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# 21. AIR

## 21.1 Construction Dust

A number of issues were raised in regard to dust emissions associated with construction. The following sections provide responses to dust impact related issues.

The air quality impact assessment prepared for the EIS includes air dispersion modelling for a range of activities which may be expected to occur at some time during construction. However, due to a range of assumptions and operational differences between the concept and detailed work methods, the model may not predict precise construction dust levels from the works. The purpose of the assessment was to assist in identifying potential issues which would require further investigation and air quality management measures as the project develops.

### 21.1.1 Dust Emission Inventory

Issues regarding the dust emissions inventory were raised, asserting the methodologies were incorrect, the scope was too narrow, did not consider 24 hour operation of the RCC concrete batch plant, or wind blown dust. These issues are addressed in the dot points below.

- dust emission estimations have been calculated in accordance with the National Pollutant Inventory *Emission Estimation Techniques for Mining, version 2.3* (NPI, 2001) and the USEPA *Compilation of Air Pollutant Emission Factors.* Both these methodologies are considered industry standard;
- RCC Batch plant operation – RCC batch plant operations have been modelled to occur 24-hours per day. Refer to Appendix F-7.1 of the EIS for a full emissions inventory;
- wind blown dust – modelling assumed wind blown dust as a source of emission for 8 hours each day. Analysis of diurnal wind flow patterns indicates that wind speeds decline dramatically during night-time hours and wind blown dust is generally not an issue at this time; and
- the dust assessment has included the major emissions sources identified to date.

It should also be noted that there is a discrepancy in the EIS with respect to respite periods during night-time hours. Table 10.6 of the EIS indicates a 3 month respite period, while Section 10.2.1.2 indicates a 1 month respite from night-time RCC Dam wall construction works – it should also read 3 months. It should be noted that this is only indicative and is subject to detailed construction planning.

### 21.1.2 Performance Goals Not Defined

Submissions raised the issue that performance goals had not been defined for the construction works.

EPP (Air) goals relevant to the Project are described in Section 10.1.1.1 of the EIS. The air quality performance targets, detailed in Table 10.1 and Table 10.13, are based on these EPP (Air) goals. These tables are reproduced below.

**Table 21-1 Summary of Project Air Quality Goals (Table 10.1 of the EIS)**

| Pollutant | Construction Air Quality Goal | |
|---|---|---|
| | Aim to Achieve | Not to exceed |
| Particles as $PM_{10}$ | 50 μg/m$^3$ (24 hour average) | 150 μg/m$^3$ (24 hour average)<br>50 μg/m$^3$ (Annual average) |
| Total Suspended Particles | - | 90 μg/m$^3$ (Annual average) |
| Particle Deposition | 120 mg/m$^2$/day | - |

**Table 21-2 Air Quality Performance Targets for Construction Works (Table 10.13 of the EIS)**

| Pollutant | Performance Target | | |
|---|---|---|---|
| | Aim to achieve | Not to exceed | Recommended Trigger level [1] |
| Particles as $PM_{10}$ | 50 µg/m$^3$ (24 hour) | 150 µg/m$^3$ (24 hour)<br>50 µg/m$^3$ (Annual average) | 500 µg/m$^3$ (20 minute) for total particulate matter |
| Particle Deposition | 120 mg/m$^2$/day | - | - |

[1] Review construction activities and sources of dust generation to limit the potential for impacts to receivers

### 21.1.3 Background Air Quality and Cumulative Dust Impacts

A submission stated that ambient air quality needed to be considered when developing performance goals. The reason why background air quality was not included was that there is no publicly available ambient air quality monitoring data in the study area. The closest EPA monitoring site located at Mountain Creek, approximately 50 km south east of the project, near Maroochydore. This station records $PM_{10}$ concentrations and are likely to represent a conservative estimate of ambient concentrations for the Project site due to its proximity to the Sunshine Motorway.

Modelling results are presented in Section 10.2.1.5 of the EIS and show modelled 24-hour $PM_{10}$ impacts to be in the order of 120 µg/m$^3$ When considering a background 24 hour $PM_{10}$ concentration of 24 µg/m$^3$ (Section 10.1.4 of the EIS), construction dust concentrations are likely to approach (and may exceed) the EPP (Air) goal of 150 µg/m$^3$ at residences closest to the works, generally within the Project area boundary. Modelled $PM_{10}$ concentrations exceeding the NEPM goal of 50 µg/m$^3$ may occur within distances of approximately 500 m from the main excavation, material handling, and site haul roads. The level of exceedance would be dependent on the proximity of works to receiver areas and management controls incorporated. The management of dust emissions from construction activities and fugitive sources around the site is therefore an important component of the Project

Modelling results indicate that annual average TSP concentrations are well below the EPP (Air) goal of 90 µg/m$^3$ at locations outside of the Project area boundary and at locations more than around 500 m from the areas of construction activity. It is likely that impacts would still be below the criteria even including background concentrations of TSP. However, this would need to be confirmed using site specific monitoring data when it becomes available.

### 21.1.4 Dust Mitigation

Issues were raised that the EIS provided inadequate dust mitigation methodologies and complaint management handling. These issues are addressed in Section 10.2.7 of the EIS, which outlines a framework for Air Quality Management during construction. It provides a commitment to an iterative approach to dust management, involving monitoring, community notification, complaint investigations and work modifications to ensure proactive dust management. Table 10.12 of the EIS outlines air quality mitigation measures and management approaches for specific components of the construction works. The EIS also indicates that these measures would form the basis of a detailed construction Air Quality Management Plan which would be prepared and implemented by the Construction Contractor(s) and would be specific to the proposed work methods. It identifies community complaints as a key trigger in initiating further investigation and modification to site work practices.

Another issue raised was that the EIS advises modelling included strict dust management controls for the crushing and concrete batch plants, but these measures were not described. The emission estimation assumptions made as part of the dispersion modelling assessment are provided in Section 10.2.1.3 of the EIS. In addition, Table 10.4 of the EIS indicates that emission factors for concrete batching plants included fabric filters on silo transfers, watering of aggregate stockpiles and maintaining clean paved areas around the plant. Section 10.2.7.1 of the EIS indicates that specific air quality impact assessments for crushing, screening, concrete batching and quarrying would be undertaken as part of subsequent Development Approvals for each of the Environmentally Relevant Activities (ERA). Further management controls specific to the ERAs are provided in Chapter 7 of the Supplementary Report.

### 21.1.5 Dust Impacts and Community Engagement

Air quality monitoring, visual inspections and community complaints would be key triggers in initiating further investigation and modifications to work site practices. Dust management plans based on this model have been successfully implemented to minimise dust emissions and effectively manage community impacts from similar construction projects. Community engagement, including feedback and complaints response system in relation to Project construction issues have been discussed in Chapter 30 of the Supplementary Report, and would be utilised to engage to community regarding construction dust impacts.

