area for the Googong water cycle project is located within the new Greater Queanbeyan City Council LGA. Pending the preparation of a new LEP for this new LGA, land use and development controls within the study area will be subject to the existing provisions of the Queanbeyan LEP and the Yarrowlumla LEP.

The zones proposed in the Draft Queanbeyan LEP (Googong) 2007 are R1 General Residential, R5 Large Lot Residential, B2 Local Centre, RE1 Public Recreation and E2 Environmental Conservation (refer to Figure 7). All proposed zonings cater for utility installations and/or public utility undertakings as being activities that are permitted with consent. SP2 specifically provides for sewage treatment infrastructure with proposed objectives as follows:

- To provide for infrastructure and related uses.
- To prevent development that is not compatible with or that may detract from the provision of infrastructure.

The placement of the water recycling plant will be in accordance with the zoning area for SP2. It is likely that the water cycle infrastructure associated with the first stage of the project (NH1A) will be located on land zoned SP2 and R1. Googong Foreshores will be zoned E2 Environmental Conservation.

Local environmental plans

The *Queanbeyan Local Environmental Plan 1998* (Queanbeyan LEP) and *Yarrowlumla Local Environmental Plan 2002* (Yarrowlumla LEP) comprise the principal local environmental planning instruments governing land use and development control within the Googong study area. The relevant local government authorities responsible for these local environmental plans are QCC and Palerang Council, respectively.

Considering the local environmental plans have historically applied to contrasting land use contexts broadly based on the predominantly urban character of the former Queanbeyan local government area (LGA) and the rural character of the Yarrowlumla LGA, the Queanbeyan LEP generally provides the most appropriate basis for the future zoning and development control of any new urban release area (Willana, 2007). According to Part 4, division 1, section 76A of the EP&A Act.

> *'if an environmental planning instrument provides that specified development may not be carried out except with development consent, a person must not carry the development out on land to which the provision applies unless:*
>
> *(a) such a consent has been obtained and is in force, and*
>
> *(b) the development is carried out in accordance with the consent and the instrument.'*

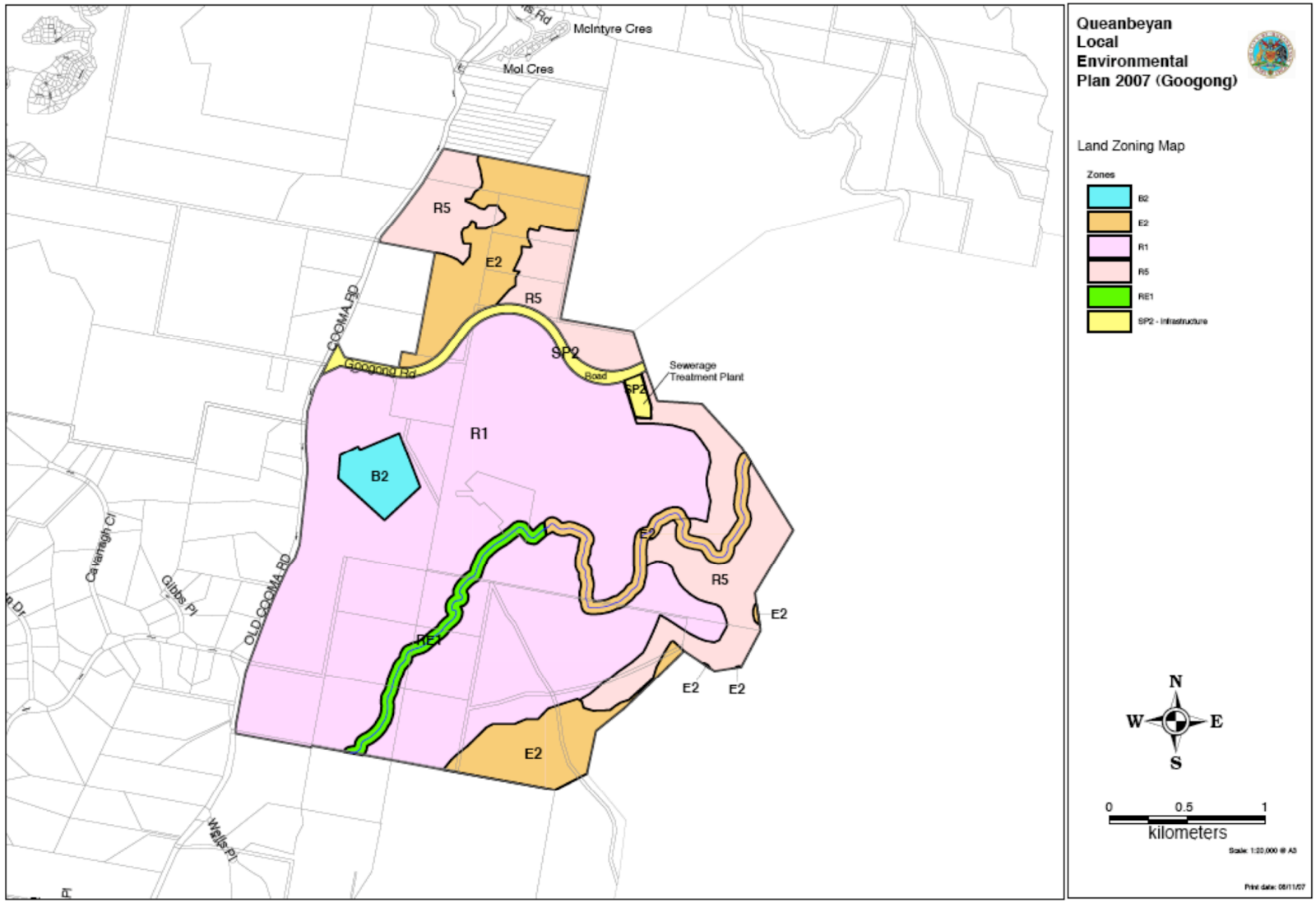
As per these provisions, Palerang Council has vested authority for the management of the land within the Palerang LGA, and development in that area is guided by the requirements of the Yarrowlumla LEP. Equally for the Queanbeyan LGA and the authoritative body is the QCC.

Land within the study area for the Googong water cycle project is currently zoned either 1(a) Rural A or 7(b) Environmental Protection B in accordance with the Queanbeyan LEP and 1(a) General Rural or 7(e) Environmental Protection in accordance with the Yarrowlumla LEP.

Additionally, the Yarrolumla LEP caters for protection of the Googong Foreshores area. This land is zoned 5(a) – Water Catchment Zone – the stated objective of which is to:

> *'restrict development of land to such uses as are compatible with the water catchment area identified by this zone.'*

Figure 7 Draft Queanbeyan LEP (Googong) 2007 zoning map



Other legislation

The following NSW legislation may have relevance to the project, and, will be considered in the environmental assessment:

- *Contaminated Land Management Act 1997*.
- *Fisheries Management Act 1994*.
- *Heritage Act 1977*.
- *Local Government Act 1993*.
- *National Parks and Wildlife Act 1974*.
- *Native Title (New South Wales) Act 1994*.
- *Native Vegetation Act 2003*.
- *Pipelines Act 1967*.
- *Protection of the Environment Operations Act 1997*.
- *Roads Act 1993*.
- *Threatened Species Conservation Act 1995*.
- *Waste Avoidance and Resource Recovery Act 2001*.
- *Water Act 1912*.
- *Water Management Act 2000*.
- *Water Industry Competition Act 2006*.

With respect to the above legislation, due consideration will be given to clauses 75U and 75V of the EP&A Act for approved Part 3A projects. These sections of the EP&A Act cater for approvals under other NSW legislation that either do not apply or are to be applied consistently.

