5. Consideration of Other Key Issues

5.1 Planning and environmental assessment process

Several submissions were received relating to the environmental planning and assessment process. An overview of the planning and approvals process and the current status of the Project is discussed in Section 1.2 and a number of issues are addressed within that section. Other issues raised can be summarised as follows.

1 **Public exhibition of the EA Report:** submissions were received requesting an extension of time to prepare a response to the public exhibition of the Tillegra Dam Planning and Environmental Assessment. Several submissions highlighted the size of the EA Report and the complex nature of some of the key issues presented for consideration and suggested that insufficient time was made available for comment (Section 5.1.1).

2 **Consistency with water resource management legislation and policies:** the NOW submission expressed the view that the Project would not meet the object and principles of NSW water legislation and policy (Section 5.1.2).

3 **Consistency with fisheries management legislation and policies:** the I&I NSW submission expressed the view that the Project was inconsistent with the *Fisheries Management Act 1994*, the *NSW Weirs Policy* and DPI's *Policy and Guidelines–Aquatic Habitat Management and Fish Conservation*. The key concerns were conservation of fish stocks, key habitat and the management of commercial and recreational fisheries (Section 5.1.3).

4 **Community consultation:** several submissions questioned the adequacy of the community consultation process and suggested there had been limited community input into the EA process. One submission proposed that Hunter Water had failed to meet the requirements of State and Commonwealth Government guidelines for community consultation (Section 5.1.4).

5 **Inconsistency with the Lower Hunter Regional Strategy:** a number of submissions suggested that the construction of the dam is contrary to some of the key objectives of the Lower Hunter Regional Planning Strategy and other regional policies and guidelines (Section 5.1.5).

6 **Adequacy of technical investigations:** concern was expressed that given the size of the Project, the technical investigations undertaken to inform the Environmental Assessment were inadequate and further investigations should be undertaken before a decision on whether to approve the Project is made. Some submissions indicated that this constituted a failure to meet the DGRs (Section 5.1.6).

7 **Independence of the EA process:** submissions questioned the independence of the assessment process and requested that an independent expert review of the EA Report and technical investigations should be undertaken (Section 5.1.7).

8 **NSW Government dam policy:** a number of submissions suggested that the proposal to build Tillegra Dam was in contradiction to the NSW Government's dam policy announced in 1995 by the then Premier, Bob Carr (Section 5.1.8).

5.1.1 Public exhibition of the EA Report

The environmental assessment and approval processes for Tillegra Dam are discussed in Chapter 8 *Planning and Assessment Process* of the EA Report. The proposed Tillegra Dam is being assessed under Part 3A of the EP&A Act. This process includes stakeholder and community consultation (refer Section 3) at several stages throughout the planning and assessment process. In addition to this consultation it is a requirement of the Act for EA Report to be made publicly available for comment. This is prescribed in Section 75H(3) of the Act and requires that:

> After the environmental assessment has been accepted by the Director-General, the Director-General must, in accordance with any guidelines published by the Minister in the Gazette, make the environmental assessment publicly available for at least 30 days

The public exhibition process is managed by DoP, during which 'any person (including a public authority) may

make a written submission to the Director-General concerning the matter' (Section 75H(4) of the EP&A Act).

It is acknowledged by Hunter Water that a large infrastructure project such as Tillegra Dam has a broad range of stakeholders with varied interests in key project aspects. Stakeholders for the Project range from residents and community groups to local and state government authorities. Hunter Water is committed to ongoing consultation (refer Section 2) with each of these stakeholders and recognises and values the importance of this feedback in the planning, assessment and approvals process.

As a result of the complexity of issues raised and the size of the EA Report, Hunter Water requested that DoP make the EA Report available for public consultation for a period beyond the statutory minimum of 30 calendar days.

The formal exhibition period, in accordance with Section 75H(3) of the EP&A Act commenced on 10 September 2009 and ended on 13 November 2009, a period of 65 calendar days. It is also noted that DoP accepted submissions beyond the closing date.

5.1.2 Consistency with water resource management legislation and policies

The NOW submission expressed the view that the Project would not meet the objects and principles of NSW water legislation and policy. Specific reference was made to the *Water Management Act 2000* and the *Hunter Unregulated and Alluvial Water Sharing Plan* (HUAWSP)

Responses to the specific issues raised are provided elsewhere in this report. The following response relates to the consistency (or otherwise) of the Project with the *Water Management Act 2000* and to the HUAWSP.

Water Management Act 2000

Section 3 of the *Water Management Act 2000* sets out the objects of this Act, namely:

> …to provide for the sustainable and integrated management of the water sources of the State for the benefit of both present and future generations and, in particular:
>
> (a) to apply the principles of ecologically sustainable development, and
>
> (b) to protect, enhance and restore water sources, their associated ecosystems, ecological processes and biological diversity and their water quality, and
>
> (c) to recognise and foster the significant social and economic benefits to the State that result from the sustainable and efficient use of water, including:
>
> (i) benefits to the environment, and
>
> (ii) benefits to urban communities, agriculture, fisheries, industry and recreation, and
>
> (iii) benefits to culture and heritage, and
>
> (iv) benefits to the Aboriginal people in relation to their spiritual, social, customary and economic use of land and water,
>
> (d) to recognise the role of the community, as a partner with government, in resolving issues relating to the management of water sources,
>
> (e) to provide for the orderly, efficient and equitable sharing of water from water sources,
>
> (f) to integrate the management of water sources with the management of other aspects of the environment, including the land, its soil, its native vegetation and its native fauna,
>
> (g) to encourage the sharing of responsibility for the sustainable and efficient use of water between the Government and water users,
>
> (h) to encourage best practice in the management and use of water.

It is clear from the above that the objects of the Act are multi-faceted. It is also apparent that there is potential to accommodate a range of water resource use and sharing activities such as environmental protection and the provision of, for example, an urban water supply.

The environmental assessment conducted for the Project considered a wide range of potential impacts including those related to water resource management. These were considered both separately (refer Working Papers A, B and C) and holistically (as documented in Working Paper D *Environmental Flows and River Management*).

A key component of the environmental assessment was the development of an environmental release strategy which, as noted in the Executive Summary to Working Paper D

> has been assessed using the river flow objectives and guidelines provided by the NSW Dept of Water and Energy (DWE). These guidelines recommend development of a release strategy on the basis of an understanding of the relationships between flow components and ecosystem responses developed for the system.

The preferred release strategy for the dam comprises:

- A transparent environmental flow to the 30th percentile of all flows
- Replacement of constant run of river transfers and flushing events with a specifically tailored event based run of river transfer protocol of 4,300 ML, consisting of a peak discharge of 1,500 ML declining over a 10 day period
- Inclusion of additional event based discharges from the dam consisting of a peak discharge of 270 ML/d, tailing off over a four day period. These discharges would be released to ensure a minimum number of variable flows important for fish passage occur below the dam wall should run of river releases or natural spills not occur
- Ensuring releases occur at the appropriate time of year to maintain the seasonality of flows within the river
- Preferential use of the multi-level off-take to control the water quality characteristics of releases, as opposed to allowing uncontrolled spillway discharges
- A whole-of-system approach through the increase of transparent environmental flows from Chichester Dam to a maximum of 20 ML/d.

The assessment acknowledges that development of an appropriate environmental release strategy is an adaptive management process and indicates that Hunter Water would continue to refine its hydrology modelling following discussion with NOW to support a recommendation on the ultimate release strategy to be adopted within the Water Sharing Plan. It is envisaged that the ultimate release strategy would adopt that approved by DoP, however, NOW as the principal regulator for water use in NSW may require additional refinements and improvements under the *Water Management Act 2000*.

Hunter Water is legally compelled to adopt an adaptive water management process as stipulated by the Act. All releases from the dam, environmental or otherwise, would be subject to access rules within the Water Sharing Plan. Any flows released from the dam would be able to be accessed by other users within the existing terms of the Water Sharing Plan.

Accordingly, Hunter Water is of the view that the Project is not inconsistent with the objects of the *Water Management Act 2000*.

Hunter Unregulated and Alluvial Water Sharing Plan

The NOW submission noted the HUAWSP commenced on 1 August 2009, and that it incorporates statements which provide flexibility regarding Hunter Water's access to water and the operation of its infrastructure to assist in mitigating potential fluvial and end-of-system flow impacts as a result of the dam.

Due consideration has been given to the HUAWSP in the development of environmental flows, however, it is noted that issues relating to the construction and operation of Tillegra Dam are separate to the ongoing development of the Water Sharing Plan for the region.

The HUAWSP includes rules for protecting the environment, water extraction, managing licence holders' water accounts and water trading in 39 water sources. The sources include the Williams River water source which is divided into two management zones; these being the Williams River Management Zone and the Seaham Weir

Management Zone. The HUAWSP makes an allowance to include the management of Tillegra Dam within its water management framework, should the Project proceed.

As noted, the preferred environmental flow release strategy for the dam has been developed with consideration of the Water Sharing Plan for the region and the NSW legislated water management framework, as required by the DGRs. Extensive discussion has been held between Hunter Water and NOW throughout the Project with regard to surface water hydrology, run-of-river transfers and transparent and translucent environmental flow releases. The preferred release strategy presented in the EA Report is an outcome of these discussions and the comprehensive assessment of ecosystem impacts of changes to the flow regime.

Hunter Water acknowledges there is a need for further ongoing discussion with NOW regarding the final environmental flow release strategy and the flow provisions past Seaham Weir adopted in the HUAWSP. The preferred release strategy identified in the EA Report is considered to provide a sound foundation for subsequent discussion. The HUAWSP has provision to include amendments to the plan following finalisation of the water sharing plan rules and construction of Tillegra Dam.

In view of the above, Hunter Water considers the Project is not inconsistent with the HUAWSP.

5.1.3 Consistency with fisheries management legislation and policies

The I&I NSW submission expressed the view that the Project was not consistent with the *Fisheries Management Act 1994* (FM Act), the *NSW Weirs Policy* and the DPI *Policy and Guidelines–Aquatic Habitat Management and Fish Conservation*. It notes that the key points of concern with the EA Report relate to the conservation of fish stocks and key fish habitats, and with the management of commercial and recreational fisheries in the Williams and Hunter Rivers.

Responses to the specific issues raised are provided elsewhere in this report. The following response relates to the consistency (or otherwise) of the Project with the FM Act and the policies and guidelines noted.

Fisheries Management Act 1994

As noted in the I&I NSW submission, the objectives of the FM Act are to conserve fish stocks and key fish habitats, and to promote ecologically sustainable development including the conservation of biological diversity. Secondary objects of the FM Act focus on the sustainable management of recreational and commercial fishing and aquaculture. These objects are acknowledged by Hunter Water.

Chapter 3 of the EA Report discussed the need for the Project. Section 3 of this report provides additional clarification on not just the justification for the Project in terms of addressing water supply security but also in relation to the preferred option. It is noted that a number of other options considered comprised online storages and I&I NSW would likely have expressed similar concern with aspects of these.

Farrier and Stein (2006:635) note that the overarching objective of the FM Act is ESD. Reference to ESD is made in various NSW Acts including Section 4 of the EP&A Act which links to the definition provided in Section 6(2) of the *Protection of the Environment Administration Act 1991*. This notes that ESD 'requires the effective integration of economic and environmental considerations in decision-making processes'.

The assessment conducted for the proposed dam has explicitly considered both economic and environmental considerations. It clearly acknowledges the unavoidable environmental impacts associated with the Project (together with the anticipated benefits) including those on fish species and their habitats in the Williams River. A range of mitigation measures have been identified and their feasibility considered both specifically in relation to the aquatic ecology of the Williams River as well as more widely to the Lower Hunter catchment. These measures will mitigate and offset unavoidable impacts and are considered to be consistent with ESD objectives.

Farrier and Stein (2006:636) note that with respect to recognising priorities in relation to the FM Act's objectives

> The challenge for fisheries managers is to ensure that their decisions are consistent with the legislation's various objectives, which in some cases can be seen as conflicting. In this regard, the structure of the NSW

> Act makes it easier (for example) to give a conservation priority over an economic object than is the case under the federal Act (the Fisheries Management Act 1991 (Cth) s.3.).

In summary, considered in isolation the Project could be regarded, on face value, as not being consistent with the objects of the FM Act. However, as with any major infrastructure project, it is imperative to holistically consider the impacts and benefits associated with the proposed activity. Hunter Water considers the environmental assessment achieves this outcome and provides a balanced package of mitigation and management measures.

NSW Weirs Policy

The goal of the NSW Weirs Policy is to halt and where possible, reduce and remediate the environmental impacts of weirs. The construction of new weirs is discouraged under the policy and should not be approved unless it can be demonstrated that the primary component of the proposal is necessary to maintain the essential social and economic needs of the affected community. This goal is supported by a number of principles as set out in the Policy.

In the section titled *Approvals for New or Expanded Weirs*, it specifically notes that the Policy

> does not act to the exclusion of any applicable EIA or heritage protection legislation, notably the *Environmental Planning and Assessment Act 1979*.

It further notes that

> A proposal to build a new weir or enlarge an existing weir should not be approved unless it can be demonstrated that the primary component of the proposal is necessary to maintaining the essential social and economic needs of the affected community.

The justification for the Project is set down in Chapter 2 of the EA Report and expanded upon in Section 3 of this report. This robustly demonstrates that the Project is required to maintain 'the essential social and economic needs of the affected community' (ie the Lower Hunter region).

The Policy indicates that

> Subject to the usual EIA process, a proposal for the construction of new, or expansion of an existing weir, that will result in a net environmental benefit may be approved (eg. this may include options to offset the impact of new or enlarged structures by the removal of existing ones).

The impact of the dam on fish passage was explicitly recognised in the environmental assessment (refer Section 10.8.1 of the EA Report and Working Paper C). It should be noted that there is already a barrier to fish passage on the Williams River in the form of Seaham Weir. While this incorporates a fishway, this is a modified orifice type design which limits the potential for fish to negotiate this barrier.

The feasibility of providing a fish bypass at the dam was considered but discounted on technical and cost issues. Instead, it was considered there would be greater environmental and social benefits for less cost by taking a catchment-wide view of opportunities to offset impacts.

As indicated in the EA Report, this would include improving fish passage at Seaham Weir by replacing the existing submerged orifice fishway with a structure(s) that operates over a much wider range of flows and allows the passage of smaller, weaker fish and macroinvertebrates which are more common in Australian freshwater systems (particularly diadromous juveniles).

Hunter Water is also consulting with I&I NSW (Fisheries) in relation to other opportunities to improve aquatic habitats in the Lower Hunter region. It would be possible to remediate several other priority barriers to fish passage within the Hunter region, in lieu of a high lift fishway at Tillegra Dam. This would provide substantial improvements to fish passage along several hundred kilometres of rivers within the region for a more measured investment of community funds.

In summary, it is considered that the Project is not inconsistent with the aims of the *NSW Weirs Policy*.

Policy and Guidelines–Aquatic Habitat Management and Fish Conservation

This document applies to planning, development proposals and various activities that affect freshwater,

estuarine and marine ecosystems. The guidelines are intended to assist developers, consultants, planners, local councils and other government agencies in assessing development to ensure that they are sensitive to and mitigate impacts on the aquatic environment.

In-stream structures which change natural flow regimes in waterways are a key threatening process under the I&I NSW (DPI) Priority Action Statement (PAS). The three threat abatement strategies that sit under this PAS with respect to in-stream structures are as follows:

- Research – determine the ecological needs of key freshwater threatened species and the flow levels required to complete their lifecycle
- Surveying and mapping – identify key in-stream barriers to populations of threatened species and use the information as a basis for prioritising rehabilitation works
- Habitat rehabilitation – facilitate fish passage at priority barriers.

It is noted that the mitigation measures presented in the EA Report address another key threatening process listed under the PAS, this being the removal of large woody debris from NSW rivers and streams. Mitigation for the Project not only includes the installation of woody debris in the river downstream of the dam but also includes retaining woody debris within the inundation area (where it would not pose hazard to watercraft) in order to provide habitat for fish species.

The assessment conducted for the Project explicitly considered impacts on aquatic habitats and on fish species utilising those habitats. This included identification of practicable impact mitigation measures. As previously noted, Hunter Water has made a commitment to I&I NSW (Fisheries) in relation to opportunities to improve aquatic habitats in the Lower Hunter region which could include the reintroduction of large woody debris into specific waterways to enhance fish habitat.

5.1.4 Community consultation

Consultation guidelines

It has been suggested that Hunter Water has failed to meet the requirements of State and Federal Government guidelines and national and international assessment frameworks for community consultation.

Consultation requirements for the Project were specified as part of the DGRs (refer Appendix 4 to the EA Report). The DGRs required an 'appropriate and justified level of consultation' and specified that the EA Report 'must describe the consultation process and clearly indicate issues raised by stakeholders during consultation and how these matters have been addressed in the Environmental Assessment'.

In addition to addressing the DGRs, Hunter Water has also followed the DoP *Guidelines for Major Project Community Consultation*. The key aims of the guidelines are to ensure that:

- Individuals and organisations that are likely to have an interest in the proposal have enough opportunity to express their views
- Information regarding the nature of the proposal is accurately and widely distributed
- Community and stakeholder feedback is encouraged and recorded
- Consultation with community and stakeholders is inclusive of the Community's diverse interests.

Hunter Water values the input from the community and other key stakeholders and consequently the consultation process undertaken by Hunter Water has exceeded these requirements. Further information regarding the consultation undertaken is detailed in Section 4 of the EA Report and summarised in Section 2 of this submission report.

5.1.5 Consistency with the Lower Hunter Regional Strategy

Some respondents expressed the view that the Project was not consistent with the objectives of the *Lower Hunter Regional Strategy*. The Strategy applies to the LGAs of Newcastle, Lake Macquarie, Port Stephens,

Maitland and Cessnock. The Lower Hunter Regional Strategy's objectives include the following:

- Maintaining and improving biodiversity
- Protecting natural and rural resource assets
- Promoting growth in centres with a greater choice of housing and jobs in the Newcastle CBD and specified major centres
- Providing for 115,000 new homes to cater for a projected population growth of 160,000 people.

Section 3.2.1 of the EA Report discussed the relationship of the Project to this Strategy. It notes the importance of providing an adequate drinking water source to meet the demands of the projected population increase in the Lower Hunter region. The Strategy also independently notes that the region's water supply is extremely volatile with resources depleting and replenishing very quickly depending on weather conditions.

The Strategy is a response to current levels of growth and recognises that this would continue as the Lower Hunter region broadens its economic role in the context of the NSW and national economy. In particular, the Strategy identifies that infrastructure planning would need to take into account the broad planning framework to ensure that future population growth is supported by services and associated infrastructure. The Tillegra Dam Project with its objective of providing increased water supply security is an important infrastructure requirement that supports the objectives of the Strategy.

Accordingly, it is considered that the Project is consistent with the objectives of the *Lower Hunter Regional Strategy*.

5.1.6 Adequacy of technical investigations

Concerns were raised regarding the adequacy of the technical investigations undertaken and whether these investigations were sufficient to meet the DGRs.

Hunter Water submitted a project application to DoP on 21 November 2007. This application included a preliminary environmental assessment (PEA) and outlined the initial environment findings and management measures and identified the proposed scope of works for the subsequent environmental assessment for the Project. A formal planning focus meeting was held on 11 October 2007 to assist in the development of the DGRs and was attended by:

- DoP
- Department of Environment, Climate Change and Water (formerly DECC)
- Industry and Investment - Fisheries Conservation and Aquaculture (formerly DPI)
- Hunter-Central Rivers Catchment Management Authority (HCRCMA)
- NSW Maritime
- NSW Rural Fire Service (RFS)
- Hunter Water Corporation
- Dungog Shire Council.

Agencies were given the formal opportunity to provide comments to DoP to inform preparation of the DGRs. These were subsequently issued on 8 January 2008 and provided as Appendix 4 to the EA Report. Supplementary DGRs (Appendix 5 to the EA Report) were issued on 1 May 2009 following consultation with the Commonwealth Department of the Environment, Water, Heritage and the Arts. The supplementary DGRs related to consideration of the potential impacts on the Hunter Estuary Wetlands, a listed Ramsar wetland.

The technical investigations undertaken for the Project explicitly considered the matters specified in the DGRs and were documented in the following Working Papers and reports:

- A Water Quality and Hydrology
- B Fluvial Geomorphology
- C Aquatic Ecology

- D Environmental Flows and River Management
- E Terrestrial Ecology
- F Sustainable Resource Use
- G Socioeconomic Assessment
- H Proposed Quart Pot/Munni Cemetery Relocation
- I Roads and Other Infrastructure
- J Air Quality
- K Noise and Vibration
- L Contemporary Heritage
- M Aboriginal Heritage
- N Draft Integrated Land Use Plan
- Construction Environmental Management Plan Guide.

The investigation into the potential impacts of the Project on the Ramsar wetlands was attached as Appendix 6 to the EA Report.

Prior to public exhibition of the EA Report, Hunter Water was required to submit all the documentation for an adequacy review as per Section 75H of the EP&A Act. The DoP review was completed in consultation with other government agencies. The EA Report was deemed to have adequately addressed all of the required issues stipulated in the DGRs such that it could be placed on public exhibition. The next step in the process for DoP is to further consider the assessment, the issues raised in submissions and Hunter Water's response to these issues provided in this submissions report.

With respect to the extent that an environmental assessment must consider the matters specified in the DGRs, Farrier and Stein (2006:241) note that

> Courts have repeatedly held that, to be valid, an environmental impact statement need only comply substantially, rather than strictly, with the statutory content requirements.

They further note

> The relevant standard was outlined by Justice Cripps in Prineas vs Forestry Commission of NSW (1983 49 LGRA 402. He said that 'a superficial, subjective or non-informative environmental impact statement' would not comply with the Act. A statement will comply, however, if it is comprehensive and objective, and informs the decision-maker, the public and the department about the consequences of the activity. It is not invalid simply because it 'does not cover every topic and explore every avenue advocated by experts'. Justice Cripps said it is doubtful an assessment could cover every aspect of a problem. An important factor is whether the statement substantially complies with the statutory requirements, not whether it complies in every conceivable way.

Hunter Water is of the view that the EA Report, including all supporting documentation together with additional information provided in this report provides an adequate basis for an informed decision to be made in order to approve the Project.

5.1.7 Independence of the EA process

A number of submissions questioned the independence of the EA process and considered that an independent expert review of the EA Report and technical investigations should be undertaken.

The planning approval process for the Project is set out in Part 3A of the EP&A Act. As required under Section 75I, the Director-General of DoP is required to prepare an assessment report on a proponent's environmental assessment. Section 75I(2) specifies the matter that this report is required to address.

The DoP assessment will be undertaken independent of Hunter Water's environmental assessment.

5.1.8 NSW Government dam policy

In 1995 the then NSW Premier, Bob Carr, announced a policy to not build any new dams in NSW. Some submissions suggested that the proposal to build Tillegra Dam would be in contradiction to this policy. The NSW Government's policy on dams is articulated within the *NSW Weirs Policy*. A weir is defined as a dam, lock, regulator, barrage or causeway under this policy. The policy states that new dams should not be constructed with the exception of those required for town water supply. The Tillegra Dam project is therefore compliant with this policy.

Information on the background to the Project and discussion of the justification for the Project is presented in Section 3 of this report.

5.2 Socioeconomic Issues

Many of the submissions received requested further information to be provided on the socioeconomic issues associated with the Project. The main issues raised in relation to socioeconomic issues are summarised as follows.

1 **Cost of the Project:** numerous submissions expressed concern about the costs of the Project, and their ability and willingness to pay for water stored in the dam. It was felt that there was uncertainty about the deferment of the cost of the dam into the future and what the cost of water would be in the future (Section 5.2.1).

2 **Methodology:** some submissions suggested that the methodology used for the EA Report did not address all direct and indirect socioeconomic impacts of the Project (Section 5.2.2).

3 **Approach to economic modelling:** some respondents felt that the economic modelling used for the Project was inaccurate and not representative of the actual nature of the Project (Section 5.2.3).

