11 Water quality

11.1 Methodology

This chapter assesses the project's impact on water quality in the Murrumbidgee River, Burra Creek and the Googong Reservoir. The focus of the chapter is on water quality in relation to environmental standards such as those outlined in the ANZECC Guidelines for Fresh and Marine Water Quality (2000) and the related Water Quality Objectives (WQO's) in NSW; drinking water quality impacts are addressed in chapter 24. The WQO's were adopted by the NSW Government following extensive community consultation in 1998. The following Chapter 12 considers the impact of water quality on aquatic ecologies.

A description of current water quality characteristics is provided, which includes water quality monitoring data from the Murrumbidgee River, Burra Creek and Googong Reservoir, based on data supplied by ActewAGL. The data are analysed to identify the project's potential impact on water quality. A copy of the data and water quality summary charts has been provided in Appendix F.

The impact assessment was undertaken by:

- Identifying potential water quality changes that may occur as a result of the project;
- Examining how any changes may impact on pre-project water quality in waterways; and
- Proposing how any potential impacts will be managed or mitigated.

The proposed water transfer could result in impacts on the water quality of Burra Creek if water from the Murrumbidgee River is markedly different from that of the Creek. Due to the ephemeral nature of Burra Creek and its disturbed catchment, the creek water quality is expected to be highly variable. This assessment considers whether post-project water quality will be within the bounds of Burra Creek's natural variability as well as proposing management or mitigation actions to protect the environmental values and recreational uses of the Creek.

11.1.1 Water quality legislation and guidelines

The project involves the transfer of water from the ACT section of the Murrumbidgee River to the Googong Reservoir, which is within NSW. Accordingly, water quality needs to satisfy the regulations and guidelines that apply to each jurisdiction, as well as any Commonwealth requirements and other national guidelines. A summary of these requirements and relevant guidelines is provided below.

ACT

Environment Protection Act 1997 and Environment Protection Regulation 2005

Under the Act there is a general environmental duty to take steps that are practicable and reasonable to prevent or minimise pollution of water. The Regulation contains a listing of water quality standards (referred to as AQUA/1). Where a value is not specified in the Regulation, the Australian and New Zealand Environment Conservation Council *Guidelines for Fresh and Marine Water Quality* guidelines (the *"ANZECC Guidelines",* 2000) are deemed applicable.

Water Resources Act 2007

This Act controls the access and use of water and groundwater in the ACT. The Act prescribes which activities must be licensed for water use. This includes the construction of a dam two ML or larger; the construction or alteration of a bore; the taking of water from a water body or bore; and construction or alteration of structures that affect flows in a waterway.

NSW

Protection of the Environment Operations Act 1997

The Act is the key pollution control legislation in force in NSW. Amongst other things, it creates a number of pollution offences, including offences relating to *'the pollution of waters through deliberate actions or actions that cause or permit pollution of waters'*. Under the Act, *'water pollution'* includes introducing litter, wash water, soil, debris, detergent, paint, cement slurry, building materials etc. into waters or placing such material where it is likely to be washed or blown into waters or the stormwater system or percolate into groundwater.

Water Quality Objectives

The NSW Department of Environment, Climate Change and Water have identified water quality and river flow objectives for surface waters in NSW, including for both the Murrumbidgee River and Burra Creek. The 'Water Quality Objectives' (WQOs) are consistent with the agreed national framework for protecting water quality as set out in the ANZECC 2000 Guidelines. These guidelines provide an agreed framework to assess water quality in terms of whether the water is suitable for a range of environmental values (including human uses). The WQOs provide environmental values for NSW waters and the ANZECC 2000 Guidelines provide the technical guidance to assess the water quality needed to protect those values.

The Murrumbidgee River and Lake George catchment is subdivided with Burra creek occurring within a subcatchment identified as a town water supply, and the potentially impacted reach of the Murrumbidgee being identified as a Stream Affected by the Snowy Scheme (DECC 2006) (Table 11.1).

The National Health and Medical Research Council guidelines are applicable for drinking waters (Table 11.2) (NHMRC 2004).

Commonwealth

Environmental Protection and Biodiversity Conservation Act 1999

The application of this Act to the project is considered in chapter 25.

National Guidelines

ANZECC (2000) Guidelines for Fresh and Marine Water Quality

The ANZECC guidelines aim to protect environmental values through setting management goals. The guidelines recommend default numerical and descriptive water quality trigger guidelines to help natural resource managers establish water quality objectives that will maintain the environmental values of a given water resource. The management framework outlined in the guidelines prefers the development of site specific water quality triggers that to take local conditions into consideration.

If water quality concentrations exceed the selected trigger values, the guidelines recommend management actions such as investigations into cause and assessment of any resulting ecological impacts. In line with the guidelines, the proponent would develop locally applicable trigger values over a period of time, based on a water quality and ecosystem monitoring program.