## 21.2 Greenhouse Gas Emissions

A number of issues were raised by submissions, action groups and agencies in regard to greenhouse gas emissions (GHG) associated with the project. The following sections provide responses to GHG emission related issues.

### 21.2.1 Embodied Greenhouse Gas Emissions

Issues regarding the embodied GHG emissions associated with concrete used for Dam construction were raised. The submissions indicated that excluding these emissions from the analysis would result in an underestimation of GHG emissions associated with the project.

The reason these emissions were not included in the original report was because embodied GHG emissions associated with cement manufacturing for dam construction are considered by the Department of Climate Change (2008a) to be Scope 3 emissions i.e. indirect emissions which are the consequence of organisations actions but are not from source owned or controlled by that organisation. The emissions associated with the cement manufacturing would be captured under the organisation that directly produces the cement. Reporting Scope 3 emissions is voluntary under the National Greenhouse and Energy Reporting System (NGERS) (DCC, 2008b) regulations. However, it is acknowledged from a greenhouse gas assessment perspective, that without the dam project the concrete would not be required and the associated energy use and greenhouse gas emissions associated with the production of the concrete would not occur. As such the $CO_{2-e}$ emissions have been calculated here to address issues raised by the submissions.

Building the dam would require 110,000 tonnes of cement for dam wall construction, and 5,100 tonnes for road construction (refer to Section 4 of the EIS). The *National Greenhouse Accounts (NGA) Factors* (DCC, 2008a), which updates and replaces the *AGO Factors and Methods Workbook* (AGO, 2005), estimates that 0.534 tonnes of $CO_{2-e}$ are emitted for every tonne of cement clinker produced. A total of 115,100 tonnes of cement would be required for the project, which equates to approximately 61,463 tonnes $CO_{2-e}$ being emitted (refer to **Table 21-3**).

**Table 21-3 Scope 3 GHG Emissions Associated with Cement Manufacturing**

| Cement Use | Tonnes | Scope 3 $CO_{2-e}$ Emissions (tonnes) |
|---|---|---|
| Dam wall construction | 110,000 | 58,740 |
| Road construction | 5,100 | 2,723 |
| **Total** | **115,100** | **61,463** |

The production of flyash has not been considered in this assessment as flyash will be sourced as a recycled waste product from power generation.

Aggregate would also be required to mix with cement. The EIS considers a range of aggregate supplies, including from the dam site, Meadvale Quarry and Moy Pocket Quarry. Approximately 779,500 $m^3$ of aggregate would be needed for dam construction (with the worst case scenario involving transporting 100% of aggregate from a quarry remote from the site, refer to Section 4 of the EIS). This volume of material roughly equates to 1,481,050 tonnes (assuming 1.9 tonnes per cubic meter). The construction methodology will seek to optimise material sources at the dam site, significantly reducing haulage fuel consumption.

As detailed materials investigations will be conducted as part of the detailed dam design, no work method statement is available for the various quarrying operations. As such, the emission estimate has been based on energy consumption from typical quarrying operations with quarry product being sold as aggregate for either concrete or asphalt production. An assessment of energy consumption and associated GHG emissions was undertaken to reflect the expected extraction at Moy Pocket / Meadvale Quarry. **Table 21-4** provides an overview of the expected potential emission calculation for aggregate quarrying for the project. It is estimated that approximately 6,540 tonnes of $CO_{2-e}$ would be emitted due to quarrying.

It should be noted that the quarrying method employed at Moy Pocket / Meadvale Quarry and equipment used for product extraction and processing may differ when compared to the assumption used made here, and as such the calculated GHG emissions presented should be used as a guide only.

**Table 21-4 GHG Emission Estimation Associated with Quarrying for Aggregate at Moy Pock / Meadvale**

| Fuel Type | Quantity Required (tonnes) | Units | Emission Factor | $CO_{2-e}$ Emissions (tonnes) |
|---|---|---|---|---|
| Explosives | 183 | tonnes | 0.18 t $CO_{2-e}$/t explosive | 33 |
| Electricity | 4,040,802 | kWh | 1.04 kg $CO_{2-e}$/kWh | 4,202 |
| Diesel | 795 | kL | 2.9 t $CO_{2-e}$/kL | 2,305 |
| Total | | | | **6,540** |

### 21.2.2 GHG Emissions Associated with the Northern Pipeline Interconnector

The Northern Pipeline Interconnector will connect dams, weirs and other water storages, and move water between Caboolture and the Sunshine Coast. The pipeline will link existing and potential future water sources throughout the Sunshine Coast. The pipeline itself is not part of this project, and was not assessed as part of the EIS.

Issues have been raised in submissions regarding potential GHG emissions associated with construction and operation of these pipelines.

A detailed assessment of the Northern Pipeline Interconnector will be prepared separately by the pipeline proponent. The TOR specify that the EIS for the pipeline project must consider impacts on air quality from gaseous emissions including carbon monoxide and nitrogen oxides from pump stations, as well as GHG and ozone emissions.

In relation to operation of the pipeline, since releasing the Traveston Crossing Dam EIS, updated information has become available that identifies if all treated water was supplied using the full length of the Northern Pipeline Interconnector to end users, energy consumption would be approximately 1.67 MWh/ML (Kellogg Brown & Root, 2008).

### 21.2.3 GHG Emissions from the Dam

The EIS presented several methods estimating GHG emissions ($CO_2$ and methane) following the inundation of vegetated land. One method presented was based on IPCC suggested methodologies provided in the *National Greenhouse Gas Inventories: Volume 4* (IPCC, 2006). The other used the *AGO's National Accounting Toolbox*. The results varied widely, as such QWI commissioned an additional review into GHG emissions from dams and impoundments through Blumfield (2008) (refer to Appendix C17).

The review concluded that there is currently a limited amount of literature on subtropical reservoirs and GHG emissions. The significant variations in GHG emissions from reservoirs in both tropical and temperate conditions are the result of very specific sets of circumstances at each storage location, which are not applicable to water storage in a sub-tropical climate. These circumstances include the combination high temperatures and large amounts of organic matter in tropical reservoirs, while temperate reservoirs experience frozen conditions.

Factors which influence emissions include sediment trapping efficiency (resulting in carbon capture), topography of the storage (deeper storages can produce greater emission as a result of water pressure), storage size, upstream land activities, stream size and gradient feeding the reservoir, flood frequency, and proximity to wetlands.

The variety of uncertainties associated with $CO_2$ storage in reservoirs is referred to by Cole et al (2007) who define inland waters (rivers, streams, lakes, reservoirs, estuaries, swamp and wetlands) as active components of the global carbon cycle that store terrestrially-derived carbon in sediments and lose $CO_2$ as emissions to the atmosphere. These emissions were estimated to vary from site to site and included emissions from rivers and streams, naturally occurring lakes and man-made storages.