4 **Potential impacts on the regional and local economy:** concerns in general centred on surrounding impacts on the regional and local economy. Concern was also expressed about the inundation of agricultural land and the economic implications of this. Some respondents acknowledged that while jobs would become available for construction of Tillegra Dam, the effect of these would be short-term and not offset the impact on the permanent loss of agricultural jobs (Section 5.2.4).

5 **Employment:** a number of submissions highlighted the concerns about the loss of agricultural jobs within the area as a result of inundation of agricultural land (Section 5.2.5).

6 **Loss of agricultural land:** a number of submissions focused on the impact of the Project on agricultural land in the Dungog area. Responses particularly focused on the impact on peoples livelihoods and ability to continue living in the region (Section 5.2.6).

7 **Impacts on tourism within the region:** some respondents were concerned about the impact that the Tillegra Dam will have on existing tourism operations within the area (Section 5.2.7).

8 **Alternative land uses:** some respondents felt that the land inundated for the Tillegra Dam could be used for alternative purposes and that financial contributions should be provided to Dungog Shire Council for the changes to land use. Some respondents also felt that Council should receive funding in perpetuity to offset the loss of land rates and assets (Section 5.2.8).

9 **Social impacts on the Dungog community:** a number of submissions highlighted the potential for a decrease in the quality of life for people within the Williams River valley. Some respondents noted the personal effect of being displaced as a result of property acquisitions. Others expressed concern about the provision of accommodation for workers and potential impacts on medical services within Dungog (Section 5.2.9).

10 **Recreational use of Tillegra Dam:** numerous submissions were received requesting that Tillegra Dam be made available for recreational use. Many respondents provided suggestions on the types of

recreational activities that they would appreciate being made available, while others were positive about the tourism opportunities that the proposed dam presented (Section 5.2.10).

11 **Potential benefits for the community:** many respondents felt that the Project would not provide the local community with any benefits (Section 5.2.11).

12 **Communication and consultation:** a number of submissions expressed the view that they were not adequately consulted in relation to socioeconomic issues (Section 5.2.12).

13 **Cumulative socioeconomic impacts:** several respondents felt that the EA Report failed to fully acknowledge the cumulative socioeconomic impacts associated with other Part 3A projects within the vicinity of the Tillegra Dam project (Section 5.2.13).

5.2.1 Cost of the Project

A number of respondents expressed concern about their ability and willingness to pay for the water stored in Tillegra Dam. It was felt that there was uncertainty about the deferment of the cost of the dam into the future and what the cost of water would be in the future.

Working Paper G of the EA Report highlighted that the final cost charged to the consumer from an augmented water supply would not be based on the levelised cost calculated by the cost effectiveness analysis should the Project be approved. Costs and charges are fixed by the Independent Pricing and Regulatory Tribunal (IPART). IPART sets the prices that Hunter Water can charge for its water, sewerage, stormwater, trade waste and miscellaneous services.

As determined by IPART, water prices are increasing because:

- Improvements in water supply and drought security for the Hunter region through the construction of Tillegra Dam
- Upgrades to the sewerage system to comply with current Department of Environment and Climate Change (DECC) standards
- Augmentation of water services to cater for forecast population growth.

To set prices, IPART balanced the impacts on customers, service standards, Hunter Water's financial viability, the environment and principles of economic efficiency. By balancing these impacts, IPART can defer recovery of 60% of the Tillegra Dam costs. These deferred costs can be recovered in future prices, thereby ensuring the costs of the dam can spread over time to match population growth and the increased use of the dam. If this approach was not adopted by IPART, water prices are likely to increase by an additional $70 by 2012/13 (IPART 2009).

Other specific issues raised in relation to costs included:

- The direct and indirect socioeconomics of escalating water provision costs resulting from the Project on the Hunter community and their willingness to pay for increased drought security
- The burden on Hunter Water rate payers
- The socioeconomic analysis did not indicate who would meet deferred payment for the dam and the likely steep rise in water bills due to lower population growth
- The dam would impose a severe economic impact on Dungog Shire Council with respect to infrastructure degradation with little prospect of the Council being able to recover these costs as ratepayers are already stretched to adequately fund Council activities
- Queries the key finding that the dam brings an additional benefit each year to the region because baseline water scarcity is worsening each year.
- The claim in the EA Report that the increase in capacity of Hunter Water's supply network and enhanced water supply security through the provision of additional yield would be pivotal in underpinning and

supporting continued population and economic growth in the region is not justified by the evidence

- The analysis of impacts of the EAR is based on erroneous assumptions and does not include costs/loss of income to Dungog Shire Council.

The economic modelling did not specifically assess the willingness or appropriateness of Hunter Water customers to pay for the Tillegra Dam project. The Computable General Equilibrium (CGE) modelling attributed the cost of the Project to the national debt and accounted for additional household income less interest repayments on the debt generated by the net increase in economic output from the Project post construction.

It is understood that the IPART Final Determination of Water Pricing for the Hunter was handed down on 17 July 2009 which was after completion of the economic modelling. The IPART determination considered the issue of cost allocation to Hunter Water's customers for the Tillegra Dam. The IPART media release that accompanied its determination stated

> IPART has accepted Hunter Water's argument that the drought security benefits of constructing the Tillegra Dam equate to 40% of the cost. This amount should be paid for by Hunter Water's existing customers, commencing in 2009.

In addition IPART concluded

> that the remaining 60% of the dam's costs provides benefits to future customers because it caters for expected population growth in the Hunter Valley. As population grows the value of that water will increase. Recovery of these costs should be through future prices. This approach is equitable in that it matches prices with benefits received by existing and future customers and at the same time ensures that Hunter Water will continue to be financially viable.

IPART commented on the issue of fairness by stating that

> as population grows we expect that the utilisation of the dam will increase. So it's only fair that a growing customer base should contribute to the remaining costs of the dam.

Therefore the IPART process is considered to have apportioned costs between existing and prospective customers at 40% and 60% respectively.

IPART has identified that existing typical customer bills in 2012/13 would include $32 per annum associated with the Tillegra Dam. The apportioning of customer costs and the equity and fairness behind the determination has been made by an independent agency after a very thorough assessment process.

With respect to the issue of impacts of the Project on Shire infrastructure, this was explicitly recognised as an issue in the EA Report (refer Chapter 12 in general and Working Paper I *Roads and Other Infrastructure*). The assessment included an inspection of routes anticipated to be used by construction traffic noting the existing condition of road pavements and identify the need for remedial works to address the issue of deterioration and safety.

In addition to commitments made in the EA Report relating to infrastructure, Hunter Water would maintain the section of road between Dungog and the dam construction site (Chichester Dam Road and Salisbury Road) for the duration of construction.

The Whole of Government Taskforce of which Hunter Water is a member is also working towards minimising the impact of the Project on Dungog Shire and to facilitate delivery of beneficial outcomes to the community.

One submission queried the key finding that the dam would bring an additional benefit each year to the region because baseline water scarcity is worsening each year. The basis of this assertion is that that there is no water scarcity in the Lower Hunter and that reduced water use would not necessarily limit economic growth. Given that the economic modelling has an end timeline of 2031, the submission's assumption of no water scarcity without new water supply infrastructure over the next 20 years against a background of sustained population and economic growth in the region appears untenable. The water consumption assumptions that underpin Hunter Water's calculation of yield adopted in the economic modelling are more plausible than the proposed submission's assumption of no water scarcity over the next 20 years.

The same submission indicated 'that the increase in capacity of Hunter Water's supply network and enhanced water supply security through the provision of additional yield would be pivotal in underpinning and supporting continued population and economic growth in the region' was not justified. The basis for this view appears to

relate to the validity of Hunter Water's assumptions for future water demand/consumption and calculation of the yield. Hunter Water's assumptions are considered well founded as is the relationship between additional yield and its support for future population and economic growth in the region over the 20 year timeline of the economic model.

On submission expressed the view that the assessment was deficient in that it did not include costs/loss of income to Dungog Shire Council. This view is not supported. Chapter 12 of the EA Report included consideration of this issue. The EA Report acknowledges that the removal of up to 38 households from the district (though not all have necessarily left the Shire) would have some effect on local business activity and Council's rate base. It should be noted that some of the farm income that is generated from the Project area is taken directly out of the Shire as owners do not reside on farm and income above that reinvested in the business is spent directly at their primary place of residence outside the region.

It is important to note that the EA Report has highlighted many economic benefits to the local and regional economies during the construction and operation phase of the Project. The EA Report maintains that the construction of Tillegra Dam is expected to bring a significant boost to the building services sector with a full range of building subcontracting work required during the construction period. Similarly, accommodation, retail and other commercial service sectors would have the opportunity to expand during the construction period.

5.2.2 Socioeconomic analysis methodology

Some submissions were concerned that not all direct and indirect socioeconomic impacts had been identified for the Project. However, it is considered that Chapter 12 and Working Paper G of the EA Report provided a comprehensive assessment of the direct and indirect socioeconomic impacts associated with the Project, in accordance with the Project DGRs.

Some submissions suggested that the Millennium Ecosystem Assessment (MEA) and the Environmental Distress Scale (EDS) be used to ensure that the demand and needs of the Hunter region were met through a detailed socioeconomic survey. A detailed socioeconomic survey was undertaken and documented in Chapter 12 of the EA Report (without reference to the MEA/EDS). It is considered this is appropriate as it addresses the DGRs and is consistent with overall assessment processes.

Some concern was expressed in relation to the monitoring, mitigating and management of the Project impacts. A profile of the existing socioeconomic characteristics of the Lower Hunter region and the Dungog Shire was provided in Section 12.2 of the EA Report. Section 12.11 provides a list of the socioeconomic mitigation measures to be implemented throughout construction and operation of the Tillegra Dam Project.

5.2.3 Approach to economic modelling

Concern was expressed in relation to the appropriateness of the economic modelling. A number of submissions particularly referred to the need for the economic modelling to match international, national and State guidelines on Cost Benefit Analysis (CBA). It was also considered that the requirement for a full account of both direct and indirect impacts outlined in the DGRs had not been achieved by Cost Effectiveness Analysis (CEA) and Computable General Equilibrium (CGE) modelling used for the Project.

Cost Effective Analysis modelling

The DGRs for the Project included a series of requirements to assess both the direct and indirect socioeconomic impacts associated with the project. They did not specify the approach that should be adopted for assessing these impacts in totality. However, key assessment requirements for the Project do make specific reference to inclusion of a CEA for the Project (and options) in the environmental assessment. Several submissions have questioned the use of the CEA methodology and have suggested that a full CBA should instead have been undertaken for the Project.

The adoption of CEA as the method for assessing the Tillegra Dam Project was determined by Hunter Water following direct consultation with NSW Treasury on this matter. Hunter Water sought out Treasury's position on

the economic assessment method at the beginning of the EA process. This was in accordance with the NSW Government *Guidelines for Economic Appraisal* (NSW Treasury 2007) which offer both CEA and CBA as acceptable economic assessment methods for infrastructure project evaluation.

Hunter Water was cognisant of NSW Treasury's Guidelines' Annex 4 *Economic Assessment of Environmental Impacts* that nominate CBA as the preferred methodology for economic appraisal of environmental impacts. The stated constraint in Annex 4 in using CBA for assessing environmental impacts is that it is often difficult to quantify external costs and benefits.

It is noted within the guidelines that while CBA is a preferred method, CEA is also an acceptable methodology dependant on the type of analysis to be performed. In adopting the CEA methodology, Hunter Water was guided by the acceptability of this to NSW Treasury, given Treasury's understanding of the Tillegra Dam Project and the availability of defensible valuations of costs and benefits.

In October 2009 Infrastructure Australia released *Better Infrastructure Decision Making Guidelines*. These national guidelines have been developed by Infrastructure Australia to consistently assess projects of national significance submitted by governments for funding under the Building Australia Fund. As noted within the NTDG submission, the guidelines state the need for robust and objective CBA to guide investment decisions.

The NTDG submission included a commissioned review undertaken by Dr Geoff Wells of the University of South Australia. This review asserts that environmental assessment based on CEA is not appropriate to decision-making for the dam and not supported by international practice or relevant Australian guidelines. It instead argues that a CBA is essential.

Ultimately both CBA and CEA are appropriate assessment tools that can be applied to consider the economic circumstances for a major project. In fact when the basic theoretical applications for CEA and CBA are considered, there is a case for preferring CEA and it is noted that its selection is appropriate for the Project. A direct response from Hunter Water on this issue is provided as Appendix C to this report.

It is important to note that CBA is an analysis tool for optimising investment decisions to ensure that only candidate projects with the best economic return are selected. It assesses the net benefits of competing projects over time to select the project with the best returns to society. In this case, competing projects may be in different geographical areas, provide quite different benefits (eg ranging from electric power to transport infrastructure) and provide these benefits to quite different communities or sectors of the community.

CEA and least-cost analysis address a different decision need where the objective of the investment analysis is to consider how best to deliver a pre-determined, specific outcome or benefit rather than necessarily maximise net benefits from the investment of funds between multiple competing infrastructure projects in different business sectors. The selection of an economic project analysis tool is therefore generally dependent on considering whether guidance is required on which project type and industry to invest within compared to how to achieve a preselected objective at the most effective cost.

Where CEA is used, the objective or outcome of all competing projects or policies must be the same or similar. This was the case of the analysis which led to the identification of Tillegra Dam as the preferred option. A range of options was considered to achieve the single objective of balancing the long-term demand for, and supply of, potable water to the growing population of the Lower Hunter region.

CEA therefore is about ranking alternative ways or projects that will deliver essentially the same outcome. As the outcome and benefits are the same, it is not considered necessary to use CBA separately to consider the benefits of each option. Each option has already been framed to achieve that outcome. It is only necessary to compare costs and select the option with the lowest present value cost. This can then be subject to further quantitative and qualitative analysis relevant to social and environmental costs.

On this basis, the CEA performed for the Tillegra Dam option is considered to be appropriate in order to inform further discussion within the Part 3A planning approval process. A review of the various government guidelines for economic appraisal in fact indicates that CEA conforms to normal requirements for a project such as Tillegra Dam. Contrary to the observation made in the NTDG-commissioned review that CEA is not appropriate, it is a legitimate economic analysis tool, and reflected as such in the NSW Treasury guidelines.

The NTDG-commissioned review provides some interesting literature reviews on the Ecosystem Services, the Total Economic Value (TEV) of Catchment Services and the variations in the use of discount rates for public projects. Notwithstanding, the literature presented highlights the significant amount of work that would be required to comprehensively undertake a CBA and the possible conjecture and uncertainty that may result in determining socio-environmental valuations to monetise community costs and benefits. Generally, economic appraisal using CBA, CEA or any method should be considered as an input into the decision making process. The NSW Government's *Guidelines for Economic Appraisal* (NSW Treasury 2007) state in Section 3 that

> Clearly the results of the economic appraisal will not be the only factors taken into account when making a decision. Nevertheless it provides vital information on the effects of each possible decision.

The NTDG submission includes a letter from the CSIRO Sustainable Ecosystems Policy and Research Unit, which supports the need for a detailed undertaking of a full CBA of the total economic value of ecosystem services provided by the catchment and infrastructure investment. The CSIRO letter offers to undertake this work and has been included within the NTDG submission in order to support the general conclusions of the NTDG commissioned review. It is noted, however, that the CSIRO letter states that it has not undertaken a detailed review of the full assessment in providing its support for its conclusions.

Computable General Equilibrium modelling

The NTDG-commissioned review also discussed the use of CGE modelling and stated that this type of modelling is explicitly ruled out of infrastructure evaluation by both NSW Treasury and Infrastructure Australia guidelines. However, contrary to this assertion, the socioeconomic study did not link the CGE modelling to the NSW Government *Guidelines for Economic Appraisal* (NSW Treasury 2007). The CGE modelling was used specifically to identify economic benefits from the construction and operational phases of the Project on the regional/state economies. It is not however a project appraisal tool such as CEA or CBA and should not be confused in this regard.

The NTDG-commissioned review correctly references the total inappropriateness of using Input Output (IO) analysis as tool for the evaluation of a project. This inappropriateness is also covered in Section 2.4 of the NSW Guidelines. The CGE modelling (which is similar to IO analysis) measured economic activity in terms of increased output, household income, employment resulting from the projects. These economic aggregates are not summative to the CEA results.

Similarly the NTDG-commissioned review references that Infrastructure Australia discourages the use of CGE modelling. The main reason behind this position is that its *Better Infrastructure Decision Making Guidelines* (IA 2009) have been developed to appraise the economic viability of infrastructure projects of national significance. Infrastructure Australia seeks to assess and prioritise projects on a consistent basis for possible funding under the Building Australia Fund. The observation is therefore not particularly relevant to the manner in which CGE modelling was applied for the Tillegra Dam project. While CEA was applied to the assess the economic merit of the process against other options, the CGE modelling was undertaken to understand possible flow on effects that could occur from the preferred option.

In the case of the Tillegra Dam environmental assessment, the CGE modelling has been undertaken using a highly reputable CGE modelling platform from the Centre of Policy Studies Monash University. The CGE modelling has provided economic aggregates that have responded to the DGRs to identify potential changes to the local/regional economy. It is noted that the NTDG-commissioned review does not offer any alternative to identifying and/or measuring the economic activity resulting from the construction and operational phases of the Tillegra Dam project.

Modelling assumptions

Concerns have been raised that the economic modelling is dependent on the assumption that water scarcity in the Lower Hunter would limit economic growth, and on the system yield and demand forecast calculations undertaken by Hunter Water. This is part of the policy scenario for the model's application but does not detract from the analysis of how a significant financial investment would cause consequent stimulation of various regional economic market sectors. These assumptions as noted in the submission also relate specifically to the issues relating to Hunter Water's justification of the need for the project. These issues have been discussed in

detail in Section 3 of this submissions report and as such have not been duplicated here.

5.2.4 Potential impacts on the regional and local economies

A significant number of submissions expressed concern at the potential impacts of Tillegra Dam on the regional and local economies. A number expressed concern over the inundation of what was considered to be the impact on prime agricultural land, the impact on farmers in the area and the subsequent implications for the regional and local economies. Submissions also expressed concern that while economic stimulus and job creation associated with the construction of Tillegra Dam may occur in the short-term, the loss of agricultural jobs would be a long term impact.

The nature of the type of agricultural land affected by the Project has been discussed in the preceding section. As noted there is no Class 1 land and only a small amount of Class 2 land in the Project area. As such, the Project is not considered to have a significant impact on prime agricultural land. The previous section also discussed the issue of compensation with affected landholders who Hunter Water negotiated with to purchase their properties.

The EA Report and Working Paper G provided an extensive assessment of the socioeconomic issues involved with the construction and operation of the Tillegra Dam and the potential impacts on the regional and local economy. The EA Report maintains that the construction of Tillegra Dam is expected to bring a significant boost to both the local and regional economies. In particular, the building services sector should be a significant beneficiary with a full range of building subcontracting work required during the construction period. Similarly, accommodation, retail and other commercial service sectors would have the opportunity to expand during the construction period.

The EA Report and Working Paper G acknowledge the potential for negative economic impacts. These indicate that approximately 2,100 hectares of agricultural land would be subsumed into the reservoir area which is predicted to reduce the amount of agricultural land under production in the Dungog Shire by 1.7%. As indicated in Working Paper G, a reduction in 1.7% of the productive agricultural land in Dungog Shire (approximately 0.1% in the Lower Hunter region) is not anticipated to have a significant impact on the regional economy.

The economic analysis indicated the positive impacts of the Project are considered significant and would accrue at the Shire, regional and State levels. At the Lower Hunter region level, the provision of water storage capacity of 450 GL would effectively double the existing storage capacity of the region. This increase in capacity in the water supply network and enhanced water supply security through provision of additional yield would be pivotal in underpinning and supporting continued population and economic growth in the region, including within Dungog Shire.

During construction, it is likely that local business would experience patronage by construction workforce personnel due to Dungog's proximity to the construction site. This would provide a stimulus to the local economy during the construction period. While it is expected that the contractor's management team would be brought in from outside the Shire, it is expected that there would be significant opportunities for construction positions to be filled by Shire residents.

There would also be opportunities for skill development in workers as well as the development of new (not currently provided in the area) services and products to assist the construction of the dam, that would provide local income for the duration of the construction period. Some of these industries could potentially remain in the area after the construction period and provide additional local income post-construction.

Following construction, it is anticipated that visitor numbers to Tillegra Dam would progressively increase, particularly as the storage nears its maximum operating level, and the capacity for water-based recreational activities increases. Due to Dungog's proximity to Tillegra Dam, the local economy would be expected to benefit from increased visitation levels.

There could be a short term decline in spending in the local economy between the end of construction (and when members of the construction workforce from outside the district leave) and when the storage reaches a level that would attract significant numbers of visitors that would engage in water-based recreational activities. This is recognised and Hunter Water would provide various types of assistance in this regard to reduce the

effect of this (refer also Section 8).

5.2.5 Employment

A number of submissions expressed concern about loss of agricultural employment within the area as a result of inundation of agricultural land.

Dungog Shire

Section 12.2.2 of the EA Report identified that Dungog Shire has experienced major economic and labour force changes over the last two decades associated with falls in industrial employment in agricultural processing sectors. Over this same period, there has been a shifting employment pattern with rising participation in the workforce by women and a growing proportion of Shire residents engaged in management and professional occupational categories, particularly in the education and health sectors within government.

Section 3.2.6 of Working Paper G indicated that there are 477 businesses in Dungog Shire, most of them small and medium size businesses with over 40% in the agriculture forestry and fishing sector, 12% in the construction sector and approximately 10% in the property and business services sector. The communication services, wholesale trade, cultural and recreational services, and education sectors are also represented with less than 10 businesses each. Aside from the agriculture-related economic activities, the industrial and commercial sectors are characterised by small-sized enterprises with a high level of local market dependence.

The 2006 census recorded 3,462 persons employed in Dungog Shire. About two thirds were working full time with the remainder working part time. Approximately 13% of employed people worked in the agriculture, forestry and fishing sector followed by the health care and social assistance, construction, manufacturing, and retail trade sectors with approximately 10% each. More men worked in the agriculture, construction, manufacturing and transport sectors, while women were employed mostly in health care, retail, education and accommodation sectors.

Implications for employment

Direct employment opportunities in the construction of Tillegra Dam and later in the operational phase would be available. Section 7.9 of the EA Report notes that the extent and composition of the construction workforce would vary over the construction of the Project depending on the requirements of particular phases of construction. The EA Report predicts that an estimated 280 people would be required on site for dam and road construction activities. For the realignment of Salisbury Road, up to 80 people could be engaged during the construction period. For dam construction, an on-site workforce of up to 200 people could be engaged during the construction period.

During operation of Tillegra Dam, a number of employment opportunities will be available. Section 6.8 of the EA Report identified that Hunter Water intends to employ up to three full-time employees whose responsibilities would include maintenance and inspection of dam infrastructure, water quality testing, monitoring of erosion and general maintenance of Hunter Water land.

Additional employment opportunities are likely to become available, particularly in the tourism and recreation sector once the storage is close to full capacity which, as previously noted, would offset the loss of employment positions in the agricultural sector.

5.2.6 Loss of agricultural land

A number of submissions made reference to the impact of the Project in reducing the amount of agricultural land in the Dungog area. It was indicated that the loss of agricultural land would adversely affect their livelihoods and ability to continue living in the region.

This impact was recognised and considered in the EA Report. As noted in Section 12.11 of the EA Report, Hunter Water has undertaken property acquisition consistent with and beyond what is statutorily required under

the *Land Acquisition (Just Terms Compensation) Act 1991*. This was intended to specifically address such issues. It is noted that while some residents of properties purchased have chosen to move away, others have purchased properties elsewhere in the district.

Section 12.2.2 of the EA Report acknowledges that there would be a reduction in the availability of agricultural land within the region (approximately 2,100 hectares). This section identified the types and amount of agricultural land (as per DPI (Agriculture) classification) within Dungog Shire. As noted, there was no Class 1 land within the Shire and the relatively small area of Class 2 land was generally flood-affected.