The management goals applicable to this project are to:

- Minimise the impacts of changes in water quality in the Murrumbidgee River downstream of Angle Crossing, on environmental values, recreational use and primary production; and
- Minimise the impact of water quality on the environmental values and recreational uses of Burra Creek.

Within the framework of the guidelines, both the Murrumbidgee River and the Burra Creek are classified as slightly to moderately disturbed ecosystems (i.e. ecosystems in which aquatic biological diversity may have been adversely affected to a relatively small but measurable degree by human activity such as catchment grazing or pastoralisation)[1]. Under this classification biological communities remain in a healthy condition and ecosystem integrity is largely retained.,

The guidelines outline levels of species protection that are appropriate for varying levels of pre-existing disturbance to the ecosystem under assessment. Water quality trigger values are then set according to the different level of species protection required for that ecosystem. The guidelines stipulate that for a system of slight to moderate disturbance, 95% of species protection should be adopted. The relevant levels are provided on water quality figures provided in Appendix F.

11.2 Existing environment

11.2.1 Overview of system boundaries, water resources and values

This assessment considers surface waterways and water resources that would:

- Have new infrastructure constructed within its current catchment area;
- Be diverted (temporarily or permanently) to cater for the project; or
- Receive water from a new source.

Figure 11.1 provides a conceptual diagram of the study area, together with a summary list of values and uses that each water resource provides (Note: groundwater resources are depicted in the figure as a water resource, however they are considered in chapter 15). Table 11.1 summarises the environmental values and uses that could be affected by water quality for each water resource.

[1] *Typically, healthy freshwater systems have slightly to moderately cleared catchments and/or reasonably intact riparian vegetation. Slightly–moderately disturbed systems could include rural streams receiving runoff from land disturbed to varying degrees by grazing or pastoralism*

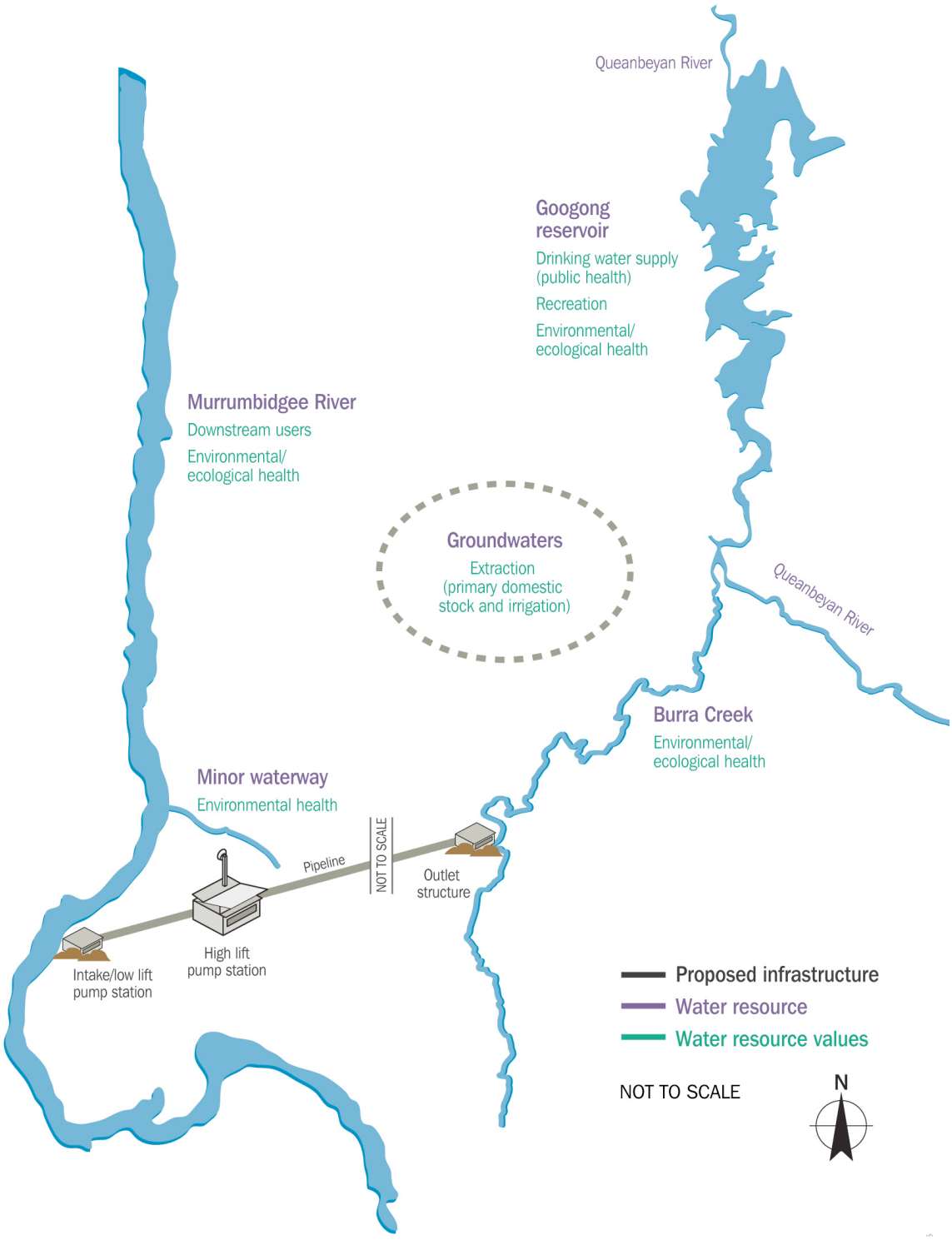

Figure 11.1 Schematic of the current water resources and the water users

Table 11.1 Summary of water resources and the water users that may be impacted by a change in water quality as a result of the project