### 21.2.4 Climate Classification of the Area and Associated $CO_2$ Dam Emissions

The discussion in **Section 21.2.3** concluded that current literature and emission estimation techniques could not accurately predict GHG emissions associated with inundated land. As such further investigation in to the matter of climate classification and its influence on predicted GHG emission rates has not been included.

### 21.2.5 Comparison with Alternative Strategies

Issues were raised in submissions claiming that the EIS did not assess the proposal against other alternatives and their relative energy consumptions, and thus GHG emissions. Alternative strategies were assessed in the *Review of Water Supply Demand Options for South-East Queensland, February 2007* (Turner et al., 2007) and *South East Queensland Regional Water Supply Strategy – Energy Consumption Discussion Paper* (Kellogg Brown & Root, 2008). These alternatives included demand management options, desalination plants, indirect potable reuse, surface water and other dam locations. This information was presented as costs and net greenhouse gas emissions and has been used to inform the project. The EIS has considered this study in the comparison of alternatives in Chapter 2, section 2.4. Power demand and energy intensity comparisons have been made in some of the cases which have been considered in the overall justifications of the project.

An analysis of the comparative GHG emissions produced by the Project in comparison to a desalination plant located on the coastal areas north of Brisbane was conducted by Marsden Jacob (2008). This analysis concluded that a desalination plant would produce significantly more greenhouse emissions over the life of the Project. Consistent with the economic analyses undertaken for the EIS, GHG emissions were streamed over a 50 year period. The annual emissions were then discounted using a 4% real discount rate, to derive a present emission. This annual emission was divided by the predicted output (i.e. 70,000ML/a post construction) to derive a levelised volume of GHG emissions per ML of output over the 50 year evaluation period. Refer to **Table 21-5** and **Table 21-6** for calculated GHG emission rates.

**Table 21-5 Operational GHG Emissions – Traveston Crossing Dam (Marsden Jacob, 2008)**

| Component | Energy Consumption | $CO_{2-e}$ Emission Rate (tonnes) | |
|---|---|---|---|
| | (MWh/ML) | Annual | Per ML |
| Dam Operations | | 1,000[1] | 0.02 |
| Water intake pump station | 0.32 | 23,296 | 0.33 |
| Water Treatment Plant | 0.43 | 31,304 | 0.45 |
| Transmission | 1.61 | 117,208 | 1.67 |
| **Total Operational Emissions** | **2.36** | **172,808** | **2.47** |

Note: Rounding errors may occur.

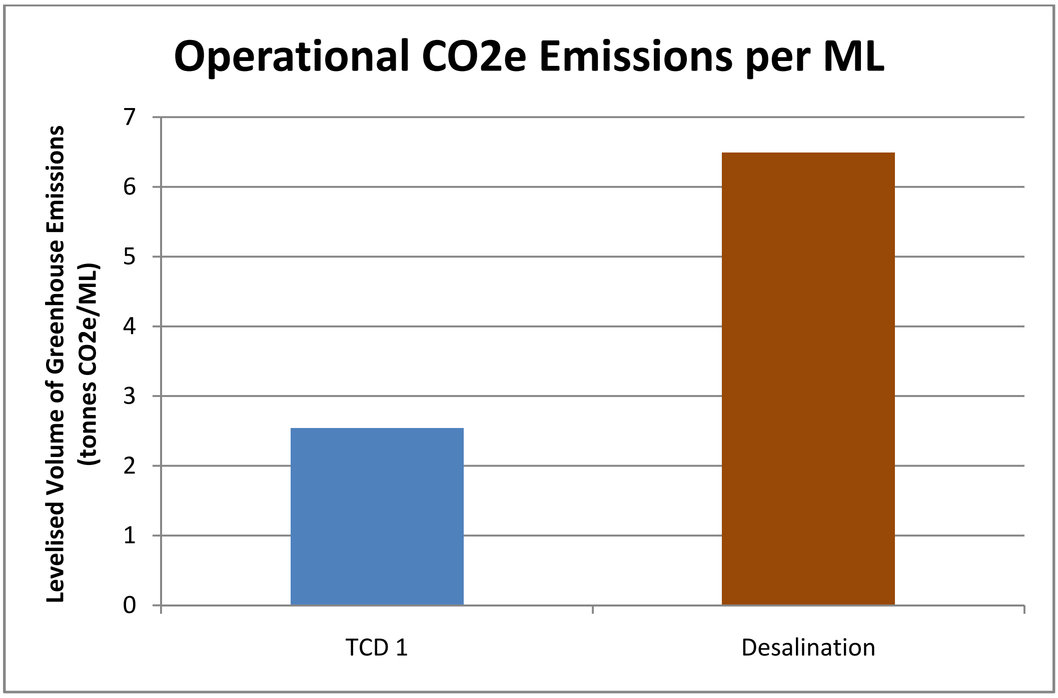
**Table 21-6 Operational GHG Emissions – Desalination (Marsden Jacob, 2008)**

| Component | Energy Consumption | $CO_{2-e}$ Emission Rate (tonnes) | |
|---|---|---|---|
| | (MWh/ML) | Annual | Per ML |
| Desalination Plant | 5.1 | 371,280 | 5.34 |
| Transmission | 1.1 | 80,080 | 1.15 |
| **Total Operational Emissions** | **6.1** | **451,360** | **6.50** |

Note: Rounding errors may occur.

[1] The Marsden Jacob (2008) report estimates that 1,000 tonnes CO2-e be emitted due to dam operation. This figure is considered the most up to date estimate available. It is noted that EIS stated that 1,045 tonnes CO2-e be emitted due to dam operations, which was the most reliable estimate at the time of writing, but has since been updated with reference to Marsden Jacob 2008.

**Figure 21-1 - Operational Emissions of GHG for TCD vs Desalination (Marsden Jacob, 2008)**




For the Project, the majority of the emissions are attributable to pumping water to and from the Water Treatment Plant (0.33 tonnes of $CO_{2\text{-}e}$/ML), treatment (0.45 tonnes/ML) and transmission through the Grid (1.67 tonnes of $CO_{2\text{-}e}$/ML), with emissions associated with the dam operations accounting for less than 1% (0.02 tonnes of $CO_{2\text{-}e}$/ML). The dam operations emissions are associated with the drawdown/fill sequences of the dam.

For the desalination option, over 82% of the volume of emissions (5.34 tonnes of $CO_{2\text{-}e}$/ML) is associated with the production of desalinated water, with the remainder (1.15 tonnes of $CO_{2\text{-}e}$/ML) associated with the transmission of the water.

In summary, the volume of emissions from the desalination plant is estimated to be around 2.5 times higher than the emissions associated with water delivered from the Project.

Over the 50 year period of the analysis, total emissions from the desalination plant (43.3 million tonnes) are estimated to be around 26.7 million tonnes of CO2e higher than those from Traveston Crossing Dam (16.6 million tonnes) for an equivalent volume of water delivered into the SEQ Water Grid at a similar location.