The percentage breakdown of each of the classes within the Shire was as follows:

- Class 2: 17%
- Class 3: 24%
- Class 4: 51%
- Class 5: 8%

The EA Report indicated that Classes 3, 4 and 5 were located within the Project area. It incorrectly noted that there was no Class 2 land within the area; some Class 2 land does occur.

The land to be subsumed by the storage area would reduce the amount of agricultural land under production in Dungog Shire by 1.7%. This would in turn reduce the economic return from this particular land use, however, as noted variously in Chapter 12, the Project would have a positive regional benefit. It was also noted that at the local level, there would be economic opportunities arising from the Project that would be of benefit to the local economy.

With specific reference to land acquisition, the view was expressed that Hunter Water should not have purchased land prior to the approval of the Project. It was considered that the permanent dislocation of 90 rural families would have long term economic and social impacts, especially on the Dungog community. It is noted that only 38 properties are affected by the Project.

Hunter Water has been progressively buying land in the area over the past 20 years following the identification of Tillegra as a site for major water storage. This is considered prudent project planning and in no way pre-empts the Minister for Planning's determination of the Project. At the commencement of the EA Report exhibition period, Hunter Water owned 72% of the land required for the dam. At the time of preparation of this submissions report, this has increased to 94%.

As has been noted in this report, acquisition of land has proceeded on a commercial basis in accordance with the market value of the land in question consistent with and beyond the provisions of the *Land Acquisition (Just Terms Compensation) Act 1991*. As has also been noted, a number of landowners whose properties have been acquired have settled elsewhere in the district and would continue to contribute to the social and economic fabric of the area.

5.2.7 Impacts of tourism within the region

Some submissions made reference to potential impacts on existing tourism operations during the construction and operation of Tillegra Dam. As noted in the EA Report the likelihood of a detrimental impact is considered low. Instead, the expectation is that the Project would encourage tourism both during construction and subsequently once the dam is operational, particularly when the storage water level approaches its intended operating range (ie between 90% and 100% of FSL). The provision for recreational activities through the ILUP is reflective of this expectation.

Some concern was expressed that following construction, the impact of the dam on migratory fish species would have a significant negative effect to the socioeconomic value of the region as a recreational fishing industry. While the dam would present a barrier to movement of fish along this section of the Williams River, it is noted that movement is already impeded through the presence of Seaham Weir further down the river.

This impact is acknowledged in the EA Report. The proposal to stock the storage with appropriate fish species

to support recreational fishing recognises this impact. As also indicated in the EA Report, Hunter Water proposes to provide funding to assist the rehabilitation of barriers to fish movements in other waterways in the Lower Hunter which would provide a widespread benefit, not to just recreational fishing but to fish populations in general.

5.2.8 Alternative land uses

Dungog Shire Council's Draft Dungog Land Use Strategy indicates that the area surrounding the storage is not considered an appropriate location for a substantial increase in population due to its isolation from services. Rather, it supports the continuation of agricultural land uses around the storage area. Some respondents were concerned about the water storage replacing Dungog's ability to generate rates income and that this income would need to be compensated for by Hunter Water.

Section 12.5 of the EA Report suggests that Council would have an opportunity to increase its rates income (and offset potential losses from the water storage) through subdivision of larger blocks of land along Salisbury Road below the dam wall, which could be zoned as RU4 Rural Small Holdings with a minimum lot size of 15 to 20 hectares. The EA Report also highlighted that Hunter Water would make a financial contribution to Council over period following construction to cover the shortfall in rates income.

Section 12.5 of the EA Report indicated that preparation of the draft ILUP overlapped with Council's preparation of its standard LEP. Attention was paid to making the draft ILUP as consistent as possible with the standard LEP to provide clear objectives for the future development of the area. To this end, the draft ILUP only identifies potential zonings that could be applied by Council on land surrounding the storage. It would be at Council's discretion as to the exact zonings allocated and the specific locations of such zonings.

5.2.9 Social impacts on the Dungog community

A number of submissions indicated the potential for a decrease in the quality of life of people within the Williams River valley. Concern was expressed about the provision of accommodation for construction workers and potential impacts on medical services within Dungog. The inundation of Quart Pot/Munni Cemetery was noted in a number of submissions, particularly in relation to emotional ties held by members of the community with family interred in the cemetery. Some respondents also noted this in relation to property acquisition, particularly where the landowner had a longstanding presence in the area.

Quality of life

The EA Report generally acknowledges the social impact of the Project on the local community, particularly within the immediate area affected by the dam. While these will vary from person to person, it is noted that during construction there will impacts such as increased numbers of vehicles on local roads, noise, vibration and dust emissions from construction activity that would affect local amenity.

This was recognised by Hunter Water and, as part of the land acquisition process for the Project, property owners downstream of the dam were provided the opportunity for Hunter Water to acquire their property, a number of whom took up the offer. This notwithstanding, an extensive range of mitigation measures have been identified and are documented in the Statement of Commitments for the Project. The implementation of these would be undertaken within an ongoing consultative framework which would facilitate effective communication with affected residents.

Construction workforce accommodation

Concerns were raised about the capacity to adequately accommodate construction workforce personnel within Dungog Shire, and particularly within Dungog itself. Section 7.9 of the EA Report indicated that the Project would not provide specific workers accommodation either on site or in nearby Dungog. This was based largely on preliminary discussions with prospective construction contractors who anticipated that the majority of the construction workforce would be recruited locally from within the Dungog LGA or from other nearby areas in the Lower Hunter region, with only approximately 10% being brought in to the area by the construction contractor.

On this basis, approximately 28 people would be looking for accommodation within Dungog or the surrounding area.

The Project is not considered to be in a remote location, being approximately 70 kilometres from Newcastle and with other towns and settlements closer to Dungog. While this view still remains valid, the possibility of siting a construction camp within close proximity to the Tillegra Dam has been given further consideration as a result of community submissions in relation to this issue. Consequently, Hunter Water has made a commitment to provide a construction camp within Dungog Shire to cater for the construction workers of the Tillegra Dam project. This would be addressed as a specific requirement in the construction contract.

The location of the proposed construction camp has not been selected, however, two potential sites have been identified. One is on the outskirts of Dungog to the south east, near Melbee Circuit on Council-owned land (refer Figure 5.1). This site has potential for use as a residential subdivision. The other potential site is at Munni, adjacent to the location of the proposed camping ground on the eastern side of the storage identified in the draft ILUP.

The EA Report notes at pages 12.23-24 that establishment and use of a construction camp would need to be subject to a separate planning approval process, if not part of the Project approval – and not on land owned by Hunter Water. This would apply to the Melbee site but not the Munni site. Lodgment of a DA for the Melbee site would require the consent of Council as the owner.

As noted, the Melbee site has potential for future residential subdivision. If services are provided to this site for construction workforce accommodation such as road access (200–400 metres to the site), water, sewerage and power, Hunter Water would be prepared to leave this infrastructure in place following decommissioning of the accommodation facility which would make it available for inclusion in Council's subdivision plans.

A management plan would be developed by the contractor for the construction camp. This would include measures to reduce impacts on the surrounding community. It is noted that impacts associated with use of the Melbee site would already be addressed through other initiatives such as road improvements to facilitate their safe use by construction traffic.

Similarly, if recourse needs to be made to the Munni site, the infrastructure provided for the construction camp could be left in place to support use of the area as a recreational precinct.

Demand on medical services

A number of respondents to the EA Report expressed concerned about the availability of medical services to residents, tourists and construction workers as a result of the presence of Tillegra Dam. Section 12.7 of the EA Report identified the existing medical facilities available in Dungog. As noted, Dungog provides for a variety of medical services and a 24-hour emergency service manages the needs of the local community and provides ambulance transfer to Maitland Hospital or other larger facilities by road or air such as the John Hunter Hospital in Newcastle.

Hunter Water reiterates that it is expected the Project would have minimal demand on local health care facilities in terms of increased demands on services. The construction contractor would have on-site first aid personnel to provide initial treatment where required. While it is expected that there may be the need to draw on local resources for initial emergency treatment, as noted in the EA Report, there is an established 24-hour emergency service available.

Following construction, it is expected that NSW Health would monitor the needs of the district and plan accordingly to address any change in demand on health services that might, for example, be driven by factors such as increased visitation numbers.

Emotional impacts

The significant emotional effect of the Project on members of the community with family and relatives interred in Quart Pot/Munni Cemetery was fully acknowledged in the EA Report and in Section 1.2 of Working Paper H *Cemetery Relocation Plan*. In its dealings with the community, Hunter Water has strived to handle this issue

Figure 5.1 Possible location for accommodation for construction workforce ('Melbee' option)

sympathetically. In progressing with the Project, Hunter Water has sought to balance technical and planning issues with the sensitive nature of this aspect of the Project.

Working Paper H identifies the practicable options Hunter Water considers are available with regard to the future of the cemetery. This includes leaving the cemetery as is, however, Hunter Water's proposed approach is to relocate the cemetery which is set out in Section 2.2 of Working Paper H. It is acknowledged that effective and sympathetic consultation and communication is imperative; Section 3 of Working Paper H outlines the approach Hunter Water proposes to take. The proposed relocation of the cemetery includes the establishment of a memorial adjacent to the current location but above FSL to acknowledge the value of the cemetery to the community.

It is acknowledged that the acquisition of properties for the Project has been a difficult process for many property owners. In its dealings with property owners, Hunter Water has strived to act sympathetically. As noted

in Section 5.2.3, Hunter Water has undertaken property acquisition consistent with and beyond what is statutorily required under the *Land Acquisition (Just Terms Compensation) Act 1991*.

Additionally, Hunter Water has previously funded Dungog Information and Neighborhood Services (DINS) to provide support services for affected members of the community since the project was announced in 2006. Hunter Water would continue to fund counselling and support services, particularly of relevance in the future, to individuals affected by the proposed relocation of the Quart Pot/Munni Cemetery.

Mitigation of socioeconomic impacts

Some respondents felt that the social costs of the Project would not be able to be adequately mitigated. A number of measures to mitigate social impacts of the Project were proposed by Hunter Water and were detailed in Section 12.11 of the EA Report and the draft Statement of Commitments. These included:

- Provision of funding of $323,000 to Dungog Shire Council in partnership with DoP to undertake a planning and land use study to support revision of the LEP. This will allow the local community to take advantage of development opportunities arising from the construction of Tillegra Dam
- Provision of funding of $100,000 to Dungog Shire Council to support a dedicated project manager to identify and secure funding for commercial and business opportunities that may arise from the Project
- Provision of funding of $30,000 to the Dungog Information and Neighbourhood Services to provide support services for affected members of the community
- Contribution of funds of $200,000 to the Dungog Advantage Fund (administered by the Department of State and Regional Development) to facilitate and promote local business enterprises; the total value of the fund is $500,000 due to additional money being made available by the Department of State and Regional Development
- Provision of funding (approximately $313,000) to contribute to road maintenance and road safety
- Provision of transitional funding to compensate Dungog Shire Council relevant to adjusting to reduced rates income from land at Tillegra ($80,000 annually for the three years following commencement of filling)
- Allowing (with the community's support) recreational facilities and activities on and around the storage to boost tourism in the area
- Potential job opportunities for the region during the construction and operation phases of the dam
- Undertaking property acquisition consistent with and beyond what is statutorily required under the *Land Acquisition (Just Terms Compensation) Act 1991*
- All affected public infrastructure would be replaced
- Recreational access to the storage for swimming, fishing and boating would be permitted except where such access would conflict with acceptable safety standards and operational requirements (generally most localities except in the vicinity of the off-take tower and dam wall)
- Visitors facilities would be established below and around the dam with low impact walking trails, lookouts, picnic areas, a boat ramp, a designated area for camping, toilets and various rest areas
- Hunter Water would sponsor a social worker to provide personal support to landholders within and around the Project area, if called upon for assistance
- Access would be maintained to all private properties during construction
- In the event that construction activities would affect a permanent access, alternative access would be provided in consultation with the affected property owner or resident. As far as practicable, alternative access would be of a standard equivalent to the permanent access. At the end of construction, the permanent access would be reinstated should this be the preference of the property owner, subject to the final layout of completed works
- Hunter Water would consult with affected families with respect to managing the impact of the Project on Quart Pot/Munni cemetery. A new working cemetery would be established in the area, funded by Hunter Water. Hunter Water would also meet all costs associated with the relocation of graves.

These are restated in the Final Statement of Commitments (refer Section 10) together with measures such as

an additional $1 million for road and bridge maintenance as part of a $2 million government initiative.

5.2.10 Recreational use of Tillegra Dam

Numerous submissions were received requesting that Tillegra Dam be made available for recreational use. The majority of these suggested that full recreational use should be allowed (not just passive recreation). A number noted the social and economic benefits of recreational use to the local community.

Feedback from the community to date has shown that recreational use of Tillegra Dam would be extremely desirable. Suggestions on the types of recreational uses included:

- Stocking the storage with native fish
- Allow boating on the storage in specified areas and minimize power boating to specific areas wherever possible to avoid bank instability
- Provision of adequate jetties and boat ramps
- Ensure water quality is of a standard commensurate with primary contact eg swimming
- Opportunities to link surrounding recreation areas with Tillegra Dam to make a recreation precinct
- Provide education opportunities at the dam, such as a water education centre or historic centre
- Provide maps of submerged topography for recreational dam users
- Provide walking/cycle/motorbike tracks, bird watching facilities, and lookouts.

As part of preparation of the draft ILUP (Working Paper N), Hunter Water sought the views of the community and other stakeholders on the management of the catchment area surrounding the storage. This also provided the opportunity to clarify community issues and concerns.

Should the Project be approved, the draft ILUP will be finalised considering feedback received during and following the EA Report exhibition period. The ILUP is intended to be a 'living' document which would be periodically reviewed and revised as required to reflect management needs. Review of the ILUP will occur in consultation with the NSW Land and Property Management Authority and other relevant stakeholders including Dungog Shire Council.

Sections 1.4 to 1.7 of Working Paper N provide details of the proposed recreational plan for Tillegra Dam. The Plan identified three precincts around the storage that could accommodate recreational facilities. These have suitable land and road access for potential recreational and commercial facilities as well as providing access to the storage. Concept layouts for the precincts were presented in Figures 8.2–8.5 of Working Paper N. Each precinct has a designated 'primary' recreational activity. The Tillegra precinct contains the proposed interpretive centre and is in close proximity to the dam wall enabling the introduction to the Tillegra Dam experience. The Munni precinct fulfils the role as a camping ground location, with Underbank being provided as a family picnic area. The Underbank precinct has potential for many uses given its flatter topography and formed access.

Being located close to Barrington Tops, there is an opportunity to connect the 'mountains to the storage', and to complement the walking and camping activities offered in Barrington Tops with boating, swimming and fishing experiences around the storage. There are opportunities to create walking tracks around the storage and extend them to Chichester Dam. There is also the potential for commercial operators to establish accommodation for tourists and to provide for local businesses in Dungog such as recreational fishing equipment shops.

Many opportunities for recreational activities are available to capitalize on the presence of the proposed dam. However, it is important to note that Hunter Water's role is simply to provide water and wastewater services to the Hunter region, not to manage recreational activities in isolation from other authorities. Recreational boating, fishing and general use of public space is generally managed by NSW Maritime, I&I NSW, local government by-laws and input from other relevant government agencies.

Constraints on recreational activities on the water storage

Some community concerns centered around the potential for degradation of water quality and its suitability for use if recreational pursuits are undertaken on the water storage. Hunter Water is supportive of use of the storage for recreational uses subject to the overarching water quality management objectives. Chapter 10 of the EA Report provides details of how the Project would be designed and operated to meet water quality guidelines detailed in *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZECC and ARMCANZ 2000) for recreational use.

The National Health and Medical Research Council (2008) guidelines for recreational water have also been used to compare the predicted water quality of the storage. Recreational activities on the water storage would carry a degree of risk to water quality of the water storage although this is considered to be relatively low. To minimize the risk of recreational activities on water quality, consideration would be given to adoption of the following measures:

- Provision of appropriate and adequate infrastructure at recreational facilities (eg toilet facilities, waste receptacles etc) to accommodate anticipated level of use
- Implementation of an appropriate management regime for recreational areas to facilitate early detection of potential issues which could impact on water quality.

Some community members also expressed concern that while the storage fills, full recreational use would not be possible. Some activities may be permitted and this would be considered during review of the ILUP. As a general comment, this would need to consider the nature of any access to the storage and to the risk attached to a particular type of activity.

Section 10.12.6 of the EA Report acknowledges that some vegetation in the inundation area would not be cleared so as to provide fish habitat. However, while water level is well below 90% of FSL, this could pose a risk to some water-based activities such as power boating and related activities such as water skiing. These activities would likely need to be managed through the establishment of 4 knot zones or other navigational rules for access. However, this would be no different from how other storages are managed in NSW.

Enhancement of the storage for recreational fishing through fish stocking would need to be assessed under the terms of the 2005 DPI's *Fisheries Management Strategy on Freshwater Fish Stocking* (the FMS). I&I NSW has indicated in-principle support for fish stocking, however, formal approval under the FMS is required.

A number of submissions were concerned about recreational access to the foreshore and within the 50 metre wide buffer zone. Three precincts are identified in the draft ILUP where recreational access points would be provided. Access on foot would be permissible anywhere within the buffer zone and a walking trail between two of the precincts is proposed. Review of the provision of access and other management measures could be undertaken during the periodic review of the ILUP.

Section 12.10.4 of the EA Report indicates that the proposed boat ramps would initially be well above the storage water level, inhibiting recreational access until the storage is close to full.

Section 10.6.3 of the EA Report also notes that the nutrient/algal situation during the initial filling period of the storage would need to be monitored as inflow nutrient concentrations would have a limited volume of dilution and reduced flushing during this period. This is unlikely to be an issue with respect to water-based recreational activities given these are likely to be restricted while the water level is low.

Recreational and related activities included in the assessment

For clarification, the following are included in the Project and have been considered as part of the assessment in the EA Report:

- Habitat replacement/restoration allowing natural regrowth and supplementary planting as required, particularly around the eastern and northern margins of the storage
- Weed management
- Walking tracks, lookouts and associated access on Hunter Water-owned land

- Fish stocking (subject to approval from DPI under Section 216 of the Fisheries Management Act 1994 to release fish into waters)
- Fencing
- Bushfire risk management
- Weather station(s) and telemetry
- Essential services
- Interpretative centre/education facilities and associated parking, access and amenities
- Interpretive signage
- Designated swimming areas including appropriate boundary marking
- Picnic/barbecue areas/facilities and associated amenities/water tanks and childrens' playground(s)
- Basic camping ground facilities, boat ramp and associated access.

Activities excluded from the assessment

The following are not included in the Project and consequently have not been considered as part of the assessment:

- Kiosks/shops
- Walking tracks/access outside of Hunter Water-owned land
- Commercially operated caravan parks, camping ground(s) and associated facilities including access road(s)
- Commercial accommodation (eg eco-lodges)
- Other commercial activities.

Assessment of impacts associated with these types of developments would be addressed separately as part of any subsequent planning consent applications and appropriate approvals will need to be obtained prior to development.

5.2.11 Potential benefits for the community

It is anticipated that the Project would deliver many benefits to the community. However, many submissions expressed concerned with what were considered to be the negative impacts on the community as a result of the Project.

The EA Report fully acknowledges the impacts associated with the Project but also indicates the expected social and economic benefits that would be generated through the injection of $396.2 million (real 2008/09) in capital investment over a three year period from 2010 to 2013. These benefits include:

- Direct employment opportunities in the construction of the dam and later in the operational phase
- Increased demand and expenditure in Dungog Shire for materials, equipment, goods and services
- Direct opportunities for Dungog Shire to attract workers with families that can positively impact on the age profile of the Shire and economic dependency ratio by increasing the level of household income
- Strengthening and expanding Dungog Shire by diversifying the range of economic opportunities available for business, these including opportunities to increase the wholesale and retail trade sectors as well as expand construction, tourism, accommodation and food service industries
- A positive boost to local tourism resulting from recreational use of Tillegra Dam; increased tourism opportunities within the Shire are expected to generate private investment into retail and accommodation services to service visitor demand.

At both the local and regional (Lower Hunter) levels, Tillegra Dam would provide a high quality drinking water source to provide drought security and to meet the needs of a growing population within the region. In addition, it would provide many recreational and social benefits for the existing community and tourists alike. These benefits serve to offset some of the impacts associated with the Project such as a reduction in land available for

agricultural purposes.

The anticipated benefits for recreation and tourism have previously been stated. The Project includes specific aspects to encourage and facilitate resources and facilities toward this as is documented in the draft ILUP.

5.2.12 Communication and consultation

A number of submissions expressed the view that they were not adequately consulted in relation to socioeconomic issues. The nature and extent of consultation activities undertaken for the Project on the large number of issues, including those related to socioeconomic issues, is described comprehensively in Chapter 4 of the EA Report and has been summarised in Section 2 of this report. These activities included providing the regular opportunities for members of the community to bring matters of interest or concern to the attention of Hunter Water.

Appendix 1 to the EA Report contained the Draft Statement of Commitments which identifies a range of further activities that would be undertaken to continue to effectively consult with the community and other stakeholders on all aspects of the Project. These are restated in the Final Statement of Commitments provided in Section 10 of this report.

5.2.13 Cumulative socioeconomic impacts

A number of respondents felt that the EA Report failed to acknowledge the cumulative socioeconomic impacts associated with other major projects within the vicinity of the Tillegra Dam project. Cumulative impact refers to the collective impact of a project and how it interacts with other projects in the immediate locality/region.

Chapter 17 of the EA Report discusses the assessment of cumulative, consequential and indirect impacts of the Project. In relation to cumulative socioeconomic impacts, Section 17.5.4 of the EA Report identified that there were no known projects within the Dungog LGA and only two major projects within 50 kilometres of the Tillegra Dam project. Section 17.5.4 also reported that there was limited potential for cumulative impacts during construction with respect to socioeconomic issues.

Subsequent to finalisation of the EA Report, two other major projects have been brought to Hunter Water's attention:

- The Gloucester Gas Project (GGP), a component of which is located in Dungog Shire
- A 132 kV transmission line from Stroud to Tomago.

These are discussed briefly as follows together with several other related cumulative impact issues.

Gloucester Gas Project

A project application for the GGP has been submitted to DoP for consideration. This project includes the construction of gas wells and associated infrastructure, the development of a central processing facility and the construction and operation of a high pressure gas transmission pipeline from Stratford to a delivery station at Hexham, NSW. The main components of the GGP are located in Gloucester Shire and it is considered there is limited potential for cumulative impacts during construction with respect to socioeconomic issues. However, approximately 30 kilometres of the proposed pipeline is located in the southeast corner of Dungog Shire.

The section of pipeline within Dungog Shire is located well away from the area directly affected by the Tillegra Dam Project. The EA Report for the GGP indicates that access to the route would generally be from The Bucketts Way and then via internal roads. Section 4.6 of the GGP EA Report identifies possible accommodation options for construction workers. None of these overlap with the Tillegra Dam Project.

It is noted that the EA Report for the GGP does not make specific reference to the Tillegra Dam Project in its discussion of cumulative impacts.

TransGrid Stroud to Tomago 132 kV transmission line

This proposed transmission line would traverses the eastern section of Dungog Shire and is a considerable distance from Dungog and the Project area. It is considered that this project would have a minimal impact on Dungog Shire.

Others

Construction of Hunter Water's 30 ML Clear Water Tank in Wade Street, Dungog has potential to result in an increase in local traffic during the construction phase of the Project. However, it is expected that the construction of the tank would be completed well before construction of the dam commences. Should this work overlap with Tillegra Dam, it is considered this would be of negligible impact even if combined with the increase in traffic during construction of the Tillegra Dam project.

One submission included reference to the potential sourcing of materials from Martins Creek quarry and associated dust, noise and road pavement impacts. Operation of this quarry has been subject to a separate planning approval process which has included consideration of associated environmental impacts. As such, it is not considered necessary to duplicate this process. It is noted that essentially all the construction materials that might be sourced from a supplier such as the Martins Creek Quarry would be obtained from quarries within the inundation area as identified in Chapter 6 of the EA Report. In any case, the EA Report has considered impacts associated with construction traffic on local roads and a suite of mitigation and management measures has been identified to address this particular issue.