Water resource and description	Water quality objectives	Main references
Murrumbidgee River is Australia's third largest river and forms part of the Murray-Darling basin system. It falls under the "streams affected by Snowy Scheme" category within the Murrumbidgee River and Lake George Water Quality and River Flow Objectives.	Protection of aquatic ecosystems Protection of visual amenity Protection of secondary contact Recreation Protection of primary contact Recreation Protection of irrigation water Supply Protection of homestead water Supply Protection of drinking water at point of supply – disinfection only Protection of drinking water at point of supply – clarification and disinfection Protection of drinking water at point of supply - groundwater Protection of aquatic foods (cooked)	Department of Environment and Conservation (2006) Murrumbidgee River and Lake George Water Quality and River Flow Objectives ANZECC (2000). *Guidelines for Fresh and Marine Water Quality* NSW WQOs ACT AQUA/1 Regulations CSIRO (2008a, 2008b) Appendix G – Aquatic Impact Assessment
Burra Creek is an intermittent waterway that drains to the Googong Reservoir. The lower part of Burra creek will receive the transferred Murrumbidgee River water. It falls under the "town water supply subcatchments" category within the Murrumbidgee River and Lake George Water Quality and River Flow Objectives.	Protection of aquatic ecosystems Protection of visual amenity Protection of drinking water – disinfection only Protection of drinking water – clarification and disinfection Protection of drinking water - groundwater	Department of Environment and Conservation (2006) Murrumbidgee River and Lake George Water Quality and River Flow Objectives ANZECC (2000). *Guidelines for Fresh and Marine Water Quality* NSW WQOs Appendix G – Aquatic Impact Assessment
Googong Reservoir is a large water supply storage for the ACT and Queanbeyan (121 GL at full capacity).	Protection of aquatic ecosystems Protection of visual amenity Protection of secondary contact recreation Protection of aquatic foods (cooked)	ANZECC (2000). *Guidelines for Fresh and Marine Water Quality* Appendix G – Aquatic Impact Assessment
Several minor ephemeral waterways are located in the study area. These drain to the Murrumbidgee River and Burra Creek.	Protection of aquatic ecosystems Provision of land drainage	CSIRO (2008a, 2008b) Eyles (1977)

Table 11.2 Key water quality parameters and default trigger values identified by ANZECC for ecosystem protection and NHMRC for drinking water

Parameter	Default Trigger values (from ANZECC (2000) and NHMRC (2004))		Median value in the Murrumbidgee (2005-2008)
	Ecosystem Protection	Drinking Water	
Turbidity	2-25 NTU	5 NTU	13 NTU
Total Nitrogen	0.25 mg/L	50 mg/L NO_3	1.15 mg/L
Total Phosphorus	0.02 mg/L	NA	0.168 mg/L
Dissolved Oxygen	90%	NA	9.8 mg/L
pH	6.5	6.5	7.4

Trigger values are fundamental to the use of the ANZECC guidelines. The trigger values for different indicators of water quality are set as a threshold or as a range of desirable values. The trigger values in Table 11.2 are default values which can be used in the absence of other information. Trigger values are are not pass / fail compliance criteria, but meant to trigger actions to monitor potential environmental impacts and undertake mitigation actions if required.

Local conditions vary between waterways and it is sometimes necessary to modify these trigger levels to local conditions, such as exist in Burra Creek. The modified triggers can be applied to assess compliance with the Protection of the Environment Operations Act 1997, or as conditions of any Environment Protection Licence issued under that Act. The guidelines provide a process for refining trigger levels and ACTEW intends to adopt that process over a period of time for application to Burra Creek as is discussed further in Section 11.2.6.

11.2.2 Water quality operational controls

Water extracted from the Murrumbidgee River will be screened at the intake/low lift pump station. The screened material will collect in grit collection hopper sumps. Jet inductors in each hopper sump would flush the collected grit into a pipeline which would flow form the low lift pump station and be continually discharged back into the Murrumbidgee River downstream of Angle Crossing. This would avoid any build up of suspended sediment in the pump system and allow the discharge to integrate without impact into the River flows downstream of the causeway.

11.2.3 Source Water Protection Program

ACTEW commenced a Source Water Protection Program (SWPP) in March 2009. It has committed approximately $6.4 million to the initial 5-year program in order to protect water quality. This is discussed in detail chapter 24.