Refer to **Section 21.2.24** for a discussion on energy consumption by the operation of the dam compared to alternative strategies.

### 21.2.6 Carbon Offsetting through Timber Plantations

As detailed in **Section 14.4.2 (B)** much of the land purchased or to be purchased by QWI is suitable for native timber plantations. Timber Queensland Ltd reviewed the feasibility of native timber plantations in the area and concluded that the land has good potential to support a significant forestry development, and a forestry development of this nature would have a range of potential benefits including delivering carbon sequestration benefits to help offset those emitted during dam construction. A copy of this report can be found in Appendix C18. QWI's target is to establish plantation of more than 2,000ha over time, which should also contribute to offsetting operational emissions. Should Stage 2 of the dam proceed and plantations been established on land to be inundated by Stage 2, these plantations would be replaced to ensure the carbon offset would be maintained.

According to the Australian Standard "Afforestation and Reforestation" (AS 4978.1-2006) a project is eligible for reforestation if the land use has changed since a reference date. In accordance with the requirements of this program the Project shall establish that the planted area was non-forest at the nominated reference date; that the area used when calculating carbon stocks excludes any areas of pre-existing forest; and that forest has been established.

Several issues were raised regarding carbon offsetting. In particular, these included the timelessness of emission reductions, permanence and additionality.

Timelessness - In this case timelessness refers to carbon sequestration in the biomass occurring over many years, while the GHG emissions associated with the construction of the Traveston Crossing Dam would occur now. While there is no immediate solution to this problem, the nature of carbon emissions is the longer term impacts on climate change, as such a longer term view of offsets has been taken into consideration. Long term carbon sink options have been investigated and discussed in the report prepared by Timber Queensland Ltd (Traveston Crossing Dam: Proposed Forestry Development, 2007). QWI is committed to carbon sequestration through the establishment of tree plantations to offset GHG emissions during construction. There consequently will be a delay before all emissions can be offset.

Permanence – Permanence refers to the potential for release of the stored $CO_2$ when trees are harvested, burnt, or decomposing etc. Plantations managed on a regular rotation continue to capture carbon from the atmosphere until they are harvested. The fate of the stored carbon depends on what happens to the tree. Under Kyoto-based accounting principles the carbon stored in plantations is considered to have been released to the atmosphere when harvested. As such, the overall carbon captured by managed plantations depends on maintaining a pool of carbon over time. By staggering the establishment and harvest cycles there is a pool of carbon over time. A simple assumption that can be used for plantations is that if there is a regular planting and harvest cycle across the estate, then around 40% of the carbon stored in a mature plantation will remain available at any time. A conservative estimate of the amount of carbon stored in wood products after the first rotation would be around 30% of the stem carbon at the end of the rotation (Queensland Timber, 2007). In addition, other plantations are being investigated, including the development of bio-fuel crops, native honey trees, and native flower plants.

Not all land will be suitable for plantations and will be more suited to native revegetation. A direct example of this is QWI's trial hardwood plantation at Traveston Crossing Road. While some 20 ha of hardwood trees were planted, a further 6ha of revegetation was provided.

Additionality - Additionality refers to the assessment of the extent to which a project that reduces greenhouse gases is over and above (or in addition to) business as usual. In this case Additionality specifically refers to actions undertaken to sequester carbon that would not otherwise have taken place. While farm management over the next 100 years is difficult to predict QWI can state that 2,000 ha or more have the potential to support forestry development (Timber Queensland, 2007), and every effort would be made to ensure tree plantation occurs.

The proposed management approach for the planting of trees required for carbon offset purposes or for environmental purposes will be subject to appropriate management requirements to ensure a long term viable planting regime. Plantations become self sufficient within five years of planting with a stocking target rate of 1000 stems/ha. The expectation is that at 12 years post planting, the plantation will be self sufficient with approximately 300 trees/ha for commercial plantations and between approximately 300 – 500 trees/ha for environmental planting purposes. Commercial plantations will be subject to independent commercial contractual arrangements.

The following management conditions are proposed:

- the required number of trees will be planted progressively from the commencement of the project and be completed within three years or at the time of commissioning of the dam, whichever is the latest; and
- the planting will be actively maintained for a period of five years to ensure their viability and with adequate viable stock to ensure the equivalent, within 12 years, of a minimum 300 tree/he for commercial plantation or between 300 – 500 tree/ha for environmental planting purposes.

### 21.2.7 Independent Verification

Submissions have also called for independent verification of the GHG emission assessment by a certified auditor.

Calculations made in this assessment regarding $CO_{2\text{-}e}$ emissions for various activities associated with construction and operations have been conducted using the approved methods as set out in the *National Greenhouse Accounts (NGA) Factors* (DCC, 2008a).Where emission factors were not available the relevant IPCC methodologies have been adopted (IPCC, 2006).

Independent certification of greenhouse gas emissions usually occurs at the stage of project where direct cost implications of emissions are realised, for example at a time when QWI look to offset the carbon emissions of the dam project.

QWI has entered into a MOU with Griffith University, which includes the scope for independent calculation of GHG emission assessment. In addition, as part of the Sustainability Principles QWI has committed to, the CSIRO will provide regular audits of project approval condition compliance.

### 21.2.8 Sediment Trapping and Flow on Effects for Oceanic Plankton

Concern has been raised regarding the build up of sediments upstream of dams which may have flow on effects for inshore sediment concentrations. Nutrients from rivers play an important role in fertilizing oceanic plankton, which in turn absorb $CO_2$ from the atmosphere. The submission claimed to quote the IPCC stating that in the absence of oceanic plankton atmospheric $CO_2$ emissions would be 55% higher than present levels. While the exact IPCC quote concerning the absorption of $CO_2$ by oceanic plankton was unable to be sourced another source The *Oceanic Sink for Anthropogenic $CO_2$* (2004) has been quoted as saying "Without oceanic uptake, atmospheric $CO_2$ would be about 55 ppm (parts per million) higher today than what is currently observed (~380 ppm)". This quote refers to the entire biogeochemical oceanic uptake and is not specific to oceanic plankton. Also from research into carbon sinks and plankton, it has been found that the majority of carbon dioxide is absorbed by the ocean (due to it's solubility) rather than oceanic biological sources.

The EIS states that the dam will capture some of the sediment transported off the land. Suspended sediment at the river mouth due to the Project is expected to be 20% less than at present, and present levels are considered higher than pre-European levels.

### 21.2.9 Vegetation Reuse

Submissions commented that no detail was provided regarding the beneficial reuses (such as furniture or woodchips). QWI will seek to have all millable timber reasonably assessable within the future inundation area recovered prior to storage commencing. This timber will be made available to the market for appropriate products, which will be relative to the timber quality and volume. In addition, there will be scope for boutique timber getting access to source timber and vegetation materials for products not utilised by commercial timber extraction operations. Such materials may include bush furnishing materials and potential pieces for artwork. Accessing these sources will also take into consideration workplace and site safety requirements to minimise any risk to those in the field.