Approvals to be applied consistently

The EP&A Act (section 75V) stipulates approvals and legislation that must be applied consistently to the approval of a project under Part 3A. Specifically, section 75V, as it relates to this project, states:

> *'An authorisation of the following kind cannot be refused if it is necessary for carrying out an approved project and is to be substantially consistent with the approval under this Part: …*
>
> *(e) an environment protection licence under Chapter 3 of the Protection of the Environment Operations Act 1997 (for any of the purposes referred to in section 43 of that Act),*
>
> *(f) a consent under section 138 of the Roads Act 1993,*

A licence under the *Protection of the Environment Operations Act 1997* is likely to be required for any proposed releases of recycled water into receiving waters, which will be considered in the environmental assessment.

Approvals that do not apply

Section 75U(1) of the EP&A Act outlines the approvals and authorisations under other NSW legislation that do not apply to an approved Part 3A project. Specifically, these include:

- The concurrence under Part 3 of the *Coastal Protection Act 1979* of the minister administering that part of the Act.
- A permit under section 201, section 205 or section 219 of the *Fisheries Management Act 1994*.
- An approval under Part 4, or an excavation permit under section 139, of the *Heritage Act 1977*.
- A permit under section 87 or a consent under section 90 if the *National Parks and Wildlife Act 1974* (this section relates to the protection of Aboriginal objects),
- An authorisation referred to in section 12 of the *Native Vegetation Act 2003* (or under any Act to be repealed by that Act) to clear native vegetation or State protected land.
- A permit under Part 3A of the *Rivers and Foreshores Improvement Act 1948*.
- A bush fire safety authority under section 100B of the *Rural Fires Act 1997*.
- A water use approval under section 89, a water management work approval under section 90 or an activity approval under section 91 of the *Water Management Act 2000* (section 75U(1)).

It should be noted that the *Rivers and Foreshores Act 1948* has been repealed.

Section 75U(2) of the Act also states that:

> *'Division 8 of Part 6 of the Heritage Act 1977 does not apply to prevent or interfere with the carrying out of an approved project.'*

3.2 Commonwealth environmental legislation

The following Commonwealth legislation may be relevant to the project:

- *Environment Protection and Biodiversity Conservation Act 1999*.
- *Canberra Water Supply (Googong Dam) Act 1974*.

These are discussed in this section and will be considered in the environmental assessment.

The following additional Commonwealth legislation may have relevance to the project, and, if necessary, will also be addressed in the environmental assessment:

- *Aboriginal and Torres Strait Islander Heritage Protection Act 1984*.
- *Protection of Movable Cultural Heritage Act 1986*.
- *Native Title Act 1993*.

Environment Protection and Biodiversity Conservation Act 1999

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is the key federal legislation for environmental protection. The Act establishes a requirement for, and a system of, environmental assessment and approval by the Commonwealth for actions that crucially affect matters of national significance or Commonwealth land, or that are undertaken by the Commonwealth. If the Federal Minister for the Environment determines that an approval is required under the EPBC Act, the proposed action is deemed to be a 'controlled action' and must undergo assessment and obtain an approval prior to being undertaken.

Actions that significantly impact on Commonwealth land are provided for in subsections 26(1) and 26(2) of the EPBC Act. Both matters of national environmental significance (NES) and impacts upon Commonwealth land will be considered in the assessment in accordance with the EPBC Act.

Canberra Water Supply (Googong Dam) Act 1974

The Googong Foreshores is an area encompassing 5,089 hectares, surrounding and including the Googong Dam and part of its tributaries to the south. The Googong Foreshores lies within NSW state boundaries, to the south-east of the ACT, and of the new Googong development. The Googong Foreshores land is defined in the *Canberra Water Supply (Googong Dam) Act 1974* (or the Googong Dam Act) as the Googong Dam Area (GDA). The Commonwealth acquired this land from NSW in 1973 (TAMS, 2007) for the purpose of constructing the Googong Dam. The small south-east corner of the Googong site (see Figure 2) that lies within the Googong Dam catchment area, comprising 39.9 hectares (less than 0.05 per cent of the Googong Dam catchment total). It is proposed that this area will be zoned E2 and therefore this section will not be developed.

The ACT Government has vested responsibility for the management of the Googong Foreshores area and ACTEW is responsible for the water resource it contains. Specifically, the *'operation, maintenance, upgrading and augmentation of water supply and treatment infrastructure within the Googong Dam area'*. The responsibility for dam operation is vested in ACTEW via a written instrument by the ACT Executive (dated 13 August 2003), which appoints ACTEW as an authorised person for the purposes of the Googong Dam Act (permitted under section 7 of the Act). Both the ACT Government and ACTEW conduct their respective responsibilities for management of the Googong Foreshores on behalf of the ACT Executive. The existing Googong Water Treatment Plant, managed by ActewAGL, and the area from the plant to the Googong development site form a part of the Googong Foreshores. Development in this area will consist of a potable water pumping station and a water pipeline from here to the development area. The pumping station will be located within the existing Googong Water Treatment Plant boundary. The pipeline to the residential development will follow the access road to the plant. The existing uses of this area mean that impacts associated within Googong water cycle management are likely to be minimal.

As land acquired by the Commonwealth, the Googong Foreshores remain part of NSW (unlike a 'territory'). As such, NSW laws apply to this section of the development area where they are capable of operating concurrently with the Googong Dam Act (as stated in section 27). In the event of contradiction of law, Commonwealth legislation takes precedence over any other (TAMS 2007). The Act states:

> *'NSW laws that operate within the Dam Area cannot restrict or impede the ACT in carrying out its functions under the Googong Dam Act because they would be inconsistent with that Act.'*

This interpretation of this legislative framework is mirrored in the MoU on ACT and NSW Cross Border Water Resources (Government of NSW, Government of Australian Capital Territory and Government of Australia, 2006), which states that the ACT has overall management responsibility for water supply and land management with the Googong Dam Area, and the power to carry out works in NSW necessary for Territory water supply.

Development within the Googong Foreshores, where not inconsistent with the Commonwealth's Googong Dam Act, is controlled mainly under the provisions of EP&A Act (NSW) and vested with local government especially in the form of local environmental plans.

3.3 Other policies

Googong foreshores draft plan of management

In September 2007, the ACT Government published the *Googong Foreshores Draft Plan of Management*. The plan acknowledges that the Googong Foreshores is a valuable, attractive and biologically diverse area that provides a source for high quality potable water for the ACT and Queanbeyan, whilst, protecting biodiversity, cultural heritage, and recreational opportunities.

The plan establishes a framework for managing activities that will retain the values of the area (heritage, environmental and social) whilst ensuring these activities do not adversely impact on the areas' primary purpose of providing a potable water supply to the ACT and the Queanbeyan region. In relation to the management and maintenance of the water supply infrastructure, the draft plan requires that a best practice approach is adopted for management of the reservoir and the water quality therein (TAMS, 2007).

There will be no direct impact on the Googong Dam Catchment from the development. The small southeast corner of the Googong site that currently drains toward the dam will not be developed; hence there will be no discharges to the dam. The inward recreational focus of the masterplan will discourage human activity in the area that could impact on the water cycle.

4 Existing environment

The descriptions of the existing environment are taken from the studies of the area that have been done over the last five years. Additional studies and verification of the information will be done as part of the detailed assessments.