As part of this programme, through ActewAGL, ACTEW have been involved with the UMCCC and other key stakeholders to address periods of high turbidity in the Murrumbidgee River. ActewAGL commenced aerial surveys of the Murrumbidgee catchment in July 2009 to identify turbidity sources and provides outcomes to the stakeholders. As part of this Program, ActewAGL provided financial assistance of $3000 to the UMCCC towards the revision of their land-holder publication *"Look after your natural assets".*

11.2.4 Historic surface water quality

Water quality data for the Murrumbidgee River (near Angle Crossing), Burra Creek (just upstream of the confluence with the Queanbeyan River) and the mid-reach of the Googong Reservoir were provided by ActewAGL. Water quality monitoring of these waterways is undertaken by Ecowise Environmental as

outlined in ActewAGL's 2008 *Water Quality Management Plan*. In addition water quality data in Burra Creek were collected by the Molonglo Catchment Group from November 2008 at Williamsdale Road Crossing for some parameters.

Under the direction of ACTEW, Ecowise has commenced an expanded water monitoring program in anticipation of the need to inform future revies of the ACT Environmental Flow Guidelines, and to develop more appropriate water quality trigger levels for Burra Creek. The first reporting of results from this expanded monitoring program is due for release in March 2010.

Monitoring sites

A schematic diagram of the monitoring sites from which historical water quality data was available is provided in Figure 11.2. The Murrumbidgee River is monitored at Angle Crossing (site MUR213), adjacent to the proposed intake/low lift pump station. Monitoring data for a range of parameters dating back to November 1993 was available. This monitoring site is located within a relatively shallow section of the river which pools during low flows.

Monitoring data for Burra Creek was obtained from site GOO729. This site is inundated by Googong Reservoir when reservoir water levels approach full supply and samples are only collected when this occurs. For this reason the site has been infrequently sampled since January 2004. No water quality data is available for the flowing section of Burra Creek. As such, the monitoring results are not truly representative of water quality in Burra Creek, as the sample site is influenced by the mixing of reservoir waters. There is no other water quality data available for Burra Creek that is closer to the proposed discharge point. The site generally shows different water quality from the site in the centre of the Reservoir (site GOO724) so it is concluded that the data used in the analysis below is influenced both by Burra Creek and reservoir waters.