The majority of vegetation not sourced by the above operators, will be utilised for woodchips, particularly for local use at recreational facilities and timber plantations. In addition, suitable logs and snags will be placed strategically for use as fauna refuges for both terrestrial and aquatic fauna.

### 21.2.10 Land Clearing

A submission claimed that land clearing has already commenced at the site of the proposed Dam wall which would then be used for reaforestation and thus act as a carbon offset. However, this is not the case, clearing has not occurred.

### 21.2.11 Surface Weed Growth and GHG Emissions

A submission asked for consideration of weed growth on the surface of the dam and associated GHG emissions. Aquatic weeds would uptake $CO_2$ while growing; however, when they die they will release this $CO_2$ and methane as they decompose. Under normal operations these emissions are considered relatively small. However, should any major growth of surface weeds be allowed, there is potential for the accumulation of a large amount of biomass. When the weeds die there would be a greater amount emissions associated with the decomposition of the weeds. However, such blooms would need to be managed for a wide range of reasons and should not be allowed to get to this stage. A description of the proposed weed management measures is provided in Sections 18.3.3.3 and 19.3.1 of the Supplementary Report.

### 21.2.12 Discrepancy between EIS and Overview

A submission commented that the "Overview" document stated that 96,545 tonnes $CO_{2\text{-}e}$ would be released due to land clearing, but this was not included in the EIS. In this context the 96,545 tonnes $CO_{2\text{-}e}$ refers to net emission and was included in the EIS in Table 10.10, Section 10.2.5.2. Here it was stated that approximately 171,290 tonnes of $CO_{2\text{-}e}$ may be lost from vegetation clearing associated with the project. It was estimated that up to half of the native timbers cleared could be used for beneficial reuse such as furniture or wood chips - approximately 74,745 tonnes $CO_{2\text{-}e}$. This net result is an emission of 96,545 tonnes $CO_{2\text{-}e}$, which is the total provided in Table 10.10 as well as the "Overview" document.

### 21.2.13 Reduction in Dairying

A submission raised the issue that the dairying and stocking would occur elsewhere and therefore balance any GHG emissions/sinks associated with the project. The EIS states that the Project may result in a reduction in dairying and stocking and this would act to offset GHG emissions, however, given the uncertainty associated with the amount of offset that may occur these offsets have not been quantified in Project GHG calculations.

### 21.2.14 Life Span of the Project and Kyoto Protocol

An issue with the time frame used to investigate GHG impact has also been raised. A submission stated that the EIS appears to have used a 50 year life volume when as a signatory to the Kyoto Protocol a life span of 100 years should have been used. This reference in the EIS has not been identified, however it should be noted that all emission calculation were conducted in accordance with the *National Greenhouse Accounts (NGA) Factors* (DCC, 2008a).*The AGO Factors and*

*Methods Workbook* (AGO, 2005), or IPCC methodologies, which use the global warming potential for GHG over a 100 year period.

### 21.2.15 Fuel Usage and Scope Definition

Offsite fuel usage was calculated in the EIS and considered to be Scope 3 emissions i.e. indirect emissions associated with the project. A submission comment was that these emissions should be classed as Scope 1 as they are directly related to the Project and would not occur otherwise. In response to this query, offsite fuel usage is classed as Scope 3 as it is an indirect emission which is the consequence of Project but are not from a source owned or controlled by the Project proponent. However, these were considered as part of the project emissions as they would be contracted out to work on the project.

Further, a submission pointed out that classifying fuel usage as Scope 3 and reporting on it in the EIS, but also classifying embodied emission associated with dam construction as Scope 3 and not reporting on it in the EIS for this reason is inconsistent. In response to this and other requests for embodied emissions associated with construction to be calculated, these emission have been quantified as best possible in **Section 21.2.2** of this Supplementary Document.

### 21.2.16 Realignment of Existing Road Network and GHG Emissions

A submission inquired about the realignment of the existing road network to travel around the dam and the associated increase in fuel use and GHG emissions. Transport and access arrangements have been discussed in Chapter 13 of the EIS. Here it states that approximately 32 km of road will be upgraded or realigned. Traffic forecasts provided by ARUP for 2021 indicate that 24 hour traffic flows along the Bruce Highway between Sankeys Road and Traveston Road are not likely to change significantly as a result of the Project (a reduction of less than 1% is forecast with the Project). The expected change in distance travelled will be relatively small, and GHG emissions resulting from realignment to local roads and the Bruce Highway as a result of inundation is expected to be minimal.

### 21.2.17 Emissions Associated With Decommissioning

The nominal engineering design life of the Project is expected to be 100 years, although it is likely to be maintained after that period provided that it continues to meet dam safety requirements and remains an integral part of the regional water supply strategy. A submission calls for an assessment of GHG's associated with the decommissioning of the project.

Greenhouse gas emissions associated with the decommissioning of the dam would broadly include: fuel usage associated with on sight equipment and vehicles, transport vehicles to and from the site; electricity consumption associated with site offices and other site infrastructure; and the release of GHG from accumulated sediments (Pacca, 2007).

Assessing the decommissioning of the dam was beyond the scope of the EIS as set out in the TOR. The full detail is also not understood at this point in time, and no emission estimation techniques have been identified by either the Department of Climate Change or the IPCC. As such impacts are unable to be quantified.

### 21.2.18 Uncertainty of Trees as Sinks vs the Dam as a Source

An issue raised by the submissions was the uncertainty associated with tree planting carbon sequestration compared to emissions associated with dams, which are relied upon in the EIS. Carbon sequestration associated with tree planting has been well documented in literature and is considered an appropriate method to offset carbon generation by the Australian Government. Timber Queensland (2007) prepared a report for QWI which included an estimate of carbon sequestration due to plantations. These preliminary estimates were based on the Department of

Climate Change FullCAM model (2006). The FullCAM model is used to estimate all biomass, litter and soil carbon pools in forest and agricultural systems. In addition to this, it accounts for changes in major greenhouse gases, nitrogen cycling and human-induced land use practices. Also considered were general methods as outlined in Meynink and Borough (2007) and external carbon accounting specialist advice.

Emission estimations from the dam itself due to the breakdown of the pasture grasses and other vegetation have been discussed in **Section 21.2.3**, and it has been conducted by Blumfield (2008) review that there is still great uncertainty associated with the estimation of GHG emissions from dams. It is acknowledged that both the calculation of carbon sequestration due to tree planting and emissions associated with flooding have uncertainty associated with them. However, emissions from flooded areas are still in the more preliminary stage of investigations compared to sequestration due to tree plantations.

### 21.2.19 Reporting Units

The reporting units presented in the Greenhouse section are in million tonnes (Mt). According to a submission, this is inconsistent with the rest of the EIS and gives the impression of trying to make the impacts look smaller than they actually are. Emissions presented in Section 10 of the EIS are in tonnes. The "Overview" document states $CO_{2\text{-}e}$ emissions as both tonnes and Mt, which is an internationally accepted convention for the presentation of units. While this may be perceived as an inconsistent representation, it was not intended to mislead the reader.

### 21.2.20 Relevance of the National Greenhouse and Energy Reporting Act

The EIS refers to the National Greenhouse and Energy Reporting Bill 2007, now the National Greenhouse and Reporting Act 2008 (NGER). The NGER Act makes it mandatory for corporations to report annually on their GHG emissions and energy consumption at certain thresholds which will be phased in from July 2008. A corporation will meet a threshold in a financial year if, in that year, they emit or consume energy at or above:

a) 125 kilotonnes (kT) CO2-e or 500 terrajoules (TJ) of energy for the 2008-2009 financial year;
b) 87.5 kT CO2-e or 350 TJ of energy for the 2009-2010 financial year; and
c) 50 kT CO2-e or 200 TJ of energy for the 2010-20-11 financial year.

At a facility level, the threshold of 25 kilotonne $CO_{2\text{-}e}$ or 100 TJ of energy per financial year will apply from the commencement of the reporting system on 1 July 2008.

A submission suggested that the NGER Act was not relevant to the EIS, and the EIS should be more general. However, the Act is relevant to the Traveston Crossing Dam project as it is predicted that 177,808 tonnes (177 kilotonnes) $CO_{2\text{-}e}$ would be emitted per annum from direct energy use (refer to **Table 21-5**) thus triggering the reporting threshold for this aspect of dam operations.

### 21.2.21 Comparison with Precedent Projects

A submission has been received which queries whether the assessment of GHG emissions in the EIS is consistent with approaches reviewed by recent judicial decisions. In particular, the submitter cites the Nathan Dam, Hazelwood Power Station and Anvil Hill Coal Mine cases as providing precedents for the necessity to fully assess GHG emissions.

The decisions in the cases cited by submitters and others, in addition to other relevant material on the issue, have been used to inform the extent to which GHG emissions have been assessed in the EIS and this Supplementary Report.

The Nathan Dam decision in the Federal Court (*Queensland Conservation Council v Minister for Environment and Heritage* [2003] FCA 1463; *Minister for the Environment and Heritage v Queensland Conservation Council Inc* [2004] FCAFC 190) was cited by the submitter as authority that "all adverse impacts including direct, indirect, upstream, downstream and third party impacts are required to be assessed under the EPBC Act". Subsequent to this decision the EPBC Act has been amended to clarify that an indirect consequence of an action is a relevant 'impact' of the action, and requires assessment, if the action 'is a substantial cause of that event or circumstance' (see s.527E of the EPBC Act).

A concluded approach has yet to be determined by the Court as to how this definition of 'impact' determines the extent to which downstream GHG emissions must be assessed under the EPBC Act. The Hazelwood Power Station and Anvil Hill cases cited by the submitter relate to jurisdictions and address impacts that are not directly comparable to the assessment of GHG emissions for the current project. In particular, these two cases relate to the development of coal mines (with the product coal destined for burning in power stations in Australia or overseas) whereby a direct link can be attributed to the production of coal and the downstream release of GHG emissions with consequent environmental impacts.

The decision in the NSW Land and Environment Court in relation to the Anvil Hill project (*Gray v Minister for Planning* [2006] NSWLEC 720 (*Anvil Hill*)) held that, in that jurisdiction, the principle of ESD required the downstream impacts (scope 3 emissions) of coal production be assessed, as a sufficient proximate link existed between coal production and GHG emissions contributing to climate change. Notwithstanding this, it was specifically noted by the Court that ESD principles do not require the issue of GHG emissions to override all other relevant considerations.

Following this NSW decision, there have been two further Federal Court EPBC Act cases that have considered the issue of GHG emissions and impact on MNES. The case of *Wildlife Preservation Society of Queensland v Minister for Environment and Heritage* [2006] FCA 736 (*Isaac Plains*) related to the adequacy of the assessment of the GHG emissions for a coal mine project in Queensland, from which a significant portion of coal produced would be exported. The Federal Court found that while it was satisfied that GHG emissions from the burning of coal might arguably cause an impact on a protected matter, it was "*far from satisfied that the burning of coal at some unidentified place in the world, the production of greenhouse gases from such combustion, its contribution towards global warming and the impact of global warming upon a protected matter could be... described*" as affecting a matter of environmental significance and that in any event, any additional impact on these matters would be insignificant.

The most recent judgement on the issue, *Anvil Hill Project Watch Association Inc v Minister for the Environment and Water Resources* [2007] FCA 1480 (*Anvil Hill 2*), constituted an appeal on the EPBC Act approval to proceed with the Anvil Hill mine noted above. In dismissing the appeal, the Federal Court found that whilst the production of additional GHG emissions may contribute to climate change, it was not satisfied that the increase would be likely to have a significant impact on a matter of national environmental significance. This decision is notable in that the GHG emissions of the Anvil Hill mine were not considered likely to have a significant impact on MNES as they constituted only 0.4% of the global and 2% of Australia's annual GHG emissions.

The general approach in recent environmental assessments, which was endorsed by the Courts in these cases, is to assess Scope 1 and 2 impacts of the Project, and those Scope 3 impacts that can be reasonably and quantifiably attributed to the Project.

Consistent with these decisions, in Chapter 10 of the EIS and Chapter 21 of this Supplementary Report, QWI has assessed the direct emissions that will be produced as part of the construction and operation of the project, and those indirect emissions that have been facilitated to a major extent by the Project.

The Project's GHG emissions are projected to constitute:

- approximately 0.04% of Australia's 2005 annual GHG emissions during the construction phase; and
- approximately 0.03% per annum of Australia's 2005 annual GHG emissions during the operational phase

Both of which are considerably less than the amounts considered in Anvil Hill and Isaac Plains as being unlikely to have a significant impact on MNES.

#### 21.2.22 Underestimate of Area to be Cleared

The area defined for clearing has been calculated using Project information in a GIS and is considered to be as accurate as possible.

#### 21.2.23 Loss of Existing Agricultural Land

A submission stated that the relocation of agricultural land in the area and re-location further afield would result in longer haulage of goods from the source to the consumer, thus increased fuel consumption and associated GHG emissions.

Approximately 1.7% of agricultural land in the Mary River Basin will be affected by the Project and the value of production, as a percentage of Queensland output, represents 4.3% of dairy production and 0.1% of beef, horticulture and other industries. While these impacts create a cost for the local community, they are too small to have any significant impact on overall food prices for the SEQ region (although the impact on the dairy industry is slightly larger). Most of the vegetables grown in the SEQ region are sourced from the Lockyer Valley (around 90km south west of Brisbane). In addition, a large proportion of fruit and vegetables are sourced from north Queensland and southern States, indicating that transport costs are already incorporated in fruit and vegetable prices.