4.1 Land use and infrastructure

With the exception of the Cooma Road Quarry to the north, the Googong study area is predominantly surrounded by low-intensity grazing, bushland and rural-residential land uses. No intensive agricultural activities are known to occur within proximity to the study area. The study area is located within a rural landscape characterised by large rural landholdings, state forests and small townships. The region is predominately rural, with principal industries being beef and sheep production, stone fruit orchards, and vineyards. Improvements within the pastoral areas include houses, farm buildings, farm dams, tracks and roads. The nearest townships and residential areas are located in Queanbeyan (5km) and Bungendore (40km). Electricity is supplied from overhead lines located on the eastern side of Old Cooma Road (Willana, 2007).

The closest residences are located approximately 850 m away from the Googong Dam (this consists of two houses for a Ranger and Operation personnel for the dam). A local quarry is located along Old Cooma Road approximately 2 km away and is considered to be the closest industry within the area (Willana, 2007). The existing roads, Old Cooma Road and the Googong Dam Road provide access to the site. Old Cooma Road is the only access from the proposed development site to the existing centres of Queanbeyan and Canberra.

Land use planning within the area also needs to consider the bushfire hazards. The NSW Rural Fire Service has prepared a Bushfire Hazard Map and within the proposal area are two sections north of Googong Dam Road that are shown as Bushfire Prone Land. The most vulnerable area is north east of the site between the development area and the Queanbeyan River (Willana, 2007).

4.2 Air quality and microclimate

Reduced air quality within the study area associated with rural-residential land uses are likely to occur on an occasional basis only, and may stem from dust or particulates generated from farming activities during dry periods and from smoke and ash released during controlled burning and bushfires.

The Cooma Road Quarry presents a potential source of air pollution for the study area. Blasting, crushing and other quarrying activities, vehicle movements on unsealed surfaces and windborne particles picked up from exposed surfaces, may generate dust pollution. The quarry's Environmental Management Plan includes several measures intended to ensure properties surrounding the quarry are generally free of dust emissions, however potential impacts are to some extent variable and subject to weather conditions. Readymix Holdings Pty Limited conducts regular monitoring of dust levels at locations around the quarry's area of activity (Willana, 2007).

Climatic information has been derived from the Bureau of Meteorology (BoM). Records from the nearest automated weather station are sourced from Braidwood, approximately 40km east of the dam. Googong Dam is located within a temperate climate, distinctively characterised by dry (and warm) summers and cold winters. Mean temperatures are within the range of 15–21 degrees during summer and between 0–6 degrees in winter. Uniform rainfall is experienced throughout the year with an average of 250–750mm received per annum (Willana, 2007).

4.3 Catchment areas

Drainage and catchment

Drainage in the study area consists of a number of small ephemeral and semi permanent creeks, farm dams and depressions. The drainage reflects the nature of the rainfall in the area. Records show that the area has a mean annual rainfall of less than 600mm with summer thunderstorms and drought common features (BoM). Studies have shown that *'the ACT region has experienced severe drought conditions over the last six years – and in 2006 alone, inflows into ACT catchments were down by almost 90 per cent. The medium and long-term outlook suggests a further decline to long-term average inflows by almost 50 per cent'* (ACTEW Corporation, 2008).

Most of the study area drains to the Queanbeyan River downstream of the Googong Dam wall. The south eastern corner of the site comprises 39.9 ha of the Googong Reservoir catchment (or less than 0.05 per cent), however development will not occur in this area as stipulated in the draft Googong local environmental plan. It is recommended in the local environment study that a 20 metre buffer zone is included along the edge of the dam catchment to avoid having development occurring on the cusp of the catchment boundary. At times of reduced recycled water demand (winter), there is likely to be a need to discharge recycled water to the receiving environment from the water recycling plant. One of the discharge locations already examined includes an unnamed creek located to the northern side of Googong Dam Road. The creek flows approximately 2.2km prior to meeting the Queanbeyan River. Although dry when inspected, as the creek is steep and well formed it is expected that during wet weather that it would flow at a fast rate. The southern section of the development site drains to Montgomery's Creek.

Surface water quality

Ecowise Environmental Consultants (Ecowise, 2008) has conducted a preliminary assessment of the current status of water quality in the Queanbeyan River at three locations. The sites are:

- Upstream of the location of the proposed discharge, below the Googong Dam.
- Immediately downstream of Wickerslack Lane.
- Some distance further downstream of the Wickerslack Lane Site.

Total Nitrogen (TN) concentrations have tended to be significantly above ANZECC guideline (2000) values at both sites below Googong Dam. Historical data shows this to be a consistent trend for TN in the Queanbeyan River. Total Phosphorus (TP) concentrations have also tended to be above or very close to the ANZECC guideline (2000) values (Ecowise, 2008).

Given that the Googong Catchment is a semi protected and forested drinking water catchment, the water quality in the Queanbeyan River is regarded as good and the environmental flows that have been maintained in the river over the past decade or so, continue to support the health of its aquatic ecosystem and pristine water quality for public use at this stretch of the river.

The exceptions to this are the occasional Cyanobacterial (blue green algal) blooms, and slightly elevated levels of pH. Cyanobacterial blooms, exceeding the guidelines (ANZECC, 2000) for recreational water were recorded at the Googong Dam site upstream of the proposed discharge point during the summer of 2002–03 (December 2002 and January 2003) and again in December 2003. The data collected in the past few years indicate that at least once a year during summer, Cyanobacterial abundance increases, and for relatively short periods of time, could exceed the guidelines (ANZECC, 2000) for recreational water.

It is well established that Cyanobacterial blooms are a response to elevated summer temperatures and nutrient enrichment, mainly Phosphorus, and is often exacerbated by low flows or stagnant water conditions. The water quality at the Wickerslack Lane site appears only slightly impacted by the adjacent and upstream land uses with nutrient and other levels being slightly elevated beyond those of the dam wall site, and nutrient levels occasionally breeching the ANZECC guidelines (2000).

Based on AusRivas assessment, results both upstream and downstream of the proposed discharge point indicate that this stretch of the Queanbeyan River needs to be recognised as 'slightly to moderately impaired' in terms of its ecological health. Physico-chemical water quality indicators are not indicative of any serious implications in the 2–3km stretch of the river immediately downstream of the Googong Dam (Ecowise, 2008).

Groundwater

A desktop review of groundwater conditions has been undertaken by C. M. Jewell and Assoc (Jewell, 2004). Groundwater within the area is contained within fractured-rock aquifers and the majority of bores in the area tap into these. Previous study has suggested that the fractures do not have significant permeability (Jewell, 2004). There are several registered wells in the close vicinity to the proposal. Most yields from the bores are obtained in the first 40 meters.

There is a groundwater divide beneath the proposed development site with eastern part draining towards Googong Dam. The rate of groundwater outflow from the site to Googong Dam has been estimated at 35 megalitres per year, compared with a surface catchment yield of 5.7 gigalitres per year (Jewell, 2004). Given the low level of groundwater contamination and the low rate of groundwater inflow to the reservoir, it is anticipated that there will be no measurable impact on water quality in the reservoir (Jewell, 2004).

In addition, DWE (previously part of the Department of Infrastructure Planning and Natural Resources) has mapped how groundwater sources are vulnerable to contamination. Five classes of vulnerability ranking are chosen to describe the relative assessment of the probability of a groundwater resource to contamination: 'low', 'moderate', 'moderately high', 'high', and 'very high'. More than 90 per cent of the proposal area has been ranked as having moderate vulnerability. An area to the north east of the site has been mapped by DWE as a dryland salinity hazard area. Dryland salinity hazards may be increased by impacts on groundwater recharge (Willana, 2007).