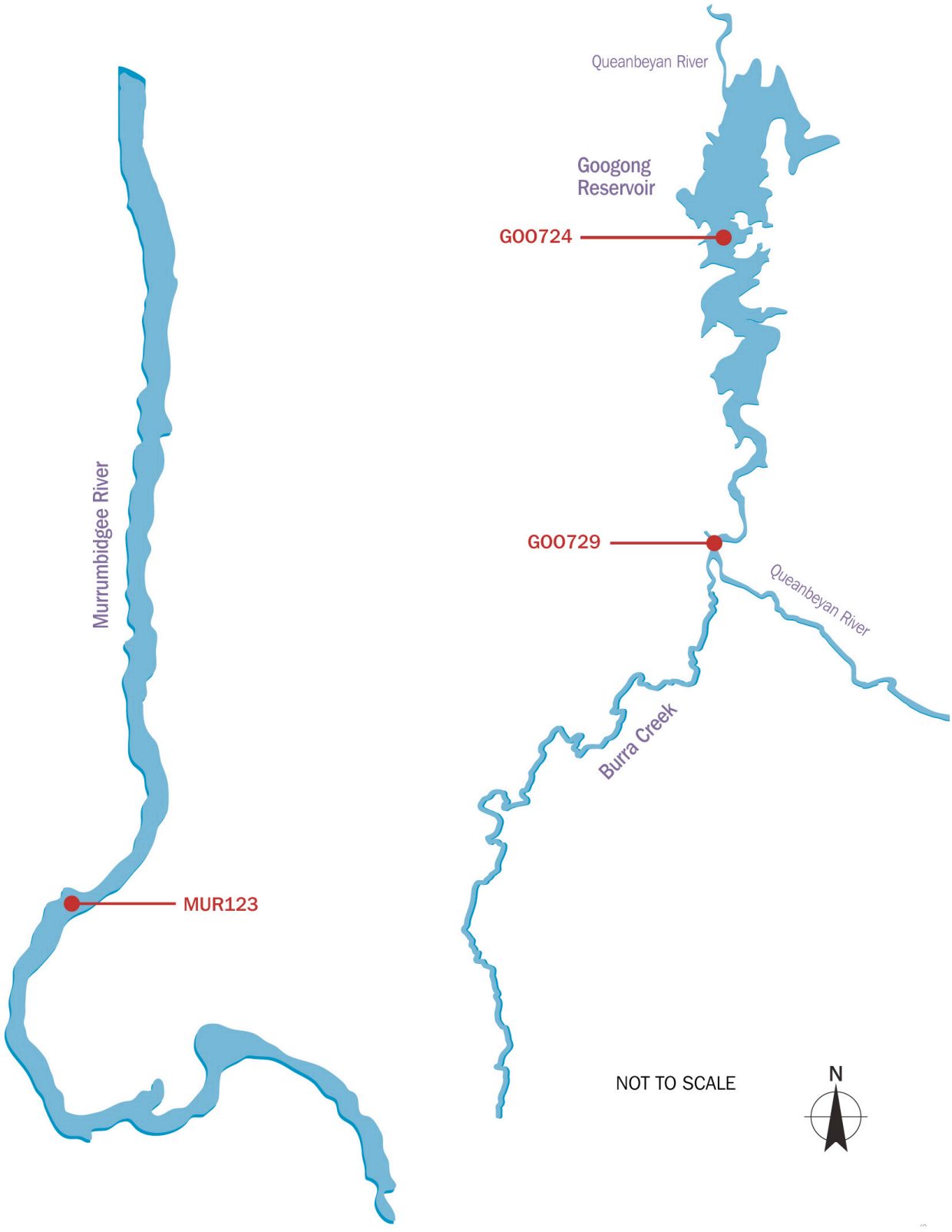

Figure 11.2 ActewAGL/EcoWise water quality monitoring sites (prior to project).

11.2.5 Comparison of historical water quality data for the Murrumbidgee River and Burra Creek

Summary data for water quality indicators are presented in Appendix F and in the Health Risk Assessment in Appendix P. These data include a comparison with relevant ANZECC default guidelines and the water

quality requirements outlined in the ACT *Environment Protection Regulation 2005* (particularly AQUA/1 requirements).

Acknowledging the deficiencies of sample site GOO729 and its limited value, a comparison with Murrumbidgee River water shows:

Turbidity and true colour
The median level of turbidity in the Murrumbidgee, 13 NTU, is lower than the DECC trigger value (25 NTU), but during high flow events the trigger levels are regularly exceeded. For the period when flow occurs in both systems (1998 to 2004) average and median levels of turbidity in the Murrumbidgee River are similar to those of Burra Creek and within ANZECC guideline levels.

Total nitrogen, total phosphorus, chlorophyll a and total algae
Total phosphorus and total nitrogen levels are close to trigger levels within both the Murrumbidgee River and Burra Creek (reservoir affected). Available data suggest there may not be a marked difference between total phosphorus and total nitrogen between the two systems.

Dissolved oxygen
Dissolved oxygen was regularly below ANZECC guidelines for both systems. The Murrumbidgee River had consistently higher dissolved oxygen levels than Burra Creek (influenced by reservoir waters).

pH
pH was found to be within the recommended ANZECC guidelines for both systems, with only few irregular exceptions throughout the available sampling period. Data collected as part of the ecological studies described in chapter 12 seem to indicate a higher pH in the Creek.

The recent monitoring data indicates the median pH based on 54 measurements from 2006-2008 in the Murrumbidgee was 7.4 (with the 25th percentile 7.2 and the 75th percentile 7.7), while the median value for Burra Creek based a survey in August 2009 was 8.1 (Biosis 2009). Other monitoring by Molonglo Catchment Group and Ecowise indicated a more neutral pH for Burra Creek.

Temperature
Burra Creek sample site is naturally cooler in winter, and warmer in summer with higher upper and lower limits than in the Murrumbidgee River. The frequent shallow pools are likely to be susceptible to long periods of cooling and heating in the winter and summer months, respectively, which often leads to temperature spikes.

Major ions (e.g. manganese and iron)
There is no significant difference in major ion concentrations between the two data sets. Data collected more recently in Burra Creek consistently indicate a higher conductivity in the creek than in the Murrumbidgee, which suggests higher concentrations of major ions. .

The water quality data collected by Molonglo Catchment Group generally shows water which is higher in electrical conductivity and total phosphorus than GOO729, at the low end of the GOO729 turbidity range, and similar to GOO729 for pH and temperature.

The recent monitoring data indicates the conductivity in the Murrumbidgee averages 114 µs cm^{-1} (range 38-219) (ACTEW 2009) while that in Burra Creek, at the gauging site, typically exceeds 600 µS cm^{-1} (Mueller, pers. comm.). Measurements at 7 sites in Burra Creek sites in August 2009 had a median conductivity of 476 µs cm^{-1}. This may reflect the origin of part of the Burra Creek flow as groundwater passing through limestone.

11.2.6 Applying the ANZECC Guidelines to Burra Creek

ACTEW has already initiated detailed monitoring to assess baseline assumptions further . From the limited additional data gathered to date, and from expert creek inspections, it is evident that the creek water is influenced by limestone outcrops of limited extent in the catchment and along the creek bed. Burra Creek shows that it has relatively higher electrical conductivity, lower turbidity and higher pH compared to the

Murrumbidgee, and compared to most other south-eastern Australian streams without such limestone influences.