One submission noted the potential impact of the Project on the Dungog landfill with respect to the disposal of materials that could not be reused or recycled. It was considered that this could detrimentally affect the lifespan of the landfill. While the EA Report notes that it is not possible to accurately estimate the amount of materials that may not be able to be reused or recycled, it indicates that the quantities are not expected to be significant. Any such materials would need to be disposed of to an appropriately licensed receiving facility which, for certain materials, may include the Dungog landfill. As the operator, it is expected that Dungog Shire Council would make a decision on whether to accept waste and consider all relevant matters in doing so.

Combined impacts of Chichester Dam and Tillegra Dam on broader community

Some respondents were concerned about the combined impacts of Chichester Dam and Tillegra Dam on the broader community. Chapter 17 of the EA Report highlights that a management strategy is being developed in consultation with DWE (now the NSW Office of Water) and other relevant stakeholders including DECCW and I&I (Agriculture) to ensure that Tillegra Dam will be an integral component of the Lower Hunter water supply system. The chapter also notes that a system-wide view would need to be taken of the operation of not just Tillegra Dam but also of Chichester Dam, Seaham Weir and all other sources within the system such as Grahamstown Dam and the various groundwater sources.

Hunter Water maintains environmental flow releases from Chichester Dam to sustain aquatic ecosystems and along the Chichester and Williams Rivers. This would also form an integral component of the management strategy for Tillegra Dam. Chapter 10 of the EA Report describes the proposed release strategy which has been designed to maintain downstream aquatic ecosystems. Development of the strategy has recognised other downstream water uses (such as irrigators) and the need to maintain their existing entitlements.

Section 17.6.4 of the EA Report highlights that when the storage is fully operational (ie when water level is in the normal operating range of 90–100% of FSL) Tillegra Dam would represent a significant regional asset with regard to a range of possible water and land-based recreational activities. Commercial opportunities may arise to provide services to visitors to the area. This is regarded as a positive consequential impact contributing to local economic growth.

5.3 Transport and traffic

Several submissions were received relating to transport and traffic issues associated with the construction of the dam and roads and post construction traffic, with roads and other infrastructure being one of the major

issues raised by Dungog Shire Council. The issues raised can be summarised as follows.

1 **Traffic and transport assessment:** some submissions suggested that the assessment in the EA Report did not adequately address the potential impacts of construction traffic or general traffic after the dam is complete; the Draft SOC did not adequately compensate or mitigate against significant long term impacts, and more assessment and specific commitments should be made with regard to traffic for the Project to be approved. (Section 5.3.1)

2 **The EA Report underestimates road use:** failure of the assessment to differentiate different class of heavy vehicles used for construction; failure to identify current and proposed increase in heavy vehicles greater than Class 3; Traffic count data do not compare to actual count; the EA Report underestimates amount of materials and vehicles for road and dam construction; overall traffic increase could be as high as 60-70% not 10-20% (Council claim); Concerns about transporting construction workers to site every day; would coach buses be considered and factored into the vehicle movement calculations in Working Paper I (Section 5.3.2)

3 **Details for some bridges are incorrect or absent:** claims by Council that structural details of some bridges are incorrect, that the Tabbil Bridge is incorrectly stated as being on MR301 instead of MR101 and that the LG Clements Bridge south of Paterson is not referred to in the report. (Section 5.3.3)

4 **Inundation of Quart Pot Creek Bridge:** the EA Report has failed to recognise lost opportunity cost due to inundation of bridge recently built in 2004 on recommendation of Hunter Water and the loan is still being repaid. (Section 5.3.4)

5 **Existing poor road conditions and safety:** many of the submissions made general comments about the generally existing poor conditions of the roads and expressed concerns about the effect that the additional traffic associated with the construction and operation of the dam would have on the roads and safety. Several submissions requested overtaking lanes on Clarence Town Road and Chichester Dam Road. (Section 5.3.5)

6 **Roads upgrades before construction and increase in funding:** many of the submissions commented that the roads in the area, particularly on the access routes, should be upgraded and additional funding made available for the roads; The roads should upgraded to cope with increase tourism traffic after dam is complete; Overtaking lanes should be provided on Clarence Town Road and Chichester Dam Road. (Section 5.3.6)

7 **Increase in traffic and hazards through local towns:** some submissions suggested the EA Report failed generally to recognise the hazard caused by the increase in traffic passing schools and sporting facilities in Clarence Town and Dungog during construction; (Section 5.3.7)

8 **Use of B-Double trucks for construction:** a couple of submissions were concerned that B-Doubles will be used to transport construction materials through Dungog to the dam when B-Doubles are not permitted in the Dungog area. (Section 5.3.8)

9 **Provision of good roads for tourism and recreation after completion of dam:** several submissions commented that if the dam were to proceed there would need to be the provision of good environmentally sound and safe roads to accommodate the increase in tourism and recreational visitors to the dam. Dirt roads in the catchment should be sealed to minimise silt and soil run-off. (Section 5.3.9)

10 **Traffic volume reports:** the traffic volume reports used in the report are dated 2006 (Tables 1 and 2.3) and are nearly four years old and do not reflect current road usage. Table 2.3 shows the wrong heading and refers to Tillegra Bridge flows. (Section 5.3.10)

5.3.1 Traffic and transport assessment

Some submissions suggested that the traffic and transport assessment provided in the EA Report was not comprehensive and did not adequately address the potential impacts of construction traffic or general traffic after the dam is complete. Hunter Water believes that the traffic and transport assessment in Chapter 16 of the

EA Report and Working Paper I *Roads and Other Infrastructure* provides an adequate assessment of the potential impacts that the increase in construction traffic will have on the region, as well as the post construction traffic once the dam is complete, in accordance with the DGRs.

The studies noted that the rural roads likely to be used for the movement of construction traffic appear to be in reasonable condition for their current rural road function. However, the inspections of the roads, undertaken as part of the Project roads study acknowledged that sections of the MR101, MR301, Salisbury Road and other local roads would require some form of remedial safety works and upgrades prior to commencement of construction.

The traffic and transport assessment was undertaken based on the understanding of the Project's requirements at the time of the study. Hunter Water confirms that, if the Project is approved, further detailed surveys, such as a full road dilapidation report, and studies, such as engineering assessment of bridges, will be required to be undertaken as part of the conditions of approval prior to any work commencing. Such action is not unusual for projects of this nature.

The EA Report also acknowledges that the construction contractor will be required to undertake more detailed investigations to support the preparation of the construction EMP and recommends periodic inspections of the construction haulage routes are undertaken during construction to:

- Monitor pavement conditions and identify any safety issues
- Schedule any necessary repairs in response to safety concerns identified
- Minimise the need for extensive pavement restoration following completion of construction.

It was also claimed that the Draft SOC does not adequately compensate or mitigate against significant long term impacts, and more assessment and specific commitments should be made with regard to traffic for the Project to be approved. Hunter Water believes this claim is not supported as the draft SOC commits to the following measures:

- Investment in road maintenance activities to account for the use of local roads by construction related traffic increases. This has been costed in the EA Report at $142,000. and funding would be provided to Dungog Shire Council and Port Stephens Council in this regard.
- A commitment to establish new line marking, install critical guard rails, erect proper signage where necessary and upgrade road safety aspects at school crossing zones, which would provide a demonstrable improvement to current road safety conditions. Required works have been costed in the EA Report at $171,000. These works would be undertaken as a priority following approval, and prior to any heavy construction vehicle movements, within the framework of the construction EMP.
- All movements of construction vehicles on public roads would proceed in accordance with a formal traffic management plan (TMP), which will be prepared prior to the start of construction activities.

Hunter Water has also specifically met with DSC, the local roads authority to further discuss road maintenance and safety issues. During these discussions Hunter Water agreed to take complete responsibility for the maintenance of Chichester Dam Road and Salisbury Road between the town of Dungog and the Tillegra Dam construction site, during the construction period.

The NSW Government also announced on 18 November 2009 that in addition to the $1.2 million in roads funding provided to DSC in the 2009/10 financial year, a further $2 million in funding would be made available for roads and bridges in the Dungog Shire. Of this, $1 million would be made available through the RTA. The other $1 million would be made available from Hunter Water should the Project proceed to construction.

Hunter Water has also arranged full engineering assessments to be undertaken on bridges on MR301. It is noted that part of the $2 million contribution from the RTA and Hunter Water would need to be allocated to upgrading Wallaroo and Unwarribin bridges.

5.3.2 Estimates of level of road use

Some submissions claimed that the assessment did not adequately differentiate the different classes of heavy

vehicles (HV) used for construction and that the EA Report underestimates amount of materials and vehicles for road and dam construction.

The matter of vehicle classes including an appropriate differentiation between classes within the traffic assessment is largely irrelevant as it is the axle load which is important to consider for understanding road maintenance issues rather than purely vehicle size and gross vehicle mass. One submission from the public in fact noted this very point.

The estimate of the construction traffic movements is based on the estimated types and quantities of materials required for construction of the dam, the Salisbury Road realignment and associated works. Hunter Water believes the estimate to be correct

The likely subsequent impacts based on the relative increase in heavy vehicle movements compared to existing RTA road counts are considered to be minimal. Council has expressed the view that the road counts presented in the EA Report were not representative and conflicted with their own traffic count data. Hunter Water offered to review the assessment based on Council's data, however this information was not supplied.

Council had in particular suggested that the estimated traffic count data on the Chichester Dam Road did not compare to actual counts. This issue is considered to have been made redundant by Hunter Water and Council through mutual agreement that maintenance of this section of road would be undertaken solely by Hunter Water during the construction period should the Project be approved. As the road would be maintained to a high standard the number of vehicles using the road is immaterial from a maintenance and safety perspective.

The funding contribution for road maintenance in the EA Report has been calculated using Council's estimate contained within its annual report for maintenance. It is noted in the Council report that $3.71 million is required per year to maintain and gradually improve its rural road network of 278 kilometres over several decades. Based on 64.8 kilometres of road from Raymond Terrace and a shire wide average increase of HV traffic of 3% (3,600 truck movements) over 180 weeks, a pro rata commensurate contribution is in the vicinity of $80,000. Despite this Hunter Water had offered almost double this amount ($142,000), as well as make a separate road safety commitment ($172,000) within the Statement of Commitments (to be shared pro-rata between Port Stephens Council and Dungog Shire Council). This offer was made to ensure a more than adequate and fair contribution to road safety and maintenance would occur.

It is noted that traffic counts vary widely between road segments. An average was taken so that this could be related back to the annual average maintenance cost cited within Council's annual report. The assessment then purposefully underestimated the amount of material that could be carted by a 19m B-Double truck by 20%.

An additional 20% allowance within the calculations was then made in favour of additional truck movements. The suppression and subsequent overestimation factors were introduced into the assessment to ensure a conservative assessment. This would also account for the fact that some material would on occasion be carted by semi-trailers and other heavy vehicle types with varying numbers of axles and further, all trucks would not always carry a full load. This also allowed the projections to include a contingency allowance for the potential movement of road based blend, which could account for up to 400 truck movements above the baseline case.

It is noted that while a contingency allowance has been made for additional truck movements, it is highly unlikely that any would be required. For example, while a contingent allowance was made for up to 400 truck movements to be made to carry road base, it is known that suitable road base can be sourced from the proposed quarries at the construction site. Therefore as previously noted, the majority of construction material is in fact sourced on site and only material such as cement and steel, would need to be carted to site as calculated for the assessment.

It is noted that the main body of the dam would be completed in 3.5 years but additional works such as tree planting and the establishment of facilities around the dam could take a little longer. To ensure a traffic assessment occurred in favour of Dungog Council (the roads authority for the area) beyond that strictly relevant to the dam wall or Salisbury Road works, a further conservative allowance of about 30% was introduced into the calculations by biasing the time period that heavy vehicles would be used to service the dam construction site. A full five year period was applied to the methodology, rather than the estimated 3.5 years which has been programmed for construction.

Once the number of vehicle movements had been calculated and averaged for one year, this was compared to the existing traffic counts in order to understand the average increase in movements (3%) across the Shire. This figure was then related back to the amount of road funding that Council had indicated was necessary for improvements to its road network per year, apportioned and accounting for the length of road to the proposed construction site from Raymond Terrace. This identified the level of funding that would need to be attributed to such a relative increase for each year in real 2008/09 dollar terms ($25,920).

An inflation rate of 4.5%, well above the normal consumer price index, was then applied and compounded to the offset figure of $25,920 for a full five year period to arrive at the nominal sum of $142,000. The total effect of this is that with consideration of the conservative measures adopted, it accounts for an equitable contribution for over 5,200 vehicle movements when in effect only 3,600 are anticipated. The contribution rate is also based on Council's own analysis of its future road funding requirements and not an arbitrary figure adopted by Hunter Water. It is noted that the assessment is made against what Council would like to spend on road maintenance ($3.71 million) as opposed to actual expenditure.

During discussions held between Hunter Water and Council, it was agreed that the number of heavy vehicle movements to and from the site would be recorded by the successful contractor, with details being reported to Hunter Water and Council. Road maintenance payments detailed in the Statement of Commitments will therefore be progressively claimed pro rata against actual movements rather than estimates.

There was a claim that construction worker traffic had not been adequately addressed. The EA Report noted that approximately 280 construction workers will be working on the Project at the peak periods and preliminary discussions with a number of construction contractors indicated that the majority of workers are expected to be recruited locally from the Dungog LGA or neighbouring LGAs. Construction hours for the dam and new road would be 7 am to 6 pm Monday to Saturday and hence the majority of the construction worker traffic would be in the early morning before 7 am and in the evening after 6 pm when local traffic movements are typically low and outside the existing peak hour movements of 8 am to 9 am and 3 pm to 5 pm.

It is further noted that light vehicles/passenger cars have an extremely low axle load in comparison to trucks. The increase of light vehicle movements on the roads has little or no relevance to understanding road maintenance requirements. Light vehicle movements are however relevant to consider in relation to general road movements, congestion and safety, which is why an amount of $172,000 was committed for road safety upgrades separate to the proposed maintenance contribution.

One submission questioned whether buses to and from Dungog would be provided for construction workers and if so, they should have been factored into the vehicle movement calculations in Working Paper I. The decision as to whether buses would be provided for construction workers is a traffic management option to be considered by the construction contractor when preparing the traffic management plan (TMP) detailed in the EA Report and is a possibility. If buses were decided to be an appropriate transport option, then they would need to be considered as heavy vehicle movements in subsequent traffic assessments and road funding negotiations. The number of movements and the length of road travelled between the town and the dam would, however, not contribute significantly to any maintenance costs. Some value, however, could be obtained by consolidated travel by bus, for road safety as there would be fewer cars on the road.

5.3.3 Details for bridges

Council claims that the structural details provided for some bridges in the EA Report are incorrect but this claim appears unwarranted. The EA Report identified bridges on the proposed construction routes in Section 3 of Working Paper I, which provided a brief description of the type of bridge (eg box culvert, concrete superstructure) and condition but did not attempt to provide structural details.

The EA Report recommends that a detailed condition assessment of bridges and other waterway crossings along the proposed construction routes be undertaken by the construction contractors prior to the commencement of constructions to ensure that they are safe for the weight and class of heavy vehicles using the bridges. Hunter Water has in fact already arranged for this to occur and agreed to additional funding to ensure bridges can be upgraded as part of the whole of government approach to improving road conditions in the Dungog and Port Stephens Shires. This funding is contained within the $2 million dollar whole of

government commitment of which Hunter Water and the RTA would be contributing. Any required remedial work would need to be undertaken in accordance with applicable codes and standards.

Hunter Water acknowledges that, although the location of the JG Hawley Bridge over Tabbil Creek is correctly identified on Clarence Town Road, it has been incorrectly identified as being on MR301 in Table 3 of Working Paper I, as noted by Council. Clarence Town Road changes from MR301 to MR101 north of the intersection with Dungog Road.

The LG Clements Bridge south of Paterson is not referred to in Table 3 of Working Paper I as it is outside the study area identified in Working Paper I.

5.3.4 Inundation of Quart Pot Creek Bridge

Council noted that the EA Report failed to recognise lost opportunity cost due to inundation of bridge recently built in 2004 on recommendation of Hunter Water and the loan is still being repaid.

This matter has been a subject of considerable discussion between Council and Hunter Water. Hunter Water did not recommend that the bridge be rebuilt and understands it was necessary as the original bridge had reached the end of its safe life. Hunter Water simply noted the current planning status for the dam several years prior to the bridge's construction. It was widely known by Council and the community that the area was considered as the next likely place for a dam to be built.

Hunter Water has indicated that the entire road infrastructure within the inundation area will be replaced by Hunter Water at no cost to Council. Further, a number of existing asset liabilities, such as Tillegra Bridge and Munni Bridge which also require upgrade or replacement for safety, are being replaced by Hunter Water through the reconstruction of Salisbury Road and the installation of three new bridges. This work will save Council considerable money, potentially in the order of several million dollars, that would have otherwise needed to be spent by Council on their normal maintenance program. This would more than compensate Council for the claimed lost opportunity cost.

Further recent engineering reports commissioned by Hunter Water (and provided to Council) show that nearly all of the bridges maintained by Council on MR301 to Salisbury Road are at the end of their useful asset life, with some bridges only retaining a small fraction of their original structural and load bearing capacity. They need to be urgently replaced. Under the NSW Government announcement in November 2009, Hunter Water has agreed to make a substantive contribution to ensure that this occurs, despite Council being the nominated roads authority and responsible for maintaining these community owned assets.

As Hunter Water would act to replace all inundation-affected infrastructure to a far higher standard than that existing, and in addition is acting to make significant contributions to the safety and maintenance of roads beyond its normal responsibility as a water and wastewater provider, this representation from Council regarding Quart Pot Creek Bridge is considered to be unwarranted by Hunter Water.

5.3.5 Existing poor road conditions and safety

Many of the submissions made general comments about the generally existing poor conditions of the roads and expressed concerns about the effect that the additional traffic associated with the construction and operation of the dam would have on the roads and safety.

The EA Report acknowledges the existing poor conditions of many of the Dungog Shire's roads and cites the route access study prepared by Council. The EA Report notes that the local road network has been identified as one of the strategic issues being addressed by the Whole of Government Taskforce (whose membership includes Hunter Water) and that basic road safety improvements would need to be undertaken on the access route to improve both general community and worker safety.

A road safety audit was also undertaken for part of the expected route to be used by construction related traffic during the construction of the dam. This study extended from Raymond Terrace, through to Seaham, Clarence Town, Dungog and then north to the proposed construction site at Tillegra, and Dungog Road from Gresford

Road to Clarence Town Road.

The purpose of the road safety audit was to identify existing road safety deficiencies along the expected construction vehicle routes and it recommended that prior to construction, the deficiencies identified in the audit be addressed consistent with the RTA *Technical Direction for Road Safety Practitioners* (TD2003/RS03). The audit also recommended that regular safety reviews be undertaken during construction and a final review conducted at the completion of construction activities.

Several submissions also requested overtaking lanes be constructed on Clarence Town Road and Chichester Dam Road. As stated previously, the local road network has been identified as one of the strategic issues being addressed by the Whole of Government Taskforce, and the provision of any overtaking lanes will be a matter for discussion and consideration by the Taskforce, as well as Council, the RTA and Hunter Water, relevant to the disbursement of the additional $2 million dollars of funds committed in November 2009.

In summary, the impact of the construction traffic has been identified as potentially contributing to the further deterioration of the sections of the access routes that are already in poor condition. Hunter Water has proposed that this would be mitigated through Hunter Water making a financial contribution to Council (as the local roads authority) for the upkeep of the routes. The amount of the contribution is more than commensurate with the increase in heavy traffic associated with the Project. The contributions will improve the safety and quality of the roads from Raymond Terrace to the Dam site.

5.3.6 Roads upgrades before construction and increase in funding

The EA Report found that the increase in vehicle movements due to construction is not likely to be significant. Nonetheless, as stated previously, Hunter Water acknowledges the current poor conditions of the road and has made commitment to pro rata funding upgrades of the roads. As noted previously, work to address identified safety issues would occur prior to the start of construction. Hunter Water has agreed in principle to pay as a minimum an amount equivalent to the percentage increase in additional heavy vehicles. For this to occur, Hunter Water has agreed to ensure that actual vehicle movements are recorded and reported to the local roads authority.

A detailed traffic management plan (TMP) will be prepared as part of the construction EMP and Hunter Water has also committed to undertake work to establish new line markings, install critical guard rails, erect proper signage where necessary and upgrade road safety aspects at school crossing zones, which would provide a demonstrable improvement to current road safety conditions. The required works have been costed in the EA Report at $171,000.

5.3.7 Increase in traffic and hazards through local towns

A few submissions claimed the EA Report generally failed to address the hazards caused by the increase in traffic passing schools and sporting facilities in Clarence Town and Dungog during construction, as well as the potential increase in noise and dust emissions generated by construction traffic.

These claims are considered unfounded as the traffic and transport assessment identifies and acknowledges the increase in traffic and potential safety issues on the existing local road network associated with the construction of the Project. The traffic construction impacts will be managed through the implementation of appropriate traffic controls within the framework of the TMP that will form part of the construction EMP, which will be prepared in accordance with relevant guidelines and in consultation with relevant stakeholders including Council.

The EA Report makes several recommendations to mitigate risks. These include:

- The proposed access route through Dungog will avoid the main thoroughfare (Dowling Street) to reduce the likelihood of conflicts with pedestrian and other non-vehicle road users such as cyclists
- The imposition of a lower speed limit (similar to a school zone) in urban areas may be implemented where risk is identified, if approved by Council

- Hunter Water would undertake work to establish new line markings, install critical guard rails, erect proper signage where necessary and upgrade road safety aspects at school crossing zones (costed at $171,000), which would provide a demonstrable improvement to current road safety conditions. The concurrence of the RTA would be required to undertake improvements at school crossing zones.

It is also noted that as previously stated, that a large proportion of light vehicle traffic generated from employee movements will be outside of normal peak hours. Further, after discussions with Council, Hunter Water has agreed to compel the successful construction contractor to provide a construction camp for employees at Dungog or at the construction site. This would remove traffic movements from the road. More information relevant to the construction camp can be found in the socioeconomic section of this report.

5.3.8 Use of B-Double trucks for construction

There was a concern in a couple of submissions that B-Doubles will be used to transport construction materials through Dungog to the dam when B-Doubles are not permitted in the Dungog area. This matter was first raised with Hunter Water in mid 2009 by Council during a consultative meeting and is considered to be a matter worth clarifying due to the concerns raised by several different parties since this time.

It is noted that during value management workshops, Council engineering staff specifically asked that the design standards for Salisbury Road, which are to be adopted by Hunter Water for construction, include provision for the movement of B-Doubles within grade and alignment considerations.

The current NSW road rules allow 19 m B-Doubles up to a gross vehicle mass of 50 tonnes to travel anywhere in the state of NSW unrestricted under current law governed by the RTA, except where prohibited by load limits specified for a road, bridge, causeway or ferry by a sign or notice specified under the *Road Transport (Mass, Loading and Access) Regulation 2005*.

It is worth noting that B-Doubles are considered by the RTA to:

- Be more stable than conventional articulated vehicles (CAVs), thereby enhancing safety performance
- Reduce pavement damage per tonne of road freight moved compared with CAVs
- Subject to vehicle and operating conditions over and above those required by CAVs resulting in improved safety and environmental performance.

To avoid potential confusion, it is noted that B-Doubles longer than 19 metres, and in excess of 50 tonnes and up to a gross vehicle mass of 62.5 tonnes are currently not permitted on MR301 past Woerdens Road just north of Clarence Town or north of the intersection of Gresford Road and Dungog Road on MR101, as indicated on the RTA *Travel Restrictions Vehicle Routes* - Maps 18 and 19.

It is further noted that road trains, oversized and overweight vehicles are regulated by the RTA and cannot be used on general roads without a permit being obtained. As with all major infrastructure projects that require substantial earth works to be undertaken, there are a number of pieces of heavy machinery that will need to be moved to the construction site and this is noted in the EA Report. However, these pieces of machinery will be stripped down into pieces for transport to reduce their size and mass.