4.4 Landscape and soils

Soils

The majority of the study area is located within the Burra soil landscape and is generally free of high erosion potential. In the northern region of the study area, around the drainage line flowing to the north to the Queanbeyan River, is a section of Campbell soil landscape. Areas within the Campbell soil landscape have the highest erosion potential. These areas comprise the steepest and least accessible

portions of the study area. The soil properties and erosion potential of the soil landscapes within the study area are summarised in accordance with the *Soil Landscapes of the Canberra 1:100,000 Sheet Report* (Jenkins, 2000 cited in Willana, 2007).

Land within the Burra soil landscape typically exhibits a moderate risk of mass movement hazard in the form of terracetting caused by damage to surface vegetation by the movement of stock on slopes. Land within the Campbell soil landscape also typically exhibits a moderate mass hazard movement. These soils are shallow, infertile and acidic while the subsoils have low permeability and are hardsetting. This gives rise to high sheet erosion potential when subjected to non-concentrated flows and very high gully erosion when subjected to concentrated flows (Willana, 2007).

Loose boulders are evident throughout the study area, especially at convex changes of slope and the crests of hills. These may become dislodged through soil creep or erosion and pose a toppling or rockfall hazard. This may be managed by securing boulders in place, blasting to reduce size or removal of the boulders. Many of the hill slopes within the study area exhibit scattered cobble and boulder sized rocks on the ground surface. These do not in themselves pose a mass movement hazard, however they do indicate the presence of rocky, shallow soils likely to influence development and construction methods (Willana, 2007).

To the north west of the study area below the Googong Dam Road is an area of Anembo soils landscape. This is characterised by undulating rises and flats over granite material. Originally the area would have been covered with open to tall open forest with woodland to low woodland in the hollows but this has been extensively cleared. These soils are described as having gravely low fertility and low waterholding capacity and they are prone to water logging. They have moderate erosion potential when subjected to non-concentrated flows and rate as high to very high erosion hazard when subjected to concentrated flows.

Two other soil landscapes are found in small areas within the proposal site. In the southern section of the proposed neighbourhood 5, Celeys Creek is characterised by rolling hills over granite rock. The soils are typically infertile, locally shallow and non-cohesive. The topsoils have been found to be acidic and high permeable while the subsoils are hardsetting with low available water holding capacity. These soils have moderate erosion potential when subjected to non-concentrated flows and high to very high erosion hazard when subjected to concentrated flows. Areas with a slope steeper than 20 per cent are particularly likely to be subject to landslide hazard (Willana, 2007).

Soil Contamination

Nine potential areas of concern in regard to soil contamination have been identified within the development site (Coffey, 2004). These areas are most likely to require remediation prior to proceeding with development. Given the isolated locations of the sites and the nature of their contamination, it has been concluded that they are likely to be able to be remediated to a level to accommodate development (Willana, 2007).

Topography

The Googong development area is located within the Mount Campbell Uplands and is generally elevated above the existing Canberra and Queanbeyan metropolitan areas. The majority of the study area displays an undulating topography characterised by rolling hills and plains, with rocky outcrops occurring on the upper slopes and crests of hills. The northern, eastern and western margins of the study area are incised by steep gullies. Land to the north of Googong Dam Road displays the most extreme variations in topography and exhibits deep, steep-sided gullies up to 140 metres deep trending north-east towards the Queanbeyan River. Ground levels within the study area range between a high of 816 metres AHD in the southwest to a low of 600 metres AHD in the north east (Willana, 2007).

Figure 8 Photograph showing general topography of Googong development site

4.5 Biodiversity

Aquatic ecology

The ecological health of the Queanbeyan River downstream of the Googong Dam has been monitored for several years. Based on AusRivas assessment results, both upstream and downstream macroinvertebrate taxa have been consistently low over the past few years. The short-to-medium term performance objective for the Queanbeyan River in the ACTEW Licence is not to impair the 'Ecological Health' from the current status. The current ecological state of the river is described in the Licence as follows: *'….Macroinvertebrate O/E rations for all sites on Queanbeyan below Googong within "slightly to moderately" impaired condition'* (Ecowise, 2008).

NSW Fisheries was consulted pursuant to Section 34A of the EP&A Act prior to preparation of the local environment study. NSW Fisheries has advised that the Queanbeyan River was once a known habitat for Macquarie Perch (*Macquaria australasica*), which is listed as a vulnerable species in accordance with the *Fisheries Management Act 1994*. NSW Fisheries has advised that any draft local environmental plan prepared for the study area should make reference to the fact that Macquarie Perch were once

known to live in the Queanbeyan River and that the precautionary principle should be adopted when preparing design requirements (Willana, 2007).

Riparian buffer zones

NSW Fisheries has advised that the degradation of native riparian vegetation is listed as a key threatening process by the *Fisheries Management Act 1994*. Appropriate buffer zones will need to be maintained along the Queanbeyan River corridor to ensure future development does not result in any harmful impacts. This requirement is currently addressed by Clause 71 of the Queanbeyan LEP 1998 and Clauses 44–46 of the Yarrowlumla LEP 2002 (Willana, 2007).

Several of the watercourses within the Googong area contain steeply sloping banks and are more densely vegetated than the surrounding farmland. These areas act as wildlife corridors accommodating many varieties of native animals. These areas are considered both visually and environmentally sensitive. A number of these watercourses have been identified by DWE as requiring preservation within a riparian buffer zone. The width of the buffer zone will generally be an average of 20 meters from the bank to the watercourse. More major watercourses such as the unnamed creek on the eastern side of Cooma Road, which flows beneath Googong Dam Road, may require a wider buffer zone, especially because of the increased steepness of the terrain on either side of the watercourse (Don Fox, 2001 cited in Willana, 2007).

Terrestrial ecology

In May 2004, Charles Sturt University conducted a survey of the proposal area. As a result of this survey areas were identified as unsuitable for development and consequently the proposal has been amended to avoid these areas with the proposed rezoning area reduced from some 1,300ha to approximately 790ha. Species and communities that are considered to be threatened, endangered or rare are listed in the EPBC Act and *Threatened Species Conservation Act 1995* (TSC Act).

Flora

The survey identified two threatened flora species and two endangered ecological communities.

'The proposal site has been subject to clearing and grazing over the last 150 years, although some high quality patches of remnant woodland remain. The proposal site is highly variable in its vegetation structure; from dry sclerophyll forest to woodland and grassy woodland, native pasture and improved pasture. The Endangered Ecological Community (EEC) of White Box, Yellow Box, Blakely's Red Gum woodland exists throughout the proposal site. There is also moderate to high native grass cover that includes Themeda australis and Austrodanthonia spp. and is likely to be part of the Commonwealth Natural Temperate Grassland EEC' (Charles Sturt, 2004, p17). These communities are found west of Old Cooma Road and north of Googong Dam Road.

In addition to the EECs there are two threatened flora species in the area:

- *Swainsona sericea* (V) – TSC Act
- Hoary Sunray (*Leucochrysum albians* var. *tricolour*) – endangered under the EPBC Act.

Nine listed noxious weed species were found during the survey of the site.

Fauna

The survey undertaken by the Charles Sturt University (1994) examined a larger area than the proposed development area. Table 4 identifies the significant species and their habitat within the broader area. It is important to note that the proposed development area was redefined in consideration of these findings.