Recent monitoring indicates conductivity, pH and possibly total phosphorus levels in Burra Creek appear to exceed the water quality guidelines under low flow conditions. For example the upper limit for conductivity identified by ANZECC (2000) is 350 µS cm^{-1}, but existing (limited) data from Burra Creek ranges from 550-740 µS cm^{-1}. Similarly the small amount of pH data considered reliable in Burra Creek frequently exceeds 7.5, the ANZECC upper limit. The limited data on phosphorus concentrations in Burra Creek (Waterwatch 2009) indicate levels far in excess of ANZECC (2000) trigger levels, but data integrity has not been verified.

The above indicates some of the default water quality trigger values developed for south-eastern Australia by ANZECC (2000) and adopted as part of the DECC ambient WQOs for NSW, may not be applicable for Burra Creek. Burra Creek specific triggers will need to be developed in accord with the recommendations of ANZECC (2000) and DECC (2006).

To establish appropriate water quality trigger levels for Burra Creek ACTEW has initiated more intensive water quality monitoring in the creek to determine median and percentile ranges. These would be used as triggers for more detailed investigation of ecological impact. The key parameters are conductivity, nutrients (total phosphorus and total nitrogen) and turbidity. The monitoring program collects data from both high and low flow events at frequent intervals.

The location of the existing five Burra Creek ECOWISE monitoring points is shown in Figure 11.3.

The future data collected will be used to set season-specific trigger levels as the parameters are likely to vary markedly between those seasons when the flow is more dominated by groundwater flows and those when overland flow is more dominant. A set of site specific water quality trigger levels will be established prior to operation. Once the initial site specific trigger levels have been established, monitoring of the creek will continue upstream and downstream of the discharge to capture additional data during operation.

Any exceedances of water quality triggers will result in management actions to intensify monitoring of any impacts on aquatic ecosystems. Any observed trends toward significant adverse impacts will trigger adjustment of the operating regime . In the longer-term, ACTEW may know in advance whether the Burra Ck water quality triggers will be exceeded by monitoring of Murrumbidgee River water quality, and will be able to initiate ecological monitoring, adjustment of operating regimes and/or other mitigation measures at the earliest possible time to minimise impacts .