A permit from the RTA and/or Council will also be sought which will include controlling provisions to ensure public safety where and as required for the movement of oversize / over mass machinery. The exact type and number plant to be moved will depend on which contractor is engaged for the work and the current fleet of plant that they own and operate. They will be required to obtain the necessary vehicle permits from the RTA and the specific conditions of any permit issued would only be provided after a consideration of the unique merits of the case.

5.3.9 Provision of good roads for tourism and recreation after completion of dam

Several submissions commented that if the dam were to proceed there would need to be the provision of good environmentally sound and safe roads to accommodate the increase in tourism and recreational visitors to the dam.

The final number of visitors that may use the dam would depend on the type of recreational activities permitted on the dam. Section 12.10.2 of the EA Report notes submissions have been invited from the public on the issue of recreational access and the type of activities that should be permitted or restricted. It is noted recreational access is strongly supported by respondents that do not oppose the Project.

In relation to the provision of good roads, the EA Report notes that no specific mitigation measures have been proposed due to increase in traffic associated with recreational visitations and tourism. However, as indicated previously, Hunter Water has made a commitment to provide Council with significant funding for road maintenance and safety.

In addition, the Salisbury Road realignment will involve 17 kilometres of new road with three new bridges. The road would be one lane in each direction, 3.5 m lane widths and 0.5 m shoulders and verges and comply with appropriate road design standards and the requirements of the local road authority. This road would far exceed the current poor standard of the existing Salisbury Road, as well as removing substantial existing Council maintenance costs required to maintain general safety.

It should be noted that once the dam is completed, any new development in the area associated with recreational activities on the dam requiring Council approval would require an assessment of the potential traffic impacts. Council would then have the opportunity to make a judgement of what level of activity is desirable around the dam. It is expected Council would factor into its assessment and subsequent approval of any development consideration of cumulative and consequential impacts to community-owned infrastructure such as roads.

Ultimately Hunter Water is not responsible for the functions of Council in providing general community infrastructure such as roads outside of its legislated responsibility as a water utility and through the adoption of the user pays principle. Hunter Water believes that an appropriate user pays contribution for road use has been made as a commitment to Council, and further to this commitment, Hunter Water would assist Council to maximise the recreational and social value of the dam to the community by the commitment to:

- Permit public and recreational access to the reservoir
- Fund the establishment of visitor facilities around the dam, with walking trails, lookouts, picnic and camping areas with toilets and a boat ramp (estimated value of works of about $5 million plus ongoing operational costs)
- Provide $323,000 funding for the review of the Dungog Shire Local Environment Plan
- Provide $100,000 a year for two years to fund a Project Officer to assist Council identify social and economic opportunities arising from the dam
- Provide a $200,000 contribution to the $500,000 Dungog Business Investment Fund.

The above items would assist Council in general to adjust and take advantage of the opportunities that arise from Tillegra Dam. Hunter Water cannot however take on Council's responsibilities in regard to providing and maintaining road infrastructure.

5.3.10 Traffic volume reports

It was noted in a submission that there was a wrong heading and dates on Table 2.3 in Working Paper I. This was a typographical error. The table number should read Table 2 (not Table 2.3) and the correct version of the table is reproduced as Table 5.1. The data in the table remains unchanged.

The traffic volumes quoted are believed to be still representative given that the population of the area grew less than 6% between 1996 and 2006), which is less than 0.5% per annum. Therefore, little additional traffic is expected. The data are taken from the RTA Traffic Volume Data records.

Table 5.1 Historic daily traffic volumes

Road	Site	1995	1998	2001	2004	2006
Chichester Dam Rd	South of Salisbury Road	–	–	–	–	500[1]
Salisbury Rd	West of Chichester Dam Road	–	–	–	–	279
MR101 Dungog Rd	South of Dungog	–	3,407[3]	1,963	2,100[2]	
	South of Wirragulla	978	845	835	870	
	South of Paterson	2,577	2,711	2,898	2,815	
	North of Lorn	11,940	13,062	13,112	13,369	
MR301 Clarence Town Rd	South of Wirragulla	1,142	1,200	1,239	1,341	
	South of Clarence Town	1,930	1,753	2,157	2,270	
	South of Seaham	4,228	5,080	5,710	6,021	

Notes:

1 No traffic count available for Chichester Dam Road–estimated volume only

2 Volume on MR101 north of Wirragulla calculated from feeder southern legs of MR101 and MR301

3 This volume appears high (by ~1,400) but is taken directly form RTA Traffic Volume Data records

5.4 Geology and geotechnical issues

The assessment of the geology of the Tillegra Dam study area, and in particular the impact it would have on the construction of the dam wall and on-going dam stability, is one of the key areas covered in the EA Report, in Chapter 5 and Technical Annexures A to D. A total of 15 submissions, including one from Dungog Shire Council were received regarding the potential impacts of geological issues, such as faults and shearing, on the Project and the adequacy of the geological studies undertaken. These issues can be summarised as follows:

1 **Adequacy of the geological reports:** several submissions made general comment that the geological studies were inadequate and more studies are required before the Project is approved. (Section 5.4.1)

2 **Information in the EA and subsequent reports do not match or is omitted:** the No Tillegra Dam Group (NTDG) in its submission claimed that information in the various reports provided in the EA Technical Annexures was inconsistent or that information presented in one report has been omitted from another. (Section 5.4.2)

3 **The EA Report should be amended to include latest information:** it was suggested in submissions that that the EA should be amended to reflect the geological information presented in subsequent reports (Design Stage Geotechnical Investigation Volume 1 - 22.09.09). The NTDG submission alleges that new information about shearing zones suggest that geology is more complex than originally thought. (Section 5.4.3)

4 **Independent review by consulting geologist GE Holt and Associates Pty Ltd:** The No Tillegra Dam Group commissioned a technical review of geological investigations by GE Holt and Associates (GEHA). As a technical document prepared by a qualified geologist, it is relevant for detailed review. This report was referenced by a number of submissions and a review was specifically requested by Dungog Shire Council (Council) to ensure matters raised within the report were resolved. (Section 5.4.4)

5 **Geological fault:** several submissions make the claim that the dam is being built on a geological fault compromising safety and will potentially require costly additions at a later date. (Section 5.4.5)

6 **Geological discontinuities:** some submissions claim that the EA Reports fails to acknowledge the clear geological discontinuities across the storage area and abrupt changes in dip and strike require more

detailed analysis. The EA also doesn't report on the full extent of shearing around the dam site and in the Chichester Range generally. (Section 5.4.6)

7 **Cost impacts because of 'inadequate' information:** some submissions express the view that the inadequacy of the geotechnical information in the EA Report geotechnical studies would impact on the final construction cost of the Dam. The EA Report claims it was required only to present the site details to a 'Concept Design' stage and this stage avoids any real discussion of the geological complexity of the site, which could add to the cost of dam construction. The potential additional cost is not revealed to the public. (Section 5.4.7)

8 **Impacts of potential landslides:** there were concerns in one submission that landslides, such as those that have occurred in the vicinity of the Chichester Dam, have not been taken into consideration with respect to possible impacts on the dam. (Section 5.4.8)

9 **Possibility of dam wall failure due to geological instability:** several submissions were concerned about the possibility of a dam wall due to a lack of detailed discussion and understanding of the geological complexity of the site. (Section 5.4.9)

5.4.1 Adequacy of the geological reports

Several submissions made general comments claiming that the geological and geotechnical studies in the EA Report and Technical Annexures were inadequate and more studies are required before the Project could be approved. Hunter Water does not believe these claims are justified and that the geological and geotechnical reports provided in the EA and the Technical Annexures A to E cover all aspects of geology adequately and provides sufficient geotechnical data necessary to make a determination on whether the dam is technically feasible in the location proposed.

Further, the reports have been independently peer reviewed by a panel of leading international experts with extensive experience in dams engineering, geotechnical engineering, geology and seismicity. Hunter Water stands by the adequacy of all the reports provided and the conclusions drawn from these reports.

5.4.2 Consistency of information in EA documentation

The No Tillegra Dam Group (NTDG) submission includes a report prepared by GE Holt and Associates Pty Ltd (GEHA) in response to the geological and geotechnical issues presented in the EA Report and the EA Technical Annexures. GEHA claims that information in the various reports provided in the EA Technical Annexures was inconsistent or that information presented in one report has been omitted from another.

Other submissions also claimed the information in the EA Report does not match that provided in more recent documents or that information was omitted because it was detrimental to the case for the dam, but they do not indicate which more recent documents they are referring to what these omissions are. It is assumed that these submissions are referring to the NTDG group submission and so have been included here for a response.

Hunter Water disagrees that the information presented is inconsistent or does not match. Nor does Hunter Water consider that information can be considered 'omitted' just because it is presented in one of the technical reports in the EA Report but not presented in another technical report in the EA Report where it is not relevant.

All the information in these reports has been made public and no information has been omitted. Specific information has been presented in the report where it is relevant and in the context of each report, as is common practice. For example, the Interim Engineering Geological report presents information on the general conditions of the geology with respect to the dam and the Concept Design Report comments on the significance of this geology from a geotechnical design perspective. Each report may differ in content, which is to be expected, but the final conclusions remain the same.

Again, Hunter Water feels it is important to reiterate that an Independent Peer Review Panel has been established to overview all the geological investigations and geotechnical design aspects of Tillegra Dam. The Panel comprises of five highly experienced and regarded international experts on a range of fields associated

with dams, four of which are experts in the field of geology and dams engineering. The Panel has been involved throughout the investigation and design process, as well as reviewing final reports. The Panel was initially briefed and undertook a site inspection in September 2007. The Panel has been, and continues to be, routinely briefed on progress and findings. They have also inspected investigation work in the field on five occasions before delivering the final review of their investigations.

5.4.3 Amendment of EA to include latest information

It was suggested in submissions that that the EA should be amended to reflect the latest geological information presented in the subsequent draft *Design Stage Geotechnical Investigation Volume 1* report (dated: 22 September 2009). The NTDG claims this information "was not made available to the public" and should have been included in the EA Report. This report was unable to be included in the EA Report as it had not been completed at the time the EA Report was finalised. (it has still not been completed and independently reviewed). However, it was provided to the NTDG in partial draft form upon request to ensure full transparency of the environmental assessment process.

It is noted that the report relates to the detailed design stage, where the micro analysis is undertaken for various parts of the dam design. A micro analysis of design stage issues is not relevant to the environmental assessment process. Indeed, as the Project continues, additional geotechnical work at the micro level will be constantly commissioned to refine general works.

The NTDG submission claims that new information about shear zones in this latest report indicates the geology is more complex than originally thought and is in 'complete contrast' to statements in the EA Report about shear zones. This claim is fundamentally incorrect and addressed in the response to the geological review undertaken by GE Holt and Associates (refer to Section 5.4.4 for additional information).

As the Project progresses, additional geotechnical investigations will be progressively commissioned to inform detail design and final construction works. The work presented to date, to at least concept design, provides sufficient information to conclusively prove that the site is adequate for construction of the dam and to properly assess the matter in accordance with the EP&A Act.

5.4.4 NTDG-commissioned review by GE Holt and Associates Pty Ltd

This report has been considered in depth as it has been referred to in a substantial number of other submissions such as the one made by Dungog Shire Council. It is noted that it has been undertaken by an established geological consulting firm and accordingly it is considered important to critically examine the merits of the various claims made within the report.

The GEHA report argues a single theme as evidenced by its covering section Summary and Conclusions. The theme comprises:

- The site is complex geologically in that it is subject to shearing
- This complexity is not reported in the EA Report
- Shearing and faulting adds to the cost of dam construction.

Hunter Water believes the GEHA report fails to substantiate the assumptions this chain of logic relies on. Most notably, the GEHA report does not discuss the link between geological complexity and the cost of engineering solutions nor does it offer any potential failure mechanisms which could significantly drive up cost. Construction cost is obviously strongly influenced by geotechnical matters but previous experience with dam construction has shown investigations do not need to identify every defect to establish suitably accurate cost estimates. The investigations reported in the EA Report effectively eliminate those geological issues which represent a high budget risk as explained as follows.

The courses of rivers are strongly influenced by geological conditions. Rivers typically follow defects which erode more readily than the surrounding rock. Defects which influence the courses of rivers commonly include bedding, jointing and shearing associated with faults. Consequently the design of dams routinely involves

dealing with geological defects local to the dam site. With the exception of off-stream storages, virtually every dam constructed will require engineering solutions to address shearing to varying degrees.

The dam's engineering challenges, which can arise as a result of shearing, relate to stability and leakage associated with both the dam site and the reservoir rim. Dam foundations are routinely treated by a combination of grouting and filters to reduce leakage and erosion. These are proven techniques that all designers anticipate will be required along the length of the embankment foundation. The designer of the dam, the NSW Department of Commerce, confirmed in its Concept Design Report that these more permeable areas are limited in extent and will be addressed with conventional grouting operations. The extent of shearing in the dam foundation will not materially alter the designer's concept design or construction costs beyond those reasonably anticipated for any dam.

Unlike concrete arch dams, which transfer high loads to the abutments, and buttress dams which are of much lower weight and hence more susceptible to sliding, concrete faced rock fill dams (as is proposed for Tillegra) are not susceptible to unstable foundations. The weight of the embankment provides a high factor of safety against sliding (sliding resistance is seven times greater than the force causing sliding) and the embankment can readily resist or accommodate other foundation movements. No stabilising work is required at Tillegra under the embankment other than routine curtain and blanket grouting and filters to prevent erosion.

An area of shearing has been identified above the left abutment and is discussed in Section 4.7 of the Concept Design Report. The Independent Peer Review Panel convened by Hunter Water to provide advice on the dam design works requested further investigation of the area but did not consider the issue to be significant. Responding to claims that the panel's request for additional investigation showed that the panel was worried about the site, a member of the panel, Emeritus Professor Robin Fell, made the following statement as reported in the Newcastle Herald, 24 April 2009:

> The issues that are mentioned are what happen in almost all dam foundations … these are not major in the sense they will lead to significant costs.

Issues related to Technical Annexure D to the EA Report

Stability and leakage of the reservoir rim are dealt with in detail in the report appended to the EA Report as Technical Annexure D. Section 4.4 of the GEHA report makes a number of specific statements about this annexure which are considered to warrant comment. This is provided in the following table.

Table 5.2 Response to GEHA issues related to Technical Annexure D

Issue	Hunter Water response
Faulting occurs on the ridge south of Spotted Gum but this area was ignored in the investigations reported. This area also coincides with the domain change between Domains 4 and 5 which coincidently incorporates the sudden swing in strike and increase in dip of bedding that reporting explains as 'gentle folding.	The assertions within the GEHA report that faulting occurs on the ridge south of Spotted Gum is based on interpretation of the 1:100,000 Dungog geological sheet (1991) by Roberts, et al. The 1:250,000 Newcastle geological sheet (1966) contradicts this view. An enlarged view, reproduced by GEHA within the report, shows the Tillegra Fault running along a contour just east of the crest and not crossing the crest. The findings of Hall (1952) also locate the fault east of the crest of the ridge. Given that, as noted by GEHA, the Roberts report covers approximately 8,000 km^2 so is limited in detail at the Tillegra dam site", it would be prudent to assume that inaccuracies may be involved, particularly in comparison to a study specifically targeting this localised area.
	Contrary to the assertions in the GEHA report this area was not ignored. The domain boundary was established after considerable work investigating the potential fault and this is specifically addressed in Section 3.2.2 of the Rim Stability Report. Conclusive physical evidence is presented to show that the Tillegra Fault does not cross the ridge and that the

Issue	Hunter Water response
	features interpreted by Roberts as a fault are actually produced by gentle folding. This conclusion was endorsed by both the Independent Peer Review Panel and the NSW Dams Safety Committee. The Independent Peer Review Panel includes five leading international experts, four of which have extensive experience in dams engineering, geotechnical engineering, geology and seismicity.
Further north Roberts et al indicated the north north western branch of the Tillegra Fault disappears under the proposed FSL. This section of the fault as mapped by Roberts et al has not been reported	Hunter Water advises that, contrary to the GEHA report, this section of fault has been demonstrated to not exist. Also, as summarised by the Independent Peer Review Panel in their Summary Reports, "several faults have been identified in the valley floor. The faults identified are not features that affect either storage rim stability or dam safety."
The western side of the Chichester Range south of Spotted Gum Trig ... appears to have been poorly examined. ... It is understood the Dam (sic) Safety Committee had some minor further questions of this area."	This assertion is incorrect. The area is covered in detail in relation to the Tillegra Fault in section 3.2.2 of the report. The NSW Dams Safety Committee advised Hunter Water by letter dated 28 May 2009 that they had determined that the report satisfies the needs of the Committee.
Overall the reporting of the rim stability is disjointed and lacks credibility. It relies on 'gentle folding' to attempt to explain the geological structure in an area known to be intersected by faulting and affected by thrust faulting to its east.	This opinion is not shared by either the Independent Peer Review Panel or the Dams Safety Committee. The Panel's Summary Report to Hunter Water comments that the "panel considers that the investigations and analysis carried out on the reservoir rim stability are of high quality." The Dams Safety Committee noted that the report satisfies its needs. The final conclusion of the Rim Stability Report is that no engineering works are required to stabilise the reservoir rim. This conclusion is accepted as satisfactorily proven by both the Independent Peer Review Panel and the Dams Safety Committee. The single biggest risk to budget from geological "complexity" is thus effectively eliminated.

Apart from the general theme of complexity and cost, the GEHA report also makes some statements and poses a number of questions which are considered to warrant a response as follows.

Table 5.3 Response to other GEHA report issues

Section/Comment	Hunter Water response
Section 4.1: Hunter Water's consultants Gibson and Dimas failed to find a record of active local faults in recent geological times. The proposition is put that just because there are no records held by public authorities, it should not be concluded that there is no seismic activity. The GEHA report states: 'So of course, where there are no records then there is no seismic activity is there?'	The Hunter Water consultants Gibson and Dimas were interested in activity in the last 1.5 million years, which is considered in geological terms to be recent, and thus could not rely on human records. While recorded seismic data was consulted as a guide, their search for evidence of activity involved detailed field investigations of the faults themselves to determine what neotectonic movement had occurred. The observation made by GEHA is therefore unwarranted and misleading.

Section/Comment	Hunter Water response
Section 4.2: A quote is taken from the EA Report: 'Current investigations for the concept design will be followed by final detailed investigations during the final design stage.' GEHA then concludes: 'So by its own statements Hunter Water acknowledges that insufficient work has been done to enable proper understanding of the geology of the site, and that this is enough for the public?'	This comment shows a poor understanding of major project planning, general engineering design practices and dam design practices in general. As has been discussed before, the concept investigations are sufficient to establish the scope of engineering works required. Detailed investigations provide the information necessary for the fine detail. For example, the concept investigations confirmed that a grout curtain is required. Detailed investigations are used to confirm how many rows of grouting are required and how deep the curtain needs to go.
Section 4.2: a number of differences between the Concept Design Report and the Interim Geology Report are noted. The Concept Design Report omits the statement 'no other major faulting was detected in the immediate vicinity of the dam footprint'. GEHA asks: 'Why is this omitted?'	The absence of major faulting means no engineering works are required and hence the statement is irrelevant in a design report. Specific information has been presented in the report where it is relevant and in the context of each report, as is common practice.
The Concept Design Report adds a statement to a section on permeability 'These more permeable areas are limited in extent and will be addressed with conventional grouting operations'. GEHA asks: "Why the difference in emphasis?"	Again, specific information has been presented in the report where it is relevant and in the context of each report, as is common practice. The Interim Engineering Geological report presents information on the general conditions of the geology with respect to the dam and the Concept Design Report comments on the significance of this geology from a geotechnical design perspective. Each report may differ in content, which is to be expected, but the final conclusions remain the same.
Section 4.2: comments were made regarding the statement "Tight rock mass zones were encountered at depth in all the boreholes in the area of the proposed embankment". GEHA asks: "What use is this statement? What about the apparent non-tight rock mass zone not at depth?"	Routine grouting treatment of the non-tight rock mass is proposed. Such grouting is to extend through the foundation into the tight rock mass. Confirming the presence of tight rock is important in establishing that grouting can be installed effectively.
Section 4.2: Both reports then continue to describe calculated seismic velocities for the initial 1-1.5m, and not surprisingly the calculation of low velocities agrees with what was dug in the test pits to these depths	There is a danger of adopting results of seismic testing without calibrating the results against known features. Such confirmation allows greater accuracy when interpreting results away from known features. This is why testing included a consideration of the test pits.
Section 4.3: Discussion is made on the advance copy of the design stage investigations. Based on this information GEHA conclude that information in the EA Report about geological conditions is misleading in that the design stage investigations identify shear zones not identified in the EA Report.	The presence of shears were always to be expected and is known to not have a major influence on cost as demonstrated in the previous discussion above.
Section 4.3: Comments are made on an area that was inaccessible to excavator: "So are we to believe that just because the Dept of Commerce could not run an excavator into the area that the shear zone suddenly ceases to exist?"	Apart from the access difficulties, investigations did not proceed to further examine the extent of the specific shear because such an examination was determined to be irrelevant to determining if and what treatment is required.

In summary, the observations made by GE Holt and Associates Pty Ltd within the report commissioned by the NTDG are welcomed as additional review is always beneficial for ensuring that complex issues such as geological investigations are properly and rigorously considered. Hunter Water's view, however, is that the existing reports commissioned by Hunter Water, and reviewed by the Independent Peer Review Panel and Dams Safety Committee, properly describe the geological matters relevant to the assessment and cost estimates.

5.4.5 Geological faults

Several submissions raised concerns that the dam is being built on a geological fault compromising safety and will potentially require costly additions at a later date. These concerns are unfounded and are not shared by either the Independent Peer Review Panel or the Dams Safety Committee. The potential fault was the subject of considerable investigation and was specifically addressed in Section 3.2.2 of the Rim Stability Report in Technical Annexure D.

Examination of the 1:250,000 Newcastle geological sheet (1966) shows that the Tillegra Fault, which is being referred to, was found not to occur east of the crest of the ridge which marks the edge of the Dam catchment. This was confirmed by Hall (1952) as well as the detailed investigations undertaken as part of the EA process. The “fault” which appears on the 1:100,000 Dungog geological sheet (Roberts et al 1991) has been found on closer examination to be gentle folding. The Independent Peer Review Panel considered that the investigations and analysis carried out on this issue are of high quality.

Detailed field investigations of the faults were also undertaken to determine whether there was any issues with the faults and the seismic activity. No such issues were found. The Dams Safety Committee was satisfied that the geology of the area did not raise concerns regarding the Tillegra Dam’s safety. Hunter Water therefore has re-affirmed the conclusion that the faults identified are not features that affect either storage rim stability or dam safety and that no engineering works are required to stabilise the reservoir rim.

5.4.6 Geological discontinuities

Some submissions claim that the EA Report fails to acknowledge the clear geological discontinuities across the storage area and abrupt changes in dip and strike require more detailed analysis. The EA also doesn’t report on the full extent of shearing around the dam site and in the Chichester Range generally.

These concerns have been addressed in the previous sections. To reiterate, the presence of shear zones is to be expected given the geology of the study area and they are unlikely to impact on the integrity of the dam or its cost. The fact that an excavator was unable to access a shear zone along its entire length because of the terrain does not prevent this issue being adequately addressed and determining what engineering treatments were required for effective and safe construction of a dam, contrary to that claimed by the NTDG submission.

The abrupt changes in ‘dip’, the angle of orientation of a tilted layer of rock measured from horizontal, and ‘strike’, the direction of an imaginary level line running on the tilted rock surface, and the subsequent geological implications of this have been adequately addressed in the EA and supplementary studies.

5.4.7 Adequacy of information and cost impacts

Several submissions allege that the geotechnical information used to cost the dam in the EA Report is inadequate and that the final construction costs are likely to be higher due to more recent geotechnical data made available since the EA Report. There is also concern that the EA Report was required only to present the site details to a 'Concept Design' stage, which avoids any real discussion of the geological complexity of the site and that this complexity could add to the cost of dam construction. The potential additional cost is not revealed to the public.