Table 4 Summary of threatened fauna species known or likely to occur in the area – species habitat requirements and potential impact

Significant Species	Habitat	Listing status
Golden Sun Moth *Synemon plan*	Native grassland with approximately forty percent of grasses *Austrodanthonia* spp.	Endangered – TSC Act Critically endangered – EPBC Act
Pink-tailed Worm Lizard *Apraisia parapulchella*	Rock outcrops and partially buried surface rock, predominantly native grassland with little of no woody vegetation, well-drained soil.	Vulnerable – TSC Act Vulnerable – EPBC Act
Rosenberg's Monitor *Varanus rosenbergi*	Heaths, humid woodlands and forests. Shelters in borrows, hollow logs and rock crevices.	
Striped Legless Lizard *Delmar impar*	Logs, rocks and other ground debris in woodland and forest or grasslands with dense *Themeda australis* or tussock grasses with grass litter between tussocks.	
Large Bent-wing Bat *Miniopterus schreibersii*	Forest, woodland and grassland where caves or other suitable roost sites occur.	Vulnerable – TSC Act
Eastern Falsistrelle *Falsistrellis tasmaniensis*	Sclerophyll forest with trees greater than 20 metres in height; tree hollows, caves and abandoned buildings for maternity sites and roosts.	Vulnerable – TSC Act
Yellow-bellied Sheathtail Bat *Saccolaimus flaviventris*	Woodlands and forest with hollow bearing trees for roosts.	Vulnerable – TSC Act
Hooded Robin *Melanodryas cucullata*	Eucalypt woodlands, acacia shrublands and open forests. Forages in open areas with dead timbers and sparse shrub cover.	Vulnerable – TSC Act
Speckled Warbler *Pyrrholaemus sagittata*	Grassy woodlands with grass tussocks, dense litter and fallen branches	Vulnerable – TSC Act
Diamond Firetail *Stagonopleura guttata*	Eucalypt woodlands, forest and mallee with a grassy understorey.	Vulnerable – TSC Act
Brown Treecreeper *Climacteris picumnus victoriae*	Eucalypt woodlands usually lacking a dense understorey. Tree hollows for nesting. Tree, fallen timber and woody debris for foraging.	Vulnerable – TSC Act
Glossy Black Cockatoo *Calyptorhychus lathami*	Woodlands and forests where casuarinas are common. Requires hollows in mature or dead trees for nesting.	Vulnerable – TSC Act

Wildlife corridors

Vegetation within the Googong development area forms part of a corridor between Googong Dam Foreshores and the Queanbeyan River to surrounding ridges and Jerrabomberra Creek. Maintaining connectivity between remnant woodland is vital to the movement and dispersal of some species of fauna, including birds and the threatened Rosenberg's Monitor (*Varanus rosenbergi*) (Charles Sturt, 2004).

4.6 Aboriginal and historical heritage

Aboriginal heritage

The Queanbeyan River valley at Googong is a known Aboriginal occupation site. The proposal area was surveyed by Navin Officer Heritage Consultants (NOHC, 2003) for the Googong local environment study. The assessment included a literature and heritage database review. Within the extended study area 18 Aboriginal sites had previously been recorded. The study identified another 34 Aboriginal sites, 20 artefact scatters and 14 isolated finds with another 24 Potential Archaeological Deposits (PAD). These are areas where the potential for subsurface archaeological material is considered to be moderate or high. Of these sites, 28 are within the revised development site. All site recordings retain significance to the local aboriginal community, however the finds were rated in regards to their significance on a local and regional level. Of the sites in the area, 14 were considered to be of low regional significance, three of low to moderate significance and 11 of moderate significance. These sites are generally rated higher for local significance (NOHC, 2003).

Historical heritage

Within the reduced area for the proposed development 12 sites have been identified as having some historical significance, associated with the historical use of the area. These sites include a shearing shed complex, homestead complexes, dwelling platforms, middens, mining sites, and miscellaneous sites (NOHC, 2003). The assessment completed by Navin Officer (2003) makes specific recommendations for sites in the area. Seven sites within the proposal area noted as requiring further assessment prior to development. These are:

- Shearing shed complex.
- European midden.
- Hut and shed sites.
- Wellsvale complex.
- Hearth/hut.
- Hut site and ploughlands.
- Cawley homestead complex (NOHC, 2003).

5 Preliminary environmental assessment

5.1 Concept plan environmental issues

The environmental risks identified relate solely to the construction and operation activities associated with the integrated water cycle infrastructure for the Googong development. It should be noted that broader environmental risks associated with the whole Googong urban development are not considered in this document.

General impacts associated with the proposal at concept level are likely to be associated with the water cycle management.

Water cycle management

The project involves the construction and operation of integrated water cycle infrastructure (as described in section 2.3) including a water recycling plant, two sewage pumping stations, reticulation, and potable and recycled water supply infrastructure. The project also involves irrigation of public areas and potential discharges of recycled water within the catchment at times.

Summary of potential impacts

The following potential impacts have been identified:

- Reduced surface water quality within the catchment.
- Reduced groundwater quality.
- Changes in biodiversity due to recycled water discharges (including impacts on aquatic ecology, riparian vegetation and weed distribution).
- Alterations to the flows and drainage in the catchment impacting on receiving water bodies (ephemeral streams and Queanbeyan River), and groundwater.

Approach to assessment

A water cycle management plan will be prepared for the area. This will take into consideration construction and operational impacts associated with the proposal at the concept level. The water cycle management plan will examine the following:

- Stormwater management across the site, including stormwater quality, treatment and proposed uses.
- Construction impacts on waterways due to runoff and discharges (e.g., from the laying of pipelines and placement of infrastructure).
- Operational impacts of the proposed water cycle management system, including:
  - Proposed recycled water quality (and treatment processes to achieve this quality).
  - Proposed uses of recycled water, the management and monitoring of these uses, and any potential impacts associated with such uses.

- Proposed recycled water discharges.
- Wastewater management practices.

In developing this plan, the following baseline data will be considered and/or collected where it is not already available in suitable format or depth:

- Ambient water quality of potentially affected catchments.
- Rainfall data and predicted climatic impacts.
- Flows within the potentially affected catchments.
- Existing flows and quality of runoff.

The water cycle management plan will accommodate requirements for water recycling plant operations (eg, consideration of the seasonal timing of any proposed discharges to minimise potential impacts) and for maintenance of water cycle infrastructure. For recycled water use, the relevant national standards will be taken into account to assess the risks to the environment and human health, with attention paid to recycled water exposure pathways. Furthermore, state guidelines for sewage treatment systems will be considered in the environmental assessment and will guide infrastructure design, placement of infrastructure and mitigation and management of measures.

With respect to stormwater management, drainage and stormwater design will incorporate water sensitive urban design principles for the development site, such as subsurface infiltration zones, drainage swales, bioretention basins/trenches and permeable paving. The existing groundwater quality and pathways will be examined.

Finally, consideration will be given to cumulative impacts on the receiving waters. An ongoing water quality monitoring program will be developed and implemented before and after commissioning to ensure that all risks are managed appropriately.

5.2 Part of project environmental issues

A preliminary environmental risk analysis was undertaken for the part of the project that provides for NH1A, to identify key and other environmental issues. It comprised a qualitative assessment based on information gathered during preliminary investigations. The level of environmental risk was assessed by considering potential environmental impacts of the project and the ability to manage those impacts in a way that minimises harm to the environment. Despite its qualitative nature, it facilitates scoping of environmental investigations and assessments, guides project design, and assists in identifying appropriate mitigation measures and management responses. The risk decision matrix is in accordance with the Australian risk management standard *AS/NZS 4360:2004 Risk Management*.

The following risk categories were adopted to determine areas of higher environmental risk requiring further scrutiny:

- Category A – May have high or significant impacts, actual or perceived. Further assessment is necessary to determine the level of potential impact and to develop appropriate measures to mitigate and manage the impacts.
- Category B – May have high, significant to moderate impacts. These impacts can be mitigated by the application of standard environmental management measures.

- Category C – Have low impacts and can be managed with the application of standard environmental management measures.