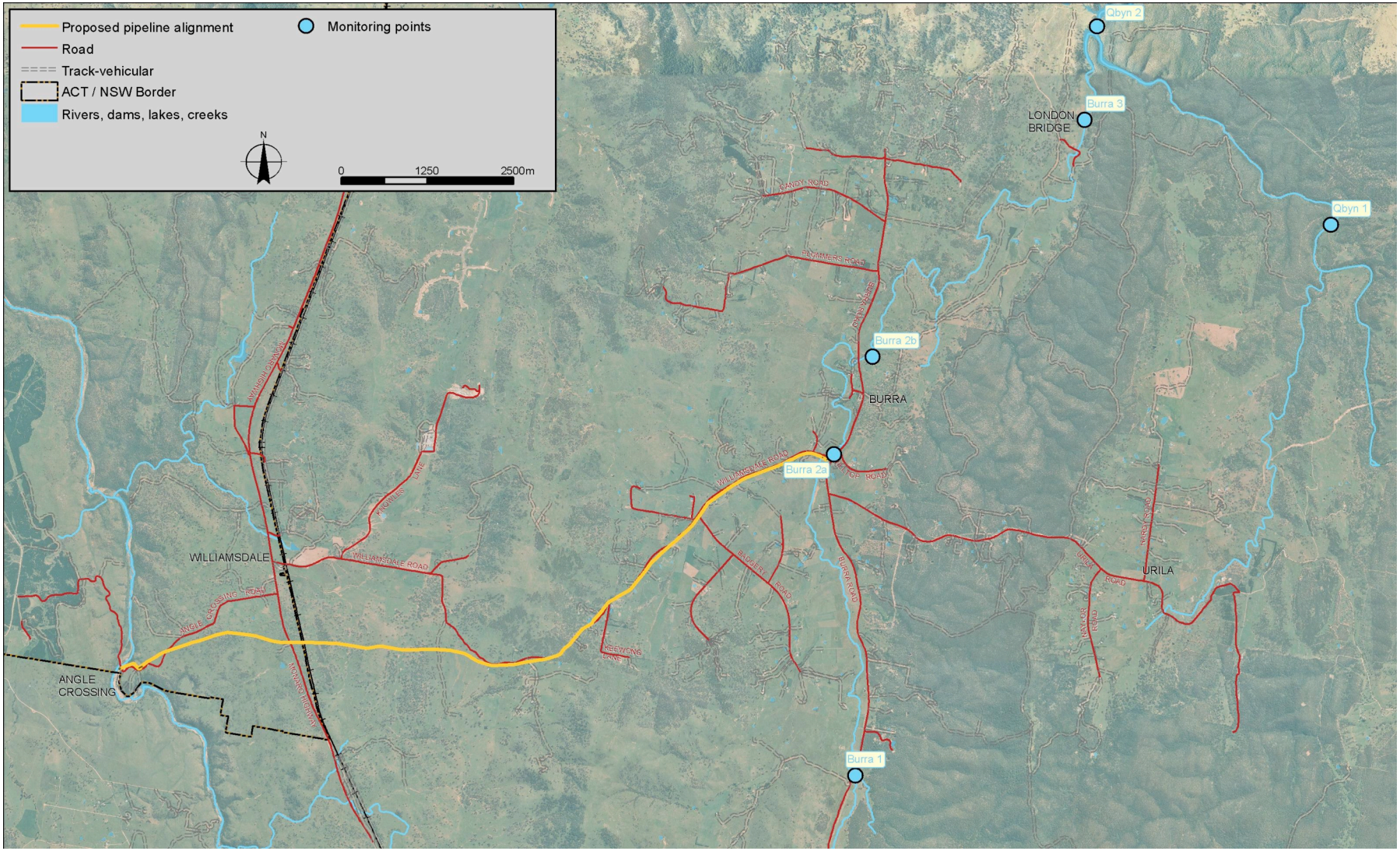

Figure 11.3 Location of ECOWISE monitoring points in Burra Creek

11.3 Impact assessment

The potential impacts, as they relate to each water resource, are outlined in the following sections for both the construction and operation of the project.

Potential construction impacts are similar for each water resource and are outlined below. Potential operational impacts are outlined in the sections that follow as they relate to each water resource.

11.3.1 Construction

Construction activities and associated increases in heavy vehicle traffic may lead to an impact on water quality in all waterways through the generation of sediment-laden overland run-off, spillage of oils (e.g. machinery fuels or maintenance), litter (e.g. from the construction workers and activities) and alkaline cement materials. Should they enter the river, these pollutants have the potential to impact on water quality by increasing turbidity and suspended particle levels, altering pH (e.g. due to alkaline cement material) or increasing hydrocarbon levels.

If inadequately controlled, changes to water quality could impact on the aquatic ecology of the river (as described in chapter 12) and any downstream water users.

Potential construction impacts can be managed by the implementation of standard construction environmental management measures through the construction environmental management plan. Provided these measures are implemented, the potential for impacts on water quality is considered to be low.

Water levels inside coffer dams around the LLPS and outlet will be maintained at lower levels than river or creek levels to prevent leakage of any pollutants into the waterways.

11.3.2 Operation

Murrumbidgee River and minor waterways

Water quality within the Murrumbidgee River and within the waterways crossing the pipeline route could be affected by the following:

- Decrease in river flows as a result of the abstraction of water from the river;
- The return of screened material from the pump station back to the river; and
- Uncontrolled incidents associated with the operation of the project.

The transfer of water would reduce the flow in the river at Angle Crossing. As noted in chapter 9, the reduction in flow would be most pronounced at median to low flows in the river. As flow decreases, this may impact on the concentration of water quality indicators such as suspended sediments. To ensure that the environmental health of the river is protected, a set regulated environmental flow would be maintained. This would be supported by the implementation of a comprehensive water quality and aquatic ecology monitoring program to monitor the effectiveness of the proposed environmental flow rules and a commitment to modify them if necessary. Provided these rules are maintained and their effectiveness is monitored, the overall impact on water quality in the Murrumbidgee River as a result of the transfer of water is considered to be low.

During operation, there would be a need to clean the screens at the low lift pump station. Screens include the course grit screens as well as the fine fish egg filter. These screens would be cleaned continuously during operation by water jets. The design of the low lift pump station incorporates jet inductors in each hopper sump, which would automatically transfer water volumes with suspended grit and sediment through a group of eight 200 mm diameter pipe to be returned to the river north of the Angle Crossing causeway. The discharge location would allow transferred flows to be fully integrated within turbulent flows over the causeway.

The jet inductors would cyclically operate by automatic valves on a timer basis, with each jet eductor operation timer controlled at regular intervals that would vary depending on river flow conditions, as measured by river level and turbidity sensors at the pump station. The automatic timer would ensure that grit and sediment is not stored within hoppers but would be transferred to the river continuously. This would

ensure that the amount of suspended materials downstream of the intake structure/low lift pump station is as close as practicable to the amount of suspended materials upstream of the intake. This would ensure that there would be no visible 'plumes' and unnatural concentrations of materials downstream, and that levels of suspended solids are not in excess of the AQUA/1 guideline for turbidity.

All chemicals, fuels and oils would be stored in appropriately bunded areas in accordance with Australian Standards to minimise the potential for any spills. Developing and adhering to hazardous substance handling and maintenance procedures would minimise the potential for spill incidents.

The pipeline would require maintenance and cleaning at irregular intervals depending on usage and inlet water quality. The levels of manganese and iron in the Murrumbidgee River water could promote biofilm development in the pipeline. Sediment may also accumulate in low points in the pipeline. Two common methods for pipe cleaning involve flushing with water or pigging (i.e. sending a machine through the pipeline to scour the biofilms and blockages from inside the pipes). Any cleaning or maintenance water discharged from the pipe would be collected in tankers and taken off-site for reuse or appropriate disposal (dependent on the water quality) as required. Intervals between maintenance and cleaning events would be of the order of many years.