These concerns have been addressed in detail in response to the GEHA report in the Section 5.4.4. To reiterate, the preparation of the dam concept design in the EA Report provides sufficient level of detail on the geological complexity to determine the cost estimates for the dam. The work was undertaken in accordance with well proven engineering practices and procedures and the investigations reported in the EA Report effectively eliminate those geological issues which represent a high budget risk.

Subsequent information provided in the Design Stage Geotechnical Investigation (September 2009), commissioned by Hunter Water, confirms that the initial design concepts were adequate and that there no additional geological issues previously unknown that will add to the original cost estimates. This report has been released to the NTDG and Hunter Water has advised that copies can be made available to any interested party.

The major cost implication with respect to geological complexity is rim instability. The Rim Stability Report (Annexure D in the EAR) concludes that no engineering works are required to stabilise the Tillegra Dam's rim. Again, as noted previously, this conclusion has been accepted as satisfactorily proven by both the Independent Peer Review Panel and the Dams Safety Committee.

5.4.8 Impacts of potential landslides

There were concerns in one submission that landslides, such as those that have occurred in the vicinity of the Chichester Dam, have not been taken into consideration with respect to possible impacts on the dam.

Hunter Water believes these concerns are unwarranted. As discussed in the previous sections, the underlying geology on which the dam is being built is sufficiently stable for the construction of a dam. The rim stability study also demonstrated that the underlying geology of the rim is also stable so that if there was any movement of the overlying soils (i.e. a landslide) it would be minor and not affect the integrity of the dam.

The proposed revegetation around the rim of the storage area is also likely to improve soil stability in the areas adjacent to the dam which currently do not have any tree cover. In addition, the design requirements for the dam exceed those adopted internationally.

5.4.9 Possibility of dam wall failure due to geological instability

Several submissions were concerned about the possibility of a dam wall failure due to a lack of detailed discussion and understanding of the geological complexity of the site. The dam would be designed, constructed and maintained with the highest level of engineering excellence and integrity based on tried and proven technology relevant to the requirements of the site and all work has been and would continue to be reviewed by the Independent Peer Review Panel.

In addition, the NSW Dams Safety Committee (DSC), a NSW government statutory authority created under the *Dam Safety Act 1978*, is charged the with the responsibility and authority to ensure that Tillegra Dam is designed, constructed, operated and maintained in such a condition so as not to pose an unacceptable safety risk, as stated in Section 6.9 of the EA Report.

The DSC requires dams to be designed according to appropriate engineering standards for the present and the foreseeable future and it has the power to direct reviews if standards change through the operating life of a dam. Selection of the appropriate design standard is driven by an assessment of the consequences of failure of the dam with the highest standards applying to dams constructed upstream of populations centres.

The DSC oversight process is rigorous and in general terms, Hunter Water must demonstrate to the DSC that the dam, both during construction and when completed, would not pose an unacceptable risk to persons, infrastructure and the environment downstream. As stated in the previous section, Hunter Water will also be required to have in place a DSEP for the dam, which will prescribe procedures to mitigate the conditions and provide timely warning in the unlikely event of a dam failure. Such an event would have less than one chance in 10 million, a figure well below acceptable risk.

5.5 Dam safety

One submission raised an issue relating to dam safety. This suggested a dam break study should be completed for Tillegra Dam, and the findings made publicly available and included in the assessment of impacts for the Project.

In ensuring that all dams in NSW are designed, constructed, operated and maintained in such a condition so as to not pose an unacceptable safety risk, the DSC requires the development of a dam safety emergency plan (DSEP). The DSEP is a formal plan to identify emergency conditions which could threaten the integrity of the dam. The requirement for a DSEP was detailed in Section 6.9 of the EA Report. As described in this section, it is not a requirement of the EA Report to include a DSEP, even though a DSEP would eventually be developed by Hunter Water for the commissioning of the dam.

The design of Tillegra Dam has followed appropriate design criteria and standards as published by the Australian National Committee on Large Dams (ANCOLD) and its parent organisation the International Commission on Large Dams (ICOLD). The design is driven by an assessment of the consequences of failure of the dam with the highest standards applying to dams constructed upstream of population centres. This assessment includes consideration of site geology and geotechnical investigations, seismic hazard, storage volume, stream flow and flood hydrology. Risks are assessed in accordance with AS/NZS 4360:2004 *Risk management* and additional requirements as set by the DSC. These requirements are based on, but are stricter than, ANCOLD/ICOLD standards and are intended to reduce the risk to less than 1 chance in 10 million that a dam safety issue would occur. As such, the design standards used for Tillegra Dam exceed those adopted nationally and internationally.

In addition, the DSEP prescribes procedures to be followed by Hunter Water to mitigate the conditions and provide timely warning to emergency management agencies. It would normally include inundation plans so that the emergency agencies would be able to formulate evacuation plans for potentially affected areas. Hunter Water must demonstrate to the DSC that the dam (both during construction and when completed) would not pose an unacceptable risk to persons, infrastructure and the environment downstream. As noted, the acceptance criteria for risk–based engineering or operational decisions are generally based on the ANCOLD Guidelines on Risk Assessment for Dams.

It is not necessary for the environmental assessment to include a DSEP or consider potential inundation areas affected by dam failure. However, in addition to designing Tillegra Dam to exceed international design standards, Hunter Water would develop a DSEP to the satisfaction of the DSC and information on potential inundation areas would be communicated to the community via the DSEP as is normal practice.

5.6 Contemporary heritage

A total of 16 submissions were received on matters relevant to the conservation of contemporary cultural heritage, including one submission from DECCW, one submission from the Hunter Regional Committee of the National Trust, one submission from the Dungog Historical Society and one submission from Dungog Shire Council. The remainder of submissions were received from members of the public. Within these submissions, the following matters were raised.

1 **Adequacy of contemporary heritage investigations:** concern was expressed that the contemporary heritage assessment and discussion of potential contemporary heritage impacts was flawed, misleading or inadequate. One submission expressed concern that the 'historical cultural landscape' had not been recognised and considered. (Section 5.6.1)

2 **Additional information and suggested technical corrections:** a number of submission provided additional detailed historical information and suggestions of historical technical corrections to the EA documentation. (Section 5.6.2)

3 **Cumulative impact and loss of heritage value of the landscape:** concern was expressed that the total impact on contemporary heritage due to inundation of the local area was unacceptable and that it would add to a cumulative loss of heritage in the region. Concern was also expressed that the heritage value of the local agricultural landscape would be lost if the dam was built. (Section 5.6.3)

4 **Munni Homestead complex:** Two submissions objected to the inundation or removal options proposed for Munni House. One of these submissions suggested that the relocation of a brick house would not be possible. The Dungog Shire Council submission suggested that elements of the house be retained within a completely new facility built in the region, instead of its relocation. Many submissions urged that further consideration of the costs associated with the movement of Munni House. (Section 5.6.4)

5 **Quart Pot/Munni Cemetery:** concern was expressed about the loss of local history associated with the inundation or relocation of the Quart Pot/Munni Cemetery and the lack of any related cost analysis. (Section 5.6.5)

Responses are provided in the sections indicated.

5.6.1 Adequacy of contemporary heritage investigations

The investigation of existing contemporary heritage and assessment of potential impacts of the Tillegra Dam Project was conducted in accordance with relevant guidelines and accepted industry best practice, and undertaken by experienced heritage consultants with recognised expertise in this area.

The investigations were conducted in two stages. The first stage involved the identification of known and potential historic heritage items and places. The second stage involved detailed historic research and community consultation before the analysis of impacts and development of mitigation measures. While individuals may hold differing views on the attributed heritage significance of specific items, the determination of significance was conducted using industry recognised procedures. The conclusions reached are therefore considered valid and appropriate.

One submission expressed concern that some heritage values in the affected area had been overlooked. The submission referred to a cave within the area that was used by bushrangers including Thunderbolt and the Governor brothers. The contemporary heritage investigations followed NSW Heritage Office guidelines and included both desktop and on-ground research. Consultation with local heritage associations and groups comprised an integral part of the investigations with a number of open days being held to obtain and collate local information first hand. No evidence of a cave used by bushrangers within the study region was found during the contemporary heritage assessment.

The submission did not provide any details of the location of the cave. Should further supporting information be made available to Hunter Water, this would be reviewed by an experienced contemporary heritage specialist. This would determine whether the cave was located in the inundation area and characterise the historic significance. If required, archival recordings would be taken before the area is inundated.

Another submission expressed concern that there was a lack of clarification and subsequent confusion between the exact location of the Project area and the study area referred to throughout the contemporary heritage component of the EA Report, and in particular Working Paper L *Contemporary Heritage*.

Both are clearly identified in Working Paper L. The Project area is referred to as the 'study location' and is identified in Figure 1.1 in the Working Paper. The study area is identified in Figure 1.2 in the Working Paper, delineated by the red border.

5.6.2 Additional information, suggested technical corrections and volunteer support

Multiple submissions provided additional historical information and suggested technical corrections to the EA Report and the two heritage Working Papers. This was reviewed and assessed in relation to the original contemporary heritage assessment. It was concluded that while of value in contributing to the general understanding of the heritage values of the Project area, the additional information and suggested corrections did not materially alter the conclusions of the heritage impact assessment or the identified mitigation measures.

Hunter Water would pass the additional information to the Dungog Historical Society for possible inclusion in future research and publications about the region.

Some submissions also offered volunteer support in interpretation, centre walks, use of rooms. etc. While Hunter Water is grateful for such offers, it is noted, however, that this is a separate issue to the planning approval process and contingent upon the Minister's determination. Should the Project be approved, it is anticipated these matters would be addressed through finalisation and the subsequent implementation of the ILUP. The details provided would be recorded and considered by Hunter Water in finalising the ILUP.

5.6.3 Cumulative impact and loss of heritage value of the landscape

Some submissions expressed concern that the heritage value of the agricultural landscape and the Williams River Valley landscape had been overlooked and would be lost if the dam is built. One submission expressed concern that the contemporary heritage assessment did not address the impact of the dam proposal on the historic landscape, instead focussing on isolated cases of heritage places and item.

Concern was also expressed that existing heritage sites had not been related to the importance of the local river landscape. Additionally, it was argued that the heritage assessment had failed to recognise the linkage between the river landscape and the contemporary and Aboriginal history. In general, the concern was that the assessment did not provide an overall definitive statement of heritage significance for the valley and instead only concentrated on individual items or potential sites.

The scope of the heritage assessment documented in the EA Report and Working Paper L built upon the Stage 1 identification and reporting, and did not explicitly encompass historic landscape considerations. Nonetheless, views and settings of each item, and the potential inter-relationships were considered. While the study area has a lengthy association with the dairy industry, the landscape did not stand out as a notable example for this aspect of NSW history.

The EA Report and Working Paper L detail the comprehensive investigations completed to identify and assess the impact on contemporary heritage. While these acknowledged the development of farming within the district with particular reference to its dairying history, the study area was not recognised as a listed area for reasons of landscape conservation. It is considered unlikely that the mitigation measures identified in Section 9 of Working Paper L would be materially changed or extended by taking landscape conservation into consideration. Further, it is noted that the recommended mitigation measures provided in Section 9.4 (*Mitigation and Management Recommendations*) would provide a record of the landscape as it is now and as it changes during the construction of the dam.

One submission referred to the National Trust having already identified numerous agricultural landscapes for listing as Landscape Conservation Areas on its Register and suggested that the proposed storage area was within the proposed Paterson-Williams River Landscape Conservation Area. Currently the proposed Paterson-Williams River Landscape Conservation Area has not been listed on the National Trust Register despite its original proposal for listing in 1984.

Nevertheless, Hunter Water has committed to archival recording of the items listed in Section 13.6 in the EA Report. In addition, oral history interviews with local residents would be undertaken and would be guided by the historic these of the study area. These measures would contribute to the existing historical record of the region as an agricultural and river landscape.

5.6.4 Munni House

The Munni homestead complex is situated within the inundation area. The heritage assessment determined it was significant in the context of Australian pastoral activities in regional NSW demonstrating early settlement patterns. The assessment also confirmed that Munni House was of local heritage significance.

The National Trust classification of Munni House, which is a non-statutory heritage listing, was acknowledged in the assessment. Investigations conducted for Stages 1 and 2 of the heritage assessment reviewed the National Trust Jubilee Register and noted that Munni House was not listed on this register.

This notwithstanding, the heritage assessment examined the heritage values of Munni House in detail against the criteria for the State Heritage Register. As noted in the EA Report and Working Paper L, the assessment also reviewed Hunter Water's Section 170 heritage register and the heritage schedule to the *Dungog Local Environmental Plan 2006*.

Concern was expressed over the loss of the Munni homestead complex and urged that it should be preserved and remain where it stands due to its heritage value. This was identified as an option (Option 1) in the assessment but discounted as it was considered there were other options which offered a better outcome in preserving heritage values to the greatest extent practicable.

The options for Munni House discussed in Chapter 13 of the EA Report and Chapter 7 of Working Paper L focus on practical conservation of the place's heritage values and are restated in Table 5.4.

The heritage assessment indicated a preference for Option 4a for the house itself and either Option 4a or 4b for at least one of the two timber slab outbuildings. As noted in the EA Report, the re-use of Munni House and outbuildings as an interpretive or visitors centre for the new dam was made as a Project commitment.

Table 5.4 Munni House management options identified in the EA Report

Option		Description
1	Leave as is	The entire complex would be left as vacated and would eventually be submerged as the storage filled. A prerequisite to selecting this option would be the archival recording of the complex and its future interpretation.
2	Leave masonry fabric only	This would involve the removal of the timber outbuildings, framing timbers, metal, shingle roofs, windows, doors, joinery, fittings and electrical, plumbing and drainage. This would leave the brick walls which would be submerged as the storage filled.
3	Removal	This option would involve the demolition and removal of all buildings from the site without retention of any historical fabric.
4a	Relocation – dismantle and reassemble	This would involve a highly detailed recording of all buildings on the site, including itemisation and scheduling before careful dismantling, tagging and packaging for transportation to a new site. This option would incur considerable cost due to the detailed recording, specification and oversight required during the dismantling and reconstruction stages.
4b	Relocation – move whole buildings	This would include relocating both the timber outbuildings and Munni House as intact elements or sections. This option would require careful investigation to determine road and bridge weight, width and height limits. While it is feasible to relocate either of the two timber slab buildings, the technology or experience to move the significant brick sections of Munni House intact is currently unavailable and would involve a high cost.

Dungog Shire Council, in its submission, questioned the value of this option noting that for a similar cost (ie to the estimated cost for the preferred mitigation), a brand new centre could be established that included salvaged elements of Munni House, other Aboriginal and European heritage items from the area together with an interpretive centre.

The Dungog Shire Submission further noted that this could be located in Dungog (rather than below the dam wall as indicated in the draft ILUP and EA Report), effectively replacing the existing visitor centre and accommodating other services such as tourist information and facilities. An amount of $80,000 per year is also sought by Dungog Shire Council for operation of the visitor centre.

Hunter Water acknowledges there is merit in further consideration of this suggestion as movement of the high conservation component of Munni House and one of the outbuildings has been costed by a quantity surveyor at $1.67 million dollars. There is therefore a strong argument that these funds could be spent on other community programs for better benefit. Further, several submissions including that from the Hunter Regional Committee of the National Trust have indicated that movement of the building is not practical nor encouraged from a conservation perspective.

While funds could be alternatively disbursed to Dungog Shire Council for use in promoting a new visitor information centre and funding its operation, there is a risk that the mitigating strategy for a key element of the areas cultural heritage could lose its focus to promoting tourism related activities, rather than cultural heritage conservation. Hunter Water has already made significant commitments to promoting tourism and recreational activities around the storage.

Accordingly, an alternative possibility may be to leave Munni House within the reservoir area, and disburse funds equally to:

- Establish a new visitor centre below the dam wall, managed by Hunter Water and containing salvaged elements of the Munni House (estimated commitment of $500,000)
- Contribute to the operation of the Dungog Shire Council Visitor Centre (estimated commitment of $500,000)
- Support the normal operations of the Dungog Historical Society. Subject to concurrence of the Society, they could also potentially help with the conservation of heritage within the Project area by assisting Hunter Water with the preparation of interpretative signage and oral history recordings. (estimated commitment to the Society of $500,000).

Either commitment, the movement of Munni House or the alternate funding proposal would be acceptable to

Hunter Water and the guidance of DoP would be sought as to which proposal would provide the best public benefit and should therefore be adopted for the Project.

5.6.5 Quart Pot/ Munni Cemetery

A number of submissions expressed concern about the loss of local history from the proposed inundation of the cemetery. The EA Report and Working Paper L provided a summary of heritage values for Quart Pot/Munni Cemetery and developed a summary of significance value with regard to applicable legislation and guidelines.

The assessment noted that the cemetery was not listed on the State Heritage Register, with the Natural Trust of Australia nor on the Register of the National Estate. It did, however, confirm that it was of local heritage significance for historic, cultural and spiritual reasons. This is reflected through its inclusion on the heritage schedule to the Dungog LEP.

As indicated, the cemetery is located in the inundation area. Figure 1 of Working Paper H (*Cemetery Relocation Plan*) shows that at the maximum water level, the water depth in the general area of the cemetery would be approximately 10 metres. Hunter Water intends to operate Tillegra Dam such that the water level is maintained between 90% and 100% for the majority of the time. Consequently, it is expected that the impact on the heritage values of the cemetery would be significant.

Section 4 of Working Paper H deals with the heritage aspects of the impacts of the Project upon the cemetery. Section 9.2 of Working Paper L lists a range of management and mitigation measures that are considered to adequately respond to the concerns expressed and which are consistent with relevant legislation and guidelines. These have been incorporated into the Project's Statement of Commitments. It is noted that should the Project be approved, it is unlikely that there are any other practicable mitigation measures available but Hunter Water would still invite suggestions in this regard.

One submission expressed concern that no costing had been provided with regard to the lengthy excavation process and the legislative compliance procedures that would be imposed by the *Coroners Act 2009*, *Public Heath Act 1991* and *Heritage Act 1977*. A preliminary cost estimate has been developed as part of overall Project budgetary planning and cost effectiveness analysis, but was not provided in detail within the EA documentation. The costs are a very small component of the overall Project budget and considered to be manageable. The work would be undertaken by skilled specialists in strict accordance with all relevant legislation and guidelines.

5.6.6 Contemporary heritage summary

The assessment of the Project's anticipated impacts on contemporary heritage has been undertaken in accordance with applicable legislation, guidelines and accepted industry practice by experienced heritage specialists. Accordingly, it is considered there is a high level of confidence in the level of significance assigned to identified heritage impacts. The issues raised in submissions are not considered to materially alter the conclusions drawn regarding the significance of impacts nor the validity of the identified impact mitigation measures.

5.7 Aboriginal heritage

Issues raised relating to the Aboriginal heritage assessment comprised the following:

1 **Adequacy of consultation with the Aboriginal community:** one submission expressed disappointment that the Aboriginal community was not consulted or engaged adequately (Section 5.7.1)

2 **Adequacy of assessment of Aboriginal heritage and potential impacts:** a number of submissions suggested that the assessment of existing Aboriginal heritage and the identification of potential impacts was conservative and inadequate. (Section 5.7.2)

3 **Impacts on local Aboriginal heritage:** concern was expressed that potential impacts on local Aboriginal heritage would be unacceptable. A few of the submissions also expressed the view that the proposed mitigation measures will do little to mitigate the total impact. (Section 5.7.3)

5.7.1 Adequacy of consultation with the Aboriginal community

Consultation with Aboriginal stakeholders was undertaken in accordance with the DECC[3] *Draft Guidelines for Aboriginal Cultural Heritage Assessment and Community Consultation* which is the currently accepted methodology. This was also the methodology Hunter Water was directed to use in the DGRs. Specific details relating to consultation activities are provided in Section 3 of Working Paper M *Aboriginal Heritage* and summarised in Section 14.6 of the EA Report.

By way of brief review, prior to the Aboriginal heritage assessment, Hunter Water wrote to multiple Local Aboriginal Land Councils (LALC) in the surrounding area advising each of the Project. Further detailed consultation was subsequently undertaken with the Karuah LALC in whose area the Project is principally located. Consultation continued with the Karuah LALC during the preliminary stage of the assessment and continued into the detailed environmental assessment in accordance with the DECC guidelines. A representative of the KLALC was also appointed to the Tillegra Dam Community Reference Group.

Prior to the inception of fieldwork, notification of the Project included placement of advertisements in various print media including the *Dungog Chronicle* and *Newcastle Herald*. In addition, as required by the DECC guidelines, notification letters were sent to the following organisations:

- Karuah LALC
- Dungog Shire Council
- Executive Director Operations, DECCW
- Registrar of Aboriginal Owners, NSW Department of Aboriginal Affairs
- NSW Native Title Services.

Consultation activities also included an invitation for interested parties to register their interest in the Project. The consulting archaeologist also employed several Aboriginal field assistants. Registered persons interested in the Project but not offered employment were also offered a guided tour of the site to observe the fieldwork occurring.

The heritage consultant's final report was circulated to registered and interested stakeholders, in accordance with the DECCW guidelines.

In view of the above, Hunter Water considers that the consultation activities undertaken in relation to the assessment were appropriate and adequate. Further consultation with the Aboriginal community would continue to be undertaken in accordance with the DECC guidelines.

5.7.2 Adequacy of assessment of Aboriginal heritage and potential impacts

A number of submissions suggested that the assessment of existing Aboriginal heritage and identification of potential impacts was conservative and inadequate with one suggesting that it did not satisfy the DGRs. Some submissions expressed concern that the Aboriginal heritage assessment was not exhaustive and was narrowly focused on cultural sites and objects, ignoring the 'living cultural landscape'. The DECCW submission also indicated that the assessment was deficient in relation to considering the potential impacts that could occur from ancillary infrastructure. The view was put forward that additional information would be needed for an adequate assessment.

The Aboriginal heritage assessment was undertaken by an experienced and recognised practitioner in accordance with applicable legislation, guidelines and accepted industry practice. The methodology is described in detail in Working Paper M. From this the following is noted:

[3] Department of Environment and Climate Change, now the Department of Environment, Climate Change and Water

- No assessment of cultural significance for specific items or locations within the study area were provided by the registered Aboriginal stakeholders at the time of the assessment
- Material recorded during sub-surface testing was determined as having a scientific significance rather than educational value
- One site (Tillegra 1) was assessed as having high scientific significance and all other identified sites were assessed as having moderate scientific significance.

The DGRs required Hunter Water to undertake an assessment of the Aboriginal cultural heritage values that may be impacted by the Project and to provide details on the subsurface investigation undertaken. It is considered these requirements have been adequately fulfilled by the Aboriginal archaeological assessment and as documented in Working Paper M.

The comments within the DECCW submission are not accepted by Hunter Water, as the work was proceeded with after thorough discussion with the Aboriginal Heritage Management Unit of DECCW. Within the EA Report it is clearly noted that the assessment was designed to develop a predictive model based on geomorphologic land forms, known archaeology for the region and environmental limitations in order to facilitate the conservation of heritage material. This process was discussed with the Coffs Harbour Office of DECCW and it was agreed that the approach to be taken would be valid. These discussions were held between Hunter Water and DECCW prior to the work being undertaken by the consulting archaeologist.

Within a study area of approximately 40 km^2 it is practically impossible to undertake a detailed assessment of every square metre of the subject site and a new innovative approach was required to guide and target the assessment process.

Further, the DECCW submission refers to parts of the proposal which are no longer considered as part of this assessment process (the tunnel between Tillegra and Chichester Dam) which is noted as being held over in abeyance. The stage one report had also previously been supplied to DECCW (a scoping study) noting that other inspections had been made. For example, the connecting pipeline route to the Chichester Trunk Gravity Main was surveyed on foot with a representative of the Karuah LALC present during the inspection, contrary to the assertion made in the DECCW submission. This information was contained within the scoping study provided several years ago to DECCW.