The following factors have been identified as the key environmental issues for the part of the project that provides water and wastewater services to NH1A:

- Water quality and hydrology.
- Aquatic ecology.
- Human health.

Water quality and hydrology

Summary of potential impacts

As the proposed development is outside the direct catchment area it is unlikely to have a direct impact on the water of Googong Dam.

Impacts on surface water quality will be associated with construction and operation of the water supply, sewerage and stormwater systems for the proposed development. The quality of the recycled water must take into account the environmental and human health risks.

During the construction reduced water quality in the surrounding catchments could result from:

- Sediment laden runoff from earthworks such as the pipeline installation, etc.
- Direct impacts on drainage lines (such as bank destabilisation).
- Direct spills of pollutants (oil, grease, concrete to water courses).

During operation of the sewerage and recycled water systems (plant, pipes and pumping stations) potential impacts on surface water quality may include:

- Reduced water quality in the unnamed creek and the Queanbeyan River due to the release of recycled water discharge.
- Reduced water quality due to failure of the treatment process.
- Accidental overflows from the system (malfunctions, pump failure, breakage etc).
- Increased flows to the unnamed creek and hence Queanbeyan River – a change in the water regime in the creek from mostly dry to mostly wet is likely to impact on the creek morphology and the flora and fauna associated with the creek.
- Spills of pollutants connected to the operations (chemicals, fuels etc).
- Untreated stormwater discharge to water bodies. Stormwater from urban areas is generally of poor quality and has diffuse sources of pollutants.

Hydrological impacts could include:

- Increased flows from the release of recycled water at times to the receiving water bodies.
- Increases flows from uncontrolled discharge to water courses.
- The increased flows in water bodies could lead to stream bank and bed erosion.
- The increased flows could alter the rates and location of stream sediment deposition.

Approach to assessment

The work proposed to develop a concept level water quality management plan will guide the design and development of water cycle management for NH1A (refer to Section 5.1).

Water quality and hydrologic modelling will be conducted to determine potential impacts of proposed recycled water discharges on the receiving water environment, at part of project and overall project levels (considering the staging of infrastructure). The staged assessment of the scheme will take into account the volume and velocity of flow to the receiving water bodies. The stability of the creek bed and banks will be examined and the possible changes to the rates of erosion and deposition of sediments will be assessed. Results of these assessments will form the basis of operational environmental management plans for the water cycle project as it applies to servicing NH1A.

A water quality monitoring program for both surface and groundwater would be developed and employed before and after commissioning to ensure that surface water quality impacts are minimised and risks are managed appropriately. This program is likely to encompass monitoring of surface water quality and aquatic biota, to be considered together in terms of assessing catchment health.

Any water quality impacts associated with recycled water uses will be assessed via a human health and environmental risk assessment, as described below (see **Human health**).

Construction management plans will be developed to address any water quality impacts that may result from construction activities, including drainage and stormwater runoff.

Biodiversity – aquatic ecology

Summary of potential impacts

The following potential impacts have been identified:

- Increased active erosion and scouring, loss of riparian vegetation in water courses due to increased flows.
- Impacts on downstream ecology due to changes in hydrology of water courses.
- Changes to water flows, nutrients, alkalinity, conductivity and turbidity conditions may create changes in species composition and density in both vertebrates and invertebrates.
- It has been noted that there are weed species along water courses that could be spread by recycled water discharges. Of particular note is large bushes of the noxious weed, African boxthorn (*Lycium ferossimium*) (Ecowise, 2008).
- Recycled water may contain pathogens and contaminants harmful to aquatic biota and vegetation.

Approach to assessment

The approach to water cycle management will affect the potential impacts on aquatic biodiversity. A desktop assessment will be undertaken to inform the current state of aquatic biodiversity and to identify any information gaps. If a physical assessment is deemed necessary it will be undertaken for the purpose of the environmental assessment. Baseline data gathered will be used to gauge the effectiveness of mitigation measures.

The assessment will include examination of options for the water management system such as seasonal timing of flows for the release of recycled water to the water courses. The approach to the design and operation of the system will include consideration of treatment options for wastewater to produce the required recycled water quality, and of potential impacts on waterways due to recycled water

discharges. Recommendations made with respect to sites for discharge, operational pumping and discharge regimes will be based on mitigating the impacts on aquatic biodiversity (as well as on water quality and hydrology).

Riparian buffer zones will be incorporated into the design of water cycle management for NH1A to protect water bodies.

Human health

Any failures of the sewerage and/or recycled water system could result in increased risks to human health as a result of exposure to hazards. Hazards to humans include pathogens.

Summary of potential impacts

Health impacts on humans could happen in the following ways:

- Due to a physical failure in the sewerage system (scenarios include pump failure resulting in discharge and human contact, inadequate sizing of system resulting in overflows, infiltration during rainfall events resulting in sewer overflows, exfiltration of pipes due to breakages etc).
- Due to failures in the secondary treatment process such as aeration failure resulting in inadequate treatment, die off of activated sludge, under performance of biological reactors, failure in sludge dewatering, dosing or mixing failures.
- Due to failures in tertiary treatment such as insufficient disinfection (resulting in hazards such as pathogens), and increased concentrations of disinfectant (resulting in skin irritations).
- Health impacts on humans due to exposure of hazards in recycled water eg. accidental potable use of recycled water, cross connection of systems etc.
- The removal of biosolids off the site could expose the removalist to contact from accidental spills or poor handling.
- Spillage of chemicals being delivered for the treatment process could pose a hazard to humans.

Approach to assessment

A human health risk assessment will be conducted to determine risks associated with varying pathways of exposure to ranges of recycled water quality. Results will guide water recycling plant design, proposed recycled water uses and operational standards and mitigation measures for the recycled water scheme.

A comprehensive operational environmental management plan will be devised that addresses the risks due to the use and operation of the recycled water system.

Other environmental issues

Other environmental issues listed in Table 5 are considered to be of lesser consequence than the key issues, taking into account the scope of the project, the existing environment and the implementation of standard and best practice management and mitigation measures for water cycle infrastructure developments.

Refinement of the proposed management and mitigation measures for these issues will occur during the preparation of the detailed environmental assessment. Any additional environmental safeguards required to minimise and mitigate impacts will be documented in the statement of commitments in accordance with section 75F(6) of the EP&A Act as part of the environmental assessment.

Table 5 Other environmental issues, potential impacts and mitigation measures

Issue	Potential impacts	Management and mitigation measures

Soils and geology, and groundwater	Potential risks from erosion and contamination during construction and operational phases are as follows:
	• Soils exposed during excavation and vegetation removal may result in erosion.
	• Contaminated soils that potentially exist in the area may impact on the surrounding environment once exposed.
	• Contamination of soils due to irrigation of public areas with recycled water.
	• Expansive soils that exist in the area may create stability issues during construction.
	• Contamination of groundwater from the recycled water scheme (such as increased levels of nutrients.
	• Alteration of the groundwater recharge rates by the use of recycled water in the area, such as irrigation.
	• Contamination of groundwater from failures in storage ponds used in the recycled water treatment.
		• The measures to be implemented during construction of the project will be detailed in the statement of commitments. These will be transferred to the Construction Environmental Management Plan (CEMP) and implemented as appropriate.
		• A site specific erosion and sedimentation control plan(s) will be developed for construction.
		• A geotechnical assessment and detailed environmental site (contamination) assessment will be carried out to assess soil capability and identify existing physical conditions (slope, soil type, geology, potential for Acid Sulphate Soils and stability of likely siting of built form). The assessment will also improve understanding of potential sources of land contamination and potential impacts of the project (including compaction of soils), and will aid the development of safeguards and mitigation measures. This will take into consideration the proposed recycled water uses for Neighbourhood 1.
		• The CEMP would include appropriate protocols for accidental spills to minimise damage should spills occur.
		• A groundwater study will assess:
		  ◦ Adequacy of existing data.
		  ◦ The potential impact of irrigation by reuse water on open space areas.
		  ◦ Possible impact of bore irrigation of recycled water.
		  ◦ The potential vulnerability of groundwater and indirect impacts on the Googong Dam.
		• The human health and environmental risk assessment associated with the recycled water scheme will consider impacts on groundwater. Existing data will be used. Further data will be collected where necessary.
		• The OEMP will consider a monitoring program for groundwater (using existing bores).