Burra Creek

Water quality within Burra Creek could be affected by the following:

- The increase in low flows within Burra Creek, thereby mobilising sediments (see chapter 10); and
- The transfer of water from the Murrumbidgee River to Burra Creek.

As described in chapter 10 the increased flows and frequency of flows travelling through the creek may increase the short term potential for creek bed scour and bank erosion, leading to a potential increase in particulate matter and turbidity. This adjustment is expected to be minimal and short term in nature. The geomorphology assessment (Appendix D) indicated that after an initial disturbance period, the creek is likely to stabilise with the reestablishment of fringing vegetation. Therefore, in the long term, the risk of significant increases in suspended solids is considered to be low to moderate. Mitigation measures (as outlined in chapter 10) would also be adopted to monitor the condition of the creek.

Potential operational impacts of Murrumbidgee River water on water quality in Burra Creek is addressed in the proposed monitoring and adaptive management approach as per above Section 11.2.6.

11.4 Summary of results

The environmental values of the Murrumbidgee River and Burra Creek are partly determined by the quality of water at each location. The major potential impacts on water quality that would require management are:

- Construction and maintenance of the project; and
- Inter-basin transfer of water.

The main outcomes of the water quality assessment are summarised below:

- The potential for impact of the project on the water quality of the Murrumbidgee River is considered to be low and manageable as a result of:
  - The maintenance of regulated environmental flows;
  - The very low proportion of overall flow extraction;
  - Proposed mitigation measures to control suspended particles and sediment during construction; and
  - The short term nature of the construction period.

- The potential for impact of the project on the water quality of Burra Creek is considered to be low to moderate and manageable as a result of:
  - Proposed mitigation measures to control suspended particles and sediment during construction;
  - The short term nature of the construction period;
  - Low flow velocities in the creek (low levels of entrainment of fine creek sediment during operation) as described in chapter 10.
  - similar catchment characteristics of Murrumbidgee River and Burra Creek:
  - The ACTEW commitment to implement a monitoring and adaptive management approach based around the development of site specific trigger values to initiate more intensive ecological monitoring, adjustment of operating regimes and/or other mitigation measures at the earliest possible time to minimise impacts.

11.5 Mitigation measures

11.5.1 Construction

A sediment and erosion control plan would be developed for the project as part of the construction environmental management plan. The plan would address the requirements associated with working in the riparian zone of the Murrumbidgee River and Burra Creek, as well as the requirements for the minor waterway crossings. The plan would incorporate measures such as:

- Construction of earthen bunds and similar diversion drains around the excavation site perimeter;
- The use of silt curtains for working in waterways;
- The removal of bunds from the Murrumbidgee River;
- Hay bay filters at hydrologic run-off points;
- Geotextile filters downstream of hay bay filters for works around creek crossings;
- Stabilising of soils and banks throughout construction;
- Revegetated following laying and backfilling of pipeline;
- Management of stockpiles; and
- Dust suppression.

Potential impacts would be minimised through developing an incident management plan (as part of the construction environmental management plan) that would include the following:

- Appropriate and timely disposal of any contaminated spoil, water or waste generated during construction;
- Decontamination of plant and equipment prior to leaving the construction site;
- Removing accidental spills of soil or other material;
- Bunding of any refuelling area;
- Minimising on-site vehicle activity on disturbed surfaces during and after wet weather events;
- Regular inspection of erosion control structures and bunded areas;
- Spill kits would be provided on site to contain potential spills from equipment;
- Refuelling would be restricted to areas equipped with spill containment; and
- Flood response and management.

The construction environmental management plan would include a provision for monitoring total dissolved solids, turbidity and pH (triggers would be based on the ANZECC 2000 guidelines or any seasonal site specific triggers developed for Burra Ck.) during the construction period to serve as indicators of impacts on water quality.

11.5.2 Operation

Murrumbidgee River

- Implementation of the water quality monitoring program in the Murrumbidgee River;
- Additional protocols would be incorporated in the ACT Regional Source Water Protection Program (as outlined in chapter 24) for addressing periods of poor water quality in the Murrumbidgee River. It is noted that ACTEW's Regional Source Water Protection Program (chapter 24) also addresses the issue of improving water quality in the Murrumbidgee River, and hence the quality of water pumped to Burra Creek and Googong reservoir; and
- Development of a standard operating procedure for access to the pipe during maintenance activities, chemical/fuel storage, and for pipe flushing that meets statutory requirements.

Burra Creek/Googong Reservoir

ACTEW is committed to implementing a monitoring and adaptive management approach based around the development of site specific trigger values to initiate more intensive ecological monitoring, adjustment of operating regimes and/or other mitigation measures at the earliest possible time to minimise impacts. Specific ecological trigger levels will be established in order to determine when pumping regime modification is needed, as discussed in the next chapter.