Thus the net impact on business in the region should be low, and many farmers will be able to establish new farming enterprises in the region.

It is acknowledged that agriculture and production will need to be relocated or expanded in areas nearby or further afield. At this stage it is not know where this will be, as such an assessment of changes to transport is not possible.

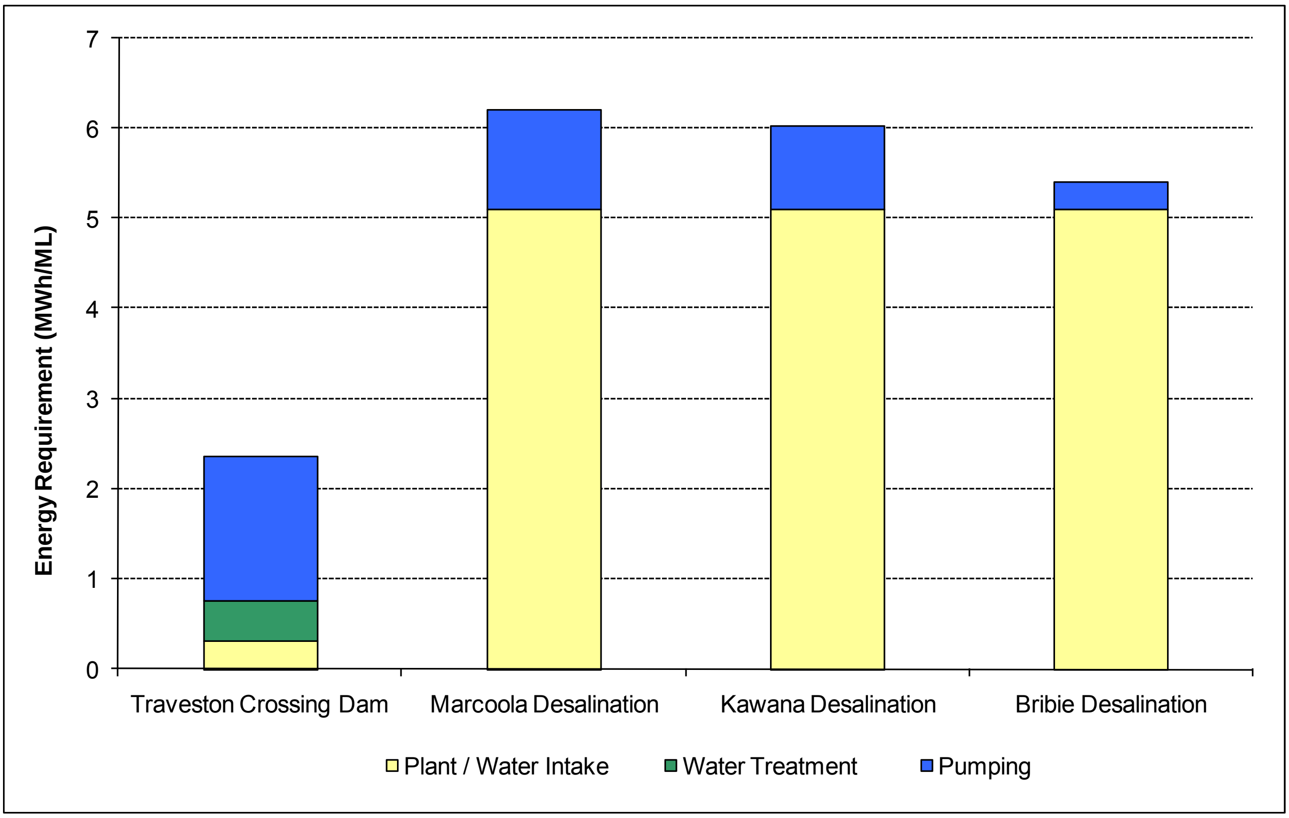
#### 21.2.24 Energy Consumption

Submissions have also asked for information regarding operational energy consumption of the Dam and the Northern Pipeline Interconnector compared to alternative water supplies. The quantities presented here are considered the most up to date at the time of writing with regards to this project.

As identified in Chapter 2 of the EIS, an assessment of alternatives identified Traveston Crossing Dam as the most economically viable source of the necessary supply of water, with desalination as the next viable alternative. **Figure 21-2** provides a graphical representation of energy requirements for the production (i.e. plant energy or treatment) and distribution (i.e. pumping) of the Project compared to other potential desalination options. Here it can be seen that while the Project requires greater energy for water distribution, the total energy requirements are much lower for Traveston Crossing Dam than any of the desalination plant options.

Irrespective of the location of a desalination plant (including Marcoola, Kawana, or Bribie Island), which yields the equivalent amount of water as the Traveston Crossing Dam, the energy consumed by the desalination plant, and hence the GHG emissions, would be in the order of 2 to 2.5 times greater.