Issue	Potential impacts	Management and mitigation measures
Terrestrial ecology	Potential impacts on terrestrial habitats due to construction include: • Removal of native vegetation (possibly in endangered ecological communities), habitat loss, habitat fragmentation and reduced habitat linkages for fauna. • Disturbance of habitat may encourage further migration of weeds (noxious and environmental) within corridor. • Impacts on fauna include entrapment, increased interactions between fauna and vehicles and disturbance to fauna life cycles and breeding cycles.	• The project will avoid, mitigate, then offset any vegetation loss in order of preference. There is likely to be minimal removal of vegetation during the construction of water cycle infrastructure. • Sensitive areas (such as EECs, areas of Commonwealth significance, threatened flora/fauna habitat) will be clearly identified through field study, and avoided where possible. • Re-instatement of vegetation will occur where practicable. • Effective weed management will be addressed and implemented in the CEMP and OEMP. • Measures associated with fauna will be included in the statement of commitments and outlined in CEMP and OEMP. • An updated terrestrial ecological assessment would be undertaken to review critical habitats of threatened species, and EECs, along with recommendations for mitigation and management of these areas.
Aboriginal and cultural heritage	Potential impacts on aboriginal and historical heritage due to construction include; • Direct impacts on identified sites of known significance. • Unforseen impacts on unrecorded archaeological deposits within the project area. • Unforseen impacts on sites that are of cultural heritage or recreational value. • Discovery of heritage issues during the construction phase resulting in delays and possible changes to siting of infrastructure. • Increased flows to the receiving waterways may impact on the structural stability of significant sites further downstream.	Using specialist advice, for the concept plan, there will be a study that will identify if the development site and impacted areas are of significant Aboriginal or historical heritage. Appropriate measures will be taken to preserve the heritage. Specifically the direct impacts on the identified pipeiline corridors and potential sites for pumping stations and treatment plants. A desktop study will be undertaken to assess any indirect impacts on the indigenous heritage values of the Googong Dam Foreshore. Separate comments will be provided for water infrastructure.

Issue	Potential impacts	Management and mitigation measures
Air quality and odour	• Plant, equipment and vehicles utilised during construction and operation will increase localised traffic levels and are likely to generate greenhouse gas emissions and impact on local air quality. • Energy usage required for construction and operation activities would result in the release of greenhouse gas emissions. • Dust emissions may be generated from earthmoving equipment activities, vegetation loss and wind erosion of stockpiled excavated material during construction.	• Existing local air quality would need to be determined, project emissions predicted (for construction and operation), and potential impacts assessed. Greenhouse gas emissions for the construction of the project will be in line with government guidelines (such as the NSW Greenhouse Plan 2005). • Air quality modelling will be carried out to assess proposed emissions for the water cycle infrastructure (odours from infrastructure), along with mitigation and management recommendations for infrastructure design. • Standard soil and water mitigation measures for water infrastructure construction would be adopted. • Dust control measures will be used during construction as required, for example on excavation sites and dirt roads. • All measures will be included in the statement of commitments and outlined in the CEMP and Operation Environmental Management Plan (OEMP).
Traffic and access	The project requires the use of existing public and potentially private roads during construction and operation. Vehicles and plant associated with the project must share these roads with other vehicles and plant. The following impacts are likely: • There may be short-term lane and/or road closures during construction of the project. This combined with the set-up and operation of satellite site compounds will increase traffic in the local area and cause potential temporary congestion. • Changes to local and private property access may concern the community. • There may be potential disruption to travel patterns during construction. • Lasting traffic impacts due to the necessary movements for operational deliveries and maintenance.	• A traffic study will be undertaken (for the broader development) to assess traffic generation and intersection implications, assessment of proposed road design, and pedestrian movement and public transport. • A traffic management plan would be developed and implemented in consideration with the broader development (and outlined in the CEMP). • There will be further ongoing consultation with residents and road authorities regarding traffic and access alternatives and issues. • Where oversized vehicles are used, suitable controls and management will be put in place and heavy vehicle permits would be obtained as required. • Transport movements and standard operating procedures for the water recycling plant and other infrastructure will be timed to minimise impacts during certain hours as determined through consultation. • All measures will be included in the statement of commitments and outlined in CEMP and OEMP.

Issue	Potential impacts	Management and mitigation measures
Visual amenity, landscape and urban design	The project will make visual changes upon the landscape during construction, which may impose on the existing visual amenity of the area. Visual amenity impacts upon the landscape in the operational phase are expected to be minimal. Likely impacts and factors affecting these are considered below: • The sewage pumping stations and majority of the water recycling plant will be underground so visual amenity impacts will be minimal. • Visual amenity impacts in the operational phase of the project will depend upon the specific location and design of the water recycling plant and reservoir. • There will be temporary visual impacts due to construction activities (satellite sites, actual works).	• The visual amenity impacts of the discharge structure will be considered in the design phase. Issues relating to visual amenity will be considered during detailed design. There would be early authority and public consultation of the proposed design solution. • The stakeholder engagement and community consultation program would account for issues relating to the amenity of satellite sites. Responses would be incorporated in the database and considered in site design and location. • Architect and landscape architect skills would be integrated in the design team to provide input on the aesthetics of the above ground structures. • In assessing visual amenity impacts, consideration would be given to land use, heritage, recreational and precinct character, as well as pedestrian and cyclist use, and open space networks. • The water cycle infrastructure will fit in to the urban and landscape vision and design objectives developed for the proposal. • A visual impact study will assess above ground infrastructure for the water cycle, and will provide management and mitigation measures to minimise visual impact (eg. Landscaping and alternative siting).
Waste	The project would generate a number of resource and waste streams and utilise a variety of materials during construction. Resources and waste generated during water infrastructure construction would potentially include excess unsuitable spoil material from trenching and building. This may require transport and disposal if not reused on site. When in operation the treatment process for potable water and recycled water will produce waste in the form of biosolids.	Resource use and management would be undertaken in the CEMP waste management plan in accordance with the resource management hierarchy principles of the *Waste Avoidance and Resource Recovery Act 2001*. • The OEMP will include a waste management plan for the disposal of bi-products and waste associated with the water recycling plant.

Issue	Potential impacts	Management and mitigation measures
Utilities and services	The water cycle infrastructure may impact upon other major projects/infrastructure/land use in the area, due to construction and operation. There may be delays and interruptions to road, rail and other services during construction works. Not properly identifying services and utilities would impact upon these, eg powerlines and underground cables.	• Standard infrastructure design and installation approaches will be included in the statement of commitments and hazards and risk management plan. Measures will be detailed in CEMP and OEMP.
Hazards and risks	Potential hazards and risks associated with construction of the project include interference with other services, trench collapse, traffic hazards, bushfire impact with overhead powerlines, personal safely and security.	• Specific construction hazards will be addressed through best practice industry occupational health and safety measures including training, accreditation and adherence to WorkCover requirements. • Inspections, audits and site management planning for occupational health and safety would support these measures. • An incident management plan that addresses all hazards will be developed. • A bushfire hazard assessment will determine if potential hazards exist on or adjacent to the development site, and will provide recommendations for mitigation and management. • A full risk assessment will identify hazards associated with operations such as accidental spills and sewerage overflows. Mitigation measures will be included in the statement of commitments and will be outlined in CEMP and OEMP.
Socio-economic issues	The project will impose socio-economic issues during construction and operation. These are considered below: • Impacts on recreational use at various nearby sites during construction. • Reduced recreational amenity and/or recreational areas may result from the project due to the location of permanent structures and changes in flows. • Amenity impacts due to siting of infrastructure, or due to noise and dust during construction.	• A comprehensive community engagement and stakeholder management (CE&SM) program has commenced and would continue to determine a profile of the project corridor and the surrounding local area. • A review of socio-economic issues for the area would be undertaken to more fully assess the impacts of the project. • Stakeholder views and community responses are to be considered in the assessment.

Issue	Potential impacts	Management and mitigation measures

Noise and vibration	The construction of the water infrastructure will increase noise and vibration within the area. During construction, noise will result from actual works and traffic.
	Pumping stations and water recycling plant treatment facilities are potentially sources of noise and vibration during operations.
	Additional truck movements during both construction and operation are a potential noise source.
		• A construction and operational noise and vibration assessment would be undertaken for the project (focussing on the impact of traffic noise for future dwellings). Specific potential impacts of water cycle infrastructure will be considered. This would involve:
		  ◦ Identification of all noise sensitive receivers.
		  ◦ Noise monitoring for baseline noise levels.
		  ◦ Modelling and predictions of noise levels.
		• The potential impacts will be minimised by the design and siting of the infrastructure within the development.
		• Activities would be organised so that noise and vibration impacts are minimised during construction and operation.
		• Construction activities that could potentially produce significant noise and vibration levels would be scheduled during practicable hours.
		• Measures will be included in the statement of commitments and outlined in CEMP and OEMP.

6 Proposed scope of environmental assessment

The proposed scope of environmental assessment for general issues relating to both the concept and project plans is outlined in Table 6. The proposed scope for the project environmental assessment is outlined in Table 7. Scope is based on the preliminary assessment of key issues discussed in section 5.1 and 5.2 of this document. Preliminary information obtained for the project indicates that environmental issues other than those considered key issues, can be managed through the detailed design stage and with the application of best practice measures and site-specific safeguards as described in the tables.

Notwithstanding this, other environmental issues may be subject to further more detailed assessment in order to best inform route selection and to ensure avoidance of identified environmental constraints. For instance, detailed field surveys for biodiversity (terrestrial) will be conducted, as well as other studies.

Table 6 Scope of concept plan and part of project environmental assessment: general issues

Issue	Scope of studies for the environmental assessment
General	• Consideration of planning and statutory requirements. • Strategic justification for the project. • Description of the project. • Discussion of project options. • Outline of construction activities. • Consideration of the principles of sustainability in the context of the project.
Community engagement and stakeholder management	• Description of engagement and consultation activities conducted to date, issues identified, and influences on project design and construction activities. • Ongoing consultation to engage local community and key stakeholders around the project and planning process. • Outline of overall community engagement and stakeholder management strategy to be implemented during construction.
Environmental risk analysis	• Identification of potential environmental impacts associated with the project, proposed mitigation measures and potentially significant residual impacts after the application of proposed mitigation measures. • Should any additional key environmental impacts be identified, an appropriately detailed impact assessment would be included in the environmental assessment.

Issue	Scope of studies for the environmental assessment

Key environmental issue for concept plan: **Water cycle management**	• A water cycle management plan will be developed at concept level to guide the entire development, and the development of infrastructure to service NH1A specifically. This will address:
	  ◦ Proposed recycled water quality, uses and potential discharges to receiving waters.
	  ◦ Stormwater, wastewater and recycled water scheme impacts (operational) and proposed operational management practices.
	  ◦ Construction impacts of the proposal on water quality and hydrology.
	  ◦ Staging of proposed water cycle components to address potential impacts.

Table 7 Scope of environmental assessment for part of project: key issues

Issue	Scope of studies for the environmental assessment
Water quality and hydrology	• Water quality and hydrology will be assessed, as part of the development of the water cycle management plan for concept level. • A combined water quality and hydrologic assessment will be conducted incorporating the modelling of water quality, proposed recycled water discharges and catchment flows. Potential impacts on the receiving waters within the catchment will be assessed. • The study will document these impacts and recommend design, mitigation and management issues. Results of the assessment will form the basis of operational environmental management plans for the water cycle project as it applies to servicing NH1A. • A water quality monitoring program would be developed and employed before and after commissioning to ensure that water quality impacts are minimised and risks are managed appropriately. This program is likely to encompass monitoring of surface water quality and aquatic biota, to be considered together in terms of assessing catchment health. • Construction management plans will be developed to address any water quality impacts that may result from construction activities, including drainage and stormwater runoff. • A stormwater management plan will be prepared to assess water quality, drainage, flooding and water sensitive urban design impacts on neighbourhood 1A. • Environmental risks (relating to water quality) from the recycled water scheme will be assessed in conjunction with the human health risk assessment (see below).
Aquatic ecology	• Assess the health of the catchment waters that are potentially impacted by the water cycle development. • Consider pre-development monitoring and a monitoring program based on identification of more detailed design water cycle infrastructure.
Human health	• Assess the risks to human health of proposed reuse of recycled water (pathways of exposure) and discharge to receiving environments. • Assess the risk to human health from operations.
Draft statement of commitments	• A draft list of construction and ongoing environmental management and mitigation measures to be applied to the project.

7 References

ACTEW corporation. *Water Security Program*. Source: http://www.actew.com.au/WaterSecurity/Research/water_security_review.aspx. (accessed 2007).

Australian and New Zealand Environment and Conservation Council (ANZEC), 2000. *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*.

Beauro of Meteorology (BoM), Source: http://www.bom.gov.au. (accessed 2007).

Charles Sturt University, May 2004. *Environmental Assessment Googong Urban Investigation Area*.

C.M.Jewell & Associates Pty Ltd, 2004. *Desktop Review of Potential Hydrological Impact – Googong Development Water Cycle*.

Coffee, 2004. *Googong Local Environment Study – Preliminary Environmental Site Assessment*.

Department of Planning, 2007. *Departmental Review Queanbeyan City Council Residential and Economic Strategy 2031*.

Department of Planning, 2008. *Sydney–Canberra Corridor Regional Strategy 2007–31*.

Ecowise Environmental, 2008. *Wastewater Treatment & Reuse Scheme – Preliminary Assessment Report*.

Googong New Town information website, Source: www.googong.net. (accessed 2008).

Government of NSW, Government of ACT, 2006. *Memorandum of Understanding on ACT and NSW Cross Border Region Settlement*.

Government of NSW, Government of ACT, Government of Australia, 2006. *Memorandum of Understanding on ACT and NSW Cross Border Water Resources*.

Navin Officer Heritage Consultants (NOHC), December 2003. *Googong Local Environmental Study – Cultural Heritage Component*.

NSW Recycled Water Coordination Committee (RWCC), May 1993. *NSW Guidelines for Urban and Residential Use of Reclaimed Water*.

Natural Resource Management Ministerial Council (NRMMC, 2008). *Australian Guidelines for Water Recycling: Managing Health and Environmental Risks*.

Territory and Municipal Services (TAMS), 2007. *Googong Foreshores Draft Management Plan 2007*.

Willana associates, 2007. *Googong urban investigation area – Local Environmental Study*.