One submission drew attention to an Aboriginal land rights claim lodged by the Karuah LALC under the *Aboriginal Land Rights Act 1983* pending for a parcel of Crown land that is a historic travelling stock route. This claim is acknowledged in Section 8.1.6 of the EA Report. Hunter Water would work cooperatively with the NSW Land and Property Management Authority[4] (LPMA) and supply any information required to the LPMA to allow a decision to be properly made on the validity of the land claim.

5.7.3 Impact on local Aboriginal heritage

Concern was expressed that Aboriginal heritage would be significantly impacted by the proposed works because the Williams River is important to the Aboriginal community and that the proposed mitigation measures were inadequate because items should be retained in situ.

During the consultation process and during discussions with Aboriginal stakeholders, it was made clear that all areas of past Aboriginal activities are significant to the Aboriginal community. In some cases, the landscape or other non-modified features can also hold significance for individual groups. In relation to the movement of objects versus allowing them to remain in situ, it is noted that consultation to date has indicated that there is a strong preference for material to remain in situ and spiritual consequences would occur should material be removed.

The archaeological salvage of the material identified in the areas of direct impact including at the dam wall area, sample locations along the proposed road diversion and in areas of inundation has been recommended by the consulting archaeologist. The option of archaeological salvage is provide as a mitigation measure to take the opportunity to record artefacts and enable further research on items that would otherwise be inundated or

[4] formerly the NSW Department of Lands

destroyed during construction works. It was noted that to leave the identified items in situ would neglect the opportunity to obtain valuable archaeological information. Archaeological excavation would only be undertaken by a suitably qualified archaeologist and would include appropriate consideration of relevant recommendations in the Aboriginal archaeological heritage report (Working Paper M).

While the consulting archaeologist has noted the value of sites for scientific research and therefore salvage as articulated in the above paragraph, Hunter Water would however work with the Aboriginal community to respect their wishes on how material would be handled and cared for. For example, it may be possible to photograph material in situ rather than completely salvage the material, for further scientific research. Such options would be explored further during completion of the committed works. Should the majority of Aboriginal people expressing an interest in the work decide that material should be left in situ, then those wishes would be respected by Hunter Water and steps would be taken to ensure that such action occurred.

Given the large inundation area for the dam, it is inevitable that some impacts on identified Aboriginal heritage sites would not be possible to avoid. The mitigation measures aimed at exploring the area with the predictive model and archaeological salvage (or in situ recording) however provides an adequate commitment for ensuring that information from such heritage sites are properly document and recorded.

5.7.4 Aboriginal heritage summary

The environmental assessment acknowledged that a number of known Aboriginal archaeology sites would be impacted by the Project. Hunter Water has therefore proposed and committed to a number of initiatives that include further consultation with the Aboriginal community.

Similarly to the preferred management strategy for contemporary archaeology issue, the archaeological excavation and archival recording of items is not recommended as a 'substitute' for the items themselves, rather the collective mitigation recommendations aim to retain and conserve where possible, comprehensively record, and interpret Aboriginal heritage values and items in the study area for current and future generations.

5.8 Noise and vibration

Seven submissions (DECCW, DSC and five from the public) were received regarding noise and vibration issues associated with the construction of the dam. One submission was also concerned about the dam's potential impact on existing rural amenity. The issues raised can be summarised as follows:

1 **Noise and vibration assessment (NVA):** the DECCW submission noted that the NVA was resubmitted to DECCW during the adequacy review period to update the assessment to comply with the most recent NSW Industrial Noise Policy Guideline (ICNG) Another submission (277.45) felt that the NVA clearly assessed noise and vibration aspects associated with dam construction in accordance with relevant Government policies, regulations and guidelines and that there was a need to ensure all of the noise management recommendations were implemented. The DECCW submission provided a number of observations on the number of noise affected residences, that it would be premature to agree to out of hours works and that a new noise assessment would be required to support agreement to out of hours work based on the detailed analysis of out of hour work practices and the outcomes of community consultation. Specific recommendations were also made for conditions of approval. (Section 5.8.1)

2 **Noise and vibration mitigation commitments:** three submissions were concerned that the proposed mitigation measures are inadequate. The DECCW submission also made recommendations for conditions of approval based on those formulated for road projects but modified for the current project and the use of the Interim Construction Noise Guidelines (ICNG.) (Section 5.8.2)

3 **Community consultation:** the DECCW submission claimed the community has not been consulted on specifics of dam building activities in preparation of the NVA and another suggested that a community representative committee (similar to the TDCRG) be established as soon as a determination on the application is made. (Section 5.8.3)

4 **Unacceptable construction noise levels:** one submission commented generally that they were

concerned the construction noise would be unacceptable for a small community. (Section 5.8.4)

5 **Traffic construction noise in Dungog:** some submissions, including Dungog Shire Council (DSC), commented on the potential for an increase in construction traffic noise in Dungog during construction of the dam. (Section 5.8.5)

6 **Dam will cause pollution, noise and disturbance:** two submissions were concerned that when the dam is completed, noise and disturbance would increase in the Dungog region impacting on the existing quiet rural amenity due to an increase in visitors and tourism. (Section 5.8.6)

5.8.1 Noise and vibration assessment

The DECCW submission noted that the NVA was resubmitted to DECCW during the adequacy review period to update the assessment to address the NSW *Interim Construction Noise Guideline* (ICNG). Another submission (277.45) felt that the NVA clearly assessed noise and vibration aspects associated with dam construction in accordance with relevant Government policies, regulations and guidelines and that there was a need to ensure all of the noise management recommendations were implemented. The DECCW submission provided a number of observations on the number of noise affected residences and also noted that it would be premature to agree to out of hours works. A new noise assessment would be required to support an agreement to any out of hours work proposed based on a detailed analysis of out of hour work practices and the outcomes of community consultation. Specific recommendations were also made for conditions of approval.

Noise and vibration issues were addressed in detail in the NVA in Working Paper K and summarised in Section 16.1 of the EA Report. The noise and vibration studies were undertaken in accordance with the Directors General requirements and the relevant DECCW noise and vibration policies and guidelines. The NVA was also completely reworked at substantial cost to account for new noise guidelines introduced in 2009, beyond the requirements of the DGRs. Hunter Water acknowledges the submission that the NVA provides a detailed assessment of the potential impacts of noise and vibration based and Hunter Water believes the NVA provides an adequate foundation for the management of the noise and vibration issues.

The NVA has shown that under typical worse case construction scenarios, computational simulation has shown that some properties in the vicinity of the dam wall may be affected by construction noise. However, the noise levels predicted did not exceed the Highly Noise Affected criteria. Further, Hunter Water has purchased further properties since the NVA was undertaken and now owns most of the potentially noise-affected properties in the vicinity of the dam wall with exception of two properties on the north eastern side of the dam construction site, who are the nearest sensitive receivers, and two properties approximately 1.5 kilometres to the south east of the dam construction site.

In order to address potential construction noise impacts Hunter Water has committed to a construction Noise Management Plan (NMP), which would be prepared in consultation with DECCW and noise-affected residents. The NMP would detail the measures proposed to monitor and mitigate construction noise, as well as the consultation process.

Hunter Water has met with all affected residents including the two most potentially noise-affected residents (sensitive receivers 1 and 2 in Figure 3.1, Working Paper K) to discuss noise impacts and construction activities. Hunter Water has committed to work closely with them to ensure that they are not detrimentally affected by the Project and re-affirms this commitment. That no submissions were received from the two most potentially affected residents is seen as indication of the success of the consultation to date.

5.8.2 Adequacy of noise and vibration mitigation commitments

The DECCW submission considers the proposed mitigation measures in the Draft SoCs with respect to noise and vibration (Item 10, Appendix 1 to the EA Report) to be inadequate and recommends conditions of approval based on those that have been formulated for road projects but modified to be applicable for the current project and the use of ICNG. Two other submissions were also concerned that the proposed mitigation measures would be inadequate, one from a resident approximately 1.5 km to the south east of the dam.

In general it is noted that the Draft SoCs states that 'appropriate construction and operational mitigation measures to be implemented are those detailed in the EA Report'. The recommendations for noise mitigation are detailed in Chapter 7 of Working Paper K, Volume D of the EA Report and states that the noise management approach would follow the recommendations in the ICNG. Importantly, a construction Noise Management Plan (NMP) will be prepared and implemented in accordance with the INCG prior to the commencement of construction. Preparation of the NMP would involve consultation with DECCW.

In this regard, Hunter Water will accept the recommended conditions of approval put forward by DECCW. The noise levels predicted for standard work hours were predicted not to exceed the 'Highly Noise Affected' criterion for a worse case operating scenario. The DECCW has provided 'Recommended Conditions of Approval' in paragraphs 9 to 22 of Appendix B to its submission. Hunter Water has reviewed the proposed conditions and believes they are reasonable and consistent with the proposed mitigation and management measures in the NVA and EA Report for construction.

In relation to operational noise limits, which will extend for many years over the life of the dam, Hunter Water notes that limits are routinely updated every few years by DECCW to meet the community expectations and standards of the day. Hunter Water will comply with these relevant standards set by the NSW Government in order to continue to meet community expectations on an ongoing basis.

In relation to out of hours work during construction Hunter Water has identified that this would be required for the project during the establishment of temporary coffer dams and for the main dam embankment which requires continuous concrete pours on the upstream face of the dam.

DECCW has noted that it is premature to agree to out of hours works. The ICNG notes there are five categories of works that can be undertaken outside the recommended standard hours, these being:

- The delivery of oversized plant or structures that police or other authorities determine require special arrangements to transport along public roads
- Emergency work to avoid the loss of life or damage to property, or to prevent environmental harm
- Maintenance and repair of public infrastructure where disruption to essential services and/or considerations of worker safety do not allow work within standard hours
- Public infrastructure works that shorten the length of the Project and are supported by the affected community
- Works where a proponent demonstrates and justifies a need to operate outside the recommended standard hours.

Out of hours work would be required to construct the coffer dams which must be established rapidly to minimise the risk of being washed away in a flood during construction. Once constructed they would be able to withstand high flows and floods, however during their initial installation it is important to undertake the work as quickly as possible to enable the coffers dams to be properly established and stabilised.

On the main dam embankment, the construction methodology requires continuous concrete pours to ensure that the concrete slabs installed on the upstream face are able to set solidly without cracks or defects. Accordingly, it is noted that the construction of the dam could not occur without approval for out of hours work.

Hunter Water would therefore demonstrate and justify the need to operate outside standard working hours and that the work would be undertaken as prescribed by the process in the INCG and in consultation with the community. Hunter Water has noted that it owns nearly all of the properties within close proximity to the dam construction site and has a firm commitment with the two most sensitive receivers on land not owned by Hunter Water to positively address all reasonable requests that would provide relief from noise impacts.

5.8.3 Community consultation

Hunter Water has engaged in extensive consultation with the community in preparation of the EA Report, as well as during and following public exhibition of the report. The details of the community consultation program are provided in Chapter 4 of the EA Report.

In addition to the consultative activities noted, representatives of Hunter Water met with both tenants and private property owners in the immediate vicinity of the dam wall. The claim by DECCW that the community has not been consulted on specifics of dam building activities in preparation of the NVA is therefore incorrect. Section 16.1.3 of the EA Report states

> The management of noise needs to be considered on the merits of particular circumstance as related to each individual residence. On this basis the Hunter Water has currently liaised with each of the affected landholders below the dam wall and spillway to determine the most appropriate mitigation measure.

In fact, one on one consultative sessions were held to explain the results of the noise modelling results, likely construction work, the types of machinery likely to be operated, operational noise (including spillway noise) and other factors of interest. Each resident was advised of potential management actions available which varied depending on the location of the property and the structure of house. Visual impacts were also discussed at that time. Each landholder was also provided with a commitment from Hunter Water that the Corporation would work proactively and progressively with them to address any concern.

Consultation with potentially affected residences was also undertaken in establishing suitable locations for noise monitoring for the background noise survey during the preparation of the NVA.

In addition, the community will be further consulted on the specifics of dam building activities once a final contractor for the work is selected. This consultation will be undertaken in accordance with the commitment made in Section 16.1.3 of the EA Report indicates:

- Advanced notification will be provided to the affected community of any expected noise disruptions that might occur
- The community will be consulted to establish variations to noise criteria to allow for louder construction noise certain times, as well as provide regular updates informing them of upcoming work and whether they should expect any heightened disturbance
- Temporary relocation of residents will be offered during worst case noise emitted during construction, such as out of hours work.

5.8.4 Unacceptable construction noise levels

Some submissions were concerned that construction noise levels would be unacceptable. As stated previously, the NVA has shown that under typical worse case construction scenarios, computational simulation has shown that some properties may be affected construction noise. However, the noise levels predicted did not exceed the Highly Noise Affected criteria and in order to address potential noise impacts Hunter Water has committed to a construction Noise Management Plan (NMP), which will be prepared in consultation with DECCW and the local community. The NMP will detail the measure proposed to monitor and mitigate construction noise.

One submission commented generally that they were concerned the construction noise would be unacceptable for a small community. While the modelling indicates that this specific person may not experience excessive noise emissions from the construction of the dam, a noise logger will be located within reasonable distance to the property in question to provide ongoing monitoring to verify the modelling results in the field.

Any construction activities that need to be conducted outside of the standard hours (eg at night or on Sundays), will be discussed with DECCW before these activities are undertaken to ensure that appropriate measures are put in place as discussed in Section5.8.2 above, and will involve consultation with the potentially affected residences.

Therefore, Hunter Water believes the Project will be conducted in accordance with the ICNG, whereby construction noise levels will comply with the relevant noise criteria and all efforts will be made so that noise levels are acceptable to the community.

5.8.5 Traffic construction noise in Dungog

A couple of submissions also expressed concern construction traffic through Dungog would be noisy due to the existing poor state of the roads on the proposed route.

Hunter Water has made a commitment, as stated in the EA Report and reiterated in Section 5.3, to provide assistance with upgrades and improvements to the roads. The road maintenance program will be determined in consultation with Dungog Shire Council. The improvement to the roads will not only reduce the potential noise impacts associated with the dam construction traffic, but will also improve the general amenity along the route by reducing noise impacts from non-dam related vehicle movements.

5.8.6 Dam will cause pollution, noise and disturbance

Some submissions expressed concern that when the dam is completed, noise and disturbance would increase in the Dungog region impacting on the existing quiet rural amenity due to an increase in visitors and tourism.

The potential environmental noise impact of the dam on the surrounding community after its completion has been addressed in Section 16.1.2 of the EA Report. A qualitative assessment of the operational noise impacts concluded that the noise levels from the operation of the dam would be unlikely to exceed allowable noise criteria.

However, it was noted that there is potential for noise from the spillway when there are flow releases, which would be constant in nature and similar to that from a waterfall. Monitoring of this noise would be undertaken to determine the noise levels and the potentially affected residences consulted to determine if noise levels are unacceptable. It is noted that Hunter Water will operate the dam with the preferential use of the multi-level off-take tower. This will reduce considerably the frequency of spillway flows and will therefore considerably reduce the amount of noise emitted from the dams operation. None the less Hunter Water would act to sound proof homes affected by noise generated by the spillway or hydro-electric plant or offer to purchase these properties at agreed market rates if no practical management arrangements could be implemented to the reasonable satisfaction of the affected party.

It is acknowledged by Hunter Water that there is likely to be an increase in traffic in the area because of activities associated with the dam, such as recreational use of the dam, tourism and dam maintenance. However, an assessment of road traffic noise concluded that traffic noise due to the potential increase in traffic volumes after the dam is completed is still likely to be well below the traffic noise criteria, and that it would take a doubling of traffic volumes to increase traffic noise by 3 dB.

5.9 Air quality

Four submissions [DECCW and three public] were received regarding air quality issues associated with dust emissions during the construction of the dam. The issues raised can be summarised as follows:

1 **Dust control and mitigation measures:** the DECCW submission notes that the Air Quality Impact Assessment has been undertaken in accordance with the DECCW's 'Approved Methods for the Modelling and Assessment of Air Pollutants in NSW' and notes that the proponent commits to an air quality management plan stated in the EA Report to control and mitigate dust emissions generated by wind, construction and traffic. (Section 5.9.1)

2 **Dust monitoring and community consultation:** one submission recommended that Hunter Water commit to installing dust monitoring equipment during construction to check effectiveness of dust control measures, compliance with criteria and also establish a community consultative committee. (Section 5.9.2)

3 **Dust criteria:** one submission suggested that the air quality TSP background levels be 're-rated down' from 30 µg/m3 to 15 µg/m3. (Section 5.9.3)

5.9.1 Dust control and mitigation measures

The DECCW submission notes that:

- The air quality assessment in Working Paper Volume 4 of the AE Report has been undertaken in accordance with the DECCW guideline *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW*
- No exceedances of relevant criteria are predicted at residences on privately owned land.

Hunter Water commits to design, construct, commission, operate and maintain the Project in manner that minimises or prevents the emission of dust from the Project site, including wind blown, construction generated and traffic generated dust.

To meet this commitment, as noted by DECCW, Hunter Water will prepare an air quality management plan (AQMP) that will detail a range of measures to control and mitigate dust (refer Sections 8.4 and 9 of the Air Quality Assessment, Volume 4, Working Paper J and Draft Statement of Commitments Volume 2, Appendix 1).

The AQMP will form an integral part of the construction EMP. The AQMP will adopt DECCW recommendations and consultation with DECCW will occur on the final draft of the AQMP before construction commences.

5.9.2 Dust monitoring and community consultation

The construction EMP for the dam and new Salisbury Road alignment will include the preparation of an AQMP to manage and mitigate dust emissions during construction, as stated in the previous section. Provisions for monitoring and consultation will be made within the framework of AQMP and the construction EMP and include:

- Dust monitoring at appropriately representative locations to assist in maintaining air emissions within regulatory limits
- Consultation with potentially affected residences to develop practical and satisfactory resolution of any air quality issues
- The installation of an automatic weather station (AWS) to monitor meteorological parameters as specified by DECCW. The parameters include wind speed, wind direction, sigma theta, temperature, rainfall and solar radiation.

5.9.3 Dust criteria

One submission suggested that the assumed air quality background level for TSP of 30 µg/m^3 was unacceptable and should be 're-rated down' to 15 µg/m^3. Hunter Water acknowledges that typical background TSP levels in the Tillegra area may be lower than the assumed value of 30 µg/m^3, but this value was adopted as a conservative value to ensure that the modelled emissions from construction, when superimposed on the assumed worse case background level, still complied with DECCW annual average TSP air quality criteria of 90 µg/m^3.

In effect, re-rating the background level down within a cumulative assessment would only demonstrate that the likelihood of dust pollution occurring at a distance from the construction work site, as being even more unlikely than that shown in the existing assessment.

5.10 Climate change and greenhouse gas emissions

Several submissions including an independent report commissioned by The Wilderness Society were received relating to the GHG assessment and climate change. The issues raised can be summarised as follows.

1 **Underestimation of GHG emissions:** submissions raised concerns that the GHG emissions from the Project have been underestimated. Concern was also expressed that impacts associated with methane emissions from rotting vegetation had not been investigated in the EA Report (Section 5.10.1)

2 **Failure to consider land use change in calculating methane emissions** (Section 5.10.2)

3 **Methane emissions from agricultural land use:** a concern was raised that baseline methane emissions from agriculture were not incorporated into the assessment and that a reduction in methane emissions from agriculture would offset that produced by decomposing vegetation. (Section 5.10.3)

4 **Removing mini-hydroelectric plant offset:** submissions suggested that the offset claimed from renewable energy generated by the mini-hydroelectric plant should be removed. (Section 5.10.4)

5 **Increased carbon emissions:** submissions were received stating that the dam will result in an increase in carbon emissions. (Section 5.10.5)

6 **Carbon neutrality:** submissions questioned the validity of classifying the Project as 'carbon neutral'. (Section 5.10.6)

7 **Costing of carbon emission offsets:** one submission suggested that proper costings of carbon emissions offsets needs to be considered. (Section 5.10.7)

8 **Use of outdated climate data:** submissions were received stating that outdated climate data for the Project site was used. (Section 5.10.8)

9 **Micro-climate change:** one submission suggested that the EA has failed to identify the effect of the change in microclimate due to the Project. (Section 5.10.9)

10 **Soil carbon dynamics:** one submission suggested that the EA Report should be amended to account for current understandings of the soil carbon dynamics associated with tree planting. (Section 5.10.10)

11 **Inclusion of GHG emissions from material production:** one submission stated that the EA Report should be amended to include the GHG emissions from the manufacture of materials used in the construction of the Project, particularly steel and cement. (Section 5.10.11)

12 **Future planning and GHG assessments:** one submission suggested that the full GHG impacts of dam proposals including surface emissions should be included in future planning for urban water supply across Australia. (Section 5.10.12)

13 **Carbon Pollution Reduction Scheme and reservoirs:** one submission suggested that the Australian Government should include surface reservoir emissions, particularly those from storages built after 2010, under the proposed Carbon Pollution Reduction Scheme. (Section 5.10.13)

14 **Offsetting residual emissions:** one submission suggested that the figure recommended in the working paper is significantly lower than the proponents figure in the Statement of Commitments. (Section 5.10.14)

15 **Adequacy of carbon sequestration:** one submission suggested that the National Carbon Accounting Toolbox be used to confirm that the proposed carbon sequestration in the habitat corridor is adequate to meet carbon offset objectives. (Section 5.10.15)

16 **Independent review of climate change data:** one submission suggested that an independent review of climate change information by accredited experts be undertaken to inform the use of the best available information. (Section 5.10.16)

5.10.1 Estimation of GHG emissions

Submissions were received stating that the GHG emissions associated with the Project had been underestimated. A related issue that was raised was that impacts associated with methane emissions from rotting vegetation had not been considered in the EA Report.

Estimation of GHG emissions

Both Chapter 19 of the EA Report and Working Paper F provide estimates for GHG emissions generated during the construction and operation of the proposed dam provided an indication of the contribution of the Project to climate change. Section 4.2.6 of Working Paper F provides a total for GHG emissions for Scopes 1, 2 and 3 emissions at the construction and operation stages of the Project.

Emissions have been calculated in terms of relevant direct Scope 1 emissions and indirect Scope 2 and 3 emissions using the approach outlined in the *Technical Guidelines for the Estimation of Greenhouse Emissions and Energy at Facility Level – Energy, Industrial Process and Waste Sectors in Australia* (Department of the Environment and Heritage, Australian Greenhouse Office 2007).

It should be noted that reductions in GHG emissions from the removal of dairying and cattle grazing activities from the Project site have not been included in offsetting the Project's emissions as indicated in the EA Report. The estimate is therefore considered conservative.

Exclusion of methane from GHG assessment

An independent report prepared by the ISF and attached to one of the submissions stated that methane emissions from Tillegra Dam were not considered within the EA Report, that the IPCC (2006) methodology for calculating emissions should be used and that when applied, the median estimate of emissions is calculated at 290,000 tonnes of CO_2 equivalent over 20 years based on 2,300 tonnes of methane contributing to the overall figure, converted at a ratio of 72 tonnes of methane per equivalent tonne of CO_2.

This report is also referenced by numerous submissions including several hundred form letters received from the No Tillegra Dam Group.

Decomposition of vegetation in the inundation area and the GHG emissions generated from this decomposition are discussed in Section 4.2.5 of Working Paper F. Emissions from the inundation area during operation of the proposed dam would not be required to be reported under the National Greenhouse and Energy Reporting Act 2007 as they are currently classified as land use change emissions. Notwithstanding this, it was decided to include the GHG emissions from the inundation area in the EA Report to provide a more accurate estimation of the Project's carbon footprint.

Emissions from decomposition were calculated using the National Carbon Accounting Toolbox as a foundation for the assessment. The results are summarised in Table 3 in Section 4.2.5 of Working Paper F. Use of the Toolbox is accepted current practice in Australia for such a proposal. This approach also forms part of the National Carbon Accounting System that is considered leading world's best practice in calculating land use change GHG emissions. However, this tool does not account for non-CO_2 emissions such as methane. Coupled with this, the reporting of methane emissions from the inundation area is not standard practice amongst water authorities in Australia. In addition the water industry in Australia also considers the measurement of fugitive emissions such as methane from water supplies as not being well understood at a local level and still requires further detailed investigation before being addressed as standard practice in water sector greenhouse inventories.