**Figure 21-2 Energy Required for Plant Operation / Water Treatment and Distribution of Various Water Supply Options**

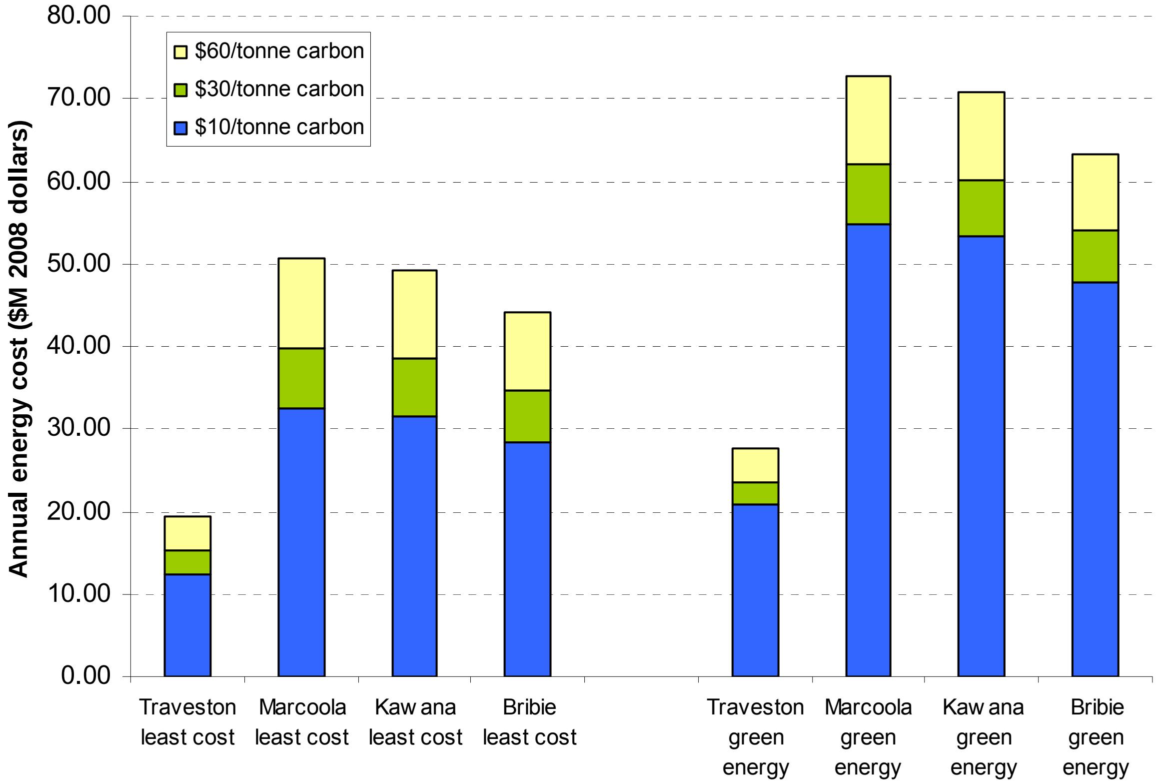



While an assessment of the embedded emissions for the alternative supply option of desalination has not been undertaken because this would be dependent upon the specific site conditions of the desalination plant, the elements that would make up the embedded emissions for a desalination plant would include:

- site clearing;
- site excavation;
- diesel use for transport of materials and construction;
- cement production;
- aggregate sourced from quarries;
- steel production;
- tunnel boring for intake and outlet pipes;
- tunnel boring for interconnection to the grid; and
- electricity transmission line augmentation.

Submissions have queried whether renewable energy could be used to negate the impact of the significant greenhouse emissions that would be associated with a desalination plant located on the coastal areas north of Brisbane. It is recognised that renewable energy could be used to power a desalination plant, in the same way that renewable energy could be used to power the energy requirements of the Traveston Crossing Dam. However, it should be noted that the use of renewable energy has a significant cost burden associated with it. An analysis of the cost associated with the use of renewable energy was conducted by consultants Energy Edge (2008) (Appendix C19). This analysis concluded that the use of renewable energy for a desalination plant would increase the annual operating costs by $22.1 million. In comparison, the use of renewable energy for Traveston Crossing Dam would increase annual operating costs by $8 million. The reason that the use of renewable energy has such a significant impact on the annual operating costs for a desalination plant in comparison to the Traveston Crossing Dam is that desalination uses significantly more power. The results of the analysis are graphically in **Figure 21-3**.

**Figure 21-3 Annual Energy Acquisition Costs for a Desalination Plant or Traveston Crossing Dam (real 2008 dollars) via Commercial or Green Energy, each with Three Carbon Cost Scenarios (Energy Edge, 2008)**




The operating costs for each of the relevant scenarios above was then included in the overall whole of life costs for desalination and Traveston Crossing Dam. This direct comparison, as opposed to a comparison of water supply portfolios was undertaken as a sensitivity test in Marsden Jacob's 2007 Economic Report (s4.5.4 of the 2007 Economic Report).

Green energy costs further increase the differential in cost between the Project and desalination, with the cost of desalination being an estimated $579 million to $807 million greater than Traveston Crossing Dam if green energy is utilised (in favour of Traveston). These results show that the use of green energy adds an increased margin to the significant cost difference between Traveston

Crossing Dam and a desalination plant located on coastal areas north of Brisbane. The analysis of green energy usage and comparison is further discussed in Section 6.3.1.1.2.

### 21.2.25 Appropriate Estimation of GHG Emissions and Methodology

An issue raised was that the EIS significantly underestimates GHG emissions associated with the Project and overestimates proposed sequestration. However, GHG emissions attributable to the project have been considered in terms of direct (site) emissions and indirect (off site) emissions, where relevant. The assessment was undertaken in accordance with the appropriate methodologies at the time by the *AGO Factors and Methods Workbook, December 2006*, which was recently superseded by the *National Greenhouse Accounts (NGA) Factors, January 2008*; and AGOs National Carbon Accounting Toolbox.

The methodology used in this assessment has been documented throughout the Chapter 10 of the EIS and this Submissions Report. This methodology details data sources and GHG emission factors used.

### 21.2.26 Construction GHG Emission Summary

This section of the report provides a summary of GHG emissions calculated as part of the EIS and submission response paper. A summary of emissions associated with dam construction is provided in **Table 21-7**.

**Table 21-7 Summary of GHG Emissions Associated with Construction**

| Emission source | Estimated usage during construction | Emission factor | Annual GHG Emission (tonnes $CO_{2-e}$) | Total GHG emission during construction (tonnes $CO_{2-e}$) | Source / Reference |
|---|---|---|---|---|---|
| **Scope 1 Emissions** | | | | | |
| Diesel used on site[1] | 5,410 kL / yr | 2.7 t $CO_{2-e}$ /kL | 14,608 | 36,521 | EIS Table 10.8 |
| Explosives (heavy ANFO) | 400 t / yr | 0.178 t $CO_{2-e}$ /t | 70 | 178 | EIS Table 10.8 |
| Clearing vegetation | 424.3 ha | | | 171,290 | EIS Table 10.10 |
| Cleared vegetation reuse and recycling | | | | -74,745 | |
| **Scope 2 Emissions** | | | | | |
| Electricity use during construction | 73 MWh | 1.046 | 75 | 190 | EIS Table 10.9 |
| **Scope 3 Emissions** | | | | | |
| Off site diesel use – transporting aggregate and flyash[2,3] | 1,314 kL / yr | 2.7 t $CO_{2-e}$ /kL | 3,549 | 8,873 | EIS Table 10.9 |
| Cement production | 115,100 tonnes | 0.534 | - | 61,463 | Section 21.2.1 of this report |
| Quarrying for aggregate | - | - | - | 6,540 | Section 21.2.1 of this report |

[1] Includes estimates of vehicle kilometres travelled during spoil placement within the inundation area and Burnett River Dam site diesel usage

[2] Includes estimates of vehicle kilometres travelled during haulage from Moy Pocket Quarry and flyash / cement from Brisbane

[3] Fuel usage would be reduced with materials sourced at dam site

### 21.2.27 Conclusion

QWI has undertaken an assessment of the emissions associated with construction and operation of the Traveston Crossing Dam. In addition, an assessment has been undertaken of the emissions associated with an alternative desalination plant, which concluded that desalination would emit between 2 and 2.5 times the emissions of Traveston Crossing Dam. QWI will offset Scope 1 emissions from construction of Traveston Crossing Dam through the establishment of timber plantations. Overall, QWI is aiming to establish 2000 hectares of timber plantations, which should also contribute to offsetting operational emissions.