Nonetheless, as noted in Working Paper F, while methane emissions are an important component of the total GHG emissions from decomposition, substantial amounts are only generally produced from dams within tropical regions. Due to the cooler climate at Tillegra, it was considered that methane emissions would be minimal and impossible to estimate accurately as emissions from temperate regions are yet to be sufficiently quantified through rigorous scientific research. The potential for regional specific emissions would in fact be best identified from direct measurement in the field.

The IPCC (2006) methodologies for estimating methane emissions were considered during preparation of the EA Report. It was considered however that the adoption of such methodologies would be materially misleading as they are identified by the IPCC as only possible approaches, and that have a high degree of uncertainty and require further methodological development.

The ISF report, which formed the basis of several hundred submissions within form letters and other representations, is not considered to present a valid estimate of GHG emissions from Tillegra Dam.

5.10.2 Exclusion of land use changes in calculating methane emissions

One submission was received noting that methane produced by cattle would more than account for any methane emissions from the dam.

The submission noted that over a 20 year period 2,372.5 tonnes of methane could be expected to be produced from cattle farmed within the inundation area, and that was equivalent to the 2,300 tonnes of methane predicted to be released over 20 years from decomposing vegetation, as estimated within the prominent independent report publicly released and then subsequently submitted to DoP for consideration within the approval process for Tillegra Dam.

It is noted that the assessment of methane emissions from Tillegra Dam did not include a consideration of the baseline emissions from agricultural activities undertaken within the proposed inundation area. The assessment did not account for the cessation of these activities and replacement with an alternate source of emissions from decomposition (net emissions from land use change).

It is also noted that methane and nitrous oxide emissions from agriculture currently constitute 16.3% of the national net carbon emissions reported within the National Greenhouse Gas Inventory (Department of Climate Change 2009). Agriculture is therefore a major contributor to atmospheric emissions within the Australian emissions profile.

Research into methane emissions from cattle is currently underway by the CSIRO and most State government agricultural departments. Such research has shown that emissions from cattle can range from 270-450 g/d (Victorian Department of Primary Industry 2007).

The submission therefore highlights an important point for consideration. Hunter Water's calculations show that methane emissions from cattle would range between 1,427 and 2,379 tonnes over a 20 year period from within the inundation area and an additional amount ranging from 1,900 to 3,172 tonnes would otherwise be produced from farming activities across the proposed habitat offset corridor and National Park area.

In total, Tillegra Dam would therefore reduce methane emissions from cattle production within the Project area by between 3,330 and 5,551 tonnes over a 20 year period, accounting for or exceeding far in excess any emissions likely to be emitted from the dam. Caution however is needed to be exercised in assigning a specific level of methane emissions from cattle as emission rates can vary due to feed quality, farming technique and climate.

For example, the IPCC 2006 guidelines for calculating methane emissions from cattle from enteric fermentation vary widely from country to country, depending on a number of different attributes. The IPCC guidelines suggest that within Oceania, cattle production would produce 60-90 kg of methane emissions per head per year, with an additional rate of 29 kg per year per head assigned for manure management. Using these estimates would result in an upper estimate of 4,000 tonnes of emissions being attributable to cattle production in the Project area over a 20 year period.

Which ever method and assumptions on methane emission factors are used however, the bottom line is that the amount of methane produced by agriculture would still by far exceed methane emissions from the decomposition of vegetation, even as calculated by third parties. Construction of the dam would therefore result in a net decrease in methane emissions as opposed to that originating from the current land use.

5.10.3 Mini hydro-electricity power plant

The mini hydro-electricity power (HEP) plant was identified as a major abatement initiative with estimations of abatement potential calculated as a function of the amount of electricity the plant would contribute to the National Electricity Market. It is noted that two other HEP plants currently exist within Hunter Water's supply system (and are maintained by third party operators). The installation of a third plant is not considered to be a significant issue of concern for Hunter Water.

Submissions were received stating that the offset claimed from renewable energy generated by the mini HEP plant should be removed. The mini HEP plant was included as a key component of the Project. While an estimate of the plant's capacity has been made, this cannot be finalised with utmost certainty until such time as the Minister for Planning makes a determination on the Project. It should also be noted that the NSW Office of Water may attach conditions relating to the environmental flow regime for the dam which may also have bearing on the final capacity.

This occurs as the final design for the turbine is dependant on the size and frequency of environmental flows. Once the environmental flow strategy is set by NOW and DoP, detailed design can then be undertaken, including how the plant will be housed, and noise emissions controlled. The mini HEP plant was described as not being part of the Project in terms of assessing noise emissions within the SoundPLAN/CONCAWE model as detailed specifications for the plant are currently unknown. There is however a commitment to offset GHG emissions through the installation of a mini HEP plant and the planting of up to 1.5 million trees.

Should the Project be approved, abatement initiatives such as the plant would be included at the detailed design stages of delivery where they would be progressed through a third party engagement during procurement for the construction of the dam. Issues such as plant viability and renewable energy certificate (REC) ownership would form part of the procurement negotiations to ensure offsets are legitimately claimed and that they are not accounted for twice. It is expected there would be a requirement to report to DoP periodically to demonstrate the advancement of the offsetting proposal and how the construction of the dam is tracking towards achieving the objective of carbon neutrality. The considerations relevant to the formation of a corporate/private partnership to deliver the plant and the contractual arrangements relevant to return on capital and distribution of RECs do not form part of the planning approval process.

5.10.4 Increased carbon emissions

Submissions were received stating that the dam would result in an increase in carbon emissions. Sections 4.1-4.5 in Working Paper F address the Project's GHG emissions.

Working Paper F acknowledges that the Project would result in the generation of GHG emissions. Section 4.2 outlines the GHG emissions profile for the Project for both construction and operation scenarios. As a baseline scenario was not assessed within the EA Report to consider potential net changes in emissions from land use change, and with the exception of methane data from cattle production presented within this document, any net increase/decrease in GHG emissions cannot be reported. However, the Project's emissions are considered to be within the normal bounds in comparison to relevant emissions profiles in this sector.

5.10.5 Information on targets and timing

A submission raised a concern that Working Paper F claims to present information regarding targets and timing which it does not deliver.

Sections 4.1.3, 4.1 and 4.4 of Working Paper F address the Project's GHG emissions. Table 5 in Section 4.4 provides a summary of the offsetting initiatives including reduction targets for each offsetting initiative and a timeframe (25 year scenario).

5.10.6 Carbon neutrality

Submissions raised concerns that classifying the Project as 'carbon neutral' is inappropriate and that Hunter Water does not have control over final carbon neutrality. A submission also stipulated that the mitigating and carbon offset initiatives needed to be implemented to ensure Hunter Water achieves carbon neutrality for the Project. Another submission asserted that all actions towards building Tillegra Dam should be halted until the existing carbon neutral strategy is revisited.

The Project's approach to becoming carbon neutral is addressed in Chapter 2 of the EA Report and in more detail in Sections 4.1 – 4.5 in Working Paper F. As stated, the Project aims to achieve carbon neutrality within 25 years, and a substantial contributing manner in which this will be achieved is carbon sequestration from tree plantings. The advice received from the NSW Department of Primary Industries Forest Science Centre is that final equilibrium carbon of the tree biomass is predicted at about 500 t CO_2-e ha^{-1} with 50% of this captured at a fairly linear rate in the first 25 years and 90% within 100 years. This means that the total carbon sequestered by the Project over the longer tem, with the operation of the mini HEP plant and once the forest in the corridor reaches maturity, would be 826,000 tonnes.

Excess carbon sequestered by the Project over time would be used by Hunter Water to acquit against general corporate emissions from other activities outside those relevant to the construction work for the Tillegra Dam project. This would allow Hunter Water to proactively account for all of its emissions and work towards a carbon neutral future.

It is noted that there is currently no standardised approach regarding carbon neutrality and industry practice in carbon neutral strategies in the water sector generally only cover energy and electricity consumption not fugitive emissions as is the case for the Project. Hunter Water is therefore developing an approach based on leading best practice. The carbon neutral strategy is intended to be further developed and built upon as more accurate information pertaining to the Project's GHG emissions profile, viable GHG abatement and offsetting activities becomes available. This is indicated in Section 4.1.3 of the EA Report that states that preliminary reduction targets are established in the EA Report. Hunter Water agrees that the carbon abatement and offsetting initiatives need to be implemented in order to neutralise GHG emissions.

The carbon neutral strategy is captured in the sustainability assessment framework discussed in Chapter 2 of the EA Report where progress toward reducing and therefore neutralising GHG emissions will be measured and reported using sustainability indicators (Table 2.2, Chapter 2). This measurement and reporting process will enable the carbon neutral strategy to be reviewed and updated. Chapter 2, Section 2.3.6 states that Hunter Water has committed to annual reporting and reviewing of those key indicators relevant during the construction and operation phases of the Project. This would include the indicator pertaining to GHG emissions reductions. Further, Section 4.5 of Working Paper F states that the *National Greenhouse and Energy Reporting Act 2007* should guide GHG assessments and Hunter Water's reporting obligations. These reporting requirements will enable Hunter Water to update its carbon neutral strategy to reflect its reportable emissions profile.

It should be noted that developing a carbon neutral strategy is a voluntary initiative being undertaken by Hunter Water. Currently there is no national emissions trading scheme and Hunter Water is currently operating within a policy vacuum prior to national debate being settled on a trading scheme or an alternate process. It is noted that at this time implementing a carbon neutral strategy is not mandated under legislation or regulation and is not a DGR for this Project. It is also noted that the offsetting strategy proposed for this project may need to be modified (with consent concurrently being sought from DoP) in order to comply with any law passed in the near future by the Commonwealth government related to any proposed carbon pricing mechanism.

5.10.7 Cost of emissions offset

A submission was received stating that proper costing of GHG emissions offsets needs to be considered. Sections 4.3 and 4.4 in Working Paper F addresses the Project's GHG emissions.

GHG abatement or offsetting activities proposed as part of the Project have been costed and were included in the total budget estimate used in the CEA. The selection and implementation of other abatement or offsetting

activities based on financial imperatives is a business decision that would be undertaken by Hunter Water outside of the planning approval process.

5.10.8 Use of outdated climate data

Submissions were received stating that outdated climate data for the Project site was used. Section 19.3 of the EA Report addresses climate change. This used data sourced from two government reports for climate change projections: the *Climate Change in Australia–Technical Report* (CSIRO and Bureau of Meteorology 2007) and *Summary of Climate Change Impacts–Hunter Region* (NSW Department of Environment and Climate Change 2008).

The projections in CSIRO and Bureau of Meteorology (2007) state that precipitation is expected to increase in daily intensity with heavy precipitation events in summer and autumn, and longer dry spells. The projections in NSW Department of Environment and Climate Change (2008) report state that rainfall will change with wetter summers and drier winters. It should be noted that at the time of preparing the environmental assessment these two reports were the best publicly available state government endorsed reports for climate projections for the Project site.

5.10.9 Microclimate change

A submission raised concerns that the environmental assessment failed to identify the effect of the change in microclimate due to the Project.

Microclimate impacts were not considered in the assessment. Although there is some academic literature on possible microclimate changes from the construction of dams (Oh *et al* 2004; Jianbo *et al* 2004), understanding and measuring the impacts is still in its infancy. It is noted that a study of potential impacts on the microclimate was not required by the DGRs for the Project and is typically not included in other related environmental assessments.

It is noted that the most likely change to the immediate microclimate of the dam locality would relate to surface evaporation and humidity. It is noted however that the area is in a high rainfall area and substantive impacts of any note are not considered likely. The microclimate in the vicinity of the dam is likely to be similar to that at Chichester Dam, which is not considered to have had an adverse environmental impact on the immediate environment.

5.10.10 Soil carbon dynamics

A submission was received stating that the EA Report should be amended to account for current understandings of the soil carbon dynamics associated with tree planting.

Section 4.4.1 of Working Paper F addresses carbon sequestration through tree planting. While not explicitly discussed in Working Paper F, soil carbon dynamics were considered in the development of the carbon sequestration rate outlined in Table 5.

In determining carbon sequestration the NSW Department of Primary Industries (2009) advised that ideally soil samples would be taken from the pasture and remnant forest patches at Tillegra to assess any likely change to soil carbon on conversion from pasture to forest. However, for the purposes of the EA carbon sequestration, they recommended that a potential rate of 130-200 tCO_2 ha^{-1} be adopted. This was expected to fall by 10-15% during site establishment but would be expected to recover within 10-15 years.

5.10.11 Inclusion of emissions from material production

Submissions stated that the EA Report should be amended to include the GHG emissions from the manufacture of materials used in the construction of the Project, particularly steel and cement. Section 4.2 of Working Paper F outlines the scope of the Project's GHG emissions.

The GHG emission estimates for the Project have been based on the Commonwealth Government's technical guidelines and standards, *Technical Guidelines for the Estimation of Greenhouse Emissions and Energy at a Facility Level - Energy, Industrial Process and Waste Sectors in Australia* (Department of the Environment and Heritage, Australian Greenhouse office 2007). These guidelines do not require a GHG inventory to include estimation of emissions from the manufacturing of construction products. Further, the *National Greenhouse and Energy Reporting Act 2007* does not require the inclusion of emissions from construction material production in the dam GHG inventory.

The emissions associated with production processes of, for example, concrete and steel should be captured by third parties such as manufacturers of such products under the *National Greenhouse and Energy Reporting Act 2007*. Therefore the inclusion of GHG emissions associated with manufacturing processes in the estimation of the Project's emissions profile is considered to be double counting.

Also as there is no standardised approach for the development of carbon neutrality strategies, there is no requirement to include a life-cycle assessment of construction materials in the Project GHG emissions profile that will be offset by the carbon neutral strategy.

5.10.12 Future planning and GHG assessments

A submission suggested that the full GHG impacts of dam proposals including surface emissions should be included in future planning for urban water supplies across Australia. Working Paper F outlines the scope of the Project's GHG emissions.

The issue of considering surface emissions in future planning for urban water supplies across Australia is outside the scope of the environmental assessment and considered to be a matter for future policy debate on climate change assessment.

5.10.13 Carbon polluting reduction scheme and reservoirs

A submission was received stating that the Australian Government should include surface reservoir emissions, particularly those from storages built after 2010, under the proposed Carbon Pollution Reduction Scheme. Working Paper F outlines the scope of the Project's GHG emissions and the national greenhouse legislative obligations.

This issue of including surface reservoir emissions under the proposed Carbon Pollution Reduction Scheme is outside the scope of the EA Report. Should the Australian Government include surface emissions from water storages under any proposed carbon pricing mechanism, Hunter Water would revise any aspect of the current offsetting proposal to ensure that the Tillegra Dam project complied with the scheme.

5.10.14 Offsetting residual emissions

A submission suggested that the figure recommended in the working paper for tree planting is significantly lower than the proponents figure in the Statement of Commitments. Working Paper F outlines the estimation of the Project's GHG emissions and offsetting approach.

Table 5 of Working Paper F states that a total of 331,800 trees would be required to be planted to offset the GHG emissions from the construction and operation of the Project. The 1.5 million trees stated in the Statement of Commitments was the original estimation of trees required to be planted prior to the GHG assessment being completed.

5.10.15 Adequacy of carbon sequestration

A submission suggested that the National Carbon Accounting Toolbox be used to confirm that the proposed carbon sequestration in the habitat corridor is adequate to meet carbon offset objectives. Working Paper F outlines the estimation of the Project's GHG emissions and offsetting approach.

As outlined in Section 4.2.5 of Working Paper F the National Carbon Accounting Toolbox was used as a foundation to estimate the GHG emissions from the decomposition of vegetation in the inundation area. The National Carbon Accounting Toolbox was also used, along with expert advice from the I&I NSW (NSW Forests Centre) to inform the carbon offset approach outlined in Section 4.4.1 of Working Paper F.

5.10.16 Independent review of climate change data

A submission suggested that an independent review of climate change information by accredited experts be undertaken to inform the use of the best available information. Section 19.3 of the EA Report addresses climate change and was peer reviewed by an independent expert.

Chapter 19 uses data sourced from two government reports for climate change projections: *Climate Change in Australia–Technical Report* (CSIRO and Bureau of Meteorology 2007) and *Summary of Climate Change Impacts–Hunter Region* (NSW Department of Environment and Climate Change 2008). At the time of preparing the environmental assessment these two reports were the best publicly available State government endorsed reports for climate projections for the Project site.

5.11 Sustainability

Several submissions were received relating to sustainability. The issues raised are summarised as follows:

1 **Sustainability issues not addressed:** submissions raised concerns that sustainability issues have not been adequately addressed (Section 5.11.1)

2 **A sustainable development:** one submission stated that the EA Report fails to establish the proposal as a sustainable development (Section 5.11.2)

3 **Sustainability principles:** submissions stated that important sustainability principles are not demonstrated in the EA Report and that the report fails to promote sustainability principles (Section 5.11.3)

4 **Intergenerational equity:** submissions suggested that there was inadequate treatment of intergenerational equity (Section 5.11.4)

5.11.1 Sustainability issues have not been addressed

Submissions were received suggesting that sustainability issues have not been adequately addressed in the EA Report. Chapters 2, 20 and 21 addresses sustainability issues for the Project.

Chapter 2 discusses sustainability issues relevant to the Project and provides a preliminary sustainability assessment framework through which these sustainability issues will be addressed. The process for developing the sustainability assessment framework for the Project has been based on a review of international and domestic policy and legislation pertaining to sustainability issues as well as other sustainability assessment models and the infrastructure sustainability literature (Chapter 2, Sections 2.1, 2.2).

Sustainability issues specific to the Project are addressed in the sustainability assessment framework through the various categories (Chapter 2, Section 2.3). Section 2.3 gives an indication as to how the sustainability assessment framework may operate in practice including how indicators might be measured. The measurement of the various indicators will assist Hunter Water in understanding and addressing the various sustainability issues across the Project cycle, as well adapting the sustainability assessment framework as the Project develops and more information becomes available.

5.11.2 A sustainable development

A submission was received stating that the EA Report fails to establish the proposal as a sustainable development. Section 21.6 of the EA Report addresses the Project with respect to sustainability principles.

It is acknowledged that achieving sustainable development is challenging and many factors across economic, social and environmental parameters need to be considered, including where trade-offs are to be expected for example between securing water supply and impacts on biodiversity. This challenge of trade-offs is highlighted in NSW legislation where ecologically sustainable development is often one of a number of objects to be considered, some of which may be competing (see for example the various objects in Section 5A of the EP&A Act). As a means of addressing this challenge, Section 21.6 of the EA Report uses the following ecologically sustainable development principles from the *Protection of the Environment Administration Act 1991* to assess the Project and highlight how it can contribute to the goal of sustainable development.

Intra and intergenerational equity

The Project is a means of safeguarding current and future generations against potential water shortages and associated social and environmental impacts. Various avoidance, minimisation, mitigation and offset measures would be implemented to address potential environmental impacts to ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations.

The precautionary principle

The Project has been assessed using specialist advice on potential environmental impacts based on best available technical information. This has been coupled with the adoption of best practice environmental standards, goals and measures in developing mitigation measures to minimise the risks associated with potential environmental impacts.

Conservation of biological diversity and ecological integrity

It is acknowledged that the Project would impact on biodiversity for example on native vegetative communities and on connectivity in the Williams River. Various avoidance, minimisation, mitigation and offset measures would be implemented to address these and other potential impacts to maintain biological diversity and ecological integrity.

Improved valuation and pricing of environmental resources

Values placed on environmental resources potentially affected by the Project were established through a combination of Project-specific studies and through stakeholder consultation. The extent of avoidance of impacts upon important environmental and social attributes and the application of extensive mitigation and management measures reflects a significant consideration of the value of environmental resources in a non-monetary sense.

Stakeholder participation

Effective consultation has been and would continue to be an important element of the Project. A key vehicle for this was the Tillegra Dam Community Reference Group established by Hunter Water in early 2007. Further, the sustainability assessment framework outlined in Chapter 2 would be reviewed and updated in consultation with relevant Project stakeholders (Section 20.2 of the EA Report). This would ensure that on-going sustainability initiatives and activities are underpinned by stakeholder participation.

5.11.3 Sustainability principles

Submissions were received claiming that important sustainability principles were not demonstrated in the EA Report and that the assessment failed to promote sustainability principles.

These claims are not considered to be substantiated. Chapters 2 and 21, and Section 21.6 of the EA Report explicitly consider the Project with respect to sustainability principles.

A sustainability assessment framework was developed to assist the Project realise its sustainability goals. Sustainability principles are considered essential to this framework. Chapter 2 discusses how sustainability principles are integrated into the sustainability assessment framework. Sustainability principles are labelled 'sustainable development themes' within the framework. Each theme is addressed using various sustainability categories and indicators to be measured across the life of the Project. Table 2.2 in Chapter 2 highlights the relationship between the sustainable development themes and other components of the framework.

It is important to note that the sustainability assessment framework is in its preliminary phases of development and would be further developed as the Project progresses. This is important because the sustainability issues vary across various stages of Project delivery. It is therefore important to have a framework that is developed using a dynamic, iterative process that includes a process for stakeholder participation and continuous improvement (refer Section 20.2). Section 21.6 analyses the justification of the Project using sustainability principles.

5.11.4 Intergenerational equity

Some submissions suggested that there was inadequate treatment of inter-generational equity.

Chapters 2 and 20, and Section 21.6 of the EA Report address the issue of inter-generational equity. Chapter 2 (refer Table 2.2 in particular) demonstrates how sustainability principles are integrated into the sustainability assessment framework, including the principle of inter-generational equity.

Section 21.6 assesses the Project using sustainability principles. With respect to intergenerational equity, the Project is a means of safeguarding current and future generations against potential water shortages and associated social and environmental impacts. Various avoidance, minimisation, mitigation and offset measures would be implemented to address potential environmental impacts to ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations.

5.12 Landscape and visual amenity

Some respondents commented that the Project would result in a loss of rural amenity and aesthetic value of the Dungog area. It is acknowledged that appreciation of visual amenity is subjective and an individual preference. The observation is made however, that rather than a loss (in general), there would instead be a change in visual amenity, particularly with respect to the storage water body.

The EA Report acknowledges that Tillegra Dam would inundate existing rural land, reducing the rural amenity of the area. The water impounded behind the dam would fill the valley creating a significant water body with an area of approximately 2,100 hectares. As indicated in the EA Report, the preferred operating strategy for Tillegra Dam is to maintain the storage water level between 90% and 100% of FSL for the majority of the time therefore this would become an essentially permanent feature in the landscape.

As part of the Project, it is proposed to provide a variety of infrastructure around the storage, generally centered on the three precincts identified in the draft Integrated Land Use Plan (Working Paper N). These would also introduce new elements into the landscape together with other elements such as the new section of Salisbury Road, the new Bendolba RFS station, etc.

Research has found that waterbodies in an area improve visual amenity. The NSW Planning and Environment Commission (1977) found that in general, naturally vegetated, agricultural lands and water bodies of high

recreational potential were perceived as positive landscape elements. This is also supported by a study by Purcell and Lamb (1998) that identified naturalness of the scene, scale and extent of the view, topographic variation and the presence of water as physical attributes related to experiences of attractiveness and preference.

The EA Report acknowledges the relatively greater impact of the dam wall, spillway and related infrastructure compared to the storage water body. Section 15.6 of the EA Report identifies that the residences to the east of the dam wall within a distance of approximately three kilometres would have views of the dam wall and spillway with the level of visibility at individual residences dependent on intervening topography and vegetation.

As indicated in Section 15.9.3 of the EA Report, it may be necessary to provide screening planting to mitigate visual impacts at any or all of the residences identified in Table 15.1. Planting would be provided for these residences where there is no existing visual screening or where vegetation is inadequate to provide sufficient screening. The types and/or number of trees that would be provided for screening of each residence would be progressed through consultation with individual property owners during the exhibition period or at anytime requested by the property owners. Hunter Water would maintain screening plantings until they